Suncor Base Mine Extension Project

DRAFT TAILORED IMPACT STATEMENT GUIDELINES PURSUANT TO THE *IMPACT ASSESSMENT ACT*

February 23, 2021

DRAFT FOR PUBLIC COMMENT

Contents

List of Abbreviations and Acronyms

Abbreviation/Acronym	Definition
AAQO	Alberta Ambient Air Quality Objectives and Standards
AB TOR	Alberta Terms of Reference
the Act	Impact Assessment Act
Agency	Impact Assessment Agency of Canada
BCRs	Bird Conservation Regions
CAAQS	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
GBA+	Gender Based Analysis Plus
GHG	Greenhouse gas
GIS	Geographic Information Systems
HIA	Health Impact Assessment
IVOC	Intermediate volatile organic compounds
LSA	Local Study Area
Minister	Minister of Environment and Climate Change
Internet Site	Impact Assessment Agency of Canada's website
NAAQO	National Ambient Air Quality Objectives
NOC	National Occupational Classification
OCAP	Ownership, Control, Access and Possession
OSBTT	2019 Oil Sands Bird Technical Team
PACs	Polycyclic aromatic compounds
PAD	Peace-Athabasca Delta
Project	Suncor Base Mine Extension Project
Registry	Canadian Impact Assessment Registry

RSA	Regional Study Area
SACC	Strategic Assessment of Climate Change
SARA	Species at Risk Act
SOAs	Secondary Organic Aerosols
SVOCs	Semi-volatile organic compounds
Guidelines	Tailored Impact Statement Guidelines
VC	Valued component (including environmental, health, social, economic and potentially other elements of the natural and human environment)
VOCs	Volatile organic compounds

1. Introduction

The federal Impact Assessment process serves as a planning tool that considers a broad range of potential environmental, health, social, cultural and economic effects of designated projects identified by regulation or designated by the Minister of Environment and Climate Change (the Minister). Decisions are based on whether the potential adverse effects in areas of federal jurisdiction are in the public interest. The public interest determination is guided by the factors set out in the *Impact Assessment Act* (the Act) in section 63:

- the extent to which the project contributes to sustainability;
- the extent to which the adverse effects within federal jurisdiction and the adverse direct or incidental effects that are indicated in the impact assessment report in respect of the project are significant;
- the implementation of the mitigation measures that the Minister or the Governor in Council, as the case may be, considers appropriate;
- the impact that the project may have on any Indigenous peoples and any adverse impact that the designated project may have on the rights of the Indigenous peoples[1] of Canada recognized and affirmed by section 35 of the *Constitution Act, 1982*; and
- the extent to which the effects of the project may hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change.

A key element for the federal impact assessment process is the introduction of Tailored Impact Statement Guidelines (Guidelines)[2], which will provide the proponent with direction and requirements for the preparation of an Impact Statement. The Guidelines have been specifically tailored for the Suncor Base Mine Extension Project (the Project), by the Impact Assessment Agency of Canada (the Agency). The tailoring is based on the nature, complexity and context of the project, and is informed and guided by consultation and engagement that occurs with the public, Indigenous groups, jurisdictions, federal authorities and other interested parties during the Planning phase of the impact assessment process.

The draft guidelines have taken into account comments from certain federal authorities who have submitted proposed amendments to the Guidelines Template[3] to tailor it to the project.

In order to support the Government of Canada's objective of "one project, one assessment", the Guidelines have also been tailored to identify where the federal and provincial assessment processes have shared

[1] These guidelines use the term "Indigenous peoples" to represent the "aboriginal peoples of Canada" which includes Indian, Inuit and Métis peoples as defined in subsection 35(2) of the *Constitution Act, 1982*, and "rights of Indigenous peoples" is used to reflect the full scope of Aboriginal and Treaty rights recognized and affirmed by section 35 of the *Constitution Act, 1982*.

[2] As set out in paragraph 18(1)(b) of the *Impact Assessment Act.*

[3] The Guidelines Template is posted in the *Practitioner's Guide to Federal Impact Assessments under the Impact Assessment Act* on the Agency's website: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act.html

information needs. While the information requirements may be shared, the impact assessment will respect the jurisdiction of each governing body. The draft version of Alberta's Terms of Reference (AB TOR) is included as Annex I in the Guidelines.

The Guidelines will be finalized following a comment period on this draft version of the Guidelines, which will run from February 2~~3~~ to April ~~7~~1, 2021.

The proponent may present the information in the Impact Statement in the manner it deems most appropriate. While the Guidelines do not prescribe a preferred structure for the Impact Statement, it is recommended to follow a structure similar to the Guidelines to facilitate the review of the Impact Statement and participation in the process.

Irrespective of the preferred structure for the Impact Statement, it is essential that the Impact Statement address all requirements outlined in the Guidelines. If the proponent does not submit the information required in the Guidelines, it should include an explanation justifying the exclusion. To facilitate the review of the Impact Statement, the proponent must provide a table of concordance that indicates where each requirement of the Guidelines is addressed. In the case where information required in the Guidelines is not provided and the explanation justifying its exclusion is not acceptable to the Agency, in accordance with 112(1)(c) of the Act, the Agency will suspend the timelines to allow the proponent to provide the required information.

The proponent must provide the information in a machine-readable, accessible format, to support the Government of Canada's commitment to open science and data and facilitate the sharing of information with the public through the Registry and the Government of Canada's open science and data platform. The proponent should contact the Agency to obtain additional direction regarding the format and distribution of the Impact Statement.

1.1. Factors to be considered in the Impact Assessment

The Guidelines correspond to factors listed in subsection 22(1) of the Act and prescribe that the impact assessment of a designated project must take into account:

(a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including:

  (i) the effects of malfunctions or accidents that may occur in connection with the designated project;

  (ii) any cumulative effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out; ~~and~~

  (iii) the result of any interaction between those effects;

(b) mitigation measures that are technically and economically feasible and that would mitigate any adverse effects of the designated project;

Commenté [LS1]: as per letter of February 26th from the Agency to Communities and communications from Suncor

(c) the impact that the designated project may have on any Indigenous group and any adverse impact that the designated project may have on the rights of the Indigenous peoples of Canada recognized and affirmed by section 35 of the *Constitution Act, 1982;*

(d) the purpose of and need for the designated project;

(e) alternative means of carrying out the designated project for all project phases including design, application, operations and closure that are technically and economically feasible, including through the use of best available technologies including conservation (e.g. better vehicle mileage, better use of space heat), improved efficiency (e.g. hybrid vehicles) or fuel substitution via natural gas, hydrogen or renewables, and the effects of those means;

(f) any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project;

(g) Indigenous knowledge provided with respect to the designated project;

(h) the extent to which the designated project contributes to sustainability;

(i) the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change;

(j) any change to the designated project that may be caused by the environment;

(k) the requirements of the follow-up program in respect of the designated project;

(l) considerations related to Indigenous cultures with respect to the designated project;

(m) community knowledge provided with respect to the designated project;

(n) comments received from the public;

(o) comments from a jurisdiction that are received in the course of consultations conducted under section 21 of the Act*;*

(p) any relevant assessment referred to in sections 92, 93 or 95 of the Act*;*

(q) any assessment of the effects of the designated project that is conducted by or on behalf of an Indigenous governing body and that is provided with respect to the designated project;

(r) any study or plan that is conducted or prepared by a jurisdiction – or an Indigenous governing body not referred to in paragraph (f) or (g) of the definition *jurisdiction* in section 2 of the Act – that is in respect of a region related to the designated project and that has been provided with respect to the project; and

(s) the intersection of sex and gender with other identity factors.

The impact assessment of the project has been referred to an independent review panel by the Minister. In accordance with paragraph 22(1)(t) of the Act, any other matter relevant to the impact assessment that the Agency would require to be taken into account would be detailed in the Terms of Reference for the review panel. The scope of the factors in paragraphs 22(1)(a) to (f), (h) to (l), and (s) that are to be taken into account, including the extent of their relevance to the impact assessment, is determined by the Agency and is outlined in the Guidelines.

2. Proponent information

2.1. The proponent

The Impact Statement must:

- provide contact information for proponent representatives for the project (e.g. name, address, phone, fax, email);
- identify the proponent(s) and, where applicable, the name of the legal entity(ies) that would develop, manage and operate the project;
- describe corporate structure, including roles and responsibilities of key personnel;
- specify the mechanism used to ensure that corporate policies will be implemented and respected for the project; and
- identify key personnel, contractors, and/or sub-contractors responsible for preparing the Impact Statement.

2.2. Qualifications of individuals preparing the Impact Statement

The proponent must:

- provide information on the individuals who prepared the sections within the Impact Statement;
- when available, demonstrate how qualified individuals adhere to or meet the professional requirements prescribed for practitioners of that specific discipline; and
- demonstrate that qualified individuals have prepared the information or studies provided. Where possible, the proponent should use experts who are members of a professional body or recognized association.

A qualified individual would include someone who, through education, experience or knowledge relevant to a particular matter, may be relied upon by the proponent to provide advice within a given area of expertise. Knowledge relevant to a particular matter may include Indigenous and community knowledge. With respect to Indigenous and community knowledge and its consideration, integration and interpretation in the assessment, it is recommended that an individual(s) in the social sciences be included. Further, in some instances, qualitified individuals may include those representing the Indigenous community(s).

3. Project description

3.1. Project overview

The Impact Statement must:

- describe the project, key project components and activities, scheduling details, the timing of each phase of the project and other key features.

As the extension project is part of a larger sequence of projects, the Impact Statement must outline the larger context and integration with, or leverage of, existing components. The impact statement should make clear where existing project components are being used or transferred from the existing Base Mine operations (e.g. existing activities and components described in Table 3 of the proponent's Detailed Project Description that are operating under existing approvals) and would be captured within the current baseline versus where components and activities are new or additional. While it is important to understand the scale and scope of the proposed Project components and activities, this clarity is required to ensure that approved and operating components are not inadvertently subject to re-assessment. In detailing the use of exising components of Base Mine infrastructure, provide a description of if and how such infrastructure will be managed to meet 'technology of the day'/BATEA (e.g. to meet climate change targets). Recognizing certain components may have been modified over time, items operating under existing approvals should list assessment date, approval date of each major item or subcomponent, any changes made and associated approvals and the relevant standards, limits or comparitors required for those assessments (e.g. sulphur limit level used, hydrology design criteria used, GHG targets and pricing used). Any components approved more than ten (10) years ago will require re-assessment to maintain general consistency with advances in environmental stewardship, technology, carbon pricing and continuous improvement principles.

3.2. Project location

The Impact Statement must describe the geographical setting and socio-ecological context in which the project is to take place. The description should focus on aspects of the project and its setting that are important in order to understand the potential environmental, health, social, cultural and economic effects and impacts of the project.

The following information must be included and, where appropriate, located on map(s)[4]:

- geographic coordinates (i.e. longitude/latitude using international standard representation in degrees, minutes, seconds) for the centre of the main project site;
- project footprint, complete with associated upgrader(s), refinery(ies) and interconnections / pipelines, including the extent of the tenure;
- the surface areas, location and spacing of the project components;

[4] The geospatial database should be developed by referencing base layers and methods provided by the provincial government (https://www.isprs.org/proceedings/XXXVIII/part1/02/02_02_Paper_171.pdf)
Examples of base layers published by the government of Alberta are provided below and should be used to geospatially reference the project setting and used to identify the boundary conditions of the impact assessment and modelling exercises. Geological formations - https://ags.aer.ca/publication/alberta-table-formations; Hydrology - https://www.alberta.ca/hydrological-data.aspx; Soil type - https://cfs.nrcan.gc.ca/publications?id=39761; Biophysical - https://www.alberta.ca/biophysical-data.aspx#jumplinks-0; https://www.abmi.ca/home/data-analytics/da-top/da-product-overview; Wildlife sensitivity - https://www.alberta.ca/wildlife-sensitivity-maps.aspx, https://www.alberta.ca/access-fwmis-data.aspx; Land disturbance - https://ags.aer.ca/publication/dig-2019-0020

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- services and infrastructure and current land and aquatic uses in the area including:
  - roads;
  - municipalities and administrative regions;
  - operating and planned resource development projects ~~already underway~~ in the local and regional study areas (e.g. mines, SAGD operations, transmission and pipelines and forestry operations, including any ancillary works such as roads, exploration wells, quarries, etc.); and
  - local businesses and industries such as fisheries and outfitters, and any other relevant uses;
- distance of the project components to any federal lands and the location of any federal lands within the regional study area, including lands in a reserve within the meaning of subsection 2(1) of the *Indian Act*;
- distance of the project components to any Indigenous community or hamlet, Indigeous-community owned or held lands (e.g. leased lands), and community-identified traditional territory within the regional study area;
- description of local and Indigenous groups;
- culturally important features of the landscape as identified by Indigenous groups;
- all permanent and temporary waterbodies and watersheds potentially affected by the project and their location on a map;
- navigable waterways identified through the Canadian Navigable Waters Act as well as identified by Indigenous groups;
- environmentally sensitive areas potentially affected by the project, such as national, provincial, and regional parks, UNESCO World Heritage Sites, other protected areas, ecological reserves;
- ecological classification of the landscape according to provincial and federal systems (e.g. ecosites, ecoregions, ecodistricts and ecozones)[5]; and description and locations of all potable drinking water sources (i.e. municipal or private); and
- lands subject to conservation agreements or management plans.

The proponent is required to adopt federal and provincial geospatial data to define modelling domains and local and regional study areas. If alternate domains or study areas are proposed, ~~techcnail~~ technical rationale as to the appropriateness must be provided.

Maps are to be provided to the Agency as electronic geospatial data file(s) compliant with requirements set out in section 21.5 *Geospatial data requirements*~~*Geospatial data requirements*~~.

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[5] see: *Introduction to the Ecological Land Classification (ELC)*. 2017. available at: https://www.statcan.gc.ca/eng/subjects/standard/environment/elc/2017-1 and *Canadian Council on Ecological Areas. Ecozones Introduction*. available at: http://www.ccea.org/ecozones-introduction/

3.3. Regulatory framework

The Impact Statement must identify:

- any federal power, duty or function that may be exercised that would permit the carrying out (in whole or in part) of the project or associated activities;
- legislation and other regulatory approvals that are applicable to the project at the federal, provincial, regional and municipal levels, including those denoted in the Permitting Plan;
- a list of federal, provincial or territorial greenhouse gases (GHG) legislation, policies, or regulations that will apply to the project;
- a list of federal, provincial or territorial environmental assessment and protection legislation, policies, or regulations that will apply to the project;
- a list of federal, provincial or territorial human health assessment and protection legislation, policies, or regulations that will apply to the project;
- government policies, resource management plans, land use or environmental management planning or study initiatives relevant to the project and impact assessment and their implications, including relevant local, sub-regional and regional studies and strategic assessments;
- any treaty, self-government, land claims or other agreements between federal or provincial governments and Indigenous groups that are pertinent to the project and the impact assessment;
- existing Indigenous governance systems and Indigenous laws relevant to the project or the impact assessment, as identified by Indigenous groups;
- any relevant land use plans, land zoning, or community plans;
- information on land lease agreement or land tenure, when applicable; and
- municipal, regional, provincial and/or national objectives, standards, regulations or guidelines, by-laws, or ordinances that have been used by the proponent to assist in the evaluation of any predicted environmental, health, social, cultural or economic effects or impacts.

3.4. Project components and activities

The Impact Statement must:

- provide an assessment of Best Available Technology and Alternate Options Analysis to support the proposed project design and technologies for construction, operation, remediation (treatment) and reclamation (closure) phases.
- describe the project by describing the project components, associated and ancillary works including processing for the bitumen product [e.g. upgrader(s) and refinery(ies)[6], and other characteristics to

[6] Suncor is a vertically integrated energy company that produces bitumen, upgrades it, refines it and sells products in its chain of PetroCanada retail stations. Suncor's main upgrader was built in 1967 (it is 54 years old) and has had

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assist in understanding the potential environmental, health, social, cultural and economic effects, and impacts on Indigenous peoples and their rights, as identified by the Indigenous groups;

- include descriptions of project activities to be carried out during each project phase (site preparation, construction, operation, remediation or treatment of contamination, closure or abandonment and reclamation). Project activities that should be considered in this description are outlined in section 21.1 *List of project activities*~~*List of project activities*~~.
- describe how predicted impacts to environmental, health, social, cultual and economic effects, and impacts on Indigenous peoples and their rights will be monitored, assessed and mitigated during each project phase (site preparation, construction, operation, remediation closure or abandonment and reclamation).
- include descriptions of the components and activities identified in sections 2.1, 2.5 and 2.6 of the Alberta Terms of Reference (AB TOR) (see Annex I);
- include a summary of any change made to the project as originally proposed in the Detailed Project Description, including the reasons for these changes;
- include a detailed description of how, where existing Base Mine infrastructure will be used, each existing component will meet 'technology of the day'/BATEA with respect to environmental, cultural and socio-economic effects minimization (e.g. to meet climate change targets) compared to other alternatives for mining and upgrading the reserve;
- provide sufficient detail to support analysis regarding the project's impacts in the context of potential interaction between valued components (VCs) including a summary of identified project related stressors and associated impacts for each identified project activity by phase and proposed mitigation;
- include the location, magnitude and scale of each project activity, and a schedule including, as applicable, the activity's expected start date, duration, time of year, time of day (e.g. night operations), and frequency, for all project stages;
- highlight activities that involve periods of increased disturbance to environmental, health, social, cultural and economic conditions or impacts on Indigenous peoples; and,
- include maps of key project components, boundaries of the proposed site with geographic coordinates, major existing infrastructure, proponent lands, and leased properties or lands, adjacent resource lease boundaries, adjacent land uses and any important environmental features. Maps are to be provided to the Agency as electronic geospatial data file(s) compliant with requirements set out in section 21.5 *Geospatial data requirements*~~*Geospatial data requirements*~~.

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numerous fires, failures, leaks and explosions over its lifespan. Suncor has three old Canadian refineries with Edmonton Strathcona being 70 years old, beginning operations in 1951 (https://www.suncor.com/en-ca/newsroom/community-news/4119) and using 100% oil sands crude, Sarnia ON being 68 years old (the refinery received first crude in 1953, https://www.suncor.com/en-CA/about-us/history/the-early-years) uses 80% oil sands bitumen and Montreal PetroCanada/PetroFina refinery being 66 years old (began operating in 1955 by PetroFina https://digital.library.mcgill.ca/hrcorpreports/pdfs/6/638509.pdf) uses 30% oil sands feedstock (feedstock percentages from https://www.oilsandsmagazine.com/news/2020/2/6/suncor-shelves-plans-to-build-coker-in-montreal-in-lieu-of-more-barrels-at-firebag).
These facilities were all developed according to Regulatory and design practices of the day. These facilities were certainly never assessed for GHG considerations and any assessments for other metrics (air emissions, water management, safety, etc) may be out of step with current societal expectations and with Canada's intentions toward sustainability.

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Several requirements included in section 2 of the AB TOR (Annex I) are relevant to subsequent sections of these Guidelines. The Impact Statement may include the information and cross-reference as is most logical, including the requirements for:

- benefits of the project and adaptive management based on monitoring and assessment of valued components and environmental, health, social, cultual and economic effects, and impacts on Indigenous peoples and their rights from previous projects with similar project phases, technologies, and operations (section 2.1 [H] and [I]);
- criteria to identify constraints and how the Project has been designed to accommodate those constraints, such as Indigenous traditional land and water use, known traplines, cumulative environmental and social impacts in the region (section 2.2);
- involvement in regional and cooperative efforts and opportunities for sharing infrastructure and coordinating reclamation plans (section 2.3);
- process and infrastructure alternatives (section 2.4);
- air emissions management (section 2.7);
- water management information (section 2.8), including for water supply, surface water, and wastewater management including, but not limited to, tailings and oil-sands contacted water and process water;
- waste management information (section 2.9) , including remediation and treatment of gaseous, liquid and solid waste streams (e.g. municipal, industrial wastewater,tailings, air emissions, petroleum coke, sulfur);
- conservation and reclamation (section 2.10); and
- environmental management systems (section 2.11).

3.5. Workforce requirements

The Impact Statement must describe the anticipated labour requirements, employee programs and policies, and workforce development opportunities for the project, including:

- opportunities for employment outlining the anticipated number of full-time and part-time positions and duration (in months) to be created and how this can change during the project, including identification of continued employment for employees of the existing Base Plant post-closure;
- anticipated workforce region of origin (i.e. local, regional, out-of-province or international employees);
- anticipated workforce that will relocate or participate in a fly-in/fly-out program; describing incentive programs for the former as well as a cost-benefit analysis of the two options;
- aniticipated workforce participation of Indigenous communities differentiated by casual, part-time and full-time and percentage anticipated for both labourer and management classifications;
- the skill and education levels required for the positions;
- investment in training opportunities;
- expected workforce requirements based on the National Occupational Classification system and timelines for employment opportunities;

- working conditions and anticipated work scheduling for construction and operation (e.g. hours of work, rotational schedules, workers' modes of travel to work sites, fly-in/fly-out);
- anticipated hiring policies, including hiring programs;
- workplace policies and programs for Indigenous employment, workforce diversity and employment of women and other underrepresented groups;
- employee assistance programs and benefits programs; and
- workplace policies and programs, including codes of conduct, workplace safety programs and cultural training programs.

Workforce requirements must take Gender Based Analysis Plus (GBA+)[7] into consideration (see also section 21.4 *Application of GBA+*~~*Application of GBA+*~~). The information must be presented in sufficient detail to analyse how vulnerable or underrepresented groups will be taken into account, including Indigenous groups and other relevant community subgroups (e.g., women, youth, seniors).

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4. Project purpose, need and alternatives considered

The proponent must identify the purpose of and need for the project, the alternative means of carrying out the project, and the alternatives to the project in its Impact Statement. The proponent should consult Agency guidance documents, particularly the documents *Guidance: "Need for", "Purpose of", "Alternatives to" and "Alternative Means"* and *Policy Context: "Need for", "Purpose of", "Alternatives" and "Alternative Means"*.

4.1. Purpose of the project

The Impact Statement must outline what is to be achieved by carrying out the project. The Impact Statement should broadly classify the project (e.g. bitumen extraction/processing) to provide energy supply for vehicle transport and space heating in descriptive terms of end-use metrics of kilometers (automobiles), kilometer-tonnes (rail and watercraft), passenger-kilometers (aircraft), kwh delivered (remote power) and heating degree-days delivered (space heating) and indicate the target market (e.g. international, domestic

[7] Gender Based Analysis Plus (GBA+) provides a framework to describe the full scope of potential adverse and positive effects under the Act. GBA+ is an analytical framework that guides practitioners, proponents and participants to ask important questions about how designated projects may affect diverse or potentially vulnerable population groups. These Guidelines refer to "various subgroups" in the context of GBA+, either in reference to groups within the general population or within communities. The Agency's guidance document *Gender-Based Analysis Plus in Impact Assessment* provides guiding principles to allow proponents to use this analytical framework in their Impact Statement.

by Province[8], local, etc.), where applicable. The *purpose of* statement should include any objectives the proponent has in carrying out the project and describe how the project, as proposed, fits into Suncor's overall development and growth strategy for its assets and how it differs from, and is an improvement of past proposals (i.e. Voyageur and Voyageur Upgrader projects that were proposed in the regulatory system and then subsequently abandoned).

The proponent is encouraged to consider the perspectives of participants (i.e. public, Indigenous groups, governments) in establishing objectives that relate to the intended effect of the project on society.

4.2. Need for the project

The Impact Statement must describe the underlying opportunity or issue that the project intends to seize or solve and should be described from the perspective of the proponent. In many cases, the need for the project can be described in terms of the demand for a resource. The proponent should provide supporting information, including a quantitative evaluation, that demonstrates the need for the project.

The proponent should solicit and report on the comments or views of Indigenous peoples, the public and other participants on the proponent's need statement, in the same section as the supporting information.

The Impact Statement must provide the following information:

- an assessment of the need for, and viability of, the project in relation to the demand for (bitumen and bitumen-based) vehicle transport and space heating products, including an evaluation of the national and global demand for these products during the operating years of the project;
- an assessment of EROEI (energy return on energy invested) across the life cycle at the following points including systems decriptions, basis, accuracy and EROEI value (e.g. 4 units out per 1 unit in) and :
    - sourcing of energy inputs to production of bitumen/dilbit at mine lease gate
    - sourcing of energy inputs to production of upgraded products at upgrader(s) lease gate(s)
    - sourcing of energy inputs to production of refined products at refinery(ies) lease gate(s)
    - sourcing of energy inputs to products at retail sale point(s)
    - sourcing of energy inputs to effective use as transport or heat including losses / inefficiency of energy conversion from combustion to useful work/distance/tonnage
- an assessment of net energy yield across the entire life cycle from sourcing of inputs to effective use for fossil inputs and renewable inputs including systems decriptions, basis, accuracy and expressed as:

[8] Provincial differences in electricity supply and geography may imply different market uptake and impacts of the proposed project / products or preference alternates to the project / products (e.g. available clean electricity may sway consumers to reduce demand for or avoid the proposed products). Provincial environmental plans (local air quality/smog concerns, GHG commitments) may also pre-empt or dramatically reduce future potential use of the proposed products.

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- GJ input (including natural gas, bitumen resource and diluents) per kilometer travelled (automobiles);
- GJ input (including natural gas, bitumen resource and diluents) per kilometer-tonne of freight (rail and watercraft);
- GJ input (including natural gas, bitumen resource and diluents) per passenger-kilometers (aircraft);
- GJ input (including natural gas, bitumen resource and diluents) per kwhr delivered (remote power generation); and
- GJ input (including natural gas, bitumen resource and diluents) per heating degree-days delivered (space heating).

- an assessment of the need for, and viability of, the project in relation to it contribution to cumulative effects considering uncertainties with reclamation and talilings management outcomes taking into account the costs of adaptive management and successful closure;
- an evaluation of the need for the project that must:
  - consider the current climate context;
  - consider potential economic liabilities and cost-benefit factors associated with the project;
  - account for the potential for local and international markets to significantly reduce their demand for (bitumen and bitumen-based) vehicle transport, remote power and space heating products in the coming years either by overall reduction in demand of transport, remote power or heating from conservation or optimization, more efficient processes including hybrid vehicles and heat pumps or fuel substitution including use of natural gas, hydrogen or renewables products in the coming years; and
  - take into account the possibility of a decline of renewable energy prices.

4.3. Alternatives to the project

In addressing alternatives to the project, the Impact Statement must provide a description of the functionally different ways that are technically and economically feasible to meet the stated project need and achieve the project purpose of vehicle transport, remote power and space heating from the perspective of the proponent. The Impact Statement must provide sufficient information for the selection of alternatives to the project. The process of identifying and considering alternatives to the project must solicity and consider the views, information and knowledge from Indigenous peoples, the public and other participants, as well as existing studies and reports. The Impact Statement must present a rationale for selecting the proposed project over other options.

The analysis of alternatives to the project should serve to validate that the preferred alternative for the project is a reasonable approach to meeting the need and purpose and is consistent with the aims of the Act. Alternatives must explicitly include at minimum:

- Conservation
  - Incentive pograms for hybrid and high efficiency vehicles in tandem with premium charges for high displacement engines

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- Widescale building retrofits to reduce heating load
- Transport
  - Direct use of natural gas for vehicle fuelling
  - Renewable ethanol and biodiesel for vehicle fuelling
  - Renewable electricity[9] for vehicle charging
  - Renewable electricity to green hydrogen for vehicle fuelling
- Remote power and heating
  - District heating and low-GHG energy[10] for communities using diesel generators
  - Direct use of natural gas for space heating
  - Direct use of renewable biogas for space heating
  - Renewable electricity and heat pump use for space heating
  - Passive and active solar space heating

If the Proponent decides to include storage considerations for electrical alternatives, then the project case must also consider infrastructure, impacts, remediation and costs associated with the bitumen-to-fuel energy system across the life cycle from energy input source to end use for effective comparison.

~~A no-action (null) alternative must be included, noting the baseline conditions of the valued components associated with the Project, as well as changes to these baseline conditions that are likely to occur in the future if a Project was not carried out (e.g. changes in result of other projects already planned for the region, changes to the socio-economic conditions, etc.).~~

4.4. Alternative means of carrying out the project

The Impact Statement must identify and consider the potential environmental, health, social, cultural and economic effects and the impacts on the rights of Indigenous peoples of alternative means of carrying out the project that are technically and economically feasible, including project component alternatives..

For the selection of the alternative means of carrying out the project, the Impact Statement must describe:

- the criteria to determine technical and economic feasibility of possible alternative means;
- the best available technologies considered and applied in determining alternative means, including how these compare to using existing Base Mine components;
- those alternative means that are technically and economically feasible, presented in sufficient and appropriate detail; and
- the particularities of each alternative mean and their potential adverse and positive environmental, health, social, cultural and economic effects, and their impacts on the rights and interests of Indigenous peoples, as identified by Indigenous peoples.

The Impact Statement must then describe:

[9] Renewable electricity includes hydroelectricity, biomass, solar, wind and geothermal electricity.
[10] Low-GHG energy includes biodiesel, lake or ocean thermal loops, use of industrial waste heat.

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- the preferred alternative means of carrying out the project based on the consideration of environmental, health, social, cultural and economic effects, the impacts on the rights and interests of Indigenous peoples, technical and economic feasibility, and the use of best available technologies; and
- the methodology and criteria that were used to compare the alternative means, to determine the preferred means of carrying out the project, and to justify the exclusions of other solutions, based on the trade-offs associated with the preferred and other alternative means.
- a summary, including ranking, of the assessment of best available technologies and alternate options analysis for the oil sands sector to support the selected project design and technology proposed for extraction and processing of bitumen and generation and storage of waste streams.

The application of GBA+ to the analysis of alternative means of carrying out the project is necessary to inform how effects may vary for various subgroups (e.g. by gender, age, ethnicity, socio-economic status, health status, etc.). The proponent must also indicate how the views and information solicited and provided by Indigenous peoples, the public and other participants were considered in establishing and applying the criteria for comparing the project's alternative means, including project component alternatives.

In its alternative means analysis, the proponent must address the following project elements and components:

- project site location;
- access to the project site;
- project elements which may have the potential to contribute to identified (existing) cumulative impacts at local, sub-regional and regional scales;
- location of key project components, including a list of facilities and infrastructures for which locations may only be determined later (see also AB TOR section 2.2; Annex I);
- route for any linear or other infrastructure development or modification, including means for transportation of bitumen to existing processing facilities (see also AB TOR section 2.4; Annex I)
- facility design;
- processing facilities location and design;
- excavation methods;
- construction alternatives;
- mining operations (e.g. open pit, underground, bitumen extraction) (see AB TOR section 2.4; Annex I);
- remediation (or treatment) of contaminated materials;
- suspension, abandonment, decommissioning and reclamation options;
- thermal energy and electric power sources for the project site, and other stationary sources to provide heat or steam to the project (see AB TOR section 2.2; Annex I);
- waste disposal for all aqueous, gaseous and solid streams and their management, including tailings management (see AB TOR sections 2.4 and 2.9; Annex I);
- management of excavated materials, including potentially acid-generating or leachable materials, as well as materials that may be a source of wind-blown dust;
- crossing, diversion and dewatering of watercourses and waterbodies, including wetlands;

- management of water supply, mine-affected waters and wastewater, including location of the final effluent discharge points and water treatment technologies and techniques to control effluent quality to the receiving environment;
- best available control technologies economically and technologically achievable and/or best management practices to minimize air emissions and ensure air quality management (see AB TOR section 2.7; Annex I) for area and point sources, as well as sources of fugitive air emissions;
- mobile mining equipment management and air emissions minimization;
- incorporation of leading environmental technology for water conservation, energy reduction, energy recovery and reuse
- incorporation of renewable energy for electric or thermal purposes
- any component or activity that has an effect on critical habitat of a species listed under the *Species at Risk Act*, *Migratory Birds Convention Act* or *Fisheries Act;* and
- the timing options for various components and phases of the project.

The information provided to satisfy the requirements of section 2.4 of the AB TOR may be referenced ~~as~~ where relevant to meet the requirements above, as applicable to the assessment of alternative means for process and infrastructure, including for tailings management.

If applicable, the assessment of alternatives should include, but not be limited to, the following information sources:

- any research or monitoring study previously conducted under the provincial Environmental Protection and Enhancement Act (EPEA) and Oil Sands Conservation Act Approvals for existing operations and technologies which will be relied on in the proposed project;
- any research or monitoring study previously undertaken by the proponent or accessible through participation in the Canadian Oil Sands Innovation Alliance (COSIA), Alberta Innovates, National research Council of Canada (NRCAN), and academic institutions (including NSERC programs);
- State of the Environment, including surface water, wetlands, terrestrial and biological, groundwater, air and cumulative effects, published by the Oil Sands Monitoring;
- any regional or strategic assessment;
- any study or plan that is conducted or prepared by a jurisdiction or an Indigenous governing body related to the area affected by the project and provided with respect to project;
- any relevant assessment of the effects of the project that is conducted by or on behalf of an Indigenous governing body and that is provided with respect to the project;
- Indigenous knowledge, community knowledge, comments received by the public, and comments received from jurisdictions;
- information and learnings from the Voyageur and Voyageur Upgrader project applications; and
- other studies or assessments realized by other proponents.

Should potential impacts to critical habitat be predicted, potential risks to critical habitat must be considered for each alternative, including a description of how avoidance of effects was considered and how it may be achieved through alternate means of carrying out the project or alternatives to the project.

5. Description of public participation and views

5.1. Summary of public engagement activities

The Impact Statement must describe the proponent's ongoing and proposed public engagement activities regarding the project.

The Impact Statement must provide a description of efforts made to distribute project information and provide a description of information and materials that were distributed during the consultation process. The Impact Statement must indicate, for example, the methods used; where the consultation was held; the persons, organizations and diverse groups consulted; the views expressed; and the extent to which this information was ~~incorporated~~ integrated in the design of the project and the Impact Statement and assessment of potential effects.

Engagement activities must be inclusive and ensure that interested members of the public have an opportunity to share their views. They must also consider the language needs of the people being engaged.

The proponent should consult Agency guidance documents on this topic, particularly: *Interim Framework: Public Participation Under the Impact Assessment Act*, and *Interim Guidance: Public Participation under the Impact Assessment Act*.

5.2. Analysis and response to questions, comments and issues raised

The Impact Statement must:

- provide a summary of key issues related to the project and that were identified through engagement with the public, as well as the potential environmental, health, social, cultural and economic effects, including disproportionate effects for diverse subgroups within the population and the project's contribution to regional and cumulative effects;
- include a statement by engaged parties that the summary of key issues is an accurate representation of concerns shared during engagement activities;
- describe how the key issues and any other questions and comments raised by the public and how they influenced the design, construction, ~~or~~ operation or closure plans of the project;
- identify the alternative means, mitigation measures, or the monitoring, adaptive managment and follow-up programs identified to address key issues, questions and comments~~uncertainties~~ raised by the public;
- identify public key issues, questions and comments~~concerns~~ that have not been addressed, if any, and provide the reasons why they have not been; and

- describe plans to maintain the public engagement, if the project were to be approved and proceed, to ensure that the public will have an appropriate forum for expressing their views on the ongoing development, operation, and reclamation of the Project, and be involved in follow-up and monitoring programs (see also AB TOR section 1; Annex I).

6. Description of engagement with Indigenous groups

The proponent must engage with Indigenous groups, in order to identify and understand the potential impacts of the project on Indigenous peoples and their Rights[11], including their lands, territories and resources, and to ~~incorporate~~ integrate Indigenous knowledge into the impact assessment appropriately guided by Indigenous perspectives. Engagement with Indigenous groups is required to inform the impact assessment and identify measures to avoid or minimize potential impacts on Indigenous peoples and their Rights from the project. This engagement may also identify potential positive outcomes, including measures that could improve the underlying baseline conditions that support community prosperity.~~the exercise of rights~~. Ideally, the project will be designed not only in such a way as to minimize its negative effects, but also to maximize its positive impact on the quality of life of Indigenous peoples.

Engagement with Indigenous groups must involve ongoing information sharing and collaboration between the proponent and Indigenous groups to contribute to the information collected and assessed, the culturally-relevant and ethical methods by which Indigenous knowledge and information is integrated and assessed, and the validation of conclusions and assessment findings. The results of any engagement with each Indigenous group must be presented in the Impact Statement, and, as best as possible, convey the perspective of the Indigenous peoples.

To the extent possible, information should be presented separately for each Indigenous group involved in the assessment, and describe contextual information about the members within an Indigenous group (e.g. women, men, elders and youth). The Impact Statement may also consider presenting information at different scales but must include a justification, such as in the case where groups have expressed a preference in that regard for certain VCs (e.g. use of a regional scale vs. community-specific)

As part of an impact assessment under the Act, the proponent must strive to collaborate or partner[12] with potentially affected Indigenous groups in completing its Impact Statement. The Agency notes that not all Indigenous groups may be willing to collaborate with the proponent, therefore the proponent must demonstrate they have made best efforts at collaboration, and provide the Agency with an explanation regarding circumstances where collaboration was not possible. Where Indigenous groups do not wish to participate, the proponent is encouraged to continue sharing information and analyses with the Indigenous

[11] Indigenous Rights includes Section 35 Aboriginal and Treaty Rights, under the, *Constitution Act, 1982*, AND Rights defined by UNDRIP = minimum standards for survival, dignity and wellbeing.

[12] Refer to *Interim Guidance: Collaboration with Indigenous Peoples in Impact Assessments*. Impact Assessment Agency of Canada. 2020.

Commenté [LS2]: as the exercise of rights is dependant on the availability of the land, water and its resources in a healthy state as defined by that Indigenous community, the only way baseline conditions could be improved are if there is less anthropengic disturbance for example – the company provides an offset greater than the proposed project disturbance area or the company does not proceed until such a time as successful reclamation to support rights has occurred that is larger than the proposed disturbance area

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groups, to use publicly available sources of information to support the assessment, and to document their efforts in that respect.

The proponent must consult the Agency's guidance documents on Indigenous participation and engagement listed in Appendix 1.

6.1. Indigenous knowledge considerations

Indigenous knowledge is holistic, multi-generational, and geospatially related (often place-based) and in impact assessment, it can provide insights related to knowledge of the biophysical environment, as well as social, cultural, economic, and health aspects, Indigenous governance and resource use. It is important that Indigenous knowledge, where available to the proponent, be included for all of these aspects in the impact assessment, not only to look at potential impacts of the project on Indigenous groups. It is also important to capture the context in which Indigenous groups provide their Indigenous knowledge and to convey it in a culturally appropriate manner.

In instances where an Indigenous group is willing to collaborate with the proponent, Indigenous knowledge ~~that is not already publicly available should~~will not be included without written consent from the Indigenous group, regardless of the source of the Indigenous knowledge. This is to ensure that the Indigenous knowledge is not misrepresented, misinterpreted or taken out of context. The guidance document *Protecting Confidential Indigenous Knowledge under the Impact Assessment Act*, to which the proponent must refer, describes the approaches to be favoured. Appropriate, culturally-based Indigenous methodology for integrating Indigenous knowledge and community input into the impact assessment is necessary to appropriately and ethically assess potential effects and significance of those effects from an Indigenous perspective.

When provided by the Indigenous group, the proponent must consider Indigenous knowledge and guidance on Rights and cultural impacts, best practices, technical standards, performance assessment systems and risk paradigms in the assessment methods used to compile the Impact Statement, including but not limited to the Environmental Impact Assessment or Statement (EIA/EIS) and Health Impact Assessment (HIA), Tradional Use and Resourrces Assessment, Socio-Economic Assessment, Physical and Cultural Heritage Assessment, and Rights Assessment components.

The proponent must refer to *Indigenous Knowledge under the Impact Assessment Act: Procedures for Working with Indigenous Communities.* Impact Assessment Agency of Canada. 2020 (Appendix 1).

6.2. Record of engagement

The Impact Statement must provide a record of engagement that describes all efforts, successful and unsuccessful, taken to seek the views of each potentially affected Indigenous group with respect to the project. This record of engagement is to include all engagement activities undertaken prior to the submission of the Impact Statement.

At a minimum, the proponent must engage with the Indigenous groups identified[13] by the Crown in the Indigenous Engagement and Participation Plan issued along with the Notice of Commencement for the project. The purpose of this engagement is to gain an understanding of the issues and concerns of potentially affected Indigenous groups, and to inform an assessment of the potential adverse impacts of the project on Indigenous peoples and their rights.

The record of engagement must include:

- an outline of the proponent's Indigenous engagement policy, as well as established policies and stated principles related to the collection of traditional knowledge and traditional land use information;
- a copy of each community-specific engagement plan developed collaboratively by the Indigenous community and the proponent for the project (if only one engagement plan was developed soley by the proponent for engagement with all Indigenous groups, provide a description of how opportunity was given to Indigenous groups for input and how that was considered or not in the plan);
- the list of Indigenous groups engaged by the proponent, including those that the proponent was unsuccessful in engaging;
- the engagement activities undertaken with each Indigenous group, including the date, means and results of engagement;
- a description of the outcomes of conversations with each Indigenous group about how they wish to be consulted by the proponent, including feedback from each Indigenous group on their expectations for consultation plans, engagement activities, and assessment participation opportunities;
- the results of any engagement and the perspectives of the Indigenous peoples involved as best as possible;
- the list of the consultation protocols ~~adopted~~ provided by Indigenous groups to the proponent, if applicable. A copy of the consultation protocols must be included when available in writing;
- any agreements pertaining to engagement that are finalized or in progress, with anticipated timelines to complete. If part of a larger, existing agreement, provide a description of engagement requirements by both parties;
- an explanation for cases where engagement efforts have proven unsuccessful;
- a description of how project information is frequently and transparently shared with Indigenous peoples;
- a description of the preferred methods for sharing information, including alternative solutions implemented for people and locations where technological resources are limited or language barriers exist (i.e. translation of written documents or provision of summaries in Indigenous languages);
- a description of how Indigneous expertise will be sought in carrying out the assessment phase where Indigenous R~~r~~ights may be affected, including on biophysical resources and social-cultural context that

[13] The list of Indigenous groups identified during the planning phase may change as knowledge of the effects and potential impacts of the project is gained, or if the project or its components are modified during the impact assessment. The Agency reserves the right to modify the list in the Indigenous Engagement and Participation Plan based on additional information gathered during the impact assessment.

support the exercise of rights (e.g. developing culturally appropriate baselines, temporal and spatial scales and assessment cases, assessment methodologies, management and mitigation strategies to reduce residual effects);

- a description of how Indigenous expertise will be sought to assist with the carrying out of the project, should it be approved;
- a list of desired Best Practices and Outcomes consistent with Indigenous Knowledge or as offered by the groups;
- future planned engagement activities, and if none are planned, rationale for not undertaking future engagement activities;
- a description of efforts to engage diverse segments of each Indigenous group in culturally appropriate ways, including groups identified by gender, age or other community relevant factors (e.g. hunters, trappers, and other harvesters, and teaching and production of cultural material goods and skills) to support the collection of information needed to complete the GBA+;
- a description of how engagement activities by the proponent were intended to ensure Indigenous groups were provided an opportunity to evaluate the project's potential positive and negative effects on their members, communities, and activities, and impacts to rights, as identified by the Indigenous group(s). This could include activities aimed at providing appropriate capacity funding to support the creation and operation of community-driven communication mechanisms that facilitate the flow of information and the advancement of project efforts in each affected Indigenous community;
- how the proponent has obtained or tried to obtain the free, prior and informed consent from the Indigenous groups consulted on the project, regarding the information presented in the Impact Statement, as well as the project itself; including whether this consent is influenced based on an existing agreement; and
- demonstrate that the capacity needs of Indigenous peoples were taken into account, and that timelines were adequately communicated for the review of information in the Impact Statement, including, where applicable, specific procedures for drafting sections of the Impact Statement.

