



**SUNCOR ENERGY INC.  
Base Mine Extension**

**DETAILED PROJECT DESCRIPTION**

July 2020



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## **EXECUTIVE SUMMARY**

Suncor Energy Inc. (Suncor) is submitting a proposal to develop the Base Mine Extension Project (the Project). All plausible pathways to address global emissions need energy from fossil fuels and Suncor views Canada's world class, strategic oil sands resource as a key part of the energy future for decades to come. Commensurate with Canada's ambitions, Suncor is committed to a long-term strategy of reducing absolute emissions. With the innovation we are known for, Suncor can provide the world with trusted low carbon energy.

Suncor has invested billions of dollars in infrastructure that produces value added products to meet the energy needs of Albertans and Canadians. This Project is necessary to continue to add value with this infrastructure. The bitumen from this project will supply the existing upgraders at Suncor's Oil Sands Base Plant operations (Base Plant) when the current mines are depleted. The Project is adjacent to Base Plant and includes an open pit mining operation and extraction facilities. Production is expected to be nominally 225 thousand barrels per day of replacement bitumen during the estimated 25-year operational life of the Project.

The Project application will be based on the best-available technology. In parallel, Suncor is assessing new technologies, such as non-aqueous extraction. The potential benefits of these new technologies under evaluation include the improvement of operational performance, reduction of the overall footprint, acceleration of reclamation timelines, and/or reduction of greenhouse gas emissions associated with operations. In addition, Suncor will concurrently be pursuing paths to reduce emissions in other areas of its business and in ways that sequester carbon and produce net benefits.

Significant socio-economic benefits and opportunities for Indigenous communities, local communities, the Province of Alberta, and Canada are expected to be generated by the Project. The benefits include:

- continued generation of municipal, provincial, and federal tax and royalty revenue
- direct and indirect local and national employment
- investment in innovation and technology development

Production is anticipated to support continued operations of existing infrastructure as mining transitions from the existing mines to the Project. Suncor is committed to working with regulators, governments, Indigenous communities, and stakeholders to seek approval for this Project, while ensuring we are caring for each other and the earth, with a view to the long-term interests of Canada and its Peoples.

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## **INTRODUCTION**

This information has been prepared according to the *Impact Assessment Act* Guide to Preparing an Initial Project Description and a Detailed Project Description (Government of Canada 2019a) and Annex II of the guide, which aligns with Schedule 2 of the Information and Management of Time Limits Regulations. Sections 1 through 24 below correspond to requirements 1 through 24 as outlined in Annex II of the guide. A list of references is provided in Appendix A. A glossary of technical terms and definitions of abbreviations used in this document are provided in Appendix B.

## **PART A: UPDATED GENERAL INFORMATION**

### **1. THE PROJECT'S NAME, TYPE OR SECTOR AND PROPOSED LOCATION**

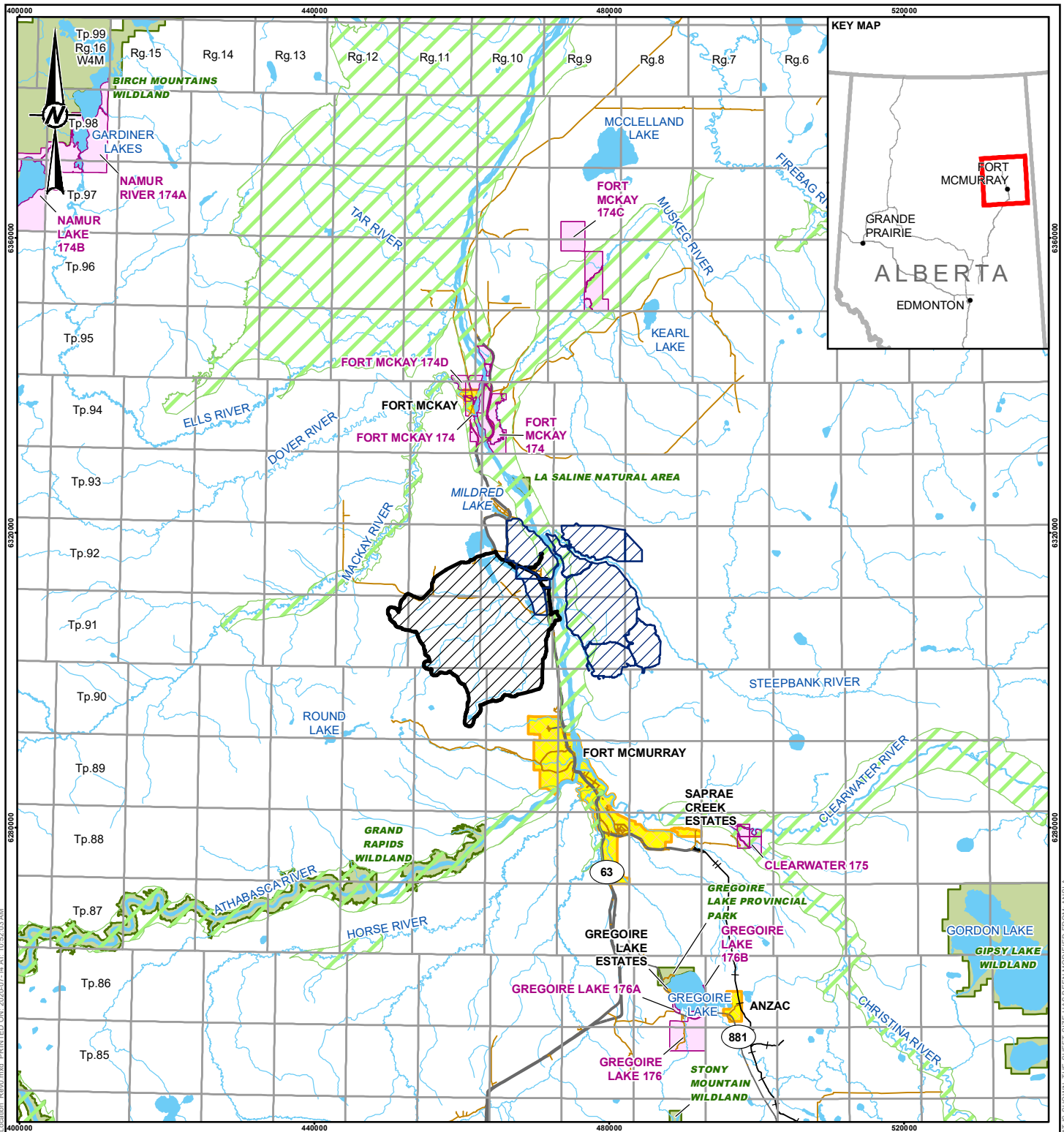
Suncor Energy Inc. (Suncor) is proposing to develop the Base Mine Extension Project (the Project) to sustain the supply of bitumen to the existing upgraders at Suncor's Oil Sands Base Plant operation (Base Plant) as the mineable bitumen resource is depleted in the existing mines. The Project includes an open pit mining operation supplying oil sands to a new bitumen froth production facility, from which bitumen froth will be delivered by pipeline to Suncor's existing Base Plant facilities where further processing occurs, including upgrading into various product blends for market. The Project is located adjacent to Base Plant and north of the city of Fort McMurray, Alberta, within the Regional Municipality of Wood Buffalo (Figure 1). Additional details on the Project location are provided in Section 13.

### **2. PROPONENT'S NAME AND CONTACT INFORMATION**

The proponent's name is Suncor Energy Inc.

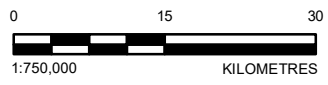
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150 – 6 Avenue SW  
Calgary, Alberta T2P 3E3  
Project email: BaseMineExtension@suncor.com  
Project phone number: 1-855-955-3054



- LEGEND**
- PRIMARY HIGHWAY
  - SECONDARY HIGHWAY
  - LOCAL ROAD
  - WATERCOURSE
  - RAILROAD
  - OPEN WATER
  - POPULATION CENTRE
  - FORT MCMURRAY URBAN DEVELOPMENT SUB-REGION
  - FIRST NATION RESERVE
  - PARK / PROTECTED AREA

- KEY WILDLIFE AND BIODIVERSITY ZONE
- BASE PLANT OPERATION
- PROJECT DEVELOPMENT AREA



PROJECT  
**BASE MINE EXTENSION**

TITLE  
**PROPOSED PROJECT LOCATION**



CLIENT	YYYY-MM-DD	2020-07-14
DESIGNED	JG	
PREPARED	PT	
REVIEWED	ZG	
APPROVED	JH	

PROJECT NO.	PHASE	REV.	FIGURE
19124718		0	1

PATH: I:\CLIENTS\SUNCOR\19124718\MapInfo\Products\DP\Drawings\19124718\_F01\_ProjectLocation\_Rev0.mxd PRINTED ON: 2020-07-14 AT: 10:52:03 AM  
 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

## **PART B: PLANNING PHASE RESULTS**

This section of the Detailed Project Description provides a summary and results of any engagement undertaken with any jurisdictions or other party as well as with Indigenous peoples of Canada. Included within this section is Suncor’s response to the Summary of Issues that were issued in response to the Initial Project Description. This section also reviews studies, plans, or strategic assessments that are relevant to the Project.

Suncor recognizes that the COVID-19 pandemic presents some unique challenges for engagement with stakeholders and Indigenous communities. Suncor has responded by adapting engagement approaches to rely on direct mail, individual email correspondence, phone, and conference calls as well as video conferencing where available. Suncor also has accommodated needs of stakeholders and Indigenous communities by collaborating with the Impact Assessment Agency of Canada (IAAC) to extend the Initial Project Description comment period from 20 to 60 days. The comment period closed on May 1, 2020.

### **3. ENGAGEMENT WITH JURISDICTIONS OR OTHER PARTIES**

Engagement with jurisdictions or agencies during the development of the Detailed Project Description is provided in Table 1.

**Table 1: Engagement with Jurisdictions or Agencies**

<b>Agency or Jurisdiction</b>	<b>Engagement</b>
Impact Assessment Agency of Canada	<ul style="list-style-type: none"> <li>• Discussion on project scope, location, schedule, engagement planning and regulatory process</li> <li>• Discussion regarding alignment of Federal and Provincial regulatory processes</li> <li>• Review of the Initial Project Description</li> <li>• Initial discussion on the content of the Detailed Project Description</li> <li>• Extension of the Initial Project Description comment period</li> <li>• Receipt of the Summary of Issues</li> </ul>
Fisheries and Oceans Canada	<ul style="list-style-type: none"> <li>• Discussion on project, scope, location, and schedule</li> <li>• Discussion regarding fish habitat offsetting options and engagement approaches</li> <li>• Preliminary discussions related to fisheries offsetting requirements</li> </ul>
Alberta Energy Regulator	<ul style="list-style-type: none"> <li>• Discussion on the Project scope, location, schedule, engagement planning, regulatory requirements, and field work</li> <li>• Discussion regarding wetland assessments</li> <li>• Discussion regarding assessment of resource drilling density for the Project</li> <li>• Discussion regarding alignment of Federal and Provincial regulatory processes</li> </ul>
Alberta Aboriginal Consultation Office	<ul style="list-style-type: none"> <li>• Pre-Consultation Assessment submitted and processed by the Aboriginal Consultation Office</li> <li>• Aboriginal Consultation Office determined five communities for Consultation: Athabasca Chipewyan First Nation, Fort McKay First Nation, Fort McMurray First Nation #468, Fort McMurray Métis Local 1935 (Credibly Asserted Métis Association), and Mikisew Cree First Nation</li> </ul>
Regional Municipality of Wood Buffalo	<ul style="list-style-type: none"> <li>• Discussion on the Project scope, location, schedule, engagement planning and regulatory process</li> </ul>



The Summary of Issues and Suncor's responses to those issues is provided in Appendix C. Issued raised only by jurisdictions and other parties include (note that issues raised by jurisdictions, other parties and Indigenous groups are noted in the list of issues included in Section 4):

- potential effects to the environment from accidents and malfunctions
- clarity on the spill prevention, preparedness, response measures and systems, response capacity and emergency management plans
- clarity on alternate means of carrying out the Project
- clarity and further details on the alternatives to the Project
- clarity on whether Canadian Ambient Air Quality Standards and Objectives will be used
- consideration of secondary pollutants such as ozone
- potential for increased production of secondary organic aerosols
- potential effects of the Project and cumulative effects to terrestrial and aquatic ecosystems associated with changes in air quality and deposition of atmospheric contaminants
- acidification and exceedance of ecosystems' critical loads
- contribution of the Project to light pollution and potential effects to nearby communities
- clarity on the scope of activities included in the annual estimates of greenhouse gas emissions for each phase of the Project
- clarity on the specific technologies and practices under consideration to reduce the Project's greenhouse gas emissions
- potential effects of the Project on the ability to achieve the Wood Buffalo National Park Action Plan goals
- potential effects to drinking water treatment facilities
- potential effects to local municipal infrastructure and increased financial and environmental liability associated with re-routing of the Poplar Creek Road
- potential effects of climate change on the Project
- production of silica dust and potential effects on human health
- effects of the Project to regional Indigenous peoples, residents, and businesses of Fort McMurray and Fort McKay due to impacts to visual aesthetics
- potential generation of odours and solvent vapors
- potential health effects of diesel exhaust particulate matter
- clarity on the proponent's plans to ensure compliance with the Migratory Birds Convention Act
- potential effects of the Project and cumulative effects to migratory birds
- potential mortality of migratory birds due to contact with harmful substances in tailings ponds or other contaminated open water on the Project site
- clarity on measures to mitigate, monitor, and adaptively respond to potential effects to migratory birds
- potential effects of the Project and cumulative effects to wildlife and other species at risk due to the loss of habitat and migration corridor area and quality, diversity, change in predator movements, and potential changes in soil quality and quantity that may result in reduced soil productivity
- potential injury or death of species at risk
- potential effects of the Project and cumulative effects to species at risk
- consideration of all migratory bird, non-migratory bird, and terrestrial species at risk
- potential effects of the Project to whooping crane population survival and migration behaviours

- analysis of current socio-economic environment, considering demographics, socio-economic conditions, and cultural trends, including relevant laws and policies
- inclusion of monitoring programs to reveal inequalities and design mitigation strategies regarding effects to specific populations
- potential effects of the Project and cumulative effects to groundwater recharge and discharge quantities, groundwater levels, and groundwater-surface water interactions
- potential effects of tailings facilities and wastewater streams
- potential effects to ecosystem function due to the removal of waterbodies and watercourses in the Project area

Suncor believes there is one issue raised by jurisdictions in the Summary of Issues that, while Suncor will conduct Gender Based Analysis Plus (GBA+) assessments to support the Project application, as well as participate in the suggested monitoring programs, it believes the establishment and management of such programs is outside of its care and control. The concern requires further clarification of the expectations of this statement from the Summary of Issues:

- inclusion of monitoring programs to reveal inequalities and design mitigation strategies regarding effects to specific populations

Suncor will continue engagement activities through regular project updates and meetings. Suncor will also gather further input from jurisdictions and agencies, as well as the public through the public comment periods on the Proposed Terms of Reference and the Tailored Impact Statement Guidelines.

In addition to this ongoing engagement, Suncor will:

- provide project-related information through news releases, radio advertisements, advertising, and the company's website
- provide communication through mail-outs, community newsletters and public meetings
- hold discussions on Project plans to identify issues and seek resolution of concerns
- continue to monitor and respond to messages received at the project email address and the toll-free phone number
- initiate a dialogue to investigate community interest in establishing a committee for residents of Parsons Creek to provide input on the Project

#### **4. ENGAGEMENT WITH INDIGENOUS PEOPLES OF CANADA**

Early engagement has occurred, and feedback has been provided by the following Indigenous groups and Trappers during preparation of the Detailed Project Description:

- Athabasca Chipewyan First Nation
- Bigstone Cree First Nation
- Chipewyan Prairie Dene First Nation
- Christina River Dene Nation Council
- Fort Chipewyan Métis Association (Local 125)
- Fort McKay First Nation
- Fort McKay Métis Nation
- Fort McMurray 468 First Nation
- Fort McMurray Métis Local 1935
- Gift Lake Métis Settlement
- K'alt'odeeche First Nation

- Little Red River Cree Nation
- Métis Nation of Alberta Region 1
- Mikisew Cree First Nation
- Willow Lake Métis Association

Details outlining the specifics of these early engagement activities are found in Appendix D. These engagement activities have included in-person meetings to review preliminary material including project location, project type, project schedule information, regulatory processes and schedules, and future engagement opportunities. Topics and concerns raised by Indigenous groups related to the Project include:

- potential impacts to waterbodies, watercourses, water quality and water quantity during operations and at closure, including potential impacts to water access and navigation
- potential impacts to quality and quantity of fish and fish habitat during operations and at closure
- potential impacts to the wildlife and wildlife habitat during operations and at closure
- potential impacts to ecosystems and harvesting areas, such as loss of traditional use plants and vegetation and reduced quantity of wildlife in harvesting areas
- potential impacts to air quality, including odours, noise, and dust from operations
- potential impacts to health status and Indigenous community health
- potential impacts to Indigenous communities, culture, and heritage resources, including the inability to practice and pass on Indigenous culture, laws, customs, and knowledge
- potential impacts on Indigenous communities' sense of wellbeing, remoteness, solitude, privacy, and safety
- potential impacts to visual aesthetics including light pollution
- reduced land access during construction, operations, and reclamation activities for Indigenous community members to exercise rights, such as hunting, fishing, gathering, and/or trapping
- potential inability to achieve planned land uses at closure
- potential cumulative environmental effects of existing and planned projects within the region
- reduced land available in the region to exercise traditional land uses and rights
- questions on how the Lower Athabasca Regional Plan (Government of Alberta 2012) balances industrial activity and the rights of Indigenous groups
- increased real or perceived contamination of land and food sources, which impacts use of the land and consumption of traditional foods
- inclusion of an external tailings area in the Project plan

Suncor's stakeholder identification process determined a number of Indigenous communities, in addition to those listed above, that could potentially be impacted by the Project. Through that initial process, the following Indigenous communities may have interest in engagement activities related to the Project:

- Athabasca Landing Community Association (Metis Local 2010)
- Buffalo Lake Métis Settlement
- Conklin Métis Local #193
- Deninu K'ue First Nation
- Driftpile Cree Nation
- East Prairie Métis Settlement
- Fort Resolution Métis Council
- Fort Smith Métis Council

- Gift Lake Metis Settlement
- Hay River Métis Council
- Heart Lake First Nation
- Lakeland Métis Community Association
- Kikino Métis Settlement
- Métis Local 1954 Touchwood Lake/Big Bay Area
- Métis Local 2002 Buffalo Lake
- Métis Local 2097 Lac La Biche
- Métis Nation of Alberta
- Northwest Territory Métis Nation
- Original Fort McMurray/Fort McKay Band/Society/Clearwater River Band #175
- Owl River Métis Community
- Peavine Métis Settlement
- Registered Fur Management Area/TPA 2457 Trapper
- Salt River First Nation
- Smith's Landing First Nation

In addition to those already engaged, more than forty trappers within or adjacent to the Project development area that may be directly affected by Project activities have been identified by Suncor and were notified of the Project development activities and submissions.

Suncor maintains active partnerships with the Indigenous communities of Wood Buffalo. The trust and support of these Indigenous communities are important to Suncor and foundational to successful energy development. As such, Suncor plans to engage early, broadly, and often to enable timely discussions, provide opportunities for Indigenous communities to influence the Project and allow relationships to continue to evolve. Suncor will continue to engage and consult with Indigenous communities throughout the entire lifecycle of the Project. Future engagement activities will vary depending on the nature and extent of impacts on communities, priorities of the individual communities and how individual communities want to be engaged. Suncor recognizes that the Crown has consultation obligations with Indigenous communities that may supplement Suncor's planned engagement practices.

In addition to this ongoing engagement, Suncor will:

- implement an ongoing communication program making use of traditional mail-outs of project information and updates combined with video and conference calls to advance engagement
- provide project-related information through news releases, radio advertisements and the company's website
- provide communication through mail-outs, community newsletters and public meetings
- hold discussions on Project plans to identify issues and seek resolution to concerns
- continue to monitor and respond to messages received at the project email address and the toll-free phone number

Appendix C provides the complete Summary of Issues as identified by all stakeholders including Indigenous Groups. Issues raised by Indigenous groups in the Summary of Issues, that are over and above those raised during engagement activities described above include the following (note that those marked with an “\*” were also raised by jurisdictions and other parties):

- \*potential effects to human health and well-being due to increased noise levels from Project activities
- \*effects to air quality and to local residents’ health and well-being due to increased fugitive dust emissions and concentrations of particulate matter
- \*effects to air quality, including cumulative effects due to emissions of criteria air contaminants
- \*assessment of the Project greenhouse gas emissions and contribution to climate change
- \*clarity on the specific technologies and practices under consideration to reduce the Project greenhouse gas emissions
- \*effects on carbon sinks
- description and/or map of existing land disturbances in the area and information on their reclamation plans and how these integrate with the reclamation plan for the Project
- current status of regional and local environmental monitoring and trends including air, water, and sediment quality
- \*clarity on whether a joint review of the Project will be conducted with the Mackenzie Valley Resource Management Board
- \*clarity on how information from the environmental assessment of the Voyageur South Project will be considered
- \*potential effects of the Project and cumulative effects on Wood Buffalo National Park and the Peace-Athabasca Delta
- request that if the Lower Athabasca Regional Plan is referenced that clarity is provided regarding Indigenous perspectives on the document
- \*potential effects to drinking and recreational water quality
- \*potential effects to the local economy
- \*potential for the Project to cause harmful alteration, disruption, or destruction of fish habitat, or death of fish
- \*potential effects to fish and fish habitat in Poplar Creek
- potential effects to benthic invertebrate communities
- potential changes to water quality that may result in fish tainting, and effects on fish health and productivity
- \*requirement to conduct a Human Health Risk Assessment and a Health Impact Assessment
- \*potential human health effects of local and regional degradation of ambient air quality from the Project
- \*clarity on consultation and engagement processes with Indigenous groups and local residents
- need for meaningful and collaborative consultation and engagement with Indigenous communities
- need for co-management and positive collaboration between Indigenous groups and the proponent
- need for consultation and engagement with Indigenous communities that follows appropriate consultation protocols
- need for traditional use studies to augment proponent studies
- need to provide Indigenous communities with capacity to support community-specific and project-specific cultural impact assessments
- consideration of existing reports and studies where appropriate

- potential effects of the Project and cumulative effects to Indigenous peoples' culture, connections to the land and interconnectedness with the ecosystem
- potential effects of the Project and cumulative effects to biodiversity and species of cultural importance to Indigenous peoples
- \*potential effects of the Project and cumulative effects to Indigenous peoples' health through consumption or use of country foods and medicinal plants
- potential effects of the Project and cumulative effects on the mental health and culture of Indigenous peoples and communities
- potential impacts of the Project and cumulative impacts to Aboriginal or Treaty rights
- need for collaborative development and shared understanding of methodologies for assessing impacts to rights and Indigenous engagement in development of mitigation and accommodation measures
- request that the Agency undertake a regional assessment focused on cumulative effects and sustainability with deliverables being concrete actions and management plans to address cumulative effects and sustainability and to accommodate impacts to rights
- clarity on potential job and training opportunities for Indigenous peoples, including women and youth
- effects of the Project and cumulative effects on the social and economic conditions of Indigenous peoples
- potential effects of the Project and cumulative effects to infrastructure and Indigenous communities due to the influx of workers from outside the region
- effects of the Project and cumulative effects to structures, sites, or things of historical, archaeological, and palaeontological significance to Indigenous peoples
- \*potential effects of the Project and cumulative effects on wetlands function, direct loss of wetlands, quality of wetland habitat, and residual effects
- potential effects of the Project and cumulative effects to navigation and safety on the Athabasca River
- \*potential effects of the Project and cumulative effects associated with tailings and tailings management
- \*potential effects of the Project and cumulative effects related to increased land disturbance, and clarity on the proposed reclamation plan for the Project
- \*description of uncertainties regarding regional reclamation success for the Project and related projects
- clarity on whether the reclamation plan for the existing Base Mine will use the newest strategies, technologies, and timelines
- clarity on whether intact pockets of healthy boreal forest within the Project area will be preserved for wildlife habitat and to support future reclamation
- potential effects to the future viability and usability of the Project area for traditional purposes
- \*potential effects to forest resources, including cumulative effects, due to the Project on the hydrology of surrounding surface watersheds
- \*positive and negative impacts of the Project on diverse groups of people and across the Project's lifecycle
- \*potential effects of the Project and cumulative effects to groundwater and surface water quality from dust deposition in waterbodies and soil erosion
- \*potential alterations to water table and groundwater elevation from depressurization of basal aquifer
- \*potential effects of the Project and cumulative effects to stream flow and water levels, and to sediment quality in the receiving environments due to excavation and the loss of Beaver Creek and Poplar Creek Reservoirs

Suncor believes that there are two issues raised by Indigenous peoples in the Summary of Issues that should not be included in the scope of review. The issues are:

- clarity on whether a joint review of the Project will be conducted with the Mackenzie Valley Resource Management Board to assess potential transboundary effects on water quality and quantity in the Northwest Territories. Suncor notes that this type of assessment has not been conducted for other oil sands projects and believes that review of the Project by the Agency and the Alberta Energy Regulator is sufficient.
- request that the Agency undertake a regional assessment focused on cumulative effects and sustainability with deliverables being concrete actions and management plans to address cumulative effects and sustainability and to accommodate impacts to rights. A Federal regional assessment is a separate process under the *Impact Assessment Act*. This should not be undertaken as part of a review of the Project.

## **5. STUDIES OR PLANS RELEVANT TO THE PROJECT**

The Project is located within the Athabasca Oil Sands Region, an area in which several developments have been the subject of provincial or joint federal-provincial regulatory review. Suncor projects that have undergone such reviews include:

- Suncor Steepbank Mine
- Suncor Millennium Oil Sands Project, including the Millennium Operational Amendment
- Suncor Voyageur Project (includes North Steepbank Extension and the Voyageur Upgrader)

Other oil sands mining projects that have undergone such reviews include:

- Fort Hills Oil Sands Project
- Teck Frontier Oil Sands Mine Project
- Canadian Natural Horizon Oil Sands Project
- Canadian Natural Horizon North Pit Extension Project (currently under review)
- Canadian Natural Jackpine Mine Project
- Canadian Natural Jackpine Mine Expansion Project
- Canadian Natural Joslyn North Mine Project
- Imperial Kearn Oil Sands Project
- Syncrude Mildred Lake Project
- Syncrude Mildred Lake Extension Project
- Syncrude Aurora North Project
- Canadian Natural Muskeg River Mine Expansion

Suncor proposed development in 2007 of the Voyageur South Project in the same general area as the Project. The Voyageur South application was subsequently withdrawn by Suncor; however, data collected as part of baseline information gathering for the development area is of relevance and will be used for the Project.

Each of the above projects has provided information on environmental conditions within northeastern Alberta. Other environmental information on the Athabasca Oil Sands Region is available from historic environmental studies as well as ongoing environmental monitoring programs within the proposed development area, including but not limited to:

- the Northern River Basins Study
- the Regional Aquatics Monitoring Program

- the Wood Buffalo Environmental Association
- the Governments of Alberta and Canada Joint Oil Sands Monitoring Program
- the Alberta Biodiversity Monitoring Initiative
- Cumulative Environmental Management Association studies
- Wildlife Habitat Effectiveness and Connectivity study
- Canada's Oil Sands Innovation Alliance studies
- Alberta's Environmental Monitoring and Science Program
- Royal Society of Canada report on health status

Information from the historic environmental studies and the ongoing environmental monitoring programs will be reviewed and considered in the impact assessment, as appropriate.

In addition, Indigenous groups have developed reports that are relevant to the Oil Sands Region. These reports, where available, may be relevant to the Project.

The Lower Athabasca Regional Plan 2012 – 2022 (LARP - Government of Alberta 2012) identified strategic directions for the region over a ten-year period, including the responsible development of oil sands resources. As noted in LARP (Government of Alberta 2012, page 23), "The vision describes a desired future state for the Lower Athabasca in which the region's diverse economic opportunities are balanced with social and environmental considerations using a cumulative management approach. Cumulative effects management focuses on achievement of outcomes, understanding the effect of multiple development pressures (new and existing), assessment of risk, collaborative work with shared responsibility for action and improved integration of economic and social considerations."

In 2014, a Review Panel was established under the *Alberta Land Stewardship Act* to review the LARP following applications for review by Indigenous groups, including Athabasca Chipewyan First Nation, Mikisew Cree First Nation, Cold Lake First Nations, Onion Lake Cree Nation, Fort McKay First Nation, Fort McKay Métis Nation, and Chipewyan Prairie Dene First Nation. A report was issued in 2015 that describes the Review Panel's findings.

The Alberta Government also developed a Climate Leadership Plan (Government of Alberta 2018) that outlines climate initiatives. Regional Traditional Ecological Knowledge for Athabasca River water flow and water levels have been completed in the Athabasca Oil Sands Region by Athabasca Chipewyan First Nation and Mikisew Cree First Nation (e.g., Chandler et al. 2010).

While preparing the Detailed Project Description, Suncor communicated with the IAAC to find out whether a regional assessment relevant to the Project existed or is planned. According to the information received from IAAC, no such regional assessment has been or is in the process of being prepared.

## **6. STRATEGIC ASSESSMENTS RELEVANT TO THE PROJECT**

The Athabasca Oil Sands Region, in general, has not been the subject of a federal strategic assessment. However, Suncor is aware of two federal assessments with relevance to the Project. The first is the Strategic Environmental Assessment of Wood Buffalo National Park World Heritage Site (IEC 2018); and the second is the draft Strategic Assessment of Climate Change (Government of Canada 2019b), which will apply to projects that undergo a federal impact assessment under the *Impact Assessment Act*.

The Wood Buffalo National Park Action Plan (Parks Canada 2019), which was informed by the Strategic Environmental Assessment for Wood Buffalo National Park World Heritage Site (IEC 2018), requires that the Outstanding Universal Value of Wood Buffalo National Park is considered in environmental assessments where potential specific or cumulative impacts may occur to Wood Buffalo National Park, including the Peace-Athabasca Delta. The Project impact assessment will include consideration of potential effects of the Project and cumulative effects on Wood Buffalo National Park and the Peace-Athabasca Delta.



The draft Strategic Assessment of Climate Change provides an approach to quantifying the greenhouse gas emissions of projects, including:

- outlining the approach to be used to estimate net and upstream greenhouse gas emissions
- clarifying that downstream emissions will not be assessed
- explaining how avoided emissions and greenhouse gas offsets are to be factored into estimates of greenhouse gas emissions

While preparing the Detailed Project Description, Suncor communicated with the IAAC to find out whether any other strategic assessments relevant to the Project existed or are planned. According to the information received from IAAC, no such strategic assessment relevant to the Project has been or is in the process of being prepared.

## **PART C: PROJECT INFORMATION**

### **7. PURPOSE OF AND NEED FOR THE PROJECT**

The purpose of the Project is to sustain the supply of bitumen to the existing upgraders at Suncor's Base Plant when the mineable bitumen resource at Base Plant is depleted. Bitumen froth production from the Project is required in 2030 to support safe and stable upgrader operations as production transitions from Base Plant.

