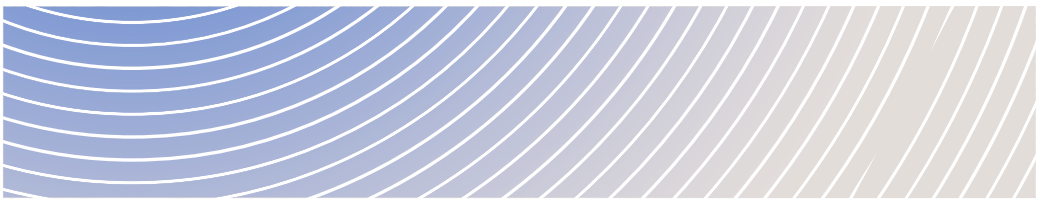
[Draft] Tailored Impact Statement Guidelines Template (nuclear reactors version)

FOR DESIGNATED PROJECTS SUBJECT TO THE *IMPACT ASSESSMENT ACT* AND *NUCLEAR SAFETY CONTROL ACT*

DRAFT FOR PROPONENT



This is a draft document. Contents may change as a result of ongoing engagement and feedback received.

Impact Assessment Agency of Canada | Agence d'évaluation d'impact du Canada

Canada

Contents

Abbreviations and Short Forms

Term	Definition
IAA	Impact Assessment Act
IAAC	Impact Assessment Agency of Canada
BAT/BEP	Best Available Technologies / Best Environmental Practices
BCRs	Bird Conservation Regions
CCME	Canadian Council of Ministers of the Environment
COPC	Contaminant of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
GBA Plus	Gender Based Analysis Plus
the Guidelines	Tailored Impact Statement Guidelines
GHG	Greenhouse gas
HHRA	Human Health Risk Assessment
LSA	Local Study Area

LTPS	Licence to Prepare a Site
Minister	Minister of Environment and Climate Change
PA	Project Area
PAH	Polycyclic aromatic hydrocarbons
Registry	Canadian Impact Assessment Registry
RSA	Regional Study Area
SARA	Species at Risk Act
SACC	Strategic Assessment of Climate Change
SSC	Structures, Systems, and Components
the Template	Tailored Impact Statement Guidelines Template
VC	Valued component

Using the Template

Instructions for using the template are shown in grey boxes, which are to be removed in project-specific Guidelines issued to proponents.

A key element for the integrated federal impact assessment process is the introduction of integrated Tailored Impact Statement Guidelines (the Integrated Guidelines), which will provide direction and requirements for the proponent in preparing an Impact Statement. The Impact Assessment Agency of Canada (IAAC) and the Canadian Nuclear Safety Commission (CNSC) will tailor the Integrated Guidelines for each designated project during the Planning phase of the impact assessment. Tailoring is based on the nature, complexity and context of the project, and is informed and guided by the Initial Project Description, response to the Summary of Issues, and any required Detailed Project Description. It is also informed by consultation and engagement with the public, Indigenous groups, other jurisdictions (e.g. provinces, Indigenous governments), federal authorities and other participants during the Planning phase.

The following Integrated Tailored Impact Statement Guidelines Template (the Integrated Template) is the starting point for the tailoring process, which will ultimately lead to the Integrated Guidelines for a project. The Integrated Template sets out a comprehensive list of potential information requirements that may be included in the Integrated Guidelines. The Integrated Template is intentionally written to be broad and inclusive of the information requirements for a nuclear reactor project and is intended to support a holistic impact assessment that recognizes that projects will have both adverse and positive effects. The Integrated Template is meant to facilitate the tailoring process, to provide transparency, and to maintain consistency among guidelines. It is also provided so proponents can be aware of what information may be required in an Impact Statement.

Through the tailoring process, IAAC and the CNSC will identify the project-specific information requirements necessary for a proponent to submit a complete and detailed Impact Statement that captures the requirements under the *Impact Assessment Act* (IAA) and *Nuclear Safety Control Act* (NSCA). IAAC and the CNSC will remove information requirements in the Integrated Template that are not relevant to the project (information in square brackets throughout the Integrated Template represent optional text that may be included in project-specific circumstances and is highlighted to facilitate tailoring). IAAC and the CNSC will also adjust the level of detail for specific information requirement(s), based on the anticipated relevance to the impact assessment. Additional information requirements beyond what are identified in the Integrated Template may be included in the Integrated Guidelines for individual projects, where required.

During the Planning phase, draft Integrated Guidelines will be posted to the Canadian Impact Assessment Registry (the Registry) for public comment. The final Integrated Guidelines are issued to the proponent along with the Notice of Commencement and are posted to the Registry, so the process is clear and transparent for all participants.

Terminology for Indigenous collectives:

IAAC should reach out to First Nations, Métis, and Inuit Peoples to confirm what the most respectful terminology in the project specific Guidelines should be. The IAA uses the terms Indigenous group and

Indigenous Peoples; however, these terms can be changed to terms such as Indigenous communities and Indigenous Nations.

Part 1 – Tailored Impact Statement Guidelines

1. Introduction

The federal impact assessment process serves as a planning tool that considers environmental, health, social and economic effects of designated projects with a focus on the mitigation or prevention of significant adverse effects within federal jurisdiction and significant direct or incidental adverse effects.

Under the *Impact Assessment Act* (the IAA), designated projects that include physical activities regulated by the Canadian Nuclear Safety Commission (CNSC) must be assessed by a review panel. The panel will conduct an integrated assessment that meets the requirements of the IAA and the applicable requirements for an initial licence(s) under the *Nuclear Safety and Control Act* (NSCA). The review panel will use the proponent's Impact Statement and other information received during the integrated assessment process to prepare a report with respect to the impact assessment and include in the report the information necessary for the initial licence(s) to be issued under the NSCA.

A key element for the integrated assessment process is the preparation of integrated Tailored Impact Statement Guidelines (the Integrated Guidelines), which provide the proponent with directions and requirements for the preparation of an integrated Impact Statement. The Integrated Guidelines, and by extension the Impact Statement, should include the information necessary to make a decision in accordance with the IAA and a decision for a licence to prepare site (LTPS) for a new nuclear reactor in accordance with the *Nuclear Safety and Control Act* (NSCA).

The [*draft*] Guidelines for [*Name of Project*] (the project) proposed by [*Name of Proponent*] (the proponent), were tailored by the Impact Assessment Agency of Canada (IAAC) and the CNSC during the Planning phase of the impact assessment. The review panel will use the proponent's Impact Statement and other information received during the integrated assessment process to prepare an Impact Assessment Report.

Tailoring of the [*draft*] Integrated Guidelines was based on the nature, complexity and context of the project, and was informed and guided by consultation and engagement with [*select those that have been engaged to date the proponent, the public, Indigenous groups, lifecycle regulators, jurisdictions, federal authorities, and other interested parties*].

The Integrated Guidelines have also been tailored to identify where IAAC and the CNSC have shared information requirements under the IAA and NSCA for an LTPS. This was done to support the Government of Canada's objective of "one project, one assessment". While the information requirements may be shared, the integrated assessment will respect the jurisdiction of each governing body under the IAA and NSCA.

The mechanism by which the NSCA requirements were incorporated into the Integrated Guidelines was through the merger of CNSC Regulatory Document[1] (REGDOC) 1.1.1, *Site Evaluation and Site Preparation for New Reactor Facilities*, Version 1.2 and other relevant REGDOCS and guidance documents that are referenced within. Per section 3.4 of REGDOC.-3.5.3, *Regulatory Fundamentals*, Version 3,

> *"…CNSC has developed regulatory documents, which are a key part of its regulatory framework for nuclear activities in Canada. They provide additional clarity to licensees and applicants by explaining how to meet the requirements set out in the NSCA and the regulations made under it. Regulatory documents are organized into three key categories: regulated facilities and activities, safety and control areas, and other areas of regulatory engagement."*

Therefore, by integrating elements of REGDOC.-1.1.1 into these tailored guidelines, the proponent is provided with clarity on meeting LTPS requirements set out in the NSCA.

While the CNSC sets requirements and provides guidance on how to meet requirements, an applicant or licensee may put forward a case to demonstrate that the intent of a requirement is addressed by other means. Such a case must be demonstrated with supportable evidence.

The Integrated Guidelines are organized into two parts:

- Part 1 of the Integrated Guidelines identify information requirements captured under both the IAA, including specific information and studies for the conduct of the assessment, and REGDOC.-1.1.1 requirements and guidance for site evaluation. Where existing IAA requirements and guidance already address REGDOC.-1.1.1 requirements for site evaluation, IAAC and the CNSC kept the existing text. However, where REGDOC.-1.1.1 augments existing information requirements under the IAA, that content has been merged. In limited instances, content from REGDOC.-1.1.1 section 4 for site preparation has also been captured in Part 1 as it is relevant to site evaluation (e.g. exclusion zone).
- Part 2 captures REGDOC.-1.1.1 requirements and guidance specific to site preparation activities (see REGDOC.-1.1.1 section 4 and associated appendices) and has been directly incorporated into the TISG. Content from Part 1 and Part 2 are necessary to address LTPS requirements under the NSCA.

The [*draft*] tailoring decisions by IAAC and the CNSC, regarding the specific information and studies for the conduct of the assessment include:

[1] REGDOCS are approved by the Commission following *public consultation.*

- a focus on adverse effects within federal jurisdiction [direct or incidental adverse effects, decision-making factors and key issues identified in the Planning phase including, *list any additional key issues raised through the Planning phase that is included in impact assessment with a rationale*]; and
- [tailoring of information related to list any elements removed because of a reliance on means from other jurisdiction(s); reliance on existing evidence or proven mitigation; reliance on information already provided during the Planning phase; nature, complexity or context for the project; etc. and the rationale.]

To simplify and align the language with the IAA, REGDOC.-1.1.1 'shall' statements have been modified to 'must' statements in the TISG. For both parts of the Integrated Guidelines, as was captured in REGDOC.-1.1.1, references to other regulatory documents, national and international standards, and relevant guidelines were referenced in the text when appropriate.

1.1 Site Evaluation and Site Preparation for New Nuclear Reactor Facilities

The CNSC's regulatory framework for new nuclear reactors requires a description of the site evaluation process to inform the application for a licence to prepare a site. Applicable requirements are from REGDOC.-1.1.1, *Site Evaluation and Site Preparation for New Reactor Facilities*, Version 1.2. This section provides an overview of site evaluation and site preparation, and how these intersect with the requirements of an impact assessment conducted under the IAA. (section 3.0 and section 4.0 of REGDOC.-1.1.1 have been integrated into section 1.1). More information on site evaluation methodology is in section 7.9 of this document.

1.1.1 Site Evaluation

Site evaluation is the process of evaluating sites for new nuclear reactors, it is done before the proponent submits a licence application and continues throughout the lifecycle of the proposed project, to ensure that the facility's design basis and safety case remains current with changing environmental conditions or modifications to the facility itself. Site evaluation information is also a key input into reactor facility design and subsequent lifecycle phases. The proponent should reject any unacceptable or inappropriate site before applying for a licence to prepare site, without requiring CNSC involvement. Submission of site evaluation information on rejected sites is not required. (section 3.0 of the REGDOC.-1.1.1)

Site evaluation is not a licensed activity under the NSCA. Information gathered through the site evaluation process should be used during the impact assessment process and will be reviewed by the CNSC during the assessment of the LTPS and may be used to satisfy information needed for subsequent licensing phases. Therefore, the site evaluation requirements of REGDOC.-1.1.1 have been consolidated into these Integrated Guidelines (REGDOC.-1.1.1 - section 3).

The site evaluation process overlaps substantially with the requirements of an impact assessment conducted under the IAA. The site evaluation and impact assessment determine, for the entire lifecycle of the project, whether:

- siting option choices were made to avoid or minimize environmental effects;
- the proposed facility and site infrastructure designs to be established are adequate (including the exclusion zone boundary, where appropriate);
- the proponent will ensure adequate provision for the protection of the environment, the health and safety of persons and maintaining national security; and
- the effects are likely to be, to some extent, significant, and the extent to which they are significant, taking into consideration mitigation measures (REGDOC.-1.1.1 - section 2.4).

The site evaluation process should satisfy the criteria contained in the following documents that apply to the facility being considered:

- applicable federal environmental legislation;
- REGDOC.-2.5.2, *Design of Reactor Facilities*, Version 2.1, EPS1/PG/2 Environmental codes of practice for steam electric power generation: siting phase;
- Canadian Standards Association (CSA) N288.6, *Environmental risk assessments at nuclear facilities and uranium mines and mills*; and
- REGDOC.-3.5.1, *Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills*, Version 2.1 (REGDOC.-1.1.1 - Appendix B.1).

In accordance with CSA N288.6, the site evaluation is periodically re-evaluated. The re-evaluation focuses on confirmation of the site characteristics (in particular, external events) and assessing the effects of the updated information. Design modifications, updates to operations, or both may be needed (REGDOC.-1.1.1 - section 3.1).

1.1.2 Site Preparation

Site preparation is a licensed activity under the NSCA. The proponent is required to hold an LTPS before any work is done on the site. The potential LTPS will be based on information gathered for the impact assessment, and thus should demonstrate that the proponent is taking into account future steps in the lifecycle of the proposed facility (construction, operation, decommissioning, and abandonment). For guidance on the information requirements for a LTPS application, see Part 2 – Licensing Requirements of the Canadian Nuclear Safety Commission.

The proponent for the project is applying for a LTPS for a nuclear reactor [tailor if the proponent applies for other licences].

[*Add for draft Guidelines*: The Guidelines will be finalized following a comment period on this draft version of the Guidelines, which will run from XXX to XXX.]

1.2 Factors to be considered in the integrated assessment

section 22 of the *Impact Assessment Act* (IAA) prescribes the factors to be taken into account in the integrated assessment:

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;

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 that are technically and economically feasible, including through the use of best available technologies, and the effects of those means;

- any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project;

f) Indigenous Knowledge provided with respect to the designated project;

g) the extent to which the designated project contributes to sustainability;

h) 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;

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

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

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

l) community knowledge provided with respect to the designated project;

m) comments received from the public;

n) comments from a jurisdiction that are received in the course of consultations conducted under section 21 of the IAA*;*

o) any relevant assessment referred to in sections 92, 93 or 95 of the IAA*;*

p) 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;
q) 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 IAA—that is in respect of a region related to the designated project and that has been provided with respect to the project;
r) the intersection of sex and gender with other identity factors; and
s) any other matter relevant to the impact assessment that the Agency requires to be taken into account.

IAAC took these into account in determining what information and studies are required in the proponent's Impact Statement, as set out in these [draft] Guidelines. [*if the scope of the factors referred to in paragraphs 22(1)(a) to (f), (h) to (l) and (s) and (t), including the extent of their relevance to the impact assessment, has been narrowed, the narrowed scope can be specified for transparency*.]

[If applicable: The assessment of the project has been referred to a review panel by the Minister and the other matter relevant to the impact assessment that IAAC would require to be taken into account are detailed in the Terms of Reference for the review panel.]

Pursuant to section 24 of the NSCA, the Integrated Assessment will also need to include consideration of:

- whether the proponent is qualified to perform the activity to be licensed; and
- whether in carrying on that activity the proponent will make adequate provisions for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Further details on licensing requirements are identified in Part 2 of this document.

Key principles and elements used in developing this document are consistent with national and international standards.

This document serves the broader licensing needs under the NSCA and provides additional guidance for facilitating a more effective and efficient regulatory review. As with *IAEA Safety Standards Series No. SSR-1: Site evaluation for nuclear installations*, this document considers all licensing phases, because information from the site evaluation process is required to support the CNSC licensing process at all phases of the facility lifecycle.

1.3 Gender-Based Analysis Plus (GBA Plus)

The Integrated Guidelines will refer to Gender-Based Analysis Plus (GBA Plus) with respect to requirements related to the consideration of intersection of sex and gender with other identity factors in the impact assessment. GBA Plus is an analytical process that can guide practitioners in developing

responsive and inclusive initiatives. It identifies who is impacted by a project, assesses how they may experience impacts differently, tailor initiatives to meet the diverse needs of those most affected, and develops mitigation measures to address these differential impacts. Using GBA Plus involves a gender- and diversity-sensitive approach, considering intersecting identity factors beyond sex and gender. These Guidelines refer to "diverse population groups" in the context of GBA Plus, accounting for various identity factors (e.g., sex, gender, age, disability, education, race, ethnicity, geography, language, religion, Indigenous identity, socio-economic status, health status) and their intersections (e.g., Indigenous women and racialization, young men recently immigrated to a rural area). This approach considers how people's identities intersect with context, lived experience, and structural barriers to impact how people may be affected by the project. IAAC's Guidance: Gender-Based Analysis Plus in Impact Assessment provides guiding principles and tools to apply GBA Plus.

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

- be sufficiently disaggregated to support the analysis of disproportionate effects as per GBA Plus' intersectional approach. As much as possible, the data must be disaggregated by identity and cross-identify factors (e.g. by sex, gender, age, ethnicity, Indigenous identity, ability, and any other community-relevant identity factors) and presented distinctly for each population group;
- describe how community and Indigenous Knowledge from affected populations, including community-developed indicators and locally collected data, was used in establishing baseline conditions and informing effects assessments;
- describe how community members differ in access to resources, opportunities and services;
- describe the circumstances in which diverse population groups could suffer more adverse effects or receive fewer benefits related to the project than others, and how they may respond differently to effects; and
- describe mitigation or enhancement measures to address these differential effects.

Quantitative information, including equality, diversity and inclusion sensitive data, should be complemented by qualitative insights from studies or consultations, and other sources. The description of effects should be based on both data collected and concerns expressed through engaging with the affected Indigenous groups and community members.

1.4 Preparing the Impact Statement

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 diverse population groups; and

- 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 or standards adopted by an Indigenous group) and disaggregated data from small or unique populations.

The proponent may present the information in the Impact Statement in the manner it deems most appropriate. IAAC and the CNSC recommend the Impact Statement follow a structure similar to the Guidelines in order to facilitate its review and participation in the process. To facilitate the review of the Impact Statement, the proponent must provide a table of concordance that indicates where each requirement of the Integrated Guidelines is addressed.

The Impact Statement must address all requirements outlined in the Integrated Guidelines. Where the proponent is of the opinion that the information is not required or can be achieved in an alternative manner, it should contact IAAC and the CNSC to confirm the rationale prior to submitting the Impact Statement. The rationale for not including the information must also be provided in the Impact Statement. The proponent should also notify IAAC and the CNSC of any changes made to the project as proposed in the [Initial Project Description or Detailed Project Description] that may result in a different set of effects and may require a reconsideration of information requirements.

Where relevant, the Impact Statement must consider:

- any relevant regional or strategic assessment;
- any study or plan that is conducted or prepared by a jurisdiction—or an Indigenous governing body—in respect to the region related to the project and that is provided to the proponent with respect to the 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 to the proponent with respect to the project;
- Indigenous Knowledge, community knowledge, comments received by the public, comments received from a jurisdiction; and
- other studies or assessments realized by the proponent or other proponents.

IAAC and the CNSC are available to support the proponent during the preparation of the Impact Statement and may establish technical advisory groups, consisting of federal authorities and others, as appropriate. The proponent is encouraged to engage IAAC and the CNSC early in the process to clarify requirements and expectations as presented in the Guidelines. The proponent should, in consultation with IAAC and the CNSC, consider submitting documents for review (e.g. proposed study plans, draft sections of the Impact Statement) prior to submitting the formal Impact Statement. Active engagement will support early identification and resolution of issues.

IAAC and the CNSC will conduct an initial conformity review of the submitted Impact Statement to confirm that the document contains sufficient information to proceed to a technical review, as well as a public comment period on the Summary of the Impact Statement. If so, IAAC and the CNSC will engage with

federal authorities, jurisdictions, Indigenous groups and participants to undertake a technical review of the Impact Statement and commence a public comment period, as well as consultation with Indigenous groups. If warranted, IAAC and the CNSC will require that the proponent respond to identified deficiencies. When IAAC and the CNSC are satisfied that the proponent has provided it with all of the required information or studies, IAAC will post a notice on the *Canadian Impact Assessment Registry* (the Registry).

The proponent must provide IAAC and the CNSC with the information or studies required in the Integrated Guidelines within three years after the day on which a copy of the Notice of Commencement is posted on the Registry. The three-year time limit includes the time required for the review of the Impact Statement by IAAC, the CNSC and participants and for the proponent to address any deficiencies. At the proponent's request, IAAC may, considering the proponent's progress, work plan and other relevant factors, extend the time limit by any period that is necessary for the proponent to provide IAAC and the CNSC with the information or studies. If the proponent does not provide IAAC and the CNSC with the information or studies required by the Integrated Guidelines within the three-year time limit, or within any extension of that time limit, the impact assessment is terminated.

1.5 Format and accessibility

The impact assessment must be based on information that is publicly accessible, within the limitations of confidentiality and ethical constraints, such as in relation to Indigenous Knowledge and community knowledge, business confidential information, and intellectual property.

The Impact Statement must include:

- a summary for the documents that served as key references and are not otherwise publicly accessible, and, where possible, appending them to the Impact Statement; and
- all information in a machine-readable, accessible format.

Where information is provided as a map in the Impact Statement, the proponent must provide corresponding electronic geospatial data file(s). IAAC will make the geospatial data files available to the public under the terms of the Open Government Licence – Canada. Geospatial data files must include metadata that are 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
- confirmation that there are no restrictions or limitations on sharing the data.

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

The proponent should be prepared to provide data, including surveys, analyses, methods, modelling, and results in well-documented data files, including geoenabled format where available, if requested by IAAC or review panel to support the integrated assessment process. These requirements 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.

All information submitted is subject to the provisions of the *Access to Information Act* and the *Privacy Act*. It is the proponent's responsibility to identify and justify any material that is not suitable for disclosure (that is, subject to confidentiality requirements).

As required by section 27 of the *General Nuclear Safety and Control Regulations (SOR/2000-202)*, the proponent must keep a record of all information relating to the licence that is submitted by the proponent to the review panel.

Note that prescribed information, such as details of the security program, may be transmitted only by secure means, such as letter mail or encrypted secure memory devices. It is prohibited to submit prescribed information via unencrypted email. Guidance for the protection and transmission of prescribed information can be found in REGDOC.-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material*, Version 2.1. (REGDOC.-1.1.1 -Appendix A1)

1.6 Coordination of federal authorizations

Federal authorizations required under other federal legislation are distinct from the impact assessment process. Although federal authorities may be prohibited from issuing authorizations during the impact assessment process, some of the information and consultation requirements for key federal authorizations may be completed at the same time as the impact assessment. In some cases, the same information may be used to inform both the impact assessment and other federal authorizations.

While it is not a requirement, a proponent may choose to work concurrently on federal authorizations during the impact assessment process. Providing the required information during the impact assessment process may expedite federal regulatory approvals following the impact assessment process. The proponent is encouraged to discuss opportunities for coordination of federal authorizations with IAAC and the CNSC early in the process.

Further information is available in the guidance document Coordination of Federal Authorizations through the Impact Assessment Process, available on IAAC's website.

2. Proponent Information

2.1 The proponent

The Impact Statement must:

- include contact information for proponent representatives for the project (e.g. name, position, business address, phone, email), including:
  - name of the persons or organizations submitting the Impact Statement and applying of the licence under the NSCA, as it appears on the proof of legal status documentation. (REGDOC.-1.1.1 - section 3.1)
    - First-time proponents must provide proof of legal status by appending proof of incorporation, corporation number or charter.
    - Include the corporation's legal name, corporation number, date of incorporation, registered office address (if different from head office address). (REGDOC.-1.1.1 - section 3.4).
    - If the mailing address is different from the head office address, the proponent should provide the mailing address. The proponent should notify IAAC and the CNSC within 15 days of any changes to this information. (REGDOC.-1.1.1 - section 3.2)
    - Persons who have authority to act for them in their dealings with IAAC and the CNSC or the review panel; (REGDOC.-1.1.1 – section 3.3)
    - name, title and contact information of the individual who is signing the application as the proponent authority; (REGDOC.-1.1.1, section 3.8)
  - name, position, contact information, mailing address of the person responsible for licence fee payments; (REGDOC.-1.1.1, section 3.7)
  - organizational management structure insofar as it may bear on the proponent's compliance with the NSCA and the regulations made under it, including the internal allocation of functions, responsibilities and authority, and the roles and responsibilities of key personnel; and,
  - names and position titles of the persons who are responsible for the management and control of the licenced activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; (REGDOC.-1.1.1 - section 3.6)
- evidence that the proponent is the owner of the site or has the authority from the owner of the site to carry on the activity to be licensed; (REGDOC.-1.1.1 – section 3.5).
- 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

In support of transparency, the Impact Statement must:

- provide information on the individuals who prepared the sections within the Impact Statement; and
- demonstrate that qualified individuals have prepared the information or studies, as demonstrated by formal education training or certification, experience, or credibility or standing as knowledge holders. Where possible, the proponent should use experts who are members of a professional body or recognized association, or holders of Indigenous Knowledge.

IAAC also expects proponents to demonstrate scientific integrity in their preparation and delivery of Impact Statements by:

- following existing standards and best practices for the responsible conduct of scientific research;
- declaring and managing any real or perceived conflict of interest for individuals involved in preparing the Impact Statement;
- eliminating, controlling for, or appropriately managing potential biases; and
- characterizing all potential sources and types of scientific uncertainty, including their magnitude and any differences in the interpretation of scientific results.

Proponents are expected to demonstrate their adherence to these methods and processes within their Impact Statement.

2.3 Management System for Site Evaluation

As the CNSC's regulatory framework for new nuclear reactors require a description of the management system to be applied to the site evaluation process, this section lists the information requirements for the management system. The management system may be graded in accordance with the importance to safety of the individual evaluation activity under consideration. (REGDOC.-1.1.1 - section3.8)

For information requirements on the management system to be implemented for the management and control of all licensed activities for a licence to prepare a site, see Part 2 (REGDOC.-1.1.1 - section4.3).

The Impact Statement must:

- describe the management system the proponent has established to govern the conduct of site evaluation activities;
    - the process of establishing site evaluation-related management system parameters should involve technical and engineering analyses, along with judgments that require extensive experience and knowledge. Evaluations should be reviewed and verified by individuals or groups that are independent of those who did the work;
- demonstrate that the management system will include:
    - procedures to control the effectiveness of assessments and engineering activities performed in the different stages of the site evaluation process;
    - appropriate organization, planning, work control, personnel qualification and training, and activity verification and documentation, to ensure that the management system is carried out as effectively as possible;
    - records of all work carried out in the site evaluation process;
    - documentation of the results of studies (including models and simulations) and investigations in sufficient detail to permit independent review; and
    - a report that documents the results of all site evaluation work, laboratory tests, and geotechnical analyses and evaluations.
- describe the components of the management system. Content should include (but not limited):
    - data control, verification and validation,
    - data format,
    - traceability of data,
    - configuration control (including data, environmental, meteorological, geological, geophysical, survey, hydrological, biological),
    - measuring and test equipment,
    - use and control of computer modelling,
    - field and laboratory work,
    - calculations and analyses, and
    - measures to ensure that the results of the site characterization are accurate, complete, reproducible, traceable and verifiable.

For more information see:

- *CSA N286:12 (R2022), Management system requirements for nuclear facilities*
- *IAEA GSR Part 2, Leadership and Management for Safety: General Safety Requirements*
- *IAEA GS-G-3.1, Application of the Management System for Facilities and Activities*
- *IAEA GS-G-3.5, The Management System for Nuclear Installations*

- *CNSC REGDOC.-2.1.1, Management System,*
- *CNSC REGDOC.-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 2* (REGDOC.-1.1.1 - section 3.8)

3. Project Description

3.1 Project overview

The Impact Statement must:

- describe the project, key project components and ancillary activities (both nuclear and non-nuclear), scheduling details, the timing of each phase of the project, the total lifespan of the project and other key features. If the project is part of a larger sequence of projects, the Impact Statement must outline the larger context;
- describe the purpose of the facility, such as for electrical power or to generate steam for industrial purposes;
- provide the total facility's capacity in Megawatts thermal (MWth) and Megawatts electric (MWe);
- provide the total number of nuclear units and the projected in-service dates for each unit. (REGDOC.-1.1.1 - section 4.2)

If site preparation activities involve construction of non-nuclear facility structures, systems and components (SSCs), the Impact Statement must:

- demonstrate that the SSCs are appropriate for any reactor technology proposed for the site, such as water treatment plants, excavation (that is, earthen structures) and condenser cooling structures. (REGDOC.-1.1.1 - section 4.2)

The proponent should clearly itemize all high-level activities proposed to be conducted under the licence to prepare site. An application considering several technologies should clearly identify those site activities proposed to be undertaken under a licence to prepare site that are not affected by the technology choice, as well as those that are. (REGDOC.-1.1.1 - section 4.2)

- [Add any additional information requirements specific to the project and its context]
- [If warranted for greater clarity: The project subject to the impact assessment is the designated physical activity (add description) and any incidental physical activity. The following physical activities are incidental to the designated physical activity and are thus part of the project: add list of physical activities.]

3.2 Project location

The Impact Statement must describe the project's location, the geographical setting and the 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 to understand the potential effects of the project. The following information must be included and, where appropriate, located on map(s):

- geographic coordinates (i.e. longitude/latitude using international standard representation in degrees, minutes, seconds) for the centre of the main project site [*for a linear project:* provide the beginning and end points];
- project footprint, including the extent of the tenure;
- 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;
- description of the site of the activity to be licensed, including the location of exclusion zone and any structures within that zone;
- plans showing the location, perimeter, areas, structures and systems of the nuclear facility;
    - satellite or aerial photographs of the site and surrounding region, with a resolution scale of 1:1,440 or better, including the proposed exclusion zone and site boundary; and
    - topographical map(s) for each site layout in 1:50,000 to no smaller than 1:250,000 scale for all structures and associated infrastructure (all drawings are to scale and include a legend);
- proposed layouts of labelled structures, including:
    - reactor building;
    - turbine-generator block;
    - auxiliary power buildings (for example, diesel generators) and related fuel storage;
    - switchyard;
    - cooling tower structures, water intakes and outlets;
    - large structures (for example, machine shops or storage buildings for parts inventory) in the immediate vicinity to the proposed nuclear facility;
- proposed conventional and radiological waste transfer and storage areas
- layouts of all site roads and proposed transmission corridors; (REGDOC.-1.1.1 - section 4.6.3)
- distance of the project components to any federal lands and the location of any federal lands within the RSA;
- services and infrastructure and current land and aquatic uses in the area, including:

  - transportation corridors (e.g., roads, rail lines, shipping lanes, airports) (REGDOC.-1.1.1 - section 4.6.3)
  - municipalities and administrative regions,
  - resource development projects already underway in the study area (e.g. mines and forestry operations), and
  - local businesses and industries such as fisheries and outfitters, and any other relevant uses;
- primary, secondary and tertiary watersheds;
- all waterbodies and watercourses, including intermittent and ephemeral streams, and their location on a map;
- navigable waterways;
- landcover in the area, including important or critical habitats;
- ecozones, ecoregions, and ecodistricts as per the province's or Canada's Ecological Landscape Classification (see Introduction to the Ecological Land Classification (ELC) 2017);
- environmentally sensitive areas, such as national, provincial, territorial and regional parks, Indigenous Protected and Conserved Areas, UNESCO World Heritage Sites, ecological reserves, [marine protected areas, marine refuges,] ecologically and biologically sensitive or significant areas, wetlands, estuaries, and habitats of federally or provincially listed species at risk and other sensitive areas;
- lands subject to conservation agreements;
- description and locations of all potable drinking water sources (i.e. municipal or private);
- [*if the potential for effects to cross a border is identified:* distance to the international (e.g. the United States) or provincial border];
- description of local community and Indigenous groups;
- Indigenous traditional territories and/or consultation areas, Treaty and/or Title lands, Indian Reserve lands, Indigenous harvesting regions (with permission of Indigenous groups), Métis settlements; and
- culturally important features of the landscape.

3.3 Regulatory framework and the role of government

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, and any financial support that federal authorities are, or may be, providing to the project;
- legislative or regulatory requirements that are applicable to the project at the federal, provincial, regional and municipal levels or from any body, including a co-management body, established under a land claim agreement referred to in section 35 of the *Constitution Act, 1982*, or from an Indigenous

governing body that has powers, duties or functions in relation to the environmental effects of a project;

- federal, provincial or territorial greenhouse gas (GHG) legislation, policies or regulations that will apply to the project, in accordance with the Strategic Assessment of Climate Change (SACC);
- government policies, resource management plans, planning or study initiatives relevant to the project and/or the impact assessment and their implications, including relevant regional studies, regional assessments 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/or the impact assessment;
- any relevant land use plans, land zoning, or community plans;
- information on land lease agreement or land tenure, when applicable;
- municipal, regional, provincial and/or national objectives, standards or guidelines, by-laws or ordinances that have been used by the proponent to assist in the evaluation of any predicted environmental, health, social or economic effects or impacts; and
- Government of Canada's environmental obligations and commitments in respect of climate change which the effects of the project may hinder or contribute to (see section 13 Canada's Ability to Meet its Environmental Obligations).

3.4 Project components and activities

Project components and activities that should be considered in this description are outlined in Appendix 1 - List of Project Components & Activities.

The Impact Statement must:

- describe the project components, associated and ancillary works, and other characteristics to assist in understanding the project and potential environmental, health, social and economic effects, and potential impacts on Indigenous Peoples and their rights.
- describe project activities to be carried out during each project phase, including life extension plans (REGDOC.-1.1.1 – Appendix B.4) with a focus on activities with the greatest potential to have environmental, health, social and economic effects, or impacts on Indigenous Peoples and their rights.
    - describe the location, methods used, schedule (including expected start date, time of year, duration and frequency), magnitude and scale of each project activity, and
    - highlight activities that involve periods of increased disturbance to environmental, health, social and economic conditions or impacts on Indigenous Peoples;

- describe nuclear facilities-related activities: reactor design; water cooling systems for nuclear reactors, including intake and discharge structures; and waste management strategies for low and intermediate level radioactive waste and used fuel for the facility's lifecycle. (REGDOC.-1.1.1 - Appendix G.1)
- provide a summary of any change made to the project as proposed in the [Initial Project Description or Detailed Project Description], including the reasons for these changes;
- provide sufficient detail to support analysis regarding the project's impacts in the context of potential interaction between valued components (VCs); and
- detail how input from diverse population groups was used to identify potential components or activities of concern; 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.

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 to be created, and timeline for when they will be created. Positions should be presented using the National Occupational Classification system;
    - anticipated workforce region of origin (i.e. local, regional, out-of-province or international employees);
    - the skill and education levels required for the positions;
    - anticipated hiring policies and programs;
    - investment in training opportunities;
    - working conditions [and anticipated work scheduling for construction and operation (e.g. hours of work, rotational schedules, fly-in/fly-out)];
    - [*if applicable:* the anticipated transportation options for employees to commute to and from the project site];
    - [*if applicable*: accommodation and lodging requirements for the workforce during each project phase];
    - workplace policies and programs for Indigenous employment, and employment of other underrepresented groups;

  - workplace policies and programs, including codes of conduct, workplace safety programs and cultural training programs; and
  - employee assistance programs and benefits programs; and
- consider GBA Plus and present the information in sufficient detail to analyze how historically excluded or underrepresented groups will be taken into account, including Indigenous groups and diverse population groups.

4. Project Purpose, Need and Alternatives Considered

The proponent must identify the purpose of and need for the project. The proponent must also analyze alternatives to the project and alternative means of carrying it out. The proponent should consult IAAC guidance 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. new nuclear energy) and indicate the target market (e.g. international, domestic, local), where applicable. The “purpose of” statement should include any objectives the proponent has in carrying out the project, and the proponent is encouraged to consider the perspectives of participants (i.e. public, Indigenous groups, governments) in establishing its objectives.

4.2 Need for the project

The Impact Statement must:

- describe need for the project as 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 information provided should make it possible to reasonably conclude that there is an opportunity or issue that warrants a response and that the proposed project is an appropriate approach;
- include supporting information that demonstrates the need for a project;
- present any comments or views of Indigenous Peoples, the public and other participants on the proponent’s need description;

- describe whether and how the Project would support any federal or provincial government objectives; and
- [Include any project specific information requirements to be included in the Need for description as a bulleted list, if applicable.]

4.3 Alternatives to the project

The Impact Statement must:

- provide a description of the alternatives to the project that are technically and economically feasible to meet the project need and achieve the project purpose, from the perspective of the proponent;
- present a rationale for selecting the proposed project over other options, considering sustainability principles (see section 15. Sustainability);
- consider the views, information and knowledge from Indigenous groups potentially impacted by the project and other participants, as well as existing studies and reports in identifying and considering alternatives to the project; and describe, at a minimum, the following alternatives to the project:
  - [*if applicable:* any alternatives identified in the Planning phase that require evaluation], and
  - [*if required:* the no-action (null) alternative to serve as a benchmark for the assessment and comparison of the project and any alternatives to a project. The description should note the baseline conditions of the VCs 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 as result of other projects already planned for the region, changes to the socioeconomic conditions, future climate change)].

In the case of a nuclear energy project, an assessment of energy mandates established through federal and provincial legislation or policy may not be within the scope of the impact assessment. As a result, the alternatives to the project presented by the proponent need not include alternatives that are inconsistent with federally mandated initiatives and/or a province's formal plans or directives. However, the proponent should explain where this rationale has been applied to exclude consideration of possible alternatives to the project.

[If sufficient information was provided in the Planning phase to demonstrate that there are no "alternatives to" the project that are technically and economically feasible to meet the need for the project and achieve its purpose, then the Guidelines should (a) include the rationale from the Initial Project Description or Detailed Project Description, (b) state that no additional information is required, and (c) require that the information contained in the Initial Project Description or Detailed Project Description be included in the Impact Statement.]

4.4 Alternative means of carrying out the project

The Impact Statement must:

- identify and consider the alternative means of carrying out the project that are technically and economically feasible;
- for the selection of the alternative means of carrying out the project, describe:
  - the criteria to determine technical and economic feasibility of possible alternative means;
  - the best available technologies considered and applied in determining alternative means;
  - those alternative means that are technically and economically feasible presented in sufficient and appropriate detail; and
  - the particularities for each alternative mean and their potential adverse and positive environmental, health, social and economic effects, and their potential impacts on Indigenous Peoples and their rights, as identified by Indigenous groups.
- describe 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 including:
  - consideration of environmental, health, social and economic effects, the impacts on the rights of Indigenous Peoples, technical and economic feasibility, risk from accidents and malfunctions, and the use of best available technologies, and consideration of the sustainability principles;
  - environmental criteria should include effects to air quality, surface water quality, groundwater quality, soil, sediment, all wildlife and associated habitat (including wetlands);
  - potential effects to species at risk as per the *Species at Risk Act* (SARA), including any critical habitat, including a description of how avoidance of effects was considered and how it may be achieved through alternative means of carrying out the project; and
  - application of GBA Plus to the analysis of alternative means of carrying out the project to inform how effects may vary for diverse population groups; and
  - how concerns, views and information provided by Indigenous Peoples, the public and other participants were taken into account in establishing criteria and conducting the analysis;
- address key project elements in the alternative means analysis, including, but not limited to, the following, [*include elements relevant to the project*:
  - project site and/or component locations, including temporary components used for construction;
  - provide a high-level overview of alternate sites considered prior to selecting the proposed site, including a brief description of the degree and depth of site evaluation used to narrow down the final choice(s) (see REGDOC.-1.1.1, section 3.3 for guidance);
  - timing options for components and phases of the project;

- access to the project site;
- facility design;
- switchyard design;

- nuclear facilities-related activities:
  - reactor design,
  - water cooling systems for nuclear reactors, including intake and discharge structures), and waste management strategies for low and intermediate level radioactive waste and used fuel;
  - energy sources to power the project site and other stationary sources to provide heat or steam to the project;
  - water and wastewater management including:
    - location of effluent discharge points, and
    - treatment technologies and techniques to control effluent quality;
  - waste management;
  - construction alternatives;
  - location, construction and crossing methods for waterbodies, watercourses, wetlands and other obstacles;
  - management of excavated materials, including those that are potentially acid generating or leachable; and
  - suspension, abandonment or decommissioning options

5. Description of Public Participation and Views

The proponent must engage with the public and interested parties, including local communities. Engagement activities should be inclusive and ensure that interested members of the public have an opportunity to share their views. They should also consider the language needs, with regards to official languages, of the people being engaged. Particular attention must be paid to the engagement of individuals and communities that have interests in the lands affected by the proposed project.