It is expected that the engagement activities for the preparation of the Impact Statement should be carried out with integrity and transparency, without conflicts of interest, in good faith, and conducted in a manner that is attentive to the concerns of Indigenous groups and committed to producing mutually beneficial outcomes.

6.3. Analysis and response to questions, comments, and issues raised

The Impact Statement must provide an analysis of any potential effects and impacts to Indigenous peoples and of all input received from Indigenous groups with respect to the project, including its contribution to cumulative effects. This analysis is to include all input received by Indigenous groups prior to, and since commencing, the impact assessment process. This analysis should serve to inform the identification of potential effects and impacts on any applicable VCs, impacts on Indigenous peoples and their rights, and proposed measures to mitigate or accommodate for adverse impacts, enhance or optimize positive effects.

The analysis may be summarized in the relevant effects section. The location and level of detail of the information in the Impact Statement will depend on its importance to the selected VCs.

It is recommended that the proponent organize and analyze information relevant to Indigenous groups in separate sections for each one potentially affected by the project, either by nation, community, or other grouping based on the preference expressed by those people. In all cases, ethical guidelines and culturally appropriate protocols governing research, data collection and confidentiality must be followed.

The Impact Statement must:

- provide a summary of key issues related to the project and that were identified through engagement with each Indigenous group, as well as the potential spiritual, cultural, environmental, health, social, ~~cultural~~ and economic impacts;
- include a statement by each Indigenous group that the summary of key issues is an accurate representation of concerns shared during engagement activities.
- describe how the key issues and any other questions and comments raised by each Indigenous group influenced the design, construction or operation of the project;
- identify the alternative means, mitigation measures, or the monitoring and follow-up programs identified to address key issues, questions and comments raised by each Indigenous group;
- identify key issues, questions and comments that have not been addressed, if any, and provide the reasons why they have not been;
- describe the potential effects and impacts to environmental, health, social, cultural and economic conditions of each Indigenous group, informed by the Indigenous group(s) involved in the assessment and must include both adverse and positive effects;
- describe the rights or interests of each Indigenous group, including those that the groups themselves have identified, that may be impacted by the project;
- provide an analysis of the extent of the potential effects on each Indigenous group, and the views of Indigenous groups regarding the extent of impact on the exercise of rights within their traditional territory; and
- describe the potential effects and impacts to lands in a reserve within the meaning of subsection 2(1) of the *Indian Act*. Note that section 2 of the Act defines federal lands as including "reserves, surrendered lands and any other lands that are set apart for the use and benefit of a band and that are subject to the *Indian Act*, and all waters on and airspace above those reserves or lands."
- describe the potential effects and impacts specific to lands within an Indigenous community or hamlet, Indigeous-community owned or held lands (e.g. leased lands), Indigenous-held Registered Fur Management Area and community-identified traditional territory within the regional study area;
- identify the sources of information used to inform the analyses of potential effects and impacts to rights;
- describe the type of information received from Indigenous groups (observations, questions, issues, comments, knowledge, expertise or other);
- describe the methodology used for assessment and whether that methodology was informed or developed by Indigenous groups;

- describe how the information gathered during the Planning phase of the impact assessment was considered and ~~incorporated~~ integrated into the analysis, including the documents uploaded to the Registry by Indigenous groups during that phase of the impact assessment;
- append any specific studies provided by Indigenous groups, if permission has been obtained from the Indigenous group concerned to publish them, and explain how it was taken into account and ~~incorporated~~integrated;
- describe how any relevant Indigenous-led studies and/or assessments were ~~incorporated~~ integrated into project planning and used to inform project activities;
- detail the main issues, questions and comments raised during the engagement activities by each Indigenous group, the proponent's responses, including how matters have been addressed in the Impact Statement or will be addressed in the future. Detail the engagement with each Indigenous group to confirm that issues, questions and comments were addressed. Any proposed mitigation measures are to be clearly linked, to the extent possible, to the effect pathways for VCs in the Impact Statement as well as to specific project components or activities;
- incorporate of the perspectives of Indigenous youth, women, and elders where provided;
- indicate where and how the information received was integrated into or contributed to decisions regarding the project or its impact assessment (e.g. project design), including in:
  - scoping of assessment factors (spatial and temporal study boundaries), VC-selection, and development and collection of baseline information;
  - the construction, operation, decommissioning, closure and reclamation, abandonment and maintenance plans;
  - the evaluation of alternatives to the project;
  - characterization of the potential environmental, health, social, cultural and economic effects of the project for each Indigenous group and potential avoidance, mitigation, or accommodations measures related to those effects; and
  - Indigenous participation in follow-up and monitoring activities should the project proceed;
- describe how Indigenous expertise and knowledge would be considered in carrying out the project, should the project be approved; and
- provide, where potential impacts on the rights or interests of Indigenous peoples are identified, an assessment and a description of how each potential impact would be avoided, mitigated, managed, or otherwise accommodated (and provided for each Indigenous group separately). Detail the engagement with each Indigenous group to confirm that the information used and assessed and the measures applied was appropriate.

7. Assessment methodology

The proponent should review the applicable guidance documents listed in section 20 *Appendix 1 – Reference* documents~~*Appendix 1 – Reference* documents~~ and conform to requirements outlined in section 21 *Appendix 2 – Additional guidance*~~*Appendix 2 – Additional guidance*~~. Summary tables are required~~recommended~~ to convey key information and findings (see section 21.11 *Summary Tables*~~*Summary Tables*~~).

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7.1. Baseline methodology

The Impact Statement must provide a description of the environmental, health, social, cultural and economic setting directly and ~~incidentally~~ indirectly related to the project. This should include the existing environmental, health, social, cultural and economic components, interrelations and interactions as well as the variability in these components including how historical and current cumulative effects have already affected current conditions and the natural range of variability for VCs, processes and interactions over time scales and spatial boundaries appropriate to the project. Meaningful dialogue with communities and Indigenous groups provides input that may describe how these components and processes are defined and interrelated holistically, temporally, and spatially, and can allow the establishment of a common understanding of the Indigenous knowledge perspective on the project's potential effects and impacts.

The Impact Statement must:

- include baseline data collected in a way that makes descriptive and inferential statistical analyses, extrapolations and reliable predictions possible. The collated data ~~should~~ must make it possible to carry out comprehensive analyses to estimate pre-project baseline conditions and pre-oilsands development scenario, predict impacts, assess and compare post-project conditions, all at the scale of the project, and the local and regional assessment areas;
- pre-project baseline conditions should include both a pre-regional oilsands development baseline and a current operations baseline;
- provide detailed descriptions of data sources and data collection methods including sampling, survey and research protocols, modeling methods, error estimates, and any assumptions or biases;
- provide a description of the information sources used to determine pre-oilsands development and current baseline conditions, including the sources of all available information and a justification of, or rationale for, the information source selected for use in baseline condition analysis, and their adequacy. The justification should explain any limitations or uncertainty pertaining to the information sources available, such as for project-specific studies, field surveys, and the use of existing data and information;
- where applicable, describe modelling methods and include assumptions, calculations of margins of error and other relevant statistical information. Models that are developed should be validated using independent field data from the appropriate local and regional study areas;
- where applicable, provide information to show how the baseline data are spatially and temporally representative of the site conditions if surrogate data from reference sites are used rather than specific measurements at the project site;
- provide detailed descriptions of statistical methods used to establish baseline conditions including results of the data analysis to support the proposed baseline condition for environmental, health, social, cultural and economic components;
- indicate if baseline data gaps exist and additional steps taken to address gaps in information. For instance, while there may be a rise in census participation from Indigenous communities, the information may not be publicly available;

Commenté [KD3]: Lisa, just bringing to your attention that we should be specific here for the IAAC in what we mean by 'pre-development', as we can't assume they understand that we mean a pre-oilsands development, not all development (which would push the '1960' timeline back to the early 20th century, when rail was brought to the region, and other industry before oil).

- indicate how the baseline data gaps identified can be addressed through additional future research, monitoring, and/or field studies, whether through the proponent's efforts as part of project operations or as strategic regional initiatives involving industry and government;
- identify any thresholds relevant to understanding the current state of the biophysical resource and any change in the resource that has occurred over time;
- describe where and how Indigenous knowledge and input were acquired, considered, and verified in determining all baseline conditions including how such conditions compare to the pre-oilsands development scenario reference condition. If only a desktop review is used to acquire Indigenous knowledge, there should be a description of efforts made to verify the information; and
- apply GBA+ as described in section 21.4 *Application of GBA+*~~*Application of GBA+*~~ and related guidance documents in section 20 *Appendix 1 – Reference* documents~~*Appendix 1 – Reference documents*~~.

Relevant sources of baseline information are listed in section 21.2 *Sources of baseline information*~~*Sources of baseline information*~~. The proponent should also consult requirements and guidance provided in sections 21.3 *Ecosystem approach*~~*Ecosystem approach*~~, 21.5 *Geospatial data requirements*~~*Geospatial data requirements*~~, and 21.6 *Reference documents requirements*~~*Reference documents requirements*~~.

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7.2. Selection of valued components

The Impact Statement must describe VCs (for environmental, health, social, cultural and economic factors), processes, and interactions that are identified to be of concern or likely to be affected by the project. The Impact Statement must indicate to whom these concerns are important (e.g. the public, federal and/ or provincial authorities, health, energy and/ or environmental departments/ branches, Indigenous groups) and the reasons why~~, such as~~each environmental, cultural, spiritual, historical, health, social, economic, recreational, and aesthetic VC is consider~~ed~~ations. The value of a component not only relates to its role in the ecosystem, but also to the value people place on it.

The Impact Statement must provide the rationale for selecting specific VCs and for excluding others by referencing and adhering to requirements in Sections 5 and 6. The priority in selecting VCs to be included and assessed should be project-specific stressors, consider current environmental and health condition and focused on appropriateness, ~~not~~ rather than be influenced by the quantity of information available or the use of the VCs in ~~other~~ previous assessments (such as oil sands surface mine project applications). In instances where there is limited information available, identify how additional information will be collected to either increase the confidence in the assessment or alternatively to validate predictions vis a vis follow up monitoring programs.

In selecting a VC to be included, the following factors should be considered:

- VC presence in the study area;
- The extent to which the VC reflects key issue(s), question(s) or concern(s) identified by public or Indigenous group (Sections 5 and 6), respectively;
- The extent to which the VC reflects baseline conditions for environmental, health, social, cultural and economic components (Section 7)

- the extent to which the effects of the designated project and related activities have the potential to interact with the VC;
- the extent to which the VC may be under stress from other past, existing or future undertakings in combination with other human activities and natural processes;
- the extent to which the VC is linked to Indigenous interests or rights of Indigenous peoples and whether an Indigenous group has requested the VC;
- the extent to which the VC is linked to a federal, provincial, territorial or municipal government legislation and priorities;
- information from any ongoing or completed regional assessment processes;
- the possibility that an adverse or positive effect on the VC would be of particular concern to Indigenous groups, the public, or federal, provincial, territorial, municipal or Indigenous governments; and
- whether the potential effects of the project on the VC can be measured and/or monitored or would be better ascertained through the analysis of a proxy VC. If a proxy is to be used provide a rationale other than limited data/information for the selection of the proxy (e.g. represents a more sensitive receptor, represents a better umbrella species for that component, etc.). Where a particular species has been identified as a culturally important species to Indigenous groups a proxy should not be used.

The VCs must be described in sufficient detail to allow the reviewer to understand their importance and to assess the potential adverse and positive environmental, health, social, cultural and economic effects and impacts arising from the designated project activities.

As part of the Planning Phase of the impact assessment, potential VCs have been identified from:

- the proponent's Detailed Project Description. Tables E-1 and E-2 identify a series of potential valued components to be considered for inclusion in the Guidelines, as well as the rationale for selection, assessment endpoints, and measurement indicators;
- comments from Indigenous groups. As of the date of issuance of these draft Guidelines comments from Indigenous groups indicate that the following components should be treated as VCs:
  - species of Indigenous importance: moose, beaver, lynx, marten, ducks and fishers;
  - ecosystem functions of Indigenous importance: biodiversity, connectivity, intact core area (i.e., natural land cover that is at least 500 m distant from anthropogenic footprint), resource abundance;
  - specific vegetation types (e.g. various wetland types, old growth forest, traditional plant habitat, medicinal plants);
  - current and future land and resource use;
  - sites important for current use of and resources for traditional purposes (hunting, trapping, fishing, ~~and~~ gathering, habitation/camping, and ~~and~~ traveling);
  - landscapes of ~~interest~~ importance with respect to tangible or measurable purposes (e.g., resource harvest, orientation, traveling, etc.) and intangible purposes (e.g., teaching, language, stories, and knowledge transmission, spiritual and peaceful~~ness~~enjoyment-no sensory disturbance); and
  - sacred and archaeological sites; and
- engagement with participants in the impact assessment, such as the public and federal authorities, during the preparation of the Summary of Issues and the draft version of these Guidelines.

Commenté [LS4]: Caution identifying 6 species, this could misdirect the proponent. Additional examples of culturally significant species include: caribou, bison, geese, grouse, eagles, black and grizzly bears, muskrat, otter, whitefish, goldeye, burbot, sucker, pike, walleye, aquatic invertebrates (non-species specific), clams, cattails, mint, rat root, willow, labrador tea, blueberry, cranberry, balsam, and birch; however, species should be identified using functional food webs for aquatic, wetland and terrestrial habitats in each geographic area within the Regional and Local Study Areas (ie Boreal Forest, Athabasca River, Muskeg areas, wetland areas, Lake Athabasca, Peace Athabasca Delta, etc). as the species of importance vary be ecosystem and traditional use activity and via direct engagement about VCs and indicators.

For example, traditional food surveys identify over 70 plant, fish and animal species are required to assess 95% of traditional foods consumed and assessing a small subset could underestimate potential exposure to contaminants and the significance of traditional foods and medicines in Indigenous peoples culture and traditional way of life

The proponent should specifically engage Indigenous groups on the selection and confirmation of VCs prior to finalization.

The following valued components (VCs) must be considered in the Impact Statement:

- fish and fish habitat;
- vegetation (including forested and non-forested wetlands, old growth forest, traditional plant habitat, key habitats associated with species at risk);
- species at risk and their habitat - each species at risk that the project interacts with must be considered separately within the broader VC;
- migratory birds and birds of Indigenous importance (including ducks and geese);
- wildlife and wildlife habitat (including moose, beaver, lynx, marten, fisher, muskrat, aquatic mammals such as river otter and beaver, black bear, caribou);
- wildlife health;
- surface waters (including cultural and sacred areas, intrinsic and cultural value of water, springs, surface and shallow groundwater drinking water sources, aesthetic qualities such as taste, colour, and odour, available and connected navigation routes allowing access across the landscape for traditional purposes) under typical, high-flow, low-flow and extended long-cycle drought conditions;
- human health (including separate consideration of Indigenous health and culturally-relevant indicators);
- cultural and heritage resources;
- social determinants of health (including: income and social status, employment and working conditions, education and literacy, childhood experiences, physical environments, social supports and coping skills, healthy behaviours, access to health services, biology and genetic endowment, gender, culture and race / racism[14]);
- Indigenous land and resource use (including navigation and landscape accessibility for traditional purposes);
- other land and resource use (including compliance with land use planning objectives, recreational and commercial activities);
- economic opportunities; and
- community well-being (including both Indigenous and non-Indigenous communities).

The following assessments must be undertaken to support the assessment of VCs

- Biophysical assessments (habitat surveys, migrartion patterns, modelling)
  - Mammals (migratory and non-migratory)
  - birds(migratory and non-migratory)
- Ecological Risk Assessment

[14] as defined by Government of Canada. 2020. Social determinants of health and health inequalities Accessed at: https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health.html

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- aquatic health components (semi-aquatic furbearers, aquatic birds, fish, invertebrates, algae, emergent and non-emergent macrophytes)
- terrestrial health components (wildlife, plants, invertebrates)
- wetland health components (wildlife, plants, invertebrates)

- Human Health Risk Assessment
  - Indigenous groups
  - Non-indigenous Residents
  - Public
  - Workers
  - Recreational users
- Health Impact Assessment (Social and Cultural Determinants)
  - Indigenous groups
  - Non-indigenous Residents
  - Public
  - Workers
  - Recreational users

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The following components may either be considered as VCs or as important intermediate components to support the evaluation and understanding of impacts to other VCs.

Commenté [KD5]: Lisa, would we add usability v. availability here or elsewhere?

- air quality, odour, dust and climate;
- noise and light;
- hydrogeology, including groundwater quality;
- hydrology;
- surface water quality; and
- terrain and soils.

The list of VCs to include in the Impact Statement will be finalized in the final version of the Guidelines, at the end of the Planning Phase, and will be informed through engagement with the public, Indigenous groups, jurisdictions, federal authorities, and other participants.

7.3. Spatial and temporal boundaries

The spatial and temporal boundaries determined and established for the impact assessment will vary depending on the VC and should be considered separately for each VC. The proponent must engage with Indigenous groups when defining spatial and temporal boundaries for valued components that are identified by, or relate directly to, Indigenous groups.

The Impact Statement must explain how the proponent considered the information received by Indigenous peoples in its definition of spatial and temporal boundaries, particularly for VCs related to effects on

Indigenous peoples including their ability to carry out traditional uses, cultural practices and the exercise of their interests and rights.

7.3.1. Temporal Boundaries

The proponent has identified four typical development scenarios in the Detailed Project Description, Appendix E, as follows:

(a) Pre-development Scenario, scenario that existed prior to the establishment of any industrial development in the Athabasca Oil Sands Region;

(b) Current Case, which considers the current conditions and existing project or activities;

~~(a)~~(c) Baseline Case, which includes existing conditions, existing and approved projects or activities;

~~(b)~~(d) Application Case, which includes the Baseline Case with the Project added; and

~~(c)~~(e) Planned Development Case, which described the environmental conditions that would exist as a result of the interaction of the Project, other existing projects and other planned projects that can be reasonably expected to occur.

The proponent also proposes to identify additional scenarios for all or individual components, such as a Project-only case for the Air Quality assessment.

In defining the assessment scenarios, the Impact Statement must:

- define temporal boundaries for baseline conditions by taking into account past conditions. Past conditions will help establish a historical context and reveal temporal patterns or trends for VCs within the adequate spatial boundaries. Information on past conditions will also inform whether present-day conditions are representative, whether biophysical VCs are currently within their natural range of variability, and how the project may affect them. This should be considered in the proposed *pre-development scenario* and *baseline case* and how they relate to other scenarios;
  - During the planning phase of this assessment, the importance of a pre-development baseline to support the context of generationally transmitted Indigenous Knowledge and land use expectations, information, and decision-making was stated by Indigenous groups for assessment of VCs as appropriate, particularly for those related to impacts to Indigenous peoples and the exercise of their rights.
  - For biophysical VCs, temporal boundaries used to establish the baseline conditions must be defined to allow for the detection of all species using the study areas throughout the year and from one year to another, to reflect and take into account temporal use patterns and variability, including the natural range of variability for that VC.~~.~~
- define temporal boundaries according to the planned schedule for all phases of the project in order to understand potential effects according to key timelines and milestones for project components and activities. If potential effects are predicted after project closure and reclamation, this should be taken into consideration in defining specific boundaries. This should be considered in the proposed *application case* and how it relates to the other scenarios; and

- clearly identify and describe effects from the project for all VCs, such that effects discussed in a *project-only case* or an *application case* due to the project are presented in a meaningful context (i.e. relative to the pre-development and current scenarios) that can easily be understood, and not only expressed relative to the *baseline case*.

See the document *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* for more information on establishing temporal boundaries.

7.3.2. Spatial Boundaries

The Impact Statement must:

- establish the spatial and temporal boundaries to assess the VCs by presenting the project location in relation to geospatial data and files published or provided by:
  - Provincial government (Government of Alberta; branches, divisions and departments)
  - Provincial regulator (Alberta Energy Regulator and Alberta Geological Survey)
    Oil Sands Monitoring Program
  - Federal government
  - Areas of concern identified by engaged Indigenous groups for VCs that are identified by, or relate directly to, Indigenous groups.
- identify and describe the spatial boundaries, including local and regional study areas, for each VC included in assessing the potential adverse and positive environmental, health, social, cultural and economic effects of the project and provide a rationale for each boundary;
- define spatial boundaries by taking into account:
  - the appropriate scale and spatial extent of potential effects and impacts (direct and indirect) of the project including the mine, natural gas and diluents source(s), upgrader(s), refinery(ies) and product(s) distribution systems;
  - the physical location of potential receptors, including, where applicable, the historical and current movement patterns of potential receptors;
  - the relationships between VCs (e.g. interaction between wildlife and vegetation);
  - community knowledge and Indigenous traditional knowledge;
  - current or traditional land and resource use by Indigenous peoples;
  - rights of Indigenous peoples, including cultural and spiritual practices;
  - physical, ecological, technical, social, health, economic and cultural considerations; and
- take into account the size, nature and location of past, present and foreseeable projects and activities as factors included in the definition of spatial boundaries, particularly for regional study areas.

The proponent should consider additional guidance for assigning appropriate study areas or boundaries provided in section 21.7 *Establishing spatial boundaries~~Establishing spatial boundaries~~*.

The proponent is required to present the study area boundaries in maps and in a geospatial format (see section 21.5 *Geospatial data requirements~~Geospatial data requirements~~*).

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In its Detailed Project Description, Appendix E, the proponent identifies proposed spatial boundaries for:

- Air modelling domain and regional study area (Figure E-1)
- Hydrogeology regional study area (Figure E-2)
- Aquatic resources local study area (Figure E-3)
- Aquatic resources regional study area (Figure E-4)
- Terrestrial resources local study area (Figure E-5)
- Terrestrial resources regional study area (Figure E-6)

The Agency understands that the proponent will apply these boundaries in their Impact Statement, unless additional information is acquired through feedback on these draft Guidelines or through the development of the Impact Statement, as appropriate to adequately depict and assess each VC.

The proponent should specifically engage Indigenous groups on the temporal and spatial boundaries prior to finalization.

7.4. Effects assessment methodology

The environmental, health, social, cultural or economic effects should be described in terms of the context, magnitude, geographic extent, ~~context,~~ timing, duration and frequency, and whether effects are reversible or irreversible. The description of the context includes a description of historical and current cumulative effects to environmental, social, cultural and economic conditions.

The description of the effect can use either qualitative or quantitative criteria, taking into account any important contextual factors. If quantitative criteria are available, they should be presented. Regardless of whether qualitative or quantitative criteria are adopted, supporting rationale must be provided to describe how each component was evaluated and the final ranking system. In the case of quantitative predictions derived from models, the Impact Statement must detail the model assumptions, parameters, the quality of the data and the degree of certainty of the predictions obtained, including an explanation of model calibration, validation and model performance metrics used.. The description of effects will also describe ~~For other effects, it may be more appropriate to use other~~ criteria, such as the nature of the effects, directionality, causation and probability. The effects assessment should also set out the probability or likelihood of that effect occurring and describe the degree of scientific uncertainty related to the data, information, and methods used. The degree of confidence must be discussed in the analyses.

The Impact Statement must:

- describe in detail the project's potential direct and indirect adverse and positive effects in relation to each phase of the project (construction, operation, closure and reclamation) including how baseline and pre-development data was used to inform this analysis;
- describe where and how Indigenous knowledge and input were appropriately incorporated into the assessment;
- describe how Indigenous rights, including the purpose and importance of the rights to the rights-bearing people (i.e.the practices, customs, beliefes, worldviews and livelihoods), have influenced the

Commenté [LS6]: This reference to the DPD should be removed – the spatial boundaries identified in the project description should be used for engagement, adapted to address Indigenous groups and public concerns and then presented in the EIS.

Rationale - The proposed spatial boundaries (RSA and LSA) have not been determined based on geospatial mapping with the available provincial, federal and oil sands monitoring program geospatial data and therefore is not repreasentative.

see examples of inappropriateness of proponent defined study areas in comments below.

Commenté [LS7]: The local study area identified in Figure E-3 doesn't seem to include the entirety of the potentially affected local watersheds, including those to the north. – this may have been excluded because the areas overlap with part of another project (Syncrude). However it should still be valid to require an investigation of historical conditions, existing impacts and the potential for cumulative impacts to these areas. This is especially true when taking onto account the extent of groundwater-surface water interactions. If not, how will these potential impacts be treated in this process?
Inflowing water to BMX from upstream in one local watershed must be diverted in part to the neighbouring oil sands project – this makes it very clear that at least that watershed is overlapping between projects.
THE LSA MUST INCLUDE ALL POTENTIALLY AFFECTED WATERSHEDS

Commenté [LS8]: Beyond the local study area, the regional study area does not include the entire lower Athabasca River watershed (i.e., tributaries), but only a narrow strip around the Athabasca River itself and the PAD. This would not account for atmospheric deposition effects on water quality (e.g., atmospheric deposition effects on the water quality in watersheds along the eastern side of the Athabasca River, or to the north and south of BMX.)
THE RSA MUST INCLUDE THE ENTIRE LOWER ATHABASCA RIVER WATERSHED

Commenté [LS9]: Ideally the local study area will encompass (i.e., follow the boundaries of) the entire hydrologically-connected wetland ecosites or broader wetland ecosystems that the footprint intersects, as opposed to only following a standard buffer around the project footprint

selection of indicators and values considered in each section of the Project Assessment and the final residual impact ratings;

- provide a rationale for the absence of details if they cannot be provided (e.g. for future events such as upon closure and reclamation), as well as a more general description of the expected activities and effects;
- employ analytical methods to compare predicted effects and actual effects that are statistically and scientifically defensible and provide a discussion on what kind of analysis will be employed (e.g. Before, After, Control, Impact (BACI)? If so how will control sites be chosen and where?).;
- take into account any thresholds relevant to evaluating change in the resource that has occurred over time;
- include clearly stated assumptions for all predictions and clearly describe how each assumption has been tested;
- discuss the degree of confidence associated with assumptions obtained from other jurisdictions or the literature (e.g. air emission factors), their relevance to the project given the climate in Alberta and operating conditions of the project, and how varying levels of uncertainty associated with these assumption may impact the effects assessment outcome;
- consider and describe the interactions between the environmental, health, social, cultural and economic effects as well as the interaction and interconnectedness of selected VCs while taking into account community values and a systems approach;
- take into account the tolerance thresholds regarding the potential negative effects that Indigenous peoples have identified;
- describe where and how Indigenous knowledge and input were acquired, verified, and ~~considered~~integrated into the assessment; and
- include GBA+ as described in section 21.4 *Application of GBA+*~~*Application of GBA+*~~ and guidance documents (see section 20 *Appendix 1 – Reference* documents~~*Appendix 1 – Reference* documents~~).

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7.5. Mitigation and enhancement measures

Every impact assessment conducted under the Act must identify all measures that are technically and economically feasible that would mitigate the project's adverse environmental, health, social, cultural and economic effects. Conversely, the proponent can identify enhancement measures to increase positive effects for example, local and regional training efforts, investment in infrastructure and services, projects to rehabilitate degraded environments, etc.. Mitigation and enhancement measures that will be proposed are discussed during the review of the Impact Statement and may be modified as a result of the review. Mitigation and enhancement measures may be considered for inclusion as conditions in the decision statement. Although adaptive management is considered a best practice in environmental management, it is not, in and of itself, considered a mitigation measure. Similarly, although an approval requirement should the project proceed, reclamation in and of itself should not be considered a mitigation measure, particularly for returning lands and waters to a condition for Indigenous traditional use and the exercise of rights. Enhancement measures, if proposed, must be within the defined regional study area for which potential effects are expected to be experienced.

The proponent must work together with Indigenous groups to find mutually agreeable solutions to concerns raised about the project, especially for those concerns raised by Indigenous peoples about impacts on the exercise of their rights (e.g. project changes, accomodation, mitigation, and complementary measures including offsets or compliance with federal conditions, crown programs, policy changes, or off-sets).

A description of how the Agency describes the hierarchy of mitigation measures is captured in section 21.9 *Mitigation hierarchy~~Mitigation hierarchy~~*.

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The Impact Statement must:

- describe the standard mitigation practices, policies and commitments that constitute proven technically and economically feasible mitigation measures for identified adverse environmental, health (ecological and human), social, cultural and economic effects and that are to be applied ~~as part of standard practice~~ within the project design, and whether such practices differ from the existing 'business as usual' practices;
- describe the current mitigation practices, policies, and commitment being applied as part of standard practice within the existing operations, as well as their effectiveness as mitigation measures;
- provide an update and information on the level of success of mitigation measures that have been employed for Base Mine or other oil sands mine operations;
- specify the interventions, the work, the ecological footprint reduction techniques techniques (including by ecompassing existing disturbance), the existing best technology, the best environmental practices, the corrective actions and any addition anticipated in the various stages of the project with a view to eliminating or mitigating the adverse effects of the project;
- describe any new or innovative mitigation measures being proposed, including technological innovations, and provide detailed information on the nature of these measures, their implementation and anticipated effectiveness, management and related requirements of the follow-up program;
- provide an assessment of the anticipated effectiveness of ~~the~~ all technically and economically feasible mitigation measures and describe all relevant uncertainties. The assessment must:
  - provide the reasons and supporting data for determining if the mitigation measure will reduce the extent to which the adverse effects are significant;
  - to the extent possible, provide relevant technical and scientific data and information from Base Mine and analogous projects; and
  - if there is little experience or some question as to the effectiveness of any measures, describe the potential risks and effects should those measures not be effective or malfunction;
- provide evidence that the standard mitigation practices being proposed have been successful in minimizing impacts. Evidence could be from collected data, peer-reviewed literature or other literature sources; but cannot simply be anecdotal or because they are commonly/historically used mitigation measures;
- write mitigation measures as specific commitments, for each identified adverse environmental, health (ecological and human), social, cultural and economic effect, that clearly describe how and when the proponent intends to implement them and their desired outcomes. Measures are to be specific, achievable, measurable and verifiable, and described in a manner that avoids ambiguity in intent, interpretation and implementation. Where appropriate, an implementation methodology and associated timelines should be linked to each mitigation measure and initiative. How each proposed mitigation

measure and initiative compares to the mitigation measures and initiatives for existing operations should be provided, including how the proposed measures represent continuous improvement;

- identify other technically and economically feasible mitigation measures that were considered but are not proposed for implementation, and explain why they were rejected. Justify any trade-offs between cost savings and effectiveness of the various forms of mitigation measures through a systematic and data driven decision making process that shows the rationale for the selection of the preferred technically and economically feasible mitigation measures;
- describe how the effectiveness of the chosen mitigation measures will be measured, monitored, and if possible, improved over the course of the project life;
- describe the approach that would be taken if a mitigation measure is no longer feasible while the project is carried out, or does not perform as expected;
- describe any environmental protection plan being prepared for the project and, if applicable, the environmental management system through which plans will be delivered. The plan(s) must provide an overall perspective on how potentially adverse effects would be minimized and managed over time;
- describe any human and social health and protection plan being prepared for the project and, if applicable, the environmental management system through which plans will be delivered. The plan(s) must provide an overall perspective on how potentially adverse effects would be minimized and managed over time;
- discuss the mechanisms the proponent would use to require its contractors and sub-contractors to comply with these commitments and policies and with auditing and enforcement programs;
- describe how, throughout the project's duration, the lessons learned through follow-up programs will be used to continually improve mitigation measures (see also AB TOR section 2.11B; Annex I);
- include a mitigation and decommissioning plan for temporary components of the project;
- include a conceptual closure, conservation and reclamation plan and:
    - describe how it will develop over time based on project sequencing, new information or technology as it becomes available, monitoring from similar regional efforts and input from stakeholders and Indigenous groups;
    - describe in detail the uncertainties related to reclamation outcomes to support the exercise of Indigenous rights;
    - describe plans and timelines through which to accelerate progressive reclamation;
    - describe monitoring plans and associated monitoring criteria and indicators for ensuring the return of equivalent land capability for traditional uses on reclaimed lands; and
    - describe plans to engage Indigenous communities to develop required performance criteria.
- identify the party responsible for the implementation of mitigation measures and the system of accountability; and
- explain how mitigation and enhancement measures were developed with communities and Indigenous peoples, as well as federal, provincial and municipal authorities.

Effects from the project that remain after other mitigation measures are applied may need to be offset by implementing compensatory measures. Where compensatory measures are proposed as measures to

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mitigate remaining effects on species at risk and their critical habitats, fish and fish habitat, or wetland functions, the Impact Statement must include offsetting or compensation plans for consideration during the impact assessment process. Compensatory measures, must be within the defined regional study area for which potential effects are expected to be experienced. Guidance on the preparation of compensation plans is outlined in section 21 *Appendix 2 – Additional guidance*~~*Appendix 2 – Additional guidance*~~ and within section 8 *Biophysical environment*~~*Biophysical environment*~~.

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Mine Fleet Emissions

The Impact Statement must identify all possible options for reducing mine fleet emissions from the "business as usual" case including, at a minimum, the following:

- use of alternate vehicle fuels: compressed natural gas (CNG), liquid natural gas (LNG) and/or hydrogen fuel;
- the transition to electric vehicles;
- the use of retrofit and/or add-on emission controls on existing and new vehicles;
- accelerated introduction of new lower emitting mine fleet vehicles;
- the use of autonomous mine fleet equipment; and
- alternate mining plans that reduce haul distances and the gross operating hours of the mine fleet per barrel of bitumen ore.

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For each of these options, and any other mine fleet emission reduction options identified by Suncor, the Impact Statement shall include an outline of how Suncor plans to evaluate each option and its cost-effectiveness in terms of reducing mine fleet GHG and criteria air contaminant emissions including diesel particulate matter. This plan shall include aspirational goals for mine fleet reduction goals throughout the life of the BMX project and the specific evaluations that will be undertaken to evaluate each of the options identified. The option evaluation plans in the Impact Statement shall, at a minimum, indicate how the evaluation will be conducted, key resources that will be consulted, the methodology to be used, and the factors that will be considered in the assessment of the feasibility of each option, the schedule for evaluation of each option and when and how the results of each option evaluation will be reported to regulators and the Indigenous stakeholders impacted by the mine fleet emissions.

In the evaluation of mine fleet emission reduction options, information from the following sources should be consulted:

- the management practices presented in the document *Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities;*
- Natural Resources Canada's "*Green Mining Innovation*" and "*Energy Efficiency*" initiatives; and
- the Environment and Climate Change Canada Report: "*Evaluation Of Vehicle Emissions Reduction Options for the Oil Sands Mining Fleet Final Report*: March, 2008".

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8. Biophysical environment

Although the requirements set out in these Guidelines are separated by biophysical, health, social, cultural or economic conditions and elements, the Impact Statement must consider and describe the interactions

between the environmental, health, social, cultural and economic effects as well as the interaction and interconnectedness of selected VCs while taking into account community and Indigenous values.

8.1. Meteorological environment

8.1.1. Baseline conditions

The Impact Statement must:

- describe the local and regional climate, in sufficient detail to highlight weather variations and characteristics of the region affected by project activities and components;
- provide mean, maximum and minimum temperatures;
- provide representative~~typical~~ wind speed(s) and direction(s) at local, sub-regional and regional scales for ground level and higher atmospheric elevations;
- identify the potential for extreme weather events such as inversions, ~~,~~ wind, precipitation and temperature extremes;
- provide estimates of "long-cycle droughts" in the local area and descriptions of waterbody extent, depth and width under those conditions;
- provide a summary of and a reference to the data source(s) and unique weather station identifiers to the hourly meteorological data (wind speed and direction, air temperature, dew point temperature or humidity, air pressure, evaporation and precipitation data) gathered for data sources which meet provincial and federal requirements[15] ~~from a minimum of one year of study~~to support dispersion modelling that captures the normal variability of meteorological conditions; ~~and~~
- identify if fewer than 90% of the annual data are available and cases when meteorology data is insufficient to support modelling and requires predictive modelling;
- consider the influence of climate change in the description of the local and regional climate and in the risks of extreme weather events. Provide an "envelope" of climate change scenarios in respect to temperature, precipitation and evaporation; and~~.~~
- consider the state of baseline conditions in relation to the natural range of variability.

8.2. Geology, geochemistry and geological hazards

8.2.1. Baseline conditions

The Impact Statement must:

[15] Alberta Environment and Parks. Draft Air Quality Model Guideline. 2020. Accessed at: https://www.alberta.ca/assets/documents/aep-air-quality-model-guideline-2020-draft.pdf.

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- describe the geology of surficial deposits, bedrock at an appropriate scale. Include a table of geologic and lithologic descriptions, including alteration styles, geological maps and cross-sections of appropriate scale. Geospatial data files must also be included;
- describe the geomorphology, topography and geotechnical characteristics of areas proposed for construction of major project components;
- provide a characterization of the geochemical composition of the materials to be excavated including NORMs (normally occurring radioactive materials);
- identify and provide maps of any areas with potential for acid-generating rock and provide geochemical characterization of potential for metal leaching and acid rock drainage, for major and trace elements, including oxidation of primary sulphides and secondary soluble sulphate minerals, as applicable;
- identify any geological hazards that exist in the areas planned for project facilities and infrastructure, including:
  - a history of seismic activity in the area, including induced earthquakes (fracking), and any secondary effects, such as the risk of landslides and liquefaction;
  - a discussion pertaining to the potential presence of active faults; and
  - a history of landslides, slope erosion and the potential for instability/landslides, and subsidence during and following project activities;
- describe baseline concentrations of contaminants of concern (these may include selenium, sulphate, cadmium, nitrate and calcite, heavy metals , NORMs) within the local, regional and downstream receiving environments; ~~and~~
- describe the presence and location of landforms associated with important wildlife habitat features (see 21.12 *Additional guidance for biophysical components*~~*Additional guidance for biophysical components*~~ for a list of habitat features); and
- ~~-~~ consider the state of baseline conditions in relation to the natural range of variability.

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8.3. Topography, soil and sediment

8.3.1. Baseline conditions

The Impact Statement must:

- describe the landforms, terrain, soils and sediments within the local and regional study areas, including sediment stratigraphy. Provide surficial geology maps and cross-sections of appropriate scale;
- provide a description and location of any erosion-sensitive soils (see also AB TOR section 3.9; Annex I)~~-~~, their erosion resistance properties and limit velocities and areas of ground instability;
- provide maps depicting soil depth by horizon and soil order within the project area to support soil salvage and reclamation efforts;

- describe the suitability and availability of reclamation material (soils, suitable overburden) (see also AB TOR section 3.9; Annex I), taking into account the acid and salt generating and metal leaching potential of overburden to be used, including with respect to lean oil sands, if applicable;
- identify soils within the local and regional study areas susceptible to potential acidification (by soil type) (see also AB TOR section 3.9; Annex I);
- identify soils within the local study area that are more susceptible to compaction by the Project (see also AB TOR section 3.9; Annex I);
- describe the historical and current land use and the potential for contamination of soils and sediments; and
- describe the historical and current land use with respect to topography;
- describe any known or suspected soil contamination within the study area that could be re-suspended, released or otherwise disturbed as a result of the project; and
- consider the state of baseline conditions in relation to the natural range of variability.

8.3.2. Changes to topography, soils, and sediment

- provide figure overlays of the locations of soil inspections relative to the direct disturbance area of the project footprint;
- quantify the anticipated impacts of the project on each soil type relative to compaction by the project footprint and provide supporting figures and tables;
- quantify the anticipated changes in moisture among existing soil types due to the project and provide supporting figures and tables to quantify anticipated impacts;
- describe changes to topography including important land features identified by Indigenous groups; and
- assess how anticipated changes to soil conditions (e.g., compaction, contaminants, salinity, soil moisture, nutrient depletion, erosion, etc.) may impact future Indigenous land use due to magnified impacts on other terrestrial resources (e.g., vegetation and wildlife).

8.3.3. Mitigation and enhancement measures

- provide a monitoring plan to ensure that soils susceptible to compaction are monitored during all phases of the project and are mitigated if necessary. Identify key mitigations that will be implemented;
- provide a monitoring plan for tracking potential impacts of the project on soil moisture. Identify key mitigations that will be implemented;
- describe how the end of life mine closure plan will integrate Indigenous knowledge and information to minimize loss of traditional use, cultural and knowledge in the end landscape with respect to important topographic features and loss of site-specific use;
- provide a monitoring plan for tracking potential impacts to soil resources that are related to future Indigenous land use.

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8.4. Atmospheric, acoustic, and visual environment

8.4.1. Atmospheric environment

The proponent should consult the additional guidance for requirements pertaining to the atmospheric environment provided in section 21.12 *Additional guidance for biophysical components*~~*Additional guidance for biophysical components*~~.

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8.4.1.1. Baseline conditions

The Impact Statement must:

- provide an assessment of the ambient air quality in the project, local and regional study areas and identify existing emissions, deposition and contaminant sources;
- provide the results of a baseline survey of ambient air quality, in particular near key receptors by identifying and quantifying emission sources for the following contaminants:
  - total suspended particulates,
  - fine particulates smaller than 2.5 microns ($PM_{2.5}$),
  - respirable particulates of less than 10 microns (PM_{10}),
  - diesel particulate matter,
  - carbon monoxide (CO),
  - sulphur dioxide (SO_2),
  - nitrogen oxides (NOx),
  - acidifying compounds/ acid deposition,
  - volatile organic compounds (VOCs),
  - hydrogen sulphide (H_2S) and other reduced sulphur compounds (RSCs),
  - polycyclic aromatic compounds (PACs), including polycyclic aromatic hydrocarbons (PAHs), alkylated PAHs, PAH transformation products, including nitro and oxy-PAHs, and dibenzothiophenes (DBTs)
  - ammonia,
  - metals related to bitumen resource extraction activities, including aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, vanadium, zinc,
  - and any other toxic air pollutants (mobile, stationary and fugitive sources);

- include information on the baseline dust levels[16] in areas that could potentially be affected by project activities, including via transportation of workers to residences in Fort McMurray;
- compare ambient air quality results with applicable regional, provincial and federal standards. For air pollutants with standards, the proponent must use the averaging period and the statistical format associated with each numerical value.
  - Standards include the Canadian Ambient Air Quality Standards (CAAQS), National Ambient Air Quality Objectives (NAAQO), the Alberta Ambient Air Quality Objectives and Standards (AAQO), and Fort McKay's Air Quality Objectives[17]. The proponent must refer to the new CAAQS established by the Canadian Council of Ministers of the Environment (CCME) for $PM_{2.5}$, O_3, SO_2 and NO_2 to take effect in 2020 and 2025;
- identify and address issues pertaining to the quality of the monitoring data, including seasonal variability in the baseline survey, and determine ambient contaminant concentrations using complete, exhaustive, and representative monitoring data, collected over an appropriate duration (multi-year) and geographic scope. Data validation, quality control methods, and any assumptions made must also be described;
- provide dispersion modelling of a base case for existing pollutant sources and to determine the spatial distribution of pollutants in all study areas;
- describe past and existing flaring activities, including number of hours of flaring per year associated with Base Mine operations; and
- provide dispersion modelling of a baseline assessment of odours at key receptor points, including in Fort MacKay and Fort McMurray.