The Project is needed to:

- realize the value of a responsibly produced strategic oil resource that helps to meet ongoing global energy needs and provides energy security for Canada
- sustain socio-economic benefits and employment
- support Natural Resource Canada's vision of "Improving the quality of life of Canadians by creating a sustainable resource advantage" (Natural Resources Canada website [<https://www.nrcan.gc.ca/nrcan/about-us/10838>] accessed January 9, 2020)

The potential benefits of the Project include:

- continuing the use of existing oil sands processing facilities at the Base Plant
- creating value from Canada's oil sands resources, proximal to existing Suncor facilities and infrastructure
- generation of significant socio-economic benefits and opportunities for Indigenous communities, local communities, the Province of Alberta, and Canada, including continued generation of municipal, provincial, and federal tax and royalty revenue, continued direct local and national employment, as well as indirect and induced provincial and national economic benefits and employment
- fostering opportunities to implement innovations that are currently being developed and enabling ongoing investment in research and development
- providing stable revenue that can be reinvested in assets that support the transforming global energy economy
- creating value for Suncor's shareholders
- satisfying the Alberta Energy Regulator's mandate to "ensure(s) the safe, efficient, orderly, and environmentally responsible development of oil, oil sands, natural gas, and coal resources over their entire life cycle" (Alberta Energy Regulator website [<https://www.aer.ca/providing-information/about-the-aer/who-we-are>] accessed January 9, 2020)

## 8. PROVISIONS IN THE SCHEDULE TO THE *PHYSICAL ACTIVITIES REGULATIONS* (PROJECT LIST)

The relevant provision, Section 25 of Schedule 2, to the *Physical Activities Regulations* is:

*“The expansion of an existing oil sands mine, if the expansion would result in an increase in the area of mining operations of 50% or more and the total bitumen production capacity would be 10 000 m<sup>3</sup>/day or more after the expansion.”*

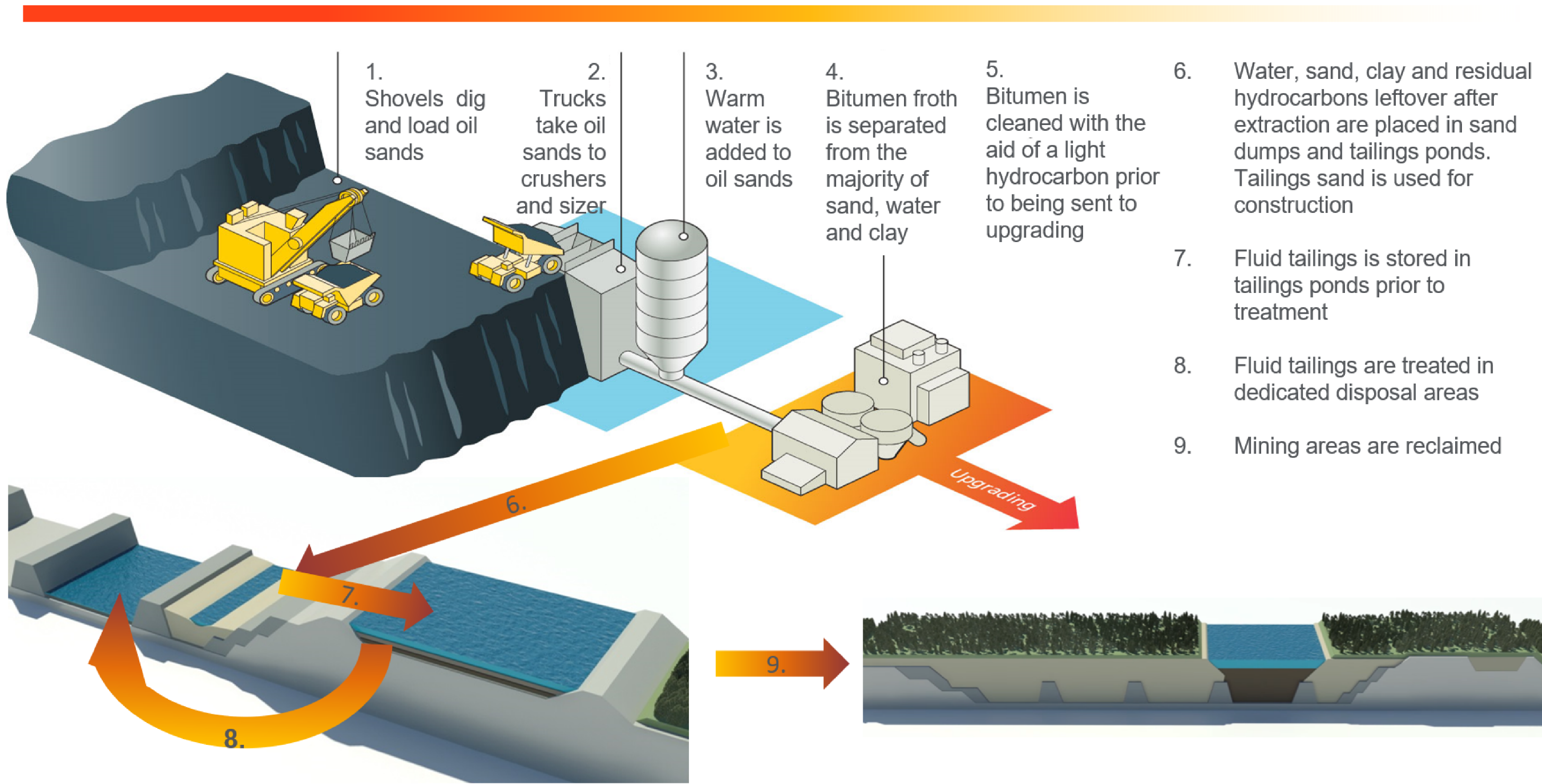
The development area of existing mining operations is approximately 23 thousand hectares. The Project development area is expected to be approximately 30 thousand hectares, which represents an increase in the area of mining operations that is greater than 50%. The Project will not increase total bitumen production capacity. Total production is currently higher than 10 thousand cubic metres per day.

In the Initial Project Description, the term “development area” only considered the Project disturbance footprint, which was approximately 20 thousand hectares. The term “Project development area” used in this document considers both the Project disturbance footprint and corresponding buffer. As such, the Project development area has increased from approximately 20 thousand hectares to approximately 30 thousand hectares since described in the Initial Project Description. The reasons for this increase include:

- areas between the planned diversion channels associated with the Project and the Project disturbance footprint have been included in the development area, which allows for consideration of direct and indirect effects to these areas – added approximately 4 thousand hectares
- a 500 metre buffer was added to the planned Project disturbance footprint to account for potential adjustments that could occur as design of the Project continues – added approximately 6 thousand hectares.

## 9. CONSTRUCTION, OPERATION, AND DECOMMISSIONING ACTIVITIES

A description of the oil sands mining, tailings, reclamation, and extraction process provides context for the infrastructure, structures and physical works discussed in the tables below. Throughout the following discussion, please refer to Figure 2.



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CLIENT	YYYY-MM-DD	2020-07-14
DESIGNED	JG	
PREPARED	PT	
REVIEWED	LP	
APPROVED	TD	

PROJECT		BASE MINE EXTENSION	
TITLE		GENERIC OIL SANDS PROCESSES SCHEMATIC	
PROJECT NO.	CONTROL	REV.	FIGURE
19124718		0	2

**Step 1: Excavation** – Large mine shovels dig and load oil sands and overburden (not depicted) into mine trucks. Overburden is located above the oil sands and must be removed before the oil sands can be mined.

**Step 2: Transportation of Mined Materials** – Mine trucks transport material to assigned destinations. Overburden is transported to construction projects such as roads, dams, and overburden disposal areas. Oil sands are transported to the Ore Preparation Plant where it is crushed to reduce the occurrence of lumps in the oil sands prior to slurry preparation.

**Step 3: Ore Slurry Preparation** – Warm water is added to the crushed oil sands to create a slurry that is transported via pipeline to the primary extraction plant.

**Step 4: Primary Extraction** – This stage involves the separation of bitumen from the slurry, producing a bitumen froth. The bitumen froth is subsequently transported by pipeline to the secondary extraction facility at Suncor's existing Base Plant. The remaining material (primary extraction tailings) is transported by pipeline to a tailings area for disposal at the Project (see Step 6).

**Step 5: Secondary Extraction** – This stage involves the addition of a light hydrocarbon (naphtha) to clean the bitumen by removing residual minerals and water before the bitumen is transported by pipeline to upgrading for further processing. The residual minerals and water are treated to recover the light hydrocarbon before being transported by pipeline to a tailings area at the Project for disposal.

**Step 6: Coarse Tailings** – The primary extraction tailings are comprised of water, sand, clay, and residual hydrocarbon. This material is deposited in a tailings area, whereby the sand, some clay and some water quickly separate to form a coarse tailings deposit.

**Step 7: Fluid Tailings** – The disposal of coarse tailings in a tailings area results in the natural separation of fluid tailings, comprised primarily of water with suspended fine minerals. Over time, the fine clay minerals in the fluid tailings settle while water rises to the surface. This water is recycled for re-use in the extraction process.

**Step 8: Treated Tailings** – The fluid tailings are transferred to a dedicated disposal area within a mined-out area of the mine pit for treatment and deposition. The treatment promotes rapid settlement and expression of water using coagulants and flocculants. This water is recycled for re-use in the extraction process. Treatment of fluid tailings accelerates the reclamation process for the fluid tailings stream.

**Step 9: Reclamation** – Disturbed areas are reclaimed progressively as the necessary reclamation criteria are met. The final landscape is expected to be a mix of uplands, wetlands, lakes, and streams. The closure drainage system will be designed to convey water via streams to lakes and wetlands prior to release to the surrounding environment, subject to meeting approved water release criteria.

Anticipated activities, infrastructure, structures, and physical works for the Project are provided in Table 2. All sizes, lengths, volumes, and other quantities are estimates and provided to inform readers of the scale of the Project. All estimates are subject to change during finalization of the Project design.

**Table 2: Activities, Infrastructure, Structures, and Physical Works**

Phase	Activities, Infrastructure, Structures, and Physical Works
Construction	modification of, and adoption of the Base Plant Emergency Response Plan as relevant for Project construction
	timber salvage to clear construction, mine start-up, tailings, and overburden disposal areas (approximately 3,400 hectares)
	salvage and stockpiling of reclamation soils from construction and mine start-up areas for use when reclamation activities begin (approximately 18 million cubic metres)
	the water management system will include (the quantities provided are cumulative over the construction period): <ul style="list-style-type: none"> <li>• approximately 67 kilometres of stream diversion channels to divert natural runoff flows around the Project site.</li> <li>• water handling facilities to manage the water collected within the development footprint that does not come into contact with oil sands or plant processes. This water is released to the receiving environment by complying with regulatory release criteria. The facilities include: <ul style="list-style-type: none"> <li>– one reservoir to enable supply of water (from the local watersheds) to the existing Syncrude Mildred Lake Mine operation</li> <li>– approximately 300 km of ditches and four sumps to collect water from muskeg drainage and overburden dewatering</li> <li>– 10 to 15 groundwater wells to manage groundwater entering the mine pit</li> <li>– one sedimentation pond to manage runoff sediment inflows before release to the environment. An existing reservoir – Beaver Creek Reservoir – will also be used to manage runoff sediment inflows</li> </ul> </li> </ul>
	relocation of third-party infrastructure, such as powerlines, pipelines, and roads located in the Project development area – including the AOSTRA road that will connect to the existing Suncor overpass at Highway 63
	aggregate material for construction projects (approximately six million cubic metres)
	initial overburden excavation (approximately 140 million tonnes) in the mine start-up area that is required to: <ul style="list-style-type: none"> <li>• expose ore for the start of bitumen production</li> <li>• excavate overburden materials required for the construction of: <ul style="list-style-type: none"> <li>– access roads and mine haulage roads</li> <li>– overburden disposal areas</li> <li>– external tailings area dams</li> <li>– tailings and other pipeline corridors</li> <li>– plant site pad, Ore Preparation Plant facility, maintenance shop pad, administration building pad, and various laydown yards for equipment and/or supplies, as needed</li> </ul> </li> </ul>
	acquisition and deployment of trucks and shovels to support construction activities and in preparation for start of production, including: <ul style="list-style-type: none"> <li>• approximately 21 Ultra Class Haul trucks (460 tonne)</li> <li>• approximately four Mining Shovels (90 tonne)</li> <li>• support equipment (graders, excavators, smaller haul trucks, loaders, and dozers)</li> <li>• auxiliary equipment to support construction, such as water trucks for dust control on roads, lube/maintenance trucks, forklifts, light and heavy tow trucks, light plants, light and heavy cranes, tire handler for mine mobile equipment, pumps, cable reelers for mine cable shovels, generators deck trucks and lowboys</li> </ul>
	construction of facilities: <ul style="list-style-type: none"> <li>• administration building, emergency services, equipment, and parts laydown areas, tailings, and mine maintenance shops (approximate footprint of 220 hectares)</li> <li>• Ore Preparation Plant, comprised of ore crushers and sizers where warm water is added to the ore to make a slurry (approximate footprint of 125 hectares)</li> <li>• Primary Extraction Plant where bitumen froth is separated from the sand, water, and clay (approximate footprint of 35 hectares)</li> </ul>

**Table 2: Activities, Infrastructure, Structures, and Physical Works**

Phase	Activities, Infrastructure, Structures, and Physical Works
Construction (continued)	<p>construction of linear infrastructure:</p> <ul style="list-style-type: none"> <li>• between Ore Preparation Plant and Primary Extraction Plant (approximately 3 kilometres), including:               <ul style="list-style-type: none"> <li>- three oil sands slurry pipelines</li> <li>- two high voltage powerlines (260 kilovolts)</li> <li>- a hot water pipeline</li> <li>- a cold water pipeline</li> <li>- a natural gas pipeline</li> <li>- a diesel pipeline</li> <li>- an access road</li> </ul> </li> <li>• between Primary Extraction Plant and Base Plant (approximately 17 kilometres), including:               <ul style="list-style-type: none"> <li>- two high voltage powerlines (260 kilovolts)</li> <li>- a bitumen froth pipeline</li> <li>- a hot water pipeline</li> <li>- a cold water pipeline</li> <li>- a river water pipeline</li> <li>- a secondary extraction tailings pipeline</li> <li>- a natural gas pipeline</li> <li>- a diesel pipeline</li> <li>- a high-pressure steam pipeline</li> <li>- an access road from Highway 63</li> </ul> </li> <li>• between Primary Extraction Plant and the external tailings area (approximately 3 kilometres), including:               <ul style="list-style-type: none"> <li>- three coarse tailings pipelines</li> <li>- two recycle water pipelines</li> <li>- a service road</li> </ul> </li> <li>• within the external tailings area between the sand dump and containment area (approximately six kilometres)               <ul style="list-style-type: none"> <li>- three fluid tailings pipelines</li> </ul> </li> </ul>
	general maintenance (e.g., mobile equipment) and emergency services
	waste management and recycling
	Operation
tree clearing and timber salvage to clear areas for mining related activities (approximately 600 hectares per year)	
salvage, stockpiling and placement of reclamation material from mining areas to support reclamation activities (approximately 2 to 3 million cubic metres per year)	

**Table 2: Activities, Infrastructure, Structures, and Physical Works**

Phase	Activities, Infrastructure, Structures, and Physical Works
Operation (continued)	<p>mining operations, including:</p> <ul style="list-style-type: none"> <li>• excavation of overburden in advance of oil sands mining activities (approximately 240 million tonnes per year). Most of this material is transported to overburden disposal areas. Some material will be used for completion of the external tailings area dam, light vehicle roads, and mine haul roads for the transportation of overburden, oil sand, and reclamation materials.</li> <li>• excavation and transportation of oil sands ore to the Ore Preparation Plant, where it is crushed and sized to make a slurry (approximately 125 million tonnes mined per year). Oversize from the crushers will be hauled back to the mine pit or overburden disposal areas.</li> <li>• construction of haul roads for the transportation of overburden and oil sand (approximately 10 kilometres per year)</li> <li>• blasting might be used in specific circumstances to make material easier and safer to dig</li> <li>• annual infill drilling approximately 4 years in advance of the overburden excavation to ensure that the mining operations are carried out with an appropriate understanding of the resource (approximately 50 to 100 drillholes per year).</li> <li>• aggregate resources (sand and gravel) to be used in various mine development activities such as mine haul road construction and maintenance (approximately 2 Mm<sup>3</sup>/yr of aggregate).</li> <li>• acquisition and deployment on site of various mobile equipment required over the life of the Project, including:               <ul style="list-style-type: none"> <li>– approximately 95 Ultra Class autonomous mine haul trucks (460 tonne)</li> <li>– approximately 15 Mining Shovels (90 tonne)</li> <li>– support equipment such as graders, small excavators, smaller haul trucks, and various sizes of loaders and dozers. This equipment is needed to support the daily mine operations, including the maintenance of haul roads for the efficient transportation of mined materials.</li> <li>– auxiliary equipment to support the mine operation, such as water trucks for dust control on roads, lube/maintenance trucks, forklifts, light and heavy tow trucks, light plants, light and heavy cranes, tire handler for mine mobile equipment, pumps, cable reelers for mine cable shovels, generators deck trucks and lowboys</li> </ul> </li> </ul>
	<p>tailings operations, including:</p> <ul style="list-style-type: none"> <li>• transportation of tailings via pipeline from the primary extraction plant to tailings areas where coarse tailings will be deposited (approximately 180 million cubic metres per year)</li> <li>• construction and operation of coarse tailings deposits (approximately 50 million cubic metres per year)</li> <li>• transportation of fluid tailings via pipeline from the coarse tailings deposit to the containment area where settlement occurs (approximately 130 million cubic metres per year)</li> <li>• continued construction and operation of the containment area where settlement occurs</li> <li>• construction and operation of fluid tailings treatment facilities to manage approximately 30 million cubic metres of treated fluid tailings per year, and deposit the treated fluid tailings into the designated disposal area within the mined-out area of the mine pit</li> <li>• operation of water recycle pipeline for re-use of tailings water in the extraction process (approximately 100 million cubic metres per year)</li> <li>• transportation of secondary extraction tailings to the Project (approximately 15 million cubic metres per year)</li> <li>• construction and operation of the secondary extraction tailings deposit (approximately four million cubic metres per year)</li> <li>• equipment required includes approximately:               <ul style="list-style-type: none"> <li>– six dozers</li> <li>– nine barges with pumping systems</li> </ul> </li> </ul>
	<p>oil sands ore processing (approximately 80 million barrels of bitumen froth per year):</p> <ul style="list-style-type: none"> <li>• operation of the Ore Preparation Plant</li> <li>• transportation of oil sand slurry from the Ore Preparation Plant to the Primary Extraction Plant via pipeline</li> <li>• operation of the Primary Extraction Plant</li> <li>• transportation of bitumen froth from the Primary Extraction Plant to the Base Plant secondary extraction via pipeline</li> </ul>
	<p>general maintenance (e.g., processing plants, mobile equipment, and linear infrastructure) and emergency services</p>
	<p>waste management and recycling</p>

**Table 2: Activities, Infrastructure, Structures, and Physical Works**

Phase	Activities, Infrastructure, Structures, and Physical Works
Operation (continued)	<p>the water management system will include (quantities are cumulative over the life of mine and incremental to the structures built during the construction period):</p> <ul style="list-style-type: none"> <li>• an additional approximate 13 kilometres of stream diversion channels.</li> <li>• water management facilities to manage the water collected within the development footprint, but that does not come into contact with oil sands or plant processes. This water is released to the receiving environment by complying with regulatory release criteria. The facilities include: <ul style="list-style-type: none"> <li>- approximately 330 km of ditches to collect muskeg drainage and overburden dewatering</li> <li>- 20 to 30 shallow groundwater wells to manage groundwater entering the mine pit</li> <li>- one sedimentation pond to manage runoff sediment inflows before its release to the environment. Three existing reservoirs – Beaver Creek Reservoir, Ruth Lake, Poplar Creek Reservoir – would also be used to manage runoff sediment inflows</li> <li>- approximately four sumps and associated pump and pipeline systems</li> </ul> </li> <li>• water management facilities to manage and recycle the water that comes into contact with oil sands or plant processes. The facilities include: <ul style="list-style-type: none"> <li>- approximately 80 kilometres of collector ditches.</li> <li>- approximately 20 sumps and associated pump and pipeline systems.</li> <li>- 10 to 15 deep groundwater wells to manage groundwater entering the mine pit</li> </ul> </li> </ul>
	<p>progressive reclamation of mining and tailings areas (approximately 320 hectares per year):</p> <ul style="list-style-type: none"> <li>• development of surface drainage channels and micro-topographical features in support of closure design</li> <li>• topsoil and subsoil placement</li> <li>• revegetation</li> </ul>
	development, monitoring and maintenance of closure landforms
	environmental monitoring
Decommissioning	modification of, and adoption of the Base Plant Emergency Response Plan as relevant for Project decommissioning
	ongoing treatment of fluid tailings (approximately 30 million cubic metres per year for 10 years):
	<ul style="list-style-type: none"> <li>• transportation of fluid tailings via pipeline from the containment area for treatment and deposition in the designated disposal area</li> </ul>
	removal of buildings, plants, linear infrastructure, and water management systems
	sale and salvage of mobile equipment
	maintenance (e.g., mobile equipment) and emergency services
	waste management and recycling
	<p>reclamation of remaining disturbance areas in the Project development area (approximately 6,600 hectares):</p> <ul style="list-style-type: none"> <li>• development of surface drainage channels and micro-topographical features in the development and completion of the closure landscape</li> <li>• topsoil and subsoil placement</li> <li>• revegetation</li> </ul>
ongoing environmental monitoring and maintenance (as required) of closure landforms and aquatic features in compliance with approved Reclamation and Closure Plans	



The Project will integrate with existing water, power, heat, and fuel utilities and use existing approved secondary extraction and upgrading facilities at the Base Plant (Figure 1). Existing facilities that will be operated in association with the Project but are approved under existing approvals are provided in Table 3.

**Table 3: Existing Infrastructure, Structures, and Physical Works Operated in Association with the Project**

Phase	Existing Infrastructure, Structures, and Physical Works
Construction	existing power sources at Base Plant as well as the existing substations and power distribution network will support construction
	some support services (such as, hazardous waste yard, recycling, and landfill) at Base Plant may serve the Project during the construction phase
	AOSTRA Road and the existing Highway 63 overpass will provide access to the site until the permanent access road is constructed
	lodging facilities (Worker Camps)
Operation	operation of existing water intakes, steam and hot water sources at Base Plant will support ongoing operations
	access to the site will utilize the existing Highway 63 overpass
	existing power sources as well as the existing substations and power distribution network at Base Plant will support ongoing operations
	operation of existing secondary extraction at Base Plant – where bitumen is cleaned with the aid of a light hydrocarbon
	existing upgrading facilities at Base Plant – bitumen is delivered to the upgraders for further refinement. Existing tanks at Base Plant will be used to store products and the existing network of pipelines will be used to distribute the various products from Upgrading to market
	some support services (such as, hazardous waste yard, recycling, and landfill) at Base Plant may continue to serve the Project during the operations phase
	lodging facilities (Worker Camps) – may be required during periods of peak manpower requirements such as large maintenance events
Decommissioning	existing power sources at Base Plant as well as the existing substations and power distribution network will support decommissioning
	access to the site utilize the existing Highway 63 overpass
	some support services (such as, hazardous waste yard, recycling, and landfill) at Base Plant may continue to serve the Project during the decommissioning phase
	lodging facilities (Worker Camps)

Plans will be developed as the application progresses to address third party infrastructure timing and relocation requirements. For any additional third party infrastructure that may be required, Suncor will make specific applications under relevant legislation prior to Project construction.

## **10. ESTIMATE OF MAXIMUM PRODUCTION CAPACITY AND DESCRIPTION OF PRODUCTION PROCESSES**

The Project is expected to produce up to 80 million barrels per year (nominally 225 thousand barrels per day) of bitumen froth during its estimated 25-year operational life.

The Project is an open pit mine and Suncor plans to employ the best available oil sands development practices. Ore is mined with large mine shovels and transported by mine trucks to the Ore Preparation Plant where the ore is crushed and mixed with warm process water. The resultant slurry is transported by pipeline to the Primary Extraction Plant where a bitumen froth is produced and is subsequently transported by pipeline to the existing Base Plant secondary extraction facility. Additional information on key processes and produced materials is presented in Section 9.

The plan is for the Project to integrate with existing water, power, heat, and fuel utilities and use the existing approved secondary extraction, upgrading facilities, and product tankage at Base Plant.

## 11. ANTICIPATED SCHEDULE FOR THE PROJECT

The anticipated schedule for the Project (Table 4) includes an initial estimated seven-year regulatory process to achieve regulatory approval. A decision by Suncor to sanction the Project would occur following receipt of regulatory approvals.

**Table 4: Anticipated Project Schedule**

Phase	Timing	Notes
Regulatory Process	2019-2026	Both federal and provincial regulatory processes leading to regulatory approval
Construction	2026-2030	Site preparation and construction of facilities on Project site, including infrastructure to existing Base Plant facilities
Operations	2030-2055	Mining, reclamation, and bitumen extraction activities
Decommission	Starts in 2055	Removal of all structures, reclamation, and closure. The duration will be more certain as plans are developed

## 12. POTENTIAL ALTERNATIVE MEANS AND ALTERNATIVES TO THE PROJECT

The purpose of the Project is to sustain the supply of bitumen to the existing upgraders at Suncor's Base Plant facility when the mineable bitumen resource at Base Plant is depleted. Bitumen froth production from the Project is required in 2030 to support safe and stable upgrader operations as production transitions from Base Plant to the Project.

Alternatives to the Project include development of a different Suncor-owned oil sands lease, and import of bitumen from existing bitumen production operations, which could be Suncor-owned or owned by other operators.

Suncor has a long history in the oil sands industry, starting in 1967, during which there have been numerous advances made in technology to increase the health and safety of personnel, production and operations efficiency, and improve the economics of its operations.

Suncor utilized bucketwheel excavators and overland conveyor systems to mine and transport the oil sands to the extraction facilities at Base Plant until the early 1990s. A major shift to the use of large mine haul trucks and shovels for the transport of all mine materials occurred in the 1990s. Although variations of the truck and shovel mining method have been evaluated for many years, this mining method continues to be proven as the most efficient, productive, and economic to meet the demands of oil sands operations. Current operations at Base Plant are incorporating autonomous mine trucks to improve productivity, and health and safety. This technology will be utilized for the Project. This will provide an experienced pool of personnel for operations and maintenance and best practices as the mining and primary extraction operations shift from the Base Plant to the Project.

The primary extraction technology chosen for the Project is the same as the current Base Plant technology as this continues to be an effective technology to maximize bitumen recovery. Suncor will be evaluating waterless or near waterless technology in the coming years. If successful, this technology may be used for the Project at a future date but will not be available in time for this regulatory application process.

Integration of the Project with Base Plant assets is planned to be limited to the existing secondary extraction, bitumen upgrading processes and utilities, including the river water intake, hot water, and steam, downstream of the Project's primary extraction facility. This level of integration maintains the current Base Plant oil sands operation and reclamation schedule as planned and approved, unimpeded by the Project activities.

Suncor has invested significant time and expense to improve tailings management to increase long term reclamation certainty. The current processes utilized at the Base Plant for the management of fluid tailings have been tested and proven to be effective at improving performance during operations and for the final landscape at closure. These technologies, which include the Tailings Reduction Operations (TRO; started

in 2009) and Permanent Aquatic Storage Structure (PASS; started in 2018), utilize coagulants and flocculants to accelerate settlement of the fines in the fluid tailings (see Glossary in Appendix B). The Project will use the PASS technology.

The use of PASS for the treatment of fluid tailings enables an aquatic closure landscape to be developed for treated fluid tailings that are deposited in the mined-out pit. The aquatic closure landscape is expected to manage the settlement rates of fluid tailings more effectively than terrestrial landscapes, improving certainty of achieving closure goals and timelines.

The reclamation methods and practices that have been developed and refined on the Base Plant operation will be utilized for the Project. These proven methods and practices are effective at achieving planned reclamation targets.

Suncor continues to evaluate new technologies that may have one or more benefits, including improvement of operational performance, reduction of the overall footprint, acceleration of reclamation timelines, and/or reduction of greenhouse gas emissions associated with operations. Suncor will work with groups like Canada's Oil Sands Innovation Alliance, communities, regulators, and stakeholders to share information as development is advanced.

## **PART D: LOCATION INFORMATION AND CONTEXT**

### **13. GEOGRAPHIC INFORMATION**

The Project is located north of the city of Fort McMurray, Alberta, within the Regional Municipality of Wood Buffalo, approximately three kilometres north of the Fort McMurray Urban Development Sub-Region boundary on the west side of Highway 63, in Township 92, Ranges 9-11, West of the 4<sup>th</sup> Meridian; Township 91, Ranges 9-11, West of the 4<sup>th</sup> Meridian; and Township 90, Ranges 9-11, West of the 4<sup>th</sup> Meridian (Figure 1). Fort McKay, which is approximately 21 kilometres north, and Anzac, which is approximately 50 kilometres south, are other communities located near the Project development area (Figure 1).

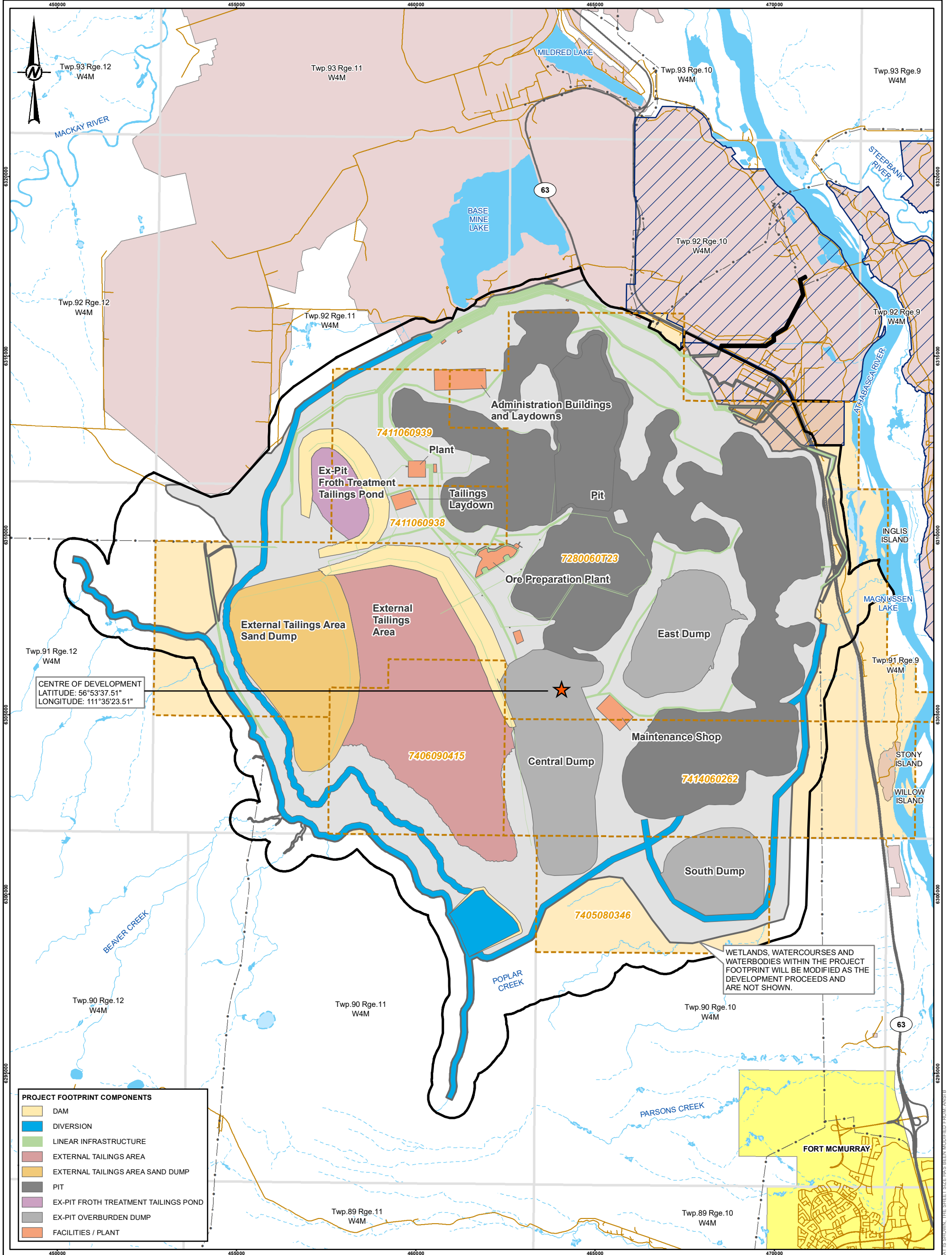
The Project is located adjacent to two active open pit mining operations: west of the Base Plant and south of Syncrude Mildred Lake operations (Figure 3) and in an area where Traditional Land Use is practiced. There are five potential trapper cabins close to the Project development area that will be validated with owners during consultation. There are five temporary worker camps within the Project development area and three located within two kilometres of the Project development area.