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

The proponent of a nuclear facility must also comply with CNSC REGDOC.-3.2.1. *Public Information and Disclosure*.

5.1 Summary of public engagement activities

The Impact Statement must:

- describe the proponent's public engagement activities regarding the project, including:
  - efforts made to distribute project information and the information and materials that were distributed during the consultation process;
  - methods used, where consultations were held, the persons, organizations and diverse population groups consulted;
  - efforts made to involve the public in the development of the Impact Statement, including collection and incorporation of community knowledge; and
  - efforts to engage diverse population groups of the community to support the collection of information needed to complete the GBA Plus (see section 1.2. GBA Plus).

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, including the potential environmental, health, social and economic effects and potential for disproportionate effects for diverse population groups, which were raised through engagement with the public, or how they were incorporated into the Impact Statement;
- describe any questions and comments raised by the public and how they influenced the design of the project;
- describe the alternative means, mitigation measures or the follow-up and monitoring programs identified to address public concerns;
- identify public concerns that have not been addressed, if any, and provide the reasons why they have not been; and
- provide details and commitments regarding the public information program should the project proceed, including a public disclosure protocol, in compliance with *REGDOC.-3.2.1. Public Information and Disclosure* (see Part 2, section 3.12. *Other Matters of Regulatory Interest*).

6. Description of engagement with Indigenous groups

The proponent must engage with Indigenous groups at the earliest reasonable opportunity, in order to identify and understand the potential impacts of the project on Indigenous Peoples and their rights, including their lands, territories and resources, and to incorporate Indigenous Knowledge into the impact assessment. Engagement with Indigenous groups is required to inform the impact assessment and identify measures to avoid, minimize, offset or otherwise accommodate for potential impacts on Indigenous Peoples and their rights. This engagement may also identify potential positive outcomes, including enhancement measures. The project should be designed to minimize its negative effects, and to maximize its positive impact on Indigenous Peoples and their rights. The assessment process will be conducted in a manner consistent with the Indigenous Engagement and Partnership Plan.

The proponent's engagement with Indigenous groups must:

- be consistent with the Government of Canada's commitment to implement the United Nations Declaration on the Rights of Indigenous Peoples (the Declaration) as a comprehensive international human rights instrument and Canada's roadmap for reconciliation, including working together to achieve consensus as detailed in IAAC's guidance document Implementing the United Nations Declaration on the Rights of Indigenous Peoples;
- be consistent with jurisprudence and best practices in respect of implementing the common law duty to consult. IAAC has obligations and commitments to consult and engage with Indigenous groups participating in the impact assessment process and proponent engagement with Indigenous groups will inform IAAC's consultations. The Indigenous Engagement and Partnership Plan identifies Indigenous groups that the Crown will consult with to understand the concerns and potential impacts of the project on their exercise of potential or established Aboriginal or Treaty rights and, where appropriate, make accommodations. The degree of engagement with each community will vary and in general, will be proportionate to the evidence provided by Indigenous groups regarding potential pathways of impact from the project on Aboriginal or Treaty rights. Engagement is also conducted for other purposes, including as an opportunity to learn about and further explore Indigenous community interests in a project, or to understand other potential project effects not directly related to the exercise of Aboriginal or Treaty rights;
- be carried out with integrity and transparency, without conflicts of interest, in good faith, and in a manner that is attentive to the concerns of Indigenous groups and committed to producing mutually beneficial outcomes;
- involve ongoing information sharing and collaboration to contribute to the development and validation of conclusions and assessment findings related to potential impacts and pathways of effects to Indigenous Peoples and their rights. 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 groups being engaged;

- consider how GBA Plus and relevant approaches to engagement would create safe spaces for meaningful dialogue to enable full and free participation of community members, including different sub-populations (e.g., Elders, women, youth, gender diverse and two-spirit peoples), in the engagement process; and
- provide an opportunity for Indigenous groups to review and provide comments on information prior to submission of the Impact Statement and incorporate the comments.

The proponent must collaborate with Indigenous groups in completing its Impact Statement and [, at minimum, for the Indigenous groups identified in section XX of the Indigenous Engagement and Partnership Plan], must:

- seek available Indigenous Knowledge and, as directed by the Indigenous groups, include it in its Impact Statement;
- share project information frequently and transparently with Indigenous groups;
- support the participation of Indigenous groups in the completion of the Impact Statement, which could include funding studies conducted by potentially affected Indigenous groups who will have demonstrated interest in this regard;
- present information in a format requested by the Indigenous groups;
- engage with Indigenous groups to understand and discuss perspectives in order to seek agreement on the nature of potential impacts on Indigenous Peoples and their rights as well as appropriate ways to address those impacts;
- work with Indigenous groups to define and apply criteria and benchmarks for the description of impacts on Indigenous Peoples and their rights; and
- cooperate with Indigenous groups to identify preferred measures to avoid, minimize, offset or otherwise accommodate for adverse impacts on Indigenous Peoples or their rights, as well as to optimize the project's benefits for their communities; and
- make best efforts at collaboration, and provide IAAC with an explanation regarding circumstances where collaboration was not possible. Where Indigenous groups who are included in the list of groups in the Indigenous Engagement and Partnership Plan do not wish to participate or have not responded to outreach by the proponent, the proponent should continue sharing information and analyses with the Indigenous groups on the potential effects of the project (unless the Indigenous groups requests otherwise), document its efforts in that respect, and use available public sources of information to support the assessment.

The proponent must consult IAAC's guidance documents on Indigenous participation and engagement throughout the Impact Statement, including Collaboration with Indigenous Peoples in Impact Assessments, which are available on IAAC's website and are listed in Appendix 2 – Resources and Guidance of the Guidelines Template.

6.1 Indigenous Knowledge Considerations

Indigenous Knowledge[2] is holistic and, when integrated in impact assessment, informs the assessment on areas including the biophysical environment, as well as social, cultural, economic and health aspects, Indigenous governance, resource use, and mitigation. Indigenous Knowledge should be brought together on equitable footing with scientific or technical information to inform all aspects of the impact assessment including the environmental, health, social, economic and rights assessments. Indigenous Knowledge should be conveyed it in a culturally appropriate manner which captures the context in which it was provided.

The Impact Statement must:

- reflect that community-specific engagement protocols and procedures around Indigenous Knowledge in assessment processes are understood, respected and implemented;
- indicate where input from Indigenous groups, including Indigenous Knowledge, has been incorporated and how it was considered. 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, Two-Spirit peoples, Elders and youth);
- indicate where Indigenous Knowledge that was provided was not included in the assessment and provide a rationale. Where findings differ between Indigenous Knowledge and scientific or technical studies, the proponent should clearly present how both were considered in the Impact Statement.

Indigenous Knowledge, whether publicly available or directly shared with the proponent, should not be included without written consent and validation from the Indigenous community, regardless of the source of the Indigenous Knowledge. The proponent must refer to IAAC's guidance document Protecting Confidential Indigenous Knowledge under the Impact Assessment Act, and follow appropriate, culturally based Indigenous methodology to appropriately and ethically carry the assessment.

6.2 Record of engagement

The Impact Statement must:

[2] The Government of Canada recognizes that Indigenous Peoples refer to their knowledge in different ways, characteristic of their unique languages. Within the context of these Guidelines, the term Indigenous Knowledge is used to refer to all Indigenous ways of knowing. The proponent is encouraged to respect the terminology preferences of the Indigenous groups involved in the assessment.

- 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, including:
    - the proponent's Indigenous engagement policy, as well as established policies and stated principles related to the collection of Indigenous Knowledge and traditional land use information;
    - the list of Indigenous groups engaged by the proponent, including those that the proponent was unsuccessful in engaging;
    - the list of Indigenous groups or communities wishing to be engaged but omitted by the proponent from engagement and the reasons for their omission;
    - where applicable, a copy of each community-specific engagement plan developed collaboratively by the Indigenous groups and the proponent. If only one engagement plan was developed for engagement with all Indigenous groups, provide a rationale for this approach;
    - a description of all 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 engaged by the proponent;
    - the results of any engagement and the perspectives of the Indigenous groups involved;
    - the list of the consultation or engagement protocols adopted by each Indigenous group, if applicable. A written copy of the protocols must be included when available;
    - an explanation for cases where engagement efforts have proven unsuccessful;
    - a description of how project information was frequently and transparently shared with Indigenous groups;
    - 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 Indigenous groups were provided with a reasonable opportunity to review draft sections of the Impact Statement prior to them being filed, where disagreements occurred, and how disagreements were considered;
    - a description of how Indigenous expertise will be sought to assist with the carrying out of the project, should it be approved;
    - 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) to support the collection of information needed to complete the GBA Plus;
    - 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 and impacts on their members, communities, activities and rights, as identified by the Indigenous group(s);

- where applicable, a description of Indigenous-led assessments and a summary of the scope, objectives and timelines of the assessments, as made available to the proponent;
- a description of how the proponent sought to build consensus and obtained the agreement from Indigenous groups regarding information specifically pertaining to those Indigenous groups, including Indigenous Knowledge, that is presented in the Impact Statement
- a description of the proponent's progress in seeking free, prior and informed consent from Indigenous groups, as identified by the Indigenous groups themselves, where Indigenous groups have agreed to including this information in the Impact Statement; and
- any agreements pertaining to engagement that are finalized or in progress, with anticipated timelines to complete;
- a demonstration that the capacity needs of Indigenous groups were taken into account, and that timelines were adequately communicated and flexible enough to ensure Indigenous groups had the ability to review and gain understanding of, and contribute to, information in the Impact Statement.

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

The Impact Statement must:

- provide an analysis of any potential impacts, including cumulative impacts, on Indigenous Peoples and their rights, considering all input received by Indigenous groups prior to, and since commencing, the impact assessment process. The analysis may be summarized in the relevant section on effects to a VC. The location and level of detail of the information in the Impact Statement will depend on its importance to the selected VCs;
- information relevant to Indigenous groups should be organized and analyzed in separate sections for each group potentially affected by the project, either by nation, community, or other grouping based on the preference expressed by each Indigenous group. Where applicable, the information and analysis must also be sufficiently disaggregated to support the GBA Plus. In all cases, ethical guidelines and culturally appropriate protocols governing research, data collection and confidentiality must be followed;
- consider and incorporate Indigenous Knowledge, spiritual practices, cultural beliefs, laws and norms in the assessment, including whether the project would be inconsistent with Indigenous laws and norms;
- describe the type of information received from Indigenous groups (e.g., observations, issues, knowledge);

- describe the potential adverse and positive effects to environmental, health, social, cultural and economic conditions of each Indigenous group as informed by the Indigenous group(s);
- describe the potential effects resulting from any change to the environment to 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, informed by the Indigenous groups involved in the assessment;
- describe the potential impacts on the rights each Indigenous group, that the groups themselves have identified and consented to including in the Impact Statement, that may be impacted by the project;
- describe the potential effects and impacts to lands in a reserve[3] within the meaning of subsection 2(1) of the *Indian Act*;
- provide an analysis of the extent of the potential effects on each Indigenous group, and the views of each Indigenous group regarding the extent of impact on the exercise of rights as well as how these effects and impacts may be avoided, managed, mitigated or accommodated;
- detail the main issues, questions and comments raised by each Indigenous group during engagement activities and the proponent's responses, including how matters have been addressed in the Impact Statement or will be addressed in the future;
- append any specific studies or assessments provided by Indigenous groups, if permission has been obtained from the Indigenous group to publish them, and describe how it was taken into account;
- identify the sources of information used in the analyses of potential impacts to rights, as well as assumptions and methodologies used for the analyses;
- integrate the perspectives of Indigenous youth, women, gender diverse, two-spirited people, individuals with disabilities, and Elders where provided;
- indicate where and how Indigenous groups' knowledge, perspectives and input were integrated into or contributed to decisions regarding the project or its impact assessment, including:
    - the construction, operation, decommissioning, closure and reclamation plans,
    - the evaluation of alternatives to the project and of alternative means of carrying out the project,
    - developing the assessment, including setting spatial and temporal boundaries, identifying and selecting VCs and collection of baseline information,
    - characterization of potential environmental, health, social and economic effects of the project for each Indigenous group,

[3] Note that section 2 of the IAA 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".

- measures to mitigate effects or to enhance or optimize potential project benefits,
- follow-up and monitoring activities should the project proceed, and

- describe how the information gathered during the Planning phase of the impact assessment was included, including the documents submitted to the Registry by Indigenous groups.

6.4 Collaboration with Indigenous Peoples following the submission of the Impact Statement

The Impact Statement must:

- describe how the proponent plans to continue to work with Indigenous Peoples throughout the lifecycle of the project, should the project proceed, including:
  - any proponent commitments for engaging affected Indigenous groups;
  - involvement of Indigenous groups throughout the project lifecycle; and
  - how Indigenous Knowledge and expertise would be considered.

7. Assessment Methodology

7.1 Uncertainty and bias

For major claims[4] where uncertainty and bias may meaningfully impact conclusions, the Impact Statement must:

- describe the major sources of uncertainty, including uncertainty arising from:
  - limitations on data accuracy, precision, completeness and reliability,
  - environmental variability, including spatiotemporal variability,
  - extrapolations from other contexts (e.g., baseline conditions are extrapolated from other locations, time periods, populations or communities),

[4] Major claims may include the descriptions of baseline conditions, assessment of effects, effectiveness of mitigation (for adverse effects) or enhancements (for beneficial effects), residual effects, cumulative effects and the extent of significance of residual effects.

  - extrapolations from proxy measures or indicators to VCs themselves,
  - model limitations arising from incomplete or imperfect knowledge of the structure or function of the system being modelled, and
  - provide a quantitative (where possible) or qualitative estimate of the magnitude of major sources of uncertainty and provide an explicit justification or rationale for these estimates or why no estimate was possible;
- describe the potential sources of bias in the design, execution or interpretation of studies or analysis, including:
  - selection bias resulting in non-representative sample populations,
  - confounding bias arising from inadequate control of factors that may influence project effects,
  - measurement bias associated with the methods used to establish baseline conditions,
  - detection bias in monitoring or surveillance data,
  - outcome reporting or publication bias when relying on external studies or scientific publications, and
  - observer, confirmation, performance, or interpretation bias by those conducting or interpreting studies;
- provide a quantitative (where possible) or qualitative estimate of the direction and magnitude of each major source of scientific bias, and provide an explicit justification or rationale for these estimates or why no estimate was possible;
- describe the potential implications of the estimated cumulative uncertainty and bias (i.e., the total uncertainty and bias arising from all identified sources), including:
  - providing a quantitative range [lower bound, upper bound] (where possible) or qualitative estimate, for residual effects, and, where relevant, on the extent of significance, in light of the estimated cumulative uncertainty and bias, and
  - describing the difference in consequences to any associated VCs if realized (“actual”) residual effects were of a magnitude equal to the lower versus upper bound of the range;
- describe any approaches that were used or could be used to reduce sources of uncertainty or bias associated with the conclusion (e.g., additional data collection or research); and
- describe how the precautionary principle was applied and any precautionary approaches that have been used in the effects assessment or in the development of mitigation.

7.2 Baseline methodology

The Impact Statement must provide a description of the baseline for the environmental, health, social and economic conditions related to the project, including interrelations and interactions among them, and the

variability in these conditions over temporal and spatial boundaries appropriate to the project. Meaningful, two-way dialogue with communities and Indigenous groups should support the description of how environmental, health, social and economic conditions are interrelated.

Baseline data must be collected in a manner to allow for reliable analysis, extrapolation and predictions. The baseline data should be suitable to estimate pre-project baseline conditions, to predict effects from the project, and to evaluate post-project changes in the conditions within and across the project, local and regional study areas. Baseline data must be captured within auditable management systems, quality management or quality assurance programs, additional information can be found in section 2.3 Management System. (REGDOC.-1.1.1 - section 3.4,)

For all baseline conditions, the Impact Statement must:

- describe the baseline for the environmental, health, social and economic conditions related to the project and the interrelations and interactions among them;
- describe changes in the baseline conditions that are likely to occur in the future, if the project was not carried out, including changes due to future climate change;
- include baseline data collected in a way that makes reliable analyses, extrapolations and predictions possible, and are suitable to estimate pre-project baseline conditions, to predict effects from the project throughout the project lifecycle, and to evaluate changes in the conditions within and across the study areas;
    - where sampling is used to gather field data, standard sampling techniques and approaches should be from recognized government agencies and peer-reviewed published scientific literature for the appropriate technical discipline (e.g., groundwater monitoring, fish monitoring).
    - when reference sites/areas are used, a minimum of two should be identified in order to characterize natural spatial variability in measured parameters (REGDOC.-1.1.1 - section 3.3.4);
- ensure adequacy of baseline data collection for those elements of the environment to be carried forward into future licensing phases with the objective of monitoring for a specified level of change in some environmental parameter or analyte; (REGDOC. 1,1,1 - Appendix B3)
- provide detailed descriptions of data sources and data collection methods, including sampling, survey and research protocols, modelling methods and any assumptions;
    - identify measurement end points, as appropriate (REGDOC. 1,1,1- section 3.4);
- describe modelling methods and include software used, assumptions, estimations of margins of error, validation with field or other appropriate data, model performance and other relevant statistical information;
- show that the data sources used are relevant to and representative of conditions within the established spatial and temporal boundaries and account for natural variability, especially if surrogate data from representative sites are used rather than specific measurements at the project site;

- indicate where baseline data gaps exist and steps taken to address these;
- discuss the degree of confidence in the baseline data (REGDOC.-1.1.1 – C7.1); and
- describe where and how community or Indigenous Knowledge and input were collected and considered in determining baseline conditions.

Proponents are encouraged to consult with IAAC during the development and planning of baseline studies and may use relevant sources of existing baseline information, including those listed in Appendix 1 - Sources of baseline information.

7.3 Selection of valued components

The Impact Statement must identify the VCs that will serve as the focal points for the impact assessment. VCs consists of components that are of particular concern or value to participants and that may be affected by the project. The value of a component not only relates to its role, but also to the value people place on it.

The Integrated Guidelines, in section 8, provide information requirements organized in categories that may be considered as VCs, or may be considered as intermediate components to inform the assessment of VCs, depending on the project. The VCs will help to organize the description of the effects of the project required by the Guidelines.

The VCs included in the Impact Statement must include, at minimum:

Valued Component	Rationale for inclusion
Valued Components for the assessment of adverse effects within federal jurisdiction, as defined under section 2 of the IAA	
Fish and Fish habitat	[e.g., Changes to water quantity and quality could adversely affect freshwater fish and fish habitat.]
[if the project may impact the marine environment: Marine plants]	[e.g., Changes to water quality and habitat could adversely affect marine plants, which are defined as aquatic species.]
Migratory birds	[e.g, Higher noise levels, the presence of lights and removal or disturbance habitat could adversely affect migratory birds.]

Valued Component	Rationale for inclusion
[if applicable: any components of the marine environment affected by pollution that would occur outside Canada or to boundary or international waters not already listed above, e.g., marine water quality]	[e.g, Waste discharge from the facility could result in marine pollution adversely affecting the marine environment affecting marine water quality]
[if the project may impact the environment on federal lands: list potentially impacted VCs linked to these federal lands not already listed above]	[e.g., There are several marine special areas that may be affected by the project.]
Indigenous physical and cultural heritage, and structures, sites or things of significance [*list any structure, site or thing*];	[e.g., Project infrastructure may adversely historic and archaeological sites from the point of view of Indigenous groups]
Current use of lands and resources for traditional purposes by Indigenous Peoples [*add list as appropriate, including any species of concern*]	[e.g., Changes to the terrestrial and marine environment, may adversely affect the experience of traditional fishing and boating by Indigenous groups]
Health, social and economic conditions of Indigenous Peoples [*add list as appropriate*]	[e.g., Project construction and operation may cause changes to air and surface water quality, and to the noise and light environments, likely to adversely affect the health of Indigenous Peoples]
[for a physical activity or designated project that is a federal work or undertaking: list any additional VC such as any additional environmental, health, social or economic effects associated with the project. All potential non-negligible adverse effects of that activity or project should be listed here, e.g., GHGs, wetlands, navigation safety, tourism, etc. Note: nuclear facilities are federal works or undertakings. In such cases, the adverse effects within federal jurisdiction include all potential adverse non-negligible effects resulting from each component of the project that is a federal work or undertaking, irrespective of whether that component is a	[e.g., Dust emissions associated with the port component of the project may affect air quality, and as a result impact human health and community well-being.]

Valued Component	Rationale for inclusion
designated physical activity or an incidental physical activity.]	

The proponent may identify additional VCs beyond those included in the Guidelines, in consultation with Indigenous groups and other participants. Indigenous groups may identify holistic VCs that encompass multiple environmental, health, social, or economic components. Where identified, the proponent should structure the analysis and presentation of individual components into an assessment of the holistic Indigenous VC. Proponents are encouraged to work with Indigenous groups to identify holistic VCs, which may increase the efficiency of the assessment and clarity of presentation.

The Impact Statement must:

- describe the VCs and provide a rationale for the selection of VCs in sufficient detail to allow the reviewer to understand their relevance to the assessment;
- describe the ecological significance of VCs;
- indicate the source and reasons of the concerns or interests considered in the selection of VCs, including from the public, provincial or federal authorities, Indigenous groups, and other participants;
- in the event that a VC is suggested by an Indigenous group but is excluded from the Impact Statement, provide a justification for its exclusion; and
- describe how community and Indigenous knowledge and the perspectives were considered in selecting VCs.

7.4 Spatial and temporal boundaries

The Impact Statement must establish appropriate spatial and temporal boundaries to describe the baseline conditions for, and to guide the assessment of, each VC. The proponent must engage with Indigenous groups when defining spatial and temporal boundaries for VCs that are identified by, or related directly to, Indigenous Peoples.

The proponent should consider additional guidance for assigning appropriate study areas or boundaries provided in Appendix 1 - Establishing spatial and temporal boundaries of the Integrated Guidelines Template.

7.4.1 Spatial boundaries

The proponent should generally establish three spatial boundaries of study areas to assess the impacts on each VC:

- Project Area (PA): defined as the project footprint including all temporary and permanent areas associated with the project, and alternatives considered;
- Local Study Area (LSA): defined as the area beyond the project footprint where project effects may extend; and
- Regional Study Area (RSA): defined as the larger area around the LSA (delineated by ecological, social, economic or other appropriate boundaries), including the region where cumulative effects may extend.

The Impact Statement must:

- describe the spatial boundaries for each VC and provide a rationale for each boundary. Spatial boundaries must be shown on maps;
- define spatial boundaries by taking into account:
  - scale and spatial extent of potential effects and impacts of the project,
  - the physical location of potential receptors, including, where applicable, the movement patterns of potential receptors,
  - relationships between VCs (e.g. interaction between wildlife and vegetation),
  - community knowledge and Indigenous Knowledge,
  - current or traditional land and resource use by Indigenous groups,
  - rights of Indigenous Peoples, including treaty lands, traditional territories and areas or sites used for cultural and spiritual practices,
  - physical, technical, ecological, social, health, economic and cultural considerations,
  - size, nature, location and known effects of past, present and foreseeable projects and activities, particularly for the RSA, and
  - information received from Indigenous groups.
- identify where spatial boundaries may extend to areas that are (i) on federal lands, (ii) in a province other than the one where the project is being carried out, or (iii) outside Canada.

7.4.2 Temporal boundaries

The Impact Statement must:

- describe the temporal boundaries for each VC and provide a rationale for each boundary; and
- define temporal boundaries by taking into account:
  - the project's lifecycle (i.e., site evaluation, site preparation, construction, operation, decommissioning and abandonment);
  - schedule of phases of the project,
  - past conditions and historical context,

- community knowledge and Indigenous Knowledge,
- current or traditional land and resource use by Indigenous groups,
- rights of Indigenous Peoples, including treaty lands, traditional territories and areas or sites used for cultural and spiritual practices,
- relevant physical, technical, ecological, social, health, economic and cultural considerations,
- timing of past, present and foreseeable projects and activities, and
- information received from Indigenous groups.

7.5 Effects assessment methodology

The Impact Statement must describe the changes to the environment or to the health, social or economic conditions and the positive and negative consequences of these changes (the effects) that are likely to be caused by the carrying out of the project, and the results of interactions among the effects. The overall effects assessment methodology must also consider the project's potential impacts on the exercise of rights of the Indigenous Peoples of Canada as further detailed in section 10. The description must include the information requirements detailed in specific effects sections in the Guidelines.

The assessment of effects must be based on a comparison of baseline conditions and the predicted future conditions with the project. In some cases, it may be appropriate to determine future conditions both with, and without, the project, in order to account for potential changes in baseline conditions (e.g. due to climate change or to anticipated changes in socioeconomic conditions).

After considering the technically and economically feasible mitigation measures (see section 7.6 Mitigation and enhancement measures), the Impact Statement must describe any residual[5] environmental, health, social or economic effects of the project. The assessment of residual effects must also take into account interactions between the residual effects of the project and those of past, existing and reasonably foreseeable projects or physical activities, as described in section 7.7 Cumulative effects assessment.

Depending on the VC, the description of the effects can be either qualitative or quantitative, taking into account any important contextual factors, as appropriate. The Impact Statement may describe the effects in terms of magnitude, geographic extent, timing, duration and frequency, and whether effects are reversible or irreversible. For some effects, it may be more appropriate to use other criteria, such as the

[5] Residual effects are changes to the environment or to the health, social or economic conditions, and the positive and negative consequences of these changes, of the project that remain, or are predicted to remain, even after mitigation have been implemented.

nature of the effects, directionality, causation and probability. The scope of information should be scaled to the scope of anticipated adverse effects (REGDOC.-1.1.1 - Appendix G5.4,). The ecological and socioeconomic context should also be provided. The perception of the same effect may vary among different individuals, groups and communities. Consequently, the effects assessment should take into account views and concerns expressed through engagement with Indigenous Peoples and community members.

The Impact Statement must:

- describe the project's potential direct and indirect, adverse and positive effects for each phase of the project;
- identify and describe measures that are technically and economically feasible and that would mitigate the project's adverse effects or enhancements to increase positive effects (*see section* 7.6 Mitigation and enhancement measures for *more details*);
- describe any residual effects of the project;
- identify the effects that are adverse effects within federal jurisdiction and the direct or incidental adverse effects, as defined in section 2 of the IAA;
- describe how baseline data were used to inform this analysis;
- describe the analytical methods selected to assess effects, including clearly stated assumptions for all predictions and how each assumption has been tested and criteria or descriptors used;
- describe the probability or likelihood of that effect occurring, using methods that are statistically and scientifically defensible;
- for quantitative predictions based on models, describe detail 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;
- discuss the degree of confidence in the predictions and conclusions of the effect assessment;
- if a detailed description of effects cannot be provided, provide a rationale for the absence of details and a general description of the potential effects and related project activities (e.g. activities and effects related to closure and reclamation). The proponent should confirm the rationale with IAAC before submitting the Impact Statement;
- for predictions that may be affected by climate change, discuss how the range of potential climates informed the assessment, including predicted changes in climate extremes;
- consider and describe the interactions among the environmental, health, social and economic effects and impacts on Indigenous Peoples and their rights;
- consider and describe the perspectives, concerns and tolerance levels of Indigenous groups and other participants;
- describe where and how Indigenous Knowledge and community knowledge and input were considered and incorporated into effects assessment; and

- describe how GBA Plus was applied to examine differences in effects among diverse population groups and provide disaggregated data where necessary.

7.6 Mitigation and enhancement measures

The Impact Statement must identify mitigation measures that are technically and economically feasible and that would eliminate, reduce, control or offset adverse effects within federal jurisdiction, and direct or incidental adverse effects. The Guidelines, in sections 8 to 11, provide additional requirements specific to mitigating environmental, health, social and economic effects which may be considered for the development of mitigation measures of adverse effects within federal jurisdiction, or direct or incidental adverse effects. As such, for the purpose of these Guidelines, the term “mitigation” is used broadly to refer to any measure to eliminate, reduce, control or offset adverse effects. The proponent may also identify enhancement measures to increase positive effects, such as local and regional training efforts, investment in infrastructure and services, and projects to rehabilitate degraded environments. For more guidance on developing mitigation and enhancement measures see Appendix 1 - Developing mitigation measures and enhancements of the Guidelines Template.

The Impact Statement must:

- describe mitigation that are specific to each environmental, health, social or economic effect identified in the effects assessment including:
  - mitigation practices, policies and commitments that are part of the project design and that are required to achieve the predicted effects (e.g. project design elements that were accounted for in the effects assessment),
  - standard mitigation practices, policies and commitments that constitute proven technically and economically feasible mitigation measures and that are to be applied as part of standard practice, and
  - any new or innovative mitigation measures being proposed;
- propose differentiated mitigation, if applicable, so that adverse effects do not fall disproportionately on diverse population groups, or so they are not disadvantaged in sharing any development benefits and opportunities resulting from the project. Mitigation measures should be developed in collaboration with those who are vulnerable and/or disadvantaged;
- write mitigation as specific commitments that clearly describe how the proponent intends to implement them and the desired outcomes. Measures are to be specific, achievable, measurable and verifiable, and described in a manner that avoids ambiguity in intent, interpretation and implementation;
- identify and describe the use and application of best available technology and best environmental practice in identifying, assessing and implementing mitigation measures;

- describe any environmental protection plan(s) for the project and, if applicable, the environmental management system through which the proponent will deliver this plan. The plan(s) must provide an overall perspective on how adverse effects would be minimized and managed over time;
- identify the party responsible for the implementation of mitigation measures and the system of accountability;
- discuss the mechanisms the proponent would use to require its contractors and sub-contractors to comply with any commitments;
- describe the approach that would be taken if a mitigation measure is no longer feasible while the project is carried out;
- describe how, throughout the project's duration, the lessons learned through the follow-up program will be used to continually improve mitigation measures;
- where components are to be decommissioned and abandoned, include planned activities to do so. Project components that may be abandoned and decommissioned during the construction or operation phases may include access roads, temporary laydown areas, aggregate extraction sites and other temporary sites;
- where appropriate, provide details regarding financial liability and compensation in place as required by regulation or company commitment in relation to decommissioning or abandonment;
- document specific suggestions raised by Indigenous groups for avoiding, mitigating or otherwise accommodating the project's environmental, health, social and economic effects, including potential effects and impacts on Indigenous Peoples and describe whether and how these measures will be incorporated in the project design;
- identify opportunities for enhancing positive effects, such as creation of local employment and infrastructure improvements;
- 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;
- in cases where proposed mitigation differ from any specifically suggested in the Guidelines, provide a rationale; and
- describe any relevant federal, provincial, regional or municipal legislative or regulatory frameworks (such as regulations, approvals, and programs) that will contribute to the management of effects; and how they will contribute to the management of effects (see section 3.3 Regulatory framework and the role of government).

For each mitigation identified, the Impact Statement must:

- provide an assessment of the anticipated effectiveness and resulting residual effects, including available information that was relied on such as technical information from other projects, peer-reviewed studies, as well as Indigenous Knowledge and community knowledge;

- if there is little experience or uncertainty as to the effectiveness of any measures, describe the potential risks and effects should those measures not be effective or malfunction;
- for those mitigation intended to address impacts on Indigenous Peoples and their rights, provide a description of the consultation with Indigenous groups regarding the residual impacts;
- assess any potentially adverse environmental effects associated with the mitigation method itself; and
- describe how disproportionate effects that were identified in the GBA Plus results were used to inform mitigation and enhancement measures.

7.7 Cumulative effects assessment

The proponent must assess the project's cumulative effects using the approach described in IAAC's guidance document Policy Framework for Assessing Cumulative Effects under the *Impact Assessment Act*.

Cumulative effects are changes to the environment, health, social, cultural and economic conditions, as a result of the project's residual effects combined with the effects of other past, existing and reasonably foreseeable projects and physical activities. Cumulative effects may result if:

- the implementation of the project may cause residual adverse effects to the VC, and
- the same VC has been or can be affected by other past, existing or future projects or physical activities.

A cumulative effect on an environmental, health, social or economic component or on Indigenous Peoples and their rights may be important even if the project's incremental effects to these components by themselves are minor. Project components and activities should be considered in the cumulative effects analysis to understand synergistic, compensatory, masking or additive effects.

The Impact Statement must:

- identify the VCs that will be subject to the cumulative effects assessment, including: all VCs for which the proponent or an Indigenous group anticipates residual effects or impacts on Indigenous Peoples and their rights from the project and those identified as a concern in the Planning phase;
    - [add list of VCs identified during the Planning phase for the cumulative effects assessment];
- include a rationale, with prior consultation with IAAC, if VCs are excluded from the cumulative effects assessment;
- identify and justify the spatial and temporal boundaries for the cumulative effect assessment for each VC, taking into account:
    - boundaries may differ for each VC and will generally be larger than the boundaries for the project effects alone,

  - boundaries should not be constrained by jurisdictional boundaries and may extend beyond Canada's jurisdiction,
  - temporal boundaries should account for potential effects throughout the lifecycle of the project, including decommissioning and abandonment, and
  - spatial and temporal boundaries for VCs related to effects and impacts on Indigenous Peoples defined in collaboration with the Indigenous groups concerned;
- identify the sources of potential cumulative effects. Specify which other projects or activities that have been or will be carried out that could have resulted or could result in effects on the VCs within the defined boundaries and whether those effects could interact with the residual effects of the project. Clearly explain and justify the rationale for selecting other past, existing or future projects or activities to include in the cumulative effects assessment. Project activities to be considered include, but are not limited to:
  - [list projects and activities to be considered in the assessment of cumulative effects, if known];
- consider the results of any relevant regional studies or regional assessments;
- describe how the selection of boundaries and other past, existing or future projects or activities for cumulative effects assessment were informed by consultations with the public, Indigenous Peoples, lifecycle regulators, jurisdictions, federal authorities and other participants;
- assess the cumulative effects for each selected VC:
  - the analysis must include the effects of past, existing and future projects and physical activities in combination with the residual effects of the project, taking into account how the effects may interact (additive, synergistic, compensatory, and masking effects;
  - the analysis of the effects of future projects and physical activities must include a comparison of possible future scenarios with and without the project, and must reflect the full range of cumulative effects and not just the project's contribution;
  - the effects of past and existing projects and physical activities can be used to put the current state of the VC into context, 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
  - the potential for disproportionate cumulative effects for diverse population groups as per the GBA Plus;
- describe technically and economically feasible mitigation proposed for cumulative environmental, health, social and economic effects, as well as potential impacts on Indigenous Peoples and their rights, including:
  - an assessment of the effectiveness of the measures proposed to mitigate the cumulative effects,
  - in cases where measures to mitigate these effects are beyond the control of the proponent, identify any parties that have the authority to act on these measures. In such cases, the Impact

Statement must summarize any commitments by the other parties regarding implementation of the necessary measures and any associated communication plans; and

- assess the regional implications of applying project-specific mitigation and enhancement measures, taking into account any reasonably foreseeable development in the area.

The cumulative effects assessment must include consideration of cumulative effects in relation to the ability of Indigenous Peoples to exercise their rights and culture and must take into account the views and preferences of each Indigenous group in carrying out and presenting the assessment. Both the content and means of presenting this information is to be developed in consultation with each potentially impacted Indigenous group. Where provided with information, the proponent must also document the lived and told experience of the changes in relation to the ability of Indigenous Peoples to exercise their rights and culture through time in collaboration with Indigenous communities. If Indigenous groups do not wish to participate in the cumulative effects assessment, the proponent should continue sharing information and analyses with the Indigenous groups, to use publicly available sources of information to support the assessment, and to document their efforts in that respect.

The Government of Canada has developed the Open Science and Data Platform as a means to access science, data, publications and information about development activities to better understand cumulative effects. Proponents are encouraged to make use of this resource in their cumulative effects analysis.

7.8 Extent to which adverse federal effects are significant

For adverse effects within federal jurisdiction and direct or incidental adverse effects, the Impact Statement must:

- characterize adverse residual effects and cumulative effects, using criteria and language most appropriate for the effect;
- consider using the following criteria, as appropriate:
  - magnitude,
  - geographic extent,
  - timing,
  - duration,
  - frequency,
  - reversibility, and
  - uncertainty;
- the environmental, health, social and economic context within which likely effects may occur 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 wildlife,
  - the existence of standards, guidelines, tolerance levels and other sources of information to assess effects, and
  - the potential for disproportionate residual effects for diverse population groups as per GBA Plus;
- characterize the extent to which the residual adverse effects within federal jurisdiction and the residual direct or incidental adverse effects are significant;
- characterize the extent to which the cumulative adverse effects within federal jurisdiction, and cumulative direct or incidental adverse effects, are significant;
- describe how the probability or likelihood of that effect occurring and the degree of scientific uncertainty related to the data and methods used in the effect assessment, where considered in characterizing the extent of significance;
- indicate, among the residual and cumulative adverse effects within federal jurisdiction and direct or incidental adverse effects, those that are likely to be, to some extent, significant;
- justify the methodology and choice of quantitative or qualitative criteria used to determine the extent to which the residual and cumulative effects are significant; and
- identify and explain relevant sources of information that were used to characterize the extent to which residual and cumulative effects are significant, including how the perspectives, concerns and tolerance levels of Indigenous groups and other participants were considered.

The information provided must be clear and sufficient to enable IAAC and the review panel, Indigenous groups, and participants to evaluate the proponent's characterization of the extent of significance of adverse residual effects within federal jurisdiction and of direct and incidental adverse effects.

Criteria and relevant benchmarks should be defined and applied with Indigenous groups, including but not limited to the description of effects on Indigenous Peoples. Criteria may include those identified in Guidance: Assessment of Potential Impacts on the Rights of Indigenous Peoples and other relevant criteria proposed by an Indigenous group. These criteria should be applied to determine the extent to which adverse effects on Indigenous Peoples are significant.

For more information please see IAAC's guidance on Describing effects and characterizing extent of significance.

7.9 General Criteria for Site Evaluation

A detailed and methodical site evaluation, using a graded approach commensurate with the risks posed by the proposed reactor facility, is essential in preparing site mitigation strategies (including emergency response plans) that will adequately protect the facility personnel, the public and the environment from the effects of nuclear and hazardous substances arising from licensed activities. In order to apply for a LTPS, the Impact Statement must be prepared in a manner to demonstrate the following requirements have been met, which has further been integrated in the requirements of section 11 Security Considerations, 13 Effects of the Environment on the Project, and in Part 2.

7.9.1 Requirements for site evaluation

Site evaluation must take into account all phases of the facility lifecycle, from site preparation to abandonment. The proponent must:

- use a documented, systematic process for site evaluation (including site characterization);
- consider the synergy of multiple simultaneous events (e.g. combinations of external hazards, reactor facility events including beyond-design-basis events and severe accidents, and multiple effects of different activities on the site);
- ensure that the site is evaluated at a level sufficient to confirm the suitability of the site for the activity (REGDOC.-1.1.1 - section 3.3);
- document the methodology used to determine the suitability of the site over the full lifecycle of the proposed facility;
    - demonstrate how facility decommissioning at the end of the project is being considered in the overall lifecycle of the nuclear facility;
    - consider the ease with which the proposed facility can be decommissioned; that is, the facility is designed to be readily dismantled and disposed of in a fashion that minimizes environmental effects;
    - take into account proximity and transport considerations to recycling, waste storage and disposal infrastructure; (REGDOC.-1.1.1 - section 3.9); and
- document the processes used to manage the quality of work during site evaluation and the activities that verify compliance (REGDOC.-1.1.1 – Appendix B.1)

For analysis of external hazards, the proponent must consider both design-basis events and beyond-design-basis events. In particular, the proponent must consider the concept of potential cliff-edge effects when analyzing external hazards, where a small change of conditions may lead to a catastrophic increase in the severity of consequences.

For reactor facilities, the proponent must analyze external hazards at the site evaluation stage, to confirm that the reactor facility will withstand such events.