8.4.1.2. Changes to the atmospheric environment

The Impact Statement must:

- provide a detailed description of all emission sources of air pollutants from the project listed under 8.4.1.1 *Baseline conditions*~~*Baseline conditions*~~, including all point sources, area sources, and mobile and road sources and identify if these emissions differ from the existing Base Mine operations;
- provide a detailed methodology and assumptions used to estimate emissions of air pollutants at all phases and for mine fleet emission estimates, indicate how all available onboard and in-use testing of emissions from heavy haulers was used in estimating mine fleet emissions and the uncertainty range associated with the mine fleet emission estimate;
- provide details of the occurrence of flaring and associated assumptions. Describe the gas composition under both normal and upset flaring conditions;

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[16] The potential for the project to generate dust at a noticeable level in Fort McMurray and surrounding areas was noted as a frequent concern in early public comments.

[17] see the Public Registry for the Project, reference number 80521, file reference #77]

- estimate the deposition of dust and other contaminants on sensitive receptors (including Fort McMurray and Fort MacKay communities) and transportation of dust into communities via project or worker vehicles;
- provide a description of the odours potentially associated with the project including extent and frequency, including distinguishing between normal and upset operating conditions;
- estimate and define by location gross addition to atmosphere of the project of CO2. Include Scope 1 (direct emissions including land use change and carbon sink disruption), Scope 2 (indirect including extraction, treatment and transport of fuel supply; exploration, extraction, transport and storage of diluent(s); concrete and steel production and transport purchased electricity and / or heat) and Scope 3 (product end use including upgrading, refining, transport, storage, distribution, fugiitves and end-use combustion).
- predict the fate of emissions resulting from all project sources for all emissions listed under 8.4.1.1 *Baseline conditions*~~*Baseline conditions*~~, by using atmospheric dispersion modelling;
- predict ground-level pollutant concentrations, and plot predicted concentrations using appropriately scaled contour maps;
- provide rationale for the choice of air quality model, including the type and magnitude of emissions, the complexity of sources, terrain and meteorology;
- provide emission rates for all project and regional sources within the study areas, including emission factors and all related assumptions and related parameters that would enable calculations to be reproduced. Include details on methodology, uncertainty assessment and references, and provide sample calculations;
- provide detailed information on emission estimation methodologies for all project phases, including details on the configuration of the atmospheric dispersion models used (e.g. meteorology, land use, modelling domain, receptor grid density, land users, default options and chemical and physical transformation parameters, where applicable);
- refer to Health Canada's Guidance for Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality and Canadian Council of Ministers of the Environment Ecological Risk Assessment Guidance Document to ensure modelling data meets requirements for undertaking the health impact assessment, human health risk assessment and ecological risk assessment.
- assess the uncertainty in the modeled air pollutant concentrations using relevant range of model inputs. All sources of uncertainty should be taken into account, including:
  - model uncertainty, including a consideration for how uncertainty in modelled predictions may vary spatially and temporally;
  - uncertainty in baseline concentration estimates;
  - uncertainty in the estimates of meteorological inputs; and
  - uncertainty in estimates of source emissions (from sources attributable to the project, and externally). Uncertainty in source estimates should take into account any field measurements or studies acquired through existing Base Plant operations, regional studies conducted through Wood Buffalo Environmental Association (WBEA) or the Oil Sands Monitoring Program (OSMP), and

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other published studies which have shown apparent discrepancies between reported and observed emissions[18];

- provide maps of isopleths illustrating the predicted ground level concentrations~~emissions~~ for the modelling scenarios, using an appropriate scale to visualize the extent of dispersion and sensitive receptors;
- determine whether the formation of secondary pollutants resulting from the project has the potential to raise concentrations above baseline levels – if so, identify and characterize these pollutants;
- compare the predicted air quality results with applicable regional, provincial and federal standards for ambient air quality and community-based air quality and odour guidelines.
  - The assessment against CAAQS should be based on the principles of "keeping clean areas clean" and "continuous" improvement and in the context of air sheds and air zones with the Air Quality Management System; and
  - The assessment against CAAQS should be compared against the yellow, orange, and red management thresholds, along with maps of isopleths illustrating the areas with predicted ground level concentrations exceeding each respective management thresholds;
- provide an air dispersion modelling assessment of odours at key receptor points, including in Fort MacKay and Fort McMurray. The assessment should be comprehensive and considers the wide range of odorous compounds emitted by the project, their respective odour thresholds, the additive nature of odorous compounds, as well as the typical magnitude and duration of odour events currently experienced at key receptor points;
- consult and consider odour impact assessment guidance and considerations outlined in the document Guidance for Odour Impact Assessments and Odour Management for Proposed Oil Sands Projects on Fort McKay's Traditional Territories;
- conduct a source contribution analysis to assess the relative contributions of project and non-project emission sources on pollutant concentrations at key receptors. The source contribution analysis should be conducted for all pollutants that exceed 10% of the relevant guidance or standard value. Emission sources should be grouped into appropriate categories, such as mine fleet, mine face, haul roads, material handling, tailings storage areas, etc.;
- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, and monitoring. Discuss how issues, concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to the atmospheric environment.
- take into account the tolerance thresholds for potential adverse effects (e.g. odours) that Indigenous peoples have identified; and
- describe any positive changes.

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[18] Example: Li et al., 2017. Reference Li, S.-M., et al. *Differences between measured and reported volatile organic compound emissions from oil sands facilities in Alberta, Canada*. (2017) Proceedings of the National Academy of Sciences of the United States of America, 114 (19), pp. E3756-E3765

Secondary organic compounds

The Impact Statement must quantify secondary organic compounds as a result of the project, by using the following approach:

- quantify the emissions of gas-phase precursor compounds of secondary organic aerosols (SOA) for each relevant source;
- identify the individual chemical compounds considered as SOA precursor emissions (VOCs, IVOCs and SVOCs). In addition, group total organic gas-phase emissions on the basis of volatility for each source, to use in the estimation of SOAs; and
- estimate the concentration of SOAs (as $PM_{2.5}$) with an appropriate model using the quantified SOA precursor emissions for the base case, project-only, and application-case scenarios. SOA precursor emissions from other oil sands projects in the region may be approximated by scaling measured emissions from these facilities to production levels. The model should provide an accurate estimation of SOA formation that will be included with primary $PM_{2.5}$ emissions to arrive at a total $PM_{2.5}$ burden.

Acid deposition

The Impact Statement must assess the potential for the project's emissions of acidifying pollutants to contribute to acid deposition at the regional scale, by using the following approach:

- conduct model simulations to predict acidifying deposition using emissions of NOx and SO_2 from processing facilities and mining activities that are part of the Project. Compare acidifying deposition predictions for the Project to those associated with the current Base Mine operations as well as other development scenarios listed in Section 7.3.1 Temporal Boundaries;
- using modeled acidifying deposition rates, assess the potential for the project to contribute to ecosystem damage by estimating exceedances of critical loads (an effective measure of ecosystem sensitivity) in the region. Critical loads must be estimated using methods consistent with the internationally recognized UN-ECE Convention on Long-Range Transboundary Air Pollution (CLRTAP, 2017)[19]; and
- compare potential effects with critical thresholds, considering current and historical loadings, buffering capacity, and critical loads.

The proponent should refer to Health Canada's Guidance for *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality* to ensure that it provides the information and analysis considered necessary to assess the project's impacts on human health in relation to changes to air quality. It is requested that the proponent complete the checklists provided in this guide (Appendix A in the air quality guide) to assist participants in verifying that the main elements of a air quality impact assessment have been completed and in identifying the location of this information in the Impact Statement. These

[19] CLRTAP 2017. *Manual on methodologies and criteria for modelling and mapping critical loads and levels and air pollution effects, risks and trends*.

checklists will facilitate the review of the Impact Statement and will be particularly useful if analyses on these aspects are found in several sections of the Impact Statement.

It is recommended that the proponent engage with experts at Environment and Climate Change Canada (ECCC) to inform the choice of program to model acidifying deposition rates.

8.4.1.3. Mitigation and enhancement measures

The Impact Statement must:

- provide a description of all the methods and practices to be deployed to reduce and control emissions, including options to reduce flaring (e.g. control equipment, heat or gas recovery system) and options to reduce mine fleet emissions. If the best available technologies are not selected in the project design, the proponent must provide a rationale to justify the technologies selected;
- document and justify how the contaminant emission reduction efficiencies were applied in the calculation of emission rates, including details of all assumptions associated with these mitigation measures and their feasibility;
- provide a description of methodology to measure and verify the efficiency of contaminant emission reduction measures;
- provide a description of existing and planned measures to reduce odours and dust, including a description of improvements to existing infrastructure, equipment and operational practices as applicable, supplemented with quantitative data or records that demonstrate the efficiency of existing mitigation measures; ~~and~~
- provide a description of participation in national or regional air emission tracking and reporting programs (e.g. National Pollutant Release Inventory) or provide rationale why participation is not required;
- develop and implement strategies compliant with regional and national commitments, such as the CCME's commitment regarding pollution prevention; ~~and~~
- consult and consider best management practices presented in the document Good Practices Guide for Odour Management in Alberta;
- consult and consider best management practices presented in the document *Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities.* for dust suppression and fugitive dust minimization during mining operations, as well as for emission reduction measures associated with vehicle and equipment engines; and
- consult and consider odourant emissions monitoring recommendations presented in the document Guidance for Odour Impact Assessments and Odour Management for Proposed Oil Sands Projects on Fort McKay's Traditional Territories.

8.4.2. Acoustic environment

8.4.2.1. Baseline conditions

The Impact Statement must:

- provide current ambient noise levels at key receptor points (e.g. nearby communities, residences, Indigenous land users, locations of traditional land use, wildlife), including the results of a baseline ambient noise survey and permissible noise levels for each receptor. The information on typical noise sources (natural and anthropogenic), their geographic extent and temporal variations must be included. At the time of collecting baseline data for the study on ambient noise where there are human receptors, it is recommended that the following aspects be considered:
  - natural sounds,
  - soundscapes (see standard *ISO 12913-1:2014. Acoustics — Soundscape — Part 1: Definition and conceptual framework*),
  - expectations regarding quiet conditions in specific places or at specific times,
  - usual sleeping hours (the default assumption is 10:00 p.m. to 7:00 a.m.), and
  - degree of baseline annoyance attributable to existing noise sources (e.g. vehicle traffic, aircraft, other industrial noise);
- justify the selection of and provide information on all noise-sensitive receptors in the study area, including any foreseeable future receptors, and distances of receptors from the project; and
- describe engagement with Indigenous communities to identify receptor locations.

8.4.2.2. Changes to the acoustic environment

The Impact Statement must:

- provide a list of all noise sources;
- describe changes in ambient vibration and sound levels resulting from the project;
- quantify sound levels at appropriate distances from any project facilities and/or activities and describe for each sound source the timing, frequency, and duration of sound events and their characteristics, including the frequency spectrum, tonality and perceptibiliy;
- describe the locations and characteristics of the most sensitive receptors (e.g. species at risk and traditional land use sites);
- identify and justify the approach to characterize sound effects resulting from the project that may be adverse. Take into account:
  - the distribution of the reference nighttime sound events relative to the individual sound events expected at night at the location of each receptor; and
  - expectations of peace and quiet for receptors (e.g. in a quiet rural area or during land use by Indigenous peoples) and noise policies (e.g. processes for resolving and dealing with public complaints);
- refer to Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise to ensure that it provides the information and analysis considered necessary to assess the project's impacts on human health in relation to changes to the sound environment during the health impact assessment and human health risk assessment;.
- describe consultation with regulators, stakeholders, community groups, landowners and Indigenous groups about potential effects to the acoustic environment;

- where there is public concern associated with an increase in sound levels during construction and operations, provide a vibration and sound impact assessment including an overview of the concerns including an assessment of the change in percent highly annoyed (see Health Canada guidance on Noise);
- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation and monitoring. Discuss how issues, concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to the acoustic environment.
- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified; and
- describe any positive changes.

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8.4.2.3. Mitigation and enhancement measures

The Impact Statement must:

- identify current and proposed noise mitigation measures and their effectiveness, including design, construction and operational factors referenced in AER's *Directive 38: Noise Control* (see also AB TOR section 3.1; Annex I);
- explain how a complaint-response protocol may be implemented and reported on to document any complaints and associated mitigation measures undertaken to resolve the complaints, including the nature of the noise produced (e.g. tonal, impulsive, highly impulsive, and the timing of the noise event); and
- explain how a community engagement plan may be implemented and reported on to proactively inform community members and Indigenous groups who may be affected by project-related noise, such as anticipated changes in noise levels (e.g. blasting).

The proponent should refer to Health Canada's Guidance for *Evaluating Human Health Impacts in Environmental Assessment: Noise* to ensure that it provides the information and analysis considered necessary to assess the project's impacts on human health in relation to changes to the sound environment. It is requested that the proponent complete the checklists provided in thisese guide (Appendix B in the above-referenced Health Canada Guidance on noise) to assist participants in verifying that the main elements of a noise impact assessment have been completed and in identifying the location of this information in the Impact Statement. These checklists will facilitate the review of the Impact Statement and will be particularly useful if analyses on these aspects are found in several sections of the Impact Statement.

8.4.3. Visual environment

8.4.3.1. Baseline conditions

The Impact Statement must:

- consider visibility of the existing and proposed project components (i.e. lighting, sky glow, dust, flares, stack plumes, infrastructures, etc.) from key receptor points, including but not limited to Fort MacKay and Fort McMurray, as well as traditional land use locations identified by Indigenous stakeholders;
- describe existing ambient night-time light levels at the project site and at any other areas where project activities could have an effect on light levels;
- describe night-time illumination levels during different weather conditions and seasons; ~~and~~
- describe landscapes of interest, visual screens and other components of the visual environment, and locate them on a map(s); and~~.~~
- delineate the zone(s) of influence within which receptors (Indigenous groups, land users, and wildlife) may be impacted by changes in the visual environmental and night-time light levels, and identify the zone(s) of influence and receptor view points on a map.

8.4.3.2. Changes to the visual environment

The Impact Statement must:

- describe any changes in night-time light levels as a result of the project;
  - quantify light levels at appropriate distances from any project components and at key receptor points within the defined zone(s) of influence~~facilities~~, including the source, timing (e.g. night hours), frequency, duration, intensity, distribution and character of light emissions;
  - describe the locations and characteristics of the most sensitive receptors, including species at risk, nearby communities, and areas favoured by Indigenous groups for the practice of traditional activities;
  - describe consultations and, where appropriate, provide a record of engagement with regulators, stakeholders, community groups, landowners and Indigenous groups regarding potential effects on the visual environment;
- describe any changes to the visual environment that would consist of aesthetic disruptions to the cultural landscape (e.g. from deforestation, changes to topography, additional presence of humans). This assessment should focus on land users and people traveling along the Athabasca river;
- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, monitoring, and reclamation plan. Discuss how issues, concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to the visual environment.
- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified; and
- describe any positive changes.

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8.4.3.3. Mitigation and enhancement measures

The Impact Statement must describe existing and proposed mitigation measures for anticipated changes to the visual environment.

Consult and consider design principles and light technical parameters to minimize spill-over light and sky glow as outlined in the following documents:

- Canada Green Building Council LEED guidelines; and
- Commission Internationale de l'Éclairage's Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (CIE, 2003)

The proposed mitigation measures should consider the background environment and demonstrate that the appropriate technical limits (i.e. illuminance value, Upward Light Ratio, etc.) are applied to the luminaires and lighting used.

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8.5. Groundwater and surface water

8.5.1. Baseline conditions

The Impact Statement must:

- provide complete hydrometeorological information (temperature, precipitation, evapotranspiration) based on data from nearby weather stations or from a weather station on site;
- describe and illustrate on one or more topographic maps, at appropriate scales, the drainage basins in relation to key project components. On the map(s), identify all waterbodies and watercourses, including intermittent streams, wetlands, springs, watershed and sub-watershed boundaries, and indicate the intended locations of crossings of water bodies or watercourses, if applicable, and any watercourse diversions;
- indicate the type of watercourse impacted (e.g. lotic or lentic system, lake, river, pond, temporary or permanent stream); the size of the water bodies and watercourses, the width at the ordinary high water mark (OHWM) based on the following classes: large stream (over 20m in width), medium stream (between 5 and 20m in width), small permanent and intermittent streams less than 5m in width);
- for each watercourse impacted describe the channel slope, cross section, top width at 100 metres intervals; sinuousity, bed material; flow characteristics (volume and velocity profile) for 5, 10, 20, 50, 100, 200, 500 and PMF (probable maximum flood) flows; flow characteristics (volume and velocity profile) for low annual flows, 7Q10 flows and flows under long-cycle drought conditions. These reference data will be used for approximate recreation of post-closure / reclamation watercourses.
- provide flow hydrographs for nearby streams and rivers, including the Athabasca River, below Fort McMurray (i.e. station number 07DA001) and immediately upstream of the Peace-Athabasca Delta (i.e. station number 07DD001), locations in the PAD to characterize flow rates and directions and water depths in Lake Athabasca, Lake Claire, Lake Mamawi, Lake Richardson, Mamawi Creek, Rivière des Rochers, the Revillon Coupé, the Chenal des Quatre Fourches, Pine River, Baril River, at the Lake Athabasca inlet, at the Peace River interfces with the PAD, at the Slave River inlet and to characterize perched basins and wetlands in the PAD; and nearby streams similar to Poplar Creek and Beaver Creek, showing the full range of seasonal and inter-annual variations, as well as seasonal baseflow. Seasonal variability must cover the entire low flow season of late summer to early spring, particularly during river freeze-up and periods important for Indigenous navigation within the PAD (e.g. early spring

and late summer/fall [20]). They may be based on data from nearby gauging stations or from gauging stations on site. Information pertaining to the Peace-Athabasca Delta must also be included;

- provide stage hydrographs for nearby lakes showing the full range of seasonal and inter-annual water level variations;
- for each waterbody and watercourse affected by the project, provide the timing of freeze-thaw cycles, ice cover, ice thickness and ice conditions;
- provide for each water body affected by the project, the total surface area, bathymetry, maximum and mean depths, and sediments composition, density and mass / volume (e.g. particle size analysis, sediment quality, total organic carbon);
- develop sediment yield characterization (e.g. curves) for each watercourse;
- develop and describe erosion resistance capability for each watercourse;
- develop and describe erosion resistance capability and precipitation-runoff dynamics / response for each discrete landform type. Provide accuracy limits and, if modeled, supporting field data, calibration data, model validation and accuracy;
- provide a delineation and characterization of groundwater–surface water interactions, including an identification of groundwater-dependent ecosystems, wetlands, discharge and recharge areas.;
- develop a quantitative surface water balance for the local or regional watershed(s) containing the project including pore-water at mines, water storage reservoirs, tailings facilities, compensation lakes and evaporation from these surfaces;
- identify springs and potable surface water resources within the local project area and describe their current use, historical and traditional use, potential for future use, and whether their consumption has Indigenous cultural importance with a focus on characterizing areas identified by Indigenous groups as traditional use (i.e. muskeg seepage zones, fens, bogs, areas where traditional and current hunting and fishing occur);
- describe the characterization of the predevelopment baseline scenario;
- describe the surface water quality baseline characterization program including in relation to the predevelopment baseline scenario, including sampling site selection and locations including rationale of selection to ensure ongoing long term data collection, monitoring duration and frequency, sampling methodology, and analytical protocol, including quality assurance and quality control measures for each waterbody and watercourse potentially affected by the project. Baseline samples should also be collected from reference locations that are unlikely to be impacted by the project;
- provide physical limnology (e.g. lake vertical profile data, information on stratification and turnover, ice cover) and baseline data for physiochemical parameters (temperature, pH, electrical conductivity, dissolved oxygen, turbidity, total suspended solids, total hardness, total dissolved solids) and relevant chemical constituents (major and minor ions, trace metals (total and dissolved), radionuclides, total mercury, methylmercury, naphthenic acids (in terms of measured and measureable concentrations included in monitoring programs and not merely in terms of “labile” and refractory” fractions), PACs

[20] Suggested Reference: Transport Canada (2019) *Athabasca River Navigational Study*, prepared by Dillon Consulting for Transport Canada. Retrieved from: https://tc.canada.ca/en/marine/navigation-study-lower-athabasca-river

(including PAHs, alkylated-PAHS, PAH transformation products, including nitro and oxy-PAHs and dibenzothiophenes (DBTs)), nutrients, organic and inorganic compounds, including those of potential concern). Water sample collection and analysis should use appropriately sensitive detection limits and locations should be selected including rationale to ensure ongoing long term data collection. Include additional data, ~~as appropriate,~~ to illustrate the seasonal and inter-annual variability in baseline surface water quality with sufficient years of baseline data to fully characterize natural variability, including possible changes due to groundwater–surface water interactions;

- describe baseline concentrations of elements or contaminants of concern in relation to applicable water quality guidelines. Include hydrogeochemical plots, such as Piper Plots with end members indicated;
- identify domestic, communal, or municipal water wells within the local and regional study areas, including available information on their depth, distance from the project, stratigraphy, screened hydrostratigraphic unit and piezometric level, and specific capacity. Describe their current use, historical and traditional use, potential for future use, and whether their consumption has any Indigenous cultural importance;
- identify groundwater-producing strata (course-grained sediments and permeable bedrock) that may be affected by the project. Where current domestic, communal, or municipal water wells access these strata, their distance from the project must also be marked and added to the map;
- identify groundwater monitoring wells regional study area, including their location, groundwater quality information, and monitoring frequency;
- provide monitoring well hydrographs showing the range of seasonal and inter-annual water level variations for groundwater monitoring wells within the regional study area;
- describe the groundwater quality baseline characterization program including sampling site selection and location, monitoring duration[21] and frequency, sampling methodology, and analytical protocol including quality assurance and quality control measures. Include baseline samples for upgradient reference locations that are unlikely to be impacted by the project (giving consideration that they may be impacted due to cumulative effects);
- provide baseline groundwater quality data for physicochemical parameters (e.g. temperature, pH, electrical conductivity, dissolved oxygen) and relevant chemical constituents (e.g. dissolved metals, major and minor ions, naphthenic acids, PACs (including PAHs, alkylated-PAHs, PAH transformation products, including nitro and oxy-PAHs, and dibenzothiophenes (DBTs)) radionuclides (including uranium-238, radium, polonium, and thorium), nutrients, and organic compounds). The data should illustrate the seasonal and inter-annual variability and any other relevant small-scale temporal variability in baseline groundwater quality, including possible changes due to groundwater–surface water interactions; include an evaluation of the effects of dewatering;
- describe the hydrostratigraphic units (aquifers, aquitards, aquicludes) of the affected hydrogeological environment, illustrated using geological cross-sections, and provide a piezometric map showing heads and the direction of groundwater flow;

[21] baseline conditions should be based on a minimum of three years of data to capture inter-annual and seasonal variations in hydrogeological characteristics.

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- describe the structural geology of the affected hydrogeological environment, including any major faults, fracture density and orientation and bedding orientation with respect to groundwater flow directions;
- describe the groundwater flow boundaries (including groundwater divides and boundaries with surface water) of the hydrogeological environment for the purposes of the Impact Statement;
- provide the hydraulic properties of the hydrostratigraphic units, including data on hydraulic conductivity, specific storage, transmissivity, storativity, saturated thickness, porosity, and specific yield, as applicable;
- provide hydrogeological maps and cross-sections of the study area showing water table elevations, potentiometric contours, interpreted groundwater flow directions, groundwater divides and areas of recharge and discharge;
- where community drinking water supply wells are present within the Regional Study Area, provide the groundwater capture zones, and the potential for the groundwater to be under the direct influence of surface water;
- present a conceptual model of the hydrogeological environment, including a discussion of geomorphic, hydrostratigraphic, hydrologic, climatic, and anthropogenic controls on groundwater flow;
- develop a 3-dimensional numerical groundwater flow model for the project area based on the conceptual model of the hydrogeological environment;
- Develop a conceptual model of how the subject surface water systems function, as well as how impacts may occur. This should serve as the basis for development of computational surface water models used to model Baseline conditions and in the assessment of Project impacts. Such models will provide outputs of predicted hydrological, and water/sediment quality-related outcomes for all subject surface waters, including rivers, streams, lakes, springs and wetlands.
    - Input from multiple parties, including regulators and Indigenous communities, can and should be explicitly considered throughout the conceptual model development and computational model selection, evaluation and application process.
    - Data quality and adequacy must be assessed before using a computational surface water model. Input data must adequately reflect conditions in all seasons and the complete hydrological cycle. Water and sediment quality input data must span at least three years of data collection from all systems to be modeled. Where data are not available, data collection must be completed and surrogate data from another water body should not be substituted. Further information is available from: Alberta Environment. 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Prepared by Patricia Mitchell Environmental Consulting. 67 pp.
    - If a new or an existing model(s) is applied in this way, it must be evaluated for the specific Project application in order to answer the following questions:
        - How have the principles of sound science been addressed during model development?
        - How is the choice of model supported by the quantity and quality of available data?
        - How closely does the model approximate the real system of interest?

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    - How well does the model perform the specified task? (See US EPA (United States Environmental Protection Agency). 2009. Guidance on the Development, Evaluation, and Application of Environmental Models. Office of the Science Advisor, Council for Regulatory Environmental Modeling.)
  - Surface water models must be calibrated and validated to determine how well they correspond to the system being modeled. This includes using independent measured environmental data, not previously used in model development or parameterization, to compare to model outputs.
- state limitations and assumptions in the modelling approach, calibration methods, model validation and accuracy;
- calibrate the numerical model to baseline hydrogeological conditions using groundwater level and stream flow monitoring data; and provide metrics and graphs describing the quality of the calibration that was achieved; and discuss the spatial variability in model calibration;
- analyse the sensitivity of key model outputs to hydraulic properties and climatic parameters such as recharge; and
- provide a baseline groundwater budget (using the calibrated numerical model) including distributed surface recharge, groundwater discharge to wetlands, lakes streams and rivers, infiltration from surface water features to the groundwater flow system, and any anthropogenic withdrawals.
- provide all linkages with of the groundwater and surface water baseline, including the predevelopment scenario with Section 8.7 fish and fish habitat.

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The proponent shall refer to the Health Canada guide *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Water Quality* to ensure that all necessary information and analyses are provided to assess the project's impacts on human health in relation to changes in water quality. The proponent should complete the checklist in this guide (Appendix A) to assist participants in verifying that the main components of a water quality impact assessment have been completed and to identify the location of this information in the Impact Statement. The checklist will make it easier to review the Impact Statement, and it will be particularly helpful if analyses on this aspect are found in multiple sections of the Impact Statement.

8.5.2. Changes to groundwater and surface water

The Impact Statement must:

- identify locations of interaction of the project with surface water and groundwater, including aquifers;
- describe changes to the quantity and quality of domestic, communal, or municipal wells;
- describe and characterize the contaminants potentially associated with the project that could affect surface and groundwater quality, including information on the source(s) of any contaminants and their transport and fate in the hydraulic environment;
- identify potential contaminant flow paths, including groundwater seepage pathways and its relationship to potential receptors;

- describe potential effects to surface water as a result of acidifying emissions from the project and acid deposition;
- describe the downgradient flow of groundwater affected by the project, including the quantity and the contaminant mitigation capacity within the hydrogeological units in the project area, to identify the potential for off-site groundwater and surface water contamination;
- indicate the groundwater and surface water withdrawal requirements during all phases and specify:
  - the quantity and quality of water withdrawn from the environment (flow rates, timing and annual volumes);
  - any treatment carried out on these waters (e.g. addition of a tracer); and
  - the conditions under which this water is released into the receiving environment including any long-term intention for treatment and/or release of tailings water or oil sands affected process water complete with treatment details and performance objectives proposed for water quality;
- provide a project-specific water use assessment identifying and describing the quantity of water resources potentially affected by the project, including water withdrawn from local waterbodies used as a supply source, the flow or volume of water available in the waterbodies, and how and where waste waters could be spilled or discharged and any potential changes to seasonal flows or fluxes from project activities;
- quantify the extent of hydrological changes that will result from disturbances to groundwater and surface water movement from project activities, from climate change, and from cumulative effects, including:
  - changes to the quantity or timing of surface flow, water levels, ice thickness or extent, sediment input and channel regime in watercourses and water levels in affected waterbodies of the local project area, during minimum, average and peak flows, including seasonal variability including hydrology effects to fish habitat;
  - changes to the quantity or timing of surface flow, water levels, ice thickness or extent, sediment input and channel regime in watercourses and water levels in affected waterbodies of the regional study area (including the Peace-Athabasca Delta [PAD], Ruth Lake, Richardson Lake, the Athabasca Watershed, Slave River, and Old Fort River), during minimum, average and peak flows, including seasonal variability. Seasonal variability must cover the entire low flow season of late summer to early spring, particularly during river freeze-up and periods important for Indigenous navigation within the PAD (e.g. early spring and late summer/fall). Changes to water levels and flows in the PAD should be referenced to important thresholds such as those required for safe and reliable navigation through the PAD by Indigenous peoples (suggested reference Athabasca River Navigational Study from Transport Canada, 2019[22]);
- provide an operational/management plan related to the water intake, including the timing and volumes of water withdrawal and resulting impacts to water levels and navigation;

[22] Transport Canada (2019) *Athabasca River Navigational Study*, prepared by Dillon Consulting for Transport Canada. Retrieved from: https://tc.canada.ca/en/marine/navigation-study-lower-athabasca-river

- describe any changes in habitat structure (e.g. streambed, aquatic vegetation, benthic communities, and linkages to fish habitat);
- describe changes to surface or groundwater quality as a result of changes to or removal of vegetation communities, and riparian, wetland, and terrestrial environments, (see also AB TOR section 3.6.2, Annex I);
- discuss changes to watersheds, including alignment and condition of all streams, waterbodies, and wetlands, both ephemeral and permanent, including those created, removed or altered by the project (e.g. Beaver Creek and Poplar Creek Reservoirs) and impacts to navigation and access to the land for traditional activities;

With respect to the assessment of changes to groundwater, the Impact Statement must:

- present a 3-dimensional numerical groundwater flow model of the hydrogeological system that incorporates all major project features such as open pits, overburden disposal areas, tailings management facilities, dewatering wells, and water diversion ditches:
  - the model should be based on the calibrated model used to represent baseline conditions; and
  - the use of telescopically refined groundwater flow models is recommended in the vicinity of open pits and tailings management facilities;
- using the numerical groundwater flow model, estimate key project fluxes, including open pit inflow rates, dewatering rates, pit closure flooding rates, and seepage rates from project facilities during operations and the post-closure period;
- using the numerical groundwater flow model, estimate seasonal changes to surface water and groundwater regimes during operations and the post-closure period, including effects of depressurization of the basal aquifer and dewatering of surficial deposits, including effects on baseflow in rivers and streams, effects on wetlands, effects on potable supplies, and effects on natural flow divides;
- provide drawings and/or figures showing groundwater piezometric contours and/or particle tracking results to illustrate projected seepage patterns for applicable project components.

With respect to potential project effects on water quality, the Impact Statement must:

- describe potential downstream effects to water quality including in Wood Buffalo National Park, Ruth Lake, Richardson Lake, the Athabasca Watershed, Slave River, PAD and Old Fort River;
- present any applicable site water management plan, including water diversion and mine flooding strategy in the post-closure period;
- present estimates of surface water runoff rates for a range of design storms (5, 20, 50, 100, 200, 500, PMF) for major project components, including waste rock piles, ore stockpiles, and tailings management facilities and demonstrate stability, safety and ability to manage flows on-site for events up to the 500 year storm (i.e. 5% likelihood of exceedance in 25 years operation);
- present an integrated site water balance model incorporating surface and groundwater fluxes to or from all major project components, for the operation and post-closure periods;
- present an integrated chemical mass balance model incorporating surface and groundwater chemical loads to or from all major project components, for all project phases; this should include:
  - a clear description and rationale for all input parameters and assumptions, and

- base case estimate (i.e. most likely scenario), worst case scenario, best case scenario, plus applicable sensitivity scenarios;

- describe any applicable water quality treatment measures and provide evidence supporting the effectiveness of these measures;
- describe the timing, duration, quantity and quality of all effluent streams released from the site to the receiving environment, including seepage from tailings management facilities, overflow from pits or mine workings, and surface runoff from mine components;
- describe potential changes to surface water quality due to any project-derived erosion and sedimentation;
- describe potential changes to surface water quality due to aerial deposition of fugitive dust and particulate matter containing contaminants such as metals (including total mercury and methylmercury) and PACs;
- describe changes to geomorphology and suspended solid concentrations in surface waters due to changes in surface flows;
- describe how the alteration of the Beaver River and Poplar Creek watersheds may affect water and sediment quality in the receiving environment considering that these channels are much altered already as indicated in the Voyageur South EIA;
- describe changes to groundwater quality due to effluents from the project, including changes to physicochemical parameters and chemical constituents listed in baseline 8.5.1;
- describe the potential for the project to result in contamination and transport of radionuclides in groundwater, including a characterization of the concentration of radionuclides per element in ore and the equilibrium concentration with daughter materials;
- describe any changes to groundwater quality that could affect surface water quality, particularly of the Athabasca River and its tributaries and the PAD;
- describe potential effects to groundwater or surface water quality or quantity resulting from the removal or diversion of watercourses;
- describe tailings management strategies including:
  - the composition and volume of specific waste streams;
  - measures to minimize fine fluid tailings production;
  - measures to segregate and monitor streams with elevated solvents or radionuclides;
  - disposal sites, including their location on the post-closure landscape including description of ultimate post-closure / reclamation landform type;
  - feasibility and effectiveness of different reclamation strategies (i.e. various wetland landscapes and dry landscapes);
  - measures and strategies for recycling, preventing pollution and minimizing waste through-out the life-cycle of the project, including information on the technologies that will be employed; and
  - identify the limits of proposed tailings treatment technologies at closure;
- provide an assessment for off-site migration pathways for impacted groundwater, and an analysis of contaminant attenuation capacities within the hydrogeological units of the project study area;

- describe predicted changes to surface water quality due to all discharges from the project including impacts to surface water from groundwater-surface water interactions. This should include changes to physicochemical parameters and chemical constituents listed in baseline 8.5.1;
- compare any changes to surface or groundwater quality to applicable guidelines, objectives or standards. Standards include; Environmental Quality Guidelines for Alberta Surface Waters (Government of Alberta), Alberta Tier 1 and Tier 2 Groundwater Remediation Guidelines (Government of Alberta), Canadian Environmental Quality Guidelines (CCME), Guidelines for Canadian Drinking Water Quality (Health Canada), Indigenous Water and Sediment Quality Criteria (IWSQCs).
- ~~Where guidelines are exceeded,~~For all parameters, the risk of adverse effects occurring to receptors in the receiving environment, should be evaluated on a site specific basis, and adaptive management practices identified~~, where appropriate~~;
- describe potential changes to surface water quality associated with the inclusion of end pit lakes in the project, including predicted water and natural or tailings-derived sediment quality within the pit lake through closure and post-closure. This should include:
  - a comprehensive water balance complete with source assumptions for water filling and timeline to fill any pit lakes ;
  - modelling of a comprehensive suite of predicted closure water and sediment quality paramters (i.e., basic physicochemical, nutrient, metal and organic parameters) and associated timelines throughout the development of pit lakes until stability is achieved, including modelling of potential releases of contaminants into the water column, sediment resuspension, and potential stratification;
  - potential for mercury methylation, sulfide and methane generation;
  - benchmark case studies of successfully established comparable reclaimed pit lake outcomes including area and depth, substrate (e.g. quarry, hard rock or oil facility), biota presence and diversity, human health safety studies and timelines to achieving successful outcomes;
  - agreement from indigenous groups that presence and location of each pit lake would not hinder or dissuade navigation through or across the landscape or to areas upslope of the pit lakes;
  - closure water quality objectives;
  - identification of end pit lakes anticipated to provide fish habtat; and
  - comparison of expected water quality to relevant surface water quality guidelines for the protection of aquatic life;
- present an analysis of current or planned process water management, including a description of possibilities for discharge (should regulations come into force) with the best available knowledge. Include discussion on potential effects to the Athabasca River and the PAD. Proposed unproven technology must be supported with contingent use of a viable existing treatment process;
- proposed monitoring points to assess potential changes to surface water quality, including:
  - all point and diffuse sources of discharges including seepage from pits or tailings structures,
  - the immediate receiving environment for any point or diffuse sources of discharges from the project,
  - at the end of pipe (note that the Fisheries Act does not allow for a~~outer boundary of the~~ mixing zone),

Commenté [LS10]: Risk assessment can't be done on those constitutents that exceed guidelines only, although it should be completed on them. The comprehensive and complete water quality model predictions must be brought into the risk assessment, especially to be able to assess the potential risk of complex mixtures of contituents

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- where the water quality from the immediate receiving environment begins to meet Water Quality Guidelines, or background levels for that contaminant;
- in final reclaimed landscape wetlands, waterboides and watercourses,
- at the project boundary,
- at the LSA boundary, and
- at the RSA boundary.

- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, monitoring, and reclamation plan. Discuss how issues, concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to groundwater and surface water.
- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified for both groundwater and surface water;
- Surface water models should be used to predict and characterize change to the hydrological regime, including at a seasonal and monthly reporting period, and change in water and sediment quality at a seasonal reporting period that coincides with changes in hydrological conditions (e.g., high flow, open water, under ice) for all subject surface water systems, including rivers, streams, lakes, springs and wetlands.
- Sensitivity and uncertainty analyses should be used to further evaluate the degree of confidence that can be placed in model results.
- The complete surface water model evaluation should be clearly and completely communicated along with model results to regulators and decision makers, so that an appropriate degree of confidence is assigned to that information.
- The proponent should refer to Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Drinking and Recreational Water Quality* to ensure that it provides the information and analysis considered necessary to assess the project's effects on human health in relation to changes to water quality. It is requested that the proponent complete the checklist provided in this guide (Appendix A) to assist participants in verifying that the main elements of a water quality impact assessment have been completed and in identifying the location of this information in the Impact Statement. This checklist will facilitate the review of the Impact Statement and will be particularly useful if analyses on this aspect are found in several sections of the Impact Statement.

8.5.3. Mitigation and enhancement measures

The Impact Statement must describe the mitigation measures for the potential effects on groundwater and surface water, including:

- describe water use minimization employed including use of water condensed from flue stack heat recovery, avoidance of water-based cooling towers, creation of dry-stacked tailings, reducing pond evaporation, reducing consumptive camp use via waterless urinals and low flow fixtures, use of greywater recycling and treatment, capture of on-site precipitation and routing for productive use to minimize natural water withdrawasl volumes;

- describe the mitigation measures for the possible effects on the quantity and quality of surface water and groundwater (including water supply wells) for all project phases, including the rationale that explains the effectiveness of proposed measures;
- provide any water management plan applicable to waterbodies and watercourses likely to be affected by any phase of the project;
- describe how connectivity of surface water and groundwater within the project site with the regional landscape will be considered and maintained on the closure landscape;
- describe and justify water takings for project works (e.g. hydrostatic tests), particularly for works or water takings in sensitive environments including water-bearing strata associated with drinking water supply, and the measures that will be taken to eliminate or reduce the adverse effects, including the supply and discharge of water, and potential exchanges between watersheds.
    - If the final details of the hydrostatic tests have not been confirmed yet, the proponent nonetheless must specify the expected requirements, the options available and the criteria it intends to apply to assure protection of water resources;
- describe any groundwater and surface water monitoring programs for all project phases, including the selection and location of sampling points, the parameters that will be measured, the duration and frequency of monitoring, the sampling protocol and analysis protocol and the quality assurance and quality control measures. Where applicable, the parameters measured should include a comparison of the measured parameters with the criteria in the *Canadian Council of Minister's of the Environment Canadian Environmental Quality Guidelines* as well as any other regulatory or Indigenous group criteria or guidance. Include the description of the measures that will be implemented if the criteria are exceeded;
- describe any specific monitoring program planned during construction, including assessment of effects before and after construction activities in order to optimize or adapt mitigation measures at the time of their application; and
- describe methods for the prevention, management and control of acid rock drainage and metal leaching during construction, operation, abandonment and decommissioning phases.

8.6. Vegetation and riparian, wetland and terrestrial environments

The proponent should consult the additional guidance for requirements pertaining to wetlands provided in section 21.12 *Additional guidance for biophysical components*~~*Additional guidance for biophysical components*~~.

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8.6.1. Baseline conditions

8.6.1.1. Vegetation and communities of importance

The Impact Statement must:

- provide a description of the biodiversity, relative abundance and distribution of vegetation species and communities of ecological, economic or human importance within the local study area of the project (see also AB TOR section 3.6.1; Annex I), including:
  - rare plant communities and communities of limited distribution;
  - old growth forests;
  - species listed as at risk, may be at risk, and sensitive in the *General Status of Alberta Wild Species* (Alberta Environment and Parks);
  - species listed in Schedule 1 of the *Species at Risk Act*;
  - species assessed by COSEWIC as extirpated, endangered, threatened or of special concern. It is recommended to refer to the most recent COSEWIC annual report for the list of assessed wildlife species posted on its website; and
  - species of importance to Indigenous peoples, including traditional, medicinal, and cultural purposes. It is recommended that the proponent consults directly with Indigenous communities to verify compiled data and collect supplemental data related to traditional plants (instead of relying solely on a desktop review). Failure to consult may result in inaccurate or incomplete data, such as the omission of traditional plant species and important traditional plant habitats within the local study area;
- identify the biodiversity metrics, and biotic and abiotic indicators that are used to characterize the baseline vegetation biodiversity and discuss the rationale for their selection;
- provide maps, at an appropriate scale, of the vegetation species and communities of importance within the local study area. Maps should provides overlays of the locations of vegetation sampling plots (including rare species survey plots or transects) relative to the direct disturbance area of the project footprint;
- discuss the potential of each ecosite phase within the study areas to support the species and communities listed above and their importance for local and regional habitat, sustained forest growth, rare plant habitat and the hydrologic regime (section also AB TOR 3.6.1; Annex I);
- provide pre-project characterization of the shoreline, banks, current and future flood risk areas, depth contours and wetland catchment boundaries;
- describe the natural disturbance regimes in the local and regional study areas, including context on how past projects and activities have affected those regimes (e.g. fire, floods, droughts, diseases, insects and other pests, etc.);
- describe and quantify the extent of any weed species, other invasive species, and introduced species of concern within the project study areas;
- describe the current levels of anthropogenic and natural disturbance affecting vegetation and other ecological communities, including a description and quantification of the current extent of habitat fragmentation, the extent of human access and use; and past and current fire suppression (see also AB TOR section 3.6.1; Annex I);
- identify ecosystems that are sensitive or vulnerable to disturbance, such as acidification resulting from the deposition of atmospheric contaminants or the generation of acid rock drainage (see also AB TOR section 3.6.2, Annex I);

- describe the amount, merchantability and location of any merchantable timber to be removed during project construction within the local study area, including timber productivity ratings (see also AB TOR section 3.6.1, Annex I); and
- describe the current use of site vegetation for construction materials, medicinal purposes, firewood and as a source of country foods (traditional foods) and indicate whether its consumption has any Indigenous cultural importance. These include:
  - fruits and vegetables harvested from the wild (e.g., berries, seeds, leaves, roots, mushrooms and lichen), and
  - plant tissue (e.g., roots, bark, leaves, and seeds) ingested for medicinal or other uses (e.g., teas).

  It is recommended that the proponent consults directly with Indigenous communities to verify compiled data and collect supplemental data (instead of relying solely on a desktop review). Failure to consult may result in inaccurate or incomplete data, such as the omission of current use of site vegetation by a community member, and it reduces the certainty that the project will not disturb traditional plants and harvesting areas.