The Project will be developed on the following mineable Oil Sands Leases under the Alberta *Mines and Minerals Act*: 7280060T23, 7406090415, 7414060262, 7411060938, 7411060939, and 7405080346 (Figure 3).

The development area for the Project is approximately 30 thousand hectares in size, with the centre of the development being located at Latitude 56° 53' 37.51" and Longitude 111° 35' 23.51" (Figure 3).

There are several Indigenous communities with reserve lands located within a 200-kilometre radius of the Project. The reserve lands closest to the Project are Fort McKay First Nation, which are approximately 14 kilometres away. No portion of the Project development will occur on federal lands. In addition to the reserve lands described above, the closest federal lands to the Project are Wood Buffalo National Park, which is located approximately 120 kilometres north of the Project.

The Project is located within the Lower Athabasca Region of Alberta primarily on provincial Crown lands that are administrated under the Alberta *Public Lands Act*.



CENTRE OF DEVELOPMENT  
LATITUDE: 56°53'37.51"  
LONGITUDE: 111°35'23.51"

WETLANDS, WATERCOURSES AND WATERBODIES WITHIN THE PROJECT FOOTPRINT WILL BE MODIFIED AS THE DEVELOPMENT PROCEEDS AND ARE NOT SHOWN.

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE STREET SIZE HAS BEEN MODIFIED FOR VISIBILITY

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## 14. PHYSICAL AND BIOLOGICAL ENVIRONMENT

The Project is located in the Central Mixedwood natural subregion (Natural Regions Committee 2006). This subregion is spatially the largest in the province covering 25% of Alberta's land area. The cool boreal climate regime is conducive to the growth of mixed aspen-spruce forests. The Central Mixedwood subregion contains a significant component of wetlands in poorly drained areas. The topography of the Project development area generally has subdued relief, with nearly level to gently rolling topography.

The Project is located in the Athabasca Oil Sands Region, which is generally described as having a cool, continental climate. Three Environment Canada stations, using data from 1971 to 2000, are used to represent the range of climate conditions in the region: Fort Chipewyan (north), Fort McMurray (central) and Cold Lake (south).

Similar wind patterns are observed at Fort Chipewyan, Fort McMurray, and Cold Lake. There is a general east-west wind pattern at all stations; however, east-northeasterly winds are observed more frequently at Fort Chipewyan, while east-southeasterly winds are observed more frequently at Fort McMurray. Calm conditions occur 16% of the time at Fort Chipewyan, 17% of the time at Fort McMurray and 13% of the time at Cold Lake.

Similar temperatures are observed at all stations during the summer months. The average temperature in July is 17 degrees Celsius. There are greater differences during the winter months when Fort Chipewyan is about 4 degrees Celsius cooler than Fort McMurray and Cold Lake is about 2 degrees Celsius warmer than Fort McMurray. The lowest winter temperatures occur in January where the average temperatures are -24.2 degrees Celsius at Fort Chipewyan, -19.8 degrees Celsius at Fort McMurray and -17.5 degrees Celsius at Cold Lake. The average annual temperature is -2.1 degrees Celsius at Fort Chipewyan, 0.2 degrees Celsius at Fort McMurray and 1.4 degrees Celsius at Cold Lake.

The Project is located within the Lower Athabasca Region of Alberta primarily on provincial Crown lands that are administrated under the Alberta *Public Lands Act*. As discussed in Section 13, the Lower Athabasca Regional Plan 2012 – 2022 (LARP - Government of Alberta 2012) identified strategic directions for the region over a ten-year period, including the responsible development of oil sands resources. The current zoning designation is rural district. Zoning designations for the Project are shown in Figure 1.

The Project development area includes several existing land uses, including oil and gas, recreation (including fishing, hunting, using all-terrain vehicles, snowmobiling, and canoeing), trapping, traditional uses, and timber harvesting. The Project development area contains both privately owned and provincial Crown surface rights. Geological exploration drilling has taken place at various times within the Project development area since the 1940s. Much of the Project development area was impacted by a wildfire that burned through the area in May 2016.

Project development area and regional valued components identified previously include:

- sport and forage fish species such as Arctic grayling, burbot, goldeye, lake whitefish, mountain whitefish, northern pike, yellow perch, longnose sucker, white sucker, brook stickleback, emerald shiner, fathead minnow, brassy minnow, finescale dace, flathead chub, lake chub, northern redbelly dace, pearl dace, trout-perch, spoonhead sculpin and slimy sculpin
- terrestrial vegetation including white spruce, jack pine, aspen or mixed stands of aspen, white spruce, balsam poplar and/or white birch
- forested and non-forested wetlands types
- old growth forest areas

Valued wildlife species include those of ecological significance or with status both nationally and provincially, including moose, black bear, beaver, muskrat, fisher, lynx, woodland caribou, Canadian toad, ducks and geese, old growth forest birds, marsh birds (e.g., yellow rail), mixedwood forest birds, boreal owl and whooping crane.

A description of the approach and methodology that will be undertaken to define baseline conditions for biophysical components is provided in Appendix E.

## 15. HEALTH, SOCIAL, AND ECONOMIC CONTEXT

A description of the approach and methodology that will be undertaken to define baseline conditions for health, social and economic components is provided in Appendix E.

### 15.1. Health

#### 15.1.1. Context of Regional Municipality of Wood Buffalo

The Project is located in the Alberta Health Services North Zone, which was formed in 2009 and includes the former Northern Lights Health Region, the Aspen Health Region, and the Peace County Health Region.

The North Zone is the largest health zone in Alberta. While the Project is in the North Zone, much of the health-related research was conducted in the previous Northern Lights Health Region but is still considered relevant for the Project.

The Royal Society of Canada produced a report in 2010 on the oil sands that includes information on health status within the Northern Lights Health Region (RSCEP 2010). The report indicates that the Northern Lights Health Region has a less favourable health status than the provincial average for a number of indicators, such as prevalence of diabetes, substance-related disorders, mortality due to homicide and motor vehicle collisions, and sexually transmitted infections. The Northern Lights Health Region also has the lowest availability of medical doctors among similarly sized centres (RSCEP 2010).

A comparison of cancer rates in the North Zone to the provincial average is provided by Alberta Health Services in the *2019 Report on Cancer Statistics in Alberta* (AHS 2019). The report indicates that between 2012 to 2016, there were no statistically significant differences in the age-standardized incidence rates for all cancers (per 100 thousand population, all ages) between the North Zone and the provincial average.

### 15.2. Socio-Economics

#### 15.2.1. Context of Regional Municipality of Wood Buffalo

Development of the Regional Municipality of Wood Buffalo (RMWB), and Fort McMurray in particular, has been tied to the development of the oil sands. Prior to commercial development of the oil sands industry, the region's economy was reliant on its function as a transportation thoroughfare to regions further south, and on traditional resource industries such as hunting, fishing, trapping and forestry.

Large-scale development in the region began in the mid-1960s and led to several significant changes over the next five decades. The following information highlights periods of substantial change in regional socio-economic conditions, often driven by development of the oil sands industry.

**Early 1960s to 1986** - The construction and subsequent operation of the Great Canadian Oil Sands Plant (now Suncor Energy Inc.) in the 1960s, followed by the Syncrude Mildred Lake operation in the 1970s, ushered in the first period of rapid growth. The regional population grew from about 2,600 in the early 1960s to over 26 thousand in 1978, an annual growth rate of 15%. Most of this growth occurred in Fort McMurray which accounted for over 90% of the regional population. Between 1978 and 1986, Fort McMurray grew by a further 50%, or approximately 12 thousand residents, reaching approximately 37 thousand (AOSERP 1979; AMA 1975, 1980). This rapid population growth placed pressure on several local services and infrastructure.

**1986 to the late 1990s** - The next wave of development faltered in the early 1980s under pressure of technical challenges, rising costs, and depressed product prices. Employment in the oil sands during this timeframe was stable or marginally declining. As a result, by 1999 the population of Fort McMurray remained virtually unchanged from 1986 (RMWB 1999).

**Late 1990s to 2008** - This was the second major growth period for the oil sands and, correspondingly, for the region. Construction and sustaining capital expenditures in the province's oil sands industry increased from \$1.5 billion in 1998 to over \$18 billion in 2008. This expansion drove corresponding employment growth as the number of workers more than doubled. Employment growth drove corresponding rapid population growth in the region, leading to high demand for regional infrastructure and services. The

resident population of Fort McMurray more than doubled from approximately 36 thousand in 1999 to over 70 thousand by 2008. In the mid to latter part of the 2000's, oil sands projects were increasingly being proposed further north of Fort McMurray. This led to the development of several permanent work camps intended to support ongoing operations.

**2008 to 2011** - A number of oil sands projects were halted in response to the global financial and debt crisis, leading to a drop of nearly 40% in annual construction and capital expenditures in the province's oil sands industry between 2008 and 2009. As a result of this slowdown, growth in the region moderated. The population in Fort McMurray grew by an estimated 3% per year between 2008 and 2010 (RMWB 2010). Between 2010 and 2012, the urban population remained virtually unchanged (RMWB 2012). The reduced population growth provided infrastructure and service providers an opportunity to catch up, in part, on earlier demand (i.e., pre-2008).

**2012 to 2015** - Rebounding oil prices drove stronger than anticipated increases in oil sands investments. Some projects that were halted in 2008/2009 were back on track by the end of 2011. As a result, the resident population in Fort McMurray grew to approximately 80 thousand, an increase of over 10% between 2012 and 2015 (RMWB 2015). The region appeared poised for another extended period of growth driven by expansion of the oil sands industry.

**2015 to Present** - In late 2014, oil prices declined rapidly, falling over 50% by year's end. This led to a retraction of economic activities and a worsening economic environment. Many oil sands producers shelved future expansion projects in favour of streamlining existing operations, including implementing workforce reductions. During this period, the region was severely affected by a large wildfire that forced the rapid evacuation of several communities, destroying thousands of homes and other structures (AMA 2016; CBC 2017). As a result, the region's permanent population decreased nearly 9% between 2015 and 2018.

### 15.2.2. The Region Today

The RMWB is a relatively large and diverse municipality, principally comprised of:

- Fort McMurray, a regional service centre with an estimated permanent population of approximately 72 thousand in 2018 (RMWB 2018)
- smaller rural communities with a combined permanent population estimated at approximately 3 thousand in 2018 (RMWB 2018)
- a shadow population estimated at over 36 thousand, with approximately 90% of this population housed in temporary worker dwellings (i.e., camps) (RMWB 2018)
- an on-reserve population estimated at just over 1,700 in 2016 (StatsCan 2016)

Fort McMurray has grown over time from a relatively small, isolated northern town with few amenities into one of Alberta's larger urban centres. This transition means that the breadth and nature of services and infrastructure in the community have also grown. Today, Fort McMurray offers a range of health, education, social, recreation, and cultural amenities and services that are commensurate with a community of its size. In addition, several of the hamlets within the Regional Municipality of Wood Buffalo also have local community and recreation facilities to support residents in those communities.

Drawing on available demographic data over a period of approximately 20 years, several key elements of the region's current social environment were identified.

**Relatively young population** - Ample work opportunities over the past two decades have attracted relatively young workers to the region which has helped to keep the median age in Fort McMurray (33.1) below both the provincial and national averages (Stats Can 2016). However, with the recent economic slowdown, the median age in the community has increased slightly as the number of people aged 15 to 29 has decreased (Stats Can 2011, 2016).

**Relatively diverse population** - There are a relatively larger number of Indigenous people in the region as well as many different ethnic communities that call Fort McMurray home. These demographic factors influence the types of programs and services needed by residents as well as the way they need to be delivered (e.g., different educational and cultural backgrounds).

**Relatively large shadow (i.e., non-resident) population** - Although the majority of the shadow population are housed in temporary worker dwellings (i.e., camps), there are approximately 2,000 additional people who stay in residential accommodations (e.g., houses, apartments, condos) and approximately 1,600 people who stay in non-residential accommodations (i.e., hotels and motels) when working in the region.

## **PART E: FEDERAL, PROVINCIAL, TERRITORIAL, INDIGENOUS OR MUNICIPAL INVOLVEMENT AND EFFECTS**

### **16. FINANCIAL SUPPORT FROM FEDERAL AUTHORITIES**

The Project is planned with no proposed or anticipated federal financial support.

### **17. FEDERAL LAND USED FOR PROJECT**

No federal lands will be used for the Project.

### **18. LIST OF PERMITS, LICENSES OR AUTHORIZATIONS REQUIRED IN RELATION TO THE PROJECT'S ENVIRONMENTAL EFFECTS**

The list of permits, licenses or authorizations required in relation to the Project's environmental effects are listed by jurisdiction:

#### **Alberta Energy Regulator**

- *Oil Sands Conservation Act* Commercial Scheme approval
- *Water Act* authorization and/or license
- *Environmental Protection and Enhancement Act* approval

#### **Alberta Culture, Multiculturalism and Status of Women**

- *Historical Resources Act* clearance

#### **Impact Assessment Agency of Canada**

- Decision Statement for the Project

#### **Fisheries and Oceans Canada**

- *Fisheries Act* authorization

In addition to the jurisdictions listed above that are related to environmental effects, Suncor would also acquire permits from other agencies, as required. Other jurisdictions listed in the Initial Project Description, such as Environment and Climate Change Canada, were included because they may have duties or functions related to the review of the Project Environmental Impact Statement; however, they are not included above as they do not issue permits, licenses or authorizations.



## **PART F: POTENTIAL EFFECTS OF THE PROJECT**

Suncor has an extensive history with project development and operation in the Athabasca Oil Sands Region. This history has afforded Suncor with a unique perspective of the key issues associated with oil sands project development and operation. The knowledge on key issues is gained through experiences with its own projects and through participation in project application reviews and regulatory hearings, or through collaborative efforts among Suncor and fellow operators.

Further knowledge on key issues associated with project development in the Athabasca Oil Sands area has come directly through the submission, review and finalization of project applications that go through regulatory reviews. Suncor has had more than eleven oil sands mine-related projects that have gone through formal regulatory reviews, including two involving both federal and provincial regulatory hearings (i.e., Project Millennium and Voyageur Project). Suncor has also participated in several regulatory hearings for oil sands projects by other proponents.

An important component of the knowledge Suncor has on key issues comes from its long and extensive history of working with the Indigenous communities and groups that reside in the Regional Municipality of Wood Buffalo. Additional input has been gained through Suncor's extensive history with research and monitoring programs in the Athabasca Oil Sands area, including both Suncor's own efforts, as well as those it has undertaken cooperatively with other industry members, Indigenous groups, and regulatory teams.

The key issues that will be addressed as part of the Project will be finalized through the planned consultation process for the Project. Based on its experience, Suncor believes the key social and environmental issues to be addressed as part of the Project impact statement will include:

- Positive and negative social effects, including those on:
  - population
  - housing and workforce
  - social and municipal infrastructure
  - traffic and navigation
  - community well-being
  - archaeology
- Positive and negative economic effects, including those on:
  - employment levels and staffing pressures
  - economic effects at local, provincial, and national levels, including taxes and royalties
- Positive and negative environmental effects, including those on:
  - air quality, including odours and dust
  - greenhouse gas emissions
  - climate change effects on the Project
  - air emissions and their effects on water quality, wildlife, vegetation, and soils
  - noise and light
  - water quantity and quality for both groundwaters and surface waters, including flows and water levels in the Athabasca River
  - aquatic health
  - fish and fish habitat
  - soils
  - vegetation, including wetlands and old-growth forests
  - wildlife, including species at risk and other wildlife
  - wildlife health
  - biodiversity

- pace and outcomes from reclamation, considering sustainable ecosystems and end land uses
- sustainability
- Positive and negative human health effects, including those on:
  - human health risks related to air quality, noise, water quality and food quality
  - health-related social infrastructure
- Effects of potential accidents and malfunctions
- The role of the Project within Canada's environmental and climate obligations
- Project's contribution to sustainability

The evaluations of social effects will include the application of GBA+ to the analysis to describe disproportionate effects for diverse subgroups.

A description of the approach and methodology that will be undertaken to assess the potential effects of the Project is provided in Appendix E. Included as integral parts of the component assessments will be identification of mitigation and monitoring plans or programs appropriate to the predicted effects identified for the component.

## **19. POTENTIAL CHANGES TO COMPONENTS OF ENVIRONMENT WITH LEGISLATIVE AUTHORITY OF PARLIAMENT**

The development of the Project may impact fish and aquatic habitat due to the diversion or elimination of waterbodies and watercourses in the Project development area. Potential changes in water quality may result in fish tainting, effects on fish health, productivity, and population. The development of the Project is not expected to impact aquatic species at risk.

The development of the Project may impact wildlife (including species listed in the *Species at Risk Act*) and wildlife habitat. Potential impacts may result in changes to wildlife habitat, wildlife availability, movement, health, and populations.

The development of the Project may impact species designated under the *Species at Risk Act* or the *Migratory Birds Convention Act*. Potential impacts to migratory birds may result in changes to habitat (including breeding, foraging and stopover areas), direct and indirect mortality, abundance, and diversity.

The hydrology and water quality assessment will evaluate potential impacts on water quantity and quality in Wood Buffalo National Park.

## **20. POTENTIAL CHANGES TO THE ENVIRONMENT ON FEDERAL LANDS AND LANDS OUTSIDE ALBERTA AND CANADA**

The Project is not expected to result in direct physical changes to reserve lands and federal lands because no portion of the Project development will occur on reserve lands or federal lands. The potential impacts to air quality, hydrology and water quality may have indirect impacts on reserve lands or federal lands. The air quality assessment will evaluate potential impacts on ambient air quality, based on proximity of the Project to reserve and federal lands. The hydrology and water quality assessment will evaluate potential impacts on water quantity and quality in Wood Buffalo National Park.

The Project is not expected to result in direct physical changes outside of Alberta. The air quality assessment will evaluate trans-boundary impacts on ambient air quality, based on proximity of the Project to the Alberta/Saskatchewan border. The hydrology and water quality assessments will evaluate potential trans-boundary impacts on water quantity and quality to the Alberta/Northwest Territories border.

The Project is not expected to result in changes outside of Canada.

## **21. IMPACT TO INDIGENOUS PEOPLES – PHYSICAL AND CULTURAL HERITAGE, CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL USE, AND HISTORICAL, ARCHAEOLOGICAL, AND PALEONTOLOGICAL RESOURCES**

Suncor is engaging with Indigenous peoples to determine the potential impacts to physical and cultural heritage due to the Project. Section 4 lists concerns raised by Indigenous peoples during ongoing engagement activities.

The Project may result in impacts to Indigenous peoples, Treaty Rights and Traditional Uses through potential changes to land access, loss of traditional lands and ability to hunt, fish, gather and/or trap as well as the ability to practice their culture.

Structures, sites, or things that are of historical, archaeological, paleontological, or architectural significance to Indigenous peoples within the Project development area may be impacted by development of the Project. These will be identified through ongoing engagement and consultation with potentially impacted Indigenous peoples.

Suncor's response to input received from the review of the Initial Project Description and identified potential impacts to Indigenous peoples on physical and cultural heritage, Indigenous rights, traditional land use, historical, archaeological and paleontological resources is provided in Appendix C.

## **22. IMPACT TO INDIGENOUS PEOPLES – SOCIAL, ECONOMIC AND HEALTH CONDITIONS**

Suncor is engaging with Indigenous people to determine the potential impacts to health, social and economic conditions due to the Project. Section 4 lists concerns raised by Indigenous peoples during ongoing engagement activities. Through past engagement, Suncor understands that there are both positive and negative impacts to social, economic and health conditions to Indigenous peoples due to oil sands development.

Key socio-economic issues raised by Indigenous groups through previous engagements on Suncor-related initiatives as well as through review of the Initial Project Description include:

- the ability to participate in employment and business opportunities (for individuals, as well as Indigenous communities)
- the effect of developments on traditional lands and ways of life / culture
- the effects of developments on Indigenous people's health and well-being
- contribution of the Project to cumulative effects already being experienced in the region
- impacts to physical infrastructure in the region, including housing affordability and roads / traffic levels and related impacts to road safety
- impacts to social infrastructure and ability to access needed services (health, education, social, emergency, policing) for Indigenous communities
- changes in social conditions brought on by population change in the region

Suncor's response to input received from the review of the Initial Project Description and how identified issues for impacts to Indigenous peoples on social, economic and health conditions will be addressed is provided in Appendix C.

Suncor will continue to engage with Indigenous peoples, seek to identify specific impacts to economic, social and health conditions and incorporate into ongoing assessment work and planning for the Project.

The evaluations of Project-related impacts to social, economic and health conditions for Indigenous peoples will include the application of GBA+ to describe disproportionate effects for diverse subgroups. Included as integral parts of the assessments will be identification of mitigation and monitoring plans or programs appropriate to the predicted effects associated with the Project that are identified for the social, economic and health conditions.

## **23. ESTIMATE OF POTENTIAL GREENHOUSE GAS EMISSIONS**

An initial estimate of annual greenhouse gas emissions associated with the Project has been developed based on previously modelled estimates for other Suncor operations. The initial estimate is approximately three million tonnes of carbon dioxide equivalent annually over the life of the Project.

Detailed information on the estimated greenhouse gas emissions from the Project, as well as an assessment of those emissions and how they contribute to climate change, would be provided following the guidance in the draft Strategic Assessment of Climate Change (Government of Canada 2019b).

## **24. TYPES OF WASTE AND EMISSIONS GENERATED BY PROJECT**

This section identifies waste and emissions that have not been previously described in Section 9 and substances that are expected to leave the Project development area.

**Land** - Wastes that may be generated in or on the land during any phase of the Project include regulated and non-regulated waste products. Waste management is regulated by Condition 4.3 of Suncor's *Environmental Protection and Enhancement Act* Approval No. 94-02-00, as amended, which includes the Alberta Energy Regulator codes of practice and guidelines for landfill and hazardous waste facilities operations. In addition, waste management practices at Suncor are regulated and guided by the *Dangerous Goods Transportation and Handling Act*, the *Mines and Minerals Act*, the *Oil Sands Conservation Act*, and the *Safety Codes Act*. The management plan for Project wastes will be based on successful practices now in place at Base Plant. Non-regulated domestic and industrial waste products will be managed through approved landfills, which may be located at the Base Plant. Regulated waste products including chemical liquid wastes, inorganic compounds, bitumen sludge, flammable and corrosive liquids, dipentene, methanol, and paints are disposed of through third party waste management facilities. Recyclable and reclaimable materials include, but are not limited to aerosols, batteries, containers, cardboard, tires, and scrap metal. End destinations for these materials will vary by material type.

Suncor seeks continuous improvements in all aspects of its operations, and this includes the waste minimization areas, which is primarily associated with recycling externally and internally. In both cases, when a waste is determined as a candidate for recycling, a collection system and destination points are established.

**Air** - Air emissions that may be associated with any phase of the Project include oxides of nitrogen emissions from the mine fleet and combustion sources. Volatile organic compounds and other hydrocarbon emissions are expected from mine fleet exhaust, the mine pit area, extraction operations and tailings areas. Potential sources of total reduced sulphur and hydrogen sulphide include the groundwater management system and tailings areas. Particulate matter emissions are expected from site clearing, mining and tailings areas, and combustion sources. Greenhouse gases are also expected from combustion sources and tailings areas on the Project development area. As the Project is designed to sustain the supply of bitumen to Base Plant, annual air emissions from Base Plant operations are not expected to increase because of Project activities.

**Water** - Waste is not expected to be generated in or on water during any phase of the Project. All liquid wastes and water-carried waste that result from industrial processes related to Project activities are managed within a closed-circuit system and will not be released to the environment without appropriate management and approvals.

## **PART G: SUMMARY**

### **25. PLAIN-LANGUAGE SUMMARY**

A plain-language summary in English and in French of the information contained in Parts A to F of the Detailed Project Description is issued under separate cover.

## **APPENDIX A**

### **References**

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## **APPENDIX B**

### **Abbreviations, Acronyms and Glossary**



## ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Definition
%	percent
\$	dollars (Canadian)
3D	Three Dimensional
ACMSW	Alberta Culture, Multiculturalism and Status of Women
AEP	Alberta Environment and Parks
AER	Alberta Energy Regulator
AQHA	Aquatic Health Assessment
AQMG	Air Quality Model Guideline
ASRD	Alberta Sustainable Resource Development
BAFs	Bioaccumulation Factors
BCCAQ	Bias Correction/Constructed Analogues with Quartile mapping reordering
CAC	Criteria Air Contaminants
CadnaA	Computer Aided Noise Abatement
CCME	Canadian Council for Ministers of the Environment
CEB	Chronic Effects Benchmarks
CFOP	Conceptual Fisheries Offsetting Plan
CHR	Cultural and Historical Resources Subgroup
CIE	International Commission on Illumination
CMIP5	Couple Model Intercomparison Project Phase 5
CO	Carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSM	Climate System Model
dBA	"A-weighted" decibels
dBC	"C-weighted" decibels
ECCC	Environment and Climate Change Canada
e.g.,	for example,
EPEA	Alberta <i>Environmental Protection and Enhancement Act</i>
ERCB	Alberta Energy Resources Conservation Board
ESRD	Alberta Environment and Sustainable Resource Development
GBA+	Gender-based analysis plus
GCM	Global Climate Models
GHG	Greenhouse gases
H <sub>2</sub> S	Hydrogen sulphide
HHRA	Human Health Risk Assessment
HIA	Health Impact Assessment
HR	Historic Resources
HRIA	Historic Resource Impact Assessment
HRMB	Historic Resources Management Branch
i.e.,	that is,
IEMA	Institute of Environmental Management and Assessment
IESNA	Illuminating Engineering Society of North America
IPCC	Intergovernmental Panel on Climate Change
IS	Impact Statement

Abbreviation/Acronym	Definition
ISO	International Organization for Standardization
km	Kilometre
Ldn	Combined day-night sound level
Leq	Equivalent continuous sound level
LSA	Local Study Area
LUMIA	Land Use and Management Impact Assessment
NO <sub>2</sub>	Nitrous oxide
NO <sub>x</sub>	Oxides of nitrogen
PAH	Polycyclic aromatic hydrocarbons
PAI	Potential acid input
PASS	Permanent Aquatic Storage Structure
PCIC	Pacific Climate Impact Consortium
pH	A figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are more acid and higher values more alkaline.
PM <sub>10</sub>	Particulate matter with an aerodynamic diameter up to 10 microns (µm)
PM <sub>2.5</sub>	Particulate matter less than 2.5 microns (µm) in diameter
pSoJ	Palaeontology Statement of Justification
RAMP	Regional Aquatics Monitoring Program
RCP	Representative Concentration Pathways
RDI	Research Design Incorporated
RSA	Regional Study Area
QC	Quality Assurance
SAR	Species at Risk
SARA	Canadian <i>Species at Risk Act</i>
SO <sub>2</sub>	Sulphur dioxide
SoJ	Statement of Justification
SWQMF	Surface Water Quantity Management Framework
Tailored Guidelines	Tailored Impact Statement Guidelines
TERA	Terrestrial Ecological Risk Assessment
TLU	Traditional Land Use
TOR	Terms of Reference
TPM	Total Particulate Matter
TRS	Total Reduced Sulphur
UK	United Kingdom
USA	United States of America
VCs	Valued Components
VLS	Visual Landscape System
VOCs	Volatile Organic Compounds
WBEA	Wood Buffalo Environmental Association
WHO	World Health Organization
WMMP	Wildlife Mitigation and Monitoring Plan

## GLOSSARY

Term	Definition
<b>Base Mine</b>	Mining operations (Lease 86/17, Steepbank Mine, Millennium Mine, and North Steepbank Extension Mine) that are part of Base Plant.
<b>Base Plant</b>	Suncor's existing oil sands processing plant and associated mines (Lease 86/17, Steepbank Mine, Millennium Mine, and North Steepbank Extension Mine).
<b>Base Plant Facilities</b>	Oil sands processing plants and facilities that are part of Base Plant.
<b>Bitumen</b>	A highly viscous, tar-like, black hydrocarbon material having an American Petroleum Institute gravity of about 9 (specific gravity about 1.0). It is a mixture of complex organic compounds.
<b>Bitumen Froth</b>	Air-entrained bitumen with a froth-like appearance that is the product of the primary extraction process.
<b>Boreal Forest</b>	Forest growing in high-latitude environments where freezing temperatures occur for six to eight months and in which the trees can reach a minimum height of 5 metres and a canopy cover of 10 percent. The Boreal Forest areas are covered in forested lands that are made up of trees, such as pine, spruce, larch (tamarack), fir, poplar, and birch. The boreal forest also includes lakes, rivers, and wetlands. It is home to an extensive range of mammals, birds, insects, fungi, and micro-organisms.
<b>Coarse Tailings</b>	Coarse tailings, a subset of primary extraction tailings, is comprised of approximately 71 to 76 weight percent coarse particles (sand), 18 to 22 weight percent water, and 5 to 10 weight percent fine particles (clays).
<b>Dedicated Disposal Area</b>	An area where treated tailings are placed to further consolidate.
<b>End Land Use</b>	The allowable use(s) of disturbed land following reclamation.
<b>External Tailings Area</b>	A tailings area that is located outside the mine pit. External Tailings Areas are enclosed by dams made with tailings and overburden materials.
<b>Fisheries Offsetting Plan</b>	A plan to compensate for the effects of a project on productive fish habitats to help maintain and enhance the sustainability and ongoing productivity of downstream fisheries.
<b>Fluid Tailings</b>	Fluid tailings is a subset of the coarse tailings stream, comprised of fine particles, water and bitumen, that is not captured within the coarse tailings matrix at deposition, and collects within the tailings area separate from the coarse tailings. Fluid Tailings contain more than 5 weight percent suspended solids and has an undrained shear strength that is less than 5 kilopascals (as per Alberta Energy Regulator Directive 085 – Fluid Tailings Management for Oil Sands Mining Projects).
<b>Fugitive Emissions</b>	Substances emitted from any source except those from stacks and vents. Typical sources include gaseous leakage from valves, flanges, drains, volatilization from ponds and lagoons, and open doors and windows. Typical particulate sources include bulk storage areas, open conveyors, construction areas or plant roads.
<b>GoldSim</b>	GoldSim is a mass balance model developed using a commercially available, general-purpose simulation software platform called GoldSim (GoldSim Technology Group 2014).
<b>Greenhouse Gas</b>	Gases such as carbon dioxide (CO <sub>2</sub> ), water vapour, methane (CH <sub>4</sub> ), nitrous oxide (N <sub>2</sub> O), and other trace gases which trap heat in the atmosphere, producing the greenhouse effect.