Evaluation of the suitability of a site for the construction and operation of a nuclear facility must address the following considerations:

- population density, population distribution and other characteristics of the emergency planning zone that may have an effect on the implementation of emergency response measures and the need to evaluate the risks to individuals and the general population;
- the technical basis for the safety and security analysis issues that will be included in the licence application (particularly important for the licence to prepare site), including the range of technologies being considered and the estimated total power for the reactor facility;
- categorization and assessment of the characteristics of the natural and human environment in the region that may be affected by potential radiological or conventional effects associated with site preparation and construction, operational states, and accident conditions;
- predictions about the evolution of the natural and human environment in the region, particularly population growth and distribution, which may have a bearing on safety and security throughout the projected lifecycle of the reactor facility;
- storage and transport of input and output materials – such as fresh and spent fuel, and radioactive waste;
- information about non-radiological effects due to chemical or thermal releases, or other site activities such as damage to aquatic organisms from entrainment into cooling water intakes, or physical disruption of landscape and shoreline from site development, and the potential for explosion and the dispersion of chemical products;
- as far as practicable, information about the potential for interactions between nuclear and conventional effluents, such as the combination of heat or chemicals with radioactive material in liquid effluents;
- predictions about the reactor facility's effects on the population, including those that could lead to emergency conditions, with due consideration of relevant factors (e.g. population distribution, use of land and water, radiological effect of any other releases of radioactive material in the region);
- hazards associated with natural and human-induced external events, including future alterations of magnitude and frequency due to effects of climate change; and
- evaluation against safety goals.

In evaluating the site, the proponent must also take into account the combined radiological and conventional effects of the site and the reactor facility on each other during normal and abnormal situations, based on both temporal (lifecycle) and spatial (regional, local and site) considerations.

Guidance

The proponent should provide a high-level overview of alternate sites considered prior to selecting the proposed site, including a brief description of the degree and depth of site evaluation used to narrow down the final choice(s).

The proponent should describe how the characteristics of the natural and human induced hazards, as well as the demographic, meteorological and hydrological conditions of relevance to the nuclear installation, will

be monitored over the nuclear facility's lifecycle. (section 3.3 of REGDOC.-1.1.1 has been incorporated into section 7.9.1)

7.9.2 Evaluation against safety goals from a site perspective

The proponent must evaluate reactor facility designs against applicable safety goals, taking into account the characteristics of the site, the risks associated with external hazards (including any potential cliff-edge effects that may arise from small increases in the severity of external hazards), and the potential negative effect of the reactor facility on the environment. The evaluation must include the effects of multiple unit events and – where applicable – effects from events that may affect multiple units.

To support this evaluation, the proponent must provide a summary of the process by which the different nuclear reactor technologies being considered have been included in the site evaluation. Bounding approaches for site evaluation may be considered; however, bounding limits for a proposed facility must be based on credible information from designs being considered for that site.

For more information on safety goals related to quantitative and qualitative safety goals, see Part 2, section *22.2.2 Assessment of non-malevolent nuclear accidents and malfunctions* and REGDOC.-2.5.2, *Design of Reactor Facilities version 2.1* [6].

7.9.3 Consideration of the evolution of natural and human-induced factors

The proponent must evaluate the evolution of natural and human-induced factors in the environment that may have a bearing on safety and security across a time period that encompasses the projected lifecycle of the reactor facility, with the understanding that different levels of evaluation and monitoring apply to the various phases of the reactor facility's lifecycle.

For more information, see sections 11 Security Considerations, 13 Effects of the Environment on the Project, and Part 2 – Licensing Requirements of the Canadian Nuclear Safety Commission.

7.9.4 Evaluation of hazards associated with external events

[6] CNSC, REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*, Ottawa, Canada, 2014

The proponent must examine the site with regard to the frequency and severity of external natural and human-induced events that could affect the safety and security of the reactor facility. The analysis must include an examination of potential cliff-edge effects that may arise from small increases in the severity of events. This information provides a baseline for future assessments over the life of the facility.

The proponent must apply a systematic approach for identifying and assessing the hazards associated with external events. The approach (including the underlying rationale) must be developed, documented, and implemented in an auditable fashion.

The proponent must identify and assess each external natural and human-induced event with the following considerations:

- the potential direct and indirect effects of the event on the reactor facility structures, systems, and components (SSCs), including those that could affect the safe operation of the reactor facility in both normal and abnormal operating states:
    - direct effects (e.g. an earthquake resulting in a main steam line break), and
    - indirect effects (e.g. a corrosive gas release from a nearby chemical plant degrading reactor facility safety system trip circuits via ventilation intakes);
- the potential combined effects of external and human-induced events with normal and accidental releases from the reactor facility that would exceed environmental limits, or cause a significant adverse effect to occur; and
- effects of natural external and human-induced events – including consequential events (that is, events that arise as a consequence of an initiating event) or reasonable combinations of independent events – that could influence the ability to successfully implement emergency response plans.

Derivation of the hazards associated with external events must include consideration of the combined effects of these hazards with the ambient conditions (for example, simultaneous aircraft crash and heavy snowstorm). Combined effects of external hazards can have significant effects on such facets of the reactor facility as the implementation of emergency response plans, accident mitigation, and contaminant dispersion.

The region assessed for each identified external event must encompass the environment that could be affected.

The evaluation must consider foreseeable changes in land use for the projected lifecycle of the reactor facility, in order to assess and plan for mitigation of new external hazards introduced by changes in land use.

For more information, refer to section 11 Security Considerations.

Guidance

Site-specific data should be used to determine hazards, unless such data is unobtainable. In this case, data from similar regions that is sufficiently relevant to the region of interest, or data derived from appropriate and acceptable simulation techniques, may be used. Data from similar regions and from simulated findings may also be used to augment site-specific data.

Historic and instrumentally recorded information, and records of the identified external events and their severity, should be collected for the region and analyzed for reliability, accuracy, and completeness. (REGDOC.-1.1.1 - section 3.3.3 has been incorporated into section 7.9.4)

7.9.5 Determining the potential effect of the site on the environment

In describing potential effects of the site on the environment, the proponent must consider the synergy of multiple events. Some examples of such events are:

- those that affect multiple units, including those leading to severe accidents;
- multiple effects of several different activities, such as simultaneous oil spill and fire; and
- spills of multiple chemicals and interactions thereof.

Contaminant (nuclear and hazardous substances) pathway modelling must incorporate atmospheric dispersion, surface water dispersion, and groundwater movement, as well as the associated abiotic and biotic environmental compartments.

Models used for dispersion and pathways analyses must include site-specific, local, and regional topographic features and characteristics of the reactor facility and take into account natural and human-induced events that may influence contaminant behaviour.

The pathways analyses must take specific environmental and site characteristics into account, with special attention paid to the function of the biosphere in the accumulation and transport of nuclear and hazardous substances.

To determine the potential contaminant effect on the environment, assessments of all releases must be made under normal and accident conditions for all phases of the reactor facility's lifecycle. This assessment must include an examination of potential releases from multiple unit events, or events affecting multiple units.

The proponent must complete bounding scenarios involving modelling of potential effects from maximum possible releases, in order to establish the outer boundaries or worst-case scenarios for the reactor facility. These bounding scenarios also contribute to the scenarios used for emergency planning.

Guidance

Assessments of releases or disturbances associated with normal or routine operations should be based on expected performance (e.g. average concentrations) and upper threshold bounding conditions, as well as possible pulse releases (high concentration with short exposure period) from anticipated operational occurrences.

The locations of the reactor facility and of the subsidiary structures on the site should be examined at a high level, with the assistance of environmental modelling. Such structures should be located so as to minimize potential effects on the public and on the environment (for example, emission or effluent release points, and air or water intake structures).

The proponent should identify reference areas that will be unexposed to project interactions but close enough to be similar to the special areas or activities. These reference areas are used to detect project effects relative to changes in background conditions. Reference areas should be sampled during baseline conditions to establish the natural differences from exposure sites. The baseline should be characterized sufficiently to allow for a statistically significant assessment of project effects. Two or more reference areas should be identified, in order to characterize natural spatial variability in measured parameters as a "noise" factor to be accounted for when monitoring to detect project effects. (REGDOC.-1.1.1 - section 3.3.4 has been incorporated into section 7.9.5)

For more information, see IAEA Safety Standards Series No. NS-G-3.2, *Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants*[7].

7.9.6 Population and emergency planning considerations

An exclusion zone is "a parcel of land within or surrounding a nuclear facility on which there is no permanent dwelling and over which a licensee has the legal authority to exercise control".

To support the achievement of safety objectives, the site evaluation must take the following population and emergency planning considerations into account:

- the planning basis as described in REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*, version 2;

[7] IAEA, Safety Standards Series No.NS-G-3.2, *Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants*, Vienna, Austria, 2002

- population density, characterization and distribution within the emergency planning zone, with particular focus on existing and projected population densities and distributions in the region including resident populations and transient populations (note: this data is to be kept up to date over the lifecycle of the reactor facility);
- present and future use of land and resources;
- physical site characteristics that could impede the development and implementation of emergency plans (e.g. the ability to deliver fuel in a timely manner to backup generators);
- populations, including vulnerable populations, in the vicinity of the reactor facility that are, or may become, difficult to evacuate or shelter (e.g. schools, prisons, hospitals); and
- ability to maintain population and land-use activities in the emergency planning zone at levels that will not impede implementation of the emergency response plans.

Before submitting the application for a LTPS, the proponent must confirm with the surrounding municipalities and the affected provinces, territories, foreign states, and neighbouring countries that the implementation of their respective emergency plans and related protective actions will accommodate the lifecycle of the proposed project. Discussions around early plans must include plans and consideration of the following:

- onsite response, including the capacity to bring offsite equipment onsite;
- ability of offsite licensee staff to communicate with and access the site during a catastrophic event;
- offsite response, and how it is coordinated between the licensee and federal, provincial and municipal government agencies playing a role in emergency preparedness and response;
- how the licensee will coordinate with regulatory bodies;
- how the licensee will respond and coordinate with emergency service providers (fire department, ambulance, hospital, fuel, food, and so on);

The proponent must document the strategy and process for effective two-way ongoing consultation with emergency management agencies affected by site operations throughout the project's lifecycle. Emergency management agencies include security agencies involved in the development of the site selection threat risk assessment report.

Guidance

Because of the time required for this task, the proponent should initiate these discussions during the early stages of site evaluation. These agreements would be required prior to granting a LTPS, if the project was allowed to proceed.

The emergency planning zones are established by the province or territory and are under control of the region or municipality. These zones cover the area beyond the exclusion zone that should be considered with respect to implementing emergency measures. (section 3.3.5 of REGDOC.-1.1.1 has been incorporated into 7.9.6)

7.9.7 Consideration of future life-extension activities

Where appropriate, the proponent must consider the potential effects of longer service life, power uprate activities, and modifications to accommodate additional or modified uses, including:

- any proposed longer period of service life for the reactor facility;
- additional conventional and nuclear waste generated, as well as estimated resulting effects on handling, transport, and storage of waste;
- effects of external and human induced events on the life extension, power uprate and/or modification activities; and
- effects on security and emergency planning.

Guidance

Life extension involves the replacement or refurbishment of major components, or substantial modifications to the plant, or both.

Anticipated power uprate projects represent early plans to seek to use reactor facility design margins and future operating efficiencies and experience, in order to increase reactor facility output capacity by some degree.

Power uprate projects may also require plant modernization activities, in order to maintain compliance with the NSCA and associated regulations.

For small reactors, in particular research reactors, the proponent may seek, at some point during the lifecycle of the reactor, to modify the design in order to accommodate additional uses (such as new or alternate medical isotope production, or district heating). (section 3.3.6 of REGDOC.-1.1.1 has been incorporated into 7.9.6)

8. Biophysical Environment

In describing effects to 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. The Impact Statement 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 but are not limited to: patterns and connectivity of habitat patches, continuation of key natural disturbance regimes, structural complexity, hydrogeological or oceanographic patterns, nutrient cycling, abiotic-biotic and biotic interactions, population dynamics, genetic diversity, and Indigenous Knowledge relevant for the conservation and sustainable use of relevant species populations, communities and associated habitats.

The geographical settings, as described in section 3.2 Project location, must be described and presented on maps in the relevant sections of the biophysical environment, along with the presence of endangered ecosystems, rare, limited and/or significant habitat (e.g. federal, provincial or Indigenous protected areas, wildlife sensitivity maps, RAMSAR sites, identified or proposed critical habitat in recovery strategies or action plans) potentially affected by the project).

[In addition to the following subsections on requirements for the biophysical environment, sector-specific requirements are included in Appendix 3 – Sector-Specific Considerations.]

8.1 Meteorological environment

The Impact Statement must:

- describe the local and regional climate, in sufficient detail to highlight weather variations and characteristics of the regions affected by project activities and components, including historical records of relevant meteorological information.
    - Five years of meteorological data should be used. Site-specific meteorological data may be used if it covers the most recent five-year period. The proponent should verify that the data covering the most recent one-year period is representative of the conditions at the site. If the data is not representative, then the five-year average data should be used. (REGDOC.-1.1.1 - Appendix C2).
    - The regional and local meteorological data should be appropriate as bases for:
        - evaluation of potential changes in normal and extreme values;
        - severe weather phenomena;
        - assessing effects on air quality from the project, from site preparation to abandonment (REGDOC.-1.1.1 - Appendix C2; and
- assessing the effects on design and siting of the reactor facility and its heat dissipation system (REGDOC.-1.1.1 - Appendix C2);
    - provide summary data and the reference to underlying data source, including unique weather station identifiers for:
    - monthly mean, maximum and minimum temperatures,
    - monthly mean, maximum and minimum precipitation,
    - typical wind speed and direction, and
    - standard and reliable meteorological measurement to provide estimates of evaporation (e.g. using the Penman, Morton or Meyer Methods) or of evapotranspiration;
- identify the locations of all meteorological and air quality data collection stations on an appropriately sized topographical map and include a justification of their locations; (REGDOC.-1.1.1 - Appendix C2,)
- describe the location of onsite meteorological stations and other local sources of meteorological data with respect to local topographic characteristics that could affect:
    - local airflow patterns (for example, local circulation conditions, such as “drainage flow”), and
    - if the site is located close to a lake, information about land-lake interactions; (REGDOC.-1.1.1 - Appendix C2)
    - [*if required:* provide reference to sources (and unique weather station identifiers) for hourly meteorological data (wind speed and direction, air temperature, dew point temperature or

humidity, air pressure, precipitation data, and solar radiation (REGDOC.-1.1.1 - Appendix C2) (from a minimum of one year to support dispersion modelling that captures the normal variability of meteorological conditions];

- demonstrate how criteria in the following safety guides were considered in baseline information:
  - NS-G-3.2, Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, and
  - SSG-18, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations; (REGDOC.-1.1.1 - Appendix C2)
- include information about climatic parameters as compared against references, including for air masses, general airflow, pressure patterns, and frontal systems; (REGDOC.-1.1.1 - Appendix C2)
- describe the influence of climate change on the local and regional climate and on the risks of extreme weather events.

8.2 Geology, geochemistry and geological hazards

8.2.1 Baseline conditions

The Impact Statement must:

- describe the geomorphology, topography and geotechnical characteristics of areas proposed for construction of major project components [, including the presence and distribution of permafrost];
- describe the stability of the foundation material under dynamic, static, and seismic loading, with a detailed description of surface and subsurface conditions (including hydrogeochemical effects) to be incorporated into a geotechnical investigation program for the purposes of hazard determination and mitigation (REGDOC.-1.1.1 - section 3.5.5,);
- analyze underground instability (rock falls and underground collapses) and groundwater inflow using site-specific geotechnical and hydrogeological data to assess the potential risks to worker safety (REGDOC.-1.1.1 - section 3.5.5);
- describe any potential site instability, such as collapse, subsidence, surface uplift, and liquefaction of the subsurface materials and the backfill materials (REGDOC.-1.1.1 - section 3.5.5);
- present a 3-dimensional numerical geological model developed for the site, local, and regional study areas based on the conceptual model of the geological environment;
  - include cross sections through the 3-dimensional models showing the geological units, unit thicknesses, and structural information (REGDOC.-1.1.1 - Appendix C3.1);
  - state limitations and assumptions in the modelling approach, including calibration methods, model validation and accuracy;

- calibrate the numerical model to baseline geological 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 how spatial variability is considered in model calibration;
- analyse the sensitivity of key model outputs to hydraulic properties and climatic parameters such as recharge;

- using the calibrated numerical model, provide a baseline groundwater budget including baseflow discharge to wetlands, streams and rivers, recharge from lakes or streams, and any anthropogenic withdrawals;
- describe the geology of the [surface, bedrock and unconsolidated sediments] for the project, including a table of geological descriptions, geological maps and cross- sections at appropriate [local and/or regional] scale(s);
- describe the geological history of the site, local, and regional study areas including information on bedrock lithology and stratigraphy (REGDOC.-1.1.1 - Appendix C3.1);
- include relative and absolute age information, where available, based on published government reports or journal articles (REGDOC.-1.1.1 - Appendix C3.1);
- describe baseline concentrations of contaminants of concern within the site, local, and regional study areas and downstream receiving environments;
- contaminants should be measured in appropriate media (i.e. groundwater, surface water, soil, sediment);
    - contaminants associated with historical, current, or proposed site activities should form the basis for the baseline monitoring program;
- describe the geotechnical and mechanical properties of the rocks and overburden, including shear strength and liquefaction potential (REGDOC.-1.1.1 - section 3.4.2);
- identify and describe any geological hazards that exist in the areas planned for the project facilities and infrastructure, including:
    - [history of seismic activity in the area caused by mining activities or induced by earthquakes, and secondary effects such as the risk of seismic generated landslides and liquefaction];
    - evidence of active faults;
    - structural geology and tectonic setting (REGDOC.-1.1.1 - Appendix C3.0);
    - an assessment of whether a fault or any part of a fault is capable, on the basis of geological, geophysical, geodetic, or seismological data (including paleoseismological, geomorphological data, etc.) (REGDOC.-1.1.1 - section 3.5.6);
    - isostatic rise or subsidence;
    - history of landslides, slope erosion and the potential for ground and rock instability/landslides, and subsidence during and following project activities; and

  - [*if near a shoreline:* history of landslide-generated tsunamis],
  - [*if there is a marine infrastructure:* history and potential of submarine/underwater landslides], and
  - [*if applicable:* history and potential of volcanic related hazards];
- for structures such as faults, lineaments and arches, assess their seismogenic potential and their potential to constitute preferential groundwater flow paths, with a description of their tectonic setting (REGDOC.-1.1.1 - section 3.5.6);
- conduct a seismotectonic evaluation for the region, using geophysical data and information on geotechnical hazards (REGDOC.-1.1.1 – section 3.5.6);
- prepare a site-specific seismic hazard assessment, including a paleoseismic investigation and probabilistic seismic hazard analysis to develop ground motion response spectra, for the final selected site to be referenced in the licence to prepare site application (REGDOC.-1.1.1 - Appendix C3.5);
  - conduct the assessment in accordance with CSA N289.2, *Ground motion determination for seismic qualification of nuclear power plants* (REGDOC.-1.1.1 - section3.5.6);
- identify on geological maps the location of areas of bedrock outcrops that will require blasting;
- map both active and inactive structural geological features using 2-dimensional and 3-dimensional models;
- include data from in-situ investigations, including maps of borehole locations and their positions relative to the project (REGDOC.-1.1.1 - Appendix C3.1);
  - for data obtained with in-situ investigations, indicate the location of the boreholes on maps and cross- sections with their positions relative to the planned facility shown (REGDOC.-1.1.1 - Appendix C3.2);
- include all available information (both recorded and those available from geoscientific studies and historical accounts) on volcanic activity that has occurred in the region;
  - include characteristics of potential volcanic events, such as tectonic setting, type of volcanism and nature of material produced during eruption including volatile gas emissions (REGDOC.-1.1.1 - Appendix C3.5.6);
- [*if applicable*: provide a characterization of instabilities caused by historical mining activities]; and
- [*if applicable:* provide a characterization of the geochemical composition of materials to be excavated].

The baseline information should address the criteria contained in the following documents:

- *REGDOC.-1.1.1 – sections 3.5.5, 3.5.6, appendices C.3.4 and C.3.5*
- *REGDOC.-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 2 – section B.4.1 Geology*

- *NRC Regulations (10 CFR), Appendix A to Part 100 – Seismic and Geologic Siting Criteria for Nuclear Power Plants*
- *CSA N289.2, Ground motion determination for seismic qualification of nuclear power plants*
- *CSA N289.3, Design procedures for seismic qualification of nuclear power plants*
- *IAEA NS-G-3.6, Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants*
- *IAEA NS-R-3(Rev1), Site Evaluation for Nuclear Installations*
- NRC Regulations (10 CFR), *Appendix A to Part100 – Seismic and Geologic Siting Criteria for Nuclear Power Plants*

8.2.2 Effects to geology, geochemistry and geological hazards

The Impact Statement must:

- describe the effects of the project on geology, geochemistry and geological hazards, including:
  - [list any project-specific requirements].
- assess settlements (magnitude and rate) of foundations and/or foundation soils caused by large surface loadings and/or underground water drainage, using project-specific data (REGDOC. 1.1.1 - Section 3.5.5);
- analyze differential settlement and soil distortion as required to assess their potential effects on the nuclear facility(REGDOC. 1.1.1 - Section 3.5.5);

8.3 Topography, soil and sediment

8.3.1 Baseline conditions

The Impact Statement must:

- describe the terrain, soils and sediments within the LSAs and RSAs, including sediment soil types and stratigraphy Provide surficial geology maps and cross- sections of appropriate scale;
- describe soil characteristics that are most likely to influence future assessments and which are required for modelling purposes, including pH, soil bulk density, soil moisture content (REGDOC.-1.1.1 - Appendix C6);
- provide the geotechnical properties of the soil units, such as index properties, shear strength, deformation characteristics, and liquefaction potential (REGDOC.-1.1.1 - Appendix C3.2);
- provide dynamic properties (such as shear wave velocities, damping ratio, shear modulus) to be used in soil response and soil-structure interaction analyses (REGDOC.-1.1.1 - Appendix C3.2);

- describe and map landforms associated with important wildlife habitat features including elevated land forms, eskers, ridges, cliffs, rock outcrops, exposed bedrock, talus and other karst topography caves;
- provide a description and location of any erosion-sensitive soils, predicted rates of erosion, and areas of ground instability;
- identify possible mechanisms for coastal erosion in the vicinity of the proposed facility and include both natural (such as high lake levels) and human-induced (engineering structures along the shore, dams on contributing rivers, and so on) (REGDOC.-1.1.1 - Appendix C3.3);
- provide estimates of the rate(s) of erosion of shores or riverbanks on or near the site;
    - estimates should be conducted for the average long term and also for the historical occurrence of unusual events (for example, unusually high lake or sea levels (REGDOC.-1.1.1 - Appendix C3.3);
- [provide maps depicting soil depth by horizon and soil order within the project area to support soil salvage and reclamation efforts, and to outline potential for soil erosion];
- describe the suitability of topsoil [and overburden] for use in the reclamation of disturbed areas [including an assessment of the acid generating potential of overburden to be used];
- [for agricultural lands or forested lands with agricultural capability, describe:
    - the soil classification, including the order, group, family, series and type of soil prior to construction, and quantify the soil classification,
    - the productivity of land and the type of agricultural resource,
    - the soil types in the study areas highly susceptible to wind and erosion, soil compaction and loss of structure and tilth,
    - any other soil types needing specific management, and
    - soil conservation and protection measures];
- [describe the historical land use and the potential for contamination of soils and sediments];
- [describe any known or suspected soil or sediment contamination with the study areas that could be re-suspended, released or otherwise disturbed as a result of the project];
- describe erosion mechanisms and predicted rates;
- describe baseline concentrations for relevant contaminants in relation to applicable guidelines for soil quality; and
- [identify areas or ecosystems that are sensitive or vulnerable to acidification resulting from the deposition of atmospheric contaminants, including radionuclides.
- [For projects within the permafrost regions:
- describe permafrost conditions including distribution of frozen and unfrozen ground, thermal conditions (ground temperatures), ground ice, thaw sensitivity and active layer thickness;

- describe the interactions between permafrost, surface water and groundwater, and topography, as well as rock fractures and talik zones between different surface-groundwaters; and
- describe the potential for thaw settlement and terrain instability associated with ground thawing in permafrost areas.]

For more information, the proponent should consult additional guidance in:

- CSA N288.4, Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills; and
- federal and provincial guidelines, for example, the Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.

8.3.2 Effects to topography, soil and sediment

The Impact Statement must describe all effects of the project on topography, soil and sediment including:

- potential and likelihood of re-suspended, releasing or otherwise disturbing known or suspected soil or sediment contamination; and
- effects of the project on coastal erosion (REGDOC.-1.1.1 - Appendix C3.2).

8.4 Ambient radioactivity

8.4.1 Baseline conditions

The Impact Statement must:

- describe the ambient radiological conditions at the project site and within the LSA and RSA. The Impact Statement must provide information on existing conditions including an inventory of sources, activity levels and origin for all environmental components including air, soil, food, water, aquatic sediments, plant and animal tissue;
- describe human and non-human biota exposed to ambient radioactivity, including information on radiation levels to which workers and members of the public are exposed;
- describe country food exposure pathways, taking into account cultural norms and traditional activities of Indigenous peoples; and
- describe current radiological monitoring, management programs and any special studies, including detailed results from these programs.

8.4.2 Changes to radiological conditions

For all phases of the project and all applicable VCs the Impact Statement must:

- describe changes to radiation and radioactivity present in the terrestrial and aquatic environment, the atmosphere, and to workers or nearby communities; and
- document plans and strategies for characterizing effects of the project related to the release of radionuclides to the environment, including:
  - details pertaining to sampling media and/or indicator species, measured parameters, sampling methodologies, locations, and frequencies; and
  - the use of detailed maps to present this information with sampling locations (REGDOC.-1.1.1 - Appendix C3.3).

8.5 Electromagnetism and corona discharge

The Impact Statement must:

- describe the levels of noise;
- describe ozone concentrations;
- describe electric field gradient and magnetic field strength expected at the edge of any transmission line right-of-way and maximum loading;
- describe predicted electromagnetic field levels;
- provide any relevant standards;
- identify the potential for electromagnetic interference with radio, television or other telecommunication signals and reception at maximum loading and describe the area potentially affected, the frequency and duration of occurrence and any applicable standards;
- describe potential induction effects to other infrastructure operators, and where applicable, describe any authorizations required and consultations with potentially affected infrastructure operators; and
- evaluate electromagnetic emitters in the region during operations, with respect to their potential to affect the safe operation of the reactor facility. (REGDOC.-1.1.1 - section 3.6.5)

8.6 Atmospheric, acoustic and visual environment

8.6.1 Baseline conditions

The Impact Statement must:

- characterize the ambient air quality in the project area, LSAs and RSAs and identify existing emissions and contaminant sources;

- include a description of the methods used to identify nuclear and hazardous substances that will be included in the baseline air quality characterization; (REGDOC.-1.1.1 - Appendix C.2)

- provide baseline ambient air concentrations for contaminants, in particular near key receptors (e.g. communities, traditional land users, wildlife) and quantify emission sources for the following:
  - total particulate matter,
  - particulate matter less than 2.5 microns ($PM_{2.5}$),
  - particulate matter less than 10 microns (PM_{10}),
  - carbon monoxide (CO),
  - sulphur dioxide (SO_2),
  - nitrogen dioxide (NO_2) and nitrogen oxides (NOx),
  - [ozone (O_3)],
  - [hydrogen sulphide (H_2S) and other reduced sulphur compounds],
  - [volatile organic compounds, individual or an appropriate subset],
  - [polycyclic aromatic compounds, including polycyclic aromatic hydrocarbons (PAHs), alkylated PAHs, PAH transformation products, including nitro and oxy-PAHs, and dibenzothiophenes (DBTs)],
  - [metals],
  - [diesel particulate matter],
  - nuclear emissions including tritium oxide and tritium gas, carbon 14, noble gases, iodine-131, and particulates, and
  - [any other relevant air pollutants from mobile, stationary or fugitive sources, including contaminants produced by the combustion of diesel fuel];
- compare ambient air quality results with applicable regional, provincial and federal standards. For air pollutants with standards, the comparison must use the same averaging period and the statistical format associated with each numerical value.
  - standards include: Canadian Ambient Air Quality Standards, National Ambient Air Quality Objectives and relevant provincial standards. The proponent must refer to the new Canadian Ambient Air Quality Standards established by the Canadian Council of Ministers of the Environment (CCME) for $PM_{2.5}$, O_3, SO_2 and NO_2 for 2020 and 2025;
  - for complete hazardous substance analysis, volatile organic compounds (VOCs) are compared to ozone; to particulate matter related to total suspended particulates (TSP); to particulate matter<10µm(PM10); and to particulate matter<2.5µm(PM2.5). Sulphur dioxide (SO2), nitrogen oxides (Nox) and carbon monoxide (CO) are included in the analysis;
- describe [dust and acid] deposition through either existing long-term or new monitoring data for a duration of a minimum of one year;

- [describe the data collection methods and data source(s), including data validation and quality control methods];
- [identify and address issues related to the quality of the monitoring data and seasonal variability in the baseline survey and determine ambient contaminant concentrations using complete, exhaustive and representative monitoring data, collected over an appropriate duration and geographic scope];
- [if modelling is undertaken to understand baseline ambient air quality, then describe direct and indirect sources of baseline air emissions, including mobile, stationary and fugitive];
- [describe existing radon gas conditions];
- provide current ambient noise levels at key receptor points (e.g. communities, traditional land users, sensitive human receptors and wildlife), including the results of a baseline ambient noise survey and permissible noise levels for each receptor. The information on usual noise sources (natural or 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 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 p.m. to 7 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 areas, including any foreseeable potential receptor and the distance between the receptors and the project];
- [provide current underwater soundscape and vibration sources, including those offshore in the study areas and at the project site, based on acoustic measurements. Provide information on vibration and sound sources, geographic extent and spatial and temporal variations within the water column and at the seafloor];
- 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 maps.

For additional guidance, see Appendix 1 – Guidance for biophysical components of the Integrated Guidelines Template.

8.6.2 Effects to the atmospheric, acoustic, and visual environment

The Impact Statement must describe the effects of the project on the atmospheric, acoustic and visual environment, including:

- provide a detailed description of emission sources of air pollutants from the project listed under section 8.6.1 Baseline conditions;
- provide detailed methodology and assumptions used to estimate emissions of air pollutants released, including:
  - provide and reference all relevant emission factors,
  - for all applicable emission sources, include the assumed tier of emission standard for each emission factor applied, and
  - provide details of the achievement of emission standards for all mobile and stationary engines used in the project;
- use atmospheric dispersion modelling to predict the fate of emissions resulting from project-related sources and provide appropriately scaled contour map(s) plotting the predicted emissions (see Appendix 1 – Guidance for biophysical components of the Integrated Guidelines Template for guidance on dispersion modelling):
  - determine whether the formation of secondary pollutants (pollutants which are not directly emitted but form when other primary pollutants react in the atmosphere) resulting from the project under assessment has the potential to raise concentrations above baseline levels – if so, identify and characterize these pollutants;
- provide the rationale for the choice of air quality model, including the type and magnitude of emissions, the complexity of sources, terrain and meteorology, or for why modelling is not being used to predict fate of air emissions.
  - If used, models for dispersion and pathways analyses must include site-specific, local, and regional topographic features and characteristics of the reactor facility and take into account natural and human-induced events that may influence contaminant behaviour (REGDOC.-1.1.1 - section 3.3.4);
- provide justification for all control efficiencies used to reduce emission rates of sources within the model, including details of all assumptions associated with the related mitigation, and their achievability;
- 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 modeled predictions may vary spatially and temporally, and

  - uncertainty in baseline concentration estimates, in the estimates of meteorological inputs, and in estimates of source emissions (from sources attributable to the project, and externally);
- 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;
- assess effects to receiving environment through:
  - comparison with ambient standards, including the Canadian Ambient Air Quality Standards. The assessment 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,
  - [comparison with critical thresholds (consider current, historical loadings, buffering capacity, including Acid Deposition Critical Loads)],
  - comparison with sensitive ecological receptors or VCs in the aquatic and terrestrial environment (consider effects thresholds of species in question), and
  - comparison to other appropriate existing guidelines, objectives or standards, where relevant. This includes regional and community-based air quality guidelines;
- describe changes in ambient vibration and sound levels, including frequency and timing, resulting from the project at potential receptor locations, including changes in the perception of non-anthropogenic sounds and the predicted area of influence of project acoustic effects [*list relevant project activities:* from blasting, rail transportation];
- [*where there is concern associated with an increase in sound levels during construction:* provide a vibration and sound impact assessment for the construction phase, including an overview of the expressed concerns];
- [if the project may result in an increase in sound emissions: for the [*list applicable project phases*]:
  - quantify sound levels at appropriate distances from any project facility and/or activities and describe the timing, frequency, duration and character of sound;
  - provide the hourly distribution of baseline night-time sound events compared to the individual nighttime sound events expected at each receptor location;
  - describe the locations and characteristics of sensitive receptors, including species at risk;
  - describe consultation with the public, Indigenous groups, federal authorities, and interested parties including landowners about potential effects to the acoustic environment, and
  - identify and justify the approach to determine the extent to which sound effects resulting from the project are adverse];
- provide a description of any changes in nighttime light levels resulting from the project:

- quantify light levels at appropriate distances from any project facilities, including the timing (e.g. night hours), frequency, duration, distribution and character of light emissions;
- describe the locations and characteristics of the most sensitive receptors, including species at risk and areas favoured by Indigenous Peoples for the practice of traditional activities; and
- describe engagement activities and, where appropriate, provide a record of engagement with the public, Indigenous groups, federal authorities, and interested parties including landowners regarding potential effects on the visual environment; and

- describe any positive changes.

The proponent should refer to Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise and 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 the sound environment and air quality. It is requested that the proponent complete the checklists provided in these guides (Appendix B in the noise guide and Appendix A in the air quality guide) to assist participants in verifying that the main elements of a noise or air quality 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.

- [It is recommended that the proponent consult the *[insert provincial air quality guidelines, guidelines or standards]*, to support the development of a monitoring plan.]

8.6.3 Mitigation and enhancement measures

The Impact Statement must:

- [describe all methods and practices to be deployed to reduce and control emissions. If the best available technologies are not included in the project design, the proponent should provide a rationale for 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 and their feasibility;
- document the evaluation of the proposed methodology for environmental effects monitoring, including projected minimum detectable critical effect size (spatial area where air concentrations may surpass background concentrations and/or the applicable provincial or federal air quality guidelines), and the confidence associated with the design of the monitoring and baseline data (REGDOC.-1.1.1 - Appendix G.1)
- [provide a description of existing and planned measures to reduce odours and dust, including a description of improvements to existing infrastructure, as applicable];

- 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;
- describe the implementation of strategies compliant with regional and national commitments, such as the CCME's commitment regarding pollution prevention;
- [provide a description of any ambient air quality monitoring to be implemented to verify the predictions of the modelling results and to confirm the effectiveness of the mitigation];
- provide a noise management plan, including identification of the noise sources, noise mitigation, the performance efficiency of the noise control devices, the best practices programs and the continuous improvement programs, and establish the need for follow-up monitoring for the purposes of validation of the model or due to any concern raised by participants; and
- provide a lighting management plan, including the planning and management of lighting and of the ambient light for every activity site and the consideration of measures for the reduction of excessive light during construction and operation. Consider the following options of measures for lighting management:
    - avoid or minimize the use of artificial light,
    - select low-intensity lighting,
    - use lighting fixtures that limit or concentrate the lighting to targeted areas and avoid light spilling out of the spaces to be illuminated,
    - limit the projection of light toward the sky by using fixtures that produce dark, uniform lighting that meets actual lighting needs,
    - avoid the emission of light at more than 90 degrees from the nadir, and
    - avoid lights that emit blue/green/white/ultraviolet wavelengths.

8.7 Groundwater and surface water

[Requirements for groundwater and surface water conditions in an Impact Statement must be commensurate in emphasis and detail with potential effects on groundwater and on surface water, clear pathways to adverse effects within federal jurisdiction – or direct or incidental adverse effects – and taking into consideration the means of other jurisdictions to address potential effects. Requirements listed here are in a sequence corresponding to the steps of a generic, coupled, groundwater–surface water characterization study and will be tailored to the project.]