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8.6.1.2. Wetlands

The Impact Statement must:

- quantify, describe, and map wetlands (fens, marshes, peat lands, bogs, etc.) potentially affected by the project in the context of:
  - wetland class, ecological community type and conservation status (including the use of the Alberta Wetland Classification System, as also required the AB TOR section 3.6.1; Annex I);
  - biodiversity[23];
  - abundance[24] at local, regional and provincial scales;
  - depth contours and area;
  - distribution; and
  - current level of disturbance;
- provide a wetland functions assessment in accordance with the guiding principles of *Wetland Ecological Functions Assessment: An Overview of Approaches* or any subsequently approved guidelines by which to determine the most appropriate functions assessment methodology to use (see section 21.12 for additional guidance on the assessment of *Wetlands*~~*Wetlands*~~); and

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[23] Biodiversity is defined as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Convention on Biological Diversity). Additional resources on biodiversity are available at https://biodivcanada.chm-cbd.net/what-biodiversity.

[24] Abundance is defined as "The number of individuals per species and the evenness of distribution of individuals among species in a community." from: https://www.britannica.com/science/species-abundance

- determine whether the wetlands identified are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or whether they are considered ecologically, socially or economically important to a region.

8.6.2. Changes to vegetation and riparian, wetland, and terrestrial environments

The Impact Statement must describe all the interactions between the project and vegetation and the riparian, wetland and terrestrial environments, including:

- a description and rationale for the key indicators used to assess project effects and the sensitivity of vegetation communities, wetlands, and riparian and terrestrial environments to disturbance;
- provide an overall description of temporary and permanent changes related to landscape disturbance including broadscale landscape conversion to mining, habitat fragmentation, alteration of riparian areas, including buffers and setbacks, and project effects on areas of ground instability (see also AB TOR section 3.6.2, Annex I);
- quantify the area of vegetation communities and riparian, wetland, and terrestrial environments, that may be cleared or otherwise disturbed during all project phases and from both temporary and permanent project components, including a description of the type of disturbance, (see also AB TOR section 3.6.2, Annex I);
- describe, in a regional context, effects associated with changes to or loss of any ecosite phase including effects relating to changes in future Indigenous land uses (see also AB TOR section 3.6.2, Annex I);
- describe the potential effects of the project on rare plant species and plant species at risk, including effects relating to changes in future Indigenous land uses (see also AB TOR section 3.6.2, Annex I);
- describe any hydrological or water flow changes, either permanent or temporary, that may alter moisture regimes or drainage conditions, and describe the effects on vegetation and wetland areas, including impacts on fish and fish habitat where applicable;
- describe any changes to or loss of wetland function as a result of the project, including consideration of the ecological (e.g. hydrological, water quality, biogeochemical cycling, habitat, and climate functions) and socio-economic functions of wetlands. Describe and justify the methodology used to identify impacts;
- describe the potential effects of the project on species of (cultural, traditional, or other) importance to Indigenous peoples, and discuss the potential effects of the project on future Indigenous land uses;
- describe methods for clearing and maintaining the project right-of-way and other project components and the potential effects on the quality of drinking water sources, species, biodiversity and species of (cultural, traditional, or other) importance to Indigenous peoples;
- assess the quantity, marketability and location of any commercial timber to be removed during construction;
- assess and quantify productive use for non-commercial timber including biomass burning for process, water or space heating or processing into marketable products;

- identify any other forest or vegetation resources that may be harvested by Indigenous peoples prior to and during the construction;
- identify opportunities for integrated land management and disturbance minimization during timber harvest for site development;
- describe the potential changes on soils and sediments of trenching, drilling, underground infrastructure burial and compaction; stream and water body crossings; and dewatering, diversions, and water withdrawals (e.g. hydrostatic testing). This includes changes in topography, erosion, altered bank slopes and re-suspension of sediment;
- describe any changes in soil quality, compaction, erosion, and soil loss that could result in a loss of soil productivity;
- describe any contaminants of concern potentially associated with the project that may affect vegetation, soil, sediment or water;
- identify any changes to vegetation, soil, sediment or water quality in wetlands and terrestrial habitats during operations and closure phases by comparing to applicable guidelines, objectives or standards.

  Standards include; Environmental Quality Guidelines for Alberta Surface Waters (Government of Alberta), Alberta Tier 1 and Tier 2 Soil Remediation Guidelines (Government of Alberta), Canadian Environmental Quality Guidelines (CCME), Guidelines for Canadian Drinking Water Quality (Health Canada), Indigenous Water and Sediment Quality Criteria (IWSQCs), Indigenous Terrestrial Quality Criteria (ITQCs).
- Provide a summary of potential effects to vegetation, soil, sediment or water from project activities (including waste streams) which may require remediation/treatment to meet applicable standards (referenced above) and identified reclamation objectives.
- describe the risk of soil and sediment contamination taking into account historical land use, as well as the potential for loss of soil fertility. Describe any known or suspected soil contamination in the study area which may be re-suspended, discharged or otherwise disturbed as a result of the project;
- describe effects onto the biodiversity of riparian, wetland and terrestrial environments, including effects from fragmentation, and changes to regional biodiversity;
- describe potential effects from project emissions that may result in contamination and acidification of nearby land and waterbodies, including consideration of the sensitivity of vegetation communities, wetlands, and riparian and terrestrial environments to disturbance (see also AB TOR section 3.6.2; Annex I);
- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, monitoring, and reclamation plan. Discuss how issues, concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to vegetation, riparian, wetland and terrestrial environments;
- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified; and
- describe any positive changes (e.g. from offsets that result in re-vegetation, new wetlands, etc.).

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8.6.3. Mitigation and enhancement measures

The Impact Statement must describe the mitigation measures for the potential effects of the project on riparian, wetland and terrestrial environments, including:

- describe any reclamation and revegetation procedures to be implemented as part of the project or as additional mitigation measures, including:
  - techniques that will be used to ensure geotechnical stability of the closure landscape;
  - during operations:
    - hydrologic design storm used to prevent erosion and protect slope and surface stability to a protective standard of less than 5% cumulative exceedance (i.e. 500 year return period for 25 years of operation)
    - hydraulic design basis for on-site operational drainage or conveyance channels and structures to a protective standard of less than 10% cumulative exceedance (i.e. 250 year return period for 25 years of operation)
  - for reclamation / post-closure design:
    - use of PMF hydrologic design storm to prevent erosion and protect slope and surface stability for long-term protective standard
    - hydraulic design basis using the PMF for permanent drainage or conveyance channels and structures
  - revegetation techniques and the locations where they would be implemented, including supporting literature and data to show that the selected revegetation techniques have been successful, particularly for natural recovery of wetlands and other wetland revegetation techniques;
  - the selection of plant species to be maintained and planted to promote return to a natural ecosystem, including consideration for Indigenous use, during operation and upon reclamation, and integration of the reclaimed landscape with the regional landscape;
  - seed mixes to be used, application rates and location of application; Native and Indigenous species adapted to the local conditions should be used when the purpose of revegetation is to naturalize or regenerate the area;
  - fertilizers to be used, application rates and locations, and criteria for determining these specifications;
  - the planting and seeding plans that include a description of species to be replanted, the locations for replanting and criteria for determining these specifications;
  - the expected timelines, from an ecological perspective, for establishment and recovery of vegetation communities and the expected differences in community composition and structure, (see also AB TOR section 3.6.2, Annex I);
  - how reclaimed areas and vegetation communities on the project site will integrate with local and regional vegetation communities and landscape features, (see also AB TOR section 3.6.2, Annex I);
  - any uncertainty with respect to the anticipated effectiveness of reclamation, with particular consideration given to uncertainties surrounding the reclamation of peat-forming wetlands; ~~and~~

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- plans and timelines through which to accelerate progressive reclamation (given the extended length of time that the project area will be unavailable for traditional use);
- reclamation standards to be used to evaluate ecological equivalency of post-operation reclaimed landscapes, including:
  - biodiversity monitoring plans and criteria to measure the effectiveness of biodiversity restoration;
  - plans to engage Indigenous communities to develop performance criteria to assess the return of equivalent land capability for traditional uses on reclaimed lands;
- detailed ; reclamation monitoring plans and associated monitoring criteria and indicators for traditional land use objectives and targets
- Include a Groundwater Management Framework and provide a clearly defined the Aquifer Reclamation Plan; and.
- Develop a process to clearly define appropriate regional and site-specific compliance points to meet groundwater level and groundwater quality objectives in proposed reclaimed landscapes

- describe any positive changes (e.g. from offsets that result in re-vegetation, new wetlands etc.);
- describe mitigation plans for the rare species that may be removed by the project footprint;
- describe ways that the project will encompass existing disturbance in order to minimize overall disturbance to natural land cover types, particularly wetlands and traditional use areas;
- describe and justify the ways of avoiding or reducing the temporary or permanent adverse effects on areas of the study area with vegetation that is currently used for construction materials, medicinal purposes, firewood and as a source of country foods (traditional foods), including:
  - fruits and vegetables harvested from the wild (e.g., berries, seeds, leaves, roots, mushrooms and lichen), and
  - plant tissue (e.g., roots, bark, leaves, and seeds) ingested for medicinal or other uses (e.g., teas).
- describe and justify the ways of avoiding or reducing the temporary or permanent adverse effects on wetlands and riparian habitats;
- concerning wetlands:
  - explain how avoidance of wetlands was considered, namely by considering other locations for project components and activities;
  - explain how the effects will be reduced and controlled when applying special mitigation or by modifying the activities and components that have the potential to affect wetlands during all of the phases of the project, including how the available procedures, practices and technologies that are standardized, proven, or experimental and wetland-specific were considered;
  - explain how mitigation measures consider the natural succession and the variability of the environment over time; and
  - describe proposed compensation measures, if applicable (see section 21.10 *Compensation and offset plans*~~*Compensation and offset plans*~~ for relevant guidance);
- describe and justify the construction methods used to cross wetlands and other sensitive terrestrial habitats, and the criteria for determination of techniques proposed for each crossing, including the locations where trenchless crossing methods will be employed;

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- describe and justify the proposed measures to mitigate bank erosion, including measures to eliminate the potential for erosion, such as bank stabilization using vegetation;
- describe the vegetation standards and controls that will be deployed during construction and operation of the project;
- relating to invasive species and vegetation management:
  - describe and justify the measures allowing identification of invasive species or other undesirable introduced species, avoid their propagation and control them during all phases of the project, including the necessity of preconstruction surveys to identify the areas with a high density of these;
  - if applicable, identify the criteria and circumstances of application of chemical, biological or mechanical control methods as well as the pertinent regulation and determine the adverse effects associated;
  - describe ways of avoiding chemical control methods in areas of the study area near Indigenous trails and traditional land use areas, including areas with vegetation that is currently used for construction materials, medicinal purposes, firewood and as a source of country foods (traditional foods); and
  - describe the selection of plant species to be conserved and planted in order to promote vegetation communities with low natural growth;
- describe the vegetation standards and controls to be implemented during all project phases (see also AB TOR section 3.6.2, Annex I). Describe any integrated vegetation management programs, including:
  - the criteria and circumstances for applying chemical, biological or mechanical control methods; and
  - the methods to be used to assess and prevent the introduction and/or spread of non-native, invasive species;
- describe and justify the soil treatment methods to eliminate or reduce the adverse effects on the soils and materials in the root area, including recovery techniques (e.g. soil stripping including the proposed width, stump removal and other soil treatment techniques), soil separation maintenance measures, control measures for wind and water erosion, work shutdown procedures in case of wet conditions, and soil settlement prevention measures;
- describe and justify how to locate pre-existing soil or sediment contamination, the mitigation and monitoring measures that will be undertaken in this regard, and the applicable regulatory restoration measures; and
- describe and justify the biosafety measures that will be employed to identify biological risks and eliminate their propagation, such as diseases in the soil or the roots.

8.7. Fish and fish habitat

8.7.1. Baseline conditions

The Impact Statement must:

- provide a list of all waterbodies and watercourses (permanent and intermittent) that may be directly or indirectly affected by the project. Group water bodies and watercourses by sub-watershed using the following criteria:
  - the type of watercourse (e.g. lotic or lentic system, lake, river, pond, temporary or permanent stream);
  - the size of the water bodies and watercourses, the width at the ordinary high water mark (OHWM) based on the following classes: large stream (over 20 m in width), medium stream (between 5 and 20 m in width), small permanent and intermittent streams less than 5 m in width);
  - the sensitivity of fish habitat; and
  - for crossings, the anticipated or selected method of crossing (trenched or trenchless) and for road crossings (fording or with culverts or bridges);
- characterize the aquatic environment potentially affected by the project, including the extent of habitat disturbance (e.g. fragmentation). Present the information in the form of tables where appropriate, accompanied by maps and photos;
  - For watercourses, it is recommended that characterization be performed on the basis of homogeneous section. Averages of depth, velocity and width at 3 or more cross sections along the section, (up to 20-30 stream widths, depending on length of the section) is recommended for adequate data collection. This would also apply to the other parameters and observations as described below. The parameters to be measured include length of the section, width at the ordinary high water mark, depth, streamflow types and characteristics (velocity, turbidity, peak and low flows, etc.), substrate type (shoreline and bottom), aquatic (grass flat) and riparian vegetation, natural barriers (significant vertical drop, waterfalls, subsurface flow over large distances, beaver dams, etc.), and other barriers (existing stream crossing structures, etc.) that impede or obstruct free passage of fish. The obstacles must be documented (size, condition, etc.) and their passability by fish must be assessed.
  - For waterbodies, the parameters to be measured include bathymetry, maximum, minimum and average depths, seasonal water level fluctuations, substrate type (sediment), aquatic (submerged, floating and emergent) and riparian vegetation, and water quality (temperature and dissolved oxygen profile, turbidity, transparency, pH). It is recommended that mean depths are obtained by cross sectional depth measurements of at least 10 stations in two cross sections at right angles or by sonar coverage of the waterbody. Establish permanent stations at the deepest point in the waterbodies for repeat measures of water quality profiles.;
- provide a description of potentially affected fish species and populations (as defined in subsection 2(1) of the *Fisheries Act*) and other aquatic species (e.g. aquatic and benthic invertebrates) based on field surveys (standardized experimental fisheries using recommendations of the two experimental fisheries protocols published by ASRD "Standard for sampling of small streams in Alberta" and "Sampling for small-bodied fish in Alberta" and Alberta FWIN gillnet sampling) and available data (e.g. government and historical database, fisheries data, information from consultation and engagement activities, traditional knowledge of Indigenous peoples affected by the project, etc.). The data sources must be identified, including information on the surveys carried out (description of gear and catch methods, location of sampling stations, catch methods, date of catches, date of surveys, species surveyed, size and life cycle stage, catch per unit effort, etc.). It is recommended that the information be presented in the form of tables and meets the requirements of Alberta FMIS data logging;

- provide a characterization of potentially affected fish and other aquatic species, on the basis of relevant parameters including but not limited to: life history, food web interactions, population dynamics, movements and migratory patterns, seasonal and annual trends in abundance, sensitive habitats and periods in relation to the study areas, and predator-prey interactions, which are critical to identifying potential effects to population persistence and ecological processes;
- provide the location and area of potential and confirmed fish habitat in or near the project area and describe how they are used by fish in terms of habitat function (species abundance and composition, spawning, nursery, growth, foraging, migration, cover habitat, thermal and winter refuge, etc.) and habitat suitability for species present. It is recommended that the information be presented on one or more maps at appropriate scales, and in the form of tables (refer to Golder 2008 for fish habitat suitability measures in terms of habitat units FISH SPECIES HABITAT SUITABILITY INDEX MODELS FOR THE ALBERTA OIL SANDS REGION Version 2.0 October 2008 Prepared by: Golder Associates Ltd);
- characterize the baseline biodiversity for fish and include the rationale for the selection of biodiversity metrics and biotic and abiotic indicators, such as relative abundance of fish species in each habitat type, species richness and evenness from each habitat type, fish species catch densities per unit area (or CPUE if it is not possible to estimate density from the catches).and biodiversity potential of each habitat type;
- provide a list of aquatic species at risk (provincial and federal) likely to be present and provide the location and a description of suitable or potential habitat for these species (residence and critical habitat) at or near the project area. Include:
  - species listed as at risk, may be at risk and sensitive in the General Status of Alberta Wild Species;
  - species identified by the *Alberta Wildlife Act* as endangered, threatened, or species of special concern;
  - species listed in Schedule 1 of the federal *Species at Risk Act*; and
  - listed as at risk by COSEWIC; ~~and~~
- describe the use of fish and/or aquatic species as country foods[25] or for other traditional purposes, including a description of the particular species of importance, and whether its consumption has cultural importance for Indigenous peoples, including medicinal uses. All sites used in the study area or historically important sites for the collection of country foods must be identified and mapped, such as important fishing sites; and
- ~~-~~provide all linkages with of the fish and fish habitat baseline including the predevelopment scenario with Section 8.5 groundwater and surface water..

[25] Country foods, or traditional foods, are defined as all foods sourced outside of commercial food systems. They include any food that is trapped, fished, hunted, harvested, or grown for subsistence or medicinal purposes, outside of the commercial food chain, including aquatic and terrestrial wildlife that is fished, trapped, hunted or harvested for domestic consumption; fruits and vegetables harvested from the wild; plant tissue ingested for medicinal or other uses; agricultural products grown in gardens and/or home orchards, and aquatic and terrestrial wildlife produced exclusively for domestic consumption.

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It is worthwhile noting that certain intermittent streams or wetlands (marshes, bogs, ponds, etc.) may constitute fish habitat or contribute indirectly to fish habitat. The absence of fish or water at the time of the survey does not irrefutably indicate an absence of fish and/or fish habitat (e.g. migratory corridor). Similarly, beaver dams and accumulations of woody debris are not considered impassable barriers to fish. Section 34.3 (1) and (2) of the Fisheries Act states that the Minister may instruct removal or alteration of obstructions in streams so as not to impede the free movement of fish; in this instance it would mean that trash materials cannot be left in streams during clearing.

8.7.2. Effects to fish and fish habitat

The Impact Statement must describe the potential effects on fish and fish habitat as defined in subsection ~~2~~34(1) of the *Fisheries Act* (see also AB TOR section 3.5; Annex I). Consider any effects whether they are adverse or positive, direct or indirect, and temporary or permanent, for all phase of the project, and for all developmental stage of fish and in keeping with "Fish and Fish Habitat Protection Policy Statement" and "Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the Fisheries Act" DFO Ottawa, 2019.~~.~~

For each waterbody and watercourse potentially affected by the project, the following must be documented and considered in the determination of effects:

- the geomorphological changes and their effects to hydrodynamic conditions and fish habitats (e.g. modification of substrates and sediment load, dynamic imbalance, silting of spawning beds);
- the modifications of hydrological and hydrometric conditions on fish habitat and on the fish species' life cycle activities (e.g. reproduction, rearing, feeding and growth, movement and migration, winter refuge);
- potential effects to riparian areas that could affect aquatic biological resources and productivity taking into account any anticipated modifications to fish habitat (e.g. structure, cover) (see also AB TOR section 3.5.1; Annex I);
- potential fish mortality associated with noise caused by project activities in or near the aquatic environment, or by entrapment or entrainment at fish intakes during water pumping or withdrawal activities (e.g. hydrostatic testing) (see also AB TOR section 3.5.2; Annex I);
- potential changes in light and noise levels that could result in increased stress, and chronic or acute effects to fish health (see also section 3.5.1; Annex I);
- the potential for introduction of deleterious substances (e.g. sediments, project-related contaminants) and aquatic invasive species into the aquatic environment frequented by fish;
- changes to water quality and quantity (e.g. flow, temperature, acidification and eutrophication), both at the discharge point and in the receiving environment. Consideration should also be given to changes to surface water conditions resulting from changes to groundwater quality and quantity;
- effects that may be caused by erosion and sedimentation in waterbodies (see also AB TOR section 3.5.1; Annex I);
- changes in access to fishing grounds and resulting effects on fish populations and aquatic resources (see also AB TOR section 3.5.2; Annex I);

- potential direct and indirect effects from habitat fragmentation (see also AB TOR section 3.5.2; Annex I);
- potential alteration of fish habitat and changes in fish use of habitat, including in the ability to access the habitat;
- contaminant levels in harvested species and their prey, with a focus on traditional foods harvested by Indigenous peoples; and
- any other changes resulting from the project that may affect fish and fish habitat.

The Impact Statement must:

- take into account and include an examination of the correlation between construction periods and sensitive periods for fish (e.g. reproduction), and any potential effects due to overlapping periods. The biologically sensitive periods of all fish species should be assembled into a species periodicity table by week of the year that details spawning times, hatching, drifting, juveniles and adults etc;
- evaluate, where applicable, anticipated habitat losses (temporary or permanent) in terms of area and in terms of habitat units as determined from use of the same habitat by different species and the quality (suitability) of that habitat for each species/life stage, sensitivity of habitat lost (e.g. resilience of affected species and their dependence on habitat, habitat scarcity, habitat resilience, contribution to fisheries productivity, species at risk, etc.) and significance (e.g. magnitude, intensity and persistence). Habitat losses must be clearly located and described. It is recommended that the information be collected in the form of a map at appropriate scales, as well as in the form of a table;
- characterize how potential chronic and acute effects to fish populations relates to population density and resilience;
- describe potential effects to fish from contaminants, including in fish downstream of the project. Include a comparison of predicted water quality for all project phases at all key locations in the receiving environment to applicable water quality guidelines, site-specific objectives or benchmarks, and relevant toxicity test results (either site-specific or published), or other applicable methods. Describe potential effects from contamination on fish behaviour, distribution, abundance, and migration patterns;
- describe how the project's effects on aquatic biodiversity may contribute to changes in regional biodiversity and effects on local and regional ecosystems (see also AB TOR section 3.8.2; Annex I);
- provide an assessment of potential effects to fish populations in the Athabasca River, PAD and the Slave River;
- take into account the tolerance thresholds for potential adverse effects that the Indigenous peoples have identified;
- provide a quantification of any positive effects to fish and fish habitat, if applicable, such as area of habitat creation and number of fish in re-stocking activities;
- cross reference between fish inhabitants of water bodies and streams with fish eating birds and mammals;
- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, monitoring, and reclamation plan. Discuss how issues,

concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to fish and fish habitat;

- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified; and
- describe any need for a *Fisheries Act* authorization or a permit under the *Species at Risk Act*, describe any review of Fisheries and Oceans Canada guidance documents (e.g. "Fish and fish habitat protection policy statement", "Policy for Applying Measures to Offset Adverse effects on fish and fish habitat under the Fisheries Act", "Consultation Paper: Consideration of Cumulative Effects under the Fisheries Act", Fact Sheet: "Consideration of Cumulative Effects under the Fisheries Act". "Interim Policy for Establishing Fish Habitat Banks to Support the Administration of the Fisheries Act and the Species at Risk Act").

8.7.3. Mitigation and enhancement measures

The Impact Statement must describe the proposed mitigation measures for fish, fish habitat and aquatic resources applicable for each phase of the project (design, construction, and operations) (see also AB TOR section 3.5.2; Annex I), including:

- measures applicable to all water crossings, including how and by whom crossings would be maintained and financed for long term sustainability and upkeep including capital for sporadic major rehabilitation (e.g. at end of useful infrastructure lifeapsn or if storm events exceed design protection) following construction of the project;
- measures proposed to restore aquatic environments, including the criteria used to assess successful restoration;
- measures to mitigate effects from harmful, destructive or disruptive activities during sensitive periods and in sensitive locations (e.g. spawning and migration areas) for fish in water or places frequented by fish;
- measures to mitigate sensory disturbance and functional fish habitat loss that may result from project components and activities;
- measures to avoid fish mortality as a result of the use of explosives in or near the aquatic environment, or by fish entrainment during pumping and water withdrawal operations (e.g. during construction of temporary structures and hydrostatic tests);
- measures to prevent the deposit of harmful substances to fish in the water or in zones frequented by fish;
- measures to prevent the introduction and intrusion of invasive aquatic species during work in or near the aquatic environment; and
- all standard measures, policies and commitments regarding mitigation that constitute technical and economically feasible proven mitigation measures and that will be applied in common practice, regardless of the location, as well as any new or innovative mitigation measure proposed.

The Impact Statement must also:

- describe measures and plans to offset or compensate for any loss in productivity of fish populations and fish habitat as a result of the project (see section 21.10 *Compensation and offset plans*~~*Compensation and offset plans*~~); and
- describe how environmental protection plans will address any applicable federal and provincial policies with respect to fish habitat (see also AB TOR section 3.5.2; Annex I).

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8.8. Birds, migratory birds and their habitat

The proponent should consult the additional guidance for requirements pertaining to birds provided in section 21.12 *Additional guidance for biophysical components*~~*Additional guidance for biophysical components*~~.

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8.8.1. Baseline conditions

The Impact Statement must:

- identify any applicable Bird Conservation Regions (BCRs) and BCR strategies[26] applicable to the local and regional study areas;
- describe the biodiversity of bird species and their types of associated habitats that are found or are likely to be found in the study areas, noting all avian species at risk and species of Indigenous importance or use including:
    - species listed in Schedule 1 of the federal SARA. A preliminary list of species at risk likely to use the Project area is provided in section 21.12 Additional guidance for biophysical components. Each of these species must be discussed separately;
    - species listed as at risk, may be at risk and sensitive in the General Status of Alberta Wild Species or under any other applicable provincial legislation;
    - species assessed by COSEWIC as extirpated, endangered, threatened or of special concern. It is recommended to refer to the most recent COSEWIC annual report for the list of assessed wildlife species posted on its website;
    - species of importance to Indigenous peoples, notably pertaining to the practice of rights, considering traditional knowledge; and
    - species of other ecological, economic or human importance;
- identify the biodiversity measures (i.e. biotic and abiotic indicators) used to characterize the baseline avifauna biodiversity conditions and discuss the rationale for their selection. Describe and quantify the existing bird biodiversity in the study areas and compare this to other areas in the boreal forest with similar habitat types and across a range of development levels; ;
- provide quantitative estimates of the abundance and distribution, and information on the life history of migratory and non-migratory birds (e.g. waterfowl, raptors, shorebirds, forest birds, fen/bog/marsh

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[26] Bird Conservation Regions and strategies

birds, and other land birds) in the study areas defined for the assessment; providing methods used and rationale for the baseline and pre-development data collection;

- provide maps showing areas of highest concentrations of species and identify areas of concentration of migratory birds, including sites used for migration, staging, breeding, feeding and resting. Maps must comply with requirements set out in section 21.5 *Geospatial data requirements*~~*Geospatial data requirements*~~;
- describe food webs and trophic linkages to summarize biotic interactions. Ensure described food webs or interactions are relevant to the study areas defined for the assessment since these can vary geographically and by ecosystem;
- provide a characterization of potential habitat and habitat features found in the project area that are associated with the presence of those bird species that are likely to be affected, based on the best available existing information (e.g. land cover types, vegetation, aquatic elements, fragmentation, disturbance). Provide maps showing the location of identified habitat and habitat features associated with the presence of those bird species that are likely to be affected. This information can refer to the habitat description required in section 8.6 *Vegetation and riparian, wetland and terrestrial environments*~~*Vegetation and riparian, wetland and terrestrial environments*~~;
- provide an estimate of year-round bird use of the area (e.g. winter, spring migration, breeding season, fall migration), based on data from existing sources and surveys to provide current field data if required to generate reliable estimates. In each portion of the year, survey effort must account for differences in species movements including: ~~winter~~ seasonal usage by~~of~~ highly habitat reliant species and highly mobile species that will accurately characterize the use of a site;
- identify all federal species at risk and identify and map critical habitat in the study areas; sites that are likely to be sensitive locations and habitat for birds; and environmentally significant areas. These include National Parks, Areas of Natural or Scientific Interest, Migratory Bird Sanctuaries, Important Bird Areas or other priority areas or sanctuaries for birds, National Wildlife Areas, World Biosphere Reserves and provincially or territorially designated areas, such as Wildlife areas. This information can supplement the requirements in section 3.2 *Project location*~~*Project location*~~; and
- describe the use (magnitude, timing) of migratory and non-migratory birds as a source of country foods (traditional foods) and where use has Indigenous cultural importance.

Relevant information sources are provided in section 21.2 *Sources of baseline information*~~*Sources of baseline information*~~. The proponent should consult the *Framework for the Scientific Assessment of Potential Project Impacts on Birds* for examples of project types and recommended techniques for assessing effects on migratory birds.

8.8.1.1. Whooping Crane

In relation to Whooping Crane, in addition to the information required above, the Impact Statement must:

- quantify Whooping Crane use of the study areas defined for the assessment with surveys focused on landings and stopover use of habitat during migration to complement existing data on relative use of different habitats and features in the project area and support the evaluation of project and project component siting decisions or impact predictions;

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- provide the best available information from the relevant jurisdiction concerning baseline range population size and trend, and ~~consider~~ including Indigenous knowledge and community knowledge; and
- document and demonstrate how the information was developed, including how the proponent consulted:
  - experts of the relevant jurisdiction on appropriate survey methodologies;
  - the Whooping Crane sighting reporting protocols included in the 2019 Oil Sands Bird Technical Team (OSBTT) mine operators monitoring program in order to design surveys; and
  - relevant published studies, including the Use of different habitat types by Whooping Crane during stopovers relative to overall habitat availability in the northeastern Alberta Oil Sands Region and mineable oil sands area (see Bidwell & Conkin 2019[27]).

8.8.2. Effects to birds, migratory birds, and their habitat

The Impact Statement must:

- describe the interaction between the project and birds, migratory birds, and their habitat;
- describe predicted direct, ~~incidental~~ indirect and cumulative effects to migratory and non-migratory birds and their habitat, including species at risk, and their eggs and nests, including population level effects, that could be caused by any~~all~~ project-related activities, including but not limited to:
  - site preparation/vegetation removal, particularly of habitats important for nesting, rearing, foraging, staging, moulting, overwintering, and movement corridors between habitat;
  - deposit of harmful substances in waters that are frequented by migratory birds;
  - construction and operation of tailings disposal facilities (i.e. tailings ponds), wastewater ponds, or other ponds containing process liquids or substances harmful to birds;
  - construction and operation of aerial structures, including transmission and distribution lines;
  - changes to the aquatic flow regime and sediment load;
  - changes to the atmospheric, acoustic, and visual environment (noise, vibration, lighting, air emissions and dust);
  - flaring of gas;
  - site reclamation; and
  - any project activities that may occur during critical periods and/or restricted activity periods for migratory and non-migratory bird species, including species at risk;

[27] Bidwell, M. and Conkin, J. 2019. *Monitoring of Whooping Cranes during Migration through the Oil Sands Region Mid-Year Status Report on Habitat Use during Landings and Overnight Stopovers 2018-19*. Terrestrial Unit, Wildlife and Habitat Assessment Section, Prairie Region, Canadian Wildlife Service, Environment and Climate Change Canada. Technical report. 26p.

- analyze the predicted effects of the project to identified migratory and non-migratory birds, plus each species at risk and priority BCR species (Region 6 – Boreal Taiga Plains);;
- describe and map short term and long term changes to habitats and food sources of migratory and non-migratory birds, including species at risk (in terms of types, quality, quantity, availability, distribution and function), including habitat loss, fragmentation and structural change;
  - consider important habitats, including: forests, riparian zones, wetlands and other similar geological formations, and open waters; and
  - if there is displacement of breeding birds, the reference data should provide evidence that there is a significant number of equivalent habitats in which the birds can move and that the vegetation removed is not unique to the project area;
- describe and quantify, where possible, any changes to bird-habitat relationships, including avoidance of habitats due to sensory disturbance and any change in diversity, abundance, and density of the avian community and bird species at risk that utilise the various habitat types or ecosystems. Particular attention must be paid to the change in detection, including quantification of detection error, before and after the project is carried out;
- describe and quantify, where possible, the change in mortality risk, including as a result of collision of migratory and non-migratory birds and bird species at risk with flaring gas, any project infrastructure and vehicles, and as a result of indirect effects such as an increase in the ease of movement of predators in the predictions of mortality effects;
- describe and quantify, where possible, potential incidental effects caused by increased disturbance (e.g. sound, artificial light, presence of workers), such as change in relative abundance movements, distribution, and daily or seasonal movement pattterns movements considering the critical periods for birds, including nesting, breeding, staging/stopover, migration and overwintering. If a temporary relocation hypothesis is made during the operational phases of the project, support the hypothesis or test the hypothesis with scientific evidence or through study and monitoring within the project area as the project proceeds;
- describe and quantify, where possible the potential direct effects of contaminants and bioaccumulation of contaminants on resident and migratory birds, and bird species at risk, including those that may be consumed by Indigenous peoples; and
- should the project be expected to result in or contribute to downstream effects to water quality in the Athabasca River system, including the PAD, describe potential effects to migratory and non-migratory birds and their eggs, including bird species at risk, that may be present in or utilize that area.
- describe potential adverse and positive effects of the project on bird species noted as important to Indigenous groups and local communities, such as effects resulting from changes to important habitat areas, including but not limited to grouse, ducks, and geese, and their eggs and nests that are not currently listed under the Species at Risk Act or provincial statutes. This must include a discussion of the availability of species for traditional use, considering potential habitat loss, habitat avoidance, increased mortality (e.g. due to vehicle collisions, increased non-Indigenous hunting pressure), and other project-related effects (see also AB TOR section 3.7.2; Annex I);
- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, monitoring, and reclamation plan. Discuss how issues,

concerns, or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to migratory and non-migratory birds, including species at risk.

- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified;

In describing activities that may result in direct, ~~incidental~~ indiect and cumulative positive and/or adverse effects to migratory birds and non-migratory birds, including species at risk, the proponent must describe the amount, duration, frequency, and timing of disturbances. The proponent should refer to the Government of Canada's guidance on this topic, including *Avoiding harm to migratory birds*.

8.8.2.1. Whooping Crane

Concerning the description of the Project effects on Whooping Crane, the Impact Statement must describe effects in consideration of Whooping Crane usinge data collected in accordance with the protocols of the mine operators monitoring program initiated in 2019 by ECCC with partners of the OSBTT, to report whooping crane sightings on mine leases, including:

- crane proximity to mine infrastructure (e.g. transmission lines or process-affected water);
- number and type of bird deterrents active in the area;
- levels of human activity;
- habitat attributes and proportions of habitat types at landing sites; and
- local weather conditions at the time of occurrences.

8.8.3. Mitigation and enhancement measures

The Impact Statement must:

- describe measures that will be implemented to mitigate any direct, ~~incidental~~ indirect and cumulative adverse effects identified above to migratory birds and non-migratory birds, including species at risk, their eggs and nests, or through effects to their habitats.
  - Include a description of measures applied during sensitive periods and in sensitive locations, such as avoiding lights at night during key migration peaks and avoiding excessive loud noises, vibration or blasting during breeding season;
- describe the deterrent systems that will be used to mitigate impacts on migratory and non-migratory birds due to for instance, attraction to tailings ponds, wastewater ponds, or other areas with open water on the project site, (see also AB TOR section 3.7.2, Annex I);
- describe the anticipated effectiveness of the measures proposed to mitigate effects on birds, including deterrents. The anticipated effectiveness of mitigation measures, including deterrent systems, must be supported with scientific evidence or tested through study and monitoring within the Project area as the project proceeds;
- describe measures that will be used to mitigate sensory disturbance and the functional habitat loss it may cause;

- describe approaches to decreasing tailings pond size including by use of dry-stacked tailings and by pro-active and accelerated reclamation;
- describe technologies and approaches that will be used to minimize the impacts of tailings ponds on migratory birds that maybe come into contact with process affected waters;
- describe measures for preventing the deposit of substances harmful to migratory birds in areas frequented by migratory birds;
- demonstrate how the proponent considered the timing of vegetation removal and construction to be outside the main breeding season or other critical periods for birds, including staging/stopover, migration and overwintering; ~~and~~
- provide a waterfowl protection plan which addresses how bird use of the project area will be monitored consistently across the project area and during project activities, including a description of how monitoring thresholds and how exceedances of these thresholds will be managed.
- take into account bird species of interest to Indigenous peoples in the identification of mitigation measures for potential effects on species and ecological communities; provide evidence of mitigation effectiveness corresponding to the identified issues and concerns from Indigenous communities;
- provide details of the monitoring program that will address uncertainties in the assessment for birds and the effectiveness of proposed mitigation measures, including bird deterrent systems, where scientific evidence supporting their effectiveness is not currently available. Define any thresholds that would be used to evaluate mitigation effectiveness; and
- regarding the reclamation plan, discuss expected timelines for establishment and recovery of vegetative communities, waterbodies, and bird habitat and anticipated recolonization by bird indicator species. Provide an outline for key milestone dates for reclamation, including targets for vegetative communities, waterbodies, and bird habitat and how progress to achieve these targets will be measured. Ensure active involvement of relevant Indigenous groups in the reclamation planning so that Indigenous views and perspectives are represented and taken into account for the restoration of resource quality..

In this regard, and for nesting periods, the proponent is encouraged to refer to the *Guidelines to reduce risk to migratory birds* and to ECCC's website on *General nesting periods for migratory birds*. It should be noted that these dates cover the main nesting periods of migratory birds, which reduces the risk of taking their nests or eggs. This recommendation does not authorize the disruption, destruction or taking of a migratory bird, its nest or its eggs outside these periods.

8.9. Wildlife and its habitat

The proponent should consult the additional guidance for requirements pertaining to wildlife provided in section 21.12 *Additional guidance for biophysical components*~~*Additional guidance for biophysical components*~~.

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8.9.1. Baseline conditions

The Impact Statement must:

- describe and map the wildlife resources (amphibians, reptiles, terrestrial and aquatic mammals and bats) within the study area that are likely to be directly or indirectly affected by the project, including:
  - species listed in Schedule 1 of the federal SARA. A preliminary list of species at risk likely to use the Project area is provided in section 21.12 *Additional guidance for biophysical components*~~*Additional guidance for biophysical components*~~. Each of these species must be discussed separately;
  - species listed as at risk, may be at risk and sensitive in the *General Status of Alberta Wild Species* or under any other applicable provincial legislation;
  - species assessed by COSEWIC as extirpated, endangered, threatened or of special concern. It is recommended to refer to the most recent COSEWIC annual report for the list of assessed wildlife species posted on its website;
  - species of importance to Indigenous peoples, notably pertaining to the practice of rights, considering traditional knowledge; and
  - species of other ecological, economic or human importance;
- for these species, describe and map as appropriate (see also AB TOR section 3.7.1; Annex I), providing quantitative information, where possible:
  - species composition, abundance (including relative abundance in each habitat type), population status, distribution (including across survey sites), general life history
  - the location and quantity of habitat, including residences, seasonal movements and ranges, movement and migration corridors, habitat features, requirements, key habitat areas, and species use and potential use of habitats. Describe and demonstrate the validation of any habitat models used to map wildlife resources. If collected field data are insufficient, additional surveys should be completed or alternative, external sources of data should be used to provide a quantitative validation of the habitat models developed for the proposed Project;
  - their regional importance, including ecological, economic, and human importance (e.g. traditional use, wetlands, old growth, etc.);
  - sensitive periods (e.g. seasonal, diurnal and nocturnal) and sensitive locations~~,~~ (e.g. key wildlife and biodiversity zones) including critical timing windows (e.g. denning, rutting, spawning, calving, breeding, roosting), setback distances from sensitive areas, or other restrictions related to wildlife species and species at risk;
  - a map showing the highest concentrations or areas of use by species; and
  - locations of identified or proposed critical habitat and/or recovery habitat and ranges for species at risk, with information and locations differentiated between federal and non-federal lands;
- identify the metrics and biotic and abiotic indicators that are used to characterize the baseline conditions (e.g. population size, recruitment rates, etc.) and discuss the rationale for their selection;
- describe the use of all wildlife species as a source of country foods (traditional foods) and whether its consumption and use has Indigenous cultural importance, including for medicinal purposes;
- describe the use and harvesting of fur-bearing species and whether its harvesting has Indigenous cultural or economic importance;

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- take into account the species identified as being of importance or sensitive from an ecological, economic or human point of view, which may include, among others, insects and arthropods (e.g. the reference conditions of certain insect larvae in aquatic environments can serve as relevant indicators for the subsequent development of a biodiversity monitoring program);
- describe and quantify wildlife habitat, including function; location; suitability; structure; diversity; relative use; natural inter-annual and seasonal variability; and abundance (see also AB TOR sections 3.7.1 and 3.8.1; Annex I);
- list, and depict on a map, wildlife management areas and established or proposed sanctuaries; and
- provide the information required in section 3.8.1 of the provincial terms of reference (Annex I). including mapping and quantify biodiversity information where possible, for terrestrial and aquatic biodiversity to inform characterization of the existing ecosystem, impacts, and assessment of the proposed reclaimed landscape. Identify quantitative biodiversity metrics used to characterize the baseline biodiversity for terrestrial wildlife and discuss the rationale for their selection. Compare biodiversity measures for the Project area to other areas in the boreal forest with similar habitat types and across a range of industrial development levels.

The proponent should consult the Species at Risk Public Registry to obtain information on the list of species at risk and their protection status, as well as available recovery strategies. The Impact Statement must specify the references and dates consulted. The proponent is responsible for ensuring that the most up-to-date documents have been used and that the status of the species is current.

8.9.1.1. Caribou

The Impact Statement must provide the best information available from the Government of Alberta regarding population size and trends for herds within the regional study area. The proponent should consult Alberta provincial experts on appropriate survey methods for caribou and provide justification for the methodology used.