Term	Definition
<b>Hydrogen Sulphide</b>	Hydrogen sulphide is a chemical compound with the formula H <sub>2</sub> S. It is a colourless chalcogen hydride gas with the characteristic foul odour of rotten eggs.
<b>Hydrotransport</b>	The transport of granular materials (e.g., oil sands ore or extraction tailings) by means of a water-based slurry in a pipeline.
<b>Littoral Area or Zone</b>	The area/zone in a lake that is closest to the shore. It includes the part of the lake bottom, and its overlying water, between the highest water level and the depth where there is enough light (about 1% of the surface light) for rooted aquatic plants and algae to colonize the bottom sediments.
<b>Lower Athabasca Regional Plan</b>	The Lower Athabasca Regional Plan (LARP) is a comprehensive, forward-thinking, and legally binding roadmap that enhances the Alberta government's environmental management, addresses growth pressures, and supports economic development. It is the first of seven regional plans committed to under Alberta's innovative Land-use Framework. The regional plan considers the cumulative effects of all activities on air, water, and biodiversity. It establishes new environmental frameworks with limits to protect air and surface water quality and increases the total conserved land within the region to more than two million hectares.
<b>Mine Pit</b>	The areas where overburden and oil sands ore are mined.
<b>Oil Sands Deposit</b>	A sand deposit containing a heavy hydrocarbon (bitumen) in the intergranular pore space of sands and fine-grained particles. Typical oil sands comprise approximately 10 weight percent bitumen, 85 weight percent coarse sand (>44 µm), and a fines fraction (<44 µm).
<b>Oil Sands Ore (Mineable Bitumen)</b>	Oil sands ore (or mineable bitumen) is that portion of an oil sands deposit that is economical to extract bitumen that meets the Alberta Energy Regulator Directive 082 – Operating Criteria: Resource Recovery Requirements for Oil Sands Mine and Processing Plant Operations.
<b>Oil Sands Slurry</b>	Consists of oil sands ore, which is made up of sand, clay, and bitumen, as well as water.
<b>Overburden</b>	Overburden is the material that lies above the mineable oil sands deposit. Overburden is removed during surface mining and may be deposited in external disposal areas, backfilled into mine pit areas, used as part of reclamation activities, or used for construction purposes. Overburden material that has specific strength attributes can be used for the construction of dams for the containment of fluids, such water and/or tailings.
<b>Ore Preparation Plant</b>	The bitumen production facility where the mined oil sands ore is crushed (sized) and mixed with hot/warm water to form a slurry that can be pumped to the primary extraction plant.
<b>Particulate Matter</b>	Refers to any mixture of solid particles or liquid droplets that remain suspended in the atmosphere for appreciable time periods. Examples of particulates are dust and salt particles, water, and acids.
<b>Permanent Aquatic Storage Structure</b>	A process that involves treatment of fluid tailings with both in-line flocculation and coagulation followed by deposition into a dedicated disposal area, where water is expressed from the tailings. The objective is to create a deposit that can then be reclaimed by capping with water to develop a viable aquatic ecosystem.
<b>Primary Extraction Plant</b>	A processing plant where slurried oil sands from the Ore Preparation Plant is separated into a bitumen froth and a tailings stream. The bitumen froth is delivered via pipeline to the Secondary Extraction Plant. Tailings from the primary extraction plant is sent to the external tailings area via pipeline.
<b>Project</b>	The Suncor Energy Inc. Base Mine Extension Project

Term	Definition
<b>Reclamation</b>	The return of disturbed land or wasteland to a state of useful capability. Reclamation is the initiation of the process that leads to a sustainable landscape (see definition), including the construction of stable landforms, drainage systems, wetlands, soil reconstruction, addition of nutrients and revegetation. This provides the basis for natural succession to mature ecosystems suitable for a variety of end uses.
<b>Regional Municipality of Wood Buffalo (RMWB)</b>	A specialized municipality located in northeastern Alberta that was formed as a result of the amalgamation of the City of Fort McMurray and Improvement District No. 143 on April 1, 1995. The RMWB, which is the second largest municipality in Alberta by area, is the home to vast oil sands deposits, also known as the Athabasca oil sands.
<b>Revegetation</b>	The process of replanting disturbed land.
<b>Secondary Extraction Plant</b>	This plant receives bitumen froth from the primary extraction plant where it is diluted with a light hydrocarbon (naphtha) and centrifuged to produce a clean bitumen product for refinement in the upgraders. The waste by-product of this plant is a tailings stream (froth treatment tailings).
<b>Tailings Areas</b>	Constructed impoundments required to contain tailings and effluent enclosed by dams made with materials such as coarse tailings, overburden, and other mined waste materials suitable for construction.
<b>Total Reduced Sulphur</b>	A term used to collectively describe hydrogen sulphide and mercaptans.
<b>Traditional Land Use</b>	Use of the land by Indigenous groups for harvesting traditional resources such as wildlife, fish, or plants, or for cultural purposes such as ceremonies or camping.
<b>Treated Tailings</b>	Any fluid tailings treated through mechanical processes, natural processes, or chemical addition designed to densify the fluid tailings to promote accelerated reclamation of tailings areas.
<b>Tailings Reduction Operation (TRO)</b>	Tailings Reduction Operations is a holistic tailings management approach that includes Sand Dumps, Fluid Transfer and Storage Systems and Dedicated Disposal Areas.
<b>Truck and Shovel Operation</b>	The process of using large trucks and shovels (specialized excavators) for the excavation and transportation of mined materials, such as overburden and oil sands.
<b>Upgrader</b>	A facility for processing heavy oil or bitumen to reduce the density and viscosity of oil, and otherwise improve the value of the oil.
<b>Volatile Organic Compounds</b>	Volatile organic compounds are compounds that easily become vapours or gases. They have high vapour pressure at ordinary room temperatures. They are released from burning fuels such as gasoline, wood, coal, or natural gas.
<b>Wood Buffalo Environmental Association</b>	An association whose purpose is to monitor and provide accurate, credible, transparent, and understandable information on air quality and air related environmental impacts in the Regional Municipality of Wood Buffalo.

## **APPENDIX C**

### **Responses to Summary of Issues**

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
<b>Accidents and Malfunctions</b>	
Potential effects to the environment, particularly nearby waterways, groundwater and surface water quality, and environmentally sensitive areas, from accidents and malfunctions, such as failure of containment structures on tailings impoundment areas, spills or leaks, uncontrolled releases of explosive gases, or incidents associated with other project components or activities, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 23.1 in the standard Tailored Impact Statement Guidelines. The assessment of effects associated with potential accidents and malfunctions is discussed in Section 14 of the Detailed Project Description, with details on assessment approaches included in the specific component areas included in Appendix E.
Clarity on the spill prevention, preparedness, response measures and systems, response capacities, and emergency management plans that will be implemented.	This issue will be addressed in the Impact Statement. It is covered by requirement 23.1 in the standard Tailored Impact Statement Guidelines, as well as items 2.5, part D, and 6.2 in the proposed Terms of Reference. Suncor's Emergency Response planning associated with the Project is discussed in Section 9 of the Detailed Project Description.
<b>Acoustic Environment</b>	
Potential effects to human health and well-being due to increased noise levels from project activities such as machinery use, blasting, drilling activities, and increased traffic, including timing of activities and proposed mitigation and monitoring plans.	This issue will be addressed in the Impact Statement. It is covered by requirement 16 in the standard Tailored Impact Statement Guidelines, as well as item 3.1.2, part C, in the proposed Terms of Reference. The assessment of potential effects of noise is discussed in Section 14 of the Detailed Project Description, with additional detail provided in Appendix E-3.
<b>Alternative Means of Carrying Out the Project</b>	
Clarity on alternative means of carrying out the Project, including any technologies and processes considered, and justification for selection(s).	This issue will be addressed in the Impact Statement. It is covered by requirement 4.4 in the standard Tailored Impact Statement Guidelines, as well as item 2.4 in the proposed Terms of Reference. The consideration of alternative means of carrying out the Project is discussed in Section 12 of the Detailed Project Description.
<b>Alternatives to the Project</b>	
Clarity and further detail on the alternatives to the Project that were considered and rationale for why the current approach was selected.	This issue will be addressed in the Impact Statement. It is covered by requirement 4.4 in the standard Tailored Impact Statement Guidelines. The consideration of alternatives to the Project is discussed in Section 12 of the Detailed Project Description.

Subject and Summary of Issues	Suncor Response
<b>Atmospheric Environment</b>	
Effects to air quality and to local residents' health and well-being due to increased fugitive dust emissions and concentrations of particulate matter in the atmosphere from fuel combustion by-products, earth moving, and project operations, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 16 in the standard Tailored Impact Statement Guidelines, as well as items 2.7 and 6.1 in the proposed Terms of Reference. The assessment of potential effects of air quality and human health is discussed in Section 14 of the Detailed Project Description, with additional details provided in Appendix E-2 and E-13.
Clarity on if the Canadian Ambient Air Quality Standards and objectives will be used to undertake an assessment of existing (baseline) and predicted future (Project, Project + baseline, and Project + baseline + existing and planned future developments) air quality (e.g., for nitrogen dioxide (NO <sub>2</sub> ), sulphur dioxide (SO <sub>2</sub> ), fine particulate matter (PM <sub>2.5</sub> ), and ozone).	This issue will be addressed in the Impact Statement. It is covered by requirement 14.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.1.2, part A in the proposed Terms of Reference. The assessment of potential effects of the Project on air quality is discussed in Section 14 of the Detailed Project Description, with additional detail provided in Appendix E-2.
Consideration of secondary pollutants, such as ozone, in the air quality assessment.	This issue will be addressed in the Impact Statement. It is covered by requirement 14.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.1.2, part A in the proposed Terms of Reference. The assessment of potential effects of the Project on air quality is discussed in Section 14 of the Detailed Project Description, with additional detail provided in Appendix E-2.
Effects to air quality, including cumulative effects, due to emissions of criteria air contaminants (e.g., nitrous oxides (NO <sub>x</sub> ), PM <sub>2.5</sub> , volatile organic compounds (VOCs), SO <sub>2</sub> , polycyclic aromatic compounds (PACs), and metals) from the combustion of diesel fuel in large off-road vehicles, the processing of bitumen, and exposed surfaces such as the mine face and tailings ponds.	This issue will be addressed in the Impact Statement. It is covered by requirement 14.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.1.2, part A in the proposed Terms of Reference. The assessment of potential effects of the Project on air quality is discussed in Section 14 of the Detailed Project Description, with additional detail provided in Appendix E-2.
Potential for increased production of secondary organic aerosols, such as PM <sub>2.5</sub> , downwind of the project area due to increased emissions of precursor compounds.	This issue will be addressed in the Impact Statement. It is covered by requirement 14.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.1.2, part A in the proposed Terms of Reference. The assessment of potential effects of the Project on air quality is discussed in Section 14 of the Detailed Project Description, with additional detail provided in Appendix E-2.
Potential effects of the Project and cumulative effects to terrestrial and aquatic ecosystems, including sensitive ecosystem receptors, due to local and regional degradation of ambient air quality and deposition of atmospheric contaminants, which may result in impacts to water quality, soil resources, flora, and fauna in and around the project area.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.3 and 15 in the standard Tailored Impact Statement Guidelines, as well as items 3.1.2, 3.5.2, and 3.9.2 in the proposed Terms of Reference. The assessment of potential effects of degradation of ambient air quality and deposition of atmospheric contaminants health is discussed in Section 14 of the Detailed Project Description, with additional detail provided in Appendix E-6, E-8.3, E-10, and E-11.



<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Acidification and exceedance of ecosystems' critical loads due to emissions of NOx and SO2 from the Project, and resultant impacts to plants, wildlife, and fish and fish habitat.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.3 and 15 in the standard Tailored Impact Statement Guidelines, as well as items 3.1.2, 3.5.2, and 3.9.2 in the proposed Terms of Reference. The assessment of potential effects of degradation of ambient air quality and deposition of atmospheric contaminants health is discussed in Section 14 of the Detailed Project Description, with additional details provided in Appendix E-9, E-10, and E11.
Contribution of the Project to light pollution and potential effects to nearby communities.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.1 and 15.1 in the standard Tailored Impact Statement Guidelines, as well as item 2.6, part C in the proposed Terms of Reference. The assessment of potential effects of the Project to light pollution is discussed in Section 14 of the Detailed Project Description, with additional details provided in Appendix E-4.
<b>Climate Change and Greenhouse Gas Emissions</b>	
Assessment of the Project's greenhouse gas (GHG) emissions and contribution to climate change as per the draft Strategic Assessment of Climate Change <sup>1</sup> , and description of how the Project aligns with the Government of Canada's long-term goal to achieve net-zero emissions by 2050.	This issue will be addressed in the Impact Statement. It is covered by requirements 15.5 and 24 in the standard Tailored Impact Statement Guidelines, as well as item 2.7, part B in the proposed Terms of Reference. The assessment of potential effects of the Project on greenhouse gas emissions and climate change is discussed in Sections 14 and 23 of the Detailed Project Description. Additional details are provided in Appendix E-2.
Clarity on the scope of activities included in the annual estimate of GHG emissions, an estimate of GHG emissions for each phase of the Project, and information on the methodology, data, emissions factors, and assumptions used to quantify GHG estimates.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.5 in the standard Tailored Impact Statement Guidelines, as well as item 2.7, part B in the proposed Terms of Reference. Information on the Project greenhouse gas emissions is discussed in Sections 6 and 23 of the Detailed Project Description.
Clarity on the specific technologies and practices under consideration to reduce the Project's GHG emissions, including best available technologies and best environmental practices.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.5 in the standard Tailored Impact Statement Guidelines, as well as item 2.7, part A in the proposed Terms of Reference. The consideration of new technologies that may be applied to the Project is discussed in Section 12 of the Detailed Project Description.
Effects on carbon sinks (e.g., forested areas, wetlands, etc.) and implications for climate change.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.5 in the standard Tailored Impact Statement Guidelines, as well as item 3.6.2, part F in the proposed Terms of Reference. The assessment of potential effects of the Project on carbon sinks is discussed in Section 14 of the Detailed Project Description, with additional details provided in Appendix E-10.

Subject and Summary of Issues	Suncor Response
<b>Cumulative Effects – Regional Initiatives and Assessments</b>	
Description and/or map of the existing land disturbances in the area, current and approved projects in the region (including SAGD projects), and information on their reclamation plans and how these will integrate with the reclamation plan for the Project.	This issue will be addressed in the Impact Statement. It is covered by requirement 8.8 in the standard Tailored Impact Statement Guidelines, as well as items 3.6.1, part B, and 3.10.1 in the proposed Terms of Reference. Information on reclamation plans associated with existing disturbances and how they integrate with the reclamation plans for the Project is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-10.
Current status of regional and local environmental monitoring and trends including for air, water, and sediment quality.	This issue will be addressed in the Impact Statement. It is covered by requirement 26 in the standard Tailored Impact Statement Guidelines, as well as item 2.11 in the proposed Terms of Reference. Information on monitoring programs is discussed in Sections 5, 14 and 21 of the Detailed Project Description.
Clarity on whether a joint review of the Project will be conducted with the Mackenzie Valley Resource Management Board to assess potential transboundary effects on water quality and quantity in the Northwest Territories.	Suncor believes that this issue should not be included in the scope of review. Suncor notes that this type of assessment has not been conducted for any other oil sands project and believes that review of the Project by the Agency and the Alberta Energy Regulator is sufficient.
Clarity on how information from the environmental assessment of the Voyager South Project will be considered.	This issue will be addressed in the Impact Statement. It is covered by requirement 7.2 in the standard Tailored Impact Statement Guidelines, as well as item 3 in the proposed Terms of Reference. A discussion on how information from the Voyager South Project will be used in the baseline information for the Project is included in Section 5 of the Detailed Project Description.
Potential effects of the Project on the ability to achieve the Wood Buffalo National Park Action Plan goals and any associated monitoring or management actions implemented by the Wood Buffalo National Park Action Plan Committee.	This issue will be addressed in the Impact Statement. It is covered by requirement 7.2 in the standard Tailored Impact Statement Guidelines. The Wood Buffalo National Park will be considered within the study areas established for the Project impact assessment. Consideration of the Wood Buffalo National Park Action Plan is discussed in Section 6 of the Detailed Project Description.
Potential effects of the Project and cumulative effects on Wood Buffalo National Park and the Peace-Athabasca Delta due to downstream movement of contaminants along the Athabasca River from the project area, particularly from tailings disposal areas. Include information and findings of the Strategic Environmental Assessment.	This issue will be addressed in the Impact Statement. It is covered by requirement 7.2 in the standard Tailored Impact Statement Guidelines. The Wood Buffalo National Park will be considered within the study areas established for the Project impact assessment. Consideration of the Wood Buffalo National Park Strategic Environmental Assessment is discussed in Section 6 of the Detailed Project Description.

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Request that if the Lower Athabasca Regional Plan is referenced that clarity is provided regarding Indigenous perspectives on the document.	This issue will be addressed in the Impact Statement. Consideration of the Lower Athabasca Regional Plan is covered by requirement 7.2 in the standard Tailored Impact Statement Guidelines, as well as by item 2.2, part A in the proposed Terms of Reference. Suncor will commit to including a discussion on Indigenous perspectives of the document when it first references the Lower Athabasca Regional Plan in the Project impact assessment. Consideration of the Lower Athabasca Regional Plan is discussed in Section 5 of the Detailed Project Description.
<b>Drinking Water</b>	
Potential effects to drinking and recreational water quality due to spills and local alteration of groundwater flow patterns and local and regional drinking water sources, both treated and on the land, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 16 and 23.1 in the standard Tailored Impact Statement Guidelines, as well as item 10 in the proposed Terms of Reference. Potential effects to drinking and recreational water quality is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-8.3.
Potential effects to drinking water treatment facilities and their treatment capacity, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 17.1 and 23.1 in the standard Tailored Impact Statement Guidelines, as well as items 3.4.2, part C, and 10 in the proposed Terms of Reference. Potential effects to drinking water treatment facilities is discussed in Section 15 of the Detailed Project Description.
<b>Economic Conditions</b>	
Potential effects on the local economy, including effects related to the use of automated haul trucks, such as direct and indirect impacts to employment and GDP, the local housing market and property values, local businesses, provincial and federal government revenues, and means to mitigate adverse effects, enhance positive effects, and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 17 and 18 in the standard Tailored Impact Statement Guidelines, as well as item 7.2 in the proposed Terms of Reference. Potential effects to the local economy are discussed in Section 15 of the Detailed Project Description.
Potential effects to local municipal infrastructure and increased financial and environmental liability that may be associated with re-routing the Poplar Creek Road, including costs associated with maintaining road access for oil sands projects west of the proposed Project that currently rely on this road.	This issue will be addressed in the Impact Statement. It is covered by requirements 17 and 18 in the standard Tailored Impact Statement Guidelines, as well as item 7.2 in the proposed Terms of Reference. Potential effects to the local municipal infrastructure are discussed in Section 15 of the Detailed Project Description.

Subject and Summary of Issues	Suncor Response
<b>Effects of the Environment on the Project</b>	
Potential effects of climate change on the Project that could lead to accidents and malfunctions or changes in baseline conditions, including clarity on measures or design features to increase the resilience of the Project to climate change, information on tailings management, water management, and post-operation closure plans.	This issue will be addressed in the Impact Statement. It is covered by requirement 23.2 in the standard Tailored Impact Statement Guidelines, as well as items 2.8.1, part A, 3.1.1, part A, and 3.1.2, part B in the proposed Terms of Reference. Consideration of the potential effects of climate change on the Project is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-19.
<b>Fish and Fish Habitat</b>	
Potential for the Project to cause harmful alteration, disruption, or destruction of fish habitat, or death of fish, and means to mitigate, offset, and monitor effects, including consideration of potential cumulative effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.5.2, part A, in the proposed Terms of Reference. Means to potentially mitigate and offset effects are covered by requirement 20 in the standard Tailored Impact Statement Guidelines, as well as item 9 in the proposed Terms of Reference. Consideration of the potential effects of the Project on fish and fish habitat is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-9.
Potential effects of the Project and cumulative effects on the ability of fish to use fish habitat to carry out life processes due to water withdrawals, water drawdown, and erosion and sedimentation in waterbodies, and means to mitigate, offset, and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.5.2, part A, in the proposed Terms of Reference. Means to potentially mitigate and offset effects are covered by requirement 20 in the standard Tailored Impact Statement Guidelines, as well as item 9 in the proposed Terms of Reference. Consideration of the potential effects of the Project on fish and fish habitat is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-9.
Potential effects to fish and fish habitat within Poplar Creek, which provides important fish spawning habitat and feed forage for Lake Athabasca fish species.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.5.2, part A, in the proposed Terms of Reference. Consideration of the potential effects of the Project on fish and fish habitat in Poplar Creek is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-9.
Potential effects to benthic invertebrate communities due to alteration and removal of waterbodies and watercourses, and resultant effects to fish populations and the ability of Indigenous peoples to practice the right to fish.	This issue will be addressed in the Impact Statement. Potential effects to benthic invertebrate communities and fish populations are covered by requirement 15.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.5.2, part A, in the proposed Terms of Reference. Potential effects to the ability of Indigenous people to practice the right to fish is covered by requirement 19.2 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, part A of the proposed Terms of Reference. Consideration of the potential effects of the Project on benthic invertebrate communities is discussed in Sections 14 and 21 of the Detailed Project Description, with additional details provided in Appendix E-9.

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Potential changes in water quality that may result in fish tainting, effects on fish health and productivity that could result in changes to abundance, reduced survival and reproduction rates, including consideration of long- term population sustainability and productivity.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.1 in the standard Tailored Impact Statement Guidelines, as well as item 3.5.2, part A, in the proposed Terms of Reference. Consideration of the potential effects of the Project on water quality that might result in effects to fish is discussed in Section 14 of the Detailed Project Description, with details provided in Appendix E-9.
<b>Human Health and Well-Being</b>	
Production of silica dust from the Project and potential effects to human health, including silicosis, and proposed means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 8.1 in the standard Tailored Impact Statement Guidelines, as well as items 3.1.2, part A, and 6.1, parts A and C in the proposed Terms of Reference. Consideration of the potential effects of the Project in association with dust production is discussed in Sections 14 and 15 of the Detailed Project Description, with details provided in Appendix E-13.
Effects of the Project to regional Indigenous peoples, residents and businesses of Fort McMurray and Fort MacKay due to impacts to the visual aesthetics of the area and along the Athabasca River.	This issue will be addressed in the Impact Statement. It is covered by requirements 12.2 and 16 in the standard Tailored Impact Statement Guidelines, as well as items 2.10, part A, and 3.9.2, part C in the proposed Terms of Reference. Consideration of the potential effects of the Project in association with impacts to visual aesthetics is discussed in Sections 14 and 22 of the Detailed Project Description, with additional details provided in Appendix E-17.
Potential generation of odours and solvent vapours during oil sands extraction and any real or perceived effects to Indigenous communities and other residents and businesses of Fort McMurray and Fort MacKay.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.1 and 19.1 in the standard Tailored Impact Statement Guidelines, as well as item 2.7, part B, 3.1.2, part A, and 3.9.2, part C in the proposed Terms of Reference. Consideration of the potential effects of the Project in association with potential generation of, and effects from odours is discussed in Sections 14, 15 and 22 of the Detailed Project Description, with additional details provided in Appendix E-2.
Requirement to conduct a Human Health Risk Assessment that contains all relevant contaminants and exposure pathways, and locations of human receptors relative to the Project.	This issue will be addressed in the Impact Statement. It is covered by requirement 16 in the standard Tailored Impact Statement Guidelines, as well as item 6.1 in the proposed Terms of Reference. The discussion on completion of a human health risk assessment is discussed in Section 15 of the Detailed Project Description, with additional details provided in Appendix E-13.
Requirement to include a Health Impact Assessment that considers potential positive and negative socio-economic factors that may impact physical, mental, and social well-being, and incorporates community concerns, Indigenous determinants of health and gender-based analysis plus.	This issue will be addressed in the Impact Statement. It is covered by requirement 19.1 in the standard Tailored Impact Statement Guidelines, as well as item 6.1 in the proposed Terms of Reference. The discussion on completion of a human health risk assessment with consideration of effects to Indigenous peoples is discussed in Sections 15 and 22 of the Detailed Project Description, with additional details provided in Appendix E-13.

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Potential human health effects of diesel exhaust or diesel particulate matter.	This issue will be addressed in the Impact Statement. It is covered by requirement 16 in the standard Tailored Impact Statement Guidelines, as well as item 6.1 in the proposed Terms of Reference. The discussion on potential effects of air emissions to human health is discussed in Section 15 of the Detailed Project Description, with additional details provided in Appendix E-13.
Potential human health effects of local and regional degradation of ambient air quality from the Project.	This issue will be addressed in the Impact Statement. It is covered by requirement 16 in the standard Tailored Impact Statement Guidelines, as well as item 6.1 in the proposed Terms of Reference. The discussion on potential effects to human health in association with the Project's potential effects on ambient air quality is discussed in Section 15 of the Detailed Project Description, with additional details provided in Appendix E-13.
<b>Indigenous and Stakeholder Consultation and Engagement</b>	
Clarity on consultation and engagement processes with Indigenous groups and local residents of Fort McMurray and the surrounding area that will support the identification of different needs and ensure transparency and inclusivity, including barriers to participation in consultation for local under-represented groups.	This issue will be addressed in the Impact Statement. It is covered by requirements 5, 6, 20 and 22 in the standard Tailored Impact Statement Guidelines, as well as items 1 6.1, 4.1, part C, 6.1, part B, and 6.2, part A in the proposed Terms of Reference. Discussion on consultation and engagement processes is discussed in Sections 3, 4, 14 and 15 of the Detailed Project Description.
Need for meaningful and collaborative consultation and engagement with Indigenous communities, including development of a consultation plan, identification of both positive and negative consequences of changes to the environment or to health, social and economic conditions as early as possible in project planning, pre-disturbance assessments, effects monitoring (e.g., Indigenous monitoring), and site visits.	This issue will be addressed in the Impact Statement. It is covered by requirements 5, 6, 20 and 22 in the standard Tailored Impact Statement Guidelines, as well as items 1 6.1, 4.1, part C, 6.1, part B, and 6.2, part A in the proposed Terms of Reference. Discussion on consultation and engagement processes is discussed in Sections 3, 4, 14 and 15 of the Detailed Project Description.
Need for co-management and positive collaboration between Indigenous peoples and the proponent to mitigate project-specific effects, to protect the sustainability of regional Indigenous communities' health and wellness, and to protect key cultural sites.	This issue will be addressed in the Impact Statement. It is covered by requirements 5, 6, 20 and 22 in the standard Tailored Impact Statement Guidelines, as well as items 1 6.1, 4.1, part C, 6.1, part B, and 6.2, part A in the proposed Terms of Reference. Discussion on consultation and engagement processes is discussed in Sections 3, 4, 14 and 15 of the Detailed Project Description.
Need for consultation and engagement with Indigenous communities that follows appropriate consultation protocols and ensures that vulnerable and underrepresented groups are considered.	This issue will be addressed in the Impact Statement. It is covered by requirements 5, 6, 20 and 22 in the standard Tailored Impact Statement Guidelines, as well as items 1 6.1, 4.1, part C, 6.1, part B, and 6.2, part A in the proposed Terms of Reference. Discussion on consultation and engagement processes is discussed in Sections 3, 4, 14 and 15 of the Detailed Project Description.

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
<b>Indigenous Knowledge</b>	
Need for traditional land use studies to augment proponent studies and consideration of Indigenous knowledge throughout the impact assessment process.	This issue will be addressed in the Impact Statement. It is covered by requirements 12 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 1, 3.6.2, part C, and 5 in the proposed Terms of Reference.
Need to provide Indigenous communities with capacity to support community-specific and project-specific cultural impact assessments regarding effects to socio-economic well-being, Aboriginal or Treaty rights, and traditional land use; collaborative development of mitigation and monitoring plans; and participation in the impact assessment process and follow-up and monitoring.	Suncor will include discussion regarding incremental capacity requirements as a component of its engagement with specific communities.
Consideration of existing reports and studies where appropriate, including re-validation with the respective communities of any information used from any previous Indigenous Knowledge studies regarding the Project-specific scope and effects consideration to avoid potential misrepresentation or de-contextualization of Indigenous perspectives.	Suncor will take into consideration existing studies where appropriate and also engage with communities to better understand Project specific concerns with respect to Indigenous Knowledge.
<b>Indigenous Peoples' Use of Lands and Resources for Traditional Purposes</b>	
Effects of the Project and cumulative effects on Indigenous peoples' culture, connection to the land and interconnectedness with the ecosystem, access and availability of lands, the current and future use of lands and resources for traditional purposes, food security and the ability to sustainably continue traditional practices such as trapping, hunting, fishing, gathering (e.g., traditional plants, medicinal plants), teaching, and spiritual practices.	This issue will be addressed in the Impact Statement. It is covered by requirements 12 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 3.10.2, part A, 5 and 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Sections 21 and 22 of the Detailed Project Description.
Effects of the Project and cumulative effects to biodiversity and species of cultural importance to Indigenous peoples, including for traditional use, due to tree clearing, habitat loss and fragmentation, sensory disturbance, and effects to wildlife health, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 12 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 3.10.2, part A, 5 and 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Sections 21 and 22 of the Detailed Project Description.

Subject and Summary of Issues	Suncor Response
<b>Indigenous Peoples' Health and Well-being</b>	
Potential effects of the Project and cumulative effects to Indigenous peoples' health through consumption or use of country foods and medicinal plants exposed to contaminants from the Project in water, air, or soil; bioaccumulation of contaminants such as mercury; and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 12 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 3.10.2, part A, 5 and 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Sections 21 and 22 of the Detailed Project Description.
Effects of the Project and cumulative effects on the mental health and culture of Indigenous peoples and communities (including those living in Fort McMurray), due to permanent alteration and loss of the traditional cultural landscape.	This issue will be addressed in the Impact Statement. It is covered by requirements 12 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 3.10.2, part A, 5 and 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Sections 21 and 22 of the Detailed Project Description.
<b>Indigenous Peoples' Rights</b>	
Potential impacts of the Project and cumulative impacts to Aboriginal or Treaty rights, and means to mitigate, accommodate, and monitor impacts.	This issue will be addressed in the Impact Statement. It is covered by requirements 12 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 3.10.2, part A, 5 and 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Sections 21 and 22 of the Detailed Project Description.
Need for collaborative development and shared understanding of methodologies for assessing impacts to rights and Indigenous engagement in development of mitigation and accommodation measures.	Suncor intends to collaborate with communities to develop mitigation and accommodation measures. The regulatory process allows guidance on these methodologies through comment on the Tailored Impact Statement Guidelines and the Indigenous Engagement and Participation Plan.
Request that the Agency undertake a regional assessment focused on cumulative effects and sustainability with deliverables being concrete actions and management plans to address cumulative effects and sustainability and to accommodate impacts to rights.	Suncor believes that this issue should not be included in the scope of review. A Federal regional assessment is a separate process under the <i>Impact Assessment Act</i> . This should not be undertaken as part of a review of the Project.
<b>Indigenous Peoples' Social and Economic Conditions</b>	
Clarity on potential job and training opportunities for Indigenous peoples, including women and youth.	This issue will be addressed in the Impact Statement. It is covered by requirements 17, 18 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Section 22 of the Detailed Project Description.



<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Effects of the Project and cumulative effects on the social and economic conditions of Indigenous peoples, including effects to the price of goods, culture and language transmission, racism and violence, and alcohol and substance abuse.	This issue will be addressed in the Impact Statement. It is covered by requirements 17, 18 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Section 22 of the Detailed Project Description.
Potential social and economic effects of the Project and cumulative effects to Indigenous peoples from increased reliance on commercial foods as opposed to traditional subsistence foods due to real or perceived contamination and health risks or through reduced availability.	This issue will be addressed in the Impact Statement. It is covered by requirements 17, 18 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Section 22 of the Detailed Project Description.
Potential effects of the Project and cumulative effects to infrastructure and Indigenous communities due to an influx of workers from outside the region.	This issue will be addressed in the Impact Statement. It is covered by requirements 17 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, parts A and C in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Section 22 of the Detailed Project Description.
<b>Indigenous Peoples' Spiritual, Physical, and Cultural Heritage</b>	
Effects of the Project and cumulative effects to structures, sites, or things of historical, archaeological, and paleontological significance to Indigenous peoples, including trails; burial, ceremonial, spiritual, and sacred sites; and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 17, 18 and 19 in the standard Tailored Impact Statement Guidelines, as well as items 4 and 5 in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Section 21 of the Detailed Project Description.
Generational impacts to Indigenous communities through potential impacts to the meaningful intergenerational transmission of culture, laws, customs, language, and the practice of rights.	This issue will be addressed in the Impact Statement. It is covered by requirements 17 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, part A in the proposed Terms of Reference. Discussion on the assessment of impacts to Indigenous peoples is included in Section 22 of the Detailed Project Description.
<b>Migratory Birds and their Habitat</b>	
Clarity on the proponent's plan to ensure compliance with the Migratory Birds Convention Act, 1994 and its regulations.	This issue will be addressed in the Impact Statement. It is covered by requirements 17 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7.2, part A in the proposed Terms of Reference. Discussion on requirements and potential effects to migratory birds is included in Section 20 of the Detailed Project Description, while the assessment of potential effects and planned mitigation and monitoring are included within the assessment work as described in Section 14, with details provided in Appendix E-11.