8.7.1 Baseline conditions

The Impact Statement must:

[if generic surface and ground water requirements are warranted:

- describe the hydrographic and hydro-climatic context of the project site (e.g. climate patterns);
- identify the hydrologic network, including but not limited to the watershed delineation, stream courses identification and mapping;
- provide a characterization of groundwater resources potentially affected by the project;
- describe the local monitoring program and hydrologic data collection;
- quantify the existing surface water conditions, including the full range of seasonal and inter-annual variations, (including variations in inflows, outflows, water surface elevations, net loss, including evaporation and seepage. and storage volumes and retention time) (REGDOC.-1.1.1 - Appendix C4.3), ice cover and snow regime. This may be based on data from on-site gauging stations or from reference regional gauging stations;
- identify and describe the waterbodies and water resources potentially affected by the project;
    - for each major stream, the following information should be included in the description: flood frequency distributions, historical drought stages and discharges by month, and the seven-day once-in-10 years low flow (REGDOC.-1.1.1 - Appendix C4.2);
    - If influenced by intake or discharge structures, the description should include the size, location, and elevation of outlets, and elevation-area-capacity curves (REGDOC.-1.1.1 - Appendix C4.3);
    - a summary description of lake operating rules (for example, motorboat capacity); and
    - annual yield and dependability (REGDOC.-1.1.1 - Appendix C4.3);
- identify surface-water bodies that could affect the project's water supply and effluent;
- describe the water requirements for project construction, operation, decommissioning and closure, including estimate of quantities needed for the safe operation of the project;
- describe the adequacy of water supply to the site, include consideration of:
    - surface and groundwater resources;
    - quantity and quality of water supply;
    - reliability and availability of supply (REGDOC.-1.1.1 - section3.5.3);
    - effects of debris and fouling;
    - additional water requirements for emergency cooling or process needs;
    - effects on contaminant transportation;
    - effects of fluctuations in water temperature that could affect heatsinks; and
    - effects on firefighting capability (REGDOC.-1.1.1 - section 3.5.3;
- for each water body used as a heat sink or process water source, information about maximum, average maximum, average, average minimum, and minimum monthly temperature of the water bodies;

- describe the design-basis flood (DBF) elevation, derivation, and discharge, if applicable (REGDOC.-1.1.1 - Appendix C.4.1);
- screen baseline surface water quality data against recognized water quality guidelines such as the Canadian Environmental Quality Guidelines;
- if federal or provincial standards or guidelines are not available or where natural background as documented in an appropriate baseline study demonstrates the water quality standards or guidelines are not applicable, benchmarks from the peer-reviewed scientific literature may be used with appropriate rationale. Site-specific water quality objectives may be developed with the support of the scientific literature and the application of the procedures for deriving numerical water quality objectives as documented in the Canadian Environmental Quality Guidelines; (REGDOC.-1.1.1 - Appendix C.5.2,); [if detailed surface and ground water requirements are warranted, tailor the below list:
- 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, flood risk areas, wetlands, watershed and sub-watershed boundaries, and direction of flow;
    - show types of land use in drainage areas;
    - if applicable, indicate the intended locations of water crossing and watercourse diversions;
- provide a list of all waterbodies and watercourses (permanent, intermittent and ephemeral) that may be directly or indirectly affected by the project. Provide a table that groups waterbodies and watercourses by sub-watershed and provides the following information about each:
    - type of watercourse impacted (e.g. lotic or lentic system, lake, river, pond, temporary or permanent stream), and
    - size of the waterbodies and watercourses, as applicable (e.g. width at the ordinary high water mark, length or area);
- provide flow hydrographs and corresponding water levels for nearby streams and rivers showing the full range of seasonal and inter-annual variations; as well as seasonal baseflow:
    - hydrographs may be based on data from nearby gauging stations or from gauging stations on site;
    - approach used should take into account the need to provide information for use in fish habitat characterization and effects assessment as guided by the Canadian Science Advisory Secretariat's Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada; and
    - approach used should take into account the need to provide information for use in aquatic dispersion modelling for both groundwater and surface water;

- describe where lake level can affect the safe operation of the facility, the design basis maximum and minimum lake levels, including how those levels were derived; (REGDOC.-1.1.1 - Appendix C.4.3)
- provide stage hydrographs for lakes expected to be affected by the project showing the full range of seasonal and inter-annual water level variations;
- describe waves (statistics of wave heights, run-up, and so on), including:
    - information about historic seiche activity; and
    - where waves can affect the safe operation of the facility, information about the design basis wave conditions (including how those conditions were derived); (REGDOC.-1.1.1 – Appendix C.4.3);
- provide information about current patterns:
    - including frequency distributions of current speed, direction, and persistence;
    - at the local and regional spatial scale; and
    - at the whole-water body spatial scale within a reasonable distance from the site; (REGDOC.-1.1.1 - Appendix C.4.3);
- for each waterbody and watercourse potentially affected by the project, provide a description of ice cover, thickness and conditions and the timing of freeze-thaw cycles;
- provide for each waterbody potentially affected by the project, bathymetry, maximum and mean depths, vertical profile information, information on stratification and turnover, and sediment composition (e.g. particle size analysis and sediment quality);
- using traditional field and mapping techniques, provide a delineation and characterization of groundwater–surface water interactions, including an identification of groundwater-dependent ecosystems, wetlands, discharge and recharge areas that are potentially affected by the project
    - use this information to calibrate and verify numerical flow modelling];
- [*in northern regions:* describe permafrost conditions and taliks and their influence on groundwater–surface water interactions with consideration to potential for effects on surface water quality;]
- develop a quantitative surface water balance for watersheds potentially affected by the project, for all phases of the project detailing water intake and outflow to the environment, including upstream and downstream of the zones of influence (REGDOC.-1.1.1 - Appendix G.5.1);
- describe the surface water, ground water and sediment quality baseline characterization program, including sampling site selection and locations, *[as applicable:* upstream, within the zone of influence of the Project, and downstream] monitoring duration and frequency, sampling methodology, and analytical protocol, including quality assurance and quality control measures, including:
    - describe the incorporation of any applicable historical data or existing information, and
    - characterization program should include sampling locations within the project area, the LSAs and RSAs, and should include reference locations that are unlikely to be impacted by the project. Provide a detailed map that indicate the sampling locations;

- provide baseline data for relevant physicochemical parameters and chemical constituents for surface water, groundwater and sediment quality that are expected to change throughout the project lifecycle, including:
  - physicochemical parameters may include temperature, pH, electrical conductivity, dissolved oxygen, turbidity, total suspended solids, total hardness, total dissolved solids;
  - relevant chemical constituents may include major and minor ions, total and dissolved trace metals, radionuclides including radionuclide plumes, total mercury, methylmercury, polycyclic aromatic compounds, nutrients, organic and inorganic compounds, or other compounds of potential concern;
  - water sample collection and analysis should use appropriately sensitive detection limits and the data should 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 variabilities due to groundwater–surface water interactions; and
  - screen baseline sediment quality data against Federal Sediment Quality Guidelines;
    - if an appropriate baseline study demonstrates that natural background exceeds the available standards or guidelines (or that none exist for the COPC of interest), sediment quality benchmarks from the peer-reviewed scientific literature should be used with appropriate rationale; (REGDOC.-1.1.1 - Appendix C5.3)
- describe baseline concentrations for relevant physicochemical parameters and chemical constituents in relation to applicable water quality and sediment guidelines;
- identify springs and any other potable surface water resources within the local and regional project areas and describe their current use, potential for future use, and whether their consumption has Indigenous cultural importance;
- identify domestic, communal or municipal water wells within the local and regional areas, and provide information on their depth, distance from the project, stratigraphy, screened hydrostratigraphic unit and piezometric level and capacity, and describe their current use, potential for future use, and whether their consumption has any Indigenous cultural importance;
- identify groundwater-producing strata (coarse-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;
- provide a summary of key groundwater monitoring wells within the RSA used to inform the conceptual model, and identify their location, groundwater quality information and monitoring frequency. Provide representative hydrographs showing the range of seasonal and inter-annual water level variations and indicate any spatial variation in the RSA. Provide graphs illustrating historical analytical data for CPCs for selected wells. Trends in concentration should be interpreted and described (REGDOC.-1.1.1 - Appendix C5.4):

- describe the hydrostratigraphic units (aquifers, aquitards, aquicludes) of the hydrogeological environment in both bedrock and overburden and provide a piezometric map showing heads and the direction of groundwater flow;
    - provide piezometric maps for each hydrostratigraphic unit, and
    - include the thickness and area extent of each unit through appropriate tools such as isopach maps;
- [*if applicable:* describe the structural geology of the hydrogeological environment, including major faults, fracture density and orientation with respect to groundwater flow directions];
- describe the groundwater flow boundaries of the hydrogeological environment, including groundwater divides and boundaries with surface water;
- provide the method used and the hydraulic properties of the hydrostratigraphic units graphically, on maps, and in cross-sections in conjunction with water level and gradient information, including data on hydraulic conductivity, specific storage, transmissivity, storativity, saturated thickness, porosity, estimated rates and directions of groundwater flow, the capture zones of wells and specific yield, as applicable) (REGDOC.-1.1.1 - Appendix C5.4);
- include any chemical or isotopic tracer data that provide constraints on fluid direction, flow velocity or mixing (REGDOC.-1.1.1 - Appendix C5.4);
- provide hydrogeological maps and cross-sections, using the same scales and able to show important site features, of the study areas showing water table elevations, potentiometric contours, interpreted groundwater flow directions, groundwater divides and areas of recharge and discharge;
    - provide lithological logs, cone penetrometer logs, borehole geophysical logs, surface geological mapping, surface geophysical surveys, and trench logs for hydrogeological cross-sections (REGDOC.-1.1.1 - Appendix C5.4);
        - cross- sections must depict the interpretation of hydrostratigraphy and rationale for the interpretation must be provided. As additional monitoring or geological data are developed, cross-section interpretations should be updated, and the results of the data must be reported if they result in significant changes to conceptual models. Final drawings should be included with draft and ongoing remedial investigation reports (REGDOC.-1.1.1 - Appendix C5.4);
- provide site-specific structure contour maps that use the same scale(s) as groundwater. Contour intervals should be selected commensurate with the density and precision of the data (REGDOC.-1.1.1 - Appendix C5.4);
- present a conceptual model of the hydrogeological environment, including a discussion of geomorphic, hydrostratigraphic, hydrologic, climatic and anthropogenic controls on groundwater flow;
- amend maps (and include the amendment date) as additional monitoring or geological data are developed (REGDOC.-1.1.1 - Appendix C5.4);

- [*tailor based on the project components that may impact groundwater:* present a 3-dimensional numerical groundwater flow model developed for the project area based on the conceptual model of the hydrogeological environment:
    - state limitations and assumptions in the modelling approach, including calibration methods, model validation and accuracy;
    - calibrate the numerical model to baseline hydrogeological conditions using groundwater level and stream flow monitoring data, along with the delineation and characterization of groundwater-surface water interactions from the field data, and provide metrics and graphs describing the quality of the calibration that was achieved and discuss how spatial variability is considered in model calibration;
    - analyze the sensitivity of key model outputs to hydraulic properties and climatic parameters such as recharge; and
    - using the calibrated numerical model, provide a baseline groundwater budget including baseflow discharge to and recharge from waterbodies and watercourses, particularly those identified in the delineation of groundwater-surface interactions, and any anthropogenic withdrawals];
- present a conceptual model for the hydrological environment, as appropriate to describe baseline conditions for surface waters. The model should be developed to support the assessment of potential changes to water and sediment quantity and quality in rivers, streams, lakes, springs and wetlands, with input from regulators and Indigenous groups; and
- explain how baseline data were gathered, and modelling developed, at a scale and resolution that allows for the application of results about groundwater and surface water to the assessment of interrelated VCs, notably for fish, birds and other wildlife, their habitat and their health, human health as well as the current use of land and resources for traditional purposes.]

8.7.2 Effects to groundwater and surface water

The Impact Statement must:

- describe the effects of the project on surface and ground water, including effects related to:
    - project use of surface water or groundwater resources,
    - changes to water flow or watercourse diversions, and
    - discharge of water, effluent, wastewaters or other substances to the environment;
- describe how the effects of climate change are taken into account in the evaluation of the project effects;
- [*if applicable:* discuss changes to watersheds, including alignment and condition of waterbodies and watercourses (permanent, intermittent and ephemeral), including those created, removed or altered by the project];

- quantify the extent of hydrological changes that will result from disturbances to aquifers and surface water features, taking into account climate change. This includes 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;
- present an integrated site water balance model incorporating surface and groundwater fluxes to or from all major project components, for all project phases. Include estimates of surface water runoff rates for major project components;
- indicate the groundwater and surface water withdrawal requirements during all phases and specify:
    - the timing, quantity and quality of water withdrawn from the environment (flow rates 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;
- [*if applicable:* present key flow rates for all project components and water management structures, including inflow, outflow or surface run off from storage piles, dredge materials, contaminated material storage, and tailings management facilities];
- present a comprehensive site water management plan for the project's lifecycle, including for:
    - water inflows and outflows from project site;
    - water diversion;
    - process water management;
    - stormwater management; and
    - water management within the project site;
- present a 3-dimensional numerical groundwater flow model of the hydrogeological system that incorporates all major project features such as active drainage (subdrainage systems), excavation and grading, pump-and-treat systems, process water use, dewatering wells, and water diversion ditches:
    - the model should be based on the calibrated model used to describe baseline conditions, and
    - the use of telescopically refined groundwater flow models is recommended in the vicinity of major project features;
- using the 3-dimensional numerical groundwater flow model:
    - estimate key project fluxes, and
    - estimate seasonal changes to surface water and groundwater regimes during operations and the post-closure period, including effects of depressurization and dewatering of water bearing units, effects on groundwater-surface water interactions in waterbodies and watercourses, effects on wetlands, effects on potable supplies, and effects on natural flow divides];
- describe the contaminants associated with the project, including radionuclides, their spatial and temporal locations and their potential flow paths (e.g. groundwater seepage pathways and how they

relate to potential receptors such as drinking water sources. Characterize how they could affect surface and groundwater quality, including information on the source(s) of any contaminants, and their transport and fate in the hydraulic environment;

- demonstrate contaminant attenuation capacity empirically with field data and/or a numerical model (i.e. aquatic dispersion modelling. This model should also include a description of expected physical and geochemical reactions and transport mechanisms along flow paths (i.e., aqueous complexation, redox reactions, adsorption, ion exchange, colloidal transport, precipitation of solid phases, radioactive decay and ingrowth, advection, dispersion, diffusion) and how these were quantified or accounted for in the model;
    - If used, models for dispersion and pathways analyses must include site-specific, local, and regional topographic features and characteristics of the reactor facility and take into account natural and human-induced events that may influence contaminant behaviour (REGDOC.-1.1.1 - section 3.3.4);
- describe the downgradient flow of groundwater affected by the project, with the use of figures showing groundwater piezometric contours, drawdown contours and particle tracking results;
- describe the contaminant attenuation capacity within the hydrogeological units in the project area. With this input, assess the potential for off-site groundwater and surface water contamination. Alternatively, the proponent may conservatively assume no attenuation capacity, but must still describe, in detail, potential degradation products that may result from attenuation and other processes during groundwater flow;
- describe the potential changes to surface water, groundwater or sediment quality related to the project including:
    - potential changes to surface water quality due to surface erosion and sedimentation, from the removal of vegetation and changes to riparian, wetland and terrestrial environments;
    - potential changes to surface water quality due to the generation and deposition of dust and particulate matter and any contaminants they contain (such as metals, mercury, methylmercury);
    - changes to surface water, groundwater and sediment quality due to [*tailor based on applicable project components:* all discharges and effluents from the project, including changes to physicochemical parameters (temperature, pH, salinity, dissolved oxygen), and relevant chemical constituents (major and minor ions, trace metals, radionuclides, nutrients, organic compounds)];
    - changes to surface water from thermal plumes associated with nuclear power generating activities, including;
        - areas of influence (temperature, discharge jet) relative to intakes and known/suspected areas of VC-focused habitat use (spawning, rearing, nursery, feeding, wintering areas) and features (substrates, bathymetry, wetlands, aquatic plants);

- descriptions of models (physical, mathematical, conceptual) used to predict temperature effects and thermal discharge jet effects, and to account for long-term effects of climate warming relative to incremental effects of the project;
- descriptions of zones of influence of thermal plume temperature effect (greater than 1ºC above ambient) and physical discharge jet effect with maps and plots;
- descriptions of how alongshore currents are changed by discharge plumes, including direction, speed and sediment transport (deflection, distance and entrainment time for passively drifting biota, such as eggs, larvae);
- temperature predictions (mean, median, maximum and minimum) during critical life stage periods for potential VCs and plots of hourly maxima showing duration at peak temperatures; and
- contaminants released in the thermal discharge (REGDOC.-1.1.1 - Appendix G5.4), and

- compare any changes to surface or groundwater quality to applicable guidelines, objectives or standards;
- describe the quantity and quality of all effluent streams released from the site to the receiving environment, including effluent from treatment facilities, dewatering activities, seepage and surface run off from project components:
  - compare the quality of all effluent streams to applicable guidelines, objectives or standards to better identify possible adverse effects on the receiving environment;
- using the integrated chemical mass balance model, describe predicted worst, base and sensitivity case changes caused by project activities to surface water, groundwater and sediment quality in the receiving environment, for both physicochemical parameters and chemical constituents, including but not limited to:
  - watercourse and waterbody crossings, blasting, diversions, dewatering, water withdrawal, wastewater return, overflows from excavation, and surface runoff volumes and quality;
- compare the predicted worst, base and sensitivity case scenario changes to groundwater, surface and sediment quality to baseline and applicable guidelines, objectives or standards;
- 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 locations at which potential changes to water or sediment quality will be assessed, including:
  - all point and diffuse sources of discharges;
  - immediate receiving environment for any point of diffuse sources of discharges from the project;
  - at outer boundary of mixing zone;
  - where the water quality from the immediate receiving environment begins to meet Water Quality Guidelines, or background levels for that contaminant;
  - at project boundary;

  - at LSA boundary; and
  - at RSA boundary; and
- analyze and describe changes to surface and groundwater at a scale and resolution that allows for the application of results to the assessment of interrelated VCs, notably for fish and fish habitat and human health. Carry forward the assessment of potential changes in water quality, as required in the following sections of the Guidelines.

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.

8.7.3 Mitigation, monitoring and enhancement measures

The Impact Statement must:

- describe the mitigation for the possible effects on the quantity and quality of surface water, groundwater and sediment, including water supply wells and provide a rationale with quantitative and qualitative evidence that explains the effectiveness of proposed measures;
- describe any applicable water quality treatment measures and provide evidence supporting the effectiveness of these measures (refer to MEND report 3.50.1), including predicted inflow and outflow rates and concentrations for relevant water quality parameters;
- provide the details of mitigation comprised in water management plans proposed for waterbodies and watercourses likely to be affected during all phases of the project, including measures applicable to water use minimization;
- describe and justify water use for the project and the measures that will be taken to eliminate or reduce the adverse effects, including the supply and discharge of water, potential exchanges between watersheds and, if applicable, consider other water sources or the possibility of reusing the water;
- [*if detailed hydrostatic tests are required:* specify the expected requirements, the options available and the criteria it intends to apply to assure protection of water resources, including if the final details of the hydrostatic tests have not been confirmed yet];
- describe groundwater and surface water monitoring programs during the operations and post-closure periods, including:

- the proposed monitoring points to assess changes to surface water quality, which should include monitoring at all point and diffuse sources of discharge and in the immediate receiving environment and at the boundaries for the outer mixing zone, the project, the LSAs and RSAs,
- the proposed monitoring points to assess changes to groundwater quality, which should include well locations and depths, and
- 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. Include the description of the measures that will be implemented if the criteria are exceeded; and

- describe any specific monitoring program planned during construction, including assessment of effects before and after construction activities in order to optimize or adapt mitigation at the time of their application.

8.8 Vegetation, riparian and wetland environments

8.8.1 Baseline conditions

The Impact Statement must:

- Provide a description of the biodiversity[8], relative abundance and distribution of vegetation species and communities of ecological importance and of importance for human uses (e.g. recreational and economic uses), within the LSAs and RSAs of the project, including:
  - [rare plant communities and communities of limited distribution],
  - [old growth forests],
  - species at risk, including those listed in Schedule 1 of the SARA, provincially listed or assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to be 'at risk,' including species of concern,
  - critical habitat as described in final or draft recovery strategies or action plans for species at risk,
  - species or communities of importance to Indigenous Peoples, including for traditional, medicinal and cultural purposes, and

[8] Biodiversity can include the species or communities found, abundance, density, species richness and evenness, species distribution within the study areas; their ecological role, trophic level, their ecological or population health (e.g. breeding status, population trends, movement, habitat availability or connectivity, reproductive status or health, food availability or limitations).

- species who have harvest level records maintained by provincial, local conservation agencies or organizations (REGDOC.-1.1.1 Appendix C6);

- describe the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline vegetation biodiversity and discuss the rationale for their selection such as cover and standing biomass for aquatic plants as a basis to predict and detect changes;
- provide maps, at an appropriate scale, of the vegetation species and communities of importance within the LSA, and where available, the RSA;
- describe the current level of both anthropogenic and natural (e.g. fire, flood, drought) disturbance associated with vegetation, including a description of level of habitat fragmentation and loss, historical and current disturbance, any proximate activities that have resulted in changes to fire regimes (e.g. fire suppression, flooding, insect infestations);
  - describe any weed species, other invasive species and introduced species of concern;
  - describe past site clearing and shoreline development, if applicable (this information determines the succession trajectory of the site habitat) (REGDOC.-1.1.1 - Appendix C7.1);
- describe the use of local vegetation for medicinal purposes, or as a source of country foods (traditional foods) and whether its consumption has any Indigenous cultural importance;
- [describe the shoreline, banks, current and future flood risk areas, and wetland catchment boundaries];
- [quantify, describe and map riparian areas within the LSA and RSA potentially affected by the project];
- quantify, describe and map wetlands (e.g. fens, marshes, peat lands, bogs) within the LSA and RSA potentially affected by the project, in the context of [*list, as applicable* :
  - wetland class, ecological community type and conservation status;
  - biodiversity;
  - wetland habitat that provides important functions for species at risk, migratory birds and species of importance to Indigenous Peoples;
  - abundance at local, regional and provincial scales;
  - distribution; and
  - current level of disturbance];
- [determine whether these wetlands are within a geographic area of Canada where wetland loss or degradation has reached critical levels, or considered ecologically, socially or economically important to a region];
- [identify and map wetlands on federal lands potentially affected by the project and within the scope of federal permits, authorizations or other approvals. Provide information adequate to determine if the Federal Policy on Wetland Conservation applies];

- [identify and describe wetland capacities to perform hydrological and water quality functions, provide for wildlife and wildlife habitat or other ecological functions];
- [provide a wetland functions assessment in accordance with the guiding principles of Wetland Ecological Functions Assessment: An Overview of Approaches or any subsequent approved guidelines by which to determine the most appropriate functions assessment methodology to use (see Appendix 1 – Guidance for biophysical components of the Guidelines Template for more guidance on conducting a wetland function assessment);
    - provide a rationale for the wetland functions assessment method chosen and submit complete data sets from any survey sites, including geospatial data files];
- determine if other wetland conservation policies, regulations or wetland compensation guidelines apply (contact provincial and/or local government authorities); and
- [identify a RSA of sufficient size to capture effects to wetlands within the larger drainage area and include wetlands located outside of the LSA that may be affected by hydrological changes as a result of cumulative effects].

8.8.2 Effects to vegetation, riparian and wetland environments

The Impact Statement must describe the effects of the project on vegetation and the riparian and wetland environments, including:

- describe all potential effects due to the project, for all phases, to vegetation [and to the riparian and wetland] environments;
- [describe the key indicators used to assess project effects and the sensitivity of vegetation communities, wetlands, and riparian and terrestrial environments to disturbance];
- describe changes related to landscape disturbance, including loss and fragmentation of habitats, alteration of riparian areas, including buffers or setbacks and project effects on areas of soil or ground instability;
- quantify the area of vegetation communities, riparian, wetland, aquatic and terrestrial environments, that may be cleared or otherwise disturbed within the study areas during all phases of the project, including a description of the disturbance and changes to:
    - habitat ratios between the interior and periphery;
    - availability of rare habitat; and
    - function within the remaining vegetation or wetland complex;
- [describe the amount, merchantability and location of any merchantable timber to be removed during project construction];
- describe effects onto the biodiversity of riparian, wetland and terrestrial environments, including effects from fragmentation and changes to regional biodiversity;

- describe effects related to potential introduction of weed species or invasive species or due to the increase in the spread and prevalence of diseases or pests;
- describe any hydrological or water flow changes, either permanent or temporary, that could alter moisture regimes or drainage conditions, and describe the effects on vegetation and wetlands;
- describe any changes to or loss of wetland function, including consideration of ecological (e.g. hydrological, biogeochemical cycling, habitat and climate functions) and socioeconomic functions of wetlands. Describe and justify the methodology used to assess the effects;
- 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;
- describe potential changes to riparian, wetland and terrestrial environments due to activities that may affect topography, soil erosion, compaction and productivity, contamination, bank slopes and suspension of sediment, or due to any contaminants of concern potentially associated with the project that may affect vegetation, soil, sediment or water;
- describe potential changes to riparian, wetland and terrestrial environments as a result of any known or suspected soil contamination within the study areas that could be re-suspended, released or otherwise disturbed as a result of the project;
- present the explicit calculation of radiation doses to vegetation with recognized approaches and software tools (example of acceptable approach in CSA N288.6);
    - provide a high-level discussion of the relative merits of alternative approaches to put the presented approach in a current national and international context,
    - document details of transfer parameters and their validation for site conditions. Site-specific data, and/or authoritative data sources, should support model structure and parameter choices,
    - note the choice of food chain transfer factors for VCs, which can vary by orders of magnitude in different environments for different species, and
    - if approach different from CSA N288.6 is used, describe the model structure and implementation. Regardless of the approach taken, document a few representative samples of dose calculations starting with media and/or food concentrations (REGDOC.-1.1.1 - Appendix G8.1);
- quantify and interpret doses for the effects of controlled releases on life history parameters (morbidity, mortality, reproduction);
- if numerical benchmarks for chronic radiation effects are exceeded, interpret effects at multiple levels of organization in an ecological context relative to the potential for effects on individual biota, populations, communities and ecosystems (REGDOC.-1.1.1 - Appendix G8.2); and
- describe any positive changes.

8.8.3 Mitigation and enhancement measures

The Impact Statement must describe the proposed mitigation for the effects on vegetation and on riparian and wetland environments.

In particular, the Impact Statement must:

- describe and justify the construction methods used to cross [wetlands and other] sensitive habitats, and the criteria for determination of techniques proposed for each crossing, including the locations where trenchless crossing methods will be employed;
- describe and justify the ways of avoiding or reducing the temporary or permanent adverse effects on [wetlands] [and riparian] habitats;
- [describe and justify the width of the construction right-of-way and the permanent right-of-way, including the locations where the right-of-way will be narrowed to eliminate or reduce the adverse effects];
- [describe and justify the necessity of temporary construction sites, and the considerations taken for minimizing the adverse effects, namely the location choice and management measures];
- [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:
    - describe the measures allowing identification of invasive species or other undesirable introduced species, avoid their propagation and control their spread during all phases of the project, including the necessity of preconstruction surveys to identify any high-density areas;
    - identify the criteria and circumstances of application of chemical, biological or mechanical control methods (e.g. biocides) as well as the relevant regulations and determine the adverse effects associated with control methods to human and non-human biota; and
    - describe the selection of plant species to be conserved and planted in order to promote vegetation communities with low natural growth;
- [concerning wetlands:
    - explain how avoidance of wetlands was considered, namely by considering other locations for project components and activities;
    - explain how proposed mitigation consider the natural succession and the variability of the environment over time; and
    - describe proposed compensation measures (see Appendix 1 – Guidance for biophysical components of the Guidelines Template for relevant guidance on compensation and offset plans)];
- describe any reclamation and revegetation procedures proposed, including:
    - revegetation techniques and the locations where they would be implemented;

- 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;
- seeding and planting plans, which include a description of the species to be replanted, the replanting locations and the 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. Identify the information sources on which the predictions rely, such as evidence from peer-reviewed scientific literature; and
- reclamation standards to be used to evaluate ecological equivalency of post-operation reclaimed landscapes, in consultation with Indigenous groups;

- 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; and
- describe 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.

8.9 Terrestrial wildlife and wildlife habitat

The proponent should consult the additional guidance for requirements pertaining to wildlife provided in Appendix 1 – Guidance for biophysical components of the Guidelines Template.

8.9.1 Baseline conditions

The Impact Statement must:

- describe and map the biodiversity of terrestrial wildlife species (amphibians, reptiles, mammals) and wildlife habitats that are found or are likely to be found in the study areas;
- identify wildlife species of ecological importance and of importance for human uses (e.g. recreational and economic uses), other than birds, that are likely to be directly or indirectly affected in the study areas. Include species with harvest level records maintained by provincial, local conservation agencies or organizations (REGDOC.-1.1.1 - Appendix C6). For each species:
  - describe their distribution and location, abundance and population status, lifecycle, known residences, seasonal ranges, migration and movements, wildlife corridors and physical barriers to movement, habitat requirements, and sensitive periods (e.g. seasonal, diurnal and nocturnal); and

  - provide a map showing the highest concentrations or areas of use by species, differentiating 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, spatial distribution, density) and provide a rationale for their selection, including how the selection of indicators for baseline conditions will support adequate population monitoring;
- describe the use of wildlife as a source of country foods (traditional foods) and whether its consumption has Indigenous cultural use and value, including for medicinal purposes;
- describe the use and harvesting of fur-bearing species and whether its harvesting has Indigenous cultural use and value;
- describe, quantify and show on maps the habitat type for wildlife species, including its: function; location; suitability; structure; diversity; relative use, natural inter-annual and seasonal variability, and; abundance as it existed before project construction;
- describe any locations within the study areas that might constitute sensitive areas for terrestrial wildlife, and show on maps, such as:
  - species at risk critical habitat that has been designated or is under consideration;
  - ecological reserves; wildlife management areas, established or proposed sanctuaries and protected areas, in proximity to the project location or that could be affected by routine project operations;
  - any lands in the study areas that might constitute sensitive areas and habitat for wildlife;
  - nearby environmentally significant areas such as; National Parks, areas of natural or scientific interest, National Wildlife Areas, World Biosphere Reserves or UNESCO Natural World Heritage Sites; and areas under consideration or study for such designation; and
  - travel corridors and alternate routes for travel corridors that could potentially be affected by the project;
- identify and describe any invasive species, introduced species of concern; and other species that may be considered as “weed species” in the project’s context;
- describe the levels of disturbance currently affecting wildlife and wildlife habitat, such as habitat fragmentation and the extent of human access and use;
- describe the natural disturbance regimes and their sources (e.g. fire, floods, droughts, diseases, insects and other pests);
- describe and provide the location of any recent or currently in progress ecological or biological studies of the site or the surrounding area (REGDOC.-1.1.1 - Appendix C6); and
- describe the source of the baseline data, data collection methods, and provide a rationale for any modelling approaches chosen, and describe how community and Indigenous knowledge was incorporated.

8.9.2 Effects to terrestrial wildlife and their habitat

The Impact Statement must:

- describe the potential effects of the project on wildlife and wildlife habitat, including population level, regional or local sub-population effects, including, but not limited to:
  - site preparation, vegetation removal, particularly of habitats important for breeding, overwintering or that act as movement corridors;
  - noise, light and sensory disturbances;
  - water and air emissions or dust;
  - bioaccumulation of contaminants in wildlife;
  - habitat loss and fragmentation;
  - introduction of invasive species, including the rapid growth of pathogens such as those in the ultimate heat sink or other elements of the cooling system, and other biohazards (REGDOC.-1.1.1 - sections 3.5.7);
  - altered predator-prey relations, such as increased wildlife predation;
  - increased access by hunters; and
  - increase in the spread and prevalence of diseases and other health concerns;
- provide an evaluation of the effect of the project [, including any new road or rail access, pipeline, transmission line or other rights of way] on wildlife mortality risk and movement patterns;
- describe effects to wildlife biodiversity, considering biodiversity metrics and the biotic and abiotic indicators selected, including changes to regional biodiversity and local and regional ecosystems;
- describe and quantify, where possible, the potential effects to wildlife, including acute and chronic effects to wildlife health, of changes to air and water quality (e.g. from radiation exposure, contaminants, effluents, atmospheric emissions, dust deposition, and bioaccumulation);
- describe how predicted effects to wildlife compare to the expected reference conditions for unexposed wildlife on a biological population basis, taking into account natural variation;
- present the explicit calculation of radiation doses to terrestrial wildlife with recognized approaches and software tools (example of acceptable approach in CSA N288.6);
  - provide a high-level discussion of the relative merits of alternative approaches to put the presented approach in a current national and international context;
  - document details of transfer parameters and their validation for site conditions. Site-specific data, and/or authoritative data sources, should support model structure and parameter choices,
  - note the choice of food chain transfer factors for VCs, which can vary by orders of magnitude in different environments for different species, and

  - if an approach different from CSA N288.6 is used, describe the model structure and implementation. Regardless of the approach taken, document a few representative samples of dose calculations starting with media and/or food concentrations (REGDOC.-1.1.1 - Appendix G8.1);
- quantify and interpret doses for the effects of controlled releases on life history parameters (morbidity, mortality, reproduction);
  - if numerical benchmarks for chronic radiation effects are exceeded, interpret effects at multiple levels of organization in an ecological context relative to the potential for effects on individual biota, populations, communities and ecosystems (REGDOC.-1.1.1 - Appendix G8.2);
- 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;
- describe the potential adverse effects of the project on species noted as important to Indigenous groups and local communities, and their habitat;
- describe and take into account the tolerance thresholds for potential adverse effects that Indigenous groups have identified; and
- describe changes to important habitat for species important to current use of lands and resources for traditional purposes.

The [provincial government(s)] should be considered a source of information on appropriate methodologies to predict impacts to wildlife.

The assessment of effects on the terrestrial environment must be consistent with CSA N288.6, *Environmental risk assessments at nuclear facilities and uranium mines and mills*.

8.9.3 Mitigation and enhancement measures

The Impact Statement must describe the measures for mitigating effects on terrestrial wildlife and wildlife habitat, including:

- describe all feasible measures to avoid or lessen adverse effects on wildlife and their habitat, including residences and critical habitat. Include a description of the measures in terms of the effectiveness of each measure in avoiding negative effects;
- provide the best technically and economically feasible approaches for mitigating effects on habitat, aligned with the mitigation hierarchy, and justify moving from one mitigation option to another;
- describe and explain the condition in which the temporary construction areas and right-of-way will be restored or maintained following construction, and explain the mitigation considered including possible revegetation, obstruction of the sightline, restoration of wildlife 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 right-of-way and new access roads to access areas that were previously difficult to reach, including by wildlife predators as well as by hunters, off-roading recreationalists, and other users];
- 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;
- [describe wildlife friendly road-design principles and features, which may include underpasses and wildlife bridges (as well as monitoring to estimate bat and other wildlife mortality)];
- describe measures to prevent the release of harmful substances into waters or areas frequented or occupied by wildlife;
- describe measures to address sensory disturbance and the resulting functional loss of wildlife habitat;
- provide details of any compensation or offsetting plans proposed following guidance in Appendix 1 – Guidance for biophysical components of the Guidelines Template, if effects cannot be otherwise avoided or mitigated; and
- describe mitigation applicable to wildlife habitat and other biodiversity metrics that will be implemented through reclamation, including timelines and targets that will be used to assess effectiveness.

The [provincial government(s)] should be considered a source of information on appropriate methodologies to predict impacts to wildlife.

8.10 Species at risk and their habitat

The proponent should consult the additional guidance for requirements pertaining to Species at Risk provided in Appendix 1 – Guidance for biophysical components of the Guidelines Template.

8.10.1 Baseline conditions

The Impact Statement must:

- provide a list of all species at risk that are likely to be in the project area, including:
  - species listed in Schedule 1 of SARA; and
  - 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;
- for each species at risk identified in the list above:
  - describe abundance (including relative abundance in each habitat type), population status, and distribution;

- provide a map showing survey sites, species sighting records, the areas of highest concentration or areas of use;
- provide information and/or mapping at an appropriate scale for residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, identified or proposed Critical Habitat and/or recovery habitat (where applicable) [differentiated by federal and non-federal lands];
- describe the general life history (e.g. breeding, foraging) that may occur in the project area, or be affected by the project; and
- identify critical periods (e.g. denning, rutting, spawning, calving, breeding, roosting), setback distances, or other restrictions related to these species;

- provide any published studies that describe the regional importance (including economic), abundance and distribution of species at risk, including recovery strategies or plans;
- describe the source of the Species at Risk data, including survey design, sampling protocols and data handling:
  - when using recognized standards, provide details of any modifications to the recommended methods and rationale for these modifications; and
  - indicate who was consulted in the development of the baseline surveys (e.g. federal/provincial wildlife experts, specialists and local Indigenous groups), and describe how community and Indigenous Knowledge was incorporated.

The proponent should contact provincial or local government authorities to determine additional data sources and survey methods. [A permit under SARA must be obtained prior to conducting surveys on federal lands that are likely to harm, harass, capture or kill species at risk other than migratory birds.]

8.10.2 Effects to species at risk and their habitat

The Impact Statement must [*specific species may be listed*]:

- describe the potential effects of the project on species at risk [listed under Schedule 1 of SARA *or* identified above], and its critical habitat (including its extent, availability and presence of biophysical attributes). The analysis of potential effects should be provided separately for each species at risk, including separate analyses for each activity, component and phase of the project;
- present the explicit calculation of radiation doses to species at risk assessed by COSEWIC with recognized approaches and software tools (example of acceptable approach in CSA N288.6);
  - provide a high-level discussion of the relative merits of alternative approaches to put the presented approach in a current national and international context;
  - document details of transfer parameters and their validation for site conditions. Site-specific data, and/or authoritative data sources, should support model structure and parameter choices;

  - note the choice of food chain transfer factors for VCs, which can vary by orders of magnitude in different environments for different species; and
  - if approach different from CSA N288.6 is used, describe the model structure and implementation. Regardless of the approach taken, document a few representative samples of dose calculations starting with media and/or food concentrations;
- [describe the potential effects of the project on species assessed by the COSEWIC as extirpated, endangered, threatened or of special concern (flora and fauna), as well as on the potential habitat of these species that are not currently listed under SARA];
- [clearly identify the locations of federal and non-federal lands within the study areas and differentiate between them in the presentation of information regarding species at risk];
- identify provincial, territorial or federal permits or authorizations that may be required in relation to the species at risk, and describe discussions with the appropriate authority regarding permits or authorizations;
- describe the area, biophysical attributes and location of habitat including critical habitat affected (e.g. destroyed, permanently altered, disrupted), including direct and indirect effects due to vibration and artificial light in the project area on usage patterns and migratory behaviour of species at risk;
- describe the residual effects that are likely to result from the project after avoidance and minimization measures have been applied, including the extent, duration and magnitude of the effects on:
  - number of individuals killed, harmed, harassed; and
  - number of residences damaged or destroyed; and
- describe and take into account the tolerance thresholds for potential adverse effects that Indigenous groups have identified.

If a permit under section 73 of the SARA is anticipated, proponents may wish to coordinate the collection of information requirements and associated consultation with requirements outlined above. For information on the SARA permitting process is available here: Guidelines for permitting under section 73 of the *Species at Risk Act*.

The [provincial government(s)] should be considered a source of information on appropriate methodologies to predict impacts to wildlife species at risk. With respect to effects on bird species at risk, the information required is presented in section 8.9. *Birds, migratory birds and their habitat*.

8.10.3 Mitigation and enhancement measures

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

- describe the proposed mitigation for adverse effects on species at risk and critical habitat, include the justification, based on scientific data, for the proposed measures;

- provide an account of how the project and proposed mitigation are consistent with the recovery strategy, action plan, or management plan for the species and be described in terms of the effectiveness of each measure in avoiding negative effects;
- describe mitigation to reduce the risk of harmful, destructive or disruptive activities in sensitive times and places of importance to species at risk;
- describe measures to prevent the release of harmful substances into waters or areas frequented or occupied by species at risk; and
- provide mitigation for effects on habitat, aligned with the mitigation hierarchy and justify moving from one mitigation option to another.

[With respect to bats:

- describe the effectiveness of the mitigation, taking into account the configuration of the resources in the environment and how local bat populations use these resources;
- describe how bat behaviour (differentiated by species) has been taken into account, based on the geographical location and time period; and
- at minimum, the following mitigation should be implemented:
    - spatial avoidance:
        - a buffer zone of 120 m is recommended;
        - for resting areas and nurseries in trees, apply a buffer zone to the entire complex of roosts and nurseries; and
        - for hibernacula, apply the buffer zone to the entire underground cave and mine system;
    - temporal avoidance (timing of disruption, destruction of resting areas or exclusion):
        - avoid disruption, destruction and exclusion between April 30 and September 1;
    - lighting:
        - avoid or minimize the use of artificial light in bat habitats;
        - select low-intensity lighting;
        - use lighting fixtures that restrict or focus illumination to target areas; and
        - avoid lights that emit blue/green/white/UV wavelengths;
    - follow the Canadian National White-nose Syndrome Decontamination Protocol for entering bat hibernacula (Canadian Wildlife Health Cooperative); and
    - other compensation.]

[With respect to caribou:

- demonstrate that measures to avoid and minimize effects will be applied for boreal caribou and its critical habitat;

- describe all reasonable alternative means of carrying out the project that would avoid the adverse effects of the project on boreal 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 caribou; and
- describe all feasible measures that will be taken to minimize the adverse effects of the project on boreal 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;
  - avoid destruction of biophysical attributes (see Appendix H of the recovery strategy);
  - minimize noise, light, smell and vibrations;
  - develop a management plan;
  - use techniques to prevent predators from using the corridor; and
  - report on how the project and mitigation are consistent with the recovery strategy, action plan or management plan for the species.]

8.11 Climate change

The proponent must follow the directions and guidance contained in the Strategic Assessment of Climate Change (SACC) and the technical guides related to the SACC, developed by Environment and Climate Change Canada (ECCC), including the Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment (Technical Guide)[9]. The requirements are summarized below, and IAAC expects the proponent to keep apprised of updates to the SACC and related technical guides published by ECCC.

The Impact Statement must:

- assess the project's GHG emissions as described in section 3 of the SACC and section 2.1 of the Technical Guide;

[9] In accordance with the relevant version of the Strategic Assessment of Climate Change (SACC) and the draft Technical Guide Related to the Strategic Assessment of Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment at the time the Impact Statement is submitted to IAAC.

- [based on preliminary calculations conducted by IAAC with the support of expert federal authorities during the Planning phase, if the project upstream GHG emissions are likely greater than or equal to the thresholds outlined in Table 1 in section 3.2.2 of the SACC: assess GHG emissions upstream of the project, as described in section 3.2 of the SACC and section 5 of the Technical Guide];
- provide a quantitative and qualitative description of the project's positive or negative effects on carbon sinks as described in section 5.1.2 of the SACC and section 4 of the Technical Guide;
- [*if applicable*: an explanation of how the project may impact Canada's efforts to reduce GHG emissions, in Canada and globally as described in section 5.1.3 of the SACC and in the Technical Guide]; and
- [*should the potential exist for the project to result in increased forest fires in the region:* a description of the impact of increased forest fires that may result from the project on climate change].

8.11.1 Mitigations for climate change and greenhouse gas emissions

[For projects with a lifetime ending before 2050:

The Impact Statement must describe the mitigation that will be taken to minimize GHG emissions throughout all phases of the project, in accordance with section 5.1.4 of the SACC and section 3.4 of the Technical Guide. Emphasis must be placed on reducing net GHG emissions as early as possible in the project lifespan.