The Impact Statement must:

- describe and quantify the use of the study areas defined for the assessment by boreal caribou (e.g. distribution, movement, timing) over time using survey data to supplement existing data if it is not sufficient;
- take into account sensitive periods associated with caribou life stages such as calving, overwintering, movements, and specific sensitive time periods established by Alberta for caribou that are used to identify, delineate and take into account habitat features;
- describe the type and spatial extent of biophysical attributes present in the study areas and defined in Appendix H of the ~~*Modified*~~ *Amended* *Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2019*; ~~and~~
- present total habitat disturbance for boreal caribou at the range scale, and also in a manner that clearly indicates critical habitat disturbance within federal lands; and
- present Indigenous knowledge on the historical and current use of the project study area. ~~.~~

8.9.2. Effects to wildlife and its habitat

The Impact Statement must:

- describe the potential direct, indirect and ~~incidental~~cumulative, positive or negative effects of the project during all phases to wildlife and species at risk and their habitat and critical habitat (including its extent, availability and presence of biophysical attributes), including:
  - population level effects, including relative abundance, distribution, and mortality rates (see also AB TOR section 3.7.2; Annex I) that could be caused by project effects, particularly in the vicinity of wetland, lake and riparian habitats and on migratory corridors;
  - effects to migration, movement, habitat usage patterns, wildlife behaviour, including potential displacement of wildlife species and species at risk;
  - the potential destruction of residences of species of risk;
  - the surface area, biophysical attributes, and location of habitat, including critical habitat that may be affected;
  - effects associated with habitat and vegetation removal such as loss and fragmentation of forest cover and other habitat types, including effects to habitat quantity, diversity, spatial and temporal habitat availability, and habitat effectiveness (i.e. types, quality, and distribution) considering edge effects, particularly mixedwood and old-growth forest habitat, riparian areas, wetland (fen, bog, swamp, and marsh) areas, and sensitive habitat locations (see also AB TOR section 3.7.2; Annex I);
  - effects to species should project activities occur during critical timing windows or during other sensitive periods;
  - effects that may result from:
    - introduction and intrusion of invasive species;
    - altered predator-prey relationships, such as increased wildlife predation;
    - increased access by hunters to the project area due to new roads and access corridors, including poaching; and
    - noise, artificial light, and vibrations;
- provide an evaluation of the effects of the project, including any new road access, pipeline, powerline, water supply line or other rights of way, on wildlife and species at risk mortality risk and movement patterns;
- describe the potential for an increase in the spread and prevalence of disease as a result of project activities, including for species at risk;
- describe and quantify, where possible, the potential direct effects to wildlife and species at risk, including acute and chronic effects to wildlife health, of changes to air and water quality and/or contaminants, including effluents, atmospheric emissions and dust deposition, and bioaccumulation of contaminants in wildlife, including those that may be consumed by Indigenous peoples (see also AB TOR section 3.7.2, Annex I);
- describe potential adverse and positive effects of the project on species noted as important to Indigenous groups and local communities, such as effects resulting from changes to important habitat

areas, including moose, beaver, lynx, marten and fishers, and their habitat that are not currently listed under the *Species at Risk Act* or provincial statutes. This must include a discussion of the availability of species for traditional use, considering potential habitat loss, habitat avoidance, increased wildlife mortality (e.g. due to vehicle collisions, increased non-Indigenous hunting pressure), and other project-related effects (see also AB TOR section 3.7.2; Annex I);

- describe concerns and issues expressed by Indigenous communities and the actions taken to address those concerns and issues, including how Indigenous community input was integrated into the Project design, effects assessment, mitigation, monitoring and reclamation plan. Discuss how issues, concerns or traditional ecological knowledge from Indigenous communities were used in the significance determination of potential impacts of the proposed Project to wildlife and wildlife habitat and key indicators;.
- take into account the tolerance thresholds for potential adverse effects that Indigenous peoples have identified;
- describe and assess the resilience and recovery capabilities of wildlife populations and habitats to disturbance, including the anticipated potential for the project area to be returned to its existing state with respect to wildlife populations and their habitat following operations (see also AB TOR section 3.7.2; Annex I);
- identify provincial, territorial or federal permits or authorizations that may be required in relation to species at risk and describe discussions with the appropriate authority regarding these permits or authorizations;
- describe effects to wildlife biodiversity, considering quantitative biodiversity metrics and the biotic and abiotic indicators selected, including changes to regional biodiversity and local and regional ecosystems (see also AB TOR section 3.8.2, Annex I);
- compare predicted effects to wildlife biodiversity measures for the Project area to other areas in the boreal forest with similar habitat types and across a range of industrial development levels;.and
- describe changes to important habitat for species important for the current use of lands and resources for traditional purposes by Indigenous peoples.

Resources from the Alberta provincial government should be considered as a source of information on appropriate methodologies for predicting effects on wildlife and vegetation (see section 21.2 *Sources of baseline information*~~*Sources of baseline information*~~).

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8.9.2.1. Caribou

With respect to the description of effects on caribou, the Impact Statement must:

- provide an assessment of potential adverse effects on boreal caribou habitat;
- describe any sensory disturbance that could affect caribou within the federal range boundaries and assess if this could lead to abandonment or reduced use of habitat within the range;
- determine whether the project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion;
- evaluate habitat and connectivity at the local, regional and range scales using quantitative methods (e.g. habitat quality analysis, etc.);

- evaluate, where telemetry data are available, movements of collared individuals using quantitative methods (e.g. step analysis) to determine existing movement corridors and how these may be affected by project development;
- evaluate whether caribou have potential to interact with the project during sensitive periods associated with caribou life stages, such as calving, overwintering, and any seasonal movements;
- determine whether the project is expected to result in an increase of predator and/or prey access to undisturbed areas and provide a rationale for the conclusion; and
- evaluate the effects on individual and population status at the range scale by providing:
  - the best available information regarding population size and trend;
  - an assessment of the potential adverse effects of the project on population status (size and trend) at the federal range scale; and
  - an assessment of the potential adverse effects on boreal caribou (e.g. sensory disturbance, mortality, pollution), including legal harvesting by Indigenous peoples.

8.9.3. Mitigation and enhancement measures

The Impact Statement must describe the measures for mitigating potential effects on wildlife and species at risk and their habitat, including:

- describe all feasible measures to avoid or lessen potential adverse effects to wildlife and species at risk and their habitat, including critical habitat. Include a description of the measures in terms of the effectiveness of each measure in avoiding negative effects. The anticipated effectiveness of mitigation measures, including deterrent systems, must be supported with scientific evidence or tested through study and monitoring within the Project area as the project proceeds;
- justify how the project and mitigation measures are consistent with any applicable recovery strategies, action plans, or management plans for species at risk based on scientific data;
- provide the best technically and economically feasible approaches for mitigating effects on habitat, aligned with the hierarchy of mitigation measures, and justify moving from one mitigation option to another;
- include measures to address sensory disturbance and the resulting functional loss of wildlife habitat;
- take into account species of interest to Indigenous peoples in the identification of mitigation measures for potential effects on species and ecological communities. Provide evidence of mitigation effectiveness corresponding to the identified issues and concerns from Indigenous communities;
- describe the deterrent systems that will be used to mitigate impacts to wildlife and species at risk due to, for instance, attraction to the project site and/or components and activities associated with the project (see also AB TOR section 3.7.2, Annex I);
- describe and explain when and how temporary construction areas will be restored or maintained following construction, and explain the mitigation measures considered including possible revegetation, obstruction of the sightline, restoration of wildlife and species at risk corridors and habitat connectivity, reduction of fragmentation and reduction of long-term cumulative effects;

- describe and explain the measures to control the use of the project area and new access roads to access areas that were previously difficult to reach, including by wildlife and species at risk predators, hunters, off-roading recreationalists, and other users;
- describe measures to prevent the release of harmful substances into waters or areas frequented or occupied by wildlife or species at risk;
- provide details of any compensation or offsetting plans proposed following guidance in section 21.10 *Compensation and offset plans*~~*Compensation and offset plans*~~ and available guidance documents, if effects cannot be otherwise avoided or mitigated; and
- describe how baseline biodiversity metrics are considered in the reclamation plan Identify expected timelines, targets, and how progress to achieve these targets will be measured;
- provide details of the monitoring program that will address uncertainties in the assessment for wildlife and the effectiveness of proposed mitigation measures where scientific evidence supporting their effectiveness is not currently available; and.
- regarding the reclamation plan, discuss expected timelines for establishment and recovery of vegetative communities and wildlife habitat, and anticipated recolonization by wildlife indicator species. Provide an outline for key milestone dates for reclamation, including targets for vegetative communities and wildlife habitat and how progress to achieve these targets will be measured. Ensure active involvement of relevant Indigenous groups in the reclamation planning so that Indigenous views and perspectives are represented and taken into account for the restoration of resource quality.~~.~~

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8.9.3.1. Caribou

With respect to caribou:

- demonstrate that measures to avoid and minimize effects will be applied for boreal woodland caribou and its critical habitat, including potential use of the project area that supports population connectivity between ranges;
- describe all reasonable alternative means of carrying out the project that would avoid the adverse effects of the project on boreal woodland caribou;
- describe how these alternative means have been considered, and provide a rationale to confirm that the best solution has been adopted to mitigate adverse effects on boreal woodland caribou; and
- describe all feasible measures that will be taken to minimize the adverse effects of the project on boreal woodland caribou and its critical habitat, such as:
  - minimize the footprint of the development and consider locations where the habitat is already disturbed;
  - restore the habitat to provide availability of undisturbed habitat over time;
  - minimize noise, light, smell and vibrations;
  - develop a management plan;
  - use techniques to prevent increased predator access or density; ~~and~~
- report on how the project and mitigation measures are consistent with the recovery strategy, action plan or management plan for the boreal woodland caribou; and

- provide details of the monitoring program that will address uncertainties in the assessment for boreal caribou and the effectiveness of proposed mitigation measures where scientific evidence supporting their effectiveness is not currently available.~~,~~

8.10. Climate change

8.10.1. Baseline

Refer to the requirements provided under *Baseline conditions* in sections 8.1 *Meteorological environment*~~*Meteorological environment*~~ and 8.4 *Atmospheric, acoustic, and visual environment* ~~*Atmospheric, acoustic, and visual environment*~~ .

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8.10.2. Effects to climate change

The following requirements are based on the *Strategic Assessment of Climate Change* (SACC[28]) document developed by ECCC. The SACC provides guidance on climate change information requirements throughout the impact assessment process.

The Impact Statement must:

- provide annual estimates of net GHG emissions for each phase of the project based on the project's maximum throughput or capacity (new project) or additional throughput or capacity (replacement or expansion project) (refer to Section 3.1.1 of the SACC).
  - Include a description of each of the project's main GHG emission sources;
- provide each term of Equation 129 per year for each phase of the project (refer to Section 3.1.1 of the SACC);
- provide methodology, data, emission factors and assumptions used to quantify each element of the net GHG emissions (refer to Section 3.1.1 of the SACC);
- provide emission intensity (Equation 230) for each year of the operation phase of the project (refer to Section 3.1.2 of the SACC);
- provide the quantity and a description of the "units produced" used in Equation 2 for each year of the operation phase of the project (refer to Section 3.1.2 of the SACC);

[28] October 2020 version available at: https://www.canada.ca/en/services/environment/conservation/assessments/strategic-assessments/climate-change.html

[29] Equation1: Net GHG emissions = Direct GHG emissions + Acquired energy GHG emissions - CO_2 captured and stored - Avoided domestic GHG emissions - Offset credits

[30] Equation 2: Emission intensity = Net GHG emissions / Units produced

- provide a discussion on the development of emissions estimates and uncertainty assessment (refer to Section 3.3 of the SACC);
- provide a discussion on the level of uncertainty associated with GHG sources (including biogenic sources) and emission factors, and how these uncertainties would affect the degree of confidence in the assessment outcome;
- provide a methodology through which GHG sources and emission factors will be monitored, measured, and verified in future operational efforts and/or strategic regional initiatives;
- provide a qualitative description of the project's positive or negative impact on carbon sinks. This information must include:
  - a description of project activities in relation to significant landscape features such as topography, hydrology and regionally dominant ecosystems;
  - land areas directly impacted by the project, by ecosystem type (forests, cropland, grassland, wetlands, built-up land) over the course of the project lifetime; this includes the areas of restored or reclaimed ecosystem(s);
  - initial carbon stocks in living biomass, dead biomass and soils (by ecosystem type) on land directly impacted by the project over the course of the project lifetime;
  - fate of carbon stocks on directly impacted land, by ecosystem type: immediate emissions, delayed emissions (timeframe), and storage (e.g. in wood products); and
  - anticipated land cover on the impacted land areas after the project is in place.

With regard to federal emissions reduction efforts and on global GHG emissions, the Impact Statement must provide:

- an explanation of how the project may impact Canada's efforts to reduce GHG emissions, if applicable (e.g. by replacing higher emitting activities) (s.5.1.3 of the SACC);
- a discussion on how the project could impact global GHG emissions, if applicable (s.5.1.3 of the SACC). For example, if the project may displace emissions internationally, the Impact Statement could describe how the project is likely to result in global emission reductions. For example, a project that enables the displacement of high-emitting energy abroad with lower emitting energy produced in Canada could be considered as having a positive impact; and
- should the potential exist for the project to result in increased forest fires in the region, a description of the impacts of increased forest fires on climate change.

Although the Proponent is presenting the project as an "expansion", the previous project(s) and associated upgrader(s) and refinery(ies) have not been assessed for Climate Change considerations under the SACC. As such, the Impact Statement must provide impacts based on the full design capacity of the project. Based on project scale and characteristics (225,000 barrels per day, benchmark GHG intensity of Fort

Hills[31] is 0.069 tonnes per boe (0.036 tonnes per boe for Fort Hills[32] mine plus 0.033 tonnes per boe for upgrading), implied GHG of 5,666,625 tonnes per year at site; upstream impacts only 9% of site emissions meet and exceed the s3.2.2 threshold of the SACC. Including GHG from basic materials is expected to definitely tip the balance beyond the threshold for assesment[33]) , project boundaries are expected to include:

- impacts of the associated upstream activities including finding, supply, storage and transport of natural gas, diesel, concrete, steel (structural and piping), chemicals, diluents and blending agents;
- impacts of the associated upgrader(s), refinery(ies), storage and distribution infrastructure;
- full allocation of impacts of cogeneration emissions as counting toward Canada's Federal GHG totals; and
- impacts of combustion of the project products.

Additional information is available at: www.strategicassessmentclimatechange.ca

8.10.3. Mitigation and enhancement measures

The Impact Statement must, in accordance with Section 5.1.4 of the SACC, describe the mitigation measures that will be taken to minimize GHG emissions throughout all phases of the project. Emphasis should be placed on minimizing net GHG emissions as early as possible. The Impact Statement must:

- include a Best Available Technologies and Best Environmental Practices (BAT/BEP) Determination process to identify and select the technically and economically feasible technologies, techniques, or

[31] Fort Hills is the newest and presumably most efficient oil sands extraction facility. Fort hills uses a paraffinic extraction process that is presumed to be more efficient than the Suncor BMX naphthenic process, hence applying the Fort Hills performance metric yields a conservatively low GHG estimate.

[32] Suncor Climate Risk and Resilience Report 2020, page 23, https://sustainability-prd-cdn.suncor.com/-/media/project/ros/shared/documents/climate-reports/2020-climate-risk-and-resilience-report-en.pdf?modified=20201216022313

[33] Suncor indicates in its public disclosure document an estimate of 3,000,000 tonnes of GHG per year. Given the stream day rates of 225,000 barrels per day, this implies 0.036 tonnes GHG per barrel, the same as the brand new Fort Hills project. We consider this an unproven or "optimistic" metric, especially considering that BMX is now developing a presumably "poorer" resource than previous mines (if not, it would have been developed sooner) and as stated in the above foot note, Fort Hills uses a paraffinic process: this leaves the "heavy" end of the bitumen in the tailings pond, uses less energy (and liberates less GHG) to extract than a naphthenic process and produces a feedstock that has less heavy carbon in it for upgrading. It is also possible Suncor considers GHG emission to be 0.036 if achieving an allocation "credit" for cogeneration: while this may be in alignment to Provincial GHG allocation practices and has acted as an incentive to move coal from the Alberta grid, the reality is that the emissions will be created by Suncor (or a commercial partner) for the BMX project and will enter the atmosphere as part of "Canada's emissions". If the 3,000,000 value is used, it is possible upstream emissions may be overlooked / not be assessed; however, if the figure is later determined to be "low", "optimistic" or not reflecting the entire project (e.g. no upgrader, not full cogeneration allocation), the opportunity to assess the upstream emissions would have been forgone. Given the scale of the upstream emissions, possible large fugitives in the gas exploration and exploitation activities, and possible "optimism" of the 3,000,000 figure we recommend at minimum the "mine + upgrader" be considered with a preliminary intensity of 0.069 tonnes per boe and that upstream emissions be assessed for completeness, accuracy and materiality.

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practices, including emerging technologies, to minimize GHG emissions throughout all phases of the project. The conclusion of this BAT/BEP Determination will include:

- the technologies that will be used to mitigate the project's GHG emissions. These could include, for example, the use of low-emitting, aggressive energy conservation consistent with the Federal stated carbon price, complete energy integration and recovery from boiler stacks, organic heat engine utilisation of low grade heat, low-carbon or renewable fuel for low-grade and water heating, passive and active solar energy for space heating technologies, low-carbon or renewable fuel, electrification or carbon capture and storage;
- the practices that will be taken to mitigate the project's GHG emissions, such as anti-idling practices for mobile equipment, leak detection and repair systems, continuous monitoring systems, or fleet optimization; and
- the additional technologies and practices that could be considered during periods of project maintenance and facility upgrades to further reduce the project's GHG emissions through the lifetime of the project, as well as the planning process, timing and circumstances for that consideration;

- include a MACC (marginal abatement cost curve) presenting the suite of available management, technology and investment options to eliminate or offset GHG emissions for the project / product life-cycle emissions. The MACC must include tonnage available by each measure, cost (or savings) of implementation, utility pricing assumptions and carbon price and must show sufficient currently technologically viable (not R&D or emerging concepts) options available to reduce project emissions to "net zero GHG". If offsets, carbon capture, carbon sinks or trading are contemplated, these activities must have accompanying protocols, standards and guarantees submitted that ensure distinctness, validity, ownership tenure , irreversibility and permanence of GHG reductions and that no "rebound" or unanticipated GHGs are shifted in time, ownership or jurisdiction.
- include a timeline of implementation of the path to "net zero GHG" across the project / product life cycle showing measurable and meaningful progressive steps at each five year increment from 2025 to 2050
- include a description of measures taken to mitigate the project's impact on carbon sinks, including measures to restore disturbed carbon sinks; and
- subject to the public availability of information, include a comparison of the project's projected GHG emission intensity to the emission intensity of similar high-performing, energy-efficient project types in Canada and internationally. If applicable, the comparison should explain why the emission intensity of the project is different.

The Impact Statement must in accordance with Section 5.3 of the SACC, provide the following:

- a net-zero credible plan that describes how the project will achieve net-zero emissions by demonstrating how the net GHG emission equation (refer to Equation 1 in the SACC) will equal 0 kt CO_2 eq/year by 2050 and thereafter for the remainder of the lifetime of the project. This plan will complement and be informed by the BAT/BEP Determination process and any additional mitigation measures identified by the proponent. This net-zero plan should include, at a minimum, the following information:
  - a quantitative description of net GHG emissions reductions and the emission intensities of the project at specified intervals determined by the proponent, up to 2050. ECCC recommends intervals

to be every five (5) years or as appropriate for the project. The proponent should explain how net GHG emissions reductions are maximized in the earlier years of the project's lifespan;

- the GHG emissions and emission intensities expected for each year over the lifetime of the project's operation phase (in accordance with Section 5.1.1 of the SACC);
- a list of potential GHG mitigation measures (BAT/BEP, emerging technologies), and the level of technology maturity (i.e. when the technology could be implemented) for all phases of the project;
- the potential percentage reduction in GHG emissions associated with each mitigation measure over the project's lifetime. Further discussion of each mitigation measure, including associated costs, technical challenges, risks, infrastructure requirements and any other relevant considerations, and how the proponent could overcome them;
- an explanation of the impact of the actions the company will take to achieve net-zero emissions on Canada's net-zero goal. This explanation can refer to the proponent's corporate net-zero emission plan, if applicable;
- a description of any additional mitigation measures (such as direct air capture technology and afforestation) that will be taken to mitigate remaining GHG emissions, if applicable;
- a description of any offset credits that have been or will be obtained to mitigate remaining GHG emissions, if applicable. Proponents may also provide information on their intent to acquire or generate international offset credits. Offset credits must comply with the criteria in Section 3.1.1, and will be considered as the last option in terms of GHG mitigation measures;
- the implementation schedule of mitigation measures identified, including equipment replacement; and
- any other relevant information such as supportive actions by the Government of Canada or Government of Alberta that the proponent would need in order to be able to achieve net-zero emissions. This could include, for example, identifying the need for the construction of a grid intertie to enable access to clean electricity.

ECCC is developing additional guidance related the SACC.

NEW SECTION: Ecological health conditions

Ecological species of interest to Indigenous peoples and the fish, bird and wildlife species assessed in the biophysical/habitat components of the Impact Statement should be assessed for potential health risks using methods described in federal guidance described in *Ecological Risk Assessment Gudiance Document* (CCME, 2020).

The impact statement must:

- provide information that is sufficiently detailed to describe the project activities which, through various pathways, may affect species of concern and ecological receptors health;

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- provide a summary of and rely on air, soil, surface water, sediment, and groundwater quality modelling undertaken in previous components of the Impact Statement to identify constituents of potential concern (COPCs);
- provide a summary of species of concern to Indigenous peoples and the public and protected under provincial and federal legislation as identified in previous components of the Impact Statement to identify receptors of potential concern (ROPCs); and
- Undertake an ecological risk assessment to assess potential risks for the following groups and species;
  - aquatic health components (semi-aquatic furbearers, aquatic birds, fish, invertebrates, algae, emergent and non-emergent macrophytes)
  - terrestrial health components (wildlife, plants, invertebrates)
  - wetland health components (wildlife, plants, invertebrates)

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9. Human health conditions

9.1. Baseline conditions

Baseline information is required on existing human health conditions to prepare the community health profiles and define baseline health condition. This information must include the current state of physical, mental and social well-being and incorporate a determinants of health approach to move beyond biophysical health considerations. Additional guidance is provided in section 21 *Appendix 2 – Additional guidance*~~*Appendix 2 – Additional guidance*~~ under the *Human health baseline*~~*Human health baseline*~~ heading. The proponent must justify any omission or deviation from the recommended baseline characterization approaches and methods, including the Health Canada guidelines.

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The Impact Statement must:

- provide information that is sufficiently detailed to describe the pathways by which the project's influence on the determinants of health may affect health outcomes. This will help understand how these determinants have been taken into account and why certain indicators or information are presented when analyzing expected effects;
- identify each community (indigenous and non-indigenous) which may be affected by project related activities,
- identify baseline health condition for historical and current prevalence, incidence and trends for physical, mental and social determinants in Indigenous and non-indigenous sub-groups in the Wood Buffalo Health Region and Alberta by:
  - identifying data sources
    - provincial (including regional) health statistics reports and data
    - Indigenous community knowledge

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- providinge a summary of identified data;
- proposing methods for statistical analysis of available data
- identifying uncertainties and limitations of proposed methods and available data

- where possible, identify increased or decreased prevalence, incidence and trends for physical, mental and social determinants in Indigenous peoples which are correlated with historical and/ or oil sands sector development in the Wood Buffalo Region.
- identify any vulnerable groups or susceptable populations in the local and regional study areas;
- provide a comparison of data at the provincial, regional or national level, if possible, to better interpret baseline health and social conditions; and
- identify the social area of influence of the project.

To understand the context and to develop the baseline health profiles of local and Indigenous communities, the proponent must develop community health profiles that reflect the overall health of each community, including birth rates, death rates, sexually transmitted infections, injuries, chronic disease rates, mental health status and other community-relevant health information as reported by provincial and federal authorities[34]. Profiles must:

- describe baseline health conditions and existing health inequalities using disaggregated data include information on health VCs corresponding to health behaviours and human biology;
- use, where known, secondary information sources (e.g. Public Health Agency of Canada, Statistics Canada, provincial health authorities, academic reseach);
- describe any context-specific definitions of physical, mental and social health and well-being that are specific to the context of communities, including community and spiritual well-being, including from the perspective of the relevant Indigenous cultures and local communities;
- describe relevant community and Indigenous history or context, including historical impacts on health and intergenerational trauma;
- describe the determinants of health selected specifically for Indigenous communities, including for subgroups within them (e.g. Indigenous women);
- document and describe the relevant protection factors that contribute to community well-being and resilience (e.g. sense of belonging, cultural continuity, language, family supports);
- propose indicators of social health and well-being (including cultural), which are measurable and actionable, and will be assessed;

[34] Sources include: Alberta Health and Alberta Health Services, Interactive Health Data Application (IHDA), Primary Care Network (PCN) profiles, Administrative Health Data, AHS ACPLF/PHSI: Cancer Community Prevention & Screening Dashboard and Alberta Environmental Public Health Information Network (AEPHIN). Reports include (use the most recent if updates are available): Wood Buffalo health data summary report: https://open.alberta.ca/dataset/62df29fc-7d98-4893-b6ce-1d03def3740e/resource/eb2ad230-b15f-480f-852f-95e0fadcd361/download/phc-profile-wood-buffalo-2017.pdf; Alberta Health database: http://www.ahw.gov.ab.ca/IHDA_Retrieval/selectCategory.do; and Alberta Congenital Anomaly Surveillance Report: https://open.alberta.ca/dataset/f8b42b59-ffc6-4b34-9156-27d832bb781c/resource/8bc10915-2fa5-4ccd-8522-a70a132f3feb/download/congenital-anomalies-report-11-2017.pdf

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- provide the approximate location on a map and distance of likely human receptors, including foreseeable future receptors, which could be affected by changes in air, water, country food quality, and noise and light levels. Include communities' gathering, hunting, trapping and fishing areas, including for Indigenous peoples; permanent residences, temporary residences (e.g. Indigenous cottages and camps identified in collaboration with Indigenous peoples) and sensitive receptors (e.g. schools, hospitals, community centres, retirement complexes, health care centres) near the project;
- describe drinking water sources with existing, historical or traditional use, both surface or groundwater (permanent, seasonal, periodic or temporary), including approximate catchment areas at wellheads and their distance from project activities (see also the section on groundwater and surface water);
- provide baseline concentrations of contaminants in ambient air, drinking water and tissues of traditional foods consumed by Indigenous peoples and local communities. For game, the proponent should work with local Indigenous peoples to collect tissue samples where appropriate;
- describe the consumption of traditional foods[35] as a health-related behaviour, including what species are used, quantities, frequency, harvesting locations and how the data were collected (e.g. site-specific consumption surveys; community-led assessments on impacts to treaty and harvesting rights);
- propose indicators of traditional food and water use and security, which are measurable and actionable, and will be assessed;
- describe the level of food security and food sovereignty within local and Indigenous communities, as reported by engaged Indigenous groups. Refer to the Public Health Agency of Canada's website on food security for more information;
- ensure that the data are representative of site conditions; if surrogate data from reference sites are used rather than Project site-specific measurements, demonstrate how the data are representative of site conditions; and
- identify and describe the baseline information for social determinants of health that may be relevant to the Project, including social, cultural and economic conditions as outlines in sections 10 and 11 respectively.

9.2. Effects to human health

The proponent must assess the adverse and positive effects of the project on human health. Interconnections between human health determinants (e.g. between behavioural factors such as healthy

[35] Traditional foods refer to all foods that do not come from commercial systems. It includes all foods that are trapped, fished, hunted, harvested or grown for medicinal or subsistence purposes outside the commercial food chain. This definition includes aquatic and terrestrial wildlife that is fished, trapped, hunted or harvested (e.g. game or game birds, fish and seafood) and for domestic consumption; fruits and vegetables harvested from the wild (e.g. berries, seeds, leaves, roots and lichens); plant tissues (e.g. roots, bark, leaves and seeds) consumed for medicinal or other purposes (e.g. teas); agricultural products (e.g. fruits, vegetables and mushrooms) grown in private gardens or orchards; and aquatic and terrestrial wildlife (and its by-products) produced solely for domestic consumption (e.g. ducks, chickens or other poultry, eggs and dairy products).

eating and biological factors such as chronic stress or exposure to contaminants) and other VCs must be described, as well as the interactions between effects, especially when the proponent foresees a potential indirect effect.

Applying a determinants of health approach in the assessment of human health effects is recommended to support the identification of linkages and effect pathways between VCs as well as of disproportionate effects across subgroups.

A dedicated Health Impact Assessment~~,~~ component, supplemental to ~~supported by a~~the Human Health Risk Assessment, is required to~~should~~ show an understanding of the Project's health and social impacts on Indigenous peoples and will play a role in understanding the Project's impacts on rights and culture.

The Impact Statement must:

- Adhere to, and provide concordance with, published federal and provincial human health risk assessment guidance (Appendix 1):
- Adhere to, and provide concordance with, published federal health impact assessment guidance (Appendix 1):
- present data separately for each Indigenous group, and should be broken down by community;
- clearly describe the selected indicators of physical, mental and social health;
- describe any potential project-related effects on the community health profile (e.g. changes in existing community activities) and the availability of health-related resources; and
- indicate the potential health effects, short-term or long-term, resulting from changes on biophysical and social determinants of health during ~~the construction~~each project phase (construction, operations, closure), and determine ~~whether those effects would change again during the operation phase, at closure and during reclamation~~the type, magnitude, extent, duration, frequency, and reversability of effects assocaiated with project activities; and
- .summarize findings of the assessment for each identified indicator including the change in status from proposed mitigation or management activity.

9.2.1. Biophysical determinants of health

With regard to the biophysical determinants of health, the Impact Statement must:

- provide an assessment of adverse and positive effects on human health taking into consideration, but not limited to, potential changes in:
  - quality of environmental media (air, soil, surface water, sediment, groundwater) and direct health risks from exposure;
  - noise exposure and effects of vibration;
  - access to health services (i.e. increased demands on community services due to an influx of workers);
  - light exposure and levels;
  - current and future availability and access to (including contamination/quality) of country foods (traditional foods); and

- current and future availability and access to (including contamination/quality) of water for drinking, recreational and cultural uses, applying the strictest guideline values for the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*;
- quality of ecological receptors used by Indigenous peoples and public for;
  - traditional foods,
  - medicine,
  - ceremonies (spiritual and cultural)
  - indicators of health and well being
  - recreation

- identify any vulnerable groups or susceptable populations in the local and regional study areas, based on results of the baseline health condition assessment nd describe how this affected assessment methods and results;
- considering project design, modelling, and information shared by engaged Indigenous groups, describe the fate and transport mechanisms of contaminants from project related activities during each project phase (construction, operation, closure) by which the health of human receptors may be exposed and adversely affected;
- ~~describe how the contaminants (e.g. arsenic, cadmium, lead, mercury) related to the project and that can potentially end up in the water, air or soil can be absorbed in country foods (i.e. foods that are trapped, fished, hunted, harvested or grown for subsistence, cultural or medicinal purposes);~~
- identify ~~all the~~each potential route~~s~~ of exposure to contaminants, taking into account, among other things, potential infiltration of carbon monoxide into inhabited areas during blasting activities;
- provide a detailed description of each contaminant associated with identified project activities and phases and where exclusion of a contamiant is proposed. Pprovide ~~a~~ detailed justification for ~~every~~ each contaminant of potential concern (COPC[36]) or exposure route that ~~would~~ may be excluded and/or eliminated from the assessment of the human health risks;
- apply a Human Health Impact Assessment Approach, including consideration of Indigenous determinants of health;
- conduct a Human Health Risk Assessment (HHRA[37]) using best practices (see Health Canada, 2019. *Guidance for Assessing Human Health Impacts in Environmental Assessments: Human Health Risk Assessment*). Include consideration of synergistic and additive effects of various contamiants by

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[36] COPC: Any chemical substance for which the concentration in an environmental medium is likely to be high due to the project's activities may first be considered as a COPC. However, if it is established that the sum of the modelled concentrations and the background concentrations is below the guidelines, standards or criteria - based on health protection - for the affected area, the statement of the problem stage of the risk assessment may conclude that it is unnecessary to treat this chemical substance as a COPC in a quantitative risk assessment.

[37] HHRA: assessment of the effects on the health of persons exposed to biophysical stressors, particularly increased concentrations of chemical substances present in the environment and linked to various phases of a project (construction, operation, decommissioning and post-abandonment, as the case may be)

project related activities and phases~~COPCs~~, and all exposure pathways for identified COPC to adequately characterize potential biophysical risks to human health. A multimedia HHRA may need to be considered and conducted for any COPC with an identified risk and multiple pathways;

- when available, provide a comparison of predicted exposure to COPCs against federal and provincial health based toxicity reference values (TRVs);
- if alternate TRVs are proposed, describe and quantify~~, if possible,~~ specific thresholds used for the health effects assessment and indicate if different thresholds have been considered for vulnerable populations, including thresholds based on sex and age. Provide a justification if any applicable threshold was not used;
- document and take into account tolerance thresholds for potential adverse effects on health identified by Indigenous peoples;
- in situations where project-related air, water, seiment, soil, noise or light emissions meet local, provincial, territorial or federal guidelines, and yet public concerns were raised regarding human health effects, provide a description of the public concerns and how they were or are to be addressed for each project related activity and phase;
- provide an assessment of the carcinogenicity of diesel exhaust gases when diesel engines are a source of air pollutant emissions for the project. In characterizing the carcinogenic risk of project-related diesel exhaust gases, the proponent has two options:
  - carry out a quantitative risk assessment using the associated unit risk value published by the *Environmental Protection Agency* of California that, despite not being expressly recognized in Canada, can provide an overview of the potential impacts that a particular project may have on the risks associated with diesel emissions; or
  - provide a qualitative risk assessment of the carcinogenic risk of diesel exhaust gases related to the project, which includes three different elements to ensure transparency:
    - identification of the main sources of diesel emissions for the project and acknowledgement of the relative importance of diesel emissions as a source of air pollution for the project;
    - acknowledgement that diesel emissions have been labelled a human carcinogen by international authorities such as Health Canada, WHO's International Agency for Research on Cancer, the U.S. Environmental Protection Agency and the California Environmental Protection Agency; and
    - why a quantitative assessment of the carcinogenic risk of diesel emissions for the project is not being done;
- describe changes in terms of availability, use, consumption and quality of country foods (traditional foods), and the potential effects related to these changes on physical and mental health of communities, including for Indigenous peoples for each project related activity and phase;
- identify possibilities of avoidance of certain country food sources or drinking or recreational water sources by the Indigenous peoples due to the perception of contamination for each project related activity and phase;
- describe any project-related changes that could result in a positive health effect (e.g. restoration or remediation projects within the relevant area of interest [e.g. watershed]); ~~and~~

- assess any resultant effects of air quality changes or deposition of air contaminants on land or waterbodies to human health;
- provide a summary of the identified adverse and positive effects for identified indicators of health for each project related activity and phase; and
- for identified adverse effects to human health propose mitigation or management activities and quantify the projected change in magnitude, frequency, extent and duration of the adverse effects from the proposed mitigation or management activity.

9.2.2. Social determinants of health

With respect to the determinants of health other than biophysical ones, the Impact Statement must:

- adopt guidance in *The Canadian Handbook on Health Impact Assessment.*
- define methods and indicate concordance with *The Canadian Handbook on Health Impact Assessment Chapter 5 'Aboriginal Health and Traditional Knowledge"*
- identify any vulnerable groups or susceptable populations in the local and regional study areas, based on results of the baseline health condition assessment and describe how this affected assessment methods and results.
- Provide a summary of social determinants of health identified by engaged Indigenous groups and public groups and identify indicators which were used to assess health impacts. In cases where identified social determinats were not assessed, provide supporting rationale for the exclusion. An affidavit by engaged groups should be provided (as identified in previous sections).
- describe factors and propose indicators for the holistic interpretation of health by linking the complex interrelationships between social, economic, political and cultural health determinants with the natural environment, including but not limited to:
  - Effects on health care services
  - Effects on income, socio-economic status and employment
  - Effects on municipal revenues and local industries
  - Migration and re-settlement
  - Effects on social and community health including effects on culture and
  - way of life
  - Effects on services (e.g., education, social support networks, etc.)
  - Effects on psychological well-being (e.g., stress, anxiety, nuisance, discomfort)
- Propose the criteria for assessing impact significance considering:
  - Magnitude
  - Gepgraphical limits
  - Duration and frequency
  - Cumulative impact
  - Socio-economic importance
  - Risk (probability)

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- Affected groups
- Local sensitivity
- Reversability
- Economic costs
- Institutional capacity

- Consider any effects to social conditions, including services and infrastructure, land and resource use, navigation, and community well-being.
- ~~consider~~ describe the negative and positive health effects (i.e. general well-being) arising from the effects on social, cultural and economic VCs, and their respective indicators, reflecting the input of the affected communities; ~~and~~
- provide a summary of the identified adverse and positive effects for identified indicators of socal health for each project related activity and phase; and
- for identified adverse effects to social determinats of health propose mitigation or management activities and quantify the projected change from the proposed mitigation or management activity.
- ~~identify and describe the impacts to social determinants of health that may be relevant to the project.~~

~~Consider any effects to social conditions, including services and infrastructure, land and resource use, navigation, and community well-being.~~

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9.3. Mitigation and enhancement measures

The Impact Statement must describe the proposed mitigation and enhancement measures for any potential effects on human health, including:

- describe the mitigation and enhancement measures proposed separately for non-Indigenous and Indigenous peoples and for each Indigenous community;
- if the level of emissions from a particular project or effluent discharge is below or at the applicable limits, identify if additional mitigation measures will still be considered. However, if the change may be substantial (even within established limits) as a result of local or regional circumstances or the extent of the change, the proponent must provide additional mitigation measures to minimize pollution and risks to human health;
- when potential effects on human health exist due to exposure to a threshold contaminant, describe mitigation measures aimed at reducing residual effects to as low a level as reasonably possible;
- when potential effects on human health exist due to exposure to a non-threshold contaminant (e.g. certain air pollutants such as fine particulate matter and nitrogen dioxide, as well as arsenic and lead in drinking water), describe mitigation measures aimed at reducing residual effects to as low a level as reasonably possible;
- when potential effects on social determinants of health are identified (e.g. avoidance of traditional foods, displacement, loss of culture), describe mitigation measures aimed at reducing residual effects to as low a level as reasonably possible;

- describe any project-related change that could lead to positive health effects (e.g. resulting from improved economic opportunities or increased access to services);
- describe how the GBA+ results on disproportionate effects have been used to inform mitigation and enhancement measures;
- propose differentiated mitigation measures, if applicable, so that adverse effects do not fall disproportionately on Indigenous peoples and vulnerable subgroups, and they are not disadvantaged in sharing any positive effect resulting from the project. These mitigation measures should be developed in collaboration with the potentially affected communities and subgroups; and
- identify mitigation and enhancement measures presented in other sections that are also applicable to health and well-being effects.

The proponent is encouraged to refer to the National Collaborating Centre for Healthy Public Policy's publication entitled *Tools and approaches for assessing and supporting public health action on the social determinants of health and health equity*.

10. Social conditions

Baseline information is required on existing social conditions and must include social well-being and social activities for individual communities and Indigenous peoples. The scope and content of the social baseline conditions should be tailored to the specific project context, take into account community and Indigenous input, and should include indicators and information that are useful and meaningful for the effects analysis.

In preparing a baseline for the social context, the proponent must identify the social area of influence of the project and prepare a community profile.

The information provided must:

- describe the demographic information for the region, including descriptive statistics (age, ethnicity, sex and gender, language); and
- provide a comparison of data at the national, provincial, regional ~~or national~~and local level, if possible, to better interpret baseline health and social conditions. Local level will include not only the city centre of Fort McMurray but also, where possible, Indigenous community level information to ensure the unique social conditions faced by each Indigenous community is considered. Within this context segregrate the social conditions for each Indigenous group (for example, access to federal resources to support social programming is different for First Nation versus Métis groups in the same geographic area).

Within the context of the predicted changes to the biophysical environment, health and economic conditions resulting from the project, the proponent must assess the adverse and positive effects of the project on social conditions. Interconnections between social VCs and other VCs and interactions between effects must be described. The degree of confidence must be discussed in the analyses.

In consideration of effects, the impact statement must document and take into account tolerance thresholds for potential adverse effects identified by Indigenous peoples.

The impact statemenent should include baseline data from the pre-development scenario, where releveant, and describe how historical and current cumulative effects have already impacted social conditions.

10.1. Services and infrastructure

10.1.1. Baseline conditions

The Impact Statement must describe the existing local and regional services in the study area, including:

- capacity (currently available or planned) of institutions to deliver public services and infrastructure;
- water supplies and water lots, as well as water sources and intakes for ~~agricultural operations,~~ industries, residents and municipalities;
- accommodation and lodging (e.g. affordability, availability, suitability, home ownership), including camping facilities;
- educational services, facilities and daycare;
- elder care and services;
- existing health services and programs, including health providers' capacity;
- emergency services;
- social services; and
- all other potentially affected services.

The description of the baseline should include both a describption of the current capacity for the service or infrastructure as well as a description of the ability for the service or infrastructure to accommodate a change in demand. Indentify existing disparities of access to services amongst different social subgroups (e.g. women, gender-diverse people, youth, elders, people with disabilities) and Indigenous groups (e.g. First Nation housing programs and Métis housing).

10.1.2. Effects to services and infrastructure

The Impact Statement must:

- describe the predicted effects to the local and regional infrastructure facilities and services, including access to these infrastructure and services, in the study area, including adverse and positive effects to:
  - accommodation/lodging (e.g. affordability, availability, appropriateness, home value and home ownership), including camping facilities;
  - access to green space, recreation and parks;
  - road infrastructure and traffic safety;
  - emergency, health and social services, including the increased use of health services and related social services in the relevant communities;
  - protective services;
  - educational services, facilities and day care; and

- utilities; and

- describe any need for government and/or proponent expenditures for new or expanded services, facilities or infrastructure, arising out of project-related effects.
- describe how the project will contribute to the sustainability of the city of Fort McMurray (for example, to support local businesses, stabalize rent and stimulate the housing market.

10.2. Land and resource use

10.2.1. Baseline conditions

The information provided must describe baseline conditions for land and resource use, including:

- provide general information about local populations and diverse subgroups (e.g. women, gender-diverse people, youth, elders, people with disabilities) and their roles and responsibilities in the communities
- describe the general patterns of human occupancy and resource use based on the spatial and temporal boundaries selected (include maps where available), including seasonal cabins;
- describe sites or areas that are used for recreation or work by local populations and Indigenous peoples either for permanent residences or on a seasonal/temporary basis and the number of people who use each site or area identified (include a map(s), where possible), including any potentially impacted transportation routes;
- identify and take into account relevant local, regional, or provincial land use or resource development plans;
- provide general information about local populations and diverse subgroups (e.g. women, gender-diverse people, youth, elders, people with disabilities) and their roles and responsibilities in the communities; and
- identify parks and recreational use areas, including campgrounds, boat launches, fishing and hunting areas/lodges, hiking and OHV trails, wildlife viewing areas; and
- identify Registered Fur Management Areas or other traplines identified by Indigenous groups.

All quality related effects must be assessed in the health risk assessment (and ecological risk assessment) and the proponent is required to integrate this into the effects to resource and land use.

Describe the information sources used to develop baseline conditions including from interviews or studies provided by Indigenous groups.

Describe how historical and current cumulative effects have already impacted land and resource use.

10.2.2. Effects to land and resource use

The Impact Statement must:

- describe the potential interactions of the project with local and regional land use and resource activities (see also AB TOR section 3.6.2, Annex I), including adverse and positive effects to:
  - ~~residential~~ recreational land use including access to green space, recreation and parks;
  - water supplies and water lots, as well as water sources and intakes for ~~agricultural operations,~~ industries, residents and municipalities; and
  - other land uses;
- describe predicted effects to recreation (e.g. hunting, fishing, hiking, camping, wildlife viewing, aesthetic enjoyment) by the community and Indigenous groups (see also AB TOR section 3.6.2, Annex I), including effects to:
  - access to, and quality and quantity of resources, including terrestrial, riparian, ~~and~~ wetland areas and aquatic areas; and
  - overall experience when undertaking recreational activities, including effects of noise, viewscapes and artificial light;
- describe the land use losses associated with the security buffer zones applicable to the project;
- ~~describe how potential avoidance of land near project components by Indigenous peoples due to perceived changes in environmental quality and tranquillity was considered in assessing potential effects to Indigenous peoples (including on diet and health);~~
- describe how changes to or loss of wetlands and other waterbodies may affect land use, including use by Indigenous peoples, (see also AB TOR section 3.6.2, Annex I); and
- identify predicted effects of the project on the quality and quantity of surface water and implications for recreational uses.

Describe the information sources used to understand effects including from interviews or studies provided by Indigenous groups.

Describe how the Project contributions to historical and current cumulative effects will impact land and resource use.

Commenté [LS11]: the SEIA consultant for the proponent should not be describing this, the indigenous communities should describe this. It is already covered in the Health Section and the Indigenous Peoples section.