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Potential effects of the Project and cumulative effects to migratory birds due to the removal of nesting, foraging, staging, and overwintering habitat, and potential direct harm or mortality if project site disturbance or vegetation removal is undertaken during the nesting season.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.2 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2, parts A and D in the proposed Terms of Reference. Discussion on the assessment of potential effects to migratory birds is included in Section 14 of the Detailed Project Description, with details provided in Appendix E-11.
Potential mortality of migratory birds due to contact with harmful substances in tailings ponds or other contaminated open water on the project site, and collisions with vehicles or project infrastructure, including consideration of cumulative effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.2 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2, parts A and D in the proposed Terms of Reference. Discussion on potential effects to migratory birds is included in Section 14 of the Detailed Project Description, with details provided in Appendix E-11.
Potential effects of the Project and cumulative effects to migratory birds from sensory disturbance (i.e., noise, vibrations, light) and the presence of workers, such as avoidance of habitats adjacent to the Project and disorientation or attraction to the project area, resulting in injury or death. Include details on the amount, duration, frequency, and timing of sensory disturbances.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.2 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2, parts A and D in the proposed Terms of Reference. Discussion on potential effects to migratory birds is included in Section 14 of the Detailed Project Description, with details provided in Appendix E-11.
Potential effects of the Project and cumulative effects on wetland function, direct loss of wetlands, quality of wetland habitat, and residual effects, including consideration of socio-economic and ecological functions of wetlands and any resultant effects to migratory birds, species at risk, and other wildlife.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.3, 15.2, 15.3, and 15.4 in the standard Tailored Impact Statement Guidelines, as well as items 2.8.2, 3.3.2, 3.6.2, and 3.7.2 in the proposed Terms of Reference. Discussion on potential effects to wetlands and wetland users is included in Section 14 of the Detailed Project Description, with details provided in Appendix E-10, E-11, and E-12.
Clarity on measures to mitigate, monitor, and adaptively respond to potential effects to migratory birds throughout the project life.	This issue will be addressed in the Impact Statement. It is covered by requirements 15.2 and 20 in the standard Tailored Impact Statement Guidelines, as well as item 9 in the proposed Terms of Reference. Discussion on mitigation and monitoring associated with potential effects to migratory birds will be included in the assessment as described in Section 14 of the Detailed Project Description.
<b>Navigation</b>	
Potential effects of the Project and cumulative effects to navigation and safety on the Athabasca River by Indigenous peoples, information on relevant Water Act license(s), and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.2, 17.3 and 20 in the standard Tailored Impact Statement Guidelines, as well as items 3.3.2 and 5 in the proposed Terms of Reference. Discussion on the assessment of potential effects to water levels in the Athabasca River is included in Section 14 of the Detailed Project Description, with details provided in Appendix E-8.2.

Subject and Summary of Issues	Suncor Response
<b>Reclamation and Waste Management</b>	
Potential effects of the Project and cumulative effects associated with tailings and tailings management, including management strategies, wastes produced (e.g., exploratory drilling wastes, tailings, overburden and other mining wastes, and by-products), measures to minimize fine fluid tailings production, construction of disposal sites, feasibility and effectiveness of reclamation strategies, and measures for recycling wastes, preventing pollution, and minimizing waste throughout the life of the Project, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 8.3 and 14.2 in the standard Tailored Impact Statement Guidelines, as well as items 2.1, part B, 2.8.3 and 2.9 in the proposed Terms of Reference. Discussion on tailings and wastes, as well as on their management is included in Sections 9, 12, and 24 of the Detailed Project Description.
Potential effects of the Project and cumulative effects related to increasing land disturbance, and clarity on the proposed reclamation plan for the Project, including if pit lakes are planned.	This issue will be addressed in the Impact Statement. It is covered by requirements 8.8 and 14.3 in the standard Tailored Impact Statement Guidelines, as well as items 3.3.2, part B, 3.6.2, and 3.10.2 in the proposed Terms of Reference. Information on reclamation plan for the Project is discussed in Sections 9 and 14 of the Detailed Project Description, with details on assessment of the reclamation plan provided in Appendix E-10.
Description of uncertainty regarding regional reclamation success for this Project and related projects, which may contribute to cumulative effects to wildlife, including migratory birds and species at risk, and land disturbance.	Uncertainties associated with the success of regional reclamation plans as well as with the reclamation plan for the Project will be discussed in the Reclamation and Closure plan section of the Project application.
Clarity on whether the reclamation plan for the existing Base Mine will use the newest strategies, technologies, and timelines, and how reclamation of the Base Mine will be timed with the proposed Project.	The Project does not affect the currently approved Reclamation and Closure Plan for the Base Mine. Timing for the reclamation of the Base Mine is proceeding as planned in the currently approved Reclamation and Closure Plan. Much of the Base Mine area will be reclaimed prior to completion of activities in the Project area.
Clarity on whether intact pockets of healthy boreal forest within the Project area will be preserved for wildlife habitat and to support future reclamation purposes given current and future cumulative losses of northern boreal forest habitat.	The development footprint proposed for the Project is set to maximize recovery of oil sands ore, while minimizing additional disturbance areas that are required for overburden disposal, tailings management and other essential Project operational features. The majority of the development area, as shown in Figure 3 of the Detailed Project Description, will be disturbed. There will be two areas, located in the northwest and southeast areas of the development area where the existing boreal forest will be left undisturbed, with the exception that flows in streams passing through these areas will be reduced.

Subject and Summary of Issues	Suncor Response
Potential effects to the future viability and usability of the project area for traditional purposes, following reclamation and closure, particularly of tailings impoundment areas.	This issue will be addressed in the Impact Statement. It is covered by requirements 8.8, 14.3, 17.2 and 19.1 in the standard Tailored Impact Statement Guidelines, as well as items 3.3.2, part B, 3.6.2, and 3.10.2 in the proposed Terms of Reference. The predicted features of the reclaimed areas as well as an assessment of their utility in terms of being viable habitats for plants and wildlife will be assessed in the Impact Statement. Information on reclamation plan for the Project is discussed in Sections 9 and 14 of the Detailed Project Description, with details on assessment of the reclamation plan provided in Appendix E-10.
<b>Species at Risk, Terrestrial Wildlife, and their Habitat</b>	
Potential effects of the Project and cumulative effects to wildlife and other species at risk due to loss of habitat and migration corridor area and quality, diversity, changes in predator movements, and potential changes in soil quality and quantity that may result in reduced soil productivity, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. Effects to wildlife are covered by requirement 15.3 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2 in the proposed Terms of Reference. Changes in soil are covered by requirement 14.3 in the standard Tailored Impact Statement Guidelines, as well as item 3.9.2 in the proposed Terms of Reference. Information on the assessment of wildlife and soils for the Project is discussed in Sections 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-6 and E-11.
Potential injury or death of species listed under Schedule 1 of the Species at Risk Act or the destruction of residences or structures necessary for the reproduction and survival of species at risk during all project phases, including construction activities and vegetation removal that would be undertaken during key periods (e.g., breeding seasons).	This issue will be addressed in the Impact Statement. It is covered by requirement 15.4 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2 in the proposed Terms of Reference. Information on the assessment of species at risk for the Project is discussed in Sections 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-12.
Potential effects of the Project and cumulative effects to species at risk, including displacement, due to the removal of habitat that may serve important ecological functions for these species, such as mixed wood and old-growth forests and riparian wetland areas.	This issue will be addressed in the Impact Statement. It is covered by requirements 15.4 and 15.3 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2 in the proposed Terms of Reference. Information on the assessment of species at risk for the Project is discussed in Sections 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-12.
Potential for harmful substances to enter environments and result in adverse effects and cumulative effects to wildlife habitat and wildlife health, including migratory birds and species at risk.	This issue will be addressed in the Impact Statement. It is covered by requirements 15.2 and 15.3 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2 in the proposed Terms of Reference. Information on the assessment of species at risk for the Project is discussed in Sections 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-14.

<b>Subject and Summary of Issues</b>	<b>Suncor Response</b>
Consideration of all migratory bird, non-migratory bird, and terrestrial species at risk with the potential to occur in the project area.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.4 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2 in the proposed Terms of Reference. Information on the assessment of species at risk for the Project is discussed in Sections 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-12.
Potential effects of the Project to whooping crane population survival and migration behaviours due to wetland habitat alterations and loss, and potential for contact with contaminants in tailings disposal areas, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 15.4 in the standard Tailored Impact Statement Guidelines, as well as item 3.7.2 in the proposed Terms of Reference. Information on the assessment of species at risk for the Project is discussed in Sections 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-12.
Potential effects to forest resources, including cumulative effects, due to impacts of the Project on the hydrology of surrounding surface watersheds, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.3 in the standard Tailored Impact Statement Guidelines, as well as item 3.3.2 and 3.6.2 in the proposed Terms of Reference. Information on the assessment of changes to hydrology and potential effects on forest resources for the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessments provided in Appendix E-8.2 and E-10.
<b>Vulnerable Population Groups (GBA+)</b>	
Potential positive and negative impacts of the Project on diverse groups of people and across the Project's lifecycle, including clarity on efforts to narrow gender gaps and other disparities, as demonstrated through GBA+ (gender based analysis plus) assessment.	This issue will be addressed in the Impact Statement. It is covered by requirements 17, 18 and 19 in the standard Tailored Impact Statement Guidelines, as well as item 7 in the proposed Terms of Reference. Information on the assessment of impacts of the Project on people is discussed in Sections 14, 15 and 22 of the Detailed Project Description. The evaluations of social effects will include the application of Gender Based Analysis Plus (GBA+) to the analysis to describe disproportionate effects for diverse subgroups.
Analysis of the current socio-economic environment, considering demographics, socio-economic conditions, and cultural trends, including relevant laws and policies.	This issue will be addressed in the Impact Statement. It is covered by requirements 10 and 11 in the standard Tailored Impact Statement Guidelines, as well as item 7.1, part A, in the proposed Terms of Reference. Information on the assessment of socio-economic conditions in the Project area is discussed in Sections 15 and 22 of the Detailed Project Description.
Inclusion of monitoring programs to reveal inequalities and design mitigation strategies regarding effects to specific populations.	This issue will be addressed in the Impact Statement. It is covered by requirement 26 in the standard Tailored Impact Statement Guidelines, as well as item 10 in the proposed Terms of Reference. Information on mitigation and monitoring plans and programs for the Project is discussed in Sections 14, 15 and 22 of the Detailed Project Description.

Subject and Summary of Issues	Suncor Response
<b>Water – Groundwater and Surface Water</b>	
Potential effects of the Project and cumulative effects, to groundwater recharge and discharge quantities, groundwater levels, and groundwater- surface water interactions due to landscape alterations, the Project's groundwater management system, and tailings facilities, and means to mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 14.2 in the standard Tailored Impact Statement Guidelines, as well as items 3.2.2, 3.3.2, and 10 in the proposed Terms of Reference. Information on groundwater and surface water, as well as on mitigation and monitoring plans and programs for the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessment provided in Appendix E-8.1 and E-8.2.
Potential effects of tailings facilities, wastewater streams from all project components including release of treated process water, and other project-related emissions on groundwater quality and systems, including cumulative effects, and means to mitigate and monitor effects. Consideration of all possible project conditions (i.e., normal, start-up, worst-case scenarios, and upset conditions).	This issue will be addressed in the Impact Statement. It is covered by requirement 14.2 in the standard Tailored Impact Statement Guidelines, as well as items 3.2.2 and 10 in the proposed Terms of Reference. Information on groundwater as well as on mitigation and monitoring plans and programs for the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessment provided in Appendix E-8.1.
Potential effects of the Project and cumulative effects to groundwater and surface water quality from dust deposition in waterbodies and soil erosion.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.1, 14.2 and 14.3 in the standard Tailored Impact Statement Guidelines, as well as items 3.1.2, 3.2.2 and 3.3.2 and 2.4.2 in the proposed Terms of Reference. Information on dust and soil erosion and potential effects to water quality for the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessment provided in Appendix E-8.3.
Potential alterations to the water table and groundwater elevation from depressurization of the basal aquifer and dewatering of surficial deposits, including potential cumulative effects.	This issue will be addressed in the Impact Statement. It is covered by requirement 14.2 in the standard Tailored Impact Statement Guidelines, as well as item 3.2.2 in the proposed Terms of Reference. Information on potential effects to groundwater from the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessment provided in Appendix E-8.1.
Potential effects of the Project and cumulative effects to stream flows and water levels, and to sediment quality in receiving environments due to excavation and the loss of the Beaver Creek and Poplar Creek Reservoirs, which may result in changes to geomorphology and suspended solid concentrations in surface waters.	This issue will be addressed in the Impact Statement. It is covered by requirement 14.2 in the standard Tailored Impact Statement Guidelines, as well as item 3.3.2 in the proposed Terms of Reference. Information on potential effects to groundwater from the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessment provided in Appendix E-8.2.
Potential effects to ecosystem function due to the removal of waterbodies and watercourses in the project area, including means to avoid the removal of waterbodies to the extent possible, and mitigate and monitor effects.	This issue will be addressed in the Impact Statement. It is covered by requirements 14.2 and 14.3 in the standard Tailored Impact Statement Guidelines, as well as items 3.3.2 and 3.5.2 in the proposed Terms of Reference. Information on potential effects to surface waters and aquatic ecology from the Project is discussed in Section 14 of the Detailed Project Description, with details on the assessment provided in Appendix E-8.2, E-8.4 and E-9.

## **APPENDIX D**

### **Summary of Early Engagement Activities by Community**

All specified communities have received a copy of the Initial Project Description and a regulatory update.

Community	Engagement
Athabasca Chipewyan First Nation	<ul style="list-style-type: none"> <li>• In-person meeting in June 2019 in addition to ongoing updates as part of ongoing relationship and operational activities.</li> <li>• Athabasca Chipewyan First Nation provided comments on Initial Project Description.</li> <li>• In light of Covid-19 and at the agreement of Athabasca Chipewyan First Nation, video conferences held in April and June 2020 to provide project and regulatory updates and review comments provided on Initial Project Description.</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development</li> </ul>
Bigstone Cree First Nation	<ul style="list-style-type: none"> <li>• Initial conference call to ensure receipt of Initial Project Description. Primary project consideration stated was water issues.</li> </ul>
Chipewyan Prairie Dene First Nation	<ul style="list-style-type: none"> <li>• In-person on October 2019 and follow up phone conversation on November 2019.</li> <li>• In light of Covid-19 and at the agreement of Chipewyan Prairie Dene First Nation, conference call was held in April 2020 to provide project and regulatory update.</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development</li> </ul>
Christina River Dene Nation Council	<ul style="list-style-type: none"> <li>• Conference call to provide general project information and update in 2019.</li> <li>• In light of Covid-19 and at the agreement of Christina River Dene Nation Council, conference call to discuss economic opportunities in April 2020.</li> <li>• Provided written update on regulatory process in June 2020.</li> </ul>
Fort Chipewyan Métis Local 125	<ul style="list-style-type: none"> <li>• Suncor met with FCML 125 by phone in June 2019 and September 2019 to provide an update on development planning for the Project</li> <li>• In light of Covid-19 and at the agreement of Fort Chipewyan Metis Local 125, video conference was held in May 2020 to provide project update and discuss comments provided in response to the Initial Project Description. Preliminary discussion on engagement approach,</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> </ul>
Fort McKay First Nation	<ul style="list-style-type: none"> <li>• Suncor met with FMFN in person in September 2019 and November 2019 to provide an update on development planning for the Project and discuss the proposed regulatory process.</li> <li>• FMFN provided feedback on Suncor's Initial Project Description in November 2019.</li> <li>• In light of Covid-19 and at the agreement of Fort McKay First Nation, video conference was held in April 2020 to provide project update and review comments on the Initial Project Description. Preliminary discussion on engagement approach.</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development.</li> </ul>
Fort McKay Métis Nation	<ul style="list-style-type: none"> <li>• Suncor met with FMMN in June 2019 and December 2019 to provide an update on development planning for the Project, discuss the proposed regulatory process, and Socio-economic Baseline studies.</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development.</li> </ul>



Community	Engagement
Fort McMurray First Nation 468	<ul style="list-style-type: none"> <li>• Suncor met with FMFN 468 in person in June 2019 and November 2019 to provide an update on development planning for the Project, discuss engagement approaches and discuss the proposed regulatory process.</li> <li>• FMFN 468 provided feedback on the Initial Project Description in November 2019.</li> <li>• In light of Covid-19 and at the agreement of FMFN 468, video conferences were held in April, May, and June 2020 to provide project updates and work to develop engagement action plan.</li> <li>• Primary issues and concerns are engagement approach, mitigation measures to reduce TEK/TLU impacts during the project planning and design phase; cumulative effects on water management and water use including tailings management and water release; the reclamation planning process and socio-economic issues including such as employment, training and contracting opportunities</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development.</li> </ul>
Fort McMurray Métis Local 1935	<ul style="list-style-type: none"> <li>• Suncor met with FMML 1935 in person in June 2019 to provide an update on development planning for the Project, discuss engagement approaches and discuss the proposed regulatory process.</li> <li>• In light of Covid-19 and at the agreement of FMML 1935, video conference was held in April 2020 to provide project update and review comments provided on Initial Project Description.</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development.</li> </ul>
Gift Lake Métis Settlement	<ul style="list-style-type: none"> <li>• Initial conference call to ensure receipt of Initial Project Description. Primary project consideration stated was water and soil issues and well as socio-economics.</li> <li>• Provided written update on regulatory process in June 2020.</li> </ul>
Little Red River Cree Nation	<ul style="list-style-type: none"> <li>• Conference call to provide general project information and update in 2019.</li> <li>• In light of Covid-19, phone calls occurred March, May, and June of 2020 to provide project and regulatory update.</li> <li>• Primary concern is potential for impacts related to their most proximate reserve at Fox Lake.</li> <li>• Provide written update on regulatory process in June 2020.</li> </ul>
K'alt'odeeche First Nation	<ul style="list-style-type: none"> <li>• Provided copy of Initial Project Description and notified Suncor that they did not want to receive further notifications.</li> </ul>
Métis Nation of Alberta Region 1	<ul style="list-style-type: none"> <li>• Suncor had a phone conversation with MNA R1 in October 2019 to discuss the Project and how MNA R1 wished to be engaged.</li> </ul>
Mikisew Cree First Nation	<ul style="list-style-type: none"> <li>• Suncor met with MCFN in person or by phone in June 2019, July 2019, September 2019, and November 2019 to discuss the conceptual Project history and overview, regulatory process overview, engagement planning and previous action items.</li> <li>• MCFN provided feedback on the Initial Project Description in January 2020.</li> <li>• In light of Covid-19 and at the agreement of MCFN, video conferences were held in April, May and June of 2020 to provide project and regulatory update; review comments provided on Initial Project Description, and initiate development of an action plan on engagement approach.</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> <li>• Action Plan currently under development.</li> </ul>
Willow Lake Métis Association, Local 780	<ul style="list-style-type: none"> <li>• In light of Covid-19 and at the agreement of WLMA, video conferences were held in April, May and June of 2020 to provide project and regulatory update; review comments provided on Initial Project Description and provide further information on the project.</li> <li>• Primary issues and concerns listed in Summary of Issues.</li> <li>• Provided written update on regulatory process in June 2020.</li> </ul>

## **APPENDIX E**

### **Environmental Impact Statement - Proposed Approach and Methodology**

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## E-1. INTRODUCTION

The assessment of all biophysical environment, human health, social, economic and Indigenous Peoples components in the Project Impact Statement (IS) will be conducted in accordance with the guidance presented in the Government of Canada Tailored Impact Statement Guidelines Template for Designated Projects Subject to the *Impact Assessment Act* (Government of Canada 2019a) (hereinafter referred to as the "Tailored Impact Statement Guidelines"). All components will also be assessed in accordance with requirements in the final Terms of Reference (TOR) as issued for the Project by the Alberta Energy Regulator (AER). The TOR will be developed with consideration of the Alberta Standard Terms of Reference for Oil Sands Mines (Government of Alberta 2016), as well as with input from Indigenous groups, stakeholders, and regulators. General methodologies will also comply with the Guide to Preparing EIA Reports in Alberta (Government of Alberta 2013a).

The IS will also include consideration of sustainability as a way to assess the potential effects of the Project, following the concepts within the interim guidance and interim framework on considering the extent to which a project contributes to sustainability (Government of Canada 2019b,c). This activity is expected to consider the long-term effects on future generations, interaction of such effects and the potential for additional mitigation measures. As noted in the Interim Guidance (Government of Canada 2019b), the potential effects of the project "will be analyzed using a sustainability lens guided by the following principles:

- consider the interconnectedness and interdependence of human-ecological systems;
- consider the well-being of present and future generations;
- maximize overall positive benefits and minimize adverse effects of a designated project; and
- apply the precautionary principle and consider uncertainty and risk or irreversible harm."

The assessment of a project's contribution to sustainability requires consideration of those Valued Components (VCs) that participants characterize as important. The VCs may be interpreted differently by different groups; therefore, each perspective needs to be considered in the assessment.

The selection and methodology in selecting VCs for each component will follow the guidance in the Tailored Impact Statement Guidelines. Valued components are aspects of the biological and socio-economic environment that are considered to have economic, social, biological, aesthetic, or ethical value (Beanlands and Duniker 1983). Selection of appropriate VCs is an important part of defining the scope of an environmental and socio-economic assessment because it focuses the assessment on those aspects of the biophysical and social environments that are of greatest importance to society and that could be affected by the Project. When considering VCs to be assessed through the sustainability lens, VCs should be considered that could experience long-term effects; that may interact with other VCs; that may interact with the potential effects of the Project; or that may interfere with Project activities (Government of Canada 2019c).

Assessments to be undertaken for each VC will use assessment endpoints and measurement indicators to aid in structuring the analyses and to facilitate the assessment conclusions. Assessment endpoints are qualitative expressions that represent the key properties of VCs that should be protected. These assessment endpoints will also be defined as part of the process of selecting the VCs. Measurement indicators represent physical and biological/human attributes of the biophysical and socio-economic environments that can be measured and used to characterize changes to VCs to inform conclusions about effects to VCs, and ultimately, assessment endpoints. Measurement indicators may be quantitative (e.g., concentration of metals in surface water; amount of employment and income) or qualitative (e.g., descriptions of expected movement and behaviour of wildlife in response to noise and general human activity, or descriptions of expected changes in community well-being).

The planned assessment will also consider Intermediate Components that are critical components of the assessment, but that have no assessment endpoint. This is because the importance or significance of changes in intermediate component measurement indicators can only be evaluated by considering a VC. For example, the importance of predicted changes in air quality, or groundwater quality should be evaluated considering the consequences that these changes may have on VCs such as the health of people, plants, fish, and wildlife.

Suncor has identified potential VCs and intermediate components, assessment endpoints and measurement indicators based on input received from Indigenous Peoples, stakeholders and regulators during previous oil sands mining applications and assessments (Table E-1 and Table E-2). Suncor plans to review these potential VCs through engagement with the public, Indigenous groups, regulators, and other interested parties such that they are finalized prior to issuance of the Tailored Impact Statement Guidelines.

**Table E-1: Potential Valued Components, Assessment Endpoints and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Assessment Endpoints	Measurement Indicators
Fish and Fish Habitat – fish communities and habitat	<ul style="list-style-type: none"> <li>Traditional or non-traditional food source</li> <li>Social/cultural importance</li> <li>May be part of traditional, subsistence and/or recreational fisheries</li> </ul>	<ul style="list-style-type: none"> <li>Self-sustainability and ecological effective fish populations</li> </ul>	<ul style="list-style-type: none"> <li>Surface water quantity and quality</li> <li>Benthic invertebrate abundance and richness</li> <li>Plankton abundance and richness</li> <li>Fish survival and reproduction</li> <li>Habitat availability (quality and quantity)</li> <li>Habitat distribution (arrangement and connectivity)</li> </ul>
Vegetation <ul style="list-style-type: none"> <li>Old growth forest</li> <li>Listed plants</li> <li>Listed ecological plant communities</li> <li>Limited distribution land cover types</li> <li>Traditional use plants</li> </ul>	<ul style="list-style-type: none"> <li>Ecosystems contain plants that are of a traditional or non-traditional food source</li> <li>Social/cultural importance</li> <li>Supports biodiversity</li> <li>Habitat for wildlife</li> <li>Wetlands provide hydrologic and biochemical functions</li> <li>Sensitive to disturbance</li> <li>Plants and ecosystems may be exposed to chemical changes in air, soil, surface water, or sediment because of the Project</li> <li>Federal or Provincial species at risk/listed species protected by legislation</li> </ul>	<ul style="list-style-type: none"> <li>Self-sustaining and ecologically effective ecosystems</li> </ul>	<ul style="list-style-type: none"> <li>Changes to areas and composition of vegetation valued components in the study areas through direct or indirect effects of the Project</li> </ul>

**Table E-1: Potential Valued Components, Assessment Endpoints and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Assessment Endpoints	Measurement Indicators
<p>Wildlife and Wildlife Habitat</p> <ul style="list-style-type: none"> <li>• Aquatic mammal</li> <li>• Black bear</li> <li>• Fisher</li> <li>• Moose</li> <li>• Northern myotis (Species at Risk [SAR])</li> <li>• White-tailed Deer</li> <li>• Waterbirds</li> <li>• Whooping crane (SAR)</li> <li>• Boreal owl</li> <li>• Common nighthawk (SAR)</li> <li>• Olive-sided flycatcher (SAR)</li> <li>• Rusty blackbird (SAR)</li> <li>• Canada Warbler (SAR)</li> <li>• Canadian toad</li> </ul>	<ul style="list-style-type: none"> <li>• Traditional or current food source</li> <li>• Federal or Provincial species at risk/listed species protected by legislation</li> <li>• Social/cultural importance</li> <li>• Ecological importance</li> <li>• Wildlife that may be exposed to chemical changes in air, soil, surface water, dietary items, or sediment quality because of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Self-sustaining and ecologically effective wildlife populations</li> </ul>	<ul style="list-style-type: none"> <li>• Three primary measurement indicators will be explored for each of the VCs, including: <ul style="list-style-type: none"> <li>- Reproduction and survival</li> <li>- Habitat availability</li> <li>- Movement and habitat distribution</li> </ul> </li> </ul>
<p>Wildlife Health</p> <ul style="list-style-type: none"> <li>• Assessed for various feeding guilds, including: piscivorous birds (horned grebe), herbivorous birds (goose), insectivorous birds (tree swallow), carnivorous birds (short-eared owl), piscivorous mammals (northern river otter), herbivorous mammals (moose), omnivorous mammals (black bear), and carnivorous mammals (fisher)</li> </ul>	<ul style="list-style-type: none"> <li>• Traditional or current food source</li> <li>• Changes in air quality and surface water quality can result in risks to wildlife health</li> <li>• May result from changes in direct exposure (e.g., drinking water) and indirect exposure (e.g., incidental ingestion of soil, dietary exposure)</li> <li>• Changes in risk will be assessed using standard (regulatory endorsed) guidance for conducting Ecological Risk Assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Protection of wildlife health</li> </ul>	<ul style="list-style-type: none"> <li>• Risk estimates for acute inhalation and chronic multiple exposure pathways</li> </ul>

**Table E-1: Potential Valued Components, Assessment Endpoints and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Assessment Endpoints	Measurement Indicators
Human Health	<ul style="list-style-type: none"> <li>• People may be exposed to changes in air, soil, groundwater, surface water, sediment quality, plants, fish, and wildlife because of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Protection of human health</li> </ul>	<ul style="list-style-type: none"> <li>• Hazard quotients for acute inhalation, chronic inhalation, and multiple exposure pathways</li> <li>• The Health Impact Assessment indicators will be finalized following completion of the baseline assessment and may include demographics, housing and the cost of living, education, health services, employment and income, cultural preservation, community and social value, infrastructure and services, food security (including quality), gender, and gender relations</li> </ul>
Cultural and Heritage Resources	<ul style="list-style-type: none"> <li>• Heritage and archaeological resources have spiritual and/or cultural importance to Indigenous people and communities</li> <li>• Archaeological sites are protected under the <i>Historical Resources Act</i></li> </ul>	<ul style="list-style-type: none"> <li>• Protection of heritage resources</li> </ul>	<ul style="list-style-type: none"> <li>• Historical Resources Impact Assessment completed to assess the potential for presence of historic resources</li> </ul>
Indigenous Land and Resource Use	<ul style="list-style-type: none"> <li>• Construction, operations and decommissioning activities have the potential to affect Indigenous land and resource use through direct disturbance to Indigenous land use areas, changes in the availability of traditionally harvested resources, changes in physical access, and sensory disturbances (e.g., noise, odour, and visual effects) affecting Indigenous land users' experiences</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to maintain Indigenous culture and traditional way of life</li> </ul>	<ul style="list-style-type: none"> <li>• Availability of Indigenous use areas</li> <li>• Availability and quality of traditionally harvested resources</li> <li>• Physical access to Indigenous use areas</li> <li>• Sensory disturbances affecting Indigenous land users</li> </ul>



**Table E-1: Potential Valued Components, Assessment Endpoints and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Assessment Endpoints	Measurement Indicators
Other Land and Resource Use	<ul style="list-style-type: none"> <li>Construction, operation, and decommissioning activities have the potential to disturb land uses in the vicinity of the Project through direct land disturbance, access restrictions, impacts on harvested resources, and sensory disturbances (e.g., noise, odour, and visual effects) to land users.</li> </ul>	<ul style="list-style-type: none"> <li>Continued opportunities for land and resource use</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with land use planning objectives</li> <li>Availability of land for recreational and commercial uses</li> <li>Availability of resources for recreational and commercial uses</li> <li>Physical access to land use areas</li> <li>Sensory disturbances affecting recreational land users</li> </ul>
Economic Opportunities	<ul style="list-style-type: none"> <li>Procurement of Project materials, goods, and services can influence business revenues and opportunities</li> <li>Project workforce hiring and procurement could affect training and employment opportunities and income levels</li> <li>The capacity and availability of a local Project workforce could affect employment, income, and training participation</li> <li>People may be exposed to changes in air, soil, groundwater, surface water, sediment quality, plants, fish, and wildlife because of the Project</li> <li>Revenues for municipal, provincial, and federal governments via property taxes, corporate income taxes, and taxes on labour income associated with the Project</li> </ul>	<ul style="list-style-type: none"> <li>Business opportunities generated (e.g., procurement of materials, equipment, and services, as well as payment of wages and salaries to direct employees that, in turn, are used to purchase goods and services</li> <li>Revenue for municipal, provincial, and federal governments via property taxes, corporate income taxes, and taxes on labour income associated with the Project</li> </ul>	<ul style="list-style-type: none"> <li>Project expenditures</li> <li>Household income</li> <li>Gross domestic product</li> <li>Municipal taxes</li> <li>Provincial and federal taxes</li> </ul>

**Table E-1: Potential Valued Components, Assessment Endpoints and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Assessment Endpoints	Measurement Indicators
Community Well-being	<ul style="list-style-type: none"> <li>Job creation and economic input from the Project can change the current balance and structure of the communities and families, and traditional/cultural values, impacting both individual and community health</li> <li>The in-flow of transient workforce into local and Indigenous communities can affect community and family structures and cohesion, and the demand for housing and services</li> </ul>	<ul style="list-style-type: none"> <li>Maintaining community well-being in local communities, including Indigenous communities</li> </ul>	<ul style="list-style-type: none"> <li>Changes in community population/demographics</li> <li>Change in income of local workers</li> <li>Violence and crime rate</li> <li>Traffic levels</li> <li>Housing (prices and availability)</li> <li>Capacity of health and emergency services</li> <li>Community cohesion</li> <li>Loss of traditional/cultural values and language</li> <li>Availability and capacity of community infrastructure and services</li> </ul>

**Table E-2: Potential Intermediate Components and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Measurement Indicators
Air Quality and Climate	<ul style="list-style-type: none"> <li>Sensitivity of the environment (soils, water, plants, animals) to air quality</li> <li>Link to human health</li> <li>Greenhouse gases contribute to climate change</li> <li>Federal and Provincial concerns with greenhouse gas emissions and climate change</li> </ul>	<ul style="list-style-type: none"> <li>Ambient air concentrations that have applicable federal or provincial ambient air quality criteria including criteria air contaminants (CACs) such as sulphur oxides, nitrogen oxides, volatile organic compounds, particular matter, carbon monoxide, ammonia, and ground level ozone</li> <li>Project greenhouse gas emissions</li> </ul>
Noise	<ul style="list-style-type: none"> <li>Influence on Indigenous and other land and resource use</li> <li>Sensitivity of some wildlife species to noise</li> </ul>	<ul style="list-style-type: none"> <li>Energy equivalent sound levels for the daytime period (Leq, day) and the nighttime period (Leq, night), expressed in A-weighted decibels (dBA) and C-weighted decibels (dBC)</li> <li>Combined day-night sound level (Ldn), expressed in dBA</li> </ul>
Hydrogeology	<ul style="list-style-type: none"> <li>Important component in the hydrologic cycle. Linked to surface water quantity through exchange with overlying surface water features: important for fish and fish habitat</li> <li>Linked to surface water quality through overlying surface water features, which is important for fish and fish habitat, human use (e.g., drinking water or other consumption), and overall ecological integrity</li> </ul>	<ul style="list-style-type: none"> <li>Groundwater levels and flow rates</li> <li>Spatial and temporal distributions of groundwater</li> <li>Concentration of physical analytes (e.g., pH, conductivity)</li> <li>Concentrations of major ions and nutrients</li> <li>Concentrations of dissolve metals and radionuclides</li> </ul>

**Table E-2: Potential Intermediate Components and Measurement Indicators for the Project**

Valued Component	Rationale for Selection	Measurement Indicators
Hydrology	<ul style="list-style-type: none"> <li>• Strong link to fish and fish habitat</li> <li>• Key attribute of health and functioning aquatic and terrestrial ecosystems</li> <li>• Indigenous and other land users may use local waterbodies and watercourses for cultural or recreational practices</li> </ul>	<ul style="list-style-type: none"> <li>• Surface water levels and flow rates</li> <li>• Stream channel parameters (e.g., channel depth and width) and shoreline integrity</li> <li>• Basin water yields</li> </ul>
Surface Water Quality	<ul style="list-style-type: none"> <li>• Important to human use and health</li> <li>• Indigenous and other land users may use local waterbodies and watercourses for cultural or recreational practices</li> <li>• Strong link to fish and fish habitat</li> <li>• Key attribute of health and functioning aquatic and terrestrial ecosystems</li> </ul>	<ul style="list-style-type: none"> <li>• In Situ water quality parameters (e.g., temperature, pH, dissolved oxygen, conductivity)</li> <li>• Concentrations of major ions, suspended solids, nutrients, metals, and radionuclides in water</li> <li>• Concentrations of nutrients, metals, and radionuclides in sediment</li> </ul>
Terrain and Soils	<ul style="list-style-type: none"> <li>• Provide physical structure and foundations for aquatic and terrestrial ecosystems</li> </ul>	<ul style="list-style-type: none"> <li>• Quantity and distribution of terrain units</li> <li>• Topography and slope stability</li> <li>• Distribution of soil map units</li> <li>• Soil quality (productivity)</li> <li>• Soil acidification</li> <li>• Land capability classification</li> </ul>

Development scenarios will typically be considered to address impacts at all phases of the Project (i.e., construction, operation, reclamation, and decommissioning). The development scenarios will typically include: 1) Pre-development Scenario – a scenario that existed prior to establishment of any industrial development in the Athabasca Oil Sands Region; 2) Baseline Case – the case that considers the existing and approved developments and is designed to establish the conditions that exist or would exist prior to development of the Project; 3) Application Case – describes the Baseline Case with the effects of the Project added; and 4) Planned Development Case – describes the environmental conditions that would exist as a result of the interaction of the Project, other existing projects and other planned projects that can be reasonably expected to occur. Additional assessment scenarios may be identified for all or individual components prior to finalization of the Tailored Impact Statement Guidelines and TOR (e.g., a Project-only Case will be assessed as part of the Air Quality assessment).