The Impact Statement must provide:

- the conclusions of the best available technologies and best environmental practices (BAT/BEP) determination process to identify and select the technically and economically feasible technologies, techniques or practices, including emerging technologies, to minimize GHG emissions;
- include 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;
- include 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 of the SACC, and will be considered as the last option in terms of GHG mitigation measures;
- include a description of measures taken to mitigate the project's impact on carbon sinks, including measures to restore disturbed carbon sinks; and
- depending on the public availability of information, provide a comparison of the project's projected GHG emissions intensity with the emissions intensity of similar projects in Canada and internationally that are good examples of energy-efficient or low-emissions projects. The comparison should explain why the emissions intensity may be different.]

[For projects with a lifetime beyond 2050:

- The Impact Statement must include a credible plan that describes the mitigation measures that will be taken to minimize GHG emissions throughout all phases of the project, and achieve net-zero by 2050 in accordance with sections 5.1.4 and 5.3 of the SAAC and section 3.5 of the Technical Guide. The plan must demonstrate how the net GHG emission equation (refer to Equation 1 in the SAAC) will equal 0kt C02 eq/year by 2050 and thereafter for the remainder of the lifetime of the project. Emphasis should be placed on minimizing net GHG emissions as early as possible and throughout the project lifespan. The credible plan must include, at a minimum, the following information:
- the conclusions of the best available technologies and best environmental practices (BAT/BEP) determination process to identify and select the technically and economically feasible technologies, techniques or practices, including emerging technologies, to minimize GHG emissions throughout all phases of the project with a net zero perspective.
- a description of any additional mitigation measures (i.e. offset measures) that will be implemented for the project to achieve net-zero emissions by 2050, if applicable.
- the implementation schedule describing when the mitigation measures will be implemented, considering equipment replacement. The implementation schedule does not need to describe every technology or practice the project will implement over time to achieve net-zero emissions. The plan may describe the process the proponent will follow in order to make the decisions and investments needed to achieve net-zero emissions by 2050.
- a quantitative description of the project's estimated annual net GHG emissions over the lifetime of the project and the associated emission intensity, when relevant. This must be aligned with the implementation schedule of the different mitigation measures over time but also with the project's maximum design capacity, or expected operation capacity (if the project is operating at a significantly different capacity from the maximum design capacity);
- the emissions reductions at specified intervals determined by the proponent, up to 2050. Explain how net GHG emissions reductions are maximized in the earlier years of the project's lifespan. ECCC recommends intervals to be every 5 years or as appropriate for the project;
- a set of emissions intensity targets (and/or emission targets if EI is not relevant) at specified time intervals for the lifetime of the project;
- additional discussions of each mitigation measure, including factors such as associated costs, technical challenges, risks, infrastructure requirements and any other relevant considerations;
- any supportive actions needed 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; and
- a description of measures taken to mitigate the project's impact on carbon sinks, including measures to restore disturbed carbon sinks.
    - Recognizing that the status of emerging technologies and implementation of mitigation measures in decades to come could be challenging and uncertain, the plan can describe the

process the proponent will follow to make the decisions and investments needed to achieve net-zero emissions by 2050.]

8.12 Fish and fish habitat

The proponent should consult Appendix 1 – Guidance for biophysical components of the Guidelines Template for guidance pertaining to fish and fish habitat.

8.12.1 Baseline conditions

The Impact Statement must:

- prepare a list of all waterbodies and watercourses (permanent and intermittent) that may be directly or indirectly affected by the project and provide:
  - type of waterbody or watercourse;
  - size and depths of the waterbody or watercourse;
  - streamflow types and characteristics;
  - substrate type, vegetation and anthropogenic barriers to fish;
  - description of any proposed water work; and
  - for crossings, describe the anticipated method of crossing (trenched or trenchless);
- [*as relevant:* describe primary and secondary productivity in affected waterbodies with a characterization of trophic levels, biodiversity, key functional interactions and processes (e.g. food web and nutrient cycling), seasonal and year-to-year variability, ranges and sensitive periods and include the rationale for the selection of biodiversity metrics and indicators];
- provide information of the stability or variability of biodiversity metrics and indicators (REGDOC.-1.1.1 - Appendix C.7.1);
- provide conceptual models of existing baseline aquatic biota endpoints (for example, survival, growth, reproduction, age/size distributions) including linkages with abiotic environmental media and other biota (feeding). The conceptual model must:
  - describe the baseline sources and distribution of stressors along transport and exposure pathways resulting in baseline hazard quotients for contaminants to aquatic organisms through diet and direct exposure; and
  - include potential receptor from each trophic level (for example, piscivore, benthic prey feeder, zooplankton feeder, herbivore, primary producers);
- characterize reference locations that would not be exposed to project effects;

- for each potentially affected waterbody or watercourse frequented by fish, provide the location and area of potential and confirmed fish habitat and a detailed assessment of physical and biological habitat characteristics. Present information as maps using satellite imagery overlaid with relevant information and text description, with associated summary tables. Relevant physical and biological habitat characteristics for fish habitat include:
  - surface and ground water characteristics requested in section 8.5.1 Baseline conditions;
  - overlap of areas of project activities with aquatic VC habitat in time and space (including VC home range and migration and dispersal estimates) (REGDOC.-1.1.1 - Appendix G.5);
    - seasonal variation of species; and
    - seasonal variation of water quality (REGDOC.-1.1.1 - Appendix G.5);
  - baseline extent of habitat disturbance (e.g. fragmentation);
  - habitat use or suitability for fish and aquatic species present, including critical habitat and residences for species at risk, and habitat function (e.g. spawning, calving, nursery, growth, prey, invertebrate population, food availability, foraging, migration, cover habitat, thermal and overwintering habitat) and sensitive times for these activities; and
  - substrate type, aquatic vegetation, riparian vegetation, bank stability, light penetration, presence of woody debris, presence of beaver dams, stream segment type (riffle, run, pool), natural or anthropogenic barriers to fish passage, and geomorphological features and processes;
- present fish habitat mapping that includes existing operations thermal discharge areas of elevated temperatures and physical disruption of lake currents (depth and area) identification of habitats exposed to existing facility stressors and those potentially exposed through data review and field reconnaissance, including:
  - contaminant and thermal effluents and plumes;
  - storm water release points;
  - present and projected radiological and conventional groundwater contaminant plumes;
  - hydrological characteristics associated with any identified critical fish habitat;
  - nuclear and conventional accidents and spills (REGDOC.-1.1.1 - Appendix C7.1);

- for each potentially affected waterbody or watercourse, provide a detailed description of potentially affected fish[10] species and populations (as defined in subsection 2(1) of the *Fisheries Act*) [or marine plant[11] (as defined in section 47 of the *Fisheries Act*)], within the aquatic [or marine environment]:
    - where data are used to generate biodiversity metrics (e.g. abundance, richness, diversity, density), provide rationale on the choice of metrics based on their applicability for use in the effects assessment and associated follow-up, if applicable; and
    - provide information on the stability or variability of biodiversity metrics and indicators;
- provide information on the benthic invertebrate community in representative habitats, such as exposed rocky inshore areas or embayment wetlands (REGDOC.-1.1.1 - Appendix C7.2);
- describe parameters and ecological processes relevant to predicted effects on fish and aquatic species listed above. For example, it may be necessary to establish a broader ecological baseline if the project affects a spawning area for a migratory species but does not affect the larger area they depend on for life processes. Relevant parameters and ecological process may include migratory patterns, food webs and trophic levels, structural and functional linkages (e.g. predator-prey interactions), life history and population dynamics, sensitive habitats and periods, behaviour or other relevant ecological processes that fish depend on to carry out their life history;
    - use either a qualitative or a quantitative approach to characterize ecological processes, as appropriate, and include a rationale to support the selected approach;
- describe existing physically altered or contaminated habitats that were changed by past operations;
- identify and describe the data sources used, including information on data collection (e.g. gear and catch methods, location of sampling stations, date of catches, date of surveys, species surveyed, size and lifecycle stage, catch per unit effort). It is recommended that the information be presented in the form of detailed maps and tables;
- provide baseline measurements (typical values and variability) of contaminants in fish and aquatic species (including benthic invertebrates) including radionuclides and chemicals for study areas and reference sites;
- describe the use of fish [and aquatic plants] as country foods or for other traditional purposes, including a description of the particular species of importance and whether its consumption has cultural importance for Indigenous groups, including medicinal use. Where possible, sites used in the

[10] fish includes: parts of fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

[11] marine plant includes all benthic and detached algae, marine flowering plants, brown algae, red algae, green algae and phytoplankton.

study areas or historically important sites for the collection of country foods must be identified and mapped, such as important fishing sites;

- provide a summary of existing studies and research on potential effects of noise and vibrations on potentially affected aquatic species, including behavioural impacts, the freshwater [and marine] environment;
- [describe any existing, designated or proposed special marine areas such as: marine refuges, marine conservation areas, species at risk critical habitat, ecological reserves and marine protected areas, within or in proximity to the project location or that could be affected by routine project operations]; and
- [identify and describe sensitive habitat areas (e.g. Ecologically and Biologically Sensitive Marine Areas) within the LSA and RSAs and include maps that demonstrate proximity of these areas].

Certain intermittent and ephemeral watercourses or waterbodies may constitute fish habitat or contribute indirectly to fish habitat during a certain period. 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.

8.12.2 Effects to fish and fish habitat

The Impact Statement must describe the potential effects of the project on fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act* [and on marine plants, as defined in section 47 of the *Fisheries Act*]. Consider any effects whether they are adverse or positive, direct or indirect, and temporary or permanent, for all phases of the project, including from the release of effluent or the deposit of a deleterious substance to water frequented by fish, for all developmental stages of fish, and other aquatic species. Refer to section 8.6 Groundwater and surface water for related water quality requirements to inform the assessment.

- The Impact Statement must:
- use of a Pathways of Effects approach to determine potential effects to fish and fish habitat [and marine plants];
- for each waterbody and watercourse affected by the project, the following must be documented and considered in the determination of effects:
    - geomorphological changes and their effects on hydrodynamic conditions and aquatic habitats (e.g. modification of substrates, dynamic imbalance, long-term bank instability, silting of spawning grounds), including direct and indirect effects from habitat fragmentation;
    - changes in hydrological and hydrometric conditions and their effects on aquatic habitat and lifecycle activities (e.g. reproduction rearing, feeding, movements, migrations, winter refuge) and any changes to aquatic invertebrate communities;
    - changes to riparian areas that could affect fish and fish habitat, aquatic species at risk and productivity;

- any alteration to accessibility or use of habitat, including residence and critical habitat of aquatic species at risk;
- [*as relevant:* changes to the primary and secondary productivity, food sources, potential imbalances in the food web and trophic levels];
- risk of fish mortality, including that associated with:
  - noise and vibrations, or other disruptions caused by project activities in or near the aquatic environment [(e.g. blasting, excavating)];
  - describe the magnitude, temporal and spatial extent of blasting activities;
  - predict numbers of fish killed or injured per blast for the lifecycle of the project;
  - describe effects of blasting activities on benthic invertebrates; (REGDOC.-1.1.1, Appendix G5.1)
  - effects of thermal plume(s) on thermally sensitive fish species; and
  - entrapment, impingement or entrainment in cooling water intakes; (REGDOC.-1.1.1, Appendix G5.1)
- potential introduction of aquatic invasive species, including pathogens such as those in the ultimate heat sink or other elements of the cooling system (REGDOC.-1.1.1 - section 3.5.7), through project activities, including discussion of the frequency of those activities;
- changes to water quality and quantity, including:
  - potential introduction of deleterious substances (e.g. sediment, project-related contaminants) including contaminants that have been re-suspended or re-released from soils or sediments as a result of the project);
  - potential discharges to the aquatic environment of waters used for hydrostatic testing; and
  - effluent at the discharge point and in the receiving environment (referencing the assessment of water quality in section 8.5 Groundwater and surface water);
- compare predicted water quality for all project phases and at all key locations in the receiving environment to:
  - applicable water quality guidelines;
  - site-specific objectives or benchmarks;
  - relevant toxicity test results (either site-specific or published);
  - changes in potential contaminant levels in harvested species and their prey, with a focus on traditional foods harvested by Indigenous Peoples;
  - changes in access to the area and increased access to fishing;
  - [for linear projects: describe and justify watercourse-crossing techniques to be used and the criteria for determining the techniques proposed for each watercourse crossing]; and

        - any other changes resulting from the project that may affect fish and fish habitat [marine plants or aquatic species at risk and their habitat];
- delineate anticipated habitat alteration, disruption or destruction (temporary or permanent) in terms of area, habitat type, sensitivity of habitat and impact (e.g. magnitude, intensity and persistence). Habitat losses must be clearly located and presented on a map at appropriate scales and in a table, including;
    - timing of effects throughout the project lifecycle;
    - duration of effects; and
    - spatial scale of effects over time;
- describe potential effects to fish and fish habitat [and marine plants], based on specific life history processes, population status, resilience in the face of change, dependence on specific habitat features, or limiting ecological processes or variables;
- include an examination of the correlation between construction periods and sensitive periods for fish (e.g. reproduction), [key fisheries windows for freshwater and anadromous/catadromous species], and any potential effects due to overlapping periods;
- describe potential effects to fish [and marine plants] from contaminants, including from bioaccumulation 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 and other aquatic species' behaviour, distribution, abundance, and migration patterns;
    - effects should include direct exposure effects (for example, on survival, growth, reproduction, age, species distribution of community), and indirect effects (for example, altered predators, prey, competition, exposure via the food chain) (REGDOC.-1.1.1 – Appendix G 5.1);
    - effects should be predicted or modeled using baseline measurements of contaminants in the complete food web (including water, sediment, benthic invertebrates and prey fish), and by carbon and nitrogen stable isotope measurements in fish and the complete fish food web; and
    - describe how predicted effects to fish compare to the expected reference conditions for unexposed fish on a biological population basis, taking into account natural variation;
- describe effects from thermal plumes associated with nuclear power generating activities, including:
    - consideration of risk to aquatic biota from "pulse" temperature increases and decreases relative to ambient changes such as thermal shock from ongoing operations, outages and anticipated operational occurrences;
    - effects of contaminants released in the thermal discharge, including the combined effects of temperature and contaminants, as well as the potential for gas-bubble disease;
    - effects on fish, including:
        - physical displacement of life stages exposed to discharge jets;

    - lethal and sub-lethal effects;
    - behavioural responses (attraction and avoidance) for all life stages; and
    - direct effects (survival, growth, reproduction, diet, condition) and indirect effects (for example, discharge angling mortality, increased larval mortality from predation due to physical transfer out of discharge channel to open water body, disease prevalence) analysis and evaluation of the incremental effects from the project, and the cumulative effects of combined discharges (REGDOC.-1.1.1 - Appendix G5.4);
- present the explicit calculation of radiation doses to fish with recognized approaches and software tools (example of acceptable approach in CSA N288.6);
    - provide a high-level discussion of the relative merits of alternative approaches to put the presented approach in a current national and international context;
    - document details of transfer parameters and their validation for site conditions. Site-specific data, and/or authoritative data sources, should support model structure and parameter choices;
    - note the choice of food chain transfer factors for VCs, which can vary by orders of magnitude in different environments for different species; and
    - if approach different from CSA N288.6 is used, describe the model structure and implementation. Regardless of the approach taken, document a few representative samples of dose calculations starting with media and/or food concentrations (REGDOC.-1.1.1 - Appendix G8.1);
- quantify and interpret doses for the effects of controlled releases on life history parameters (morbidity, mortality, reproduction);
- if numerical benchmarks for chronic radiation effects are exceeded, interpret effects at multiple levels of organization in an ecological context relative to the potential for effects on individual biota, populations, communities and ecosystems (REGDOC.-1.1.1 - Appendix G8.2);
- describe how the project's effects on aquatic biodiversity may contribute to changes in regional biodiversity and effects on local and regional ecosystems;
- describe potential effects on fish behaviour, distribution, abundance, and migration patterns;
- describe tolerance thresholds for potential adverse effects that the Indigenous Peoples have identified, and how they were considered in the assessment;
- describe any need for a *Fisheries Act* authorization and/or a SARA permit and describe any consideration of Fisheries and Oceans Canada guidance documents; and
- describe any positive changes, such as habitat creation and, where applicable, provide information on re-stocking (including the number of fish) or creation of new fish habitat (including the new area created).

For effects to fish and other aquatic biota from impingement and entrainment, the estimates of intake losses (cropping rates) for all life stages of aquatic biota in numbers and biomass should be extrapolated to

the whole year, with confidence intervals based upon industry-accepted methods of sampling and analysis. This extrapolation includes the conversion of immature stages to age-1 adult equivalents for estimates of losses of population-level importance (for example, Defining and Assessing Adverse Environmental Impact from Power Plant Impingement and Entrainment of Aquatic Organisms [92]). Standard modelling and statistical approaches and contextual methods from government agencies and peer-reviewed published scientific literature should be used to project the effects on individual biota to those of the year-class or population. Mortality is assumed to be 100 percent from impingement, unless a fish handling and return system is included. The effectiveness predictions also vary by species and life stage. For example, alewife are fragile and easily killed, whereas sucker and eels are not; juveniles are easily injured and do not easily withstand mechanical handling systems (REGDOC.-1.1.1 - Appendix G5.3).

Additional guidance that should be referenced to support the effects assessment and associated follow up include:

- A framework for assessing fisheries productivity for the Fisheries Protection Program.
- A Science-Based Framework for Assessing the Response of Fisheries Productivity to State of Species or Habitats.
- Criteria contained in Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters.
- Environment and Climate Change Canada's total suspended solids and turbidity criteria (REGDOC.-1.1.1 - Appendix G5.2).

If an authorization is required under section 34 or 35 of the *Fisheries Act*, proponents may wish to coordinate the collection of information and associated consultations with requirements outlined above. Further information on authorization requirements under the *Fisheries Act* is available here: Applicants Guide Supporting the Authorizations Concerning Fish and Fish Habitat Regulations.

For projects requiring the use of natural waterbodies frequented by fish for the disposal of mine waste[12] and/or for the management of process water, an amendment to the *Metal and Diamond Mining Effluent Regulations* (MDMER) will be required. By fulfilling the requirements of the regulatory authorization during the impact assessment, notably the detailed assessment of alternatives for mine waste disposal, authorizations may be granted in an accelerated manner. For further guidance, the proponent should consult Environment and Climate Change Canada's Guidelines for the Assessment of Alternatives for Mine Waste Disposal.

8.12.3 Mitigation and enhancement measures

[12] For the purposes of this document, mine waste refers to waste rock and effluent as set out in section 5(1) of the *Metal and Diamond Mining Effluent Regulations*.

The Impact Statement must describe the mitigation measures for the effects on fish and fish habitat [and marine plants], including:

- 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;
- measures to prevent or mitigate the risk of harmful alteration, disruption or destruction of fish, fish habitat, [marine plants] or death of fish caused by any project activity, including during the sensitive periods and in the sensitive locations (e.g. spawning and migration) for fish and other aquatic species;
- [measures applicable to all water crossings, intakes, and outflows including how they would be maintained following construction of the project];
- [describe the conditions under which crossings of watercourses and riparian areas would be restored and maintained after construction of the project];
- measures to mitigate sensory disturbance and functional fish habitat loss that it may cause [, including in relation to marine shipping];
- measures recommended to avoid fish mortality, for example, during use of explosives or from thermal plumes in the aquatic environment, or by fish impingement and entrainment during pumping and water withdrawal operations (e.g. during the construction of temporary structures and of hydrostatic tests);
- measures to prevent the deposit of substances harmful to fish [and marine plants] in the aquatic environment;
- measures for impacted riparian or aquatic environments;
- criteria for assessment of the successful restoration of fish-bearing watercourses, as well as the mode and timing and the conditions of documentation of this assessment;
- mitigation measures to be applied during hydrostatic tests, including for water withdrawal and discharge activities;
- measures to prevent the introduction and intrusion of invasive aquatic species during work in or near the aquatic environment;
- measures and plans to offset or compensate for any loss in productivity of fish populations and fish habitat as a result of the project;
- describe how environmental protection plans will address any applicable federal and provincial policies with respect to fish habitat; and
- describe how the mitigation measures are consistent with any applicable recovery strategy, action plan or management plan.

The proponent must refer to Fisheries and Oceans Canada guidance and explain how it was applied to the assessment, including the references provided in Appendix 1 – Guidance for biophysical components of the Guidelines Template under Compensation and offset plans and Fish and fish habitat.

8.13 Birds and their habitat

For the purpose of the Guidelines, birds refers to migratory birds as defined under the *Migratory Birds Convention Act, 1994*, and birds of importance to Indigenous Peoples. The proponent should consult the additional guidance for requirements pertaining to birds provided in Appendix 1 – Guidance for biophysical components of the Guidelines Template.

8.13.1 Baseline conditions

The Impact Statement must:

- identify species or groups that may be affected differently by the project and may require different mitigation measures and consider them as unique VCs, including [*list to be tailored to the project:*
  - waterfowl;
  - aquatic birds and seabirds (other than waterfowl);
  - land birds, including songbirds;
  - birds of prey;
  - shorebirds; and
  - identified species at risk under federal or provincial jurisdiction];
- identify any applicable Bird Conservation Regions (BCRs) and BCR strategies;
- describe the biodiversity of bird species and their habitats that are found or are likely to be found in the LSAs and RSAs;
- identify the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline avifauna biodiversity and discuss the rationale for their selection;
- for birds that use the study areas at any time of the year that are likely to be directly or indirectly affected and describe their:
  - abundance and population status;
  - distribution;
  - lifecycle;
  - seasonal ranges, migration, movements;
  - frequency and timing of occurrence;
  - habitat association(s) and requirements for all relevant lifecycle stages; and

- sensitive periods (e.g. seasonal, time of day);

- 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 usage of highly habitat reliant species and highly mobile species that will accurately characterize the use of a site];
- identify, and show on maps, areas of concentration of birds, including sites used for breeding, feeding, wintering, resting, staging and migrating;
- describe the habitat and habitat features found in the study areas 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, marine elements) (can refer to information provided in previous sections)]. 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;
  - should there be anticipated displacement of nesting birds, baseline habitat 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 study area or region;
- [describe food webs and trophic linkages to summarize biotic interactions];
- for avian species at risk, locate on an appropriately scaled map the potential habitats, survey locations, records of the species, residences and critical habitat, except where locations and records are considered sensitive information;
  - identify any and all federal species at risk and/or critical habitat in the study areas; and
  - identify any sites that are likely to be sensitive locations and habitat for birds or environmentally significant areas. [*list as relevant:* These include National Parks, Areas of Natural or Scientific Interest, Migratory Bird Sanctuaries or other priority areas or sanctuaries for birds, National Wildlife Areas or World Biosphere Reserves, offshore Marine Protected Areas and Ecologically and Biologically Significant Marine Areas];
- illustrate on the map the project's footprint, identifying temporary and permanent infrastructure; describe the use of (magnitude, timing) birds as a source of country foods (traditional foods) and whether consumption has Indigenous cultural importance;
- describe the source of the data, data collection methods, and provide a rationale for any modelling approaches chosen. [The baseline data must be sufficient to account for natural variability in populations (generally at least two years of field data) and have been collected by well designed studies]; and
- where predictive modelling is required, provide the explanatory data (e.g. covariables such as associated land cover) required to predict effects on birds (e.g. changes in abundance, distribution or other relevant effects) collected in such a way as to represent the following sources of variation where applicable: spatial variation in land cover composition, soil type, geomorphology, hydrological processes, and inter-annual and intra-annual climate variability.

8.13.2 Effects to birds and their habitat

The Impact Statement must:

- describe the interaction between the project and birds and their habitat, for all phases, including from:
  - site preparation, vegetation removal, particularly of habitats important for nesting, foraging, staging, overwintering or that act as movement corridors;
  - deposit of harmful substances in waters that are frequented by birds and changes to water quality;
  - evaluate the risk posed from the potential introduction of aquatic invasive species, including the rapid growth of pathogens such as those in the ultimate heat sink or other elements of the cooling system, and other biohazards (REGDOC.-1.1.1 - section 3.5.7);
  - changes to the aquatic flow regime and sediment load;
  - [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 structures [including power transmission and distribution lines];
  - changes to the atmospheric, acoustic and visual environment (e.g. noise, vibration, lighting, air emissions and dust);
  - [flaring of gas];
  - site reclamation;
  - any project activities that may occur during critical periods and/or restricted activity periods birds, including species at risk; and
  - consider important habitats, including: forests, riparian zones, grasslands, old-growth forests, wetlands, eskers and other similar geological formations, and open waters];
- describe the potential effects of the project on birds, their nest and eggs, including, but not limited to, from:
  - short and long-term changes to habitats important for nesting, foraging, staging, overwintering, rearing and moulting and to movement corridors between habitat, and from habitat loss, fragmentation and structural change. [Any assumptions regarding temporary or permanent relocation should be justified using scientific evidence that there is available habitat to allow relocation under a variety of population scenarios. For example, it should be clear that a growing population will not be limited by habitat loss in the study areas];
  - [changes in food sources in terms of types, quality, quantity, availability, distribution and function, including short-term and long-term changes];
  - [changes in biodiversity, abundance, and density of the avian community that utilise the various habitat types or ecosystems;

  - changes to mortality risk, including as a result of collision of birds with project infrastructure, [buildings, flaring gas, overhead lines, vessels and vehicles], as a result of light attraction and from indirect effects, such as increased movement of predators or access to hunting;
  - increased disturbance (e.g. sound, artificial light, presence of workers) considering the critical periods for the birds, including breeding, migration and overwintering;
  - describe the activities most likely to result in disturbance, injury or take of birds, their nests and eggs, such as vegetation clearing, increased noise from industrial machinery, and whether or not those activities would be permanent or non-permanent in the environment; and
  - contaminants and bioaccumulation of contaminants, including those that may be consumed by Indigenous Peoples;
- present the explicit calculation of radiation doses to birds with recognized approaches and software tools (example of acceptable approach in CSA N288.6);
  - provide a high-level discussion of the relative merits of alternative approaches to put the presented approach in a current national and international context;
  - document details of transfer parameters and their validation for site conditions. Site-specific data, and/or authoritative data sources, should support model structure and parameter choices;
  - note the choice of food chain transfer factors for VCs, which can vary by orders of magnitude in different environments for different species; and
  - if approach different from CSA N288.6 is used, describe the model structure and implementation. Regardless of the approach taken, document a few representative samples of dose calculations starting with media and/or food concentrations; (REGDOC.-1.1.1 - Appendix G8.1)
- quantify and interpret doses for the effects of controlled releases on life history parameters (morbidity, mortality, reproduction);
- if numerical benchmarks for chronic radiation effects are exceeded, interpret effects at multiple levels of organization in an ecological context relative to the potential for effects on individual biota, populations, communities and ecosystems; (REGDOC.-1.1.1 - Appendix G8.2)
- [describe, with evidence, available habitat for the relocation of displaced birdsdescribe how predicted effects to birds compare to the expected reference conditions for unexposed birds on a biological population basis, taking into account natural variation].

The proponent should refer to the Government of Canada's guidance on this topic, including:

- Avoiding harm to migratory birds.
- A framework for the scientific assessment of potential project impacts on bird
- Migratory birds environmental assessment guideline

8.13.3 Mitigations and enhancement measures

The Impact Statement must:

- describe the measures to mitigate adverse effects to birds and their habitat, including their eggs and nests;
- describe the measures to prevent and mitigate the risk of harmful, destructive or disruptive activities during sensitive periods and in sensitive locations (e.g. breeding bird season, migration and nesting) for birds, their nests and their eggs, or areas frequented by birds, such as avoiding lights at night during key migration peaks, avoiding excessive loud noises, vibration or blasting during breeding season;
- consider the timing of vegetation removal and construction to be outside the main breeding season;
- describe measures to mitigate sensory disturbance and the functional habitat loss it may cause;
- describe measures for preventing the deposit of substances harmful to birds;
- [describe technologies and approaches to minimize the impacts of tailing ponds on birds that may come into contact with process affected waters]; and
- [describe how mitigation measures for effects on eskers serve as mitigation measures for birds, since this type of geological formation presents a type of land cover that is not widespread and is of great value to forest birds during migration and reproduction].

The proponent should refer to the Guidelines to reduce risk to migratory birds and to the General nesting periods for migratory birds, which covers the main nesting periods of migratory birds and 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.

9. Health, Social and Economic Conditions

[The scope of requirements for health, social and economic conditions may differ depending on project context and should consider key issues anticipated to be material to decision-making. For projects that do not include a federal work or undertaking or components that are carried out on federal lands, tailoring of the requirements and studies should focus on potential impacts on Indigenous rights and interests, on potential contributions to sustainability, as well as on any other key issues for the project. The health, social, and economic components are intricately interconnected, each influencing and being influenced by the others. Understanding and incorporating this interconnectedness is crucial for comprehensive analysis.]

9.1 Baseline conditions

The Impact Statement must:

- describe the current state of physical, mental and social well-being [for Indigenous groups] and incorporate a determinants of health approach that extends beyond biophysical health considerations. The determinants of health approach used should align with the World Health Organization's (WHO) expanded definition of health as is more than the absence of disease but rather a state of physical, mental, and social well-being. The selection of determinants should be guided by the references listed in Appendix 2 – Human health of the Guidelines Template;
    - develop community health profiles [for Indigenous groups] that reflect the overall health of each community, where information is available, including:
        - birth rates, death rates, rates of sexually transmitted infections, injuries, and chronic disease, and mental health status and other community-relevant health information; and
        - use, where known, secondary information sources (e.g. Public Health Agency of Canada, Statistics Canada, Indigenous Services Canada, Indigenous health authorities, provincial health authorities, municipalities);
    - describe any context-specific definitions of health and 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;
    - describe the baseline information for the biophysical as well as social and economic determinants of health that may be relevant to the project;
    - describe the determinants of health selected specifically for Indigenous groups, including for diverse population groups within them;
    - [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)];
    - 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 and characterize the existing health services and programs, including health care provider capacity;
    - describe drinking water sources, both surface and/or groundwater (permanent, seasonal, periodic or temporary), including approximate wellhead capture zones and the distance from project activities;

- describe the consumption of country foods (traditional foods) 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, First Nations Food, Nutrition and Environment Study);
  - country foods refer to all foods that do not come from commercial systems. It includes all food that is trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes or has Indigenous cultural value;
- provide baseline contaminant concentrations in ambient air, drinking water and tissues of traditional foods consumed by Indigenous groups and local communities. The proponent should work with local Indigenous groups to collect tissue samples where appropriate; and
- describe the level of food security and food sovereignty within [local communities and] Indigenous groups. Refer to the Public Health Agency of Canada's website on food security and to the First Nations Food, Nutrition & Environment Study for more information;

- describe the existing social conditions for individual [communities and] Indigenous groups;
  - develop community profiles [for Indigenous groups], including:
    - 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 gender-based violence), including indicators proposed by Indigenous groups;
    - community cohesion, including level of support and engagement in community or neighbourhood, social networks and social activities;
    - the psychosocial environment and its influence on community well-being;
    - the socio-cultural environment;
    - demographic characteristics and major socio-cultural values and concerns [of the population *and/or* of Indigenous Peoples];
    - access, ownership and use of resources (e.g. land tenure, minerals, food, water, social infrastructure);
    - capacity (currently available or planned) of institutions to deliver public services and infrastructure;
    - relevant historical community background; and
    - applicable history with previous developers.
  - [*if relevant*: describe baseline conditions for land and resource use, including:
    - general patterns and provide a brief history of human occupancy and of land resource use in the study area based on selected spatial and temporal boundaries (include maps, if possible);

- include information on major industries in the vicinity of the project site (REGDOC.-1.1.1 - Appendix C9);
- a consideration of relevant current and future land use from local, regional, or provincial land use or resource development plans;
- sites or areas that are used by local people and Indigenous Peoples either as a permanent residence or as a seasonal/temporary location, and the number of people using each identified site or area (include a map, if possible);
- identify remote, rural and urban residential areas (including seasonally and year-round occupied establishments), lands in a reserve within the meaning of subsection 2(1) of the *Indian Act*, Indigenous Peoples and Indigenous traditional and/or treaty territories;
- identify parks and primary recreation areas (including local and provincial/territorial parks and recognized scenic areas) (REGDOC.-1.1.1 - Appendix C9);
- identify monitored or administered forest areas (including forests under agreement and areas designated for timber sales);
- identify registered or recognized hunting, trapping or guiding areas, recreational and commercial fishing areas, preferred harvesting areas;
- identify water supplies and water lots, as well as water sources and intakes for farms, industries, residents and municipalities; and
- describe the natural and cultural heritage, and provide maps for buildings, sites and things of historical, archaeological, paleontological or architectural significance in the study area, including land, natural features and resources considered to be heritage];

- describe the existing local and regional infrastructure and services in the study areas [as they relate to the social conditions of Indigenous Peoples], including:
  - [road infrastructure and traffic safety;
  - railways;
  - ferry and marine terminals;
  - airports;
  - pipelines, water mains and sewer lines;
  - power lines;
  - utilities;
  - accommodation and lodging (e.g. affordability, availability, suitability), including camping facilities;
  - public transportation;
  - recreation and parks;
  - waste disposal;

    - educational services, facilities and childcare;
    - elder care and services;
    - existing health services and programs, including health providers capacity;
    - ambulance services;
    - police and fire departments;
    - social services; and
    - all other potentially affected infrastructure and services];
- describe the local and regional economic conditions including for Indigenous groups:
    - [demographic features of the local and regional population];
    - [prevalent economic concerns and economic aspirations of residents, families and workers in the study area];
    - any local, provincial, or federal economic development plans for the study areas;
    - any relevant treaty provisions pertaining to economic development or activities for Indigenous Peoples;
    - existing employment rates and economic well-being in the study area and impacted communities;
    - workforce, including the availability of skilled and unskilled workers, existing working conditions, wages and average salary range, full-time and part-time employment and training and gender gaps such as for skilled trades and in wages and qualifications;
    - local and regional workforce development and training plans, including those specific for Indigenous Peoples;
    - [main economic activities in the study areas];
    - an overview of the [Indigenous] businesses that may provide supplies and services required for the project;
    - current use of land and waterbodies for economic activities [by Indigenous groups] in the study areas including a description of hunting, recreational and commercial fishing (including catch rates, visitation rates, and angling days), trapping, outdoor recreation, use of seasonal cabins, outfitters, and forestry;
    - local organizations, user groups and Indigenous peoples interested in local land uses and resources for previous projects in the regional study area (REGDOC.-1.1.1 - Appendix C9);
    - [describe marine commercial fisheries, 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]; and
    - [describe agricultural activities, including the major crops, commercial livestock held, the growing season, and the size of local farms];

- [*if there are potential effects on navigable water:* describe baseline conditions for navigation, including:
  - existing navigable waterways, and all their uses; and
  - potentially affected waterway users and concerns regarding waterway use and access];
- be sufficiently detailed to provide a comprehensive understanding of the health, social and economic conditions [of Indigenous Peoples], including relevant trends;
- be sufficiently detailed to describe the pathways by which the project's influence on the determinants of health may affect health outcomes;
- provide a comparison of data at the provincial, regional or national level, if possible, to better interpret baseline conditions;
- identify the social area of influence of the project;
- describe how [community and] Indigenous Knowledge from relevant populations was used in establishing baseline conditions, including input from diverse population groups; and
- describe baseline conditions using disaggregated data for diverse population groups and their different access to resources, opportunities and services within the community to support GBA Plus.

Guidance for developing the appropriate baseline information relevant to human health is identified in Appendix 2 – Human health of the Guidelines Template. The proponent should refer to the Health Canada guides to ensure that best practices are followed in collecting baseline information for assessment of the project's impacts on human health caused by changes in air quality, noise levels, the quality of drinking water and water used for recreational purposes, traditional foods and the multiple contaminant exposure routes. Receptor exposure characteristics (for example, inhalation or ingestion rates), when used, should be referenced from accepted Canadian or international sources, for example:

- for hazardous substances, *2013 Canadian Exposure Factors Handbook*;
- the most up-to-date International Commission on Radiological Protection (ICRP) references; and
- the U.S. Environmental Protection Agency's Agency for Toxic Substances and Disease Registry (REGDOC.-1.1.1 - Appendix G7).

The proponent must justify any omission or deviation from the recommended baseline characterization approaches and methods, including the Health Canada guidelines.

9.2 Effects to human health, social and economic conditions

The Impact Statement must:

- assess the potential effects of the project on [human health, including the] health of Indigenous Peoples:
  - apply a [Health Impact Assessment approach and/or Human Health Risk Assessment approach];
  - apply a determinants of health lens and describe any potential health effects resulting from changes on biophysical, social and economic determinants of health, including relevant interconnections and interactions;
  - estimate radiological doses to workers from routine and non-routine work practices, including the maximum annual effective and equivalent doses to categories of workers (REGDOC.-1.1.1 - Appendix G7.2);
  - evaluate the potential risk to human and non-human biota from biocides and other means used to used to manage biohazards and invasive species (REGDOC.-1.1.1 - section 3.5.7);
  - describe any potential project effects on [Indigenous groups and/or the community] health profile; and
  - describe how community and Indigenous Knowledge was used in assessing human health effects;
- assess the adverse and positive effects of the project on social conditions [of Indigenous Peoples];
- assess potential positive and adverse effects to the local, regional, provincial and national economies;
- describe how the differential effects identified in the GBA Plus results affect diverse population groups (e.g., Indigenous women, girls, gender-diverse and Two-Spirit peoples); and
- describe the interconnections between social, health and economic conditions and other VCs and interactions between effects

For more information and best practices in the assessment of health effects using an Human Health Risk Assessment (HHRA[13]) or Health Impact Assessment (HIA)[14], the proponent should refer to IAAC guidance on Analyzing Health, Social and Economic Effects under the Impact Assessment Act, Guidance from Health Canada for Evaluating Human Health Impacts , the CSA N288.6, *Environmental risk assessments at nuclear facilities and uranium mines and mills*) (REGDOC.-1.1.1 - Appendix G.7.2) and the resources provided in Appendix 2 – Human health of the Guidelines Template. As applicable to the assessment, the

[13] 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).

[14] HIA: systematic process that uses specific steps, standards and principles to examine the possible positive and/or adverse health impacts to communities, as well as the distribution of those impacts within the population.

analysis should describe the goals of local or regional land use plans or local or regional development plans and the extent to which the project is aligned with such plans to avoid or enhance effects. The effects assessment should explore and discuss opportunities by which benefits to local communities can be enhanced. The assessment of economic effects should take into consideration the temporal scale for construction, operation and beyond and the potential for boom-and-bust cycles associated with the project.

9.2.1 Biophysical determinants of health

[The Impact Statement must:

- provide an assessment of the potential effects on human health in consideration of, but not limited to, potential changes in:
  - air quality;
  - noise exposure and effects of vibration;
  - light levels;
  - current and future availability and quality of country foods (traditional foods); and
  - current and future availability and quality of water for drinking, recreational and cultural uses;
- describe and document the method used to estimate effective and equivalent doses (see methodology guidance in REGDOC.-1.1.1 - section G.7.1);
  - consider statistical interpretation of acute exposures;
  - reference and describe alternative interpretations of radiation risk;
  - address the effects of using radiation weighting factors suggested in CSA N288.6, for calculating a “biota effective dose” from absorbed dose (i.e. weighting factors of 40 for alpha particles, and 3 for tritium beta particles); and
  - use a probabilistic modelling approach if there is ambiguity in the validity of dose estimates for site-specific conditions and/or VCs (i.e., a probabilistic approach is appropriate when it is necessary to grossly extrapolate information for other areas or species, or when there is ambiguity in the protection of any threatened or endangered species, or species of concern (REGDOC.-1.1.1 - Appendix G8.3);
- determine the anticipated effects of the project on the quality and quantity of groundwater or surface water used for domestic purposes based on the strictest guideline values for the following criteria: Guidelines for Canadian Drinking Water Quality (GCDWQ), or any relevant provincial water quality standards or guidelines;
- describe the fate and estimated travel times of contaminants of potential concern (COPCs) from contaminant source areas to drinking water sources;
- 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);

- provide the rationale if a determination is made that an assessment of the potential for contamination of country foods (traditional foods or other exposure pathways, such as inhalation) is not required or if some contaminants are excluded from the assessment;
- identify other potential routes of exposure to contaminants;
- provide a detailed justification for every contaminant of potential concern (COPC[15]) or exposure route that would be excluded and/or eliminated from the assessment of the human health risks;
- conduct a problem formulation exercise and/or preliminary model predictions to determine whether a complete HHRA is required. The proponent must provide a rationale if the problem formulation and/or preliminary model predictions indicate that a HHRA complete is not warranted;
    - problem formulation consists of identifying the main factors to consider. It briefly addresses the following factors:
        - identification of the boundaries of the study;
        - identification of the current and future COPCs;
        - identification of current and future human receptors;
        - identification of current and future exposure pathways, and
        - development of the conceptual site model illustrating the connections existing between the COPC, the receptors and the exposure routes;
- if a HHRA is conducted, the assessment must examine all exposure pathways for contaminants of potential concern 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. Use best practices in health risk assessment methods (see Health Canada, 2019. Guidance for Evaluating Human Health Impacts in Environmental Assessments: Human Health Risk Assessment);
- [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:

[15] COPC: Any chemical substance, radiological or non-radiological contaminant 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 modeled 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.