10.3. Navigation

10.3.1. Baseline conditions

The Impact Statement must describe baseline conditions for navigation, including:

- identify and describe existing navigable waterways, listed under the Canadian Navigable Waters Act as well as identified by Indigenous groups, and all their uses in open water and ice-cover conditions;
- provide a list of potentially affected waterway users, including Indigenous groups, and concerns regarding waterway use and access;

- information on existing water intake and outflow infrastructure to be used including, but not limited to, location, construction date, project methodology, Navigation Protection Program/Transport Canada file number; and
- include information pertaining to the Peace-Athabasca Delta (PAD; see also sections 8.5.1 and 8.5.2 as they relate to navigation).
- identify and take into account relevant local, regional, or provincial land use or resource development plans;

Cross-reference this section with the hydrology baseline, including the hydrology predevelopment scenario.

Describe the information sources used to develop baseline conditions including from interviews or studies provided by Indigenous groups.

Describe how historical and current cumulative effects have already impacted navigation.

10.3.2. Effects to navigation

The Impact Statement must:

- describe project components that will remove, alter or be constructed in, on, under, over, through or across navigable waterways as part of the project and include areas these will cut off and associated timelines;
- describe ancillary project components that will be constructed in, on, under, over, through or across navigable waterways to support the project and include areas these will cut off and associated timelines;
- describe potentially affected waterway users and describe consultation with waterway users including Indigenous groups regarding navigational use, issues raised and how issues were addressed;
- describe how project effects to water quantitiy and quality may effect Indigenous use for navigation;
- describe project effects to navigation and navigation safety, including potential effects from changes to water levels and flows in the PAD and include areas these will cut off and associated timelines;
- reference any potential effects on the Athabasca River in the context of the Transport Canada (2019) navigational study; and
- consider available Indigenous navigational indices or thresholds for affected waterways; and.
- describle project effects in the context of relevant local, regional, or provincial land use or resource development plans.

Cross-reference this section with the hydrology assessment, including the hydrology predevelopment scenario.

Describe the information sources used to understand effects including from interviews or studies provided by Indigenous groups.

Describe how the Project contributions to historical and current cumulative effects will impact navigation.

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10.4. Community well-being

10.4.1. Baseline conditions

To understand the community context, the Impact Statement must describe:

- influences on community well-being; (e.g. disposable income, cost of living, lifestyle; language; rates of alcohol and substance abuse, and of illegal activities and violence; rates of sexually transmitted infections and ethnicity- and gender-based violence; etc.), including indicators proposed by Indigenous groups;
- access, ownership and use of resources (e.g. land tenure, food, water, social infrastructure);
- food security, access to country foods (traditional foods) and baseline perceived quality;
- community cohesion, including factors such as community or neighbourhood engagement, support, and social networks and other social activities;
- the psychosocial environment and its influence on community well-being;
- factors supporting mental health and community well-being (including perceived stress, feelings of isolation, of remoteness, of concern for future generations, and other factors that have been identified in the wake of youth suicide in rural and remote communities);
- the socio-cultural environment, identifying Indigenous peoples and predominant cultural communities;
- demographic characteristics and major socio-cultural concerns of the population;
- safety of Indigenous and non-Indigenous women and girls, identified LGBTQ and two-spirited people;
- relevant historical community background; and
- community leadership and governance structure.

Describe the information sources used to develop baseline conditions including from interviews, studies or assessments provided by Indigenous groups.

Describe how historical and current cumulative effects to environmental and socio-cultural conditions, including changes to those conditions, have already impacted community well-being.

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10.4.2. Effects on community well-being

The Impact Statement must:

- assess potential adverse and positive effects, at the community level, of changes to social conditions including, such as those considered for the analysis in the section "*Social determinants of health*";
- describe the effects of in-and out-migration and the influx of transient workers or temporary work camps, including changes in social and cultural make-up of affected communities, changes in populations, and the potential for increased risks to local communities (e.g. greater spread of sexually transmitted infections, racism, and ethnicity- and gender-based violence) and vulnerable groups who may be disproportionately affected by these risks;
- describe, at the community level, the expected interactions between the project's construction, operation and maintenance workforce and local communities, businesses and residents;

- identify whether social divisions might be intensified as a result of a project;
- evaluate potential social effects associated with increased disposable income, including potential cost-of-living effects, adverse and positive lifestyle changes, distribution of benefits among affected people;
- describe impacts to mental health and community well-being (including perceived stress, feelings of isolation, of remoteness, of concern for future generations, and other factors that have been identified in the wake of youth suicide in rural and remote communities);
- Describe any changes to safety of Indigenous and non-Indigenous women and girls, identified LGBTQ and two-spirited people;
- Describe effects on food security, access to country foods (traditional foods) and baseline perceived quality;
- describe any anticipated effects to language;
- describe any emotional or stress factor that may result from the project including disturbance of normal daily activities (e.g. changes to viewscapes, noise, traffic) and concerns regarding public safety;
- consider the potential for stresses on community, family and household cohesion, alcohol and substance abuse, or illegal or other potentially disruptive activities; and
- describe potential effects related to greater propagation of sexually transmitted infections and gender-based violence (e.g. harassment or human trafficking);
- identify and consider the barriers that impede taking advantage of the positive effects on social conditions and how they are accentuated across diverse subgroups;
- Identify ~~and~~ the changes to, or interaction with, community leadership and governance structure; and
- document the consultation undertaken with local, regional and Indigenous communities, as appropriate.

The proponent must apply GBA+ within the information related to community well-being and document how potential effects are different across diverse subgroups, including among Indigenous peoples and other relevant subgroups (e.g. women, youth, elders). Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to. This is particularly important in the case of information gathered and studies conducted with vulnerable subgroups (e.g. analysis of gender-based violence).

Describe the information sources used to understand effects including from interviews, studies or assessments provided by Indigenous groups.

Describe how the Project contributions to historical and current cumulative effects will impact community well-being.

10.5. Mitigation and enhancement measures

The Impact Statement must describe the mitigation and enhancement measures that will be implemented for all potential effects on social conditions, including:

- explore and discuss opportunities by which benefits to local communities can be enhanced, such as improving infrastructure;

- describe the goals of local or regional land use plans or local or regional development plans where applicable mitigation or enhancement measures are proposed and the extent to which the project is aligned with such plans to avoid or enhance social effects;
- propose differentiated mitigation measures, if applicable, so that adverse effects do not fall disproportionately on Indigenous peoples and vulnerable subgroups, and they are not disadvantaged in sharing any positive effect resulting from the project. These mitigation measures should be developed in collaboration with the potentially affected communities and subgroups;
- describe how tolerance thresholds for potential adverse effects identified by Indigenous peoples were considered;
- describe how the GBA+ results on disproportionate effects have been used to inform mitigation and enhancement measures, including measures to prevent sexual harassment and gender-based violence;
- identify measures that will be implemented to prevent sexual harassment and violence in the workplace, such as programs to support the safety and security of people and codes of conduct; ~~and~~
- a description of any plans for cultural sensitivity or awareness training for non-Indigenous employees to promote a safe work environment that supports the well-being of Indigenous employees; and
- describe the monitoring and reporting that Project will undertake to confirm the accuracy of their social impact predictions

11. Economic conditions

11.1. Baseline conditions

The economic baseline must document the local and regional economic conditions and trends based on the spatial and temporal boundaries selected.

The Impact Statement must:

- describe the main economic activities in the local and regional study areas;
- provide an overview of current labour market statistics, including jobs likely to be in demand over the life of the project;
- describe the workforce, including the availability of skilled and unskilled workers, education level, existing working conditions, wages and average salary range, full-time and part-time employment and training, and gender gaps such as for skilled trades in wages in qualifications. Differentiate the description of the workforce for Indigenous Communities versus Fort McMurray. If the labour force is anticipated to draw beyond the regional labour force, describe this information as well and provide a cost benefit analysis of any anticipated Fly-In Fly-Out program is proposed;
- provide an overview of the availability of local businesses that may provide supplies and services required for the project and identify the Indigenous businesses that are available in the area;

- describe the demographic features of the local and regional population as well as any prevalent economic concerns and economic aspirations of residents, families and workers in the study area and for each Indigenous community;
- describe changes in socio-economic conditions and trends for the population as a result of oil sands development, including Indigenous community-level changes (e.g. subsistence lifestyle to a wage-based economy, population growth);
- provide an overview of the existing employment rates and economic well-being in the study area and impacted communities, including average income and wage inequality;
- describe the current use of land and water bodies in the study area, outfitters, agriculture, forestry and institutions. Consider baseline(s) described under social conditions, as relates to economic conditions;
- describe any Indigenous and non-Indigenous commercial fisheries and their fishing areas, including species fished (along with catch rates and fishing days), number of licences, value of fisheries and breakdown between domestic vs. international fisheries, where applicable.
- identify industrial and commercial sectors;
- identify monitored or administered forest areas (including forests under agreement and areas designated for timber sales); ~~and~~
- identify registered or recognized hunting, trapping or guiding areas; and

11.2. Effects to economic conditions

Within the context of the predicted changes to the biophysical environment, and health and social conditions, the proponent must assess the adverse and positive effects of the project on the economic VCs and the distribution of any adverse or positive effects. The assessment of economic effects should take into consideration the temporal scale for construction, operation and beyond, to assess the potential for, and avoidance of, boom-and-bust cycles potentially associated with the project.

11.2.1. Training

The Impact Statement must:

- describe, if applicable, the training requirements related to the project needs and the potential economic effects that these requirements could cause, including opportunities; and
- describe local and regional workforce development and training plans including those specific for Indigenous people.

11.2.2. Employment

The Impact Statement must:

- describe the potential changes in employment including:
  - an estimate of the number of workers affected at each phase of the project. A clear distinction must be made between creation of new jobs and transfer or extension of jobs due to the project. Validate

forecasts of previous oil sands EIAs with actual outcomes to provide "certainty envelope" of forecasts;

- a description of the employment likely to be in demand due to the project and the project requirements in terms of skilled and unskilled labour;
- an estimate of the availability of local workers to occupy these jobs, including by women, men and diverse groups of people;
- an analysis of the potential for labour shortages in certain sectors within communities affected by the project; and
- if applicable, a description of the plans and the justification for hiring of temporary workers to make up for the shortage of labour and skills;

- a description of the situations where the project may directly or indirectly create economic difficulties or the displacement of workers;
- provide an estimate of direct, indirect or induced income or wages, and the allocation of this income or wages, resulting from the project's expenditures during construction, operation and decommissioning;
- describe the potential positive effects in terms of long term careers and quality employment (e.g. fulltime versus precarious part time, temporary or permanent, skilled or unskilled) for the life of the project;
- analyze the potential for increasing employment for women and other subgroups and local workers more generally;
- provide an estimate of the anticipated levels of economic participation of Indigenous peoples in the project in relation to the project's total requirements (e.g. number of workers);
- describe, if applicable, the co-development processes with Indigenous peoples to ensure common development and management of programs for Indigenous employment;
- describe the project's diversity and inclusion workforce plans, policies and practices including gender-neutral signage and appropriate safety equipment and apparel;
- a description of the impacts to employment;
- estimates of government revenues, including royalties and federal and provincial tax payments; ~~and~~
- a description of the assumptions and methodologies used to derive estimates of economic benefits, including oil price forecasts;
- a description of the accuracy of the assumptions used in the development of the economic assessment, this would include the accuracy of the labour estimates provided by the proponent and the accuracy of other assumptions and inputs used in the assessment; and
- a description of the range of the labour precitions included in the assessment (e.g. if the project predicts 2,000 construction jobs will be created, what is the actual range of that estimate, how low and how high could that number be given the accuracy of the various inputs).

11.2.3. Contracting and procurement

The Impact Statement must:

- describe the products and services that would be required for the project, including those that the proponent anticipates including procurement contracts;
- provide construction procurement and contract values;
- describe how the proponent anticipates it will attribute construction contracts and procurement of products and services;
- evaluate the ability of local businesses to compete for project-related contracting or to establish a partnership with the proponent;
- describe plans to encourage procurement and contracting opportunities for Indigenous peoples and communities, including underrepresented groups;
- summarize business commitments made, if the proponent has prepared an economic benefits plan or has entered into specific cooperation agreements with communities or Indigenous peoples;
- provide an estimate of the anticipated levels of local and regional economic participation in the project in comparison to the total project requirements (e.g. total dollar value of contracts), as well as for Indigenous peoples; ~~and~~
- describe situations when the project may directly or indirectly create economic hardships or the displacement of businesses;
- a description of the accuracy of the assumptions used in the development of the economic assessment, this would include the accuracy of the spending estimates provided by the proponent, the accuracy of the provincial multiplier effect when applied to just the regional study area and the accuracy of other assumptions and inputs used in the assessment; and.
- a description of the range of the spending precitions included in the assessment (e.g. if the project predicts $500 million in local spending, what is the actual range of that estimate, how low and how high could that number be given the accuracy of the various inputs).

11.2.4. Economics

The Impact Statement must consider the following and must validate forecasts of previous oil sands EIAs (by all operators) with actual outcomes to provide "certainty envelope" of forecasts:

- include an estimate and description of direct, indirect and induced economic effects of the project in the short and long term;
- provide the estimated total project cost and indicate the percentage of expenditures expected to occur in the region, Alberta, Canada outside of Alberta, and outside of Canada;
- describe any new technology, process or other intellectual property that will be developed as part of this project, and their potential economic benefits and/or costs;
- document the sources and methodologies used for developing multipliers and estimates and, where a generic multiplier may not accurately reflect the specific situation of the project, provide evidence of specific economic activity that would result if the project is allowed to proceed;
- describe the potential effects of changes to economic conditions in affected communities, including Indigenous communities, for example, to:
  - forestry and logging operations, including the recovery of wood cut during the construction phase;

- the loss of hunting, fishing, trapping, and gathering opportunities; and
- commercial outfitters, recreation and tourism;

- consider the indirect effects on the economy resulting from changes in land use (e.g. potentially increased use of recreational vehicles, and restrictions related to the presence of the project);
- describe the potential effects on economies based on trade, namely for Indigenous peoples;
- describe the potential effects of the project on the availability and quality of land and the short-term and long-term disturbance of the related sectors of activity;
- describe the potential effects of the project on the quality and quantity of groundwater or surface water used for commercial or traditional purposes, including water lots (see social conditions baseline);
- provide a quantitative evaluation of effects on local, regional, provincial, territorial, federal government or Indigenous peoples revenues from tax levies, royalties, revenue sharing and other means for each phase of the project;
- discuss how the project would affect the gross domestic product (GDP) at the federal and provincial levels;
- evaluate the net economic benefits to the Canadian economy as a whole, which requires a detailed forecast of annual cash flows for the life of the project, including a sensitivity analysis showing the impact of changes in the discount rate, prices, capital and operating costs, or other significant parameters;
- estimate the potential effects of the project on the traditional economy, including the loss of subsistence and the potential loss of related jobs; and
- provide an analysis of potential changes to property values and to the cost of living as a result of the project; and
- Describe how the project will add to / contribute to industrial / oil and gas liabilities in Alberta including unpaid lease payments to land owners, unpaid local / municipal property tax (Machinery and Equipment [M&E] and linear), unfunded orphan well liabilities, outstanding liability to complete OSE reclamation, unfunded reclamation costs for existing oil sands mine and SAGD extraction facilities across the life-cycle including natural gas and diluent exploration and exploitation, oil sands mine addition and extension / delay of reclamation of the existing upgrader(s) and refinery(s) associated with the project;
- Provide an analysis of expected Royalties to be paid and actual historical amounts realized by the Crown;
- a description of the accuracy of the assumptions used in the development of the economic assessment; and
- a description of the range of the spending precitions included in the assessment.

11.3. Mitigation and enhancement measures

The Impact Statement must describe the mitigation and enhancement measures that will be implemented for all potential effects on economic conditions, including:

- identify opportunities for enhancing positive effects, such as creation of local employment and Indigenous employment, including:
  - describe education, training and hiring practices that encourage employment of local people;
  - describe actions taken to increase access to education and training opportunities for different groups (e.g. provision of transportation, flexible hours);
  - provide a summary of commitments made with respect to employment, training and trade, including any economic benefit plans or specific cooperation agreements with Indigenous communities and peoples and any restrictions these agreements place on the communities;
  - describe the training, education, and scholarship programs that the proponent plans to support in order to improve employment opportunities, including participation in and contribution to local training networks. Specify the types of employment targeted by these programs, as well as the targeted clientele, such as local residents, Indigenous peoples, and various relevant subgroups (e.g. Indigenous women);
  - describe cultural competency training plans for non-Indigenous employees to ensure a respectful working relationship with Indigenous employees, businesses and contractors; and
  - describe all cultural awareness training plans for non-Indigenous employees to promote a safe work environment that fosters the well-being of Indigenous employees and contractors;
- describe plans, programs and policies to encourage contracting and procurement opportunities for local and regional businesses and Indigenous peoples;
  - describe supplier network development initiatives, including the identification of potential local suppliers, and plans to provide them with information on technical, commercial and other requirements, and to debrief unsuccessful bidders; and
  - describe technology transfer and research and development programs that will facilitate the use of local suppliers of goods and services and local employees, and that will develop new capabilities related to project requirements;
  - describe how the project will minimize contribution to industrial / oil and gas liabilities in Alberta including unpaid lease payments to land owners, unpaid local / municipal property tax (M&E and linear), unfunded orphan well liabilities, outstanding liability to complete OSE reclamation, unfunded reclamation costs for existing oil sands mine and SAGD extraction facilities across the life-cycle including along the supply chain (natural gas and diluent exploration and exploitation), the mine itself and existing upgrader(s) and refinery(s) associated with the project. Include requirements to be placed on natural gas and diluent supplier / counterparties, pro-active and accelerated mine reclamation, overhaul and preventitative maintenance of upgrader(s) and refinery(ies) or contracting of newer facilities with simultatneous retirement of aged facilities, pro-active and accelerated reclamation of facilities, and posting of performance / surety to fully fund reclamation obligations;
  - elaborate on the potential of the project to benefit community members in relevant subgroups;
- where appropriate, provide details regarding financial liability and compensation in place as required by regulation or the proponent's commitments in relation to decommissioning or abandonment;
- describe and justify the need for compensation plans to mitigate potential effects on social, cultural and economic VCs related to Indigenous peoples;

- propose differentiated mitigation measures, if applicable, so that adverse effects do not fall disproportionately on Indigenous peoples and vulnerable subgroups, and they are not disadvantaged in sharing any positive effect resulting from the project. These mitigation measures should be developed in collaboration with the potentially affected communities and subgroups;
- describe plans to encourage the recruitment, development, retention and advancement of women and local workers more generally (i.e. establish employment targets for specific subgroups, such as setting targets for the number of women in management positions and on boards of directors); ~~and~~
- describe how the GBA+ results on disproportionate effects have been used to inform mitigation and enhancement measures; and
- Describe the monitoring ad reporting that Project will undertake to confirm the accuracy of their economic predictions.

12. Indigenous peoples

The Impact Statement must provide information on how the project may affect Indigenous peoples, as informed by the Indigenous group(s) involved in the assessment. The proponent is encouraged to apply Agency guidance on engaging with Indigenous groups and use of appropriate culturally relevant methodologies. These are based on the Indigenous groups' worldviews (beliefs, values, laws, customs, and protocols) and generational knowledge, critical for appropriately and accurately assessing potential effects and impacts on Indigenous peoples and their rights.

The assessment of potential effects must include both adverse and positive effects to the current use of lands and resources for traditional purposes, to physical and cultural heritage, to structures, sites or things of historical, archaeological, paleontological or architectural significance, and to environmental, health, social, cultural and economic conditions of Indigenous peoples affected by the project.

The proponent must:

- engage with Indigenous groups in developing baseline conditions including the predevelopment scenario, identification and understanding of the potential impacts of the project on Indigenous peoples, and to work collaboratively to identify preferred means to mitigate impacts;
- ~~incorporate~~ integrate Indigenous knowledge into the impact assessment and view this knowledge as complementary and influential alongside western science;
- provide a reasonable opportunity for Indigenous groups to review the information prior to submission of the Impact Statement, including in cases where information was obtained from public sources;
- take into account the capacity of Indigenous peoples to collect information on all aspects identified in relation to the current use of lands and resources for traditional purposes;
- support the participation of Indigenous peoples in the completion of the Impact Statement, which could include funding studies or assessments conducted by potentially affected Indigenous peoples who demonstrate interest in this regard; and
- indicate where input from Indigenous groups has been ~~incorporated~~integrated. To the extent possible, information should be specific to the individual Indigenous group(s) involved in the assessment, and

describe contextual information about the members within an Indigenous group (e.g. women, men, elders and youth).

The baseline conditions should be validated by Indigenous peoples. Where not publicly available, the proponent should obtain the approval of Indigenous groups to integrate current use baseline information into the Impact Statement or explain, as applicable, why the information was not validated or approved.

The proponent is also encouraged to work with Indigenous groups who demonstrate an interest in drafting sections of the Impact Statement that concern them, including sections describing Valued Components and indicators for each biophysical, social, ecomonic or cultural assessment, spatial and temporal boundaries used for each assessment, Indigenous knowledge, on the subject of current use of lands and resources for traditional purposes, on potential impacts to the rights and interests of Indigenous peoples, and for the identification of mitigation or enhancement measures. Where applicable, sections of the Impact Statement informed by or prepared by Indigenous peoples must be clearly identified. . While the goal is for all parties to agree upon the conclusions put forward in the final Impact statements, it is possible that parties will not agree on the severity of impacts. In such cases, all perspectives and rationals for different conculsions should be documented in the assessment report.

12.1. Indigenous physical and cultural heritage and structures, sites or things of significance

12.1.1. Baseline conditions

The Impact Statement must include a description of the baseline conditions associated with physical and cultural heritage and structures, sites or things of significance for Indigenous peoples. This description should give consideration to understanding the historical (pre-development) baseline conditions associated with ability to generationally transmit culture, including through language, ceremonies, harvesting, teaching of sacred laws, traditional laws, stewardship laws in relationship with lands and resources including expectations of their quality, and traditional knowledge.

The AB TOR requirements that relate to historic resources captured under the provincial *Historical Resources Act* are detailed in section 4 of the AB TOR (Annex I) and may be referenced to inform baseline conditions.

The Impact Statement must:

- provide the location of physical and cultural heritage features on maps and access routes to those features including overland and water-based options including entry and exit / landing sites for watercraft, camp locations and water sources for potable uses, if it has been shared by an Indigenous group with the proponent and if the Indigenous group has authorized its release;
- describe how input from potentially impacted Indigenous groups was sought and considered in the identification of these locations and features, including opportunities provided to participate in or lead historic resources studies (including field studies);
- Employ best practices for field studies, such as 6 mm mesh size for screening;

- describe the outcomes of engagement and consultation activities with Indigenous groups with concerns about heritage resources in the project area and indicate the participation of the members of these communities in the related studies, if applicable;
- describe how Indigenous knowledge informed studies, including the identification of the sites to assess and include studies or assessments conducted by Indigenous peoples, if any; ~~and~~
- consider natural and cultural heritage as a multidimensional concept which is not limited to particular sites or objects and which can also include components of the environment identified by Indigenous peoples as having heritage value; and
- describe how historical and current cumulative effects to environmental and socio-cultural conditions, including changes to those conditions, have already impacted physical and cultural heritage.

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Information on heritage and structures, sites, and things of significance for Indigenous peoples can include:

- burial sites;
- spiritual sites, including rivers and watercourses;
- oral histories;
- cultural landscapes
- teaching areas used to transfer knowledge between generations;
- cultural values and experiences of being on the land;
- Indigenous governance systems and Indigenous laws associated with the landscape;
- sacred, ceremonial or culturally important places and landscapes, plants, animals, objects, beings or things;
- the toponymy (place names), language and other components that make up a culture;
- sites with archaeological potential and/or known artifact sites; and
- sites occupied historically.

The proponent should consult the *Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing* on the Agency's Website.

12.1.2. Effects to Indigenous physical and cultural heritage

The Impact Statement must:

- assess potential effects to physical and cultural heritage and to structures, sites or things of historical, archaeological, paleontological or architectural significance for Indigenous peoples, including:
  - the potential for loss or destruction of physical and cultural heritage;
  - changes to access to the site(s) of physical and cultural heritage;
  - changes to the cultural value, spirituality or importance attached to the physical and cultural heritage;

- changes to sacred, ceremonial or culturally important places, objects or things, , use of placenames, ~~including~~ languages, stories and traditions; and
- changes to visual, auditory or olfactory aesthetics over the life of the project and after reclamation, abandonment or decommissioning of the project;

- take into account potential effects on physical and cultural heritage when assessing the effects on social, cultural and economic conditions;
- describe how Indigenous peoples will be notified of findings of historical resources; and
- present contingency plans and field interventions that will be applied should heritage resources be discovered during construction, operation and decommissioning.

With respect to archaeological and historical resources:

- in the event that project activities that may disturb the soil (surface or underground) are carried out on provincial Crown lands, conduct an archaeological potential study for the Crown territory affected. Based on the recommendations of this study, field work (visual inspection without snow cover, archaeological inventory, or other) could be necessary. Depending on the findings, this expertise could lead to mitigation measures related to the findings obtained, which can take the form, for example, of intensive digs at a given site or a proposal for modification of the anticipated route.

12.2. Current use of lands and resources for traditional purposes

12.2.1. Baseline conditions

The Impact Statement must include information on the current use of lands and resources for traditional purposes. The proponent must refer to the *Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA, 2012*, on the Agency's website.

The information requirements of Section 5 of the AB TOR, Traditional Ecological Knowledge and Land Use (Annex I), may be referenced as appropriate in addition to addressing the information requirements below.

Where information is publicly available and application and interpretation in a different context is re-validated with the Indigenous group; or where information ~~or~~ can be obtained from Indigenous groups and ~~has been~~ authorized by that group for its use, the Impact Statement must identify and describe:

- Indigenous governance systems and Indigenous laws, customs, and protocols associated with the ~~current~~ land and resources used for traditional purposes (e.g. harvesting rights, authorities, and principals, customs and protocols linked to harvesting);
- traditional havesting activities presently or historically practiced (e.g. hunting, fishing, trapping, gathering of plants or medicines , water, wood or other resources);
- location of traditional use areas such as hunting, trapping, and fishing camps, cabins and gathering or teaching areas;

- resources important for traditional and cultural purposes such as fish, wildlife, birds, plants or other natural resources and describe places where these resources are harvested. Identify those being species at risk and describe their traditional and cultural significance;
- country foods (traditional foods) consumed by Indigenous groups;
- quality and quantity of resources affecting usability (e.g. preferred species and ~~perception~~ perspectives on~~f~~ quality and confidence in harvesting resources);
- rotational harvesting practices and how they vary in time, such as berry and tea harvesting, bait harvesting and fishing, big game hunting and trapping of fur-bearing animals;
- cabins, campsites, staging areas used presently, or historically for traditional practices;
- access and travel routes for conducting traditional practices (e.g. physical access to harvest specific species, culturally important harvesting locations, timing, seasonality, distance from community);
- all uses of banks, waterways and water bodies navigable by Indigenous peoples, such as for travel and recreation (e.g. canoe route and portage trails, entry and exit / landing sites for watercraft);
- waterways and water bodies including springs, wetlands, and shallow groundwater used as drinking water sources and aesthetic properties (taste, colour, clarity, temperature, odour) of those waters ;
- describe the current use of lands and water bodies in the study area, including for food, social, cultural and ceremonial purposes, including as defined by Aboriginal and Treaty rights,
- the frequency, duration or timing of traditional practices;
- describe efforts by Indigenous groups to restore traditional practices, where applicable;
- the experience of the practice (e.g. connection to the landscape without artificial noise and sensory disturbances, privacy, safety, air quality, visual landscape, ~~perceived~~ cultural perspectives on ~~or real~~ contamination, demonstrated or associative, etc.);
- describe other current uses recognized by Indigenous peoples; ~~and~~
- describe how the cultural heritage values documented in Section 12.1.2 influence traditional land and resource use:
    - cultural values, spirituality or importance attached to physical and cultural heritage sites landscapes and cultural keystone species;
    - oral histories, placenames, languages, stories and traditions;
    - visual, auditory or olfactory aesthetics; and
    - locations and opportunities to transfer cultural teaching and knowledge between generations; and
- describe how historical and current cumulative effects to environmental and socio-cultural conditions, including changes to those conditions, have already impacted use of lands and resources for traditional purposes.
- ~~describe the use of the project area by non-Indigenous harvesters~~.

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12.2.2. Effects to current use of lands and resources for traditional purposes

The Impact statement must:

- within the context of historical and current cumulative effects, assess the potential effects on current use of lands and resources for traditional purposes, including but not limited to effects resulting from changes to or the loss of vegetation communities, ~~and~~ riparian, wetland, aquatic and terrestrial environments, including to:
  - current and future availability, distribution, and usable quality of country foods (traditional foods),
  - quality, quantity, and distribution of resources available for harvesting, other than for subsistence (e.g. species of cultural importance, traditional and medicinal plants);
  - quality, and usability of plant resources (in their habitat) available for harvesting, (e.g. species of cultural importance, traditional and medicinal plants, which require specific habitat quality and related protocols for harvesting and use);
  - experiences of being on the land (e.g. the changes in air quality, noise exposure, effects of vibrations from blasting or other activities, increase in artificial light at permanent and temporary sites, fragmentation of traditional territory, visual aesthetics);
  - the use of cabins, camp sites and staging areas;
  - the use of travel routes, navigable waterways and water bodies;
  - sites of interest to communities including for non-commercial fishing, hunting, trapping and gathering sites, as well as on cultural and ceremonial activities and practices that could be taking place on those sites; and
  - sites of interest to Métis communities regarding conservation and health of culturally important fish species related to the resumption of the rights-based commercial fishery downstream; and
  - access to culturally important harvesting areas, resources of importance and traditional territory;
- describe potential effects on the transmission of traditional knowledge linked to activities potentially affected by the project;
- take into account expectations pertaining to the preservation of landscapes, including nighttime landscapes and, if applicable, regulatory requirements in place concerning light pollution;
- describe the methods used to collect information on traditional use of lands and resources by Indigenous peoples; and
- describe how Indigenous peoples who participated in the gathering of traditional use information took part in the impact assessment and in the development of proposed mitigation measures, including undertaking their own assessment of effects. Include all Indigenous comments on potential effect to current use of lands and resources for traditional purposes and rationals for different conculsions about the severity of impacts;
- describe how the traditions, perspectives, values and knowledge of Indigenous communities have been considered in determineng the severity of the Project's contribution to current cumulative effects to environmental and socio-cultural conditions affecting Indigenous land and resource use.

Commenté [KD12]: Medicinal plants are largely either consumed, inhaled or topically applied, and are necessary for spiritual subsistence and health and well-being, therefore this qualifier is counterintuitive here.

- describe how information about impacts to land and resource use is integrated into Section: 12.1.2: Specifically, how:
    - changes to the access, cabins, travelways and harvesting and traditional land and resource use areas affects cultural values, spirituality or importance attached to physical and cultural heritage sites;
    - changes to traditional use of cultural landscapes including important travelways, waterways and harvesting areas associated with sacred, ceremonial or culturally important places, objects or things, use of placenames, languages, stories and traditions; and
    - changes to visual, auditory or olfactory aesthetics over the life of the project and after reclamation, abandonment or decommissioning of the project affects traditional use of ;
    - impacts to harvesting and traditional use affects teaching and knowledge transfer between generations;
- decsribe how tradional land and resource use and cultural values informed the biophysical assessment and impact rating criteria; and
- describe how the results of the biophysical assessment were integrated in the traditional land and resource use assessment and considered in the determining residual effects and the severity of impacts.

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12.3. Health, social and economic conditions of Indigenous peoples

12.3.1. Baseline conditions

The Impact Statement must meet the requirements set out in sections above with regard to the baseline for health, social and economic conditions, which must take into account Indigenous peoples and GBA+ specific to Indigenous peoples.

The baseline conditions established for Indigenous peoples must take into account Indigenous governance regimes and Indigenous laws associated with health and socio-economic conditions. The baseline conditions should provide community-specific social and economic conditions on a disaggregated basis (without identifying individuals).

12.3.2. Effects on Indigenous health, social and economic conditions

The Impact Statement must meet the requirements set out in sections 9, 10, and 11 above with regard to the effects on health, social and economic conditions, which must take into account Indigenous peoples and GBA+ specific to Indigenous peoples. Some of the above-described requirements are reiterated here.

The assessment of these effects on Indigenous peoples must describe and take into account interactions with the effects on physical and cultural heritage, on structures, sites or things of significance, and on the current use of lands and resources for traditional purposes. For example, an effect on a traditional food

may have consequences for the practice of traditional activities, and could lead to an effect on the cost of living, food security, and mental health at the community level or on vulnerable subgroups.

The Impact Statement must:

- describe the health, social and economic effects that the project may have on Indigenous peoples;
- consideration of how economic boom and bust cycles in remote communities impact social and cultural wellbeing;
- include a Health Impact Assessment including Indigenous determinants of health and Human Health Risk Assessment (see also section 9 *Human health conditions*~~*Human health conditions*~~);
- describe potential long-term health effects to Indigenous peoples due to project activities;
- describe and quantify potential effects to mental and social well-being of Indigenous peoples (e.g. stress, depression, anxiety, sense of safety);
- describe and quantify specific thresholds and document if different thresholds were considered for vulnerable Indigenous peoples, including by sex and age; provide rationale and justification if specific thresholds are not used;
- identify predicted effects of the project on the quality and quantity of ground or surface water used by Indigenous peoples;
- describe effects to the availability, quality/health, use and consumption of country foods (traditional foods) and potential health impacts of any changes to availability, use and consumption patterns;
- provide a rationale if a determination is made that an assessment of the potential for contamination of country foods (or other exposure pathways, such as inhalation) is not required or if some contaminants are excluded from the assessment;
- describe how community and Indigenous knowledge was used in assessing potential effects to Indigenous health, social and economic conditions;
- apply GBA+ across all health, social and economic effects and document how potential effects or changes to health, social or economic conditions could be different for diverse subgroups, including community relevant subgroups (e.g. women, youth, elders); ~~and~~
- describe effects on reserve lands and peoples on reserve (e.g. visual, light, dust, noise, air quality, odours, water sources and accidents/malfunctions)~~.~~;
- describe the effects and impacts specific to lands within an Indigenous community or hamlet, Indigeous-community owned or held lands (e.g. leased lands), Indigenous-held Registered Fur Management Area and community-identified traditional territory within the regional study area; and
- describe how the results of the traditional land and resource use assessment and the cultural heritage assessment were integrated in the indigenous health assessment and considered in ~~the~~ determining the residual effects and the severity of impacts. Specifically, linkages between cultural heritage and Traditional land and Reource use and:
    - country foods and clean water
    - mental and social well-being of Indigenous peoples (e.g. stress, depression, anxiety, sense of safety..

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12.4. Rights of Indigenous peoples

12.4.1. Baseline conditions

The Impact Statement must:

- identify and describe the Treaty and Aboriginal rights of Indigenous peoples potentially affected by the project including the geographic extent of traditional territory, the purpose and importance of the rights to the rights-bearing people (i.e.the practices, customs, beliefes, worldviews, and livelihoods)~~, including historic, regional, and community context~~. The description should include maps, when available, to illustrate the location of treaties, traditional territories and Metis harvesting zones and the importance of specific areas or locations that may be impacted by the project;
- document the nature and extent of the exercise of these rights by the Indigenous groups who are potentially impacted by the project, as identified by the Indigenous group(s) and the ~~.~~ historic, regional, and community context influenceing activities, resources and conditions necessary to allow a community to exercise this rights,. Indigenous groups may also provide their perspective through consultations with the Agency or directly to the review panel. Indigenous groups should be involved in the choice for the scoping and assessment of the nature and extent of the exercise of rights of Indigenous peoples; ~~and~~
- consider how the information requirements related to physical and cultural heritage, current use, Indigenous health, social, cultural and economic conditions are applicable to the nature and extent of the exercise of rights; and
- describe how Indigenous rights have influenced the selection of indicators and values considered in each section of the Project Assessment and the final impact ratings.

Further information related to rights may include:

- landscape conditions that support the Indigenous group's exercise of rights (e.g. large, intact and diverse landscapes; areas of solitude; connection to landscape , clean water, biodiversity, abundance, distribution and quality of wildlife and vegetation and their habitats);
- the Indigenous governance systems and Indigenous laws associated with the exercise of rights;
- information about members within an Indigenous group, and their role in the exercise of rights (e.g. women, men, elders, youth, people with disabilities);
- how the Indigenous group's cultural traditions, laws, protocols, and governance systems, social values, access and patterns of occupation and preferences inform the manner in which they exercise the rights (the who, what, when, how, where and why);
- where they exist, identification of thresholds identified by the community that, if exceeded, may impair the ability to meaningfully exercise of rights;
- maps and relevant data sets (e.g. overlaying the project footprint, places of cultural and spiritual significance, traditional territories, fish catch numbers); and
- pre-existing impacts and cumulative effects that are already interfering with the ability to exercise rights or to transmit Indigenous cultures and cultural practices (e.g. language, ceremonies, Indigenous knowledge), particularly in the oil sands region.

12.4.2. Impacts on rights of Indigenous peoples

The Impact Statement must describe the level of engagement with Indigenous groups regarding potential impacts of the project on the exercise of rights, and where possible, the project's potential interference with the exercise of rights. It is preferable that Indigenous peoples have all the information about the project and its potential effects on hand to be able to inform the potential impacts of the project on their rights and interests. The proponent is therefore encouraged to share studies with Indigenous peoples prior to assessing the impact on their rights or interests. In the absence of this information, the proponent must document the approach taken to support Indigenous peoples in order to identify the potential impacts of the project on their rights and interests, including the hypotheses put forward on the potential effects.

Where an Indigenous group has not provided this information to the proponent, or both parties agree that it is better to provide information related to the impact on the exercise of rights directly to the Agency or the review panel (as appropriate), the proponent must provide a rationale for the approach taken. The proponent is encouraged to discuss with Indigenous groups their views on how best to reflect the assessment of impacts on rights in the Impact Statement. Impacts on rights may be assessed using a methodology identified by Indigenous groups, including community-led assessment(s). This may include supporting Indigenous-led studies that are to be provided publicly and to the Government of Canada.

The proponent must work together with Indigenous groups to find mutually agreeable solutions to concerns raised about the project, especially for those concerns raised by Indigenous peoples about impacts on the exercise of their rights (e.g. project changes, accomodation, mitigation, and complementary measures including offsets or compliance with federal conditions, crown programs, policy changes, or off-sets)..

The Impact Statement must:

- document the project's potential impacts on the exercise or practice of the Aboriginal and Treaty Rrights of Indigenous peoples ~~or the rights arising from treaties~~ in the project area, as expressed by potentially impacted Indigenous peoples;
- document the project's potential impact to Indigeous rights described in the UN Declaration on the Rights of Indigenous Peoples which constitute the minimum standards for survival, dignity and well-being of indigenous people, including health, social, cultural and economic conditions and governance rights including self governance and self determination;
- describe ~~the~~ project impact pathways to~~on~~ the rights of Indigenous peoples, taking into account the concept of the link between resources, access and experience; ~~and~~
- document the views of potentially affected Indigenous peoples regarding the severity of impact that ~~possible connections~~the project could have on their rights and interests; and
- describe how the results of the traditional land and resource use assessment, the cultural impact or heritage assessment, health and socio-economic assessment of Indigenous peoples were integrated in the indigenous Rights assessment and considered in the determining of residual effects and the severity of impacts.~~-~~

The proponent must consult the following Agency guidance documents on this topic: *Policy Context: Assessment of Potential Impacts on the Rights of Indigenous Peoples* and the *Interim Guidance on Assessing Potential Impacts on the Rights of Indigenous Peoples*.

The proponent and Indigenous groups may consider the following:

- how the project may contribute cumulatively to any existing impacts on the exercise of rights, as identified by the Indigenous group(s);
- effects of the project on the quality and quantity of resources available for the exercise of rights;
- how the project may affect the ability of Indigenous groups to travel freely in their territory;
- effects of the project on access to areas important for the exercise of rights;
- effects of the project on the experience associated with the exercise of rights including the ability of Indigenous peoples to exercise their rights in a peaceful manner;
- effects the project on Indigenous traditions, laws and governance;
- how the project will affect the planning, management or stewardship of traditional lands and resources by Indigenous peoples;
- how the project will affect the ability of Indigenous peoples to derive future economic benefits from the land or water or to maintain an ongoing relationship with the land or water;
- the way that the project is aligned with the values, political direction and/or objectives of Indigenous peoples in the fight against climate change;
- the manner in which the project and its impacts weaken or strengthen the authority of Indigenous peoples on their territory;
- whether Indigenous peoples have given their free, prior and informed consent to the proponent regarding the information contained in the Impact Statement (from the perspective of each Indigenous people), as well as their consent to the project;
- how the project affects all other components of significance identified by Indigenous peoples; and
- ~~the severity of the impacts on the exercise of rights, as identified by the Indigenous group(s).~~

Commenté [LS13]: captured above input

12.5. Mitigation and enhancement measures

The Impact Statement must describe the mitigation and enhancement measures that will be implemented for all potential effects on Indigenous peoples, as well as on potential impacts to the rights or interests of Indigenous peoples. This includes:

- describe the mitigation and enhancement measures proposed for potential effects as described in the previous sections that will also apply to effects on Indigenous peoples and impacts on their rights, and elaborate on how these measures may vary for each Indigenous group and community;
- describe all reasonable alternatives considered that would avoid impacts on current use of lands and resources for traditional purposes considered during project development;
- describe all feasible courses of action that will be taken to mitigate potential effects of the project on traditional use of lands and resources by Indigenous peoples;
- describe any measures identified to avoid, minimize, offset or otherwise address potential adverse impacts of the project on the rights of Indigenous peoples, how these will be implemented, and identify if these are measures for which the proponent or other parties would be responsible;
- describe if and how these measures will be integrated into the project design, if applicable;

- with respect to mitigation measures proposed by the proponent, the Impact Statement must include perspectives of the potentially impacted Indigenous groups, on the effectiveness of particular mitigation measures on such impacts;
- describe cooperation with Indigenous peoples to identify preferred mitigation measures to avoid, minimize, offset or otherwise accommodate for potential adverse impacts on Indigenous groups or their rights, as well as to optimize the project's benefits for their communities;
- describe efforts to protect ecosystems (i.e. boreal forest) due to cumulative effects in the region to support continued and future use by Indigenous peoples;
- demonstrate how the timing of Indigenous activities on the land was considered when establishing the schedule for project activities;
- describe mitigation measures considered for heritage and structures, sites, and things of significance, as well as contingency plans and communications plans in the event of such discoveries during construction. This plan must include, at a minimum, the person to be contacted, intervention measures and the conditions that would lead to a shutdown and resumption of work;
- provide a intervention plan pertaining to heritage resources and structures, sites, and things of historical, archaeological, paleontological, or architectural significance, if there is a possibility of discovery during construction or development activities. This plan must include, at a minimum, the person to be contacted, intervention measures and the conditions that would lead to a shutdown and resumption of work;
- describe the measures that will be implemented by the proponent for the potential impacts of the project on the exercise of rights, including how the measures directly address the possible impacts of the project on the exercise of rights and the scope of the measures;
- describe the measures that would enhance or support the exercise or practice of rights in the project area;
- describe how the proponent has addressed the suggestions and recommendations made by potentially affected Indigenous peoples;
- propose differentiated mitigation measures, if applicable, so that adverse effects do not fall disproportionately on Indigenous peoples and vulnerable subgroups, and they are not disadvantaged in sharing any positive effect resulting from the project. These mitigation measures should be developed in collaboration with the potentially affected communities and subgroups; and
- describe how the GBA+ results on disproportionate effects have been used to inform mitigation and enhancement measures.