Biophysical components will consider temporal and spatial boundaries as established for the IS. The boundaries will vary depending on component and with consideration of VCs being assessed. Additionally, to allow assessment of the Project’s contribution to sustainability, the temporal boundaries must take into consideration potential long-term effects VCs; how effects could change over time; and how the effects could affect future generations (Government of Canada 2019c).

The spatial boundaries to be assessed for the IS will generally include a local study area (LSA) and a regional study area (RSA). The LSA allows the assessment to focus on the area where direct effects associated with the Project are most likely to be found. The larger RSA allows the assessment to examine potential areas where cumulative effects are likely to be manifested. Suncor has developed some proposed study areas for consideration for the IS that are provided in the relevant sections of this appendix.

The following sections provide additional planned baseline and assessment details specific to the IS components. The specifics within each component will be updated, as required, following issuance of the Tailored Impact Statement Guidelines for the Project.

## **E-2. ATMOSPHERIC ENVIRONMENT**

The atmospheric environment assessment will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines, and in Health Canada Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality (Health Canada 2019) (hereinafter referred to as “Health Canada Guidance”), which is referenced explicitly in the Tailored Impact Statement Guidelines. The atmospheric environment assessment will also be conducted in accordance with the issued TOR and the Alberta Air Quality Model Guideline (ESRD 2013) (AQMG).

The Project air quality assessment will follow Health Canada Guidance so that air quality assessment results can be used to support a human health risk assessment conducted in accordance with Alberta Health Guidance on Human Health Risk Assessment for Environmental Impact Assessment in Alberta (Alberta Health 2019) (hereinafter referred to as “Alberta Health Guidance”).

Suncor proposes the following for the Baseline and Assessment work on the atmospheric environment.

### **Baseline**

A baseline report will be prepared to summarize the state of the atmospheric environment in the RSA. No field work is required for this effort because the study will be based on a review of publicly available data from regional monitoring networks, such as Wood Buffalo Environmental Association (WBEA), ambient air quality monitoring networks and Environment and Climate Change Canada (ECCC) meteorological monitoring stations. The study will compare the ambient air quality data collected in the last 10 years to the applicable provincial, federal, or regional air quality criteria. The study will also include a description of RSA meteorology and terrain, which may influence the dispersion of air emissions in the RSA.

The baseline report will include discussions and details on existing ambient air quality collected from existing regional ambient air quality monitoring stations (WBEA 2020), climate and meteorological conditions, aerial deposition (nitrogen, sulphur, polycyclic aromatic hydrocarbons [PAHs], metals), and findings from recent collaborative monitoring studies. The baseline report will also include information on the meteorological environment, as laid out in the Tailored Impact Statement Guidelines.

### **Assessment**

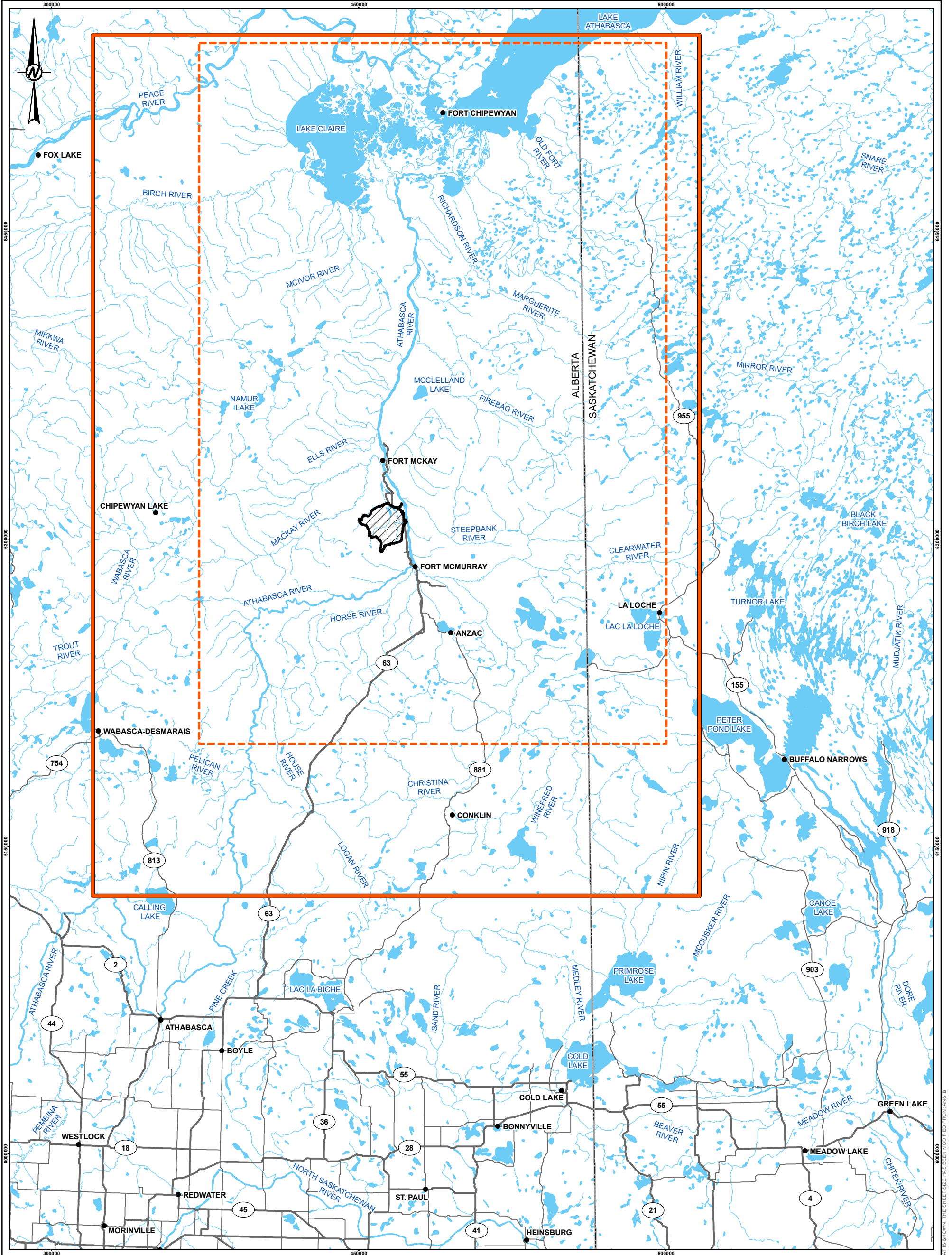
The air quality assessment will consider the four assessment cases common to biophysical environment components as well as a Project Only Case. The assessment will consider the RSA and an LSA focused on the Project footprint.

The air dispersion modelling for the air quality assessment will be conducted using the CALPUFF dispersion model (Version 7) with a 5-year (2002-2006) meteorological data set.

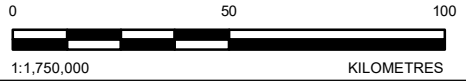
The air quality assessment will determine the potential impacts of the Project’s emissions on ambient air quality. The air quality assessment will include a quantitative assessment of sulphur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), nitrous oxide (N<sub>2</sub>O), carbon monoxide (CO), particulate matter less than 2.5 microns (µm) in diameter (PM<sub>2.5</sub>), particulate matter with an aerodynamic diameter up to 10 µm (PM<sub>10</sub>), total particulate matter (TPM), volatile organic compounds (VOCs), total reduced sulphur (TRS), hydrogen sulphide (H<sub>2</sub>S), ozone, metals, potential acid input (PAI), deposition of nitrogen, sulphur, PAHs and metals, and odorous compounds.

A climate change assessment will also be conducted as required in the Tailored Impact Statement Guidelines. The climate change assessment will consider a description of the Projects greenhouse gas (GHG) emission sources, quantification of annual GHG emissions and intensity from the Project’s emission sources, description of the Project’s impacts on carbon sinks, analysis on Project impact on global GHG emissions, estimates and discussion of upstream GHG emissions associated with the Project, and contextual discussions of Canada’s environmental obligations and commitments in respect of climate change.

A proposed air modelling domain and Regional Study Area is provided in Figure E-1.



- LEGEND**
- POPULATED PLACE
  - PROVINCIAL BOUNDARY
  - PRIMARY HIGHWAY
  - SECONDARY HIGHWAY
  - WATERCOURSE
  - OPEN WATER
  - ▨ PROJECT DEVELOPMENT AREA
  - ▭ AIR MODELLING DOMAIN
  - ▭ AIR REGIONAL STUDY AREA



**NOTE(S)**  
####

**REFERENCE(S)**  
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PROJECTION: UTM ZONE 12 DATUM: NAD 83

**PROJECT**  
BASE MINE EXTENSION

**TITLE**  
PROPOSED AIR MODELLING DOMAIN AND REGIONAL STUDY AREA

CLIENT	YYYY-MM-DD	2020-07-14
DESIGNED	JG	
PREPARED	PT	
REVIEWED	ZG	
APPROVED	JH	

PROJECT NO. 19124718 PHASE \_\_\_\_\_ REV. 0 FIGURE E1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/35mm

### **E-3. ACOUSTIC ENVIRONMENT**

The acoustic assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines, and in the Health Canada Guidance for Evaluating Human Health Impacts in Environmental Assessments Health: Noise (Health Canada 2017), which is referenced explicitly in the Tailored Impact Statement Guidelines. In addition, the acoustic assessment will be conducted in accordance with the Project TOR and AER Directive 038: Noise Control (Directive 038) (ERCB 2007), which is applicable to environmental noise from Alberta oil and gas facilities.

The Project acoustic assessment will follow Health Canada Guidance so that acoustic assessment results can be used to support a human health risk assessment conducted in accordance with the Alberta Health Guidance.

Suncor proposes the following for the Baseline and Assessment work on the acoustic environment.

#### **Baseline**

A baseline acoustic survey was conducted in 2017 using methods from Directive 038. Use of the 2017 survey is considered appropriate because current activity and development in the Project development area is similar to that of 2017. The baseline report will describe the acoustic monitoring locations and the rationale for their selection, as well as the equipment and methods used to collect and process baseline data. The baseline report will present representative estimates for existing daytime and nighttime sound levels and will comment on existing sound levels in the context of assessment criteria set out in Directive 038 and the Health Canada Guidance.

#### **Assessment**

The acoustic assessment will consider the four assessment cases common to biophysical environment components as well as an Operational Case, which is the current noise level that could also be considered as an "Existing Case". The cumulative sound levels will be compared to criteria set out in Directive 038 and criteria set out in the Health Canada Guidance. The Project acoustic assessment will characterize potential Project acoustic impacts in the context of these criteria.

The Project acoustic assessment will predict and characterize cumulative sound levels at receptors. Receptors considered in the acoustic assessment will include occupied dwellings located within 1.5 kilometres (km) of the Project boundary and/or the most impacted unoccupied locations 1.5 km from the Project boundary. In the interest of fully characterizing potential acoustic impacts, the Project assessment may also consider occupied dwellings located farther than 1.5 km from the Project boundary and/or non-dwelling locations that are important to local stakeholders.

The contribution of natural and non-industrial sources to cumulative sound levels at receptors will be characterized using a combination of measurement data collected during a July 2017 baseline field program and desktop calculation methods described in Directive 038 and the Health Canada Guidance.

The acoustic contribution from existing and approved industrial facilities to cumulative sound levels at receptors will be characterized using a combination of measurement data collected during a July 2017 baseline field program, previous acoustic assessments conducted for Suncor operations, publicly-available noise assessments for potentially-relevant third-party industrial facilities, and a predictive computer model developed using the Computer Aided Noise Abatement (CadnaA) Version 4.6.155 software package. In accordance with Directive 038, CadnaA implements the noise propagation algorithm described in the International Organization for Standards (ISO) 9613-2 technical standard (ISO 1996).

The acoustic contribution from the Project to cumulative sound levels at receptors will be characterized using predictive computer models developed in accordance with a widely accepted technical standard.

The acoustic contribution from reasonably foreseeable planned developments to cumulative sound levels at receptors will be characterized using publicly available acoustic assessments for these developments.

Computer acoustic models of existing and approved Suncor operations in the area of the Project were developed and refined as part of previous Suncor project acoustic assessments and will be updated as part of the assessment for the Project following the ISO 9613-2 technical standard. Inputs to the Project acoustic models will consist of environmental parameters (such as ground cover, temperature, humidity, and wind conditions) that are known to influence acoustic propagation along with acoustic emissions for Project equipment in the form of octave-band sound power levels. Acoustic emissions for Project equipment will be established using a combination of vendor data sheets, empirical formulae from reference handbooks, field measurements of similar equipment, and professional judgement/experience.

The acoustic assessment will model two snapshot years of Project operations. In accordance with the Tailored Impact Statement Guidelines and Health Canada Guidance, the acoustic assessment will also model one snapshot of Project construction activities. Specific snapshot years for the acoustic assessment will be selected in consultation with Suncor once detailed mine plans and status maps become available. It is likely that snapshot years will be selected to capture maximum potential acoustic impacts by focusing on, for example, the year when Project activities will be closest to receptors and/or the year when Project activities will be most intense.

#### **E-4. VISUAL**

The visual assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines and will meet the requirements of the Project TOR. The visual assessment will take guidance from the Illuminating Engineering Society of North America (IESNA), the International Commission on Illumination (CIE), and relevant reference handbooks.

Suncor proposes the following for the Baseline and Assessment work for the visual assessment.

##### **Baseline**

The Tailored Impact Statement Guidelines require the Project visual assessment “describe existing ambient night-time light levels... during different weather conditions and seasons”.

In accordance with IESNA and CIA guidance, each baseline light survey will measure: a) light trespass, which refers to the effects of light or illuminance that strays from its intended purposes onto neighbouring areas where lighting may be undesirable; and b) sky glow, which refers to the stray light scattered by the atmosphere, brightening the natural sky and reducing star visibility.

The baseline report will describe the light measurement locations and the rationale for their selection, as well as the equipment and methods used to collect and process measurement data. As required by the Tailored Impact Statement Guidelines, the baseline report will present representative estimates of light trespass and sky glow levels for different weather conditions (e.g., overcast, clear) and for different seasons (e.g., summer, winter). The baseline report will comment on existing light trespass and sky glow levels in the context of assessment criteria set out by the IESNA and CIE.

##### **Assessment**

In accordance with the Tailored Impact Statement Guidelines and relevant guidance from IESNA and CIE, the visual assessment will predict and characterize changes to light trespass and sky glow levels at sensitive receptors. The visual assessment will compare light trespass and sky glow levels for a Baseline Case and Application Case to criteria set out in IESNA and CIE guidance. The Project visual assessment will characterize potential Project light impacts in the context of these criteria.

Because the requirement to assess potential light impacts is new in the Tailored Impact Statement Guidelines, information about light emissions is typically not provided in publicly available regulatory applications for third-party facilities. Consequently, the Project light assessment will have to omit assessment cases that consider the light contribution from approved/proposed third-party facilities that have not yet commenced operation.

The light contribution of existing natural and non-industrial sources and existing industrial facilities will be characterized using a combination of measurement data collected during the baseline field programs and desktop estimation methods described by the IESNA and CIE.

The Project contribution to light trespass levels will be predicted using a commercial software tool. The Project contribution to sky glow levels will be predicted using an in-house computer model developed by Golder in accordance with relevant reference handbooks.

The light assessment will model two snapshot years of Project operations and one snapshot year of Project construction. Specific snapshot years for the light assessment will be selected in consultation with Suncor once detailed mine plans and status maps become available. It is likely that snapshot years will be selected to capture maximum potential light impacts by focusing on, for example, the year when Project activities will be closest to receptors and/or the year when Project activities will be most intense.

## **E-5. GEOCHEMISTRY AND RADIOACTIVITY**

The geochemistry and radioactivity assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines, focusing on identification of waste materials with the potential to generate acidity, salinity, metal leaching, and/or radioactivity.

### **Baseline**

The geochemistry baseline will provide a characterization of the geochemical composition of expected mined materials such as low-grade ore, tailings, overburden, and petroleum coke. Geochemical data will be obtained from the Project development area, as well as from operations currently underway at Suncor's Base Plant. The geochemical characterization program will include a comprehensive static testing program (sulphur and carbon speciation, mineralogy, major and trace elements, and metal leaching potential), lab-based kinetic testing program (i.e., humidity cell tests), and an evaluation of the potential for acidic and/or saline drainage and/or metal leaching. Baseline ambient radioactivity data, including consideration of gamma and radon, will be collected.

The geochemical baseline will identify potential risks associated with the materials expected for the Project.

### **Assessment**

The geochemistry assessment will evaluate the potential risks identified for the materials expected during Project operations, considering the management of the materials on the Project site as well as examining the potential effects under different storage conditions. The potential for radioactivity associated with Project activities will be evaluated. Mitigation options and plans will be described and assessed for both geochemistry and radioactivity in terms of effectiveness.

## **E-6. TOPOGRAPHY, SOIL AND SEDIMENT**

The topography, soil and sediment assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines and will meet the requirements of the Project TOR. Topography and soil will be dealt with in one component of the IS, while generation of sediments will be assessed in the surface water component, and in terms of potential effects in the water quality and aquatic health components of the IS.

### **Baseline**

The topography and soil baseline report will: a) include a description of desktop and field methods and the results of field surveys; b) provide information on topographic and soil mapping; c) summarize and describe the surficial materials, their extent and mode of deposition; d) describe and summarize topographic features such as slope gradients and topographic assemblages; e) describe and summarize major soil map units and parent materials including extent of disturbance by mineral and organic soil types; f) identify sensitive soil types, including effects of potential acid input; and g) provide interpretation of soil map units, including reclamation suitability, land capability classification for forestry, erosion and compaction potential.

The topography and soil baseline report will also draw on information as provided in the Geology section of the Project application.



Soil samples of the representative soil series will be collected and analyzed by an accredited environmental laboratory. Soil mapping will be finalized at a scale of approximately 1:20,000 to match existing mapping, and will incorporate the soil and terrain data obtained from the sampling programs and laboratory analytical results.

### **Assessment**

The topography and soil assessment of the IS will address anticipated Project impacts using baseline data for the LSA and RSA. An assessment of potential impacts of the Project to topographic and soil valued components will be completed, as well as assessment of cumulative effects. The analyzed topographic and soil information will also be used to help develop a Reclamation and Closure plan for the first 10-year Alberta *Environmental Protection and Enhancement Act* (EPEA) application.

## **E-7. RIPARIAN AND WETLAND ENVIRONMENT**

The riparian and wetland environment assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines and will meet the requirements of the Project TOR. The assessment will take an ecosystem approach that considers how the Project may affect the structure and functioning of biotic and abiotic components within the ecosystem using scientific, community and Indigenous knowledge regarding ecosystem health and integrity, as applicable. The IS will provide a description of the indicators and measures used to determine ecosystem health and integrity, identified during planning, and reflected in the Tailored Impact Statement Guidelines. Information required under the riparian and wetland component will be provided in two different sections of the IS, with most of the information covered in this section, but with some information on pre-project characterization of the shoreline, banks, current and future flood risk areas covered under the surface water component.

### **Baseline**

The riparian and wetland baseline will: a) provide pre-project characterization of wetland catchment boundaries; b) quantify, delineate and describe riparian and wetland environments within an LSA that may potentially be directly, indirectly and/or cumulatively affected by the Project in the context of wetland class, ecological community type and conservation status, biodiversity, abundance at local, regional and provincial scales, distribution, and current level of disturbance; c) identify riparian and wetland environments that may potentially be directly or indirectly affected by the Project and within the scope of federal permits, authorizations, or other approvals; d) determine whether these wetlands are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or is considered ecologically or socially or economically important to a region; e) provide a wetland functions assessment; f) identify and describe riparian and wetland environment capabilities to perform hydrological and water quality functions, provide for wildlife and wildlife habitat or other ecological functions; and g) identify a RSA of sufficient size to capture effects to riparian and wetland environments within the larger drainage area and include riparian and wetland environments located outside of the LSA that may be affected by hydrological changes as a result of cumulative effects.

### **Assessment**

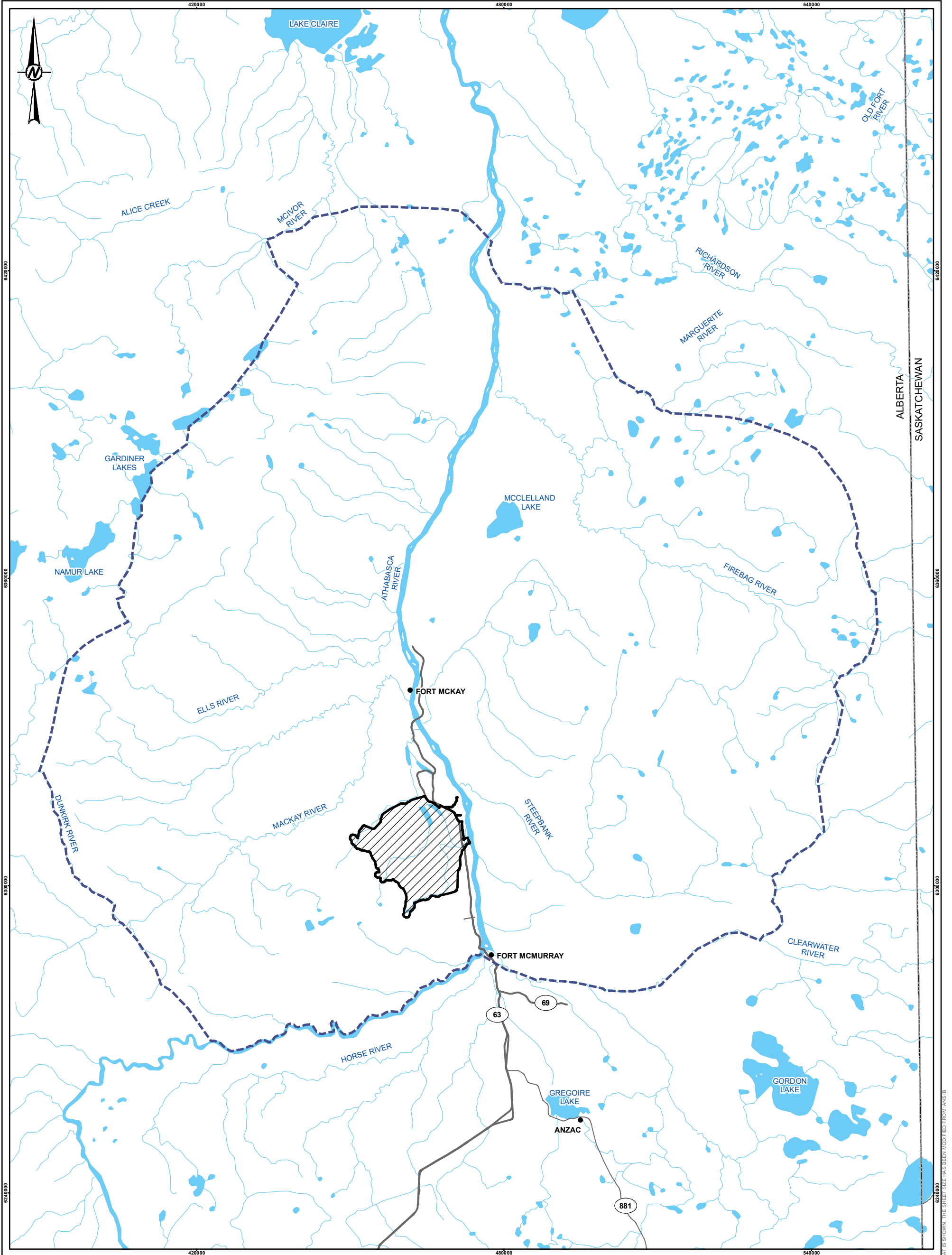
The riparian and wetland environment assessment will describe predicted changes for those areas including the description of: a) any hydrological or drainage changes that may alter moisture regimes and how that may affect wetland vegetation; b) any contaminants of concern potentially associated with the designated project that may affect wetland soil, sediment or water; c) effects to wetland biodiversity considering biodiversity metrics, effects of fragmentation or changes to regional biodiversity; and d) any positive changes (e.g., from offsets that result in re-vegetation or new wetlands).

The assessment will describe any relevant mitigation and enhancement measures for riparian and wetland environments, including the provision of any offsetting or compensation plans to address residual effects.

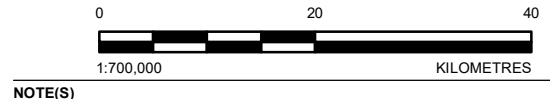
## **E-8. GROUNDWATER AND SURFACE WATER**

The groundwater and surface water assessment for the IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. The assessment of groundwater and surface water will be considered using four components for the IS, including groundwater, surface water, water quality, and aquatic health.

Proposed study areas are provided in Figure E-2 to Figure E-4, including a proposed hydrogeology regional study area (Figure E-2), a proposed aquatic resources local study area (Figure E-3) and a proposed aquatic resources regional study area (Figure E-4).



- LEGEND**
- POPULATED PLACE
  - PROVINCIAL BOUNDARY
  - PRIMARY HIGHWAY
  - SECONDARY HIGHWAY
  - WATERCOURSE
  - OPEN WATER
  - ▨ PROJECT DEVELOPMENT AREA
  - ▭ HYDROGEOLOGY REGIONAL STUDY AREA



**NOTE(S)**  
###

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

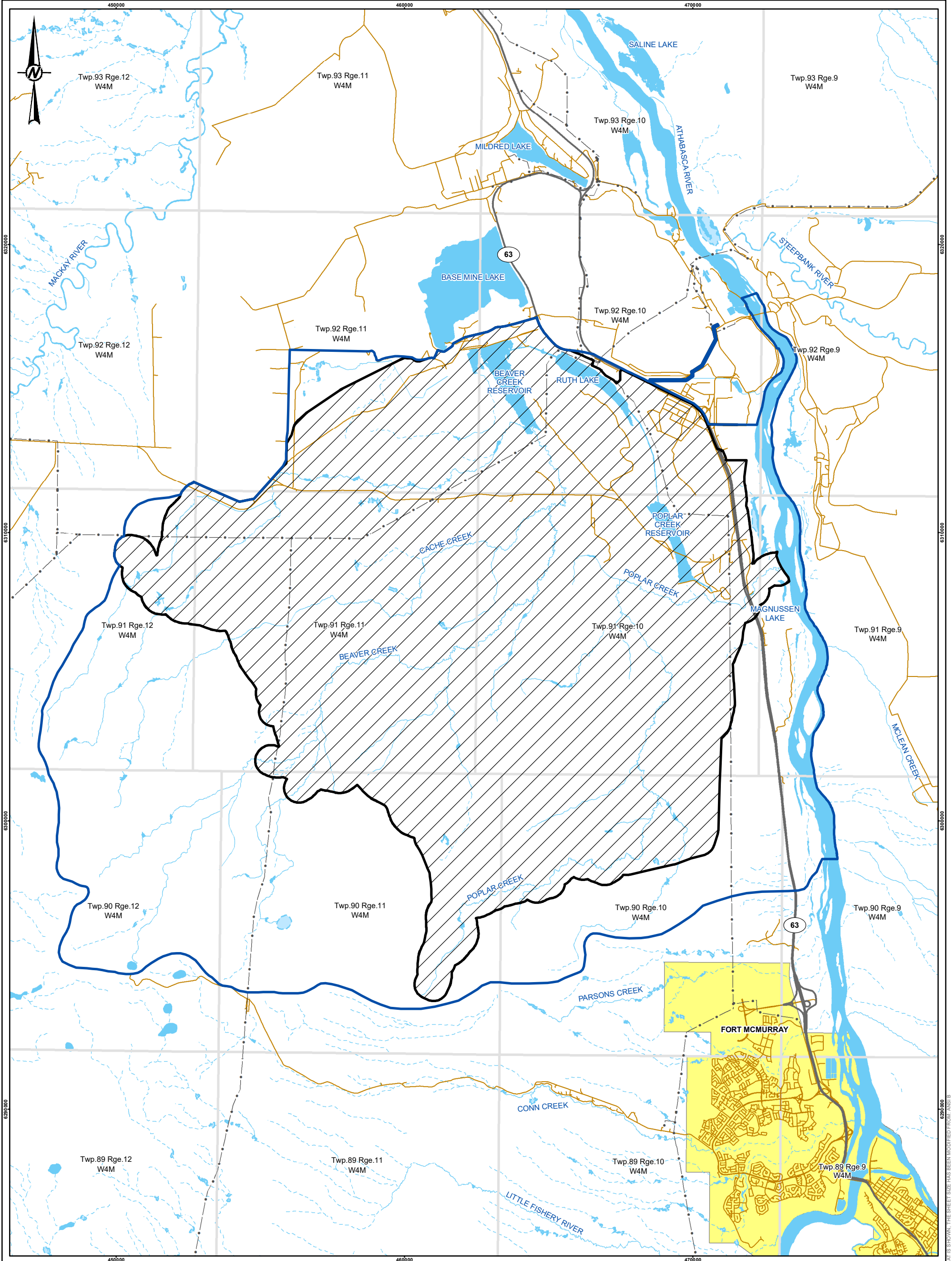
**PROJECT**  
BASE MINE EXTENSION

**TITLE**  
PROPOSED HYDROGEOLOGY REGIONAL STUDY AREA

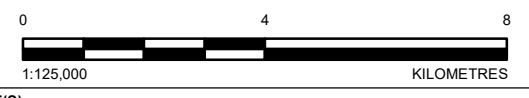
CLIENT	YYYY-MM-DD	2020-07-14
DESIGNED	MG	
PREPARED	PT	
REVIEWED	ZG	
APPROVED	JH	

PROJECT NO.	PHASE	REV.	FIGURE
19124718		0	E2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIS



- LEGEND**
- PRIMARY HIGHWAY
  - LOCAL ROAD
  - TRANSMISSION LINE
  - WATERCOURSE
  - INTERMITTENT WATERCOURSE
  - OPEN WATER
  - INTERMITTENT OPEN WATER
  - POPULATED PLACE
  - ▨ PROJECT DEVELOPMENT AREA
  - ▭ AQUATIC RESOURCES LOCAL STUDY AREA



**NOTE(S)**  
 HYDROGRAPHY WITHIN THE POPLAR CREEK AND BEAVER RIVER WATERSHEDS GROUNDTRUTHED BY GOLDR 2006-09-29. HYDROGRAPHY WITHIN THE REMAINING PARTS OF THE AQUATIC RESOURCES LOCAL STUDY AREA VERIFIED AGAINST 2017-07-07 AERIAL IMAGERY.