- 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 and quantify specific thresholds used for HHRA and document if different thresholds were considered for vulnerable populations, including by 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 or noise 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;
- with regard to potential effects on food security:
  - 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 *or* Indigenous Peoples[16]]; and
  - 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; and
- describe any project-related changes that could result in a positive health effect (e.g. remediation projects).

[16] Refer to: Health Canada, Eating Well with Canada's Food Guide - First Nations, Inuit and Métis

9.2.2 Social and economic determinants of health

The Impact Statement must:

- describe the potential health effects arising from changes to social and economic conditions that are determinants of health, and their respective indicators, reflecting the input of the affected communities;
- identify and describe anticipated changes to determinants of health that may be related to the project[, for example:
  - housing availability, home value, housing affordability and home ownership;
  - demographic information on the region, including available descriptive statistics (e.g. age, ethnicity, sex and gender, language);
  - access to health and social services;
  - access to green spaces, parks and recreational facilities;
  - community cohesion;
  - average income and wage inequality;
  - education level;
  - factors supporting mental health and community well-being (including perceived stress, feelings of isolation, of remoteness, of concern for future generations); and
  - safety of Indigenous women and girls];
- identify any emotional or social stress factor that may result from the project, particularly:
  - concerns regarding public safety raised by the construction or by the risk of accidents or malfunctions related to project operations, and
  - disturbance of normal daily activities;
- describe the effects that temporary work camps have on the safety of women and girls;
- describe potential effects on access to social and health services, including the increased use of health services and related social services in the relevant communities;
- indicate the potential health effects, short-term or long-term, resulting from changes on community cohesion and perception of well-being during the construction phase, and determine whether those effects would change again during the operation phase;
- 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 on the diet and health of Indigenous Peoples;
- document and take into account tolerance thresholds for potential adverse effects identified by Indigenous Peoples; and

- describe any positive health effects (e.g. resulting from improved economic opportunities, increased access to services).

9.2.3 Effects on community well-being

[With respect to Indigenous Peoples,]The Impact Statement must:

- describe potential adverse and positive effects, at the community level, of changes to community well-being including, but not limited to:
  - safety and security;
  - food security;
  - income inequity;
  - housing prices and availability;
  - cost of living;
  - non-commercial/trade economy; and
  - those conditions considered for analysis of determinants of health in section 9.2;
- consider the potential for stresses on community, family and household cohesion, alcohol and substance misuse, or illegal or other potentially disruptive activities;
- consider potential effects related to greater propagation of sexually transmitted infections and gender-based violence (e.g. harassment or human trafficking);
- describe, at the community level, the expected interactions between the project's construction, operation and maintenance workforce and local communities, businesses and residents;
- describe in-and out-migration effects, including changes in population;
- identify whether social divisions might be intensified as a result of a project;
- evaluate effects on access, ownership and use of resources (e.g. land tenure, minerals, food, water, social infrastructure);
- describe any anticipated effects to language, including changes to the availability of services in English, French, and local languages;
- document and take into account tolerance thresholds for potential adverse effects identified by Indigenous Peoples;
- describe how community and Indigenous Knowledge was used in assessing community well-being; and
- describe any positive effects on well-being (e.g. resulting from improved economic opportunities, increased access to services).

9.2.4 Effects on services and infrastructure

The Impact Statement must:

- describe the adverse and positive effects to the local and regional services and infrastructure anticipating and considering increased demand on these services including:
  - [housing (e.g. affordability, availability, appropriateness);
  - camping facilities;
  - educational services;
  - facilities and day care;
  - access to green spaces;
  - recreation and parks;
  - police and firefighting;
  - ambulance and health care services; including elder care and services;
  - mental health and social services;
  - road infrastructure and traffic safety;
  - transportation infrastructure (railways, ferry and marine terminals, airports);
  - pipelines, water mains and sewer lines;
  - waste disposal;
  - energy infrastructure, including generating facilities, power lines;
  - telecommunications]; and
  - other potentially affected infrastructure and services;
- take into account potential effects arising from a higher risk of accidents for each phase of the project, (e.g. a higher risk of impact on the road system and emergency services during the construction phase due to an increased use of roads); and
- describe any need for government and/or proponent expenditures for new or expanded services, facilities or infrastructure, arising out of project-related effects.

9.2.5 Effects on employment

The Impact Statement must:

- describe the potential changes in employment including the following aspects:
  - an estimate of the direct, indirect and induced employment at each phase of the project (including an estimate of the full-time equivalent (FTE) employment during the operations phase of the project and an estimate of full- and part-time employment);
  - an estimate of direct, indirect or induced income or wages;
  - a description of the types of employment anticipated to be created at each phase of the project;

- an estimate of the ability of the local and regional labour market to meet demand;
- an analysis of the potential for labour shortages in certain sectors as a result of the project;
- [a description of the plans and the justification for hiring of temporary workers to make up for any local shortage of labour and skills];
- situations where the project may cause the displacement of local workers; and
- any potential long-term changes to the local and regional labour markets as a result of this project;

- describe the potential changes in training including:
  - training programs to improve employment opportunities for local and Indigenous residents, and
  - potential economic effects from training related to the project; and
- the project's diversity and inclusion workforce plans, policies and practices, including to increase the employment of Indigenous Peoples, women and diverse population groups.

9.2.6 Effects on business environment and local economy

The Impact Statement must:

- set out the investment in the project for each phase and the total investment, including detailed forecast of capital and operating costs;
- describe, if applicable, any actions to increase procurement from local or regional businesses, and from businesses owned by Indigenous peoples, women, or diverse population groups;
- describe any economic benefit agreements under consideration or concluded with [local communities or] Indigenous groups;
- provide an estimate of the anticipated levels of local and regional economic participation in the project [for Indigenous groups] in comparison to the total project requirements (e.g. total dollar value of contracts);
- describe situations when the project may directly or indirectly create economic hardships for, or the displacement of, [Indigenous] businesses;
- [estimate the potential effects of the project on the traditional economy, including the potential loss of related jobs];
- describe the potential effects [on Indigenous groups] of changes to economic conditions for specific sectors[, for example, to:
  - forestry and logging operations, including the recovery of wood cut during the construction phase;
  - fishing, hunting and trapping;

    - commercial outfitters;
    - commercial recreation and tourism; and
    - agriculture, including predicted effects to crops and livestock health and productivity];
- [describe the potential effects of changes to land and resources used in local economic activity, including:
    - potential effects of the project on the availability, value and quality of commercial land and real estate;
    - potential effects of the project on the quality and quantity of groundwater or surface water used for commercial purposes; and
    - a description of the indirect effects on the economy resulting from changes in land use (e.g. effects on farmers from the potentially increased use of recreational vehicles, restrictions related to the presence of a pipeline)];
- evaluate the net economic benefits to the economy as a whole, including:
    - 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;
    - an estimate and description of direct, indirect and induced economic effects of the project in the short and long term;
    - [*as applicable:* discuss how the project would affect the gross domestic product at provincial and federal levels];
    - 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 will result from the project going ahead, and
    - [a description of any new technology, process or other intellectual property that might be developed as part of this project, and any potential economic benefits to Canada];
- provide information on the economic viability of the project, to support the net benefits assessment, including[, including:
    - cash-flow modelling results for the project, with a focus on net-present value, internal rate of return, and break-even commodity prices for the project;
    - forecasts of relevant commodity prices for the project and descriptions for where these were acquired and, if available, how they were forecasted;
    - the project's position on the global cost curve and any potential impact on local and global commodity markets;
    - sensitivity analysis pertaining to key aspects of the project, including, but not limited to, discount rates, prices, capital and operating costs;

- details on the financial liability and compensation relating to the proponent's commitments for the decommissioning or abandonment of the project; and
- discussion of environmental, social and governance risks to project economics, including the cost of capital].

The economic information provided will be made publicly available and should not contain confidential business information.

9.2.7 Effects on navigation

[As applicable, for potential impacts on navigable waters: The Impact Statement must:

- describe navigable waterways that could be impacted by the project, and specify the proposed crossing method;
- describe ancillary project components that will be constructed in, on, under, over, through or across navigable waterways to support the project, and specify the proposed crossing method;
- describe potentially affected waterway users and describe consultation with waterway users and Indigenous groups regarding navigational use, issues raised and how issues were addressed; and
- describe project effects to navigation and navigation safety.

If an authorization is required under the *Canadian Navigable Waters Act*, proponents may wish to coordinate the collection of information and associated consultation with requirements outlined above. Further information on the *Canadian Navigable Waters Act* is available here: About the Canadian Navigable Waters Act.]

9.3 Mitigation and enhancement measures

The Impact Statement must:

- describe the proposed mitigation and enhancement measures for effects on [human *or* the] health [of Indigenous Peoples], including:
  - the mitigation and enhancement measures proposed for each Indigenous group;
  - any additional mitigation that will be considered if the level of emissions from a particular project or effluent discharge is below or at the applicable limits. 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 to minimize pollution and risks to human health;
  - 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 aimed at reducing residual effects to as low a level as reasonably possible;

- how radiation protection measures maintain doses to the public at the environment to a level that is As Low As Reasonably Achievable (ALARA) through the application of Best Available Technology and Techniques Economically Achievable (BATEA);
  - for more information, the proponent should consult additional guidance:
  - in section 2.1 of REGDOC.-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Version 2;
  - on environmental control measures in section 3 of REGDOC-2.9.2, *Controlling Releases to the Environment*;
  - on how to conduct a BATEA assessment in section 4 of REGDOC-2.9.2, *Controlling Releases to the Environment*;

- describe how radiation protection measures maintain doses to the public at the environment to a level that is As Low As Reasonably Achievable (ALARA) through the application of Best Available Technology and Techniques Economically Achievable (BATEA);
- document radiation doses on and offsite at similar existing facilities (when they exist) that use the best available technology economically achievable (BATEA) (REGDOC.-1.1.1 – Appendix G7.1);
  - Calculated doses to persons, both on and offsite, should be traceable to the input data (for example, receptor exposure characteristics, relevant radiological data). Sample dose calculations should be included that demonstrate the link from input data (such as concentrations of radionuclides in air) to doses to persons, with all relevant assumptions provided (REGDOC.-1.1.1 - Appendix G7.1);
- identify mitigation and preventative measures to eliminate or minimize radiological hazards through design and engineering controls (REGDOC.-1.1.1 - Appendix G7.2);
  - ensure that engineered controls demonstrate that the controls reduce the magnitude of each radiation source and keep radiological exposures of workers as low as reasonably achievable (ALARA) during routine and non-routine work practices (for example, operating and maintenance activities;
  - specify radiological design objectives for engineered controls;
  - Identify the administrative controls that will be used to minimize doses to workers (e.g., personal protective equipment, training and procedures); and
  - Describe contingency responses in the events of failed engineered and administrative controls;
- identify mitigation and enhancement measures presented in other sections that are also applicable to health and well-being effects;
- describe the proposed mitigation and enhancement measures that will be implemented for all social effects [on Indigenous Peoples], taking into account local and regional land use and development plans, including:

- opportunities to enhance positive impacts, such as improving infrastructure; and
- mitigation 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. where applicable, provide documented confirmation from the grid owner(s) that, with appropriate grid and plant mitigation measures in place, the location of the reactor facility will not adversely affect the grid (REGDOC.-1.1.1, section 3.6.6);

- describe the proposed mitigation and enhancement measures that will be implemented for all economic effects [on Indigenous Peoples], including:
  - opportunities for enhancing positive effects, such as creation of local employment and Indigenous employment, such as:
    - education, training and hiring practices that encourage employment of local people;
    - actions taken to increase access to education and training opportunities for different groups (e.g. provision of transportation, flexible hours);
    - a summary of commitments made with respect to employment, training and trade, including any economic benefit plans or specific cooperation agreements with Indigenous groups;
    - 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 diverse population groups (e.g. Indigenous women);
    - cultural competency training plans for non-Indigenous employees to ensure a respectful working relationship with Indigenous contractors;
    - all cultural awareness training plans for non-Indigenous employees to promote a safe work environment that fosters the well-being of Indigenous employees, and
    - actions to provide flexibility in work schedules to enable the continued participation of Indigenous employees in traditional and cultural activities;
  - 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;
    - describe any procurement policies that facilitate the opportunities for local companies; 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;

- 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; and
- describe and justify the need for compensation plans to mitigate effects on social and economic VCs related to Indigenous Peoples.

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. Indigenous Peoples

Indigenous groups are best placed to understand how a project may impact Indigenous Peoples and their rights. The proponent should apply Agency guidance on engaging with Indigenous groups and appropriate methodologies for assessing potential impacts on Indigenous Peoples and their rights and providing this information in the Impact Statement.

The Impact Statement must demonstrate how impacts on Indigenous Peoples and their rights (collectively referred to as Indigenous rights and interests) were considered and assessed. The proponent should work with Indigenous groups and respect each group's preference regarding the assessment of impacts on Indigenous rights and interests, including residual impacts and cumulative impacts. Indigenous rights and interests include (separately, or combined):

- with respect to Indigenous Peoples, 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;
- any change occurring in Canada to the health, social or economic conditions of Indigenous Peoples; and
- impacts on Indigenous rights.

As outlined in section 7.3, Indigenous groups may identify holistic VCs that encompass multiple environmental, health, social or economic components. Where holistic VCs are identified, the proponent must combine the analysis of individual components into an assessment of the holistic VCs and note it in the Impact Statement.

The Impact Statement must contain an assessment for each Indigenous group potentially affected by the project, and summarizing any past, present and anticipated future use of, and practices within, the project areas. The Indigenous group-specific assessments should include any Indigenous group-specific methodological considerations, analyses and conclusions based on feedback or submissions from Indigenous groups. This group-specific assessment does not need to repeat everything from the analysis

of each VC, but should summarize and present the appropriate information in the context relevant to each Indigenous group. To the extent possible, each group-specific assessment should be done in a way that works best for each Indigenous group.

The proponent should discuss with each Indigenous group whether it is appropriate for the proponent to provide their views on the conclusions regarding Indigenous rights and interests. The proponent is not required to provide a conclusion about impacts on an Indigenous group if an Indigenous group has provided their own conclusion.

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

10.1.1 Baseline conditions

The description of the baseline conditions associated with physical and cultural heritage and structure, site or thing of significance for Indigenous Peoples should consider historical conditions associated with the ability to transmit culture (e.g. through language, ceremonies, harvesting, teaching of sacred laws, traditional laws, stewardship laws, Indigenous knowledge).

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

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

The Impact Statement must:

- describe the interconnections and impact pathways between heritage and cultural structures, sites, places, and things and other Indigenous rights and interests for each potentially impacted Indigenous community, including intergenerational impacts over the lifetime of the project;

- 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;
- provide the location of physical and cultural heritage features on maps, if it has been shared by Indigenous groups with the proponent and if the proponent has obtained permission from the Indigenous groups for the information to be shared publicly (if required, a coarser geographic resolution can be presented);
- include components of the environment identified by Indigenous groups as having heritage value, to reflect that natural and cultural heritage is a multidimensional concept which is not limited to particular sites or objects; and
- describe how Indigenous groups participated in the identification of locations and features, including opportunities provided to participate in or lead historic resources studies (including field studies).

The proponent should consult the Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing.

10.1.2 Effects to Indigenous physical and cultural heritage

The Impact Statement must:

- assess potential effects to physical and cultural heritage, and structures, sites or things of historical, archaeological, paleontological or architectural significance to groups, including, but not limited to:
  - loss or destruction of physical and cultural heritage;
  - changes to access to and/or experience with physical and cultural heritage;
  - changes to the cultural value, spirituality, or importance associated with physical and cultural heritage;
  - changes to sacred, ceremonial or culturally important places, objects or things, including languages, stories and traditions; and
  - changes to visual aesthetics over the life of the project and post-project abandonment or decommissioning;
- take into account potential effects on physical and cultural heritage when assessing the effects on social and economic conditions;
- provide copies of correspondence with provincial, territorial or Indigenous authorities responsible for heritage resources with comments on any physical and cultural heritage resource assessment and proposed mitigation;
- describe contingency plans and field interventions that will be applied should heritage resources be discovered during construction and operation, or cultural heritage training programs for workers;

- explain the interconnections with and potential impacts to physical and cultural heritage from changes to pre-development and current baseline environmental, social and economic conditions;
- 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 any studies conducted by Indigenous Peoples; and
- list any other effects highlighted by Indigenous groups or other participants, if applicable.

10.2 Current use of lands and resources for traditional purposes

10.2.1 Baseline conditions

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

Where information is provided or validated by Indigenous groups, the Impact Statement must identify and describe:

- Indigenous governance systems and Indigenous laws associated with the current use of lands and resources for traditional purposes;
- location and description of Treaty lands and/or geographic extent of Treaty rights, title area, land claims or traditional territory (including maps where available);
- location of reserves and communities;
- location of any Indigenous Protected and Conserved Areas;
- studies from Indigenous groups conducted to quantify use of land for hunting, fishing, trapping, medicinal plant gathering, habitation, spiritual, ceremonial, burial, or any other traditional pursuits (REGDOC.-1.1.1 - Appendix C9);
- traditional activities presently or historically practised (e.g. hunting, fishing, trapping, gathering of plants or medicines);
- location of traditional use, including hunting, trapping, and fishing camps, cabins and gathering or teaching grounds;
- resources important for traditional and cultural purposes (e.g. plants, fish, mammals, birds and other natural resources), and places where these resources are harvested. Identify those being species at risk and describe their traditional and cultural significance;

- 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;
- 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);
- uses of riverbanks, shorelines, waterways and waterbodies navigable by Indigenous Peoples, such as for travel and recreation (e.g. canoe route and portage trails), including entry and exit/landing sites for watercraft;
- waterways, waterbodies, springs, wetlands, and shallow groundwater used as drinking water sources and aesthetic properties (taste, colour, clarity, temperature, odour) of those waters;
- current use of lands and waterbodies in the study areas, including for harvesting, hunting, gathering and fishing, as well as social and ceremonial purposes, including as defined by Aboriginal and Treaty rights;
- use of cabins, camp sites and staging areas;
- frequency, duration or timing of traditional practices;
- efforts by Indigenous groups to restore traditional practices;
- country foods (traditional foods) consumed by Indigenous groups;
- quality and quantity of resources (e.g. preferred species and perception of quality);
- access to resources (e.g. physical access to harvest-specific species, culturally important harvesting locations, timing, seasonality, distance from community);
- important features for the experience of the practice (e.g. connection to the landscape without artificial noise and sensory disturbances, air quality, visual landscape, perceived or real contamination);
- location of any Indigenous-led research or monitoring activities; and
- other current uses identified by Indigenous groups.

10.2.2 Effects to current use of lands and resources for traditional purposes

The Impact Statement must:

- assess the potential effects on current use of lands and resources for traditional purposes, within the context of historical and current cumulative effects, including to:
    - current and future availability and quality of country foods (traditional foods);
    - quality, quantity and distribution of resources available for harvesting (e.g. species of cultural importance, traditional and medicinal plants);
    - access to culturally important harvesting areas or resources, access to traditional territory and to/from the community and reserves;

  - experiences of being on the land (e.g. 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 travelways, navigable waterways and waterbodies;
  - sites of interest to communities including for commercial and non-commercial fishing, hunting, trapping and gathering and cultural or ceremonial activities and practices,
  - access to the territory and to the distribution and availability of harvested wildlife (e.g. wildlife avoidance),
  - economic burdens of, and increased time for, travelling further to hunting, fishing, trapping and gathering opportunities, and
  - impacts of changes in the sensory experience of being on the land, due to noise and change in soundscape, changes in the visual landscape, and odour, and any corollary wellness impacts as a result of these sensory changes;
- describe potential effects on the transmission of Indigenous Knowledge, language, community tradition of sharing and community cohesion 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 and best practices in place concerning light pollution (the proponent needs to work with communities to ensure that any standards that are applied are protective of traditional uses and purposes and human health);
- describe the methods used to collect information on traditional use of lands and resources by Indigenous groups;
- describe how the traditions, perspectives, values and knowledge of Indigenous groups have been considered in determining the severity of the project's contribution to current cumulative effects to environmental and socio-cultural conditions affecting Indigenous land and resource use;
- describe how information about impacts to land and resource use is integrated into section 10.1.2. including 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,
  - 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, and
  - impacts to harvesting and traditional use affects teaching and knowledge transfer between generations;

- describe how traditional land and resource use and cultural values informed the biophysical assessment and impact rating criteria;
- 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;
- provide a detailed explanation of how comments from Indigenous groups and Indigenous Knowledge informed the assessment of potential effects to current use of lands and resources for traditional purposes;
- describe all reasonable alternatives considered that would avoid impacts on current use of lands and resources for traditional purposes considered during project development;
- describe and assess the interconnections and impact pathways between the current use of lands and resources and other Indigenous rights and interests, including potential intergenerational impacts over the lifetime of 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 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, 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
- [list other effects highlighted by Indigenous groups or other participants, if applicable].

10.3 Health, social and economic conditions of Indigenous Peoples

10.3.1 Baseline conditions

The baseline conditions established for Indigenous groups must meet the requirements set out in section 10 Health, Social and Economic Conditions, and take into account GBA Plus specific to Indigenous Peoples as well as Indigenous governance regimes and Indigenous laws.

10.3.2 Effects to health, social and economic conditions of Indigenous Peoples

In addition to the requirements set out in set out in section 9, the Impact Statement must:

- describe the health, social and economic effects that the project may have on Indigenous Peoples including:

- from changes to radiological conditions ;
- plans to encourage equitable employment, procurement and contracting opportunities for Indigenous groups, including education and training plans;
- estimate of the anticipated absolute and proportional levels of Indigenous economic participation in the project (e.g. number of workers, revenue sharing, ownership, equity and other related measures);
- any plans for cultural sensitivity training for non-Indigenous employees to promote a safe work environment that supports the well-being of Indigenous employees;
- any plans for cultural competence training for non-Indigenous employees to foster a respectful professional relationship with Indigenous businesses;
- effects on Indigenous groups' ability to manage or improve social and economic conditions including in relation to engaging in traditional and other economic activities;
- how the project may impact environmental and cultural stewardship;
- planned collaboration with Indigenous groups on group-specific benefit plans, including economic development, whether through an agreement or otherwise;
- how positive impacts on one or more group may result in adverse impacts on one or more other group;

- describe and assess the interconnections and impact pathways between health, social and economic conditions of Indigenous Peoples and other Indigenous rights and interests, including potential intergenerational impacts over the lifetime of the project (e.g., 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 population groups); and
- [list other effects highlighted by Indigenous groups or other participants].

The proponent should refer to the following:

- Analyzing Health, Social and Economic Effects under the Impact Assessment Act;
- Indigenous Mental Wellness and Major Project Development: Guidance for Impact Assessment Professionals and Indigenous Communities;
- More-than-mental health: Indigenous identity, culture, community and relationship with land are integral to Indigenous wellbeing (training manual); and
- Final report on Missing and Murdered Indigenous Women and Girls, in particular the Calls to Justice for Extractive and Development Industries (calls 13.1 to 13.5).

10.4 Rights of Indigenous Peoples

10.4.1 Baseline conditions

The Impact Statement must:

- identify and describe the Treaty and Aboriginal rights of Indigenous Peoples potentially affected by the project, including historic, regional and community context, the geographic extent of traditional territory, the purpose and importance of the rights to the rights-bearing communities (e.g. the practices, customs, beliefs, worldviews and livelihoods), and information on how rights have already been affected. The description should include maps, when available and permitted by the respective Indigenous groups, to illustrate the location of treaties, traditional territories and Métis harvesting zones;
- document the nature and extent of the exercise of rights of Indigenous Peoples, potentially impacted by the project, as identified by the Indigenous group(s);
- consider how the information requirements related to physical and cultural heritage, current use, Indigenous health, social and economic conditions are applicable to the nature and extent of the exercise of rights; and
- consider how the information requirements related to cumulative effects are applicable to the baseline conditions supporting the exercise of rights.

Indigenous groups may also provide their perspective through consultations with IAAC [and, to the review panel]. Indigenous groups must be involved in the baseline characterization of conditions supporting the exercise of rights, as well as the scoping and assessment of the nature and extent of the exercise of rights of Indigenous Peoples.

The information related to the rights of Indigenous Peoples may include, but is not limited to:

- the quality and quantity of resources required to support the exercise of rights (e.g. preferred species);
- access to the resources required to exercise rights (e.g. physical access to culturally important places, timing, seasonality, distance from community);
- the experience associated with the exercise of rights (e.g. noise and sensory disturbances, air quality, visual landscape);
- specific areas of cultural importance where rights are exercised;
- landscape, social and cultural conditions that support the Indigenous group's exercise of rights (e.g. large, intact and diverse landscapes, areas of solitude; connection to landscape, sense of place; language; Indigenous Knowledge; clean water, biodiversity, abundance, distribution and quality of wildlife and vegetation);
- Indigenous governance systems and Indigenous laws associated with the exercise of rights;
- where possible, role of members within an Indigenous group (e.g. women, men, Elders, youth, people with disabilities, gender-diverse and Two-Spirit peoples) in the exercise of rights;

- how the Indigenous group's traditions, values, and preferences inform the manner in which they exercise the rights (the who, what, when, how, where and why);
- any thresholds identified by the community that, if exceeded, may impair the ability to meaningfully exercise rights*;*
- maps and 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 pass along Indigenous cultures and cultural practices (e.g. language, ceremonies, Indigenous Knowledge).

The proponent should consult Agency guidance on engaging Indigenous groups, and the Guidance: Assessment of Potential Impacts on the Rights of Indigenous Peoples.

10.4.2 Impacts on rights of Indigenous Peoples

The proponent should share studies and information about the project and its potential impacts with Indigenous groups prior to assessing the impact of the project on their rights.

The Impact Statement must:

- document the project's potential impacts on the exercise or practice of the rights or the rights arising from treaties in the project area, including the severity of impact, considering links between resources, access and experience, as expressed by potentially impacted Indigenous groups;
- describe solutions to concerns raised about impacts on the exercise of rights, as agreed to by Indigenous groups;
- describe how the assessment of other Indigenous rights and interests were integrated into the assessment of Indigenous rights and considered in the determining residual impacts and the severity of impacts;
- document the level of engagement with Indigenous groups and the approach taken to support Indigenous groups in identifying the potential impacts of the project on their rights, including the hypotheses put forward;
- describe the methodology used and agreed to by Indigenous groups, including any Indigenous-led studies and
- where an Indigenous group has not provided its views on the impact of the project on their rights to the proponent, or where the proponent and an Indigenous group, in consultation with IAAC, agree that the Indigenous group will provide information on impacts on their rights and interests directly to IAAC [or the review panel] instead of through the Impact Statement, the proponent must provide this rationale in the Impact Statement.

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

The proponent, in collaboration with Indigenous groups, should consider the following factors, as relevant:

- how the project may contribute cumulatively to any existing impacts on the exercise of rights, as identified by the Indigenous group(s);
- the interference of the project on the quality and quantity of resources available for the exercise of rights;
- how the project affects the ability to travel freely in the territory;
- the effects of the project on the access to areas important to the exercise of rights;
- the effects of the project on the experience associated with the exercise of rights, including the ability of Indigenous groups to exercise their rights in a peaceful manner (e.g. without changes in connection to land, well-being, knowledge of the landscape, air quality, noise exposure, effects of vibrations, artificial light, fragmentation, visual aesthetics, safety);
- the effects of 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 groups;
- how the project will affect the ability of Indigenous groups 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 groups' actions to mitigate or to adapt to a changing climate;
- the manner in which the project and its impacts weaken or strengthen the authority of Indigenous groups on their territory;
- how the project affects all other components of significance identified by Indigenous groups; and
- the severity of the impacts on the exercise of rights, as identified by the Indigenous groups.

10.5 Mitigation and enhancement measures

The Impact Statement must:

- describe the proposed mitigation and enhancement measures for all impacts to Indigenous rights and interests, identify if these are measures for which the proponent or other parties would be responsible and how these measures vary for each Indigenous group;
- describe if and how mitigation and enhancement measures will be integrated into the project design;

- include perspectives of the potentially impacted Indigenous groups, on the effectiveness of particular mitigation measures;
- describe collaboration with Indigenous groups to identify preferred mitigation, as well as to optimize the project's benefits for their communities;
- demonstrate how the timing of Indigenous activities on the land was considered when establishing the schedule for project activities;
- provide any intervention and communication plans, as applicable, pertaining to heritage resources and structures, sites, and things of cultural, 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;
- provide copies of correspondence from provincial or territorial heritage resource authorities containing their comments on the heritage resource assessment and proposed mitigation;
- describe the measures that will be implemented by the proponent for the 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 how the proponent has addressed the suggestions and recommendations made by potentially affected Indigenous groups including where Indigenous Knowledge was provided and considered in respect of the design of proposed mitigation;
- describe any differentiated mitigation and enhancement measures for Indigenous groups and various vulnerable population groups, and how they were developed in collaboration with the potentially affected communities and diverse population groups;
- describe how GBA Plus results have been used to inform mitigation and enhancement measures;
- describe predicted climate change considerations for VCs and incorporate climate change adaptation into reclamation planning;
- describe mitigation and complementary measures for impacts to heritage and structures, sites, and things of significance; and
- provide available evidence of the effectiveness for all proposed mitigation related to Indigenous rights and interests. Where no evidence exists, describe plans to monitor the effectiveness of mitigation. The proponent is encouraged to share the evidence available with Indigenous groups and to monitor the effectiveness of mitigation in cooperation with Indigenous groups;
- where no mitigations are proposed or mitigation is not possible, describe the potential adverse impacts on Indigenous rights and interests, as identified by the Indigenous groups; and
- note if any impacts on Indigenous rights and interests are addressed through an impact benefit agreement with an Indigenous group.

11. Security Considerations

The following guidance and requirements on security considerations are included in Part 1 of the Guidelines as they apply to the entire project lifecycle. Further guidance and requirements specific to the Licence to Prepare Site are included in Part 2, section 6. *Security Baseline Data – Security Risks Presented by the Site's Location*. (section 3.7 of REGDOC.-1.1.1 has been incorporated into section 11)

For new nuclear sites and new reactor facilities on existing sites, the proponent must develop security-related physical protection objectives for reactor facilities. To do so, the proponent must include the gathering of information about the reactor facility's proposed siting location, in order to study threats or issues presented by the geographical location and characteristics of the proposed site, including potential acts of terrorism. The proponent must compile the findings from this study in a site selection threat and risk assessment (SSTRA) report. Should the project be allowed to proceed, the contents of the SSTRA report may be merged into the licensee's overall security program after the licence to prepare site has been granted.

A site selection threat and risk assessment (SSTRA) is conducted prior to the submission of an application for a licence to prepare site. . The resulting report contains an analysis of physical barriers to security presented by the location of the site over the proposed lifecycle of the project. The intent of the SSTRA is to aid the proponent in determining the suitability of the site from a security perspective. The information from the SSTRA feeds into the development of appropriate security mitigation measures for activities to be encompassed by a licence under the NSCA, to ensure that all security-related regulatory requirements are met. The SSTRA also identifies security concerns that may render the site undesirable from a security perspective.

Should the project be allowed to proceed, the SSTRA report and its basis information must be maintained as security baseline characterization data for the lifecycle of the facility. The SSTRA must include comprehensive consideration of both physical protection concerns and transportation routes, as described in the following subsections.

The SSTRA report must be classified as prescribed information and protected from release under access to information / freedom of information requests, on the basis of national security.

The Impact Statement must:

- provide a high-level description that the SSTRA report has been conducted in accordance with guidance and requirements in these Guidelines; and
- provide a commitment that the SSTRA and basis information will be maintained as security baseline characterization data for the lifecycle of the facility.

11.1 Physical protection

The proposed physical protection requirements must ensure that the appropriate detection, delay, and response considerations are taken into account.

Physical protection design requirements are influenced by the site location. Site evaluation must, therefore, address the physical dimensions of the reactor facility and its surrounding environment, including:

- the topology of the area that can be considered a component of the overall security barrier design (such as line-of-sight view);
- the proximity of various infrastructure elements that could adversely affect physical protection, such as a chemical plant that could release a noxious substance, a hydroelectric dam that could be accidentally or deliberately breached (resulting in flood), or an airport that provides significant flight traffic in the vicinity of the site;
- site boundaries;
- weather that could factor as a potential impediment to the operability of physical protection systems (that is, systems that monitor the operation of a reactor and which, on sensing an abnormal condition, automatically initiate actions to prevent an unsafe or potentially unsafe condition); and
- details pertaining to the establishment of a construction site, such as the positioning of perimeter fences, access and egress points, and storage of construction drawings.

Guidance

Reactor facilities located in a remote area bordered by a small population density may require different physical protection considerations than those that apply to reactor facilities located in a large urban area.

11.1.1 Remote areas

The proponent must evaluate remote sites with respect to the anticipated time required to implement essential response services, including how long it will take offsite armed responders to reach the reactor facility.

Guidance

This aspect of the SSTRA should support early identification of the need for establishing an onsite nuclear response force capability, to ensure that a trained response group is in position during the construction phase of possible target sets (such as vital areas) that are part of the reactor facility.

11.2 Transportation routes

The proponent must consider the transportation routes in the vicinity of the site, to ensure that they are adequately taken into account during future site development activities. The routes to be considered include waterways, land routes and airspace, as described in the following text.

11.2.1 Waterways

The site evaluation must include assessment of all waterways in the vicinity of the site, from the perspective of physical protection. For example, a waterborne vehicle – or its personnel or contents – may be used in a manner that may pose a threat to the reactor facility (for example, being an explosive risk) to disable operations, equipment, or systems, in an act of sabotage that could have radiological implications.

11.2.2 Land routes

The proponent must assess all vehicular access land routes in proximity to the site, including rail lines, to determine the security threat they may pose to potential locations of future vital areas.

Guidance

Where possible, the surrounding terrain may be considered as a natural barrier in reducing vehicle-borne explosive risk. Where this is not possible, the proponent should consider delineating areas from which land vehicles must be restricted.

11.2.3 Airspaces

The SSTRA must consider the threats and risks associated with private and commercial airports, including associated flight pathways. This requirement involves discussions with municipal, provincial or territorial, and federal governments to confirm interdiction capabilities and coordinating points of contact.

12. Effects of Potential Accidents or Malfunctions

Section 12 of the Guidelines outlines general requirements for the assessment of accidents and malfunctions. Part 2, section 5. *Assessment of Accidents and Malfunctions* outlines complementary requirements and guidance for accidents and malfunctions more specific to the lifecycle regulation of nuclear facilities.

12.1 Risk assessment

The Impact Statement must:

- identify hazards for each project phase that could lead to accidents and malfunctions related to the project;

- Describe the methods use to identify hazards and potential accidents and malfunctions, such as the use of existing information sources, recognized risk assessment methodology, the site selection threat and risk assessment (see section 11. *Security Considerations*), analysis of natural hazards (see section 13. *Effects of the Environment on the Project*), professional expertise, experience from similar projects, input from participants;
- Explain how the lifespan and design of different project components has been taken into account in the identification of hazards, and accidents and malfunctions;
- Include consideration of:
  - natural events such as flooding, earthquake, forest fires, high winds, tornadoes, hurricanes, blizzards, drought, ice storms, hail and lightning;
  - malevolent acts, including the potential for vandalism or sabotage;
  - other human-induced external events, such as at other facilities, including adjacent nuclear facilities, where applicable; and
  - potential climate change over the project lifecycle (REGDOC.-1.1.1 – section 3.5.1);

- conduct an analysis of the risk of each hazard and adverse events based on consideration of likelihood and consequences for these events;
- describe the potential consequences of accidents and malfunctions in terms of environmental, health, social and economic effects, and effects to Indigenous peoples;
  - characterize the risk to health and safety of workers and the public over the lifecycle of the project, in as much detail as possible (REGDOC.-1.1.1 - section 4.4);
- evaluate the risk of collisions with structures, systems and components; generation of explosions; chemical and radiological hazards; fires on present and proposed land; and water transportation routes in the region (REGDOC.-1.1.1 - section 3.6.2);
- identify and describe one or more of the plausible worst-case scenarios, including;
  - the magnitude, duration and extent of effects;
  - the quantity, mechanism, rate, form and characteristic of contaminants, greenhouse gas emissions and other materials released or discharged into the environment;
  - influence of local and regional terrain, topography and weather conditions (e.g. difficult access for interventions);
  - modelling for any contaminants spilled or released indirectly into water or air;
  - potential adverse environmental effects of any event sequence that may result in hazardous substance releases or large releases of energy (such as steam or electrical arcs);
  - potential environmental, health, social and economic effects, as well as impacts on Indigenous rights and interests;

        - With respect to human health specifically, consideration should be given to potential pathways of effects 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);
    - timing related to sensitive receptors (e.g. migration and nesting periods of migratory birds, spawning periods for fish, hunting season, tourist season); and
    - 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;
- identify and justify the spatial and temporal boundaries for the effect assessment associated with accidents and malfunctions. The spatial boundaries identified for effects from potential accidents and malfunctions will generally be larger than the boundaries for the project effects alone, and may extend beyond Canada's jurisdiction;
- describe long-term consequences of accidental releases (i.e., as shown from studies of major nuclear accidents such as "Differences in effects of radiation on abundance of animals in Fukushima and Chernobyl", published in Ecological Indicators (REGDOC.-1.1.1 – Appendix G8.2);
- use the notional range of 1–10 Gy to describe the effects of acute exposure (REGDOC.-1.1.1 – Appendix G8.2); and
- provide environmental sensitivity mapping that identifies site-specific conditions and sensitive receptors adjacent to project activities, including shores, streams and wetlands frequented by fish and/or migratory birds, and likely routes to them. Shoreline classification surveys and mapping must be conducted along major waterways where large spills or other accidents and malfunctions may occur and must identify the route of the effects to the sensitive receptors. The characterization criteria established by ECCC contained in the *Field Guide for Intervention in the Event of an Oil Spill on Maritime Shores* constitutes a useful guide in this regard.

The risk assessment must also:

- meet the requirements and comply with relevant guidance provided in section 7.9. *General Criteria for Site Evaluation*, including the consideration of potential cliff-edge effects that may arise from small increases in the severity of events; (REGDOC.-1.1.1 – section 3.3.1)
- address severe accident sequences, which include, where applicable, simultaneous multiple-unit events, with loss of grid / station blackout events, and events with a simultaneous loss of offsite power with loss of normal access to the ultimate heat sink for an extended period of time. Considerations must also include radioactive sources such as the wet storage bay (also called irradiated fuel bay or spent fuel pool); (REGDOC..1.1.1 – Appendix F13)

- explain how the potential for cascading or cumulative events was taken into account as part of the risk assessment and identification of worst-case scenarios, such as the potential for a tsunami generated by an earthquake as experienced during the Fukushima nuclear accident); and
- describe the risks that geohazards pose to the project, which should be described and evaluated through numerical or physical modelling.

Guidance that should be consulted to support the assessment of accidents and malfunctions on a nuclear facility include:

- IAEA Safety Standards Series No.NS-G-3.1, *External Human Induced Events in Site Evaluation for Nuclear Power Plants*;
- IAEA Safety Standards Series, Specific Safety Guide No. SSG-18, *Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations*;
- NUREG/CR-7046, PNNL-20091, *Design Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America*;
- NUREG/CR-7005, *Technical Basis for Regulatory Guidance on Design-Basis Hurricane Wind Speeds for Nuclear Power Plants*.