Where no mitigation measures are proposed or mitigation is not possible, the Impact Statement must describe the potential adverse impacts on the rights of Indigenous peoples, as identified by the Indigenous peoples.

13. Other effects

13.1. Potential accidents or malfunctions

The failure of certain works caused by malfunctions, human error or malicious act, or natural events (e.g. flooding, earthquake, landslide, forest fire) could cause major effects. If certain events are expected to occur (e.g. minor spills, road accidents), they should be included as expected effects in the previous sections.

13.1.1. Risk Assessment

The Impact Statement must:

- identify hazards for each project phase and component across the life-cycle including input and fuel supply (natural gas and diluents), upgrader(s) and refinery(ies) that could lead to events of accidents and malfunctions and provide an explanation of how these events were identified (e.g. information sources, recognised risk assessment methodology, professional expertise, similar project, participants' input, etc.);
- take into account the lifespan, design basis, age and current condition of different project components;
- conduct an analysis of the risk of each hazard/adverse event (including likelihood and consequences) including:
  - risk of a spill, release or fire linked to the bitumen / dilbit transport between the BMX mine site and an offsite facility / upgrader(s) or tank farm(s) that may impede, impact or harm traffic along highway 63
  - risk of explosion linked to the project including at upgrader(s);
  - risk of fire linked to the project including at upgrader(s) including those associated with process plants and also stockpiles of coke or sulphur materials;
  - risk of toxic or irritant release (ammonia based, sulphur based, etc) linked to the project including at upgrader(s);
  - risk of flooding from the Athabasca River or tailings pond to the upgrader(s);
  - risk of accidental leaks or failure of pipelines, tailings management facilities and/or tailings disposal areas;
  - risk of an accidental fuel spill, whether minor or major; ~~and~~
  - loss of containment of dangerous goods at permanent or temporary facilities during construction and operation, or during maintenance activities; and
  - loss of containment of radionuclide materials from segregated storage (e.g. dedicated tailings facility or portion) to broader site or off site or into a creek, river or shallow aquifer;
- describe the plausible worst-case scenarios, including;

- the magnitude and extent of effects, including a description of the quantity, mechanism, rate, form and characteristics of contaminants, greenhouse gases and other materials likely to be released or discharged into the environment;
- consideration of the influence of local and regional particularities of the terrain, in particular in terms of topography (e.g. difficult access for interventions) and weather conditions such as snow and ice cover;
- modelling for any contaminants spilled into water;
- potential environmental, health, social, cultural and economic effects, including effects on Indigenous peoples. With respect to human health specifically, consideration should be given to potential pathways of effect associated with surface water, air, country foods, and other relevant media, including short-term and long-term risks to human health;
- relative locations of sensitive receptors (e.g. humans, fish and/or wildlife and their habitat, waterways, private drinking water wells, cabins);
- consideration of timing related to sensitive receptors (e.g. hunting season, tourist season, migration or nesting period); and
- any critical infrastructure, such as local drinking water treatment plants or facilities that can treat water sources affected by the project, as well as the ability and capacity of the drinking water treatment plants or facilities to treat water sources affected by accidental releases from the project during all project phases;

- justify spatial and temporal boundaries for the assessment of effects associated with accidents and malfunctions. The spatial boundaries established for the effects resulting from possible accidents and malfunctions will generally be larger than the boundaries for effects of the project alone and must include nearby and downstream communities; and
- describe incidents that have occurred at the existing Base Mine site, lessons learned and how they have been integrated into preventing future accidents or malfunctions for the proposed project.
- describe how local residents and Indigenous groups will be informed should an accident or malfunction occur including with respect to land users who may be out on the land during unplanned events.

13.1.2. Avoidance and Mitigation Measures

The Impact Statement must:

- describe the mitigation measures and safeguards that would be in place to avoid and prevent accidents and malfunctions, including project design choices and operational considerations;
- describe measures to eliminate or reduce incidents directly impacting highway 63, the known and planned evacuation route for mines and communities to the north of te BMX site, including prevention measures (double wall pipelines, SCADA, thicker pipe walls, enhanced pipeline surveillance for corrosion and erosion, strain gauges, weekly physical transects of the line looking for incipient movement or failure indications), mitigation measures (isolation valves either side of highway 63, planning and countouring for intentional release spots if needed, incorporating intentional pressure release / failure locations distant from the highway), response measures (traffic control equipment and personnel able to respond within 5 minutes, clean up equipment and personnel deployable to a spill within 15 minutes) and contingency measures (plans for and provision of a safe, permanent and all

weather alternate bypass route, perhaps through the BMX site itself, for evacuation, emergency vehicle access and general “shift change” traffic between Fort McMurray and sites north of BMX);

- describe the proposed security measures to reduce the potential for vandalism or other malicious acts that could lead to accidents or malfunctions;
- describe the mitigation measures applicable for the potential adverse environmental, health, social, cultural and economic effects in the event of an accident or malfunction, such as emergency response and repair procedures that would be put in place;
- describe long-term monitoring and recovery measures that would be implemented to manage effects to the environment and health, social, cultural and environment conditions from accidents and malfunctions, including those to remediate affected lands and waters;
- provide details of financial liability and compensation in place pursuant to regulations or the proponent's commitment;
- provide a risk management plan;and
- describe mutual aid arrangements in the event that the incident exceeds proponent resources and how to access these resources.
- describe any plans and protocols that exist or will be developed with Indigenous communities with respect to unplanned events.

13.1.3. Emergency Management

An emergency response plan is required by the AB TOR section 6.2 (Annex I). In addition to, or as a part of this plan, the Impact Statement must:

- identify emergency planning and emergency response zones (section 7.5.1);
- present preliminary emergency measures to respond to such events, including identifying associated response systems and capabilities;
- take into account evacuation areas in the planning of emergency measures as well as the particularities linked to these areas (e.g. number of residents varying with the seasons, possible high number of individuals unfamiliar with the region, limited communication means in remote areas and with temporary residents);
- describe emergency response training and exercise programs, including a description of the participation and training agreements with Indigenous communities that could be impacted by accidents or malfunctions;
- provide a spill response plan and document spill response strategies for each type of spill scenario, including strategic locations of spill response equipment relative to likely accident and malfunction sites and/or likely pathways to sensitive environmental receptors;
- describe emergency communication plans that would provide emergency instructions to surrounding communities, including Indigenous peoples, and how these will be informed by the public and Indigenous groups. The proponent should consider including:
  - immediate urgent actions, such as notifying the public of security and safety concerns, instructions for on-site shelter or shelter-in-place, procedures and evacuation routes; and

- longer-term actions, such as a general website and telephone helplines, updates on the status of incidents, injured animal reports, etc.;

- describe liaison and continuous education plans linked to emergency preparedness for surrounding communities that may be affected by the consequences of a significant incident, including for Indigenous communities; and
- explain how the proponent has made and will continue to make an outreach effort to ensure public and Indigenous groups' understanding of the risks associated with this type of project (e.g. include a non-technical report).

13.2. Effects of the environment on the project

The Impact Statement must consider and describe how environmental conditions, including natural hazards such as severe and/or extreme weather conditions and external events (e.g. earthquakes, flooding, drought, ice jams, landslides, erosion, subsidence, fire), could adversely affect the project and how this in turn could result in effects to the environment, health, social, cultural and economic conditions. The focus should be on credible external events that have a reasonable probability of occurrence and for which the resulting environmental effects could be significant without careful management.

The Impact Statement must:

- provide details of planning, design and construction strategies intended to minimize the potential adverse effects of the environment on the project. This includes details related to any planning for upgrades or Best Available Technology (Economically Achievable) improvements to existing infrastructure or equipment;
- provide information in accordance with section 5.1.5 of the Strategic Assessment on Climate Change (October 2020) on how the project is resilient to, and at risk from, the current and future impacts of a changing climate. This information will include descriptions of:
  - the scope and timescale of the climate change resilience assessment and of the methods used to identify, evaluate and manage the climate risks that could affect the project itself and thereby the surrounding environment; and
  - the project's vulnerabilities to climate change both in mean conditions and extremes over the full project lifetime from project construction to decommissioning. This could include the impacts of extreme weather events on project infrastructure, impacts to water quality and availability, etc.; and
- describe measures to mitigate adverse environmental, health, social, cultural and economic effects resulting from effects of the environment on the project and enhance positive effects.

The resilience assessment should consider multiple scenarios and different probability patterns (e.g. 5-year flood vs. 100-year flood vs PMF[38]), and should discuss the assumptions and data sources used and the

[38] based on cumulative probability, protection based on planning infrastructure for a 5 year flood over a 25 year project life has a 64% likelihood of being exceeded / failing; planning infrastructure for a 100 year flood over the same timeframe has a 22% likelihood of being exceeded / failing. For large value assets with potentially large commercial and environmental impacts, these are high levels of risk.

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confidence or uncertainty in the results. Where in-house models or forecasts are developed to support a specific assessment, the modeling methodology, assumptions, statistical certainty and data sources should be provided.

14. Residual effects

After considering the consequences of technically and economically feasible avoidance, management and mitigation measures, the Impact Statement must describe any residual environmental, health, social, cultural or ~~or~~ economic effects.

The Impact Statement must:

- characterize the residual effects, even if deemed small or negligible, using criteria and language most appropriate for the effect. If an Indigenous group identifies that there are residual effects to rights or interests, those effects should be carried through for residual effects analysis including for interconnected biophysical or social, cultural or economic components;
- consider using the following criteria for residual effects, as appropriate:
  - magnitude;
  - geographic extent;
  - timing;
  - duration;
  - frequency;
  - reversibility; and
  - the ecological, health, social, cultural and economic context within which potential effects may occur. Context should be described and applied as part of the key criteria above, for example:
    - the sensitivity and importance of affected aquatic and terrestrial species, including species at risk and species of importance for Indigenous peoples;
    - the sensitivity and importance of affected habitats and their functions for vegetation, wildlife, birds and fish;
    - the potential for disproportionate residual effects for diverse subgroups as per the GBA+;
    - the disproportionate residual effects for Indigenous peoples as land users, including end land users; and
    - the existence of standards, guidelines and other sources of information to assess effects;
- describe the extent to which the adverse effects within federal jurisdiction and the adverse direct or incidental effects are significant;
- justify the choice of criteria used to determine the extent to which these effects are significant. The information provided must be clear and sufficient to allow the Agency, the review panel, regulatory bodies, Indigenous peoples and other participants to review the effects analysis;
- identify and explain relevant sources of information that were used to characterize the extent to which those effects were significant, including views of, and input from, the public, Indigenous groups, jurisdictions, federal authorities and other participants; and

- where applicable, specify the likelihood of, or potential for, residual effects occurring, and describe the level of scientific uncertainty associated with the data and methods used in this analysis.

The Agency prepared a technical guidance document for *Determining whether a designated project is likely to cause significant adverse effects under the Canadian Environmental Assessment Act, 2012*. The best practices described in this document also apply to the assessment of cumulative effects under the Act.

Other sources of best practices may complement the technical guidance from the Agency and be used by the proponent as reference. For example, regarding species at risk and their habitat, the report *NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk* is a reference to evaluate criteria against applicable thresholds.

15. Cumulative effects assessment

The proponent must assess the project's cumulative effects using the approach described in the Agency's guidance documents related to cumulative effects. The proponent should consult the Agency's technical guidance on *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* to complete its analysis. The best practices described in this document also apply to the assessment of cumulative effects under the Act.

Cumulative effects are defined as changes to the environment, health, social, cultural and economic conditions, after consideration of mitigation measures (residual effects), combined with the effects of past, existing and reasonably foreseeable projects and physical activities. Cumulative effects may result if:

- the implementation of the project may cause direct residual adverse effects to the VC, taking into account the application of technically and economically feasible mitigation measures; and
- the same VC may be affected by other past, present and future physical activities.

A cumulative effect on an environmental, health, social, cultural or economic component may be important even if the project's effects to this component by themselves are minor. Activities from the project itself that generate multiple emissions and discharges (e.g. simultaneous operations) may also need to be considered in the cumulative effects analysis to understand synergistic, compensatory, masking or additive effects.

The Impact Statement must:

- identify the VCs, or their indicators, that will be subject to the cumulative effects assessment;
  - VCs for which the proponent anticipates residual effects from the project must be considered in the cumulative effects assessment;
  - the proponent can refine its analysis by taking into account selected VCs that are most likely to be affected by the project in combination with other past, existing or future projects and physical activities, as well as those identified as being of particular concern in the context of cumulative effects by the public and by Indigenous groups (see list below); and
  - finalization of the selection of appropriate VCs and boundaries for cumulative effects assessment should be informed by consultations with the public, Indigenous groups, other jurisdictions, federal

authorities and other participants. Describe how this information was obtained and how it informed final selection. If a VC or spatial/temporal boundaries were identified through these consultations and not used, provide a rationale;

- include a rationale if VCs are excluded from the cumulative effects assessment;
- identify and justify the spatial and temporal boundaries of the cumulative effects assessment for each selected VC. Take into account that:
  - the boundaries of cumulative effects assessments may differ for each selected VC and should not be limited by administrative boundaries;
  - spatial and temporal boundaries for cumulative effects will generally be larger than boundaries for the effects of the project alone, and may extend beyond the jurisdictional boundaries of Canada;
  - temporal boundaries must be based on appropriate baseline conditions, including a pre-development spatial scale, and should account for all potential effects over the life cycle of the project, including closure and reclamation (see requirements in section 7.3.1 *Temporal Boundaries*~~*Temporal Boundaries*~~; and
  - spatial and temporal boundaries for VCs related to effects and impacts on Indigenous peoples including biophysical compoents related to Indigenous use and culture must be defined in collaboration with the Indigenous peoples concerned;
- identify sources of potential cumulative effects. Specify which other projects or activities that have been or will be carried out that could have, or have resulted or could further result in effects on the selected VCs within the defined boundaries and whether those effects could interact with the residual effects of the project including from project-specific and regional monitoring results. Provide both predicted and actual cumulative effects or changes to VCs.. Clearly explain and justify the process and rationale for selecting other past, existing or future projects or activities to include in the cumulative effects assessment. Projects to be considered include but are not limited to:
  - past, existing and future oil sands mine and SAGD projects;
  - past, existing and future transmission and pipelines;
  - past, existing and future forestry operations;
  - past, existing and future infrastructure projects; and
  - past, existing and future projects and physical activities contributing to the fragmentation of the territory such as roads, exploration wells, quarries, etc.;
- take into account the results of any relevant regional studies or assessments;
- assess the cumulative effects for each VC, taking into account the following;
  - the analysis must include the effects of past and future projects and physical activities in combination with the residual effects of the project, including how the effects may interact (additive, synergistic, compensatory, and masking effects);
  - the analysis of the effects of future projects and physical activities may include a comparison of possible future scenarios with and without the project, but must reflect the full range of cumulative effects and not just the project's contribution (for example potential oil sands process water releases);

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- the effects of past and existing projects and physical activities can be used to put the current state of the VC into context of natural range of variation, but must be included in the cumulative effects analysis;
- cumulative effects for the same VC may need to be assessed using a hierarchy, e.g. effects on local populations of certain species and on the larger populations; and
- consider and describe cumulative effects to Indigenous peoples, and the resources they rely upon, both locally and regionally; and

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- describe technically and economically feasible mitigation measures proposed for cumulative effects on the environment, health, social, cultural and economic conditions, as well as the potential impacts on the rights and interests of Indigenous peoples, including:
  - describe and assess the effectiveness of the measures applied to mitigate cumulative effects;
  - in cases where the mitigation measures for these effects are beyond the proponent's control, identify all parties with the power to act on these measures. In such cases, the Impact Statement shall summarize the commitments of the other parties in relation to implementing the necessary measures and any related communication plan;
  - in cases where there is little or uncertain success in a mitigation measure (e.g. reclamation for traditional use), provide an assessment scenario in the absence of that proposed mitigation;
- assess the regional implications of applying project-specific mitigation and enhancement measures, taking into account any reasonably foreseeable development in the area;
- describe, where appropriate, the extent to which the adverse cumulative effects are significant, taking into account applicable tolerance levels, including those identified by Indigenous groups and other participants; and
- develop a project-specific follow-up program including reporting schedules to verify the accuracy of the assessment and the effectiveness of mitigation measures for applicable cumulative effects. The anticipated effectiveness of mitigation measures must be supported with scientific evidence or tested through study and monitoring as the project proceeds.

The cumulative effects assessment must include consideration of cumulative effects to the rights of Indigenous peoples and their cultures. Both the content and means of presenting this information is to be developed in consultation with each Indigenous group potentially impacted by the project. Proponents are encouraged to collaborate with Indigenous groups in the cumulative effects assessment. The Impact Statement must demonstrate how Indigenous groups were involved in the cumulative effects assessment and in the design of appropriate mitigation measures and follow-up programs. If Indigenous groups do not wish to participate in the cumulative effects assessment with the proponent, the proponent must share a preliminary draft of the cumulative effects assessment on the Indigenous groups' rights and culture with them in order to receive feedback prior to submitting the Impact Statement to the Agency.

The proponent must consider the following cumulative effects raised during the Planning phase in the cumulative effects assessment, or justify their exclusion, where appropriate. The proponent must use the existing history of oil sands mining (since 1964) to validate forecasts of previous oil sands EIAs (by all operators) with actual outcomes to support its forecasts:

- cumulative effects related to fragmentation, including habitat disturbance and loss (both direct and indirect), barriers or changes to movement, and direct and indirect mortality of wildlife species,

including birds and migratory birds (e.g. moose, caribou, furbearers important to Indigenous peoples, fish at the watershed level);

- effects at other project sites due to habitat loss or disturbance in the project area (e.g. changes in the level of risk for birds and other wildlife species interacting with tailings ponds outside the project area);
- effects to water quantity and quality in the Athabasca River, Wood Buffalo National Park and the Peace-Athabasca Delta including all industrial impacts such as mines, in-situ oil sands, linear / utility corridors, OSE programs and seismic, forestry, quarrying, roads and camp sites;
- effects at the watershed scale on water quality;
- effects on navigation from the project in conjunction with surrounding works in the regional study area;
- effects on fish and fish habitat and in relation to the co-ocurrance of Syncrude Canada's MLX project with the BMX project. The revised Fisheries Act includes cumulative effects.Paragraph 34.1(1)(d) states that "…the Minister…shall consider the following factors: the cumulative effects of the carrying on of the work, undertaking or activity referred to in a recommendation or an exercise of power, in combination with other works, undertakings or activities that have been or are being carried on, on fish and fish habitat;" Consideration must also be given to DFO FFHPP Fact Sheet "Consideration of Cumulative Effects Under the Fisheries Act" and "Consultation Paper: Consideration of Cumulative Effects under the Fisheries Act: Engaging with Canadians on Key Issues" available on the "talkfishhabitat.ca" website. DFO Science Sector is presently reviewing two literature reviews in preparation for writing a cumulative effects policy statement.
- effects on migratory birds and their habitats;
- interactions with effects from mining SAGD, forestry, pipelines, transmissions lines, quarries and ancillary projects and activities notably for groundwater and noise, describing how the proponent's groundwater management plan will reduce or eliminate the potential for regional cumulative effects;
- effects from changes in atmospheric conditions, including but not limited to transboundary effects to wildlife habitat due to acid deposition;
- effects from GHG emissions, including effects of climate change on biodiversity and ecosystems;
- erosion and sedimentation of waterways;
- effects on species of interest, species of special concern and species at risk;
- direct and indirect effects related to changes in migratory routes for wildlife species;
- effects of increased access to the area of the project on the current use of lands and resources in the territory by Indigenous peoples;
- effects on the practice of current traditional activities and areas of interest (e.g. medicinal plants, wild berries, and other non-timber forest products);
- effects on the social conditions and culture of Indigenous peoples including cumulative impacts to inequality between Indigenous and non-Indigenous populations;
- effects on community well-being;
- effects on the sustainable development of the area of the project; and
- impacts on the rights of Indigenous peoples, as well as the loss of opportunities to exercise these rights.

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16. Follow-up programs

A follow-up program verifies the accuracy of the effects assessment and evaluates the effectiveness of mitigation measures. The follow-up program will explain the uncertainties surrounding the effects and whether these uncertainties are related to impact assessment predictions or the effectiveness of mitigation measures. The information obtained through the follow-up program may be used to determine whether additional actions are needed to address unanticipated outcomes.

Follow-up programs are an opportunity to continue to consult affected Indigenous peoples and, if undertaken collaboratively, can support solution-oriented approaches to adaptive management through early identification of problems in follow-up programs and appropriate solutions that take Indigenous knowledge into account. Follow-up programs also provide the opportunity to evaluate future environmental performance against predictions made in the Impact Statement and how this will factor into adaptive management plans.

The factors to be considered in developing a follow-up program include the following. The proponent must use the existing history of oil sands mining data to validate forecasts with actual outcomes to support its responses:

- VCs for which residual adverse effects are expected or uncertain;
- methods to the accuracy of the predictions;
- an assessment of the effectiveness of mitigation measures;
- the level of uncertainty regarding the effectiveness of proposed mitigation measures;
- the likelihood of viability of new or unproven techniques and technologies;
- the efficiency of new or unproven techniques and technologies;
- the nature of concerns raised by participants, including Indigenous peoples, about the project including on regional and cumulative effects and on their ability to sustain the exercise of their rights;
- suggestions from Indigenous peoples and local communities on the design of and participation in follow-up and monitoring programs, including community-based monitoring;
- the integration of Indigenous and community knowledge, if available;
- disproportionate effects highlighted by the GBA+;
- the nature of cumulative effects;
- the nature, extent and complexity of the program;
- any technically and economically feasible measures to manage the effects if the mitigation measures applied do not work as intended;
- whether scientific knowledge pertaining to effects is limited, or emerging;
- the parties that will be involved in implementing the follow-up program and reviewing its results;
- existing programs, procedures, and plans that provide relevant standardised or established follow-up and monitoring methods, such as from municipal, provincial, federal, or other appropriate centres of expertise;

- the duration of follow-up program activities, which may vary depending on the VCs assessed;
- any existing follow-up programs relevant to the project, and lessons that can be learned from their results;
- the commitments made by the proponent when the project was reviewed;
- any compensation programs proposed to offset residual effects including through existing agreements or investment opportunities that may be related to the project with repect to that portion of compensation relative to the project in relation to any other projects that may be under its purview;
- how and when the results of the follow-up program will be communicated to interested parties; and
- triggers for adaptive management of any unacceptable or unexpected outcomes.

16.1. Follow-up program framework

The duration of the follow-up program must be as long as necessary to verify the accuracy of environmental, health, social, cultural and economic effects predicted during the impact assessment and to evaluate the effectiveness of the mitigation measures. including any adaptive measures implemented during the life of the project..

The Impact Statement must present a follow-up program that includes:

- how the need for corrective action will be detected and the anticipated effectiveness of that detection;
- the range of potential corrective actions that could be applied and the general circumstances under which each such action would be applied, and the expected success of each such action based on empirically or consistently measured and publicly reported information as well as previous experience;
- how Indigenous groups will be involved in decision-making processes and activities related to the project throughout the lifecycle of the project
- the objectives of the follow-up program and the VCs targeted by the program;
- the list of elements requiring follow-up;
- the main characteristics of each of the recommended follow-up elements, including, but not limited to:
  - the objectives to be achieved (general and specific);
  - a list of the parameters to be measured, including the recommended methodology for each parameter; and
  - the proposed timelines, including the time period(s) involved (e.g. spring flood period, fish migration period), frequency and overall time frame;
- how potentially impacted Indigenous peoples have been, and will continue to be, consulted regarding follow-up programs that may affect them, including on the development of the plans and participation in follow-up measures, such as monitoring, ~~and~~ data gathering and program evaluation throughout the project life;
- the response mechanism used in the event of unanticipated environmental effects or impacts on rights and cultures of Indigenous peoples;
- how project contributions to regional cumulative effects will be monitored and managed;

- the mechanism and schedule for disseminating the results of the follow-ups (deliverables) to relevant stakeholders and per section 1 of the AB TOR (Annex I) plans to maintain the public and Indigenous community engagement to ensure that the public and Indigenous communities will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project;
- the accessibility and sharing of data for the general public.

As also required by AB TOR 2.11B (Annex I), describe adaptive management plans that minimize the impact of the Project. Describe the flexibility built into the project to accommodate future modifications required as a result of:

- any change in environmental standards, limits and guidelines (Including approach to future potential effluent release plans should regulations come into force); and
- findings from project-specific regional monitoring programs where project-specific data is made available to regional initiatives.

To accompany the description of the follow-up program, it is recommended that a table be presented showing the main characteristics for each of the recommended follow-up programs (effect of concern, objectives, parameters, timelines, and targets). It is recommended that an overall schedule be presented in the form of a table compiling all of the stages of achievement for each of the follow-ups, including all deliverables (e.g. baseline status pre-construction, post construction follow-up, follow-up protocol, work and follow-up reports, etc.).

16.2. Follow-up program monitoring

Monitoring is an essential component of effective follow-up programs. Monitoring can determine the potential for environmental, health, social, cultural or economic degradation at any stage of project development. Monitoring can also assist in developing clearly defined action plans and emergency response procedures to address the protection of the environment, health, cultural integrity, socio-economic conditions and human safety.

Monitoring is a component within an adaptive management program and should not be relied on as an acceptable mitigation activity or strategy to minimize the predicted adverse effects and impacts from the project related activities and phases.

The Impact Statement must provide an overview of the preliminary environmental, health, social, cultural and economic monitoring program, which includes:

- current information on the participation of Indigenous groups in existing monitoring activities with respect to project planning, or for projects adjacent to the proposed project (where available);
- the identification of monitoring activities that pose risks to the environment, health, social, cultural and economic conditions or VCs, and the measures and means to protect these conditions;
- the identification of regulatory instruments that include a monitoring requirement for VCs;
- the definition of positions responsible for monitoring and compliance, including for inspections, and confirmation that they are independent of the contractor;

- inspection procedures, as well as the accountability and reporting structure for inspectors. Describe the minimum qualifications and experience required for these roles, including training requirements for individuals who will be undertaking inspection and monitoring responsibilities;
- a description of the follow-up methodology and documentation of environmental, health, social, cultural and economic issues (including Indigenous health, social, cultural and economic issues), taking into account guidelines and methodologies used to establish reference conditions including predevelopment reference conditions;
- a description of the methodology and mechanism for monitoring the effectiveness of mitigation and restoration measures including how and when Indigenous peoples will be notified and incorporated into programing. Include lessons learned from mitigations used both by the proponent as well as from other operators and determination of the effectiveness where those same mitigations are being proposed in part or in whole;
    - To the extent possible, the IS should present data that may be used for a baseline or benchmark in setting targets, thereby providing the foundation needed in the future to demonstrate the effectiveness of mitigation measures.
    - Where such data for bench marks and targets is not presented, a schedule and a process by which such data will be provided and used in the development of follow-up and monitoring targets should be provided. The targets are to be used in defining the expected success of mitigation. As not all indicators or data are conducive to measurement using targets, the IS should clearly indicate where qualitative and quantitative goals are used in place of targets.
- a description of the characteristics of monitoring, where foreseeable (e.g. location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required);
- description of the proponent's intervention mechanisms in the event of the observation of non-compliance with the legal and environmental requirements or with the obligations imposed on contractors by the provisions of their contracts, including a descriptions of the quantitative thresholds that will trigger the need for corrective action;
- description of thresholds that will be used to trigger adaptive management in effects and mitigation effectiveness monitoring including how these thresholds were informed by Indigenous groups;
- procedures and schedules for the production of monitoring reports (number, content, frequency, date, format, duration, geographical scope) to be transmitted to the authorities and Indigenous peoples involved;
- plans, including funding options, to engage Indigenous peoples and local communities in monitoring, where appropriate; and
- quality assurance and quality control measures to be applied to monitoring and reclamation programs.

As also required by AB TOR 2.11C (Annex I), Describe the Suncor's current and proposed monitoring programs with respect to:

- air emissions, including fugitive emissions and for mine fleet emissions the onboard and in-use mine fleet emission monitoring that will be conducted on an ongoing basis to determine and track mine fleet emissions throughout the life of the BMX project;

Commenté [LS14]: Measuring the effectiveness of mitigation, which includes reclamation, requires that both the baseline and the future effects can be quantified. The effectiveness of mitigation measures can only be determined by a monitoring approach that is based on testable or answerable questions, and includes adequate sampling and statistical procedures.

- wastewater treatment and release; and
- hazardous and non-hazardous waste treatment and storage.

Regarding the monitoring of air pollutants that do not have established thresholds for health effects, the Impact Statement must include a description of how monitoring results will be used to trigger the proponent's response mechanisms (e.g. CAAQS for common air pollutants such as fine particles and nitrogen dioxide, and to follow the recommendation of Health Canada that concentrations of arsenic and lead in drinking water be as low as is reasonably possible).

17. Canada's ability to meet its environmental obligations and its climate change commitments

The Government of Canada, through the Act, recognizes that impact assessment contributes to Canada's understanding and ability to meet, first, its environmental obligations, and second, its commitments in respect of climate change.

In accordance with paragraph 22(1)(i) of the Act, the Impact Statement should describe the effects of the project in the context of environmental obligations and commitments in respect of climate change, with a focus on Government of Canada obligations and commitments relevant to decision-making.

Federal environmental obligations relevant to this project include the following:

- the Convention on Biological Diversity and Canada's supporting national framework (e.g. the Canadian Biodiversity Strategy, Canada's Biodiversity Outcomes Framework and the current biodiversity goals and objectives in Canada) as well as its commitments to Indigenous peoples (Articles 8(j) and 10(c) as well as referenced guidelines Akwé: Kon Guidelines regarding appropriate assessment and Tkarihwaié:ri Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity); and legislation that supports the implementation of Canada's biodiversity commitments, including SARA and the *Canada Wildlife Act (1985)*, as well as supporting policies and guidance documents[39];
- recovery strategies and action plans developed under SARA for all species at risk potentially affected by the project;
- the *Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar)*, as implemented in part under the *Federal Policy on Wetland Conservation* and supporting guidance documents such as the *North American Waterfowl Management Plan*; ~~and~~

[39] The proponent is encouraged to consult the publications and resources available on the biodivcanada website

- the *Convention for the Protection of Migratory Birds in the United States and Canada*, as implemented in part under the *Migratory Birds Convention Act (1994)*, and supporting guidance documents on conservation objectives derived from bird conservation regions and strategies;
- ;UNDRIP, 2007
- TRC, 2015: Recommendations 8 and 92

The Government of Canada through a collaborative effort with the Government of Alberta, the Government of British Columbia, the Government of the Northwest Territories, and Indigenous partners have developed an Action Plan to ensure the ongoing protection and maintenance of the Wood Buffalo National Park World Heritage Site. The proponent should ensure the project will not hinder achievement of the Wood Buffalo National Park World Heritage Site Action Plan goals and any associated monitoring or management actions implemented by the Federal-Provincial-Territorial-Indigenous Action Plan Committee.

The Impact Statement must:

- describe the extent to which the effects of the project including its complete life cycle activities and phases (i.e. Scope 1 direct impacts, Scope 2 impacts of its supply and fuel chain including natural gas, diluents, electricity, steel and concrete, and Scope 3 impacts of its downstream impacts via upgrading, refining and ultimate end-use combustion[40]) could contribute to or hinder Canada's ability to meet its obligations;
- describe where the project may enable Canada to meet its obligations, and the proponent's plans and commitments to ensure that positive contributions are respected; and
- describe where the project may adversely affect Canada's ability to meet its obligations, and the mitigation measures and follow-up programs related to those effects.

The Impact Statement must also indicate how community and Indigenous knowledge has been incorporated into the assessment with respect to the potential positive or negative effects of the project on Canada's ability to meet its obligations.

The proponent should refer to the Agency's guidance documents on this topic, including the document *Policy Context: Considering Environmental Obligations and Commitments in Respect of Climate Change under the Impact Assessment Act*, as well as section 8.10 *Climate change* ~~*Climate change*~~ of the Guidelines in reference to climate change commitments.

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[40] oil sands studies generally indicate production of oil sands accounts for about the order of 20% of life cycle emissions while end use is responsible for about the order of 80% of emissions. A preliminary estimate of emissions of the BMX mine activity from Suncor is about 3,000,000 tonnes per year. We estimate (climate change section) about 5,666,625 tonnes per year based on the newest oil sands mine and the existing upgrader. Transport and refining will add to this. As a rough approximation, the overall impact across the project lifecycle may responsible for GHG in the order of 27,000,000 tonnes per year (3,000,000 as Suncor clains x 2 for upgrading and refining + 15% allowance for upstream emissions + combustion accounting for 80%) to 32,000,000 tonnes per year (5,666,625 x 1.1 for refining and refining + 15% allowance for upstream emissions + combustion accounting for 80%). In 2005 Canada's emissions were 730,000,000 tonnes, with a 2030 goal of 30% reduction to 511,000,000 tonnes and a 2050 goal of 80% reduction to 146,000,000 tonnes. BMX could be responsible for 5.3% to 6.3% of Canada's GHG in 2030 and, if unabated, 18% to 22% of Canada's GHG emissions in 2050.

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18. Description of the project's contributions to sustainability

The Impact Statement must characterize a project's contribution to sustainability[41]. The Impact Statement should describe the context of a particular project, including the issues of importance to participants, the diversity of views expressed and the selection of VCs.

The Impact Statement must also describe the project's contribution to sustainability as defined by Indigenous groups.

Once the analysis on potential effects of a project is conducted, the sustainability principles should be applied:

- 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 the designated project; and
- apply the precautionary principle by considering uncertainty and risk of irreversible harm.

The Impact Statement must describe how sustainability principles were applied (outlined above) and identify conclusions drawn from this analysis. This summary should be qualitative in nature, but may draw on quantitative data as necessary.

In addition, the Impact Statement must:

- indicate how the planning and design of the project, in all phases, considers the sustainability principles;
- describe the process in selecting the preferred alternative means and alternatives to the project and how the sustainability principles were considered;
- indicate how monitoring, management and reporting systems consider the sustainability principles and attempt to ensure continuous progress towards sustainability;
- describe the ecological, health, social, cultural and economic benefits and costs of the project to local communities within the study area, potentially affected Indigenous groups, regional, provincial, territorial and/or federal governments; ~~and~~
- describe engagement with potentially affected Indigenous groups and describe measures and commitments to ensuring the sustainability of Indigenous livelihood, traditional use, culture and well-being;
- Describe specific and measureable commitments to ensure reliability and safety integrity and that GHGs do not increase over time as the resource becomes worse / deeper / further to process over

[41] Sustainability, as defined in section 2 of the Act, "…means the ability to protect the environment, contribute to the social and economic well-being of the people of Canada and preserve their health in a manner that benefits present and future generations".

time and as the plant and equipment wear out and become less efficient, tending to increase energy use and emissions over time, even as carbon pricing increases and economic margins presumably tighten; and.

- Describe and justify how the BMX project using a large portion of Canada's allocation of the national finite (and shrinking) GHG budget [in 2030 (5.3% to 6.3%) and in 2050 (18% to 22%) along the BMX project life cycle] contributes to sustainability.

The proponent should refer to Agency guidance on this topic: the *Guidance: Considering the Extent to which a Project Contributes to Sustainability* and the *Framework: Implementation of the Sustainability Guidance*.

This proponent may also make reference to how the Project align with the *Comprehensive Regional Infrastructure Sustainability Plan for the Athabasca Oil Sands Area*, in the Impact Statement (see also AB TOR section 2.2; Annex I).

19. Assessment summary

The proponent must prepare a stand-alone plain language summary of the Impact Statement in both of Canada's official languages (French and English). The summary must contain sufficient details for the reader to understand the project, any potential environmental, health, social, cultural and economic effects, potential adverse impacts on Indigenous peoples, proposed mitigation measures, residual effects and any required follow-up programs.

The Assessment Summary provides an opportunity for the proponent to demonstrate correspondence between issues raised during the planning phase and issues addressed in the assessment. The summary should be presented by VC, which allows the proponent to demonstrate the completeness of the assessment and provide the results of the analysis. The summary must include key maps or figures illustrating the project location and key project components.

The Impact Statement should also include a series of tables as outlined in 21.11 *Summary Tables~~Summary Tables~~*.

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20. Appendix 1 – Reference documents

Atmospheric, acoustic and visual environment

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Note: Key Agency guidance documents are provided from the *Practitioner's Guide to Federal Impact Assessments under the Impact Assessment Act*

21. Appendix 2 – Additional guidance

21.1. List of project activities

The list of project activities, as required in section 3.4 *Project components and activities*~~*Project components and activities*~~, should focus on activities with the greatest potential to have environmental, health, social, cultural and economic effects, or impacts on Indigenous peoples and their rights, as determined by Indigenous groups. Sufficient information must be included to adequately predict adverse and positive effects, the interaction between those effects and any disproportionate effects for diverse subgroups within communities.

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Project activities should include the following elements :

Preparation and clearing

- construction staging, including surveying of work areas;
- excavation and salvage of topsoil, soil and, where present, bedrock, including potentially acid-generating and metal-leaching materials;
- clearing, grubbing, and grading of site, including tree and vegetation removal and timber salvage;
- clearing of transmission corridor for powerlines; and
- seismic and vertical seismic profiling.

Use of Explosives

- blasting; and
- manufacture, storage, transportation and management of explosives.

Construction

- new construction or changes to existing infrastructure including pipelines, powerlines, and access and haul roads;
- installation of site fencing;
- construction of temporary and permanent facilities, including administrative buildings, maintenance facilities, and other ancillary facilities;
- construction of Ore Preparation Plant and Primary Extraction Plant;
- construction of temporary and permanent areas for stockpiling and storing materials, including topsoil; and
- construction of facilities for managing and disposing of tailings materials.

Transportation

- operation of light duty, heavy-duty and mobile off-road equipment (type, quantity);

- transportation and management of borrow material (source and quantity);
- transportation of construction materials, equipment and related infrastructure
- transportation of employees;
- acquisition and deployment on site of various mobile equipment; and
- use and maintenance of access and haul roads.

Activities related to water management or effects

- construction of water management infrastructure to divert, control, collect and discharge surface drainage, groundwater and groundwater seepage to the receiving environment (e.g. collector ditches, groundwater interception wells, sedimentation ponds, sumps, and pump and pipeline systems);
- work related to waterbody or watercourse crossings, temporary or permanent (bridge or culvert);
- water management activities, including information on their location, methods, and timing, such as:
  - water diversions, dewatering or deposition activities;
  - site drainage and runoff management;
  - sediment and erosion control;
  - water recycling and effluent treatment, including information on quantity, treatment requirements, and release point(s);
  - wastewater treatment;water use requirements (e.g. drinking water, water intakes and mining processes, water tanks); and
- any other activity, including temporary structures, that may affect the terrestrial, riparian and aquatic environment, including those carried out in intermittent streams and flood prone areas.

Emergency Services

- general maintenance and emergency services.

Hazardous Materials and Waste Management

- storage, handling, recycling and disposal of fuel, hazardous materials and residual materials, including information on relevant types, methods, quantity;
- waste management, other than for mine waste (disposal, recycling);
- removal of contamination from facilities and equipment, and management of residual contamination; and
- transfer of fuel, hazardous materials and waste to off-site locations upon closure.

Operation

- excavation and disposal of overburden materials;
- bitumen extraction, transportation, and processing;
- drilling, including infill drilling;
- extraction, transportation, and use of aggregate resources;
- mine waste management, including tailings, waste rock, ore, overburden and topsoil;

- storage, handling and transport of materials;
- maintenance and, where appropriate, upgrading of aboveground infrastructure and buildings housing them;
- environmental monitoring; and
- workforce management, including transportation, work schedules and lodging.

Remediation and Treatment

- inventory of mine watses and contaminated materials
- comparison to applicable environmental and human health quality standards
- proposed technologies to treat identified waste inventories to meet applicable quality standards for proposed closure/ reclamation outcomes.
- Limitations to treat mine wastes to meet quality standards and reclamation objectives due to available technologies and economic factors

Reclamation and Closure

- site restoration (works, stockpiling, storage and other affected areas during construction), including, where appropriate, reconnection of drainage systems impacted by construction work;
- activities associated with progressive reclamation, including salvage, stockpiling, and placement of reclamation material, development of surface drainage channels, and revegetation;
- development, monitoring and maintenance of closure landforms;
- plans to engage Indigenous communities on reclamation and closure design, and to develop monitoring criteria to assess the return of equivalent land capability for traditional uses;
- the inclusion and configuration of pit lakes on the post-closure landscape, including overall pit lake water management and whether pit lakes will support aquatic ecosystems. This should include information on the:
  - connectivity to surface and ground waters;
  - presence/absence of tailings;
  - presence/absence of lean oil sands; and
  - fill source (freshwater versus process-affected water) and timing to fill;
- the ownership, transfer and control of the different project components;
- final site reclamation and/or restoration plan;
- ongoing management of fluid tailings, including transportation, treatment, and disposal;
- dismantling and removal of equipment and systems;
- removal of buildings, plants, linear infrastructure, water management systems and ancillary structures; and
- long term care, monitoring and maintaining the integrity of the site (including site drainage and water management) and any remaining structures, including emergency services.

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21.2. Sources of baseline information

Information sources and data collection methods used for describing the baseline environmental, health, social, cultural and economic setting may consist of:

- the federal government, including the departments and agencies with relevant expertise for the impact assessment;
- resources from the government of Alberta (i.e. Alberta Energy Regulator, Alberta Environment and Parks, Alberta Consultation Office, etc.), for example:
  - Alberta species at risk guides and resources,
  - Alberta historic resources guides and resources, and
  - Alberta Natural Heritage Information Centre;
- Bird Conservation Region plans (BCR) and strategies;
- universities;
- field studies, including site-specific survey methods;
- database searches, including federal, provincial, territorial, municipal and local data banks, namely:
  - the Atlas of Breeding Birds of Alberta (2007);
  - other monitoring program databases such as, eBird, Breeding Bird Survey, Christmas bird count, Birds Canada's Canadian Migration Monitoring Network, NatureCounts, and iNaturalist;
  - Birds Canada's Nesting Calendar Query Tool;
  - Species at risk public registry;
  - Health inequalities data tool (Public Health Agency of Canada);
  - Social determinants of health for the off-reserve First Nations population, 15 years of age and older (Statistics Canada);
  - information available under Community and Health System Characteristics (Canadian Institute for Health Information);
  - First Nations Regional Health Survey reports and associated online data (First Nations Information Governance);
  - The Regional Aquatics Monitoring Program database (http://www.ramp-alberta.org/ramp/data.aspx)
  - The Alberta Long Term River Network (LTRN), Lake Water Quality (LWQ) program and other surface water quality data (https://www.alberta.ca/surface-water-quality-data.aspx)
  - The federal (https://www.canada.ca/en/environment-climate-change/services/oil-sands-monitoring.html) and provincial (https://aws.kisters.net/OSM/applications/public.html?publicuser=Guest#waterdata/stationoverview) databases for data generated by the Oil Sands Monitoring (OSM) program.
  - ECCC Long Term Monitorig Water Quality Monitoring Data for the Peace-Athbasca River Basin (https://open.canada.ca/data/en/dataset/0c31b924-9aaf-4ca0-ae29-276bafecf008)
  - Engaged Indigenous group studies, reports, discussions and communications on baseline health condition.