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 PROJECTION: UTM ZONE 12 DATUM: NAD 83

**PROJECT**  
 BASE MINE EXTENSION

**TITLE**  
 PROPOSED AQUATIC RESOURCES LOCAL STUDY AREA

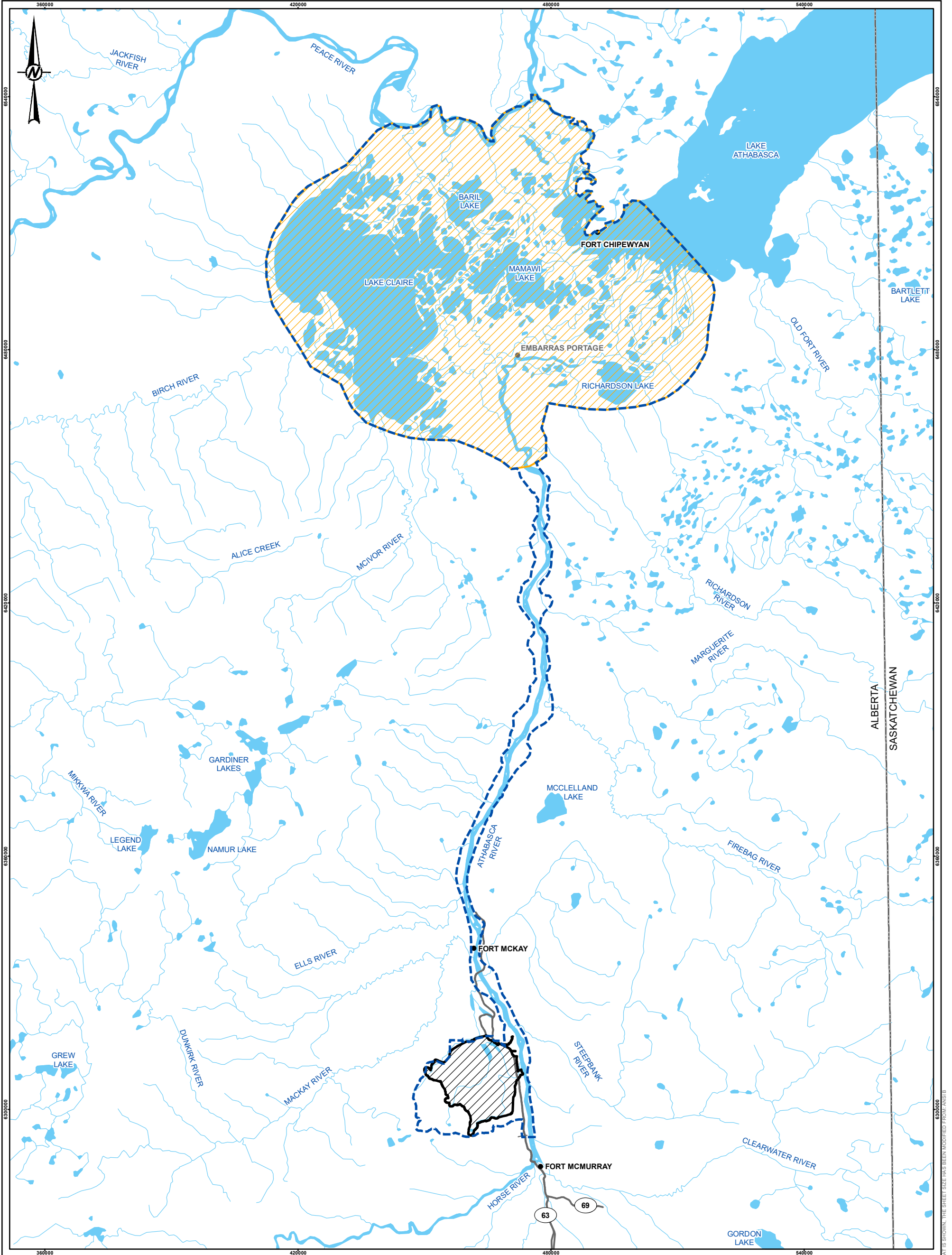
**CLIENT**

YYYY-MM-DD	2020-07-15
DESIGNED	VR
PREPARED	PT
REVIEWED	ZG
APPROVED	JH

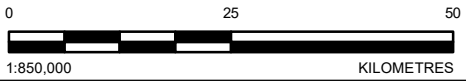
**SUNCOR**

PROJECT NO.	PHASE	REV.	FIGURE
19124718		0	E3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM THIS IS



- LEGEND**
- POPULATED PLACE
  - LOCALITY
  - PROVINCIAL BOUNDARY
  - PRIMARY HIGHWAY
  - SECONDARY HIGHWAY
  - WATERCOURSE
  - OPEN WATER
  - ▨ PROJECT DEVELOPMENT AREA
  - ▨ SURFACE AQUATIC RESOURCES REGIONAL STUDY AREA
  - ▨ PEACE-ATHABASCA DELTA



**NOTE(S)**  
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PROJECTION: UTM ZONE 12 DATUM: NAD 83

PROJECT  
**BASE MINE EXTENSION**

TITLE  
**PROPOSED SURFACE AQUATIC RESOURCES REGIONAL STUDY AREA**

CLIENT	YYYY-MM-DD	2020-07-14
	DESIGNED	VR
	PREPARED	PT
	REVIEWED	ZG
	APPROVED	JH

PROJECT NO.	PHASE	REV.	FIGURE
19124718		0	E4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM 297x420mm

## **E-8.1. Groundwater**

The groundwater assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR.

### **Baseline**

Available and relevant geological and groundwater information, spatial datasets, and reports will be compiled to characterize baseline groundwater conditions in the LSA and RSA. Information may include a) water wells, water level and groundwater quality data; b) geologic and hydrostratigraphic surfaces; c) hydrometric and other anthropogenic data that may impact groundwater regimes; and d) other project activities in the area.

The hydrogeology baseline report will integrate technical memorandums from previous field programs and will include the following: a) summary of existing groundwater information and all baseline work previously completed; b) description of field program design and methodologies for collection of field data; c) maps showing groundwater monitoring well locations, groundwater sample collection locations, hydraulic testing well locations, water levels and groundwater flow directions, including the registered groundwater users in the area; d) hydrographs showing range of seasonal and inter-annual water level variations; e) wells summary tables including water quality data, water level measurements, current use, completion details, screened hydrostratigraphic units and hydraulic testing results; f) description of quality assurance for water quality samples, the water quality types and exceedances under baseline conditions; and g) conceptual model that includes a description of hydrostratigraphic units (aquifers, aquitards, aquicludes), water levels and flow patterns, recharge and discharge areas and hydraulic properties.

### **Assessment**

Groundwater modelling will be used to provide a baseline groundwater budget and to assess the potential impacts of the Project on groundwater in both the LSA and RSA. The assessment will include incremental and cumulative effects from the Project and other developments and activities. The effect will be examined in terms of groundwater levels, flow rates, flow patterns and interaction with surface water. In addition, the modelling will be used to evaluate groundwater seepage to the pit at operational stages and to quantify industrial wastewater seepage to surface water receptors at closure conditions.

The primary objectives of the groundwater modelling assessment are to: a) assess the potential effects of the Project on groundwater levels, flow rates and flow patterns; and b) evaluate process-affected groundwater seepages to and from different mine facilities at the closure snapshots.

The groundwater flow modelling approach includes the construction and calibration of a pre-development model. The pre-development model serves as a reference for the assessment of future development phases. The forecast models will be constructed based on the pre-development model and will include a set of future developments and activities in the RSA.

Evaluation of the changes from the Project will involve considering a number of snapshots for the life of mine, including maximum dewatering, maximum diversion, and closure evaluation snapshots. Overall, at least two operational and three closure snapshots are expected to be completed. The closure snapshots will include the Project in the presence and absence of interaction with the Suncor Base Plant area as well as far-future conditions. In addition, the closure snapshots will consider historic and climate change conditions.

The following tasks will be completed: a) complete steady-state flow model calibration simulations using the pre-mining groundwater levels and stream flow data as a calibration target; b) complete transient-state flow model calibration simulation using historical pumping tests. The steady-state and transient groundwater models will be used to determine the hydraulic conductivity and storage parameters used in the model for various hydrostratigraphic units in the model; c) construct transient Baseline Case, Application Case and Planned Development Case groundwater flow operational models to estimate Quaternary dewatering volumes and Basal Aquifer depressurization rates; d) construct transient Baseline

Case and Application Case closure groundwater flow models to simulate post mining far-future hydrogeological conditions; e) complete particle tracking and process-affected groundwater seepage analysis for various closure structures for Baseline Case and Application Case, including consideration of assessment areas that include pit lakes in the Project development area, Poplar Creek at the mouth, Ruth Lake and Athabasca River; and f) complete sensitivity analysis on key model input parameters and climate change scenarios to provide a range of impact.

## **E-8.2. Surface Water**

The surface water assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR.

### **Baseline**

The Baseline will include the following activities: a) compilation of hydrology relevant climate statistics corresponding to regional and local meteorological stations using available records until December 31, 2019; b) extraction and development of relevant and available climate change scenarios and statistics for a surface water RSA and LSA in support of the IA; c) continuation of a stream flow monitoring program, which was started in 2018, throughout the winter, spring, summer, and 2020 fall seasons – the objectives of the study are to: i) collect stream flow and stream water levels measurements at five hydrometric stations, located in the Beaver Creek and Poplar Creek watersheds; ii) collect information on local ice thickness conditions during the 2019/2020 winter season to support comparison between local and regional data; iii) complete the representative database characterizing local streams geomorphology and geometry; d) develop a comprehensive regional hydrological study to support a robust calibration of the main hydrological models, which will be used to characterize the local study area streams; e) update the analyses using available records and undertake hydrology modelling to estimate relevant flow statistics at key assessment nodes for the potentially impacted streams and lakes within the LSA including Beaver Creek, Beaver River Reservoir, Ruth Lake, Poplar Creek Reservoir, and Poplar Creek for: Pre-development conditions, Baseline (existing) conditions, and analyses of pre-development and Baseline conditions under historic and, for the Baseline conditions, future climate conditions; f) analyze existing records to estimate relevant flow statistics for key assessment nodes along the Athabasca River, including the Peace-Athabasca Delta (as for the LSA streams, the analysis will consider historic and future climate conditions, with the pre-development conditions corresponding to pre-industrial hydrological configurations); g) compile regional and local data on the freeze and thaw timing and on the ice thickness for major waterbodies within the RSA; h) identify flood risk areas to the extent that it is meaningful in the context of the IA; and i) produce a climate and hydrology baseline report and a report to document the description of the climate change data analysis and the proposed climate change scenarios.

### **Assessment**

The objectives of the surface water assessment are to: a) quantify the impact of the Project on flows and water levels in natural streams and lakes, and closure drainage features, including the pit lakes in the LSA during the operation and closure stages for a number of assessment cases; and b) provide the required input to support the assessment of the water quality, and fish and fish habitat components.

The hydrology assessment for the Project IS will consider the four assessment cases. For each case, the assessment will be done for six time-snapshots (three operational and three closure). The closure snapshots will consider historic and future climate conditions.

The activities of this task will include mainly the development and use of hydrological models simulating stream flows and lake water balance to calculate lake water levels. The hydrological models will be integrated with the hydrogeological LSA model.

### **Water Balance Analysis**

A sufficient level of Project water balance information, including information on integration of the Project with Base Plant operations, will be described in the Water Management Plan section of the Project Application. The water balance information is an important input for the Project IS, particularly for the surface water quantity, quality, and fisheries assessments.

All river water withdrawals by oil sands mines are currently regulated under the Alberta Surface Water Quantity Management Framework (SWQMF) for the Lower Athabasca River (Government of Alberta 2015). The water balance analysis will show how the Project will operate under the current water licence and how Suncor will comply with the SWQMF with a sound risk management plan including mitigation and contingency measures.

The methodology proposed for the water balance analysis consists of: a) a review of available water balance analyses completed by Suncor to-date, identification of gaps, and refinement of the water balance analysis, as needed, for the Project Application and IS; b) collection of the available information and data for the water balance analysis; c) development of a probabilistic water balance model using GoldSim, a model that is being used by Suncor, and calibrate and validate the model based on the available operational data from Suncor; d) use of the water balance model to conduct simulations of various scenarios (e.g., average, design, climate change), and analysis of the simulation results to support development of the river water supply management plan including contingency measures; and e) documentation of the basis and results of the water balance analysis to support the water management plan.

### **Athabasca River Hydrology Assessment**

A hydrology assessment will be conducted based on the results of the water balance analysis, to assess the impact of the Project on the Athabasca River flows at key nodes along the river. Consistent with the respective assessment cases, the assessment will consider the cumulative effect of withdrawals by Suncor and other oil sands operators. The assessment will use the 2015 Lower Athabasca Region SWQMF as the guideline.

An existing Athabasca River hydrological model will be customized to simulate Lower Athabasca River flows under future (climate change) conditions.

### **Peace-Athabasca Delta Hydrology Assessment**

The potential cumulative impacts of oil sands projects on the Peace-Athabasca Delta flows and water levels will be assessed as part of the IS, including an estimation of changes to Peace-Athabasca Delta water levels due to cumulative impacts to the Athabasca River flows. The assessment will be done considering the defined overall assessment cases and the available information.

### **E-8.3. Water Quality**

The water quality assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR.

#### **Baseline**

Water quality baseline studies are required to describe the existing water quality conditions prior to the development of the Project. The baseline report will describe conditions in the LSA and RSA. The specific objectives of the water quality baseline program will be to: a) characterize the snow, water, and sediment quality existing conditions in the LSA and RSA; and b) provide baseline information necessary to support the Project IS.

Previously collected baseline data that will be considered includes: a) surface water data collected between 2004 and 2005; b) surface water and sediment data collected in 2013; c) snow, surface water and sediment data collected in 2014, 2015 and 2017; d) surface water data collected in winter 2016; and e) snow and surface water data collected in 2018.



A baseline report will be developed to present existing snow, water and sediment quality conditions in the LSA and RSA for the Project and include a description of field methods and the snow, water and sediment quality results from the field sampling programs since 2004. Available snow, water, and sediment quality data collected in the LSA and RSA by Environment Canada, Alberta Environment and Parks (AEP), and the former Regional Aquatic Monitoring Program (RAMP) will also be compiled.

Field and laboratory data will undergo a screening process to identify potentially erroneous values, and findings will be provided in a QA/QC appendix and summarized in the baseline report. Parameters with available regulatory guidelines will be compared to guidelines for the protection of aquatic life (Government of Alberta 2018; CCME 1999). Summary statistics (i.e., mean, median, minimum, maximum, standard deviation), data tables, and time series plots will be produced to support analysis of data. The baseline report will also include a qualitative description of seasonal changes, and temporal and spatial trends where possible based on available data. The data will be evaluated for seasonal trends for indicator parameters (e.g., total suspended solids and associated parameters, total dissolved solids and associated ions, nutrients, and organics).

The water quality baseline report will: a) describe field methods for collection of field data and samples; b) summarize snow, surface water quality and sediment quality data for the Project collected as part of this baseline study and other applicable baseline studies in the LSA and RSA; c) present maps showing snow, water and sediment quality sample collection locations; d) present time series plots to support analysis of data; e) include qualitative description of seasonal changes, and temporal and spatial trends where possible; f) present guideline comparisons; and g) describe quality assurance (QC) results.

### **Assessment**

The water quality assessment for the Project includes modelling the local and regional effects of the Project on the receiving environment, as well as the cumulative effects of the Project and other existing, approved, and planned developments within the RSA. The assessment will focus on effects related to: a) potential changes to the assimilative capacity of local and regional receiving watercourses and waterbodies; b) industrial wastewater water chemistry and its potential release to receiving watercourses and pit lakes; and c) seepage resulting from mining operations in the region.

The water quality IS will quantify the impacts of the Project on streams, pit lakes, and the Athabasca River during the operation and closure stages for the assessment cases. Potential impacts from the Project that will be quantified include: a) water quality in streams, pit lakes, and the Athabasca River; b) aerial deposition of metals and PAHs to snowpack and resulting snowmelt concentrations; c) dissolved oxygen in streams, pit lakes, and the Athabasca River; d) thermal regimes in streams, pit lakes, and the Athabasca River; e) sediment quality in streams within the LSA; and f) the effects of air emissions on aquatic receptors.

### **E-8.4. Aquatic Health**

The aquatic health assessment (AQHA) for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR.

#### **Baseline**

Baseline information relevant to the aquatic health assessment will be taken from the surface water and water quality baselines. In addition, a fish tissue field program will be completed in 2020 to support the derivation of site-specific bioaccumulation factors (BAFs).

#### **Assessment**

The Project IS will include an AQHA that will characterize the potential effects of Project on the health of aquatic organisms. The AQHA will emphasize potential changes linked to surface water quality and will include: a) refinement of existing chronic effect benchmarks (CEBs), using existing derivations where defensible but incorporating important recent updates for some constituents; b) assessment of the validity

of possible linkages between the Project and potential effects on aquatic health (i.e., confirmation of operable exposure pathways); c) classification of the potential effects of the Project on aquatic health following a systematic and quantitative framework that emphasizes surface water quality and tissue bioaccumulation; d) integration of the classification results to determine the environmental consequences of the Project on aquatic health; e) identification of key uncertainties in the assessment and a description of the implications for the results of the assessment; and f) identification of monitoring programs and measures that will be implemented to evaluate the effectiveness of mitigation or compensation activities, where necessary, for the protection of aquatic health.

## **E-9. FISH AND FISH HABITAT**

The fish and fish habitat assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR.

### **Baseline**

The fish and fish habitat baseline will require an extensive literature review and data analysis process (i.e., using data obtained from baseline field studies) to support characterization of population dynamics of fish, dispersion, recruitment, age structure, sex ratios, fish movements and migratory routes, seasonal and annual trends in abundance, and other topics listed in the Tailored Guidelines. Also, baseline summaries for the plankton, periphyton and benthic drift field studies will be prepared.

The report is expected to include; a) project description in relation to development activities with potential effects on aquatic resources; b) study objectives and survey sites for baseline surveys conducted by Suncor; c) summary of historical data and other available baseline or monitoring data collected by proponents or agencies other than Suncor in the LSA, RSA and Peace-Athabasca Delta; d) results of previous Suncor and current (2020) field work for the watercourses and waterbodies sampled; e) analysis and synthesis of the results of historical data and Project-specific field work to describe baseline fish and fish habitat conditions of watercourses and waterbodies in the LSA, RSA and Peace-Athabasca Delta; and f) characterization of life history and population dynamics of fish, as outlined in the Tailored Impact Statement Guidelines.

### **Assessment**

The fish and fish habitat component will complete evaluations based on three assessment cases, including the Baseline Case, Application Case, and Planned Development Case.

A key issue for the fish and fish habitat assessment will be to evaluate potential changes in fish habitat area (i.e., habitat losses) for preparation of the Conceptual Fisheries Offsetting Plan (CFOP).

The IS will consider potential effects on fish and fish habitat in the Peace-Athabasca Delta, if there is a valid pathway by which potential indirect effects could occur through changes in hydrology or water quality. The Peace-Athabasca Delta assessment is anticipated to consist of a semi-qualitative analysis, which will be based on a description of existing fish and fish habitat conditions and predictions from the hydrology and water quality components.

## **E-10. TERRESTRIAL VEGETATION**

The terrestrial vegetation assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. The assessment will take an ecosystem approach that considers how the Project may affect the structure and functioning of biotic and abiotic components within the ecosystem using scientific, community and Indigenous knowledge regarding ecosystem health and integrity, as applicable. The IS will provide a description of the indicators and measures used to determine ecosystem health and integrity, identified during planning, and reflected in the Tailored Impact Statement Guidelines.

## **Baseline**

The terrestrial vegetation resources in the Project LSA and RSA will be described in a baseline report, which will include a description of desktop and field methods as well as results of the field surveys. The baseline report will provide information on terrestrial vegetation mapping based on the data collected in the Project development area over the last five years. The upland, riparian and wetland vegetation types in the Project development area will be described and mapped. The report will also include information on any plant species or ecological communities of conservation concern, as well as noxious or prohibited noxious weed species and traditional use plants in the Project development area. Forest stand age and old growth forest will also be described.

The terrestrial vegetation baseline report will: a) describe the environmental setting, which will summarize data for the Project collected during the baseline studies; b) contain terrestrial vegetation, riparian and wetland community descriptions; c) present the distribution and analyses of terrestrial vegetation, riparian and wetland communities in the Project development area; and d) integrate information from previous impact assessments to describe the regional environmental setting.

Data management will include the compilation of terrestrial vegetation field data into a common vegetation database for analysis and mapping purposes. Mapping will be completed to incorporate existing and newly collected vegetation data.

## **Assessment**

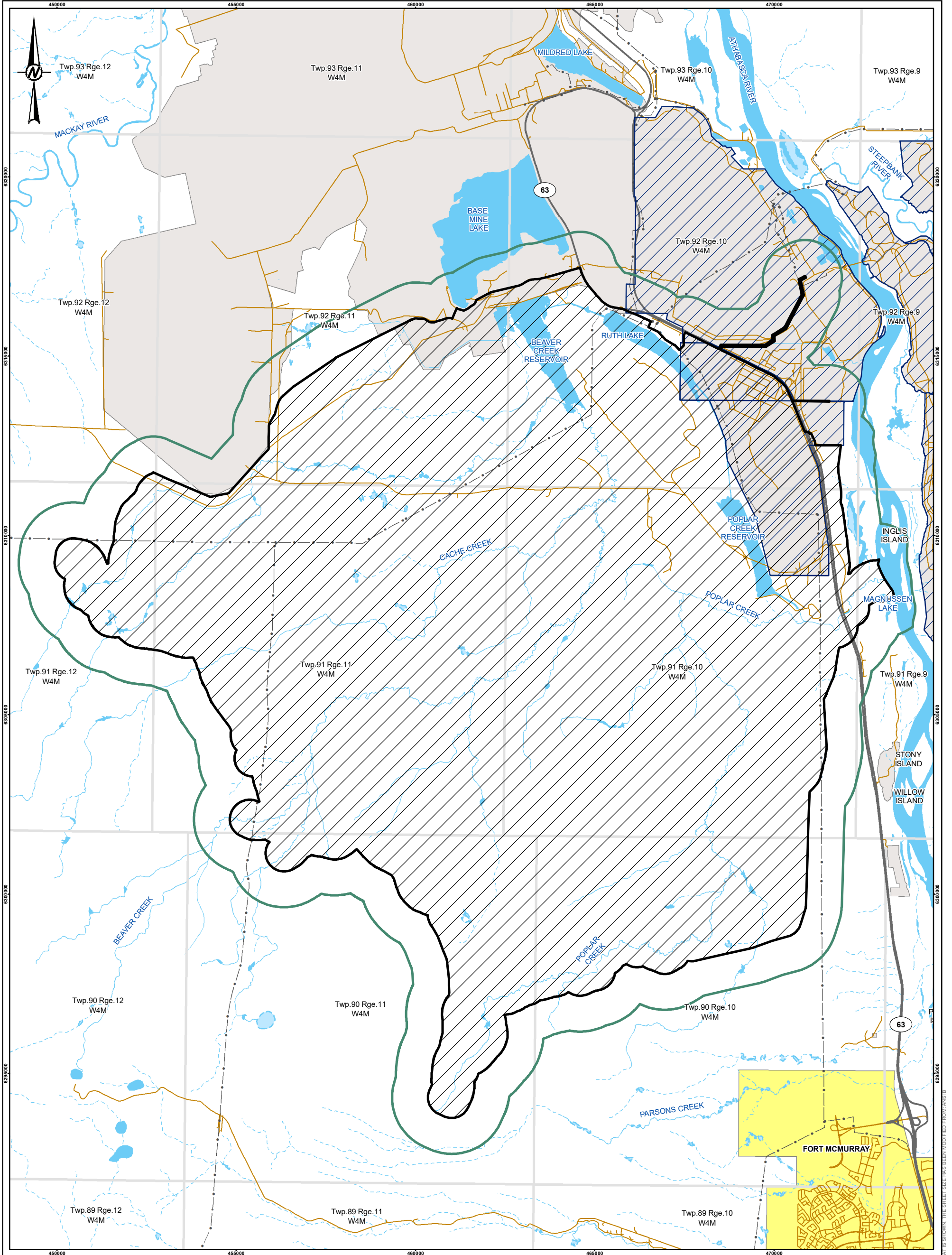
Ecological processes will be evaluated for potential susceptibility to adverse effects from the Project. Considerations for the terrestrial vegetation component of the IS include: patterns and connectivity of habitat patches; continuation of key natural disturbance regimes; structural complexity; population dynamics, genetic diversity, Indigenous knowledge relevant for the conservation and sustainable use of relevant species populations, communities and associated habitats.

The analyzed terrestrial vegetation information will be used to help develop a Reclamation and Closure plan for the first 10-year Alberta EPEA application. The predicted effectiveness of the Reclamation and Closure Plan and how it integrates with those plans for other developments will be considered in the assessment.

Specific objectives of the terrestrial vegetation component of the IS are to provide a description within the study areas, including: a) description of the biodiversity, relative abundance and distribution of vegetation species and communities of ecological, economic or human importance (e.g., traditional use, forestry, tame pasture, native prairie, wetland or old growth); b) description of the conservation status (i.e., listed under the *Species at Risk Act* (SARA) or assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to be 'at risk', including species of concern) applicable to any particular species or communities, species' critical habitat as described in final or draft recovery strategies or action plans, if applicable; c) outlining of the current level of disturbance associated with vegetation, including a description of level of habitat fragmentation; d) description of the amount, merchantability and location of any merchantable timber to be removed; e) identification of the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline vegetation biodiversity and discuss the rationale for their selection, provide data files of mapped features depicting vegetation presence within the study areas; f) description of any weed species, other invasive species, and introduced species of concern; and g) description of the natural disturbance regime (e.g., fire, floods, droughts), with description of the use of local vegetation as a source of country foods (traditional foods) and whether its consumption has any Indigenous cultural importance.

The assessment will include consideration of the potential effects to carbon sinks in association with changes to the abundance of forested and wetland areas.

The proposed terrestrial resources local study area and regional study areas are provided in Figure E-5 and Figure E-6.



- LEGEND**
- PRIMARY HIGHWAY
  - LOCAL ROAD
  - TRANSMISSION LINE
  - WATERCOURSE
  - INTERMITTENT WATERCOURSE
  - OPEN WATER
  - INTERMITTENT OPEN WATER
  - POPULATED PLACE
  - EXISTING DEVELOPMENT
  - SUNCOR OIL SANDS BASE PLANT
  - PROJECT DEVELOPMENT AREA
  - TERRESTRIAL RESOURCES LOCAL STUDY AREA



**NOTE(S)**  
####

**REFERENCE(S)**  
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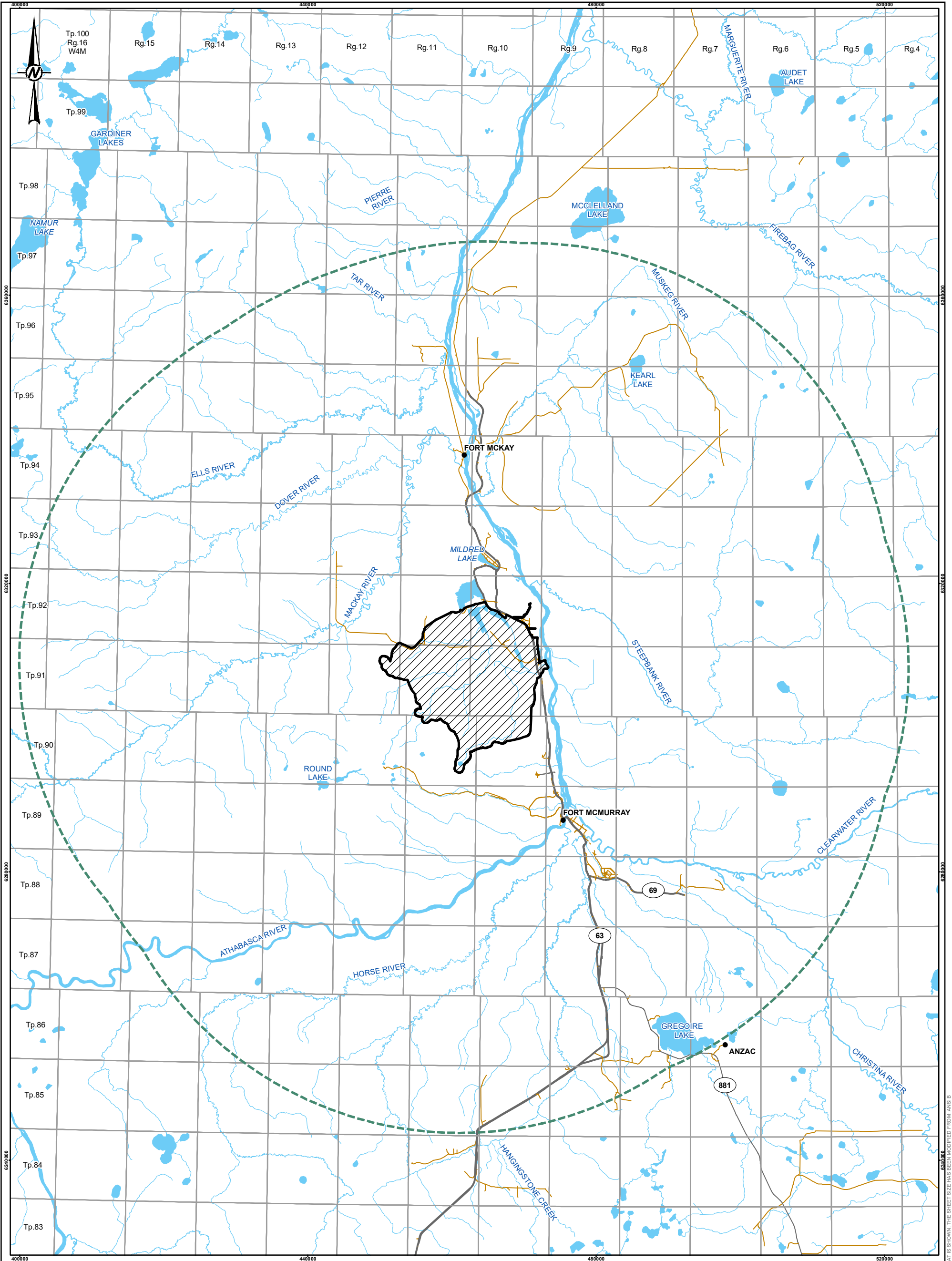
**PROJECT**  
BASE MINE EXTENSION

**TITLE**  
PROPOSED TERRESTRIAL RESOURCES LOCAL STUDY AREA

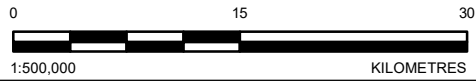
CLIENT	YYYY-MM-DD	2020-07-14
	DESIGNED	JG
	PREPARED	PT
	REVIEWED	ZG
	APPROVED	JH

PROJECT NO.	PHASE	REV.	FIGURE
19124718		0	E5

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- LEGEND**
- SETTLEMENT
  - PRIMARY HIGHWAY
  - SECONDARY HIGHWAY
  - LOCAL ROAD
  - WATERCOURSE
  - OPEN WATER
  - ▨ PROJECT DEVELOPMENT AREA
  - TERRESTRIAL RESOURCES REGIONAL STUDY AREA



**NOTE(S)**  
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PROJECTION: UTM ZONE 12 DATUM: NAD 83

**BASE MINE EXTENSION**

TITLE  
**PROPOSED TERRESTRIAL RESOURCES REGIONAL STUDY AREA**

CLIENT	YYYY-MM-DD	2020-07-14
	DESIGNED	JG
	PREPARED	PT
	REVIEWED	ZG
	APPROVED	JH

PROJECT NO. 19124718      PHASE      REV. 0      FIGURE E6

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## **E-11. BIRDS, MIGRATORY BIRDS, TERRESTRIAL WILDLIFE AND THEIR HABITATS**

The birds, migratory birds, terrestrial wildlife and their habitat assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. These sections will be included in a single Wildlife assessment. The wildlife component of the IS will characterize the potential effects of the Project on the health and viability of wildlife populations and habitat.