12.2 Mitigation and enhancement measures

The Impact Statement must:

- describe the measures that would be in place to prevent accidents and malfunctions;
- describe security measures to reduce the potential for malevolent acts that could lead to accidents or malfunctions, including (REGDOC.-1.1.1 – section 3.3.3):
    - protection of prescribed information;
    - site security program;
    - site access clearance;
    - security arrangements with offsite response forces;
    - physical security;
    - cyber security; and
    - security program officer (see Part 2, 3.10. *Security*);
- describe mitigation measures for the adverse environmental, health, social and economic effects, as well as impacts on Indigenous rights and interests, 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 and environmental conditions, as well as impacts on Indigenous

rights and interests, from accidents and malfunctions, including measures to remediate affected lands and waters;

- provide details of financial liability and compensation measures in place pursuant to regulations or the proponent's commitment in case of potential accidents or malfunctions associated with the project;
- describe mutual aid arrangements in the event that the incident exceeds proponent resources and how to access these resources;
- describe the expected effectiveness of the mitigation for the prevention of accidents and malfunctions and mitigation of their consequences, as well as other applicable response measures; and
- outline the strategy that will be taken upon the potential discovery of additional risks to the health and safety of the public and environment that were not anticipated in the Impact Statement, including the development of additional mitigation measures.

Refer to Part 2, section Mitigation measures for accidents and malfunctions should address:

- external fire criteria contained NS-G-1.5, External Events Excluding Earthquakes in the Design of Nuclear Power Plants;
- CSA N293, *Fire protection for nuclear power plants*;
- NFPA1141, *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*;
- NFPA1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*;
- NFPA1143, *Standard for Wildland Fire Management*; and
- NFPA1144, *Standard for Reducing Structure Ignition Hazards from Wildland Fire*, (REGDOC.-1.1.1, Appendix E8).

12.3 Emergency management

The Impact Statement must describe an emergency response plan and as part of this plan must:

- include all information required under Part 2 regarding emergency response, especially section 20.4. *Physical design* and section 3.8. *Emergency management and fire protection*, for the activities that would be conducted under the licence to prepare a site, such as requirements for exclusion zones, emergency planning, preparedness, management and response, and fire protection;
- identify the types of accidents and malfunctions scenarios that would require emergency response, beyond those related to activities that would be conducted under the license to prepare a site;
- identify emergency planning and emergency response zones for accident and malfunction scenarios, taking into account population density and population projections for the life cycle of the project;
- present preliminary emergency response measures, including identifying associated response systems and capabilities;

- describe security measures that will be adopted to ensure detection, minimal delay, and enhance response to security events;
- provide an overview of the security officer program, which demonstrates that the necessary skills and knowledge are maintained throughout the project lifecycle to accomplish the duties and tasks assigned to the security officer;
- take into account evacuation areas in the planning of emergency measures as well as the particularities linked to these areas (e.g. population density, 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 the potential effects of accidents and malfunctions on the emergency plan execution, including on evacuation routes;
- describe existing emergency preparedness and response systems and existing arrangements and/or coordination with the responsible response organizations in the spatial boundaries associated with the project;
- describe how the proponent will integrate its response operations into an incident management system (e.g. the Response Command System, Incident Command System) when deploying a significant incident response effort;
- describe emergency response training and exercise programs, including a description of the participation and training agreements with Indigenous groups or communities that could be impacted by accidents or malfunctions;
- document spill response strategies for each type of spill scenario [*specify any specific scenario that may be applicable*] 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 and public notification plans, community awareness plans and public reporting;
- describe emergency communication plans that would provide emergency instructions to surrounding communities, including Indigenous groups, 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;
- 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 groups;

- describe past, ongoing and planned outreach efforts to ensure the public and Indigenous groups understanding the risks associated with this type of project (e.g. providing non-technical information, providing information in local languages if requested); and
- describe any waste management plan as it pertains to waste generated during an emergency response.

13. Effects of the Environment on the Project

The Impact Statement must:

- describe how environmental conditions, including natural hazards such as severe and/or extreme weather conditions and external events, could adversely affect the project and how this in turn could result in effects to the environment, health, social and economic conditions;
    - Natural hazards to take into account include: earthquakes, landslides, avalanches, biophysical or biological hazards (such as algae, moulds, pathogens, wildlife); extreme weather events such as tornadoes, hurricanes, blizzards, dust and sand storms, floods, forest fires, drought, ice storms, hail and lightning (REGDOC.-1.1.1 – Appendix C2);
    - These events are to be considered in different probability patterns (e.g. 5-year flood versus 100-year flood) taking into account how these could change under a range of potential future climate scenarios;
    - The focus should be on credible external events that have a reasonable probability of occurrence and for which the resulting environmental effects could be major without careful management;
    - Site specific data should be used to determine natural hazards, unless such data is unobtainable (REGDOC.-1.1.1 – section 3.3.3);
- describe the project's climate resilience and how the impacts of climate change have been integrated into the project design and planning throughout the life of the project, following ECCC's technical guide on assessing climate change resilience;
- identify the project's sensitivities and vulnerabilities to changes in climate (both in mean conditions and extremes such as short-duration heavy precipitation events);
- provide details of planning, design and construction strategies intended to minimize the potential adverse effects of the environment on the project;
- describe mitigation that can be implemented in anticipation or in preparation for effects of the environment on the project;
- describe possible mitigation to address adverse environmental, health, social and economic effects resulting from effects of the environment on the project; and

- describe measures to enhance positive environmental, health, social and economic effects resulting from effects of the environment on the project.

The Impact Statement must specify, where applicable, the best practice codes and guides used to assess effects of the environment on the project, including:

- guidance related to conducting climate change resilience assessments in the *Strategic Assessment of Climate Change*;
- the National Building Code of Canada (for seismic effects);
- IAEA Safety Standards Series No.SSG9, *Seismic Hazards in Site Evaluation for Nuclear Installations*
- IAEA Safety Standards Series No.NSG1.5, *External Events Excluding Earthquakes in the Design of Nuclear Power Plants*
- CSA N289.2, *Ground motion determination for seismic qualification of nuclear power plants*
- CSA N289.3, *Design procedures for seismic qualification of nuclear power plants*
- IAEA Safety Standards, Series No.NS G3.6, *Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants*
- IAEA Safety Standards Series, Specific Safety Guide No. SSG18, *Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations*
- *Dam Safety Guidelines 2007 (2013 Edition)*
- NUREG/CR-7046, PNNL-20091, *Design Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America*
- NUREG/CR-7005, *Technical Basis for Regulatory Guidance on Design-Basis Hurricane Wind Speeds for Nuclear Power Plants*
- IAEA SSG-21, *Volcanic Hazards in Site Evaluation for Nuclear Installations .*
- CSA N293, *Fire protection for nuclear power plants*
- NFPA 1141, *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*
- NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*
- NFPA 1143, *Standard for Wildland Fire Management*
- NFPA 1144*, Standard for Reducing Structure Ignition Hazards from Wildland Fire*

13.1 Meteorological hazards

The Impact Statement must:

- document a systematic approach for identifying meteorological events for the site and surrounding region (natural external events), including steps for continued data collection for meteorological events over the project's lifecycle;
    - Provide information to show that the representative data series is complete, of adequate quality, and identify all sources for verification. Document limitations and rationale of the statistical distributions for the data sets (REGDOC.-1.1.1 – Appendix E3);
- describe all known and relevant trends in meteorological events, weather patterns or physical changes in the environment that are expected to result from climate change, and incorporate this information into a risk assessment as contributing or complicating factors for accidents and malfunctions (e.g. increased risk of forest fires);
    - Provide mitigation (both passive and active) that the proponent is prepared to take to minimize the frequency, severity and consequences of these projected effects;
- assess effects related to changes in temperature and humidity, including:
    - effects of sudden or prolonged extreme temperatures on future reactor facility SSCs that will be important to safety (for example, cooling air intakes);
    - effects of condensation and evaporation on future reactor facility SSCs that will be important to safety (for example, electronic components); and
    - potential for temperature and humidity to affect releases from the reactor facility into the environment and to affect the temperature of the condenser cooling water (REGDOC.1.1.1 - section 3.5.2);
- assess the frequency and intensity of strong winds, including tornadoes and hurricanes, on the basis of historic and recorded data for the region. Include in the assessment:
    - wind and pressure-loading effects;
    - wind-propelled missiles that could affect SSCs, or that could render offsite power supplies unavailable;
    - effects on emergency plan execution; and
    - possibility of affecting releases from the reactor facility into the environment (REGDOC.1.1.1 - section 3.5.2);
- assess the risk of dust and sand storms on the basis of historic and recorded data for the region, including consideration of the following potential factors:
    - abrasion or erosion of SSCs;
    - effects on air or water intakes;
    - effect of static electricity generation on electrical or electronic SSCs;
    - effects on offsite power supplies to the site;
    - effects on emergency plan execution; and

- possibility of affecting releases from the reactor facility into the environment (REGDOC.1.1.1 - section 3.5.2);

- assess all types of precipitation on the basis of historic and recorded data for the region, and take into account potential effects on:
  - structural loading, including acute effects from heavy precipitation, such as hail;
  - cooling air or water intakes;
  - offsite power supplies to the site;
  - dispersion of releases from the reactor facility through surface or groundwater;
  - emergency plan execution; and
  - possibility of affecting releases from the reactor facility into the environment(REGDOC.1.1.1 - section 3.5.2);
- evaluate the frequency and severity of lightning to determine potential effects on the reactor facility, including the influence of lightning events on the risks of natural fire.

13.2 Surface water hazards

The Impact Statement must:

- describe the potential for flooding in the project area and conduct flood hazard assessments from all sources of flooding (e.g. local intense precipitation, riverine flooding, failure of infrastructure, coastal flooding, etc.);
- assess how coastal erosion could affect site facilities; (REGDOC.-1.1.1 – Appendix C3.3)
- describe the approach for identifying water supply adequacy for the site and surrounding region, including steps for continued data collection over the project's lifecycle. Water supply adequacy studies should consider (REGDOC.-1.1.1 – Appendix E5):
  - reliability and availability of water supply (considering existing water-taking projects in the region, and the potential for additional water-taking projects that could exist in the region);
  - water supply changes from naturally induced failures of offsite structures, such as dams, flood control dykes; and
  - if groundwater is used as the water supply: groundwater levels, flow patterns, pumping rates, water quality and the effects on water quality during flooding or drought events (for example, excess minerals released into groundwater during flood events).

13.3 Groundwater, geotechnical, geological and seismic hazards

The Impact Statement must:

- document the investigation and evaluation of the site's and surrounding areas' susceptibility to the following events over the project's lifecycle, including how they will be addressed groundwater-related events (groundwater flow and contaminant transport), geotechnical events, and seismic and surface faulting events (REGDOC.-1.1.1 – Appendix E6). Describe effects related to:
    - groundwater conditions, including:
        - groundwater flow patterns, rates and groundwater level influence the risk of seismic events, and the stability of slopes and foundations (REGDOC.-1.1.1 – Appendix E6);
        - effects on the integrity of the reactor facility's below-grade structures, such as wet storage bays, (REGDOC.1.1.1 - section 3.5.4); and
        - the adverse effects of groundwater conditions on site preparation should be evaluated by combining the groundwater conditions with the geotechnical analysis (REGDOC.-1.1.1 – Appendix E6);
    - geotechnical events, including slope instability, underground collapse and/or rock fall, subsidence or uplift of the site surface, and instability of the soil foundation due to static or dynamic loads (REGDOC.-1.1.1 – Appendix E6);
    - geotechnical events on future site activities by combining qualitative explanations with the results of quantitative analyses (REGDOC.-1.1.1 – Appendix E6);
    - seismic events and surface faulting events, including (REGDOC.-1.1.1 – Appendix E6):
        - surface faults and lineaments in the regional, local and site scales are identified;
        - the potential for these faults to be seismogenic and seismotectonic should be evaluated;
        - their effects on future site activities should be assessed;
        - mine-induced seismic events, where applicable, and their effects on the structures, systems and components (SSCs); and
        - liquefiable soil units should be identified, and their effects on structures and site preparation should be assessed;
- assess the potential effects of seismic events on facilities and specify the ground movement parameters that will be used with the probability of occurrence (e.g. 2% in 50 years);
- evaluate the potential effects that seismic events may have on sub-surface contaminant transport for the region (REGDOC.-1.1.1 - section 3.5.6);
- specify the best practice codes and guides that are or will be used in the geotechnical effects analysis (e.g., NS-G-3.6, Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants);
- evaluate the potential for a volcanic event to occur that could affect the safe operation of the reactor facility, include:
    - potential effects on ventilation systems;
    - volcanic missiles that could affect SSCs;

- potential abrasion or chemical effects on SSCs;
- effects on air and water intakes;
- effects of static electricity generation on electrical or electronic SSCs;
- effects on offsite power supplies to the site; and,
- effects on emergency plan execution. (REGDOC.-1.1.1 - section 3.5.6)

13.4 Biological hazards

The Impact Statement must:

- describe the potential for unusual weather events to increase the risk of ventilation and cooling intake systems being clogged by biota (for example, flooding or large storm events can dislodge large biomasses of aquatic macrophytes, and those biomasses could foul the intake structures) (REGDOC.-1.1.1 – section 3.5.7);
- characterize potential biological phenomena that could affect facility SSCs over the project's lifecycle, with emphasis on the facility's operational phase, such as (REGDOC.-1.1.1 – Appendix E7):
  - plant matter, mussels or fish impingement events (for example, smelt runs) that could block water intakes;
  - the potential for the colonization and excessive growth of algae, mussels, or clams within cooling water systems, and the clogging of intake structures by large quantities of biological material (such as aquatic plants, fishes, or jellyfish) (REGDOC.-1.1.1 - section 3.5.7);
  - bird species, insects or other fauna that may nest near or in air intakes (which could result in blockages of air intakes and pathogens or chemically reactive agents from nesting areas entering air systems) (REGDOC.-1.1.1 – Appendix E7);
  - moulds, organisms or pathogens, either naturally present or generated by site activities (for example, cooling tower mist or algae in cooling water ponds), which could chemically react with SSCs and may result in reduced reliability of systems if not mitigated in design (for example, lichens chemically attacking concrete), and affect human health, either on- or offsite(REGDOC.-1.1.1 – Appendix E7);
  - algae or micro-organisms in thermal plume of the facility outlet that could degrade the quality of water entering intakes for drinking and personal hygiene or affect plant intake water quality; and
  - wildlife that could potentially reside within the facility structures and systems and cause damage or long-term degradation (REGDOC.-1.1.1 – Appendix E7);
- discuss how the biological baseline information has been collected and documented to allow the prediction of the effects of biological hazards for the project (episodic events and ongoing hazards), and to test mitigation performance;

- select and describe mitigation strategies to counter postulated biological events and explain effects on the environment and the health and safety of workers and the public will be minimized. If any credible biological events are postulated, provide a description of a follow-up monitoring plan, including methods to test the performance of mitigation of those biological hazards. (REGDOC.-1.1.1 – Appendix E7)

13.5 Fire and explosion hazards

The Impact Statement must:

- describe the effects of external fire and explosion events for each phase of site development, and provide applicable mitigation strategies, including providing information on:
  - environmental effects resulting from external fire and explosion events;
  - site security program;
  - site and regional emergency plans for the project;
  - history of significant non-malevolent external fire and explosion events in the region surrounding the site;
  - fire and explosion risks that may develop from changes in land use around the site (for example, industrial growth);
  - the effects of climate change that may increase the risks or effects of postulated fire events (for example, increased wind speed, drier weather conditions, increased lightning);
  - effects on the ability to maintain effective site security during and following these events;
  - effects on the health and safety of workers and the public, where these events interact with activities performed under the licence (for example, if the event causes a secondary fire in a chemical storage area, which causes an explosion or release of combustion products); and
  - emergency response requirements posed by these types of events (e.g. fire response, medical response, chemical spill-control and response). (REGDOC.-1.1.1 - Appendix E8)

14. Canada's Ability to Meet its Environmental Obligations

The Government of Canada 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.

The Impact Statement should describe the likely effects of the project in the context of environmental obligations, with a focus on Government of Canada obligations and commitments.

Federal environmental obligations relevant to this project include:

- [IAAC will identify applicable environmental obligations that will require consideration in the Impact Statement].

The Impact Statement must:

- describe the extent to which the likely effects of the project could hinder or contribute to Canada's ability to meet its environmental obligations;
- describe where the likely effects of the project may enable Canada to meet its environmental obligations, the proponent's plans and commitments to ensure that positive contributions are respected; and
- describe where the likely effects of the project may adversely affect Canada's ability to meet its environmental obligations, the mitigation and the follow-up program related to those effects.

With respect to climate change commitments, section 8.11 Climate change of these Guidelines outline the information required as part of the Impact Statement. IAAC, with the support of federal authorities, will provide a supplementary analysis on the project's GHG emissions in the context of Canada's emissions targets and forecasts (see section 6 of the SACC). Although it is not required, the proponent may provide its views in the Impact Statement on the extent to which the likely effects of the project would hinder or contribute to the Government of Canada's ability to meet its commitments in respect of climate change in order to inform the impact assessment.

The proponent should refer to IAAC'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.

15. Sustainability

Sustainability is 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. Sustainability is a lens to be applied throughout the impact assessment. Information and data requirements to inform the sustainability analysis should be considered from the outset of the impact assessment.

The Impact Statement must:

- provide an analysis of the extent to which the project's likely effects contribute to sustainability. The analysis should be qualitative but may draw on quantitative data to provide context, and should follow the methodology and sustainability principles outlined in the Guidance: Considering the Extent to which a Project's Likely Effects Contribute to Sustainability:

  - consider the interconnectedness and interdependence of human-ecological systems;
  - consider the well-being of present and future generations;
  - consider positive effects and reduce adverse effects of the project; and
  - apply the precautionary principle and consider uncertainty and risk of irreversible harm;
- describe engagement with potentially affected Indigenous groups and outline measures and commitments that contribute to the sustainability of Indigenous livelihood, traditional use, culture and well-being:
  - include any description of sustainability as defined by Indigenous groups;
- describe the project-specific context, including key issues of importance to Indigenous groups and the public that will inform the sustainability assessment;
- describe how the sustainability principles were considered in:
  - the assessment of the likely effects of the project, including setting spatial and temporal boundaries, and identifying mitigation and enhancements; and
  - the planning and design of the project and the selection of the preferred alternative means and alternatives to the project;
- describe and document all uncertainties and assumptions underpinning the analysis;
- describe how the precautionary principle was applied in cases where there may be risk of irreversible harm; and
- indicate how monitoring, management and reporting systems consider the sustainability principles and attempt to ensure continuous progress towards sustainability.

16. Follow-up Program

A follow-up program is a program to verify the accuracy of the impact assessment and evaluate the effectiveness of mitigation measures. Should the project proceed, the proponent would be required to develop and implement a follow-up program in consultation with relevant authorities and Indigenous groups and to submit to IAAC the results of the program. A follow-up program also provides an opportunity to continue engaging with impacted Indigenous groups during project implementation and, when undertaken collaboratively, can contribute to the incorporation of Indigenous Knowledge to support solution-oriented approaches for identifying and managing issues.

Monitoring is a key component of a follow-up program which entails collecting the information necessary to verify the accuracy of the effects predicted in an impact assessment and determine the effectiveness of mitigation measures, to decide whether new or modified action(s) are required to protect VCs.

The proponent must establish expected outcomes for their follow-up program, in consultation with relevant authorities and Indigenous groups. Expected outcomes refer to the desired environmental, health, social or

economic conditions that the proponent can reasonably anticipate achieving during all phases of the project with mitigation measures in place. Expected outcomes may be qualitative or quantitative and should be expressed in a manner to support a determination of whether mitigation measures are working effectively to eliminate, reduce, control, or offset adverse effects within federal jurisdiction. Should the project proceed, the proponent will be expected to provide information to IAAC annually on the extent to which the expected outcomes have been achieved.

If the follow-up program indicates that mitigation measures are not working effectively, additional measures may be required and implemented. If, through a follow-up program, it is identified that the predictions of the impact assessment were not accurate, corrective action or additional measures may be required to be put in place by the proponent.

The proponent should consider the use of adaptive management to address uncertainties associated with the effectiveness of mitigation measures or predicted effects and to help ensure expected outcomes are achieved. Adaptive management does not eliminate the need to provide sufficient information on the baseline conditions or effects attributed to the project, nor does it eliminate the need to characterize effects and identify appropriate mitigation measures to eliminate, reduce or control those effects.

Follow-up programs are an opportunity to continue engaging with impacted Indigenous groups. If undertaken collaboratively, they can support solution-oriented approaches to managing adaptively through the early identification of issues in follow-up programs and appropriate solutions incorporating Indigenous knowledge.

In developing the follow-up program framework for environmental, health, social or economic valued components, as applicable, the Impact Statement should take into account the considerations outlined in the Agency guidance on *Follow-up Programs under the Canadian Environmental Assessment Act* (guidance to be updated) and section 4. Environmental Protection Measures of *REGDOC.-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 2*.

16.1 Follow-up program framework

The duration of the follow-up program must be as long as required to verify the accuracy of effects, as well as impacts on Indigenous rights and interests, predicted during the impact assessment and/or to evaluate the effectiveness of the mitigation measures.

The Impact Statement must:

- identify VCs subject to the follow-up program and rationale;
- describe the effects predictions and mitigation measures that would be evaluated for each VC included in the follow-up program;

- identify expected outcomes, targets and indicators associated with each VC included in the follow-up program and describe how the proponent expects to achieve them;
- identify thresholds[17] associated with each VC included in the follow-up program and, the technically and economically feasible new or modified measures that may be implemented if the thresholds are met or exceeded, as indicated by the monitoring results;
- identify mechanism to disseminate follow-up results to relevant authorities, Indigenous groups and other interested parties;
- consider accessibility of data for the general population;
- describe how the disproportionate effects identified in the GBA Plus results would be addressed in the follow-up program; and
- describe opportunities for the involvement of Indigenous groups, local communities, stakeholders, local and regional Indigenous organizations in the follow-up program design and implementation, as well as communication mechanisms between these parties and the proponent.

16.2 Follow-up program monitoring

The Impact Statement must present the preliminary monitoring program for each VC included in the follow-up program, including:

- identification of regulatory instruments that include a monitoring requirement for the VC;
- description of the methodology for monitoring and how it was informed by Indigenous Knowledge, community knowledge and input provided by various impacted population groups;
    - monitoring programs should be based on peer-reviewed published standards, where applicable; (REGDOC.-1.1.1 -Appendix G5.3)
- description of how monitoring would be conducted (e.g. planned protocols, list of measured parameters and locations, analytical methods employed, schedule, data management, human and financial resources required);
    - Include detailed maps showing the location of sampling and monitoring stations, including stations relevant to the characterisation of baseline conditions, prediction of effects, and future stations that may be required monitoring potential effects (REGDOC.-1.1.1 - Appendix C8);
- identification of the monitoring activities that could pose a risk to the VCs, and to Indigenous rights and interests, and the measures planned to protect them;

[17] Thresholds are the levels of environmental, health, social or economic changes relative to baseline conditions that would trigger the implementation of new or modified mitigation measures.

- identification of opportunities for participation of representatives from Indigenous groups identified in the Indigenous Engagement and Partnership Plan in monitoring programs;
- outlines of the monitoring reports (number, content, frequency, format and duration of the reports) that would be provided to the authorities involved and other interested parties; and
- plans, including funding options, to involve Indigenous groups, local communities, stakeholders, and Indigenous organizations in monitoring, where appropriate.

If the proponent considers that monitoring activities required through other regulatory instruments are suitable to provide the data necessary to achieve the objectives of the follow-up program, the Impact Statement must include a justification for the use of data from existing or other planned monitoring activities.

16.3 Compliance Monitoring

Proponents are responsible for verifying whether the required mitigation measures were implemented. The Impact Statement must present a framework by which it will undertake compliance monitoring for follow-up programs. This should include, but not be limited to:

- identification of those positions accountable and responsible for monitoring and ensuring compliance;
- 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; and
- quality assurance and quality control measures to be applied to monitoring programs.

16.4 Adaptive Management Framework

Proponents should consider adaptive management as a means to address high uncertainties associated with the effectiveness of mitigation measures or predicted effects and to help ensure expected outcomes are achieved. Adaptive Management Plans establish a systematic process following six iterative steps: assess, design, implement, monitor, evaluate, and adjust. An Adaptive Management Plan may be warranted in addition to a follow-up program if it meets each of the following criteria:

- There is high uncertainty around the effectiveness of mitigation measures or predicted effects;
- There is a need for, or benefit to, reducing uncertainties through an Adaptive Management Plan; and
- Adaptive management is technically feasible.

Adaptive management does not eliminate the need to provide sufficient information on the baseline conditions or effects attributed to the designated project. Nor does it eliminate the need to characterize effects and identify appropriate mitigation measures to eliminate, reduce or control those effects.

Please refer to the Agency's guidance on Adaptive Management Measures under the Canadian Environmental Assessment Act 1992 (guidance to be updated).

17. 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, potential environmental, health, social and economic effects, potential adverse impacts on Indigenous rights and interests, proposed mitigation measures, residual and cumulative effects, the extent to which the effects that are likely to be caused by the carrying out of the project contribute to sustainability and to the Government of Canada's ability to meet its environmental obligations and the follow-up program.

The Assessment Summary provides an opportunity for the proponent to demonstrate issues raised, notably by Indigenous groups and the public, were addressed. The Assessment 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 and may summarize information through a series of tables.

The Assessment Summary must summarize the Impact Statement, including:

- potential environmental, health, social and economic effects and the potential impacts on Indigenous rights and interests;
- mitigation and enhancement measures in relation to potential effects and impacts;
- residual effects of the project;
- 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; and
- the extent to which the adverse effects within federal jurisdiction and the direct or incidental adverse effects are significant based on the characterization of residual and of cumulative effects.

Part 2 – Licensing Requirements of the Canadian Nuclear Safety Commission

1. Overview of Licensing Process

The CNSC requires the submission of a licence application with sufficient information to meet the requirements of the NSCA and associated regulations.

The CNSC's licensing process provides for the issuance of licences for site preparation, construction, operation, decommissioning, and abandonment. These Guidelines focus on the requirements and guidance related to the Licence to Prepare Site.

Subsequent licence applications and decisions related to these will be made through the CNSC licensing process. The regulatory requirements that must be addressed for these licences are provided in the NSCA and its regulations, which include the following:

- *General Nuclear Safety and Control Regulations*
- *Radiation Protection Regulations*
- *Class I Nuclear Facilities Regulations*
- *Class II Nuclear Facilities and Prescribed Equipment Regulations*
- *Nuclear Substances and Radiation Devices Regulations*
- *Packaging and Transport of Nuclear Substances Regulations, 2015*
- *Nuclear Security Regulations*
- *Nuclear Non-proliferation Import and Export Control Regulations*
- *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*

Regulatory guidance are also contained in CNSC regulatory documents located on the CNSC website at http://www.nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/index.cfm.

Where information requirements overlap between the NSCA and the IAA (e.g. environmental protection), the proponent may provide appropriate cross-referencing in the documentation. The proponent will clearly indicate where the requirements of both the NSCA and the IAA are addressed.

Additional information related to the CNSC's regulatory framework is available on the CNSC website at: http://www.nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-framework/index.cfm.

2. Licence to Prepare Site

The proponent is required to hold a licence to prepare the site before any work is done on the site. No licence will be issued until the impact assessment is complete.

Site preparation activities may involve construction of facility structures, systems and components (SSCs), including:

- facility foundation structures (including support pilings);
- facility intake and outlet channels and structures (including cooling ponds, cooling towers and related connections to the ultimate heat sink); and
- non-nuclear facility SSCs, such as a plant water treatment plant, if it can be shown that the design of these systems will be independent of the reactor technology (or technologies) being considered and will be sufficient for any reactor technology proposed for the site.

Note: For any activities that may use nuclear or hazardous substances during site preparation activities, and that are not exempt from a licence by the *Nuclear Substance and Radiation Devices Regulations (SOR/2000-207)*, the proponent must state whether the substances will be encompassed by their own CNSC nuclear substance and device licences or encompassed by the licence to prepare site. Any activities using nuclear or hazardous substances outside of the licence to prepare site must be covered by a separate licence. (REGDOC.-1.1.1 - section 3.9)

2.1 Bounding approach and decision-making considerations

Selection of a specific facility technology is typically not required when submitting a licence to prepare site application.

Decisions by the Commission on an application for a licence to prepare site under the *Nuclear Safety and Control Act* (NSCA) for a nuclear reactor project may be made with high-level facility design information from a range of reactor designs without specifying the technology to be constructed.

For an Impact Statement including an application for a licence to prepare a site submitted without the selection of a specific facility technology, the proponent should ensure that the bounding parameters encompass all technologies under consideration. In this case, the application should include all design information that is necessary to support proposed site preparation activities (e.g. plant footprint excavation, and excavation of cooling water intake tunnels).

The proponent must provide sufficient information to describe the plant-site interface and take into consideration the characteristics of the proposed site. A combination of site characteristics and bounding

design parameters will be the focus for comparison with the design characteristics of the actual plant selected for the application for a licence to construct.

If the proponent chooses to pursue a licence to prepare site without choosing a final technology for the site, the activities permitted under the issued licence to prepare site will be limited to site preparation activities that are independent of any specific reactor technology (e.g. clearing and grading the site, building site support infrastructure such as roads, site power, water and sewer services). A licence to prepare site may be issued with conditions that restrict activities to those that are not technology-dependent, until the proponent selects a facility technology. (REGDOC.-1.1.1 - Appendix F.1.1)

2.2 Considerations that will carry forward to an application for a licence to construct

The design that is eventually selected for construction need not be specifically referenced in the Impact Statement for the licence to prepare site, but the design must fit within the bounding envelope in the approved integrated assessment and licensing process. The evaluation of the design would be performed once a reactor technology is selected. This evaluation will be required to be demonstrated as part of an application for a licence to construct, or for an amended licence to prepare site, where the proponent wishes to carry out activities such as excavation to bedrock for the plant footprint, or excavation of cooling water intake and outlet tunnels (note that concrete pour will not be permitted under a licence to prepare site).

The less facility design information that is provided in regulatory review processes for a licence to prepare site, the greater the burden will be on the construction licence review process.

An underpinning concept of the bounding approach is that the environmental effects of the reactor design eventually selected for construction should be less than the bounding effects assessed in the application for a licence to prepare site. Similarly, if the site is deemed suitable to host nuclear units using bounding parameters, then the site should also be suitable for any reactor design that falls within the accepted bounding envelope. (REGDOC.-1.1.1 - Appendix F.1.2)

2.3 Criteria for level of design detail for an application for a licence to prepare site

Information required to support site evaluation around the assessment of accidents and malfunctions for the licence to prepare site includes:

- qualitative descriptions (or technical outline) of all major structures, systems and components (SSCs) that could significantly influence the course or consequences of principal types of accidents and malfunctions;
- qualitative descriptions (or technical outline) of the functionality of the SSCs important to safety; and
- qualitative descriptions of principal types of accidents and malfunctions to identify limiting credible sequences that include external hazards (natural and human-induced), design-basis accidents and beyond-design-basis accidents (severe accidents).

For site evaluation carried out in support of licensing (including emergency planning purposes), the proponent must address severe accident sequences. The severe accident sequences include, where applicable, simultaneous multiple unit events, with loss of grid/station blackout events, and events with a simultaneous loss of offsite power with loss of normal access to the ultimate heat sink for an extended period of time. Considerations must also include radioactive sources such as the wet storage bay (also called irradiated fuel bay or spent fuel pool).

The proponent must provide a description of out-of-core criticality events showing that these events would not violate criteria established by international standards and national guidance as a trigger for a temporary public evacuation.

The proponent must demonstrate that the safety goals and functional requirements are met.

Guidance

In situations where the technology to be used onsite has either not been selected (subject to a technology selection process that will occur either during or beyond site preparation) or the technology being considered is a first of a kind in Canada (design not yet fully developed), detailed quantified information about accidents and malfunctions characteristics may not be fully established. As a result, the CNSC will accept qualitative information in support of the site selection case with the understanding that there will be an increased level of regulatory scrutiny during the construction and operation licensing processes to validate the claims made.

The proponent should demonstrate that safety goals and functional requirements are met through a high-level safety analysis that demonstrates that the behaviour of the reactors being proposed is understood, and that their consequences can be accurately predicted.

For more information on safety goals, see:

- Part 1, section 5.4.4. *Assessment of non-malevolent nuclear accidents and malfunctions*; and
- REGDOC.-2.5.2, *Design of Reactor Facilities, Version 2.1*.

However, the Impact Statement must provide enough information to demonstrate that releases of nuclear and hazardous substances meet the bounds established in the Impact Statement and meet all applicable regulatory requirements.

In most cases, programs, processes and procedures developed at the licence to prepare site stage will continue to be used and will be adapted to support future phases of the project (e.g. facility construction and operation).

The proponent should also describe the process that will be followed if new information is acquired that may invalidate or cast doubt on information previously submitted to the CNSC. (REGDOC.-1.1.1 - Appendix F.1.3)

3. Site Preparation for New Reactor Facility

Activities performed at the site preparation stage in the development of a future nuclear site are similar to those found at any large-scale construction/land development project; however, because the undertaking is a licensed activity under the NSCA, the proponent must address all of the CNSC's safety and control areas (SCAs) except human performance management, fitness for service, and packaging and transport as part of the application for a licence to prepare the site. (REGDOC.-1.1.1 - section 4.2)

The CNSC uses SCAs as the technical topics to assess, review, verify and report on regulatory requirements and performance across all regulated facilities and activities. Accordingly, the information that follows is organized along the following SCAs:

- management system
- operating performance
- safety analysis
- physical design
- radiation protection
- conventional health and safety
- environmental protection
- emergency management and fire protection
- waste management
- security
- safeguards and non-proliferation

In addition, the applicant's licence application must address reporting requirements, public and Indigenous engagement, and financial guarantees. REGDOC.-1.1.1 - Appendix A.2).

For site preparation, basic human performance management aspects are addressed under the management system SCA (REGDOC.-1.1.1 - Section 4.2).

The Impact Statement must include, for the licence to prepare site, the following information to satisfy the requirements of the NSCA and its regulations.

3.1 Management System

The management system must have provisions for effective management of site characterization and evaluation, site preparation, design, construction, commissioning and technical support functions (including contractor management) being performed under the licence to prepare site so as to promote and assure safety. (sections 4.3 of REGDOC.-1.1.1 has been incorporated into 3.1)

Management system arrangements must demonstrate adherence to CSA N286, *Management system requirements for nuclear facilities*, or equivalent standard established in the licensing basis, as applicable to the relative project phase.

The provisions of the management system extend to contracted workers (contractors) who are implementing activities under the oversight of the proponent organization.

In cases where there may be the need for early procurement of SSCs to accommodate early use or long (critical path) procurement spans (for example, long-lead items), the respective design and safety analysis, and supply chain programs, processes and procedures must be in place.

Where the proponent plans for a different management system and organizational structure for the future construction and operation of the plant, the proponent must provide overall arrangements (including those for the transition to construction to commissioning to ensure continuity).

The assessment of the results of the site evaluation is a key part of activities carried out under a licence to prepare site. The proponent must describe the management system that governed the conduct of site evaluation activities (see Part 1, section 2.3. *Management System* for Site Evaluation).

Guidance

This section should describe the proponent's management system being implemented for the management and control of all licensed activities. The description should demonstrate that appropriate provisions integrating safety, health, environmental protection, security, and quality have been implemented for all safety-related activities. This section should also describe measures taken to ensure the implementation and observance of the management system programs, processes and procedures.

If external contractors are working onsite, the proponent's oversight of contractor activities should be documented, including:

- contractor's representatives performing site preparation activities, showing the line of accountability to the proponent's organization;

- organization chart for the site activities for which the contractor is responsible;
- contractor's level of authority for site activities; and
- oversight provisions by the proponent for the activities of the contractors.

Provisions for an effective management system include:

- appropriate provisions for integrating safety, health, environmental protection, security, and quality for all site preparation activities, and for understanding and promoting a safety culture;
- measures taken to ensure the implementation and observance of the management system programs, processes, procedures and practices;
- provisions for personnel responsible for compliance to have direct access to senior levels of the proponent's management structure, to ensure that their needs and concerns receive adequate consideration;
- a description of organizational structure; including authorities, accountabilities and responsibilities of positions; internal and external interfaces; and how and by whom decisions are made; and
- management system documentation that describes the corporate and site management structures of the proponent, of major technical support organizations, of the designer, and of major contractors and sub-contractors.

For more information, see

- REGDOC.-2.5.2, Design of Reactor Facilities, Version 2.1
- CSA N286:12 (R2022), Management system requirements for nuclear facilities
- CNSC REGDOC.-2.1.1, Management System

3.1.1 Human performance and safety culture

The management system sets expectations for, and supports, human performance and is instrumental in understanding and promoting a safety culture. It provides the means by which work is to be carried out safely and the processes to understand and improve the safety culture.

Safety culture is applicable to all the activities that may affect health, safety and the environment, and it applies to all personnel involved in every phase of the facility's lifecycle. A healthy safety culture in the site preparation phase increases confidence in the licensee's future performance in later licensing steps. (REGDOC.-1.1.1 - section 4.3.1)

3.1.2 Management systems for design activities during site preparation

At this stage in the project lifecycle, it is important to ensure that design activities are managed according to the design organization's management system for the reactor technologies under consideration. Design control measures, in the form of management system processes, procedures and practices, ensure consistent quality of the design of facility systems, structures and components. High quality design, and design management, serve to minimize latent design flaws that may manifest themselves as safety issues later in the facility's life.

Design includes and is not limited to:

- technical activities that start with the identification of conceptual input and that produce documentation;
- process and the result of developing the concept, detailed plans, supporting calculations and specifications for a nuclear facility and its parts; and
- engineering/technical and safety analyses and assessments.

Design management includes and is not limited to:

- demonstration of sufficient competent managerial and suitably qualified and experienced technical staff to carry out its safety functions, make safety judgments and to comply with any regulatory requirements;
- demonstration of adequate control and supervision arrangements to ensure that the responsible authority is in control of its undertakings;
- provisions to:
    - monitor performance, compliance, cultural attitudes and behaviours, and take appropriate action (monitoring may include audits, surveillance, surveys and participation in design verification activities);
    - determine that there are adequate numbers of suitably trained, qualified and experienced staff;
    - verify that the technology, tools and methods used are proven and are established on the basis of best industry practice;
    - assess the technical and safety assessment capabilities in the context of the reactor technology organization being an intelligent user of consortium members and subcontractors; and
    - ensure the product and/or work produced is of appropriate quality, through review and acceptance of engineering deliverables; and
- understand the relevance of the product and/or work to the relevant safety case or safety cases.

The process of establishing site evaluation-related management system parameters should involve technical and engineering analyses, along with judgments that require extensive experience and knowledge. In many cases, the parameters and analyses may not lend themselves to direct verification by inspections, tests, or other techniques that can be precisely defined and controlled. In these cases,

evaluations should be reviewed and verified by individuals or groups who are independent of those who did the work.

Feedback associated with experienced engineering judgment and expertise in geotechnical engineering is an important aspect of assuring the quality of the site evaluation process. For example, in the assessment of matters such as liquefaction potential and slope stability, the accuracy of the evaluation results depends heavily on insight into failures that have occurred in comparable situations. The information gathered from these assessments should be documented and analyzed to provide evidence that similar failures should not occur. (REGDOC.-1.1.1 - section 4.3.2)

3.1.3 Design of the nuclear facility – design control measures

The design programs, processes, procedures and practices for the selected facility technology must satisfy the applicable criteria for management systems established in the licensing basis, such as:

- REGDOC.-2.5.2, *Design of Reactor Facilities, Version 2.1*
  CSA N286:12 (R2022), *Management system requirements for nuclear facilities*

The design organization, if different than the proponent, must have a management system compliant with the requirements in CSA N286:12 (R2022). Where the proponent or reactor technology organization's design programs, processes procedures and practices are structured to standards other than CSA N286:12 (R2022), the proponent must demonstrate how these satisfy the applicable criteria of CSA N286:12 (R2022).