- Alberta Health and Alberta Health Services health statistic databases and reports:
- Interactive Health Data Application (IHDA)
- Primary Care Network (PCN) profiles
- Administrative Health Data
- AHS ACPLF/PHSI: Cancer Community Prevention & Screening Dashboard
- Alberta Environmental Public Health Information Network (AEPHIN)
- Wood Buffalo health data summary report: https://open.alberta.ca/dataset/62df29fc-7d98-4893-b6ce-1d03def3740e/resource/eb2ad230-b15f-480f-852f-95e0fadcd361/download/phc-profile-wood-buffalo-2017.pdf
- -Alberta Health database: http://www.ahw.gov.ab.ca/IHDA_Retrieval/selectCategory.do
- -Alberta Congenital Anomaly Surveillance Report: https://open.alberta.ca/dataset/f8b42b59-ffc6-4b34-9156-27d832bb781c/resource/8bc10915-2fa5-4ccd-8522-a70a132f3feb/download/congenital-anomalies-report-11-2017.pdf

- protected areas, watershed, or national or provincial park management plans;
- assessments and studies that may be made available through work undertaken to advance the achievement of the Action Plan for Wood Buffalo National Park;
- assessments and studies that may be made available through oil sands research or monitoring initiatives;
- natural resource management plans;
- species recovery and restoration plans;
- field measurements to gather data on ambient or background levels for air, water, soil and sediment quality, light levels or acoustic environment (soundscape);
- land cover data including terrestrial ecosystem mapping products, forest cover maps, and remote sensing information.;
- published literature, including specialized publications;
- environmental assessment documentation, including monitoring reports, from prior projects in the area and similar projects outside the area;
- regional studies, project assessments and strategic assessments;
- renewable harvest data;
- Indigenous knowledge, including oral histories;
- expert, community, public and Indigenous engagement and consultation activities, including workshops, meetings, open houses, and surveys;
- participant comments submitted during the Planning phase (posted on the Registry) that may be used to identify specific areas and existing conditions of concern to be considered in the Impact Statement;
- qualitative information gathered from interviews, focus groups or observation;
- census data;
- human health risk assessments (HHRA);
- human health impact assessments (HHIA);

- studies on community well-being and other social, cultural and economic studies;
- community and regional economic profiles; and
- statistical surveys, as applicable.

The Impact Statement must provide detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed to determine for each baseline environmental, health, social, cultural and economic condition that is described, to corroborate the validity and accuracy of the baseline information collected.

The proponent should consult with federal, provincial or local government authorities to determine whether additional data sources and survey methods may be appropriate.

21.3. Ecosystem approach

In describing the biophysical environment, the Impact Statement must 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 Impact Statement must provide a description of the indicators and measures used to determine ecosystem health and integrity, as reflected in the Guidelines. The presence of endangered ecosystems, and rare, limited and/or significant habitat (e.g., federal[42], provincial, or Indigenous protected areas, wildlife sensitivity maps[43], RAMSAR sites[44], and identified or proposed critical habitat in recovery strategies or action plans) potentially affected by the project should be included the description of the biophysical baseline conditions.

The baseline conditions must consider the resilience of relevant species populations, communities and associated habitats to the effects of the project. Ecological processes should be evaluated for potential susceptibility to adverse effects from the project. Considerations include: configurations and connectivity of habitat patches; continuation of key natural disturbance regimes; structural complexity; hydrogeological patterns; nutrient cycling; interactions of biotic components with each other and with abiotic components; population dynamics and genetic diversity, and Indigenous knowledge relevant for the conservation and sustainable use of relevant species populations, communities and associated habitats.

[42] *Canadian Protected and Conserved Areas Database*, available at https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html

[43] *Wildlife sensitivity maps* available at https://www.alberta.ca/wildlife-sensitivity-maps.aspx

[44] *Canada – Ramsar* site, available at https://www.ramsar.org/wetland/canada

21.4. Application of GBA+

methodologies as described in the following two sections to understand potential effects to diverse subgroups within the community including women, youth, elders.

To support GBA+, the information provided in the Impact Statement must:

- must be sufficiently disaggregated to support the analysis of disproportionate effects as per the GBA+. As much as possible, the data must be sub-divided by sex, age and ethnicity and presented distinctly for each Indigenous group and all subgroups forming their communities.
- be sufficient to provide a comprehensive understanding of the current state of health, social, cultural and economic conditions, including trends relevant to GBA+;
- describe how community and Indigenous knowledge from affected populations, including input from diverse subgroups, was used in establishing baseline conditions and informing effects assessments for these subgroups;
- consider that subgroups have different access to resources, opportunities and services;
- consider how the potential effects could particularly affect different subgroups, and how they may respond differently; and
- take into account the circumstances in which diverse subgroups could, due to their special situation, suffer more severe adverse effects of the project than others, or not benefit from future economic benefits.

In the preparation of the Impact Statement, the proponent must adhere to relevant ethical guidelines and cultural protocols governing research, data collection and confidentiality. This is particularly important in the case of information gathered and studies conducted with vulnerable subgroups. Namely, the proponent must respect the obligation of protecting personal information and adopt the established standards for the management of Indigenous data (e.g. the *First Nations principles of Ownership, Control, Access and Possession* (OCAP), or standards adopted by an Indigenous people).

The application of GBA+ should not be limited to simple descriptions of differences but should include an explanation of the underlying causes of these inequalities. Quantitative information, including gender sensitive data, should also be complemented by qualitative insights from studies or consultations, and other sources. Characterizing effects should be based largely on the level of concern expressed through engaging with the affected Indigenous groups and community members. The proponent is encouraged to refer to the Agency's guidance document *Gender-Based Analysis Plus in Impact Assessment*.

21.5. Geospatial data requirements

Where information is required in a map format, the proponent must also provide the Agency with the corresponding electronic geospatial data file(s). The Agency will make the geospatial data files available to the public under the terms of the Open Government License – Canada.

The proponent is required to adopt federal and provincial geospatial data to define modelling domains and local and regional study areas. If alternate domains or study areas are proposed, techcnail rationale as to the appropriateness must be provided.

Metadata included in geospatial files must be compliant with the ISO 19115 standard and, at a minimum, provide:

- title;
- abstract or summary of what is contained in the data file;
- source of the data;
- date of creation for the data;
- the point of contact and originator; and
- must confirm there are no restrictions or limitations on sharing the data.

The proponent should review the Agency's Guidance on submitting geospatial data for more information.

21.6. Reference documents requirements

The impact assessment must be based on information that is publicly accessible. Therefore, the proponent must provide ~~a summary for~~ the documents that served as key references in the Impact Statement that are not otherwise publicly accessible~~, or consider appending them to the Impact Statement~~. The Impact Statement must include a bibliography of all documents and sources of information consulted.

21.7. Establishing spatial boundaries

To establish baseline conditions, the study area boundaries need to encompass the spatial boundaries of the project including any associated project components or related activities, and the anticipated boundaries of the project effects. Since spatial boundaries can vary for each VC, the study area can also vary.

Local and Regional Study Areas should be defined using geospatial data, Indigenous groups areas of interest, modelling predictions and baseline characterization and not pre-determined in the project descroiption phase prior to establishing baseline condition components, as described in thr TISG.

Considerations in assigning appropriate study areas or boundaries would include:

- comparison of modelling predictions for each environmental media to established baseline condition (e.g. spatial boundaries should be defined by the extent and magnitude of predicted impacts and boundary conditions should be identified when baseline conditions are met).
- areas potentially impacted by changes to water quality and quantity or changes in flow in the watershed and hydrologically connected waters, including any interprovincial or territorial borders that that require a transboundary assessment (e.g. the RSA for Aquatic Resources would include complete watersheds to the ends of primary streams);

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- areas potentially impacted by airborne emissions or odours, including any interprovincial or territorial borders that that require a transboundary assessment;
- air zone(s) that are affected – based on consideration of CAAQS, AQMS/Airshed management system[45];
  - air zone CAAQS achievement status, as well as the associated management levels as outlined in the Guidance Document on Air Zone Management (following removal of transboundary flows and exceptional events per the Guidance Document on Transboundary Flows and Exceptional Events;
- existing local major emissions;
- areas within the range of vision, light and sound;
- the locations and characteristics of the key and most sensitive receptors[46];
- terrestrial and aquatic species habitat areas likely to be affected directly or indirectly, usage timing and species migratory patterns;
- sensitive and/or affected receptors, including species, soil types, etc. or due to historical loading/poor buffering, etc.;
- emergency planning and emergency response zones;
- the geographic extent of local and regional services;
- any affected communities;
- areas of importance to people, such as recreational areas;
- all potentially affected Indigenous peoples;
- areas of known current use of Indigenous land, cultural, spiritual and resource use; and
- existing affected infrastructure.

Generally, it is recommended that the proponent establish three spatial boundaries of study areas to assess the impacts on each VC:

- the Project Area: defined as the project footprint, including all temporary and permanent areas associated with the project;
- the Local Study Area (LSA): defined for each VC; and
- the Regional Study Area (RSA): defined for each VC.

[45] See http://airquality-qualitedelair.ccme.ca/en/

[46] Key receptors include sensitive receptors and other current and reasonably foreseeable human receptors that may be affected by project activities. The most sensitive receptors may include, but not be limited to, residences, health and social services institutions (hospitals, long-term care facilities, seniors' residences, etc.), educational institutions (schools, daycare centres, early childhood centres, etc.), tourism establishments (tourism information offices, museums, ski areas, summer camps, outdoor recreation areas, camp sites, etc.), recreational areas (recreational land, urban parks, parks and conservation areas, etc.), and important areas of wildlife use.

The terminology chosen to refer to the Project area, LSA and RSA can vary depending on the context of the project, for example during the project development phase (development area), the assessment methods (modelling area), the effects assessment phase (local or regional effects assessment areas), but it is common to have at least three areas that correspond to the project, the local and the regional scales. For the RSA, which is usually the area used for the assessment of cumulative effects, it will be important to correctly identify which project and past, present and reasonably foreseeable physical activities are included or excluded. The proponent must provide a rationale for each boundary.

The spatial boundaries for the Project area, LSA and RSA for the biophysical VCs should be defined using an ecosystem-centered approach (i.e. the components of the natural areas such as wetlands, birds, species at risk, etc.) and consider habitat functions. For VCs that are defined on the basis of habitat, the proponent should conduct a land cover analysis to determine appropriate ecological boundaries and buffer distances around the project area.

The spatial boundaries for the biophysical VCs should allow the following objectives to be met:

- the diversity of land cover types included in the LSA and RSA is representative of the land cover types found within the LSA and RSA;
    - the spatial pattern of land cover types is even or well distributed within the RSA boundary. Spatial boundaries of the RSA should be changed if one or more land cover types are concentrated in a sub-area and are uncommon in other parts of the region; and
- the land cover patterns within the RSA boundary being drawn show a low to moderate rate of change with increasing distance from the project area.

See the document *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* for more information on establishing spatial boundaries.

21.8. Human health baseline

Baseline information is required on existing human health conditions to prepare the community health profiles. This information must include the current state of physical, mental and social well-being and incorporate a determinants of health approach to move beyond biophysical health considerations. Information sources are described in Section 21.2 (baseline information).

In line with the World Health Organization's (WHO)[47] expanded definition of health in the context of the social determinants of health, a determinants of health approach recognizes that health is more than the absence of disease but rather a state of general well-being, which is influenced by a variety of factors (i.e. determinants). The structural and inequality factors of the socio-economic context would influence the conditions in which people are born, develop, live, work and age. Acting as intermediary factors, these same conditions would in turn influence individual factors (called behavioural and biological factors), which directly affect physical and mental health. This approach recognizes the interdependence of valued

[47] PHAC, 2018. Key Health Inequalities in Canada, Introduction Chapter.

environmental, health, social, cultural and economic components. The selection of determinants can guided by the following references:

- Canadian Handbook on Health Impact Assessment (Volumes 1 to 4). 2004. Health Canada. Accessible at: https://www.canada.ca/en/indigenous-services-canada/services/first-nations-inuit-health/reports-publications/health-promotion/canadian-handbook-health-impact-assessment-health-canada-2004.html.
- the *Social determinants of health and health inequalities* recognized by the Public Health Agency of Canada;
- resources from the National Collaborating Centre for Determinants of Health, such as the fact sheet *What are the social determinants of health?*;
- resources from the National Collaborating Centre for Healthy Public Policy;
- resources from the National Collaborating Centre for Indigenous Health, such as the report *Health inequalities and the social determinants of Aboriginal peoples' health*;
- resources from the National Collaborating Centre for Environmental Health on Health Impact Assessments; and
- the Positive Mental Health Surveillance Indicator Framework.

The following references contain best practices for health impact assessment methods, which the proponent is encouraged to consult:

- *Minimum Elements and Practice Standards for Health Impact Assessment, Version 3* (Bathia et al, 2014);
- resources from the National Collaborating Centre for Healthy Public Policy;
- the Health Equity Impact Assessment (HEIA) Tool by the Ministry of Health of Ontario; and
- *Health impact assessment. A guide for the oil and gas industry* by the International Association of Oil and Gas Producers.

21.9. Mitigation hierarchy

Mitigation measures are technically and economically feasible measures to eliminate, reduce, control or offset the adverse effects of a designated project, and include restitution for any damage caused by those effects through replacement, restoration or compensation. The "hierarchy of mitigation measures" means the descending sequence of the following three options:

- Eliminate: refers to the elimination of effects, such as by changing the location or design of the project. It can also be referred to as "avoidance" of effects.
- Reduce and control: aims to reduce effects to the extent possible, for example, by modifying the most adversely impactful project activities or components or by taking measures specific to the potential effects. There may still be residual effects where measures are not sufficient to eliminate the effects, or where their absolute effectiveness is uncertain. Effects may also be "minimized" when it is not possible to "avoid" them.

- Offset: aimed at offsetting residual effects following consideration of elimination and reduction measures, through measures referred to as “compensation” or “restitution”. For example, where an effect on fish habitat persists, it may be possible to offset through the creation of new habitat (replacement) or to propose measures to enhance or restore degraded habitat conditions. These include measures referred to as replacement, restoration or (financial) compensation.

As a first step, the proponent is encouraged to use an approach based on the avoidance and reduction of the adverse effects at the source, namely consider modifying the design or changing the location of certain project components.

21.10. Compensation and offset plans

In general, these plans should address the following elements, or refer to locations in the Impact Statement where this information is presented:

- describe the baseline conditions of the species at risk, critical habitat, and wetland functions potentially impacted by the project;
- explain and justify the hierarchy of mitigation measures considered;
- identify and describe residual effects that are the subject of the compensatory measures;
- identify a compensation ratio with rationale, including how any policies or guidance provided by federal and provincial authorities and Indigenous peoples have been considered;
- where feasible, identify the location and timing of implementation of compensation projects;
- identify and describe the success criteria;
- identify and describe in detail non-habitat related compensation measures (e.g. predator control);
- describe how the proposed measures align with published provincial and federal recovery management or action plans and strategies for species at risk, or for fish and fish habitat;
- describe how the proposed measures align with published provincial and federal recovery management or action plans and strategies for wetlands;
- identify, if possible, the parties responsible for implementation of the compensatory measures, including monitoring and review;
- identify indicator species for setting compensation objectives. The choice of indicator species should be based on baseline data. Species at risk should not be used as indicator species, since compensation efforts must be specifically directed to these species;
- describe the selection process for proposed compensation sites and associated baseline conditions;
- provide a description of the monitoring schedule and activities to be completed to verify the success of compensation activities; and
- if offsets are required to address residual effects, refer to the *Operational Framework for Use of Conservation Allowances*.

The proponent must explain how Indigenous groups were involved in the development of the compensation plans. The proponent must demonstrate how the information received from Indigenous groups has been taken into account, including the choice of compensation ratios, if applicable. The

proponent must also elaborate on how Indigenous groups will be involved in the implementation of the compensation measures and the evaluation of the success of these measures.

For compensation plans targeting **species at risk**, the proponent can refer to Template 2 in the *Species at Risk Act Permitting Policy*.

With respect to **wetlands**, compensation plans should:

- clearly indicate the location and total area of each type of wetland, as well as their respective locations, for which the residual effects should be mitigated by compensation measures;
- favour the restoration of drained or altered natural wetlands of the same type and function as those affected by the project. Wetland restoration is preferable to wetland enhancement, both of which are preferable to the development of existing wetlands or the creation of new wetlands;
- demonstrate that wetland functions can be replaced by the proposed compensation activities;
- indicate where it is not possible to compensate for the loss of functions in cases where wetlands are unique, perform habitat functions that ensure the survival of a large proportion of migratory birds, or provide habitat for species at risk; and take this information into consideration when developing compensation measures;
- use a minimum ratio of 2:1 for the area of wetlands to be restored or created, versus the original area of wetlands affected. A higher compensation ratio is recommended for wetland types where compensation is more difficult or where there is uncertainty about the success of the compensation measures. The choice of ratio for wetland compensation needs to be justified;
- prioritize compensating for locally affected wetland functions. If this is not possible, the preference is to compensate within the same watershed, and then within the same ecosystem as the one where functions are affected;
- minimize the delay between the time the adverse effects occur and the time habitat and functions are restored; and
- explain how vegetation removals, as well as soil and peat excavation activities will be managed for reclamation of disturbed wetlands (e.g. methods, conditions and timing of stockpiling).

With regard to offsetting plans for **fish and fish habitat**, each offsetting plan should include:

- baseline information, including a description of the environment (biological, hydrological, physical, chemical, etc.), an estimation of the quantity and quality of the environment in question and a description of the issue to address. Ideally, the description of the environment should be accompanied by georeferenced and dated photographs;
- a description of the proposed measures (nature, extent, method, timetable, etc.);
- exact locations for the proposed offsetting measures (latitude and longitude, lot number, municipality, regional municipality county, etc.) and property rights;
- the fish species affected by the proposed measures, including the resulting fish habitat functions (feeding, reproduction, rearing, shelter, growth, migration);
- an assessment of the benefits to fish and fish habitat resulting from the offsetting measures in terms of the significance, magnitude and adequacy of the gains to be achieved with respect to the current situation; and

- a follow-up program to measure the success of offsetting objectives, including the details of its implementation. Offsetting objectives as well as the methods and criteria used to evaluate success (parameters, frequency, duration, etc.) must be clearly identified and described. Deliverables must be identified (e.g. baseline information, follow-up protocol, plans and specifications, work report, follow-up report, etc.), along with contingency measures in case success criteria are not met. The offsetting objectives and the timelines of the follow-up program (including deliverables) should be compiled in one or more tables.

21.11. Summary Tables

The Impact Statement must include a series of tables summarizing the following information:

- potential environmental, health, social, cultural and economic effects and the potential impacts on Indigenous peoples;
- limitations or uncertainties from the available data and assessment;
- potential mitigation and enhancement measures in relation to potential effects and impacts;
- a characterization of the residual effects of the project according to the selected criteria;
- cumulative effects and proposed mitigation measures to address them;
- any other commitments made by the proponent or recommendations made by the proponent to other parties;
- effects falling within an area of federal jurisdiction as well as direct or incidental effects[48] and the extent to which they are significant. According to the Act, effects that fall under federal jurisdiction are as follows:
  - change to the following components of the environment that are within the legislative authority of Parliament:
    - fish and fish habitat, as defined in subsection 342(1) of the *Fisheries Act*;
    - aquatic species, as defined in subsection 2(1) of the *Species at Risk Act*; and
    - migratory birds, as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*;
  - a change to the environment that would occur:
    - on federal lands,
    - in a province other than the one where the physical activity or the designated project is being carried out, or
    - outside Canada;

[48] According to the Act, direct or incidental effects are defined as "effects that are directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of a physical activity or designated project, or to a federal authority's provision of financial assistance to a person for the purpose of enabling that activity or project to be carried out, in whole or in part.

- with respect to the Indigenous peoples of Canada, an impact — occurring in Canada and resulting from any change to the environment — on:
  - physical and cultural heritage,
  - the current use of lands and resources for traditional purposes, or
  - any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; and
- any change occurring in Canada to the health, social or economic conditions of the Indigenous peoples of Canada.

21.12. Additional guidance for biophysical components

Atmospheric environment

The following guidance should be consulted in conjunction with section 8.4.1 *Atmospheric environment~~Atmospheric environment~~*:

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- project sources of air pollutant emissions include the following types of sources:
  - point sources: include but are not limited to power generation equipment (i.e. gensets), fire pump stacks, turbines, compressor engines, incinerators, exhaust vents and stacks from processing facilities, ventilation vents, boilers and other heating equipment, flares, idling transport vehicles, fugitive emissions from storage tanks and leaks from gas pipes and other equipment. Where applicable, emissions from start-up and shut-down taken into account;
  - area sources: include material handling and transport, wind erosion of material piles, fugitive emissions from exposed mine faces, fugitive emissions from process areas and tailings management areas; and
  - mobile and road sources: include tailpipe emissions and fugitive dust emissions. Fugitive dust emission factors (e.g. road dust) and assumed mitigation (control efficiency) should be described and should be justifiable based on what is practicable. Tailpipe emission factors should be estimated using established methods. Include all off-road and on-road fleet vehicles used in the project;
- when providing detailed methodology and assumptions used to estimate emissions, all relevant emissions factors should be provided and referenced. For all applicable emission sources, include the assumed Tier of emission standard for each emission factor applied.
  - For the mine fleet: include the number and vehicle descriptions for all mine fleet and assumptions with activity data such as a breakdown of annual gross operating hours by fleet unit.
  - For the mine face (fugitive emissions): provide the location of the mine face areas and the surface of each area.
  - For flaring: provide details of the occurrence of flaring and associated assumptions. Describe the gas composition under both normal and upset flaring conditions;

- for requirements pertaining to the use of atmospheric dispersion modelling, the proponent should:
  - conduct modelling for a 5-year period, to account for variability in meteorology and baseline conditions;
  - conduct modelling for all relevant temporal scenarios (see section 7.3.1 *Temporal Boundaries*~~*Temporal Boundaries*~~), including: the pre-regional development case, current operations case (all existing emission sources), base case (account for all existing emission sources plus projects already approved and under construction), a project-alone scenario (recommended in order to represent emissions from the project only), the application case, and the planned development case; and
  - ensure appropriate domain boundaries. At a minimum, the modelling domain should enclose concentrations that are 10% of relevant air quality criteria;
- photochemical modelling may be necessary to model long range transport, as well as transformation processes that are beyond the capabilities of standard models, particularly for secondary organic aerosols (SOA) and acid deposition;
- the assessment of the project's emissions of acidifying pollutants, and potential to adversely affect ecosystems in the region, should include Northern Alberta, Northern Saskatchewan, the southern NWT, and NE British Columbia (boundary corners approximately at: 53N and 122W, 53N and 100W, 62N and 100W; and 62N and 122W);
- for requirements pertaining to the use of modelling for acidifying deposition, the proponent should consider the following technical requirements:
  - model simulations should be for a minimum of 1 year and should be conducted at minimum for the base case and the application case;
  - the model's horizontal resolution should comprise a horizontal grid cell size equal to or less than 12 kilometres within the region modelled;
  - the model chosen should be capable of a rigorous representation of gas and particle chemistry and physics and long range transport, to provide an estimate of acidifying deposition, and must include the explicit treatment of the following key processes:
    - chemical mechanism similar in complexity to the following mechanisms: Carbon-Bond4, Carbon-Bond5, SAPRC07, SAPRC11, RACM2, ADOMII,
    - gas dry deposition,
    - size-resolved particle dry deposition,
    - cloud (aqueous) chemistry, particle uptake into and formation from clouds and rain drops,
    - wet deposition from clouds to the surface,
    - size-resolved particle microphysics (particle nucleation, condensation, coagulation as a function of particle size),
    - inorganic particle heterogeneous chemistry, and
    - SOA formation; and
  - key chemical species the model must include are: size resolved chemically speciated particles (particle sulphate, nitrate, ammonium, base cations, water soluble iron and manganese, primary organics, secondary organics, sea-salt, black carbon, crustal material), gases (including, but not

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limited to NO, NO_2, SO_2, H_2O_2, speciated volatile organic compounds, ozone, NH_3, HNO_3, PAN, HONO, HNO_4, one or more organic nitrates, N_2O_5), and ions within precipitation (SO_4^{2-}, HSO_3^-, NH_4^+, base cations). The model must include the dry (gases, particles) and wet (ions in solution) deposition fluxes of these species.

Wetlands

The following guidance should be consulted in conjunction with section 8.6 *Vegetation and riparian, wetland and terrestrial environments*~~*Vegetation and riparian, wetland and terrestrial environments*~~.

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With regards to the wetlands functions assessment, the proponent should:

- complete the assessment for a representative selection of wetlands that the Project would directly impact and for a representative selection of wetland(s) that are hydrologically connected. In conducting this assessment, the Proponent should ensure that wetlands are considered in the context of:
  - the larger watersheds of which they are a part;
  - adjacent land use with a focus on hydrological and other functions;
  - landscape and/or watershed considering topography, soil types and hydrological linkages; and
  - the global significance of peatlands across the regional study area;
- collect data from representative wetlands in a manner that enables reliable extrapolations in space (i.e., at minimum to Project, Local and Regional Study areas) and in time (i.e., across years), including:
  - design surveys so that they represent the spatial and temporal targets of modeling and extrapolations, and to produce scientifically defensible predictions of impacts and estimates of mitigation effectiveness.
    - Survey designs should be sensitive enough to detect and quantify the impacts at the spatial and temporal scales identified above (i.e., project study area, local study area, and regional study area), any departures from predictions, and the effectiveness of mitigations. Justify the selection of modeling techniques based on current and recent scientific literature;
  - plan survey protocol for representative wetlands to include modeling and simulations to estimate sampling requirements, and analysis to evaluate resulting design options.
    - Sample size must be planned to support evaluation of the project study area within the context of the local study area and regional study area. Appropriate design of surveys will need to consider multiple survey locations in order to represent the wetland heterogeneity of the regional study area, and to yield multiple survey locations per wetland type, without requiring aggregation of habitat classes post-hoc;
- provide this assessment in a quantitative form and include the collection of site-specific baseline information on wetland functions, including:
  - surveys to assess for the presence, abundance, density, and distribution of migratory birds and federally listed species at risk, provincially listed species at risk, and species assessed by COSEWIC as at-risk in relation to potentially affected wetlands and associated riparian areas. Surveys should meet appropriate standards, be species or bird group specific as appropriate, and be conducted during the appropriate times of the year as specified for *Birds and their habitat*~~*Birds*~~

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~~*and their habitat*~~. Surveys for species at risk should assess species individually where possible (typically an indicator approach is not appropriate for species at risk). Surveys should not be limited to species or groups of species that are wetland-obligate, but rather should include any species known to use wetland habitats as part of its lifecycle. Data should be sufficiently robust to identify which wetland classes are important to which species (and for how many);

- the spatial location and a description of the biological characteristics of each potentially affected wetland and the ecological services and functions (hydrology, biochemical cycling, habitat, climate) they provide. The functions assessment should be as specific as possible to the biological characteristics of the wetland and to the ecological services and functions it provides; and
- a supporting rationale and detailed description of the methods used in completing the wetland functions assessment, including sampling design;

- submit complete data sets from any survey sites, including GIS files, compliant with the requirements outlined in section 21.5 *Geospatial data requirements*~~*Geospatial data requirements*~~; and
- contact the relevant provincial and local government authorities to determine if other wetland conservation policies, regulations or wetland compensation guidelines apply. See also resources available from The Wetland Network.

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Birds and their habitat

The following guidance should be consulted in conjunction with section 8.8 *Birds, migratory birds and their habitat*~~*Birds, migratory birds and their habitat*~~:

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- the proponent should consider and assess the following groups of migratory and non-migratory birds as valued components: waterfowl, water birds (other than waterfowl), songbirds, shorebirds, each bird species at risk and their habitat;
- in order to establish adequate baseline conditions for birds, the proponent should take into account the following technical recommendations:
  - collect bird data to adequately represent the following temporal sources of variation: among years, within and among seasons (e.g., spring migration, breeding, fall migration, overwintering), and within the 24-hour daily cycle.
  - collect and include explanatory data (i.e. covariates) necessary for modeling in such a way as to adequately represent the following sources of variation: spatial variation in land cover composition, soil type, geomorphology, hydrological processes, climatic conditions, and temporal variation in local weather (inter-annual and intra-annual climatic variability).
  - collect data in a manner that enables reliable extrapolations in space (i.e. at minimum to the project area, LSA and RSA) and in time (i.e., across years).
  - design surveys so that they represent the spatial and temporal targets of modeling and extrapolations, and to produce scientifically defensible predictions of impacts and estimates of the effectiveness of mitigation measures. Survey designs should be sensitive enough to detect and quantify: the impacts at the spatial and temporal scales identified above (i.e. project area, LSA, RSA), any departures from predictions, and the effectiveness of mitigation measures. Justify the selection of modeling techniques based on current and recent scientific literature.

- survey protocol planning should include modeling and simulations to estimate sampling requirements and analysis to evaluate resulting survey options. It is recommended to:
    - collect field data over at least two years. The goal of collecting data over multiple years is to improve the understanding of natural variability in populations. Two years of sampling is suggested as a minimum. As the number of sampling years increases so does the understanding of natural variability;
    - plan sample size to support evaluation of the project study area within the context of the local study area and regional study area. Appropriate design of surveys will need to consider multiple survey locations in order to represent the habitat heterogeneity of the regional study area, and to yield multiple survey locations per land cover or habitat class, without requiring aggregation of habitat classes post-hoc;
    - design sampling effort per unit area - field survey effort to be most intensive within the project study area. The level of effort per unit area may be similar or somewhat less within the remainder of the LSA, but should be scaled to the likelihood that project effects will effect birds within that zone. Efforts outside the project study area should be carefully designed to ensure that estimates comparing within and across the project area, LSA, and RSA are unbiased and as precise as possible; and
    - use simulation modelling to assess bias and precision between project area, LSA, and RSA to ensure the estimates are useful for comparison;
- when selecting biodiversity metrics to characterize avifauna biodiversity, it is recommended that:
    - biodiversity metrics for each VC should include the following: distribution in space, frequency of occurrence, occurrence and abundance trends in time, abundance and density, as well as the types of associated habitats and the strength of the associations; and
    - species communities should not be grouped together by diversity indicator and should not be limited to the indicator species. The identification of species, distribution, abundance and, when possible, estimates of species' breeding status should be the main quantification objectives;
- when estimating for the abundance and distribution of migratory and non-migratory birds, the proponent should:
    - base estimates on existing information, or additional surveys, as appropriate, to provide current data sufficient for reliable estimates. At minimum, the combined information from existing data and field surveys needs to be detailed enough to describe the distribution and abundance of all bird species in relation to the study areas;
    - generate measures of abundance and distribution using spatially balanced, randomly selected sample locations. Sampling should include edges and transitions between habitat types and should not be focused exclusively within homogeneous patches of a given habitat type.
        - Use simulation modelling prior to sampling to ensure coverage is broad enough to estimate and account for detection error as well as provide unbiased estimates of abundance and distributions.
        - Sampling within temporal boundaries should be spatially and temporally balanced so that all spatial areas receive comparable temporal coverage;

Commenté [LS16]: This is relevant and should be indicated under "Wildlife" and "Species at Risk" (below) as well, not just for birds and migratory birds.

This guidance should ensure adequate sample sizes for baseline datasets which is useful for improving prediction accuracy and for use in follow-up monitoring programs to evaluate predictions and mitigation effectiveness.

- provide estimates of confidence or error for all estimates of abundance and distribution. Define estimates by providing, for example, mean across years, mean across sites, and modeled prediction. If appropriate, define confidence or other intervals such as 95% confidence intervals or other credible intervals. The use of hypothesis testing p-values is generally not appropriate in this context and their use should be justified;
- whenever estimating densities for species, consider observer-induced detection error for comparisons among counts to be valid (e.g. between, before and after surveys, or between affected and unaffected sites). When accounting for detection error the method used should account for variable detection between land cover types, observers, weather, time of year, species, as well as random variation between visits. Simulation methods can help determine if a specific method is appropriate for a given survey design and analysis. Care should be taken to avoid affecting the reliability of abundance estimates[49];
- sse a spatially dispersed stratified random sampling approach to maximize efficiency. Sample sites should be selected with a randomization procedure that accounts for the project design footprint. To select specific sampling sites, care should be taken to ensure sites are spatially distributed across the area of interest and coverage is obtained across habitat types. Site locations should be randomly selected using an approach that avoids implicit bias in site selection; and
- provide a justification on the approach chosen and include all criteria used to choose plot locations in the Impact Statement. If necessary to constrain or adjust site selection based on access limitations, simulation modelling should provide evidence that this sampling strategy has not resulted in the introduction of bias. Survey vegetation features of concern in a manner that is not disproportionate to other types. Avoid bias in estimates of abundance and impair extrapolation and statistical inference;

- the following must be considered when identifying areas of concentration of migratory birds:
  - migratory bird concentrations can vary within a year and between years. It is therefore important to survey across the project study area, local study area, and regional study area both temporally and spatially;
  - migratory bird counts can vary strongly between years and so survey length must be able to estimate the variation accurately; and
  - migratory bird counts are dependent on length of stay as well as presence. Attempt to estimate abundances across a migratory period should incorporate an estimate of inter and intra-annual trends and estimates of lengths of stay. Irruptive species may act in ways similar to migrants in terms of abundance. They may be absent from an area until conditions change (such as a mast event), during which time the habitat becomes vital to these species;
- to quantify trophic linkages in the project area and the LSA, the proponent should consider using Structural Equation Models;
- in the baseline description for bird habitats, the proponent should include at a minimum, characterization of biophysical conditions with regard to ecoregion and Bird Conservation Region (BCR), and include local aerial and on-site photos. Habitat surveys need to be detailed enough within

[49] see Barker et al. 2018 Biometrics: https://onlinelibrary.wiley.com/doi/full/10.1111/biom.12734

the local and regional study areas to provide context for local and regional habitat availability and quality.

- Mixed wood and old-growth forest land cover and other upland vegetation types may be particularly important for many forest associated birds, supporting birds during migration, breeding and through the winter. Peatlands and wetlands including fens and bogs are ecologically important elements of the landscape. River riparian corridors are another relatively uncommon feature with adjacent mixed wood forest.
- Should there be anticipated displacement of nesting birds, baseline data should provide evidence that there is enough equivalent habitat for birds to be displaced to and that the habitat being removed is not unique to the project area or region. This information may serve to inform reclamation planning; and

- the proponent should curate survey data and analyses in such a way that it may be made available to participants for review upon request. It is recommended that the proponent be prepared to:
  - provide raw survey data and analysis results for 1) all birds, 2) each VC, and 3) BCR priority species showing the species ranked according to: frequency of occurrence[50], abundance, abundance in each habitat type;
  - data sets from all survey sites should be in the form of complete and quality assured relational databases, with precisely georeferenced site information, precise observation/visit information and with observations and measurements in un-summarized form;
  - provide documentation and digital files for all results of analyses that allow for a clear understanding of the methods and a replication of the results (raw scripts or workflows are preferred in place of descriptive documentation); and
  - the analysis of predicted effects on birds should:
    - include separate analyses for each activity, component and project phase;
    - distinguish between migratory and non-migratory birds;
    - consider sources of error for all analyses to ensure that the final effects predictions indicate the best estimate of precision;
    - explicitly explore, wherever possible, non-linear, indirect and synergistic responses to the project; and
    - justify any assumptions regarding relocation or temporary displacement during construction and operation of the project by using scientific references.

Wildlife

The following guidance should be consulted in conjunction with section 8.9 *Wildlife and its habitat* ~~*Wildlife and its habitat*~~

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[50] Frequency of occurrence: % frequency for Species A = (# sampling locations in which Species A detected / total # sampling locations) * 100

- collect wildlife data for animal species and species at risk to represent the sources of ~~time~~ temporal variation between years, during and between seasons (e.g. spring migration, breeding, fall migration, wintering), and in the daily 24-hour cycle;
- rare species require more survey effort to detect than common species, and this needs to be accounted for in survey design by increasing the number and duration of surveys; and
- the proponent should curate survey data and analyses in such a way that it may be made available to participants for review upon request. It is recommended that the proponent be prepared to:
  - submit complete data sets from all survey sites. These should be in the form of complete and quality assured relational databases, with precisely georeferenced site information, precise observation/visit information and with observations and measurements in un-summarized form. Databases and GIS files should be accompanied by detailed metadata that meets ISO 19115 standards; and
  - provide documentation and digital files for all results of analyses that allow for a clear understanding of the methods and a replication of the results (raw scripts or workflows are preferred in place of descriptive documentation).

Species at Risk

The following guidance should be consulted in conjunction with sections 8.8 *Birds, migratory birds and their habitat* ~~*Birds, migratory birds and their habitat*~~ and 8.9 *Wildlife and its habitat* ~~*Wildlife and its habitat*~~

- the preliminary list of species at risk that may use the project study area and local study area is as follows:
  - Bank Swallow (*Riparia riparia*);
  - Barn Swallow (*Hirundo rustica*);
  - Canada Warbler (*Cardellina canadensis*);
  - Common Nighthawk (*Chordeiles minor*);
  - Evening Grosbeak (*Coccothraustes vespertinus*);
  - Horned Grebe *(Podiceps auritus*);
  - Olive-sided Flycatcher (*Contopus cooperi*);
  - Peregrine Falcon (*Falco peregrinus*);
  - Rusty Blackbird (*Euphagus carolinus*);
  - Short-eared Owl (*Asio flammeus*);
  - Western Grebe (*Aechmophorus occidentalis*);
  - Whooping Crane (*Grus americana*);
  - Yellow Rail (*Coturnicops noveboracensis*);
  - Western Toad (*Anaxyrus boreas*);
  - Little Brown Myotis (*Myotis lucifugus*);
  - Northern Myotis (*Myotis septentrionalis*);

Commenté [LS17]: Technical recommendations under "Birds and their Habitat' are relevant for wildlife..

The guidance should ensure that adequate sample sizes for baseline datasets are achieved, which will improve prediction accuracy and provide a strong foundation for monitoring programs that will evaluate predictions and mitigation effectiveness.

With respect to wildlife models, the ability to compare modelling results across impact assessments in the region is critical for understanding impacts to wildlife across the region. Models should be standardized and input from all relevant parties (i.e., Indigenous communities, regulators, and other stakeholders) should be incorporated into the model development process. The models must be validated using independent data and any uncertainties have to be acknowledged, discussed and addressed.

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- Caribou (*Rangifer tarandus*; including West Side Athabasca, East Side Athabasca and Richardson ranges);
- Grizzly Bear (*Ursus arctos*); and
- Wolverine (*Gulo gulo*);

- the proponent should consult the Species at Risk Public Registry to obtain information on the list of species at risk and their protection status, as well as available recovery strategies. The proponent is responsible for ensuring that the most up-to-date documents have been used and that the status of the species is up to date.
- for surveys of species at risk, the proponent should:
  - take into account that the detection of species at risk will require more survey effort, since they are generally less abundant, which needs to be considered in the survey design by increasing the number and duration of surveys. It is recommended to:
    - collect wildlife data in order to represent sources of time variation between years, during and between seasons (e.g. spring dispersal and migration, breeding, fall migration, wintering), and in the daily 24-hour cycle;
    - collect field data to account for natural variability in populations. To achieve this, a minimum of two years of inventory is normally required. However, if existing data are available for the study area, it can be used to complement the data collected in the field (minimum one year). The available data must be sufficiently robust to assess the variability of populations between years and a demonstration must be presented for that purpose;
    - plan the sample size to ensure sufficient assessment of the project area in the context of the LSAs and RSAs. Survey design will need to consider multiple number of survey locations in order to represent the habitat heterogeneity of the regional study area, and to plan the number of survey locations per land cover or habitat class so that aggregation of habitat classes post-hoc is not required. In terms of sampling effort per unit area, focus primarily on field surveys within the project area. The level of effort per unit area may be similar or slightly lower in the remainder of the LSAs, but should be proportional to the likelihood that project effects will affect species at risk in that area. Actions undertaken outside the project area must be carefully designed to ensure that comparative estimates between the project area, LSAs and RSAs are unbiased and sufficiently accurate;
    - preferably use stratified random sampling of habitat. Sample sites must be selected using a random procedure such as a GIS grid overlay;
    - plan to include several sampling stations and several visits to each station to support all required assessment analyses;
    - inventories and analyses should be conducted by qualified experts; and
    - consult recovery plans for which a survey schedule would have been created to identify information gaps for these species, including for the designation of critical habitat;
- the proponent should consult provincial government experts on appropriate survey methods for bats, document baseline conditions in the project area and LSA, and provide a rationale for the methodology used. It is recommended to:
  - conduct site-specific surveys to provide an overview of the species (present/undetected);

- quantify bat baseline activity (e.g. using acoustic detection to calculate a bat activity index) to assess the relative use of different habitats or features in the project area in order to evaluate and justify decisions regarding project location and anticipated impacts. In addition, locate and confirm the use of high-value features such as nurseries and resting sites (such as hollow trees and buildings), feeding areas and hibernacula;
- identify potential regional migration corridors and identify site-specific travel corridors and movement patterns;
- include the following types of surveys:
  - acoustic surveys, ensure study design is statistically valid; and
  - continuous acoustic monitoring throughout the night (at least from sunset to sunrise: 30 minutes before sunset to 30 minutes after sunrise is recommended), active season (spring dispersal/migration, summer breeding/fall migration and swarming [fall staging]), as well as appropriate surveys of hibernation sites;
- locate and assess potential hibernation sites for bat use, taking into account the inter-annual and seasonal variability of use;
- include, in date or reports, information on the acoustic detection methods used, including: detector make and model; microphone model used; location of detectors; height of microphones; orientation of microphones; special housing that may affect microphone; sensitivity (e.g. wind screen, cones, weatherproofing); mounting method (e.g. meteorological tower, pole); device-specific settings (e.g. gain/sensitivity, etc.); recording mode (i.e. full spectrum or zero crossing); and a summary of any equipment failure issues and a description of procedures used to ensure equipment was functional during deployment (including ensuring microphone sensitivity remains within an acceptable range);
- clearly describe how a bat "passage" is defined, consistent with the definition used for any control group, and justify the choice of modality;
- clearly describe the methods used for acoustic identification, including validation procedures, species classification criteria and software used, if applicable (including versions and parameters); and
- take into account that when results are compared from year to year, the survey schedule, the equipment and the installation protocols must remain consistent from year to year;

- concerning the description of the effects on bats, the proponent should:
  - consider all effects on overwintering habitat (hibernacula, such as caves, abandoned mines and wells); summering habitat (roosting and foraging habitats, including maternity roosts), swarming habitat (used in late summer and early fall for mating and socializing), and movement corridors when assessing effects on local and regional populations; and
  - identify potential resting areas, maternity roosts, hibernacula, foraging habitat and movement corridors in the local area, as well as the project's potential impacts on these habitats or on their particular functions for bats; and
- for the analysis of effects on species at risk, it is recommended to provide a separate analysis for each species at risk, including separate analyses for each activity, component and phase of the project. To fully understand the effects or benefits of one alternative over another, all parameters relevant to species at risk should be considered.

Habitat features

In the baseline and effects descriptions concerning habitats for wildlife, including bird and species at risk, the proponent should identify and consider the following habitats features and important landscape characteristics:

- cross reference between fish inhabitants of water bodies and streams with fish eating birds and mammals.
- waterbodies, wetlands and watercourses,
- riparian habitat, stream or river banks or other eroded habitats,
- artificial water sources,
- forests, trees patches, forest edges and rows of trees,
- ridges, eskers, caves, mines,
- talus,
- karst topography,
- buildings, bridges and other anthropogenic features, including linear features (e.g. roads, electrical transmission lines),
- sources of artificial lighting attracting insects,
- critical habitat of species at risk, and
- any other habitat feature known to be important.

Annex I – Draft Provincial Terms of Reference

[English only]