### **Baseline**

Wildlife baseline studies are required to describe the existing wildlife and wildlife habitat conditions prior to the development of the Project. Data from baseline studies will be used to assess the effects from the Project on wildlife populations. The baseline report will describe conditions in the Project LSA and RSA for wildlife and wildlife habitat including species of conservation concern. The objectives of the wildlife baseline report will be to: a) describe the population status and distribution of wildlife species in the LSA and RSA; b) identify habitat features that are important to wildlife in the vicinity of the Project; and c) provide information about potential effects resulting from the Project.

Baseline data previously collected includes: a) field data collected as part of the 2007 Voyageur South Project submission (owl, amphibian, breeding bird and bat surveys); b) breeding bird data collected in 2011 and 2013; c) winter tracking conducted in 2010 and 2014; d) amphibian surveys conducted in 2011 and 2013; e) bat surveys conducted in 2012 and 2013; and f) remote camera data collected in 2011.

Data considered for the IS will come from historic surveys as well as more recent surveys completed for this IS. A cut-off of 2013 was set for data to be included in the baseline report to provide the most accurate and up-to-date description of wildlife conditions within the LSA and RSA; therefore, all data collected prior to 2013 will not be incorporated in the baseline report. Results from the pre-2013 wildlife surveys will be incorporated into the IS to provide historical context for wildlife populations and habitat in the LSA and RSA.

To supplement previously collected data, update surveys will be conducted, as per methods recommended by Alberta's Sensitive Species Inventory Guidelines (Government of Alberta 2013b), to have data collected within three years of the IS submission. Baseline surveys completed in 2017 and 2018 included: bat surveys, breeding bird surveys, amphibian surveys, remote camera monitoring for mammals, surveys for yellow rail and common nighthawk, winter track count surveys for winter-active mammals, and aerial water bird surveys.

Additional amphibian, marsh bird, and owl surveys were conducted in the spring of 2019, using autonomous recording units, to replace outdated baseline data and to improve the spatial coverage of surveys in the LSA.

### **Assessment**

Considerations for the wildlife component of the IS include: patterns and connectivity of habitat patches; continuation of key natural disturbance regimes; structural complexity; hydrogeological patterns; nutrient cycling; abiotic-biotic and biotic interactions; population dynamics, genetic diversity, Indigenous knowledge relevant for the conservation and sustainable use of relevant species populations, communities and associated habitats.

Specific objectives of the wildlife and wildlife habitat component of the IS include: a) providing a description of the indicators and measures used to determine wildlife health and integrity; b) identifying wildlife species of ecological, economic or human importance, within the study area, that are likely to be directly or indirectly affected and describe each species' biodiversity, distribution and location; c) identifying the presence of endangered ecosystems and species potentially affected by the Project and describing them in the biophysical baseline conditions; d) describing direct, incidental and cumulative

predicted positive and/or adverse effects to wildlife and wildlife habitat, including population level effects that could be caused by all project activities; e) considering patterns and connectivity of habitat patches; continuation of key natural disturbance regimes; structural complexity; nutrient cycling; abiotic-biotic and biotic interactions; population dynamics, genetic diversity, Indigenous knowledge relevant for the conservation and sustainable use of relevant species populations, communities and associated habitats; f) identifying and describing mitigation measures that would avoid or lessen potential adverse effects to terrestrial wildlife species and/or critical habitat listed under Schedule 1 of the SARA; g) interpreting the classification of results to determine the environmental consequences of the Project on wildlife and wildlife habitat; h) providing offsetting or compensation plans to address all residual effects to wildlife species at risk, and their critical habitat, and migratory birds; and i) outlining plans for a Wildlife Mitigation and Monitoring Program (WMMP) that will assess the effectiveness of proposed mitigation measures and document the response of wildlife populations and habitat to the Project.

An offsetting/compensation plan will be created for migratory birds and any species at risk identified as having residual effects following the application of proposed mitigation measures. A separate compensation plan will be created for each species or species group identified and plans will be developed considering input from Indigenous groups.

The proposed terrestrial resources local study area and regional study areas are provided in Figure E-5 and Figure E-6.

## **E-12. SPECIES AT RISK**

The species at risk assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. The information on species at risk will be provided within different components of the IS, depending on the species in question (e.g., wildlife species will be in the wildlife section, fish species will be in the fish and fish habitat section). A summary of all species at risk will be provided in a separate Species at Risk section.

### **Assessment**

The IS will include lists of species at risk that may be directly or indirectly affected by the Project. The species listed should consider: a) all species at risk listed in Schedule 1 of the federal SARA that may be directly or indirectly affected by the Project; b) provincially listed protected species at risk and species assessed by COSEWIC that have the status of extirpated, endangered, threatened or of special concern; and c) species listed "at Risk, May be at Risk and Sensitive" in the Alberta Wild Species General Status Listing in 2015 (AEP 2015).

Existing data and literature, as well as surveys will be used to provide current field data that reflects the natural inter-annual and seasonal variability of identified species. For each of the identified species, the IS will: a) provide published studies that describe the regional importance, abundance and distribution of species at risk, including recovery strategies or plans; b) supplement data by surveys, as required; c) employ survey protocols that optimize detectability to provide for comprehensive coverage at the appropriate time of year (e.g., survey breeding habitat during breeding season, stopover habitat during migration); d) for each survey protocol, provide a rationale for the scope of and the methodology used for surveys including design, sampling protocols and data manipulation; and e) where using recognized standards, provide details of any modifications to the recommended methods and rationale for these modifications and indicate who was consulted in the development of the baseline surveys (e.g., federal/provincial wildlife experts, specialists and local Indigenous groups).

Information and/or mapping will be provided for residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, and identified or proposed Critical Habitat and/or recovery habitat (where applicable). A description will be provided of the general life history of species at risk (e.g., breeding, foraging) that may occur in the Project development area or be affected by the Project.

## **E-13. HUMAN HEALTH**

The human health assessment will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines, with consideration of Health Canada Guidance, and in accordance with the Project TOR. The Tailored Impact Statement Guidelines call for a comprehensive assessment of baseline conditions of human health and a broader overall view of the potential impacts on health, wherein social, economic and biophysical impacts are considered collectively as interconnected determinants of human health using the broader Health Impact Assessment (HIA) approach. A Human Health Risk Assessment (HHRA) becomes part of the HIA, as it remains the most effective way to address those determinants of health related to the biophysical environment.

### **Baseline**

The Baseline Assessment, as detailed in the Tailored Impact Statement Guidelines, will include the “current state of physical, mental and social well-being and incorporate a social determinants of health approach to move beyond biophysical considerations.” Further the Baseline Assessment will take into “account input of public and Indigenous groups, and should include indicators that are meaningful for the effects analysis.”

The Tailored Impact Statement Guidelines require baseline information to be sufficiently disaggregated and analyzed to support the analysis of disproportionate effects as per the gender-based analysis plus (GBA+).

The human health baseline will incorporate information gathered for the baseline analyses of other components such as vegetation, fish, surface water, soil quality and air quality. The baseline will include a review of the status of air quality, water quality, and human health in the study area, with input from available community studies (e.g., community health studies in Fort Chipewyan and Fort McKay). Discussions on existing air and water quality will emphasize how these relate to human health. The baseline will also quantify human health risks associated with existing conditions and Baseline Case conditions. These risk estimates will form the benchmark against which the predicted Project impacts will be compared.

### **Assessment**

The Tailored Impact Statement Guidelines details the requirements for an effects assessment of human health, which are largely based on the concept that social, economic, health and biophysical impacts are interconnected. According to the Tailored Impact Statement Guidelines, the health effects assessment “must illustrate an understanding of linkages and effect pathways, so that when a change in one domain is predicted, there is an understanding of what other effects or consequences may be felt across the other domains. Applying a determinants of health approach in the assessment of human health effects will support the identification of these linkages as well as of disproportionate effects across subgroups.” The goal of the human health assessment will be to “provide an assessment of adverse and positive effects on human health or changes to the baseline community health profile based on changes to the environment, health, social and economic conditions, focusing on effects to health outcomes, risks or social determinants of health ...”.

Many of the components (tasks) described under the new Tailored Impact Statement Guidelines are different from how health effects have historically been assessed in the oil sands, or in other parts of the country. The new requirements will be addressed in the health effects assessment using an HIA approach.

The World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. This definition is considered an ideal to strive for, and it forms the basic principle upon which the HIA is based. Historically, the consideration of community health has been restricted to an evaluation of health impacts associated with environmental contaminants. For this reason, the HIA is intended to incorporate a wider range of potential health determinants. Often referred to as the “social determinants of health”, this collection of factors ranges



from biological characteristics (e.g., age, gender, genetics) to socioeconomic factors (e.g., education, income, lifestyle factors).

The HIA is a tool to evaluate the potential positive and negative health impacts of projects and policies. As described, the HIA process is complementary to existing HHRA and environmental assessment protocols; however, it is intended to also identify project benefits to provide a more balanced perspective of overall impact.

The Tailored Impact Statement Guidelines require applicants to “employ best practices in Health Impact Assessment methods.” While there is some international guidance available on conducting HIAs (e.g., World Health Organization), at present there is no federal or provincial guidance available in Canada. However, Intrinsic, the consultant who will complete the HIA, is currently developing HIA guidance on behalf of Health Canada. Intrinsic has successfully applied its HIA approach in several Canadian provinces and the United States. As such, Intrinsic will employ best practices in its HIA of the Project.

#### **E-14. TERRESTRIAL ECOLOGICAL RISK ASSESSMENT**

The Tailored Impact Statement Guidelines do not include specific reference to completion of a terrestrial or wildlife ecological risk assessment, although the potential effects of projects on wildlife health is an issue that has been raised by Indigenous groups and federal regulators. Assessment of the potential for both acute and chronic effects to animal health will be conducted in accordance with the Project TOR.

The suggested methodology for conducting such an assessment is to complete a detailed terrestrial ecological risk assessment (TERA). The objectives of the TERA will be to evaluate potential health risks to the terrestrial wildlife populations in association with emissions from the Project. The TERA will identify potential population-level impacts on selected local wildlife species from exposure to chemicals of potential concern emitted from the Project. A wildlife population level effects is a decline or change in abundance or distribution of the population over time, such that natural recruitment is unable to re-establish the population to its original level. The objective will be met by estimating risks to wildlife health resulting from acute (i.e., short-term) and chronic (i.e., long-term) exposure to local and regional emissions.

Evaluation of potential acute and chronic effects to local terrestrial wildlife will include identification of assessment and measurement endpoints. Assessment endpoints include direct health effects such as increased mortality or decreased growth and reproduction rates. Measurement endpoints describe an ecological effect that can be quantified in some manner (e.g., lowest observable adverse level for any given species).

The TERA will follow the Government of Canada’s 2012 Ecological Risk Assessment Guidance (Government of Canada 2012). The risk assessment will include five steps: 1) Baseline Assessment; 2) Planning Stage; 3) Exposure Assessment; 4) Hazard Assessment; and 5) Risk Characterization.

##### **Baseline Assessment**

The baseline assessment is required in the TERA process to establish a benchmark against which predicted Project impacts can be compared. Baseline data used in the HHRA will also be used in the TERA.

##### **Planning Stage**

The planning stage is an information gathering and interpretation stage, which focuses the risk assessment on identification of critical areas of concern, chemicals of potential concern, wildlife receptors potentially at risk and exposure pathways of concern. This stage includes identification of the chemicals of potential concern that could be emitted or released by the Project. Receptor identification considers the species that are listed at risk either federally or provincially, species known to frequent the Project development area, and species of ecological or cultural significance. Assessment endpoints are identified as potential effects on wildlife populations.

## Exposure Assessment

Potential wildlife exposures to chemicals of potential concern through inhalation of air, ingestion of soil, water, plants, or prey will be assessed. The chemical of potential concern concentrations will be predicted for the Baseline Case, Application Case and Planned Development Case. The data required to complete this includes: a) the concentration of the chemical in air; b) the concentrations of the chemical in water; c) the physical-chemical properties of the chemical (e.g., vapour pressure); d) the chemical's behaviour in the environment (e.g., distribution); and e) local environmental conditions (e.g., soil characteristics).

## Hazard Assessment

The hazard assessment will involve identification of the assumed exposure limits considered protective of wildlife receptors at a population level.

## Risk Characterization

The predicted exposures will be compared to benchmarks or exposure limits to determine potential risks. This puts any potential risks into context so that Indigenous peoples, stakeholders, regulators, and other interested parties can better understand the results. The potential sources of uncertainty and conservative assumptions used will also be described.

## E-15. TRADITIONAL LAND USE

The Tailored Impact Statement Guidelines indicate that to identify and understand the potential impacts of the Project on Indigenous Peoples, the baseline conditions and impact assessment should be informed through engagement with Indigenous groups (e.g., Project-specific Traditional Land Use [TLU] studies) and should incorporate Indigenous knowledge, to reflect the perspective of potentially affected Indigenous groups. The Tailored Impact Statement Guidelines note that to the extent possible, the information should be specific to the individual Indigenous group(s) included in the assessment and describe contextual information about the members within an Indigenous group (e.g., women, men, elders, and youth).

The IS is to indicate where input from Indigenous groups has been incorporated, including Indigenous knowledge. Additionally, Indigenous groups are to have the opportunity to review the information prior to submission of the IS. Where information has not been provided by Indigenous groups through engagement publicly available sources of information will be used to assess the potential effects of the Project.

The Tailored Impact Statement Guidelines also note that the IS should consider and describe effects holistically, which requires taking a systems approach that considers interactions between valued components and with other environmental, health, social and economic factors, and should consider community values.

### Baseline

The baseline report will describe baseline conditions for Indigenous Peoples related to current use of lands and resources for traditional purposes (e.g., hunting, fishing, trapping, plant gathering, ceremonial or spiritual practices) using information obtained through engagement with Indigenous groups or public sources. Since current use of lands and resources for traditional purposes will vary based on the Indigenous group being considered, baseline conditions will be discussed for each Indigenous group individually.

The baseline report will include the following information, where available: a) location and description of Treaty rights, title area, land claims or traditional territory (including maps where available); b) location of reserves and communities; c) traditional activities presently or historically practiced (e.g., hunting, fishing, trapping, gathering of plants for consumption or medicinal purposes); d) location of traditional uses, including hunting, trapping, and fishing camps, cabins and gathering or teaching grounds; e) types of traditional resources such as fish, wildlife, birds, plants or other natural resources and their habitats of importance for supporting traditional use; f) places where culturally important fish, wildlife, birds, plants or

other natural resources are harvested; g) access and travel routes for conducting traditional practices, considering access to resources (e.g., physical access to harvest specific species, culturally important harvesting locations, timing, seasonality, distance from community); h) frequency, duration or timing of traditional practices; i) where known, efforts of the groups to bring back traditional practices; j) description of country foods (traditional foods); k) the quality and quantity of resources (e.g., preferred species and perception of quality); l) the experience of the practice (e.g., connection to the landscape without artificial noise and sensory disturbances, air quality, visual landscape, perceived or real contamination); and m) other current uses identified by Indigenous groups.

### **Assessment**

The IS will assess the potential adverse and positive effects of the Project and other cumulative development on the current use of land and resources for traditional purposes, including the following, with input from other discipline/technical specialists (e.g., visual resources, noise, wildlife, health.): a) quantity and quality of resources available for harvesting (e.g., species of cultural importance, traditional and medicinal plants; b) access to culturally important harvesting areas or resources of importance; c) experiences of being on the land (e.g., changes in air quality, noise exposure, effects of vibrations from blasting or other activities); d) current and future availability and quality of country foods (traditional foods); e) the use of travel ways, navigable waterways and waterbodies; f) commercial and non-commercial fishing, hunting, trapping and gathering and cultural or ceremonial activities and practices; g) commercial, non-commercial and trade economies; and h) cultural heritage, and structures, sites or things of historical, archaeological, paleontological or architectural significance to groups, including, but not limited to: the loss or destruction of physical and cultural heritage; changes to access to physical and cultural heritage; changes to the cultural value, spirituality, or importance associated with physical and cultural heritage; changes to sacred, ceremonial or culturally important places, objects, or things, including languages, stories and traditions; and changes to visual aesthetics over the life of the project and post-project abandonment or decommissioning.

### **E-16. RESOURCE USE**

The resource use assessment for the Project IS will be conducted in accordance with the Project TOR. The Land Use and Management Impact Assessment (LUMIA) assesses the potential impacts of the Project on the non-traditional uses of natural resources and includes both commercial and domestic users of resources such as aggregate resources, forests, berries, fish, and wildlife. Impacts of the Project on non-consumptive recreation and on environmentally important areas overlapping the LUMIA LSA and RSA are also assessed.

#### **Baseline**

The resource use baseline report will include up-to-date baseline data on resource use, environmentally important areas, management plans, and access in the LSA and RSA. This includes consideration of; forestry; berry picking; hunting and outfitting; trapping; fishing; and non-consumptive recreation (e.g., boating, snowmobiling, bird watching).

#### **Assessment**

Key informant interviews will be conducted with outfitters, recreation groups, and other land users in the vicinity of the Project to characterize differential impacts on resource user groups.

The resource use assessment will describe the impacts of construction, operation, and closure of the Project. The resource use assessment will link to other environmental disciplines to describe impacts on the quantity and quality of resources (e.g., wildlife, timber, fish) accessed by users, per guidance from the Tailored Impact Statement Guidelines. The resource use assessment will integrate with the visual resources and TLU assessments to describe linked impacts on different land user groups in the vicinity of the Project.

## **E-17. VISUAL RESOURCES**

The visual assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. The Tailored Impact Statement Guidelines identify the visual environment as a component valued by communities and Indigenous groups, and recognizes that the IS should include information on: a) description and assessment of changes to the visual environment; b) potential impacts of projects on Indigenous Peoples including experience of cultural practices and the exercise of rights (e.g., connection to the landscape without sensory disturbances to the visual landscape); and c) changes to visual aesthetics over the life of the Project and after closure.

The government of Alberta identified existing management goals and objectives to sustain visual aesthetic resources in the Fort McMurray - Athabasca-Oil Sands Sub-Regional Integrated Resource Plan (ASRD 2002). The Regional Municipality of Wood Buffalo recognizes the value of the visual environment through the development of the Regional Visual Resources Management Strategy and Visual Landscape System (VLS) (CHR 2004; RDI 2003). The VLS provides a visual resource management system to maintain the visual landscape integrity and aesthetic landscape values of the region at desired levels.

### **Baseline**

Current ground level site photography is necessary to represent the viewing conditions of the Project site and adjacent landscapes. This will require panoramic site photography taken with a professional quality DSLR camera from key viewpoints surrounding the Project site, as well as geographic information and observations of viewing conditions for each photographic survey location. Desktop related tasks will include the compilation of a photographic inventory to describe the viewing condition of the Project's landscape setting from key viewpoints.

Photographic inventory data will be used in combination with relevant local and regional strategic visual resource planning objectives, VLS inventory data, and available traditional use information and Indigenous group input to characterize the existing regulatory and social context, and existing visual condition of the Project landscape. A baseline report will present the information about the existing visual condition and character of the Project development area to support further assessment of potential visual effects.

### **Assessment**

A computer-generated 3D landscape model will be developed in landscape modelling software based on spatial terrain data and Project design information. Landscape modelling will provide rendering of simulated perspective images of the Project components from key viewpoints that will be combined with site photography to produce photo-composite images that represent the viewing conditions of the Project site. This will support the assessment of Project related visual effects from key viewpoints.

The potential effects of construction and operation of the Project will be assessed using criteria based on VLS procedures for design and established technical guidance from the Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) Guidelines for Landscape and Visual Impact Assessment to provide a methodology that is based on objective criteria for the assessment of potential visual changes to the landscape. For each viewpoint, assessment will focus on the Projects predicted level of visibility and visual compatibility with the existing landscape character. Measures for avoiding, minimizing, or otherwise mitigating potential adverse visual effects will be identified based on established best management practices, professional judgment, and practical solutions specific to the Project design.

The assessment of visual resources will consider the application of mitigation measures to characterize the residual effects of the Project using established residual effects criteria. Construction and closure scenarios will not be modelled but will be qualitatively assessed to describe the potential visual effects based on available information for construction activities and closure and reclamation planning.

Consideration of disproportionate residual effects for diverse subgroups (e.g., Indigenous groups) will be included relative to available information describing cultural value and use of the visual landscape.

An assessment of residual effects of the Project in combination with predicted visual effects of reasonably foreseeable planned developments will be provided as a cumulative effects assessment as required. This will consider regional effects and will be based on available information describing additional proposed projects and activities. Potential effects of the environment on the Project landscape will also be considered (e.g., wildfire, climate change).

Potential follow-up programs for visual resources such as offsetting, monitoring, and/or management plans, will be identified and described to verify and address the predicted visual effects of the Project, and assess the effectiveness of proposed mitigation measures.

## **E-18. HISTORIC RESOURCES**

The historic resources assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. The Tailored Impact Statement Guidelines require assessment of potential effects to changes to structures, sites, or things of historical, archaeological, paleontological, or architectural significance and associated effects on other social and economic conditions.

### **Baseline**

The historic resources baseline reporting will be initiated with the completion of the Statement of Justification (SoJ) and Historic Resources (HR) application. A palaeontology SoJ (pSoJ) will also be completed to support this application. The purpose of these documents is to address gaps in historic resources survey coverage within the Project footprint and to make recommendations regarding historic resource sites and potential. This includes the following tasks: a) review of regional archaeological site distribution patterns, which are determined through archaeological and historic databases maintained at the Historic Resources Management Branch (HRMB), The Listing of Historic Resources, Current Edition; a GIS database of historic resource sites in Alberta maintained on the Alberta Culture, Multiculturalism and Status of Women (ACMSW) Web Feature Service; and a review of publicly available consultant reports; b) review of geological maps and databases of palaeontological resources to determine the potential for palaeontological resources in the Project footprint; c) review of existing historic resource concerns and recommendations; d) review of existing aerial imagery and topographic data to assess the potential presence of historic resources; e) discussion with ACMSW on the regulatory requirements of the Project and the status of the Project development area for *Historical Resources Act* approval; and f) submission of the pSoJ, SoJ form and HR application to ACMSW for review and to identify project-specific requirements.

It is likely that the historic resources baseline will require the completion of a Historic Resource Impact Assessment (HRIA) for archaeology. The following tasks will be performed to complete the HRIA: a) apply for a permit to complete HRIA field studies; b) complete a combination of helicopter overflight, foot traverses and all-terrain vehicle surveys, accompanied by visual examination of proposed impact zones and subsurface shovel testing in areas of historic resources potential that lack subsurface exposure; and c) prepare site inventory forms for any new or updated sites identified, as required in the ACMSW permit regulations. Recovered artifacts will be catalogued, analyzed, and photographed; and e) prepare a stand-alone HRIA report to fulfil ACMSW permit obligations.

### **Assessment**

The historic resources effects assessment will describe the impacts of construction, operation, and closure of the Project.

The historic resources assessment will gather baseline information regarding historic resources and will be written to comply with provincial impact assessment standards. Consideration of Indigenous Peoples input to impacts on historic resources will be incorporated as reasonably as possible if provided.

## E-19. CLIMATE CHANGE

The climate change assessment for the Project IS will be conducted in accordance with the guidance presented in the Tailored Impact Statement Guidelines as well as in accordance with the Project TOR. Guidance on completion of the climate change assessment in the Project IS will also be taken from the draft or final Strategic Assessment of Climate Change (Government of Canada 2019d).

Details on the expected GHG emissions and GHG mitigation measures will be provided in the Project application. Assessments of the climate change resilience of the Project and of expected veracity of assessment predictions under various climate change scenarios will be completed in the IS. The components of the IS that will consider the potential effects of climate change on assessment predictions will include atmospheric environment, groundwater and surface water, water quality, and the soils and vegetation components of the reclamation and closure plan.

The climate change assessment will be completed considering the future climate projections compiled by the Pacific Climate Impacts Consortium (PCIC). The PCIC offers statistically downscaled Canada-wide climate projections at 10 km spatial resolution and extending until 2100 (PCIC 2019). The PCIC climate variables (i.e., precipitation, maximum and minimum temperature) are based on Global Climate Models (GCMs) from the Coupled Model Intercomparison Project Phase 5 (CMIP5; Taylor et al. 2012) and historical daily gridded climate data for Canada (McKenny et al. 2011; Hopkinson et al. 2011). The GCMs compiled by PCIC for statistical downscaling are listed in Table E-3. They include projections associated with three available statistically downscaled data using the bias correction/constructed analogues with quartile mapping reorder (BCCAQ) method in the PCIC database for the CMIP5 Representative Concentration Pathways (RCP) 2.6, 4.5 and 8.5. These RCPs, as described by IPCC in its Data Distribution Centre website (IPCC 2019), are:

- RCP2.6 – The best case for limiting anthropogenic climate change (RCP2.6) assumes that global annual GHG emissions peak between 2010 and 2020, with emissions declining substantially thereafter.
- RCP4.5 – A scenario where global annual GHG emissions peak at around 50% higher than 2000 levels in 2040 and then decline rapidly over 30 years, stabilizing at half of 2000 levels.
- RCP8.5 – A scenario where global annual GHG emissions continue to rise throughout the 21<sup>st</sup> century.

**Table E-3: List of Statistically Downscaled Global Climate Models Provided by Pacific Climate Impacts Consortium**

GCM	Full Name and Country of Origin
ACCESS1-0 <sup>(a)</sup>	Commonwealth Scientific and Industrial Research Organization (CSIRO), Bureau of Meteorology (Australia)
BCC_CSM1_1	Beijing Climate Center (BCC) – Climate System Model (CSM) version 1.1, China Meteorological Administration (China)
BCC_CSM1_1_M	Beijing Climate Center (BCC) – Climate System Model (CSM) version 1.1 with a moderate resolution, China Meteorological Administration (China)
BNU_ESM	Beijing Normal University (BNU) – Earth System Model (ESM), Beijing Normal University (China)
CanESM2	Canadian Centre for Climate Modelling and Analysis (Canada)
CCSM4	National Centre for Atmospheric Research (NCAR) (United States [USA])
CESM1_CAM5	Community Earth System Model (CESM)1 – Community Atmosphere Model 5 (CAM), National Center for Atmospheric Research (USA)
CNRM-CM5	Centre National de Recherches Météorologiques, and Centre Européen de Recherche et Formation Avancées en Calcul Scientifique ((CNRM-CERFACS) (France)

**Table E-3: List of Statistically Downscaled Global Climate Models Provided by Pacific Climate Impacts Consortium**

GCM	Full Name and Country of Origin
CSIRO-MK3-6-0	Commonwealth Scientific and Industrial Research Organization (CSIRO), Queensland Climate Change Centre of Excellence (Australia)
FGOALS_g2	Flexible Global Ocean-Atmosphere-Land System Model Spectral version 2, Institute of Atmospheric Physics (China)
GFDL_CM3	NOAA Geophysical Fluid Dynamics Laboratory – Coupled Model version 3, Geophysical Fluid Dynamics Laboratory (USA)
GFDL-ESM2G	Geophysical Fluid Dynamics Laboratory (GFDL) (USA)
GFDL_ESM2M	NOAA Geophysical Fluid Dynamics Laboratory – Earth System Model-Modular Ocean Model, Geophysical Fluid Dynamics Laboratory (USA)
HadGEM2-CC <sup>(a)</sup>	Met Office Hadley Centre (United Kingdom [UK])
HadGEM2-ES	Met Office Hadley Centre (UK)
INMCM4 <sup>(a)</sup>	Institute for Numerical Mathematics (Russia)
IPSL_CM5A_LR	Institut Pierre-Simon Laplace – Earth System Model for the 5th IPCC report – Low Resolution, Institut Pierre-Simon Laplace (France)
IPSL_CM5A_MR	Institut Pierre-Simon Laplace – Earth System Model for the 5th IPCC report – Mid Resolution, Institut Pierre-Simon Laplace (France)
MIROC5	Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology (Japan)
MIROC_ESM	Model for Interdisciplinary Research on Climate (MIROC) – Earth System Model, Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology (Japan)
MIROC_ESM_CHEM	Model for Interdisciplinary Research on Climate (MIROC) – Earth System Model with coupled atmospheric chemistry, Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology (Japan)
MPI-ESM-LR	Max Planck Institute for Meteorology (Germany)
MPI_ESM_MR	Max Planck Institute (MPI) Earth System Model running on Mixed Resolution, Max Planck Institute for Meteorology (Germany)
MRI-CGCM3	Meteorological Research Institute (Japan)
NorESM1_M	Norwegian Earth System Model 1 – Medium Resolution, Norwegian Meteorological Institute (Norway)
NorESM1_ME	Norwegian Earth System Model 1 – Medium Resolution with capability to be fully emission driven, Norwegian Meteorological Institute (Norway)

Notes:

(a) PCIC data not available for Representative Concentration Pathway (RCP) 2.6 climate projections.

The climate change assessment will be completed by selecting five climate change scenarios following the directions from Specified Enactment Direction 003 (AER 2018) from the GCMs projections in Table E-3: Cold-Dry, Cold-Wet, Warm-Dry, Warm-Wet, and Median. The five scenarios aim to characterize the wide range of changes in precipitation and air temperature that are defined by the projection ensemble. The characteristics of the climate change scenarios relative to the historical climate are:

- “Cold” scenario is a climate change projection that has one of the smallest increases, or one of the largest decreases, in air temperature for the future period ending in 2100 relative to the base period of 1985 to 2005.
- “Warm” scenario is a climate change projection that has one of the largest increases in air temperature for the future period ending in 2100 relative to the base period of 1985 to 2005.
- “Dry” scenario is a climate change projection that has one of the smallest increases, or one of the largest decreases, in precipitation for the future period ending in 2100 relative to the base period of 1985 to 2005.
- “Wet” scenario is a climate change projection that has one of the largest increases in precipitation for the future period ending in 2100 relative to the base period of 1985 to 2005.
- “Median” scenario is a climate change projection that has close-to-median changes in both air temperature and precipitation.

The selection of the five climate change scenarios will be based on annual and seasonal changes in precipitation and air temperature and resulting changes in surface water runoff rates.

As the available climate change projections end in 2100, the assessment will use the selected scenario projections for the period between 2081 and 2100 as representative for long-term climate conditions.

The potential effects of climate change on assessment predictions will be considered by evaluating the effects of each of the five climate change scenarios for both the Baseline Case (without the Project) and the Application Case (with the Project).



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