Applicable portions of the management system must be in place before any design activities are undertaken.

Guidance

The proponent should demonstrate that design organization's management system has been reviewed, adequately implemented and accepted. (REGDOC.-1.1.1 - section 4.3.3)

3.1.4 Where a specific facility design has been selected

For reactor technologies under consideration whose design parameters are included in the application for a licence to prepare site, the design management system of the reactor vendor should be assessed to ensure it meets the requirements of CSA N286, *Management system requirements for nuclear facilities*. (REGDOC.-1.1.1 - section 4.3.4)

3.1.5 When facility design selection is deferred

Guidance

In cases where the selection of a specific facility design is deferred, the management system should include:

- programs, processes, procedures, execution plans, and so on for the selected project execution model and contracting strategy
- a description of the organization, including:
    - interrelationships, and
    - areas of responsibility, including:
        - where the proponent retains and exercises overall project and management system responsibility;
        - limits of authority; and
        - boundaries between the proponent, designer (usually the design authority up to some point during facility construction and commissioning), major technical support organizations, constructor and consortium members, and major sub-contractors;
- provisions for assuring effective management control has been and will continue to be exercised for the design (including the design authority), to promote and assure the safety aspects of work being performed; and

provisions for assuring proper implementation and observance of the management system. , REGDOC.-1.1.1 – section 4.3.5)

3.2 Operating Performance

For activities conducted under the licence to prepare site, the proponent must characterize the risks to health, safety and the environment that may be encountered by workers and the public. (section 4.4 of REGDOC.-1.1.1 has been incorporated into 3.2)

Guidance

These risks are generally similar to those encountered during pre-construction activities at a conventional large-scale construction project. Some examples are:

- noise hazards, primarily from blasting activities and operation of heavy machinery;
- dust from overburden and rock removal and movement;

- chemical hazards from fuel spills, and conventional chemicals used during the construction of non-nuclear plant structures;
- mechanical hazards from excavation, earth movement, road building, and so on;
- ground vibration and flying rock hazards from blasting activities; and
- electrical hazards from establishing construction electrical infrastructure.

The proponent should assess risks to the health and safety of workers and the public resulting from the activities encompassed by the licence to prepare site. This assessment includes consideration of accidents and malfunctions that could occur during site preparation activities (including those that might originate from adjacent nuclear facilities, where applicable).

Where risks to the health and safety of either workers or the public could be higher than for a conventional project, the proponent should provide credible research supporting the potential consequences, and measures to mitigate the risks. For example, if site investigation has indicated the presence of a sub-surface hazardous substance, the proponent should provide an investigation of the effects of that substance, if unearthed, on the health and safety of workers and the local public.

3.3 Safety Analysis

The safety analysis requirements for the licence to prepare site have been integrated in Part 1, section 11. Security Considerations.

3.4 Physical design

The proponent is required to provide certain information based on their decision for an exclusion zone. The following subsections provide information on how the applicant may decide on the proposed boundaries for this zone. (sections 4.6.1& 4.6.2 of REGDOC.-1.1.1 have been incorporated into 3.4)

An exclusion zone is a parcel of land within or surrounding a nuclear facility on which there is no permanent dwelling and over which a licensee has the legal authority to exercise control.

Physical design also applies to safety-important civil work and to the layout of areas, structures and systems.

3.4.1 Exclusion zone and emergency planning zones

The proponent must provide information on the proposed exclusion zone (including size and boundary) and on the proposed emergency planning zones (see considerations in Part 1, section 7.9. *General Criteria for Site Evaluation*). (REGDOC.-1.1.1 - section 4.6.1)

Whether the technology has been chosen or not, the exclusion zone size is characterized based on a combination of dose limits, security and robustness design considerations, meteorological conditions and emergency preparedness considerations that are affected by the land use around the site. The proponent must consider the following criteria (for an operating unit) in determining the size of the proposed exclusion zone:

- committed whole-body dose for average members of the critical groups who are most at risk at or beyond the exclusion zone boundary, is calculated in the deterministic safety analysis for a period of 30 days after the analyzed event;
- under normal operating conditions, the effective dose at the exclusion zone boundary to a person who is not a nuclear energy worker shall not exceed 1 mSv over the period of one calendar year;
- under anticipated operational occurrence (AOO) conditions, the effective dose at the exclusion zone boundary to a person who is not a nuclear energy worker shall not exceed 0.5 mSv over the release time due to the AOO;
- under design-basis accident (DBA) conditions, the effective dose at the exclusion zone boundary to a person who is not a nuclear energy worker shall not exceed 20 mSv over the release time due to the DBA; and
- demonstration that the dispersion model used for the dose calculations is representative of the actual site.

The applicant may use either of two acceptable approaches in determining the location of the exclusion zone boundary. Both approaches (described below) use site characterization information from the site evaluation.

For more information, see CSA N288.2, *Guidelines for calculating the radiological consequences to the public of a release of airborne radioactive material for nuclear reactor accidents*.

Approach 1: Simplified exclusion boundary case

A specific distance for the boundary from the facility may be selected, based on predicted bounding values for radiological dose and exposures to hazardous substances (along with assumptions of facility robustness and emergency preparedness capabilities of the site and surrounding area). Key considerations are:

- this approach requires only high-level design information for the types of facilities being considered
- if assumptions are correct, the boundary location will be conservatively located and will maximize options for locating structures on the site
- the site footprint may be larger than that used for approach 2

There may be implications for the construction and operations phases. At a later licensing stage, it may be determined that the exclusion zone boundary is too close to the facility, or the assumptions regarding releases to the environment during normal and accident conditions are not met. Mitigating actions may be required; these actions could include facility design changes or changes to the facility's operating parameters. An extension of the exclusion zone boundary later in the licensing process would likely involve

significant regulatory reviews, because of the relationship between the exclusion zone boundary and technical areas such as security and emergency preparedness.

Approach 2: Comprehensive exclusion boundary case

Using a systematic process, a detailed case is developed for the exclusion zone boundary location, based on predicted values for radiological dose and exposures to hazardous substances (along with assumptions of facility robustness and emergency preparedness capabilities of the site and surrounding area). Key considerations are:

- there is greater certainty that the design(s) proposed for the site will not require extensive design changes to meet exclusion zone radiological dose and hazardous substances exposures criteria
- the site footprint is optimized from the onset of the project
- a detailed exclusion zone case must rely on detailed facility design information; for example:
  - descriptions of all major SSCs that could significantly influence the course or consequences of principal types of accidents and malfunctions
  - implications for emergency preparedness based on the physical layout of the facility
  - security considerations

For more information, see section 7.9. General Criteria for Site Evaluation.

Emergency planning zones

The proponent is required to provide the information outline in section 7.9.6 *Population and emergency planning considerations* about the emergency planning zones.

3.4.2 Civil structures and civil works

For the licence to prepare site, the Impact Statement must include information on the design measures such as flood protection and erosion control. (REGDOC.-1.1.1 - section 4.6.2)

Guidance

The Impact Statement must provide information on any safety-important civil work carried out during site preparation and on civil structures used in site preparation (e.g. containment dykes, retaining walls, earthworks), as outlined under section 13. *Effects of the Environment on the Project*.

(Section 4.6.3 of REGDOC 1.1.1 has been incorporated into Part 1-section 3.2)

3.5 Radiation Protection

The proponent must assess the doses to workers and the public associated with activities to be encompassed by the licence to prepare site, or from exposures to any radioactive substances resulting from past or present nuclear activities (for example, discovery of contaminated soils during excavation). (section 4.7 of REGDOC.-1.1.1 has been incorporated into 3.5)

The dose assessment must demonstrate that the predicted annual effective dose, including the committed effective dose associated with annual intakes of radionuclides, to persons during site preparation will:

- not exceed the applicable dose limits of the *Radiation Protection Regulations*; and
- be as low as reasonably achievable (ALARA), social and economic factors taken into account.

The proponent must consider any associated mitigation measures that are technically and economically feasible. In particular, the proponent must identify engineering controls to be applied to reduce the magnitude of each source, and work practices aimed at controlling radiation exposure of workers; and must adopt mitigation measures as appropriate.

Guidance

The radiation protection measures should address the information provided in REGDOC 1.1.2 Licence Application Guide: Licence to Construct a Reactor Facility, Version 2 and should be commensurate with the hazards that may be encountered.

3.6 Conventional Health and Safety

The production and use of nuclear energy is under federal jurisdiction. When in the presence of a federal undertaking, and integral to the operation and management of that undertaking, the labour relations and working conditions – which includes occupational health and safety (OHS) – also fall under federal jurisdiction. (section 4.8 of REGDOC.-1.1.1 has been incorporated into 3.6)

The regulation of OHS in nuclear power plants may involve three regulatory agencies:

- Employment and Social Development Canada (ESDC);
- the provincial ministry of labour where the site is located; and
- the CNSC.

The proponent must develop, implement and maintain occupational health and safety (OHS) programs to prevent occupational injuries and illnesses.

The proponent must identify OHS hazards, assess the associated risks, and ensure the necessary materials, equipment, programs and measures are put in place to effectively manage, control and minimize those risks.

The proponent must ensure the OHS policies and procedures of the proponent and of all contractors engaged by the proponent for purposes of site preparation comply with the applicable provincial/territorial requirements.

The proponent must assess risks to the health and safety of workers and the public onsite and offsite resulting from the activities encompassed by the licence to prepare site. This assessment includes consideration of accidents and malfunctions that could occur during site preparation activities (including those that might originate from adjacent nuclear facilities, where applicable).

Guidance

Governance of OHS matters is determined by analyzing and identifying the applicable jurisdiction for each case. OHS matters at nuclear facilities usually fall under the responsibility of the Labour Program at ESDC, but licensee organizations in certain provinces be governed by provincial laws. This excludes federal jurisdiction over OHS matters at nuclear facilities that are operated by provincial crown corporations.

For provinces and territories where the governance over OHS matters has not been formally assigned by law, jurisdiction and governance over OHS issues remain with ESDC and the *Canada Labour Code, Part II*.

The proponent's health and safety organization must:

- be qualified and make adequate provision for the protection of the health and safety of persons;
- meet the requirements in the applicable provincial or federal codes;
- adequately execute the proposed worker health and safety policies and procedures described in this regulatory document; for example:
  - demonstrating adequate oversight of the site OHS program;
  - ensuring compliance with applicable OHS regulations and requirements; and
  - ensuring adequate OHS training of persons involved in site preparation activities; and
- have capabilities for reporting and investigation of incidents and significant events.

3.7 Environmental Protection

The following environmental protection requirements apply in addition to those integrated in Part 1 of these Guidelines. (section 4.9 of REGDOC.-1.1.1 has been incorporated into 3.7)

Specifically for a licence to prepare site, proponents must also fully demonstrate that they meet the requirements of:

- CAN/CSAISO 14001, *Environmental management systems – Requirements with guidance for use* (2004 edition or successor editions);

- CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities;*
- CSA N288.2, *Guidelines for calculating the radiological consequences to the public of a release of airborne radioactive material for nuclear reactor accidents;*
- CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills;*
- CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*;
- CSA N288.6, *Environmental risk assessments at nuclear facilities and uranium mines and mills*;
- CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*;
- CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities*;
- CNSC, G-228, *Developing and Using Action Levels*; and
- IAEA Safety Guide No. WSG2.3, *Regulatory Control of Radioactive Discharges to the Environment.*

3.7.1 General considerations for environmental protection

The proponent must demonstrate that all reasonable precautions are being taken to control and monitor the release of nuclear substances or hazardous substances to the environment resulting from site preparation activities and ensure that licence limits are being respected.

The proponent must demonstrate that the proposed environmental protection policies, programs and procedures needed for the subsequent licensing phases have been established.

All applications for new reactor facilities must include an environmental risk assessment (ERA). For more information, see REGDOC.-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 2*.

As described in REGDOC.-2.9.1 and as applicable to site preparation activities, the proponent must describe the proposed:

- effluent and emissions control and monitoring measures;
- environmental monitoring measures;
- groundwater protection and monitoring measures; and
- environmental management system.

3.7.2 Performance of site preparation and facility construction by different organizations

Where the proponent plans to proceed with site preparation using another organization until the selection of a reactor technology and a contract is in place, the proponent must provide information that demonstrates that the contractor organization has the capability to design environmental measures.

Guidance

Examples of environmental measures that may be carried out by contractors include the design of flood protection and erosion control, and of adequately supporting structures and civil works.

3.7.3 Protection of people

The proponent must assess the doses to the public associated with activities to be encompassed by the licence to prepare site, or from exposures to any radioactive substances resulting from past or present nuclear activities (for example, discovery of contaminated soils during excavation).

The dose assessment must demonstrate that the predicted annual effective dose, including the committed effective dose associated with annual intakes of radionuclides, to the public during site preparation will:

- not exceed the applicable dose limits of the *Radiation Protection Regulations*; and
- be as low as reasonably achievable (ALARA), social and economic factors taken into account.

The proponent must consider any associated mitigation measures that are technically and economically feasible. In particular, the proponent must identify engineering controls to be applied to reduce the magnitude of each source, and shall adopt mitigation measures as appropriate.

3.8 Emergency management and fire protection

An emergency response plan is required for the licence to prepare the site to ensure that adequate and timely emergency assistance is available to protect workers, the public and the integrity of site security, while mitigating adverse environmental effects during project activities. (section 4.10 of REGDOC.-1.1.1 has been incorporated into 3.8)

All aspects of the emergency preparedness program should be commensurate with the hazards on the licensed site. Where emergency response resources are shared between the site and other nearby nuclear facilities, the proponent must demonstrate that the site will maintain sufficient complement to adequately address emergency response needs.

The proponent must ensure that the emergency preparedness program maintains an adequate response capability to respond to and mitigate the emergency situations that could occur at the site, including malevolent acts, accidents and malfunctions for the site preparation phase.

The proponent must provide details of the site emergency response organizations of the proponent and other applicable organizations, including the numbers and positions of all site staff who are assigned to emergency response duties.

Guidance

Although hazards of a malevolent nature are not described in this section, the proponent should consider the emergency response to those hazards. Note that the effects of such hazards are likely to be similar to those of conventional accidents and malfunctions.

The program should contain the following elements:

- a training program for emergency response personnel, commensurate with evolving hazards at the site; and
- a site hazard change program that, when implemented, can inform emergency preparedness staff of changing hazards on the licensed site to maintain adequate emergency response capability for all potential accident situations (note that a sufficient notification process should be implemented to allow emergency response organizations to adequately prepare prior to the introduction of new hazards on the licensed site).

For more information on a proposed nuclear emergency preparedness program and response plan, as applicable for site preparation, see:

- REGDOC.-2.10.1, *Nuclear Emergency Preparedness and Response*, *Version 2*;
- CSA N1600:21, *General requirements for nuclear emergency management programs; and*
- IAEA GSR Part 7, *Preparedness and Response for a Nuclear or Radiological Emergency*.

3.9 Waste Management

Waste management includes both “nuclear and hazardous substances that are used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons.” (section 4.11 of REGDOC.-1.1.1 has been incorporated into 3.9)

For site preparation, the proponent should consider how to manage existing onsite hazardous substances that are identified during site evaluation, as well as the hazardous substances that will be produced during activities encompassed by the licence to prepare site.

Hazardous substances and hazardous wastes

The proponent must address:

- quantities and physical characteristics (including hazards posed to health and safety) of each substance or waste, including by-products;
- for all substances or by-products that are regulated or controlled, the appropriate list of regulations governing their control;
- transport, storage and use of hazardous substances; and
- processing and disposing of hazardous wastes.

Guidance

The proponent should characterize all hazardous substances and hazardous wastes in a list as follows:

- name of hazardous substance or hazardous waste;
- origin of hazardous substance or hazardous waste;
- possible by-products that could evolve from:
    - the hazardous substance or hazardous waste, and
    - any interactions between the hazardous substances or hazardous wastes, or between the possible by-products;
- anticipated quantity or volume, and anticipated form;
- hazards to workers and the public who may be exposed to the hazardous substance, hazardous waste or byproducts; and
- how the hazardous substance, hazardous waste or by-products will be processed or disposed of at the site.

Decommissioning

At site preparation, the proponent must consider two areas of decommissioning, 1) site evaluation from a decommissioning perspective, and 2) activities encompassed by the licence to prepare site.

- For site evaluation from a decommissioning perspective, the proponent must demonstrate that the site evaluation process:
    - has appropriately considered future decommissioning in the planning for the nuclear facility; and
    - has adequately considered end-of-life decommissioning.
- For activities encompassed by the licence to prepare site, the proponent must provide a preliminary decommissioning plan and financial guarantee that cover the scope of work and related costs to return the site from the conditions expected at the end of a licence to prepare site to an agreed-upon end state, including, if the project is halted, restoration of the site to the original condition.

Guidance

An adequate preliminary decommissioning plan ensures that the cost estimate associated with the financial guarantee can adequately decommission the facility to an acceptable end-state condition.

Note: In this context, “facility” refers to the site encompassed by the licence to prepare site, and “end-state condition” refers to the expected state at the end of completion of site preparation activities.

For more information, refer to:

- REGDOC.-2.11.2, *Decommissioning*,
- CSA N294:19, *Decommissioning of facilities containing nuclear substances*

3.10 Security

At the site preparation stage, the security program is primarily focused on protection of prescribed information. The security program is developed in view of the project progressing to the construction stage. (section 4.12 of REGDOC.-1.1.1 has been incorporated into 3.10)

Proponent submissions and resultant review correspondence related to security is considered to be prescribed information under the NSCA and is submitted in a secure manner. Prescribed equipment is not expected to be part of a licence to prepare site.

The quantity of prescribed information to be encompassed by the licence to prepare site is small and the scale of the program should be commensurate with the quantity and nature of the information.

Some examples of prescribed information are:

- security threat and risk assessments;
- electronic data/communications and/or written records;
- security arrangements;
- security equipment;
- security systems;
- security procedures established by the proponent, including any details around the management of records related to security incidents; and
- the proposed measures to control access to the site, including proposed measures to prevent loss or illegal use of information relating to security.

In an effective screening criteria process for the position of nuclear security officer, the physical, medical and psychological requirements (based on a physical demands analysis) are part of the job description (for example, performing foot/vehicle patrols, detaining unarmed intruders, comprehending procedures and

successfully completing assigned tasks). The site-specific criteria for assessing physical, medical and psychological fitness associated to training and in performing assigned duties should be included as screening criteria for security officer positions.

3.10.1 General consideration for security

The security measures must provide oversight, management and control, with documented policies and procedures.

The proponent's security measures must address the following elements:

- prescribed information,
- site security program,
- site access clearance,
- security arrangements with offsite response forces,
- physical security,
- cyber security, and
- security program officer.

Guidance

The security measures should include:

- the proposed structure and organization of the security officer service, including the duties, responsibilities and training of security officers;
- a description of the site security policy, including a list of reference documents that demonstrates that the security quality assurance criteria:
  - are integrated into overall quality assurance;
  - meet applicable requirements of the management system established in the licensing basis such as CSA N286, *Management system requirements for nuclear facilities*;
  - use a graded approach; and
  - take into account the increasing complexity of the project as it evolves;
- a demonstration that the proposed security measures have considered the applicable quality assurance criteria contained in ISO 27002:2013, *Information Technology – Security Techniques – Code of Practice for Information Security Controls*;
- a description of security measures, procedures and processes that ensure that the required quality is defined and consistently achieved within the proponent's security policy;

- documentation of how site personnel will be trained in security (high-level training strategy), measured and maintained, including measures to ensure that all security personnel are skilled, knowledgeable and accountable in performing assigned tasks and responsibilities; and
- information on the security system and subsystem availability program, including provisions for documentation and archiving, and maintaining records of functional testing and routine field testing.

3.10.2 Prescribed Information

The security program must include an inventory change control process for prescribed information.

Guidance

- The proponent's submission should include a description of adequate processes (including management system or quality assurance) to provide for adequate management of any changes to the prescribed information description.

3.10.3 Site Security Measures

The security measures must:

- be based on risk/vulnerabilities and consider applicable criteria contained in REGDOC.-2.12.3, Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Materialhave a site plan that conforms to section 16 of the *Nuclear Security Regulations*;
- contain adequate criteria for the classification of prescribed information; electronic and hard copy information that discusses security risks, vulnerabilities, and strategies may require a higher classification pursuant to the Government of Canada Treasury Board's *Policy on Government Security*;
- describe the procedures for reporting events internally and to the CNSC;
- be implemented according to the proponent's established quality assurance program;
- have a configuration management program for physical assets and "soft" assets, such as information technology and records;
- have an adequate skills (training) program, with a particular focus on staff who maintain cybersecurity and network security;
- have fitness-for-duty criteria (see REGDOC.2.2.4, *Fitness for Duty, Managing Worker Fatigue* and REGDOC.-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use*; and,
- have processes to examine, assess and implement lessons learned from similar projects and industry operational experience.

3.10.4 Site Access Clearance

For administrative processes and physical assets used in the security program, the proponent should ensure that the effectiveness of the security mitigation measures is maintained, and that the security measures meet the changing security needs due to “new” threats, risks and vulnerabilities.

The security measures must describe the process for issuing an authorization for a site access clearance. An authorization for a site-access clearance is required for security staff and security support persons, including individuals requiring unescorted access to areas and processes where prescribed information is stored or used. The security measures must contain procedures by which to adequately maintain staff security clearances.

The security measures must also contain procedures for ensuring the security of persons who may not have a site access clearance but have a valid reason to enter a location containing the prescribed information. Typically, this is accomplished through the provision of an escort at all times.

For more information, see REGDOC.-2.12.2, *Site Access Security Clearance*.

3.10.5 Security arrangements with offsite response forces

The security measures must describe the communication protocols and processes for:

- effective consultation between the proponent and the offsite response force regarding the arrangements
- ensuring that the necessary resources are available
- listing the equipment available to the proponent and the offsite response force
- any other matter relating to the security of the facility

The proponent must describe offsite communications equipment, systems and procedures. Where offsite response force capability is required, the proponent must describe arrangements that demonstrate the offsite response force can respond or support the onsite security response force in making an effective intervention when requested. Where an offsite response force is integrated into the security program, the security program must contain plans for annual familiarization visits to the facility by members of an offsite response force.

Written arrangements (for example, memorandum of understanding or other such agreement) with the offsite response force must consider response time to an incident. If the response time is not reasonable, the proponent must describe additional controls (for example, alarms or remote surveillance) to ensure the offsite response force has sufficient time for an effective intervention.

Guidance

Written arrangements should also consider other emergency response requirements of the response force (for example, natural disasters) and specific training limitations of the members of the force. Response-

time analysis should be clearly presented and credible for the environmental conditions of the site and the capabilities of the offsite response force (for example, weather, geography, layout of roads, and recall time for off-duty staff).

3.10.6 Physical Security

The proponent must consider security measures relating to detection, delay and response to security events. Security measures should address adverse weather conditions that could impede the effectiveness of the measures (for example, heavy snowfall preventing security patrols, response and police response from offsite, detection device operability in areas where ice buildup is problematic).

As per section 21 to 23 of the *General Nuclear Safety and Control Regulations*, the proponent must provide physical protection measures to control access to prescribed information, and to prevent loss, illegal use, illegal possession or illegal removal of such prescribed information. This information must be managed on a “need to know” basis.

Security system devices must meet the requirements contained in:

- REGDOC.-2.12.1, High-Security Facilities, Volume II: Criteria for Nuclear Security Systems and Devices

Guidance

The proponent should describe onsite communications equipment, systems and procedures. Security measures should give special consideration to prescribed information assets stored outside, even temporarily.

3.10.7 Cyber Security

The proponent must provide a cyber security policy that considers risks and vulnerabilities identified in the site selection threat and risk assessment (SSTRA), and that defines the objectives and elements of the cyber security program.

Guidance

The proponent should define operational procedures, including high-level technical requirements for protecting prescribed assets from a cyber attack.

The cyber security element of the security program should consider the information in CSA N290.7, *Cyber Security for Nuclear Power Plants and Small Reactor Facilities*.

3.10.8 Security Officer Program

The proponent must ensure that the security officer program meets the requirements in RD363, *Nuclear Security Officer Medical, Physical and Psychological Fitness Training*. The skills management program for security officers should ensure the necessary skills and knowledge are maintained to accomplish the assigned duties and tasks.

3.11 Safeguards and Non-proliferation

Canada has adopted both the international protocol for safeguards (IAEA INFCIRC/164, *Agreement between Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons)* and the additional protocol (IAEA INFCIRC/164/Add.1, *Protocol additional to INFCIRC/164*), which prevents unauthorized sharing of information such as for detailed designs. (section 4.13 of REGDOC.-1.1.1 has been incorporated into 3.11)

The proponent must provide a description of the arrangements made by the proponent, as applicable to site preparation, that will permit the CNSC to discharge Canada's obligations and provide information to the IAEA. The application must describe how the arrangements address the requirements in REGDOC.2.13.2, *Import and Export* and RD336, *Accounting and Reporting of Nuclear Material*.

The proponent should describe measures related to site buildings and structures, operational parameters and the flow and storage of nuclear material, from the facility's design phase through to its decommissioning and eventual abandonment.

The application should describe how the program ensures that the IAEA is able, upon request, to access the facility for inspections and other verification activities.

3.12 Other Matters of Regulatory Interest

The proponent must address other matters of regulatory interest, including public information and disclosure; Indigenous engagement; intergovernmental consultation; and financial guarantees. (section 4.14 of REGDOC.-1.1.1 has been incorporated into 3.12)

3.12.1 Public Information and Disclosure Program

The proponent must describe how their proposed public information and disclosure program (required by all licensees) meets the requirements in REGDOC.-3.2.1, *Public Information and Disclosure*.

The description must include how and with what tools the proponent would communicate with the public, particularly with those persons living in the vicinity of the site.

Guidance

The proponent should initiate the public information program well ahead of their application for a licence to prepare site.

3.12.2 Indigenous Engagement

Guidance and requirements pertaining to Indigenous engagement for an integrated assessment are documented in Part 1, section 6. *Description of engagement with Indigenous groups*.

3.12.3 Intergovernmental Consultation

Guidance

The proponent should provide a summary of the results of consultation with all levels of government, to indicate their intended involvement and support for the project.

Federal consultation should include any consultation with other national governments, if the proposed project may have interfaces with or potential environmental effects on jurisdictions outside Canada.

The summary should provide an overview of any outstanding issues resulting from consultations that must be resolved before the project can proceed.

3.12.4 Financial Guarantees

The proponent must provide financial guarantees for restoration of the site should the project be discontinued. The amount of the proposed financial guarantee must be sufficient to complete all site decommissioning activities that are described in the preliminary decommissioning plan.

For more information, see *REGDOC.-3.3.1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*.

Guidance

The proponent is not required to provide a financial guarantee for complete decommissioning of the future reactor facility until submitting an application for a licence to construct the facility.

The financial guarantee should be in proportion to the outstanding liabilities for decommissioning and related activities needed to complete the decommissioning plan.

4. Effects of the Environment on the Project

Note: The majority of the requirements for the assessment of effects of the environment on the project from REGDOC.-1.1.1. have been integrated in Part 1, section 13. *Effects of the Environment on the Project*.

A comprehensive site evaluation includes a demonstration of the understanding of the effects of credible site-specific and regional natural and human-induced external events that could affect site operations for each phase of the facility lifecycle.

The largest effects during the project lifecycle are expected to occur during the site preparation and construction stages. Project activities resulting in large and certain environmental effects during site preparation and construction include land re-contouring and water-body infill work.

Early planning ensures that natural and human-induced external events are considered when evaluating environmental effects on health and safety and on security mitigation measures.

Information on external events must be provided to determine, for the entire lifecycle of the project, that:

- the predicted effects of external events onsite events and the subsequent analyses of environmental effects are credible;
- the facility design and the design of site infrastructure are adequate; and
- the licensee will ensure adequate provisions for the protection of the environment, the health and safety of persons, and national security. (Appendix E, REGDOC.-1.1.1)

4.1 General considerations

All design-basis parameters arising from consideration of natural and human-induced external events must be identified, and their design basis values justified. These “site-related” parameters influence the design basis values for the nuclear facility and are an important input to the design and overall safety case.

The process used for each type of event analysis must be consistent with the overall management system.

Limitations presented by data used in the study must be clearly documented for future use.

For each of the following sections, any parameters having an influence on the design of the facility (design basis parameters) shall be identified, and their design basis values given and justified. All design basis parameters and their values arising from siting considerations shall be documented.

For the licence to prepare site, where multiple technologies are being considered, the plant design parameters for each of the technologies being considered for the facility must be provided, so as to demonstrate that each of the technologies is capable of withstanding the design basis conditions attributed to siting considerations.

Guidance

The analysis of postulated events should address combinations of events that are credible for the site and its surrounding region and may have a larger cumulative effect than the events in isolation.

Some examples of design basis parameters are maximum/minimum air temperatures, maximum snow load, maximum seismic ground motion, extreme flood, maximum tornado wind speeds, and maximum loadings arising from events on nearby transportation routes (REGDOC.-1.1.1 - Appendix E.1).

See Part 1, section 13. *Effects of the Environment on the Project* for the information requirements for the integrated assessment of the project.

5. Assessment of Accidents and Malfunctions

Note: General requirements for assessment of accidents and malfunctions have been integrated in Part 1, section 11.

The proponent must demonstrate that the facility is capable of safely operating within the constraints of the proposed site. Environmental effects must be as low as reasonably achievable over the full lifecycle of the proposed facility, while taking mitigating measures into account.

Any design information provided by the proponent must be credible and sufficient to adequately bound the evaluations of environmental effects and site evaluation.

Regardless of the approach used with regards to applying facility design information to their site selection case, the proponent must demonstrate a clear understanding of the basis from which the safety case is developed.

5.1 Considerations specific to the licence to prepare site

Information required to support site evaluation around the assessment of accidents and malfunctions for the licence to prepare site includes:

- a technical outline of the facility layout;

- qualitative descriptions (or technical outline) of all major structures, systems and components (SSCs) that could significantly influence the course or consequences of principal types of accidents and malfunctions;
- qualitative descriptions (or technical outline) of the functionality of the SSCs important to safety; and
- qualitative descriptions of principal types of accidents and malfunctions to identify limiting credible sequences that include external hazards (natural and human-induced), design-basis accidents and beyond-design-basis accidents (severe accidents).

The proponent must provide a description of out-of-core criticality events showing that these events would not violate criteria established by international standards and national guidance as a trigger for a temporary public evacuation.

The proponent must demonstrate that the safety goals and functional requirements are met.

Guidance

In situations where the technology to be used onsite has either not been selected (subject to a technology selection process that will occur either during or beyond site preparation) or the technology being considered is a first of a kind in Canada (design not yet fully developed), detailed quantified information about accidents and malfunctions characteristics may not be fully established. As a result, the CNSC will accept qualitative information in support of the site selection case with the understanding that there will be an increased level of regulatory scrutiny during the construction and operation licensing processes to validate the claims made.

The proponent should demonstrate that safety goals and functional requirements are met through a high-level safety analysis that demonstrates that the behaviour of the reactors being proposed is understood, and that their consequences can be accurately predicted.

For more information on safety goals, see:

- 5.4.4. *Assessment of non-malevolent nuclear accidents and malfunctions* below; and
- REGDOC.-2.5.2*, Design of Reactor Facilities: Nuclear Power Plants* (included in the facility licence where applicable).

5.2 Considerations applicable to all licensing phases

5.2.1 Assessment of non-malevolent conventional accidents and malfunctions events

Conventional accidents and malfunctions are potential events that result in the release of non-radiological hazardous substances or large releases of energy.

For the facility's technology to be constructed and operated on the site, the proponent must provide documentation to demonstrate that the safety goals and functional requirements established for non-malevolent conventional accidents and malfunction events are met through safety analysis, showing that the behaviour of the design is understood and that consequences can be accurately predicted.Security Considerations

The following guidance and requirements on security considerations are included in Part 1 of the Guidelines as they apply to the entire project lifecycle. Further guidance and requirements specific to the Licence to Prepare Site are included in Part 2, section 6. *Security Baseline Data – Security Risks Presented by the Site's Location*. (section 3.7 of REGDOC.-1.1.1 has been incorporated into section 11)

For new nuclear sites and new reactor facilities on existing sites, the proponent must develop security-related physical protection objectives for reactor facilities. To do so, the proponent must include the gathering of information about the reactor facility's proposed siting location, in order to study threats or issues presented by the geographical location and characteristics of the proposed site, including potential acts of terrorism. The proponent must compile the findings from this study in a site selection threat and risk assessment (SSTRA) report. Should the project be allowed to proceed, the contents of the SSTRA report may be merged into the licensee's overall security program after the licence to prepare site has been granted.

A site selection threat and risk assessment (SSTRA) is conducted prior to the submission of an application for a licence to prepare site. . The resulting report contains an analysis of physical barriers to security presented by the location of the site over the proposed lifecycle of the project. The intent of the SSTRA is to aid the proponent in determining the suitability of the site from a security perspective. The information from the SSTRA feeds into the development of appropriate security mitigation measures for activities to be encompassed by a licence under the NSCA, to ensure that all security-related regulatory requirements are met. The SSTRA also identifies security concerns that may render the site undesirable from a security perspective.

Should the project be allowed to proceed, the SSTRA report and its basis information must be maintained as security baseline characterization data for the lifecycle of the facility. The SSTRA must include comprehensive consideration of both physical protection concerns and transportation routes, as described in the following subsections.

The SSTRA report must be classified as prescribed information and protected from release under access to information / freedom of information requests, on the basis of national security.

The Impact Statement must:

- provide a high-level description that the SSTRA report has been conducted in accordance with guidance and requirements in these Guidelines; and
- provide a commitment that the SSTRA and basis information will be maintained as security baseline characterization data for the lifecycle of the facility.

5.3 Physical protection

The proposed physical protection requirements must ensure that the appropriate detection, delay, and response considerations are taken into account.

Physical protection design requirements are influenced by the site location. Site evaluation must, therefore, address the physical dimensions of the reactor facility and its surrounding environment, including:

- the topology of the area that can be considered a component of the overall security barrier design (such as line-of-sight view);
- the proximity of various infrastructure elements that could adversely affect physical protection, such as a chemical plant that could release a noxious substance, a hydroelectric dam that could be accidentally or deliberately breached (resulting in flood), or an airport that provides significant flight traffic in the vicinity of the site;
- site boundaries;
- weather that could factor as a potential impediment to the operability of physical protection systems (that is, systems that monitor the operation of a reactor and which, on sensing an abnormal condition, automatically initiate actions to prevent an unsafe or potentially unsafe condition); and
- details pertaining to the establishment of a construction site, such as the positioning of perimeter fences, access and egress points, and storage of construction drawings.

Guidance

Reactor facilities located in a remote area bordered by a small population density may require different physical protection considerations than those that apply to reactor facilities located in a large urban area.

5.3.1 Remote areas

The proponent must evaluate remote sites with respect to the anticipated time required to implement essential response services, including how long it will take offsite armed responders to reach the reactor facility.

Guidance

This aspect of the SSTRA should support early identification of the need for establishing an onsite nuclear response force capability, to ensure that a trained response group is in position during the construction phase of possible target sets (such as vital areas) that are part of the reactor facility.

5.4 Transportation routes

The proponent must consider the transportation routes in the vicinity of the site, to ensure that they are adequately taken into account during future site development activities. The routes to be considered include waterways, land routes and airspace, as described in the following text.

5.4.1 Waterways

The site evaluation must include assessment of all waterways in the vicinity of the site, from the perspective of physical protection. For example, a waterborne vehicle – or its personnel or contents – may be used in a manner that may pose a threat to the reactor facility (for example, being an explosive risk) to disable operations, equipment, or systems, in an act of sabotage that could have radiological implications.

5.4.2 Land routes

The proponent must assess all vehicular access land routes in proximity to the site, including rail lines, to determine the security threat they may pose to potential locations of future vital areas.

Guidance

Where possible, the surrounding terrain may be considered as a natural barrier in reducing vehicle-borne explosive risk. Where this is not possible, the proponent should consider delineating areas from which land vehicles must be restricted.

5.4.3 Airspaces

The SSTRA must consider the threats and risks associated with private and commercial airports, including associated flight pathways. This requirement involves discussions with municipal, provincial or territorial, and federal governments to confirm interdiction capabilities and coordinating points of contact.

Effects of Potential Accidents or Malfunctions, the proponent must consider the following items in the establishment and maintenance of the bounding site and facility parameters:

- past (in the context of existing facilities adjacent to the selected site) and potential abnormal plant operations, accidents and spills of relevance;
- malfunction and accident events that have a reasonable probability of occurring during the project's life, and that may involve the release of non-radiological hazardous substances or large release of energy that could significantly affect the environment;
- the source, quantity, mechanism, rate, form and characteristics, spatial and temporal extent of above-background levels of contaminants and other materials (physical, chemical, and so on) likely to be released to the surrounding environment during the postulated malfunctions and accidents;
- the effects of contaminant releases from conventional accidents and malfunctions on human health and the environment;

- mitigation means and measures, including policy, procedures and plans to mitigate, prepare for, respond to, and recover from emergencies from accidents and malfunctions (including emergency response and preparedness);
- contingency, clean-up or remediation work in the surrounding environment (including long-term monitoring) during or immediately following, the postulated malfunction or accident;
- measures and provisions, to protect against the postulated accidents and malfunctions;
- accident and severe accident management policy and procedures; and
- supporting infrastructure information external to the site and the exclusion zone; this information should show that emergency response within and external to the site will be sustainable for the facility's lifecycle. (REGDOC.-1.1.1 - Appendix F2.1)

5.4.4 Assessment of non-malevolent nuclear accidents and malfunctions

The information considered must be in line with level of plant design information available at each licensing phase while considering later licensing risks. The CNSC will consider application of a graded approach to safety analysis and facility design in certain areas where the proponent can demonstrate that risk is low for the facility type being considered. (REGDOC.-1.1.1 - Appendix F.2.2)

Identification and classification of accidents

Continuing site evaluation must include consideration of unplanned events involving the reactor which challenge the performance of the safety functions and lead to radiological releases and releases of hazardous substances to the environment.

The proponent's information must identify and describe the principal types of accidents in the categories described below including the rationales for selecting these sequences as representative accidents.

Events involving the nuclear reactor are classified as follows:

- anticipated operational occurrences;
- design-basis accidents; and
- beyond-design-basis accidents, including severe accidents.

For site evaluation carried out in support of licensing (including emergency planning purposes), the proponent must address severe accident sequences.

Calculation of accident consequences

The proponent must assess the representative accident sequences in these categories of accidents to determine releases of fission products and the potential releases of nuclear and hazardous substances from the facility.

For anticipated operational occurrences and for design basis accidents, the proponent's information must demonstrate that designs would be capable of meeting the dose limits specified in REGDOC.-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants*.

The proponent must document the potential offsite releases of radioactive products from representative severe accident sequences.

The proponent must describe:

- the source term (for example, list of radionuclides, magnitude and timing of the release);
- a description of the process followed to arrive at the final list of radionuclides; and
- where applicable, a justification of the basis for screening out radionuclides that are not included.

Meeting safety goals

The proponent must consider quantitative safety goals to ensure that the individual and societal risks to life and health posed by the facility to the public living nearby must be comparable or less than the risks of viable competing technologies, and must not significantly add to other societal risks.

The proponent's information must demonstrate that the design is capable of meeting safety goals.

Guidance

The proponent should describe the results and insights from analyses regarding the representative accident sequences used to define the safety goals.

Two safety goals are defined to protect the environment and the health and safety of the public:

- Small release frequency:
  - addresses releases of radioactive material that would trigger temporary evacuation of the population within a few kilometres of the plant to prevent unacceptable health effects resulting from limited reactor core damage with impaired containment, and
  - the sum of frequencies of all event sequences that may lead to a release that could trigger temporary evacuation must be less than 1:100,000 per reactor year.
- Large release frequency:
  - addresses releases of radioactive material that could require long-term relocation of the public to prevent unacceptable health effects resulting from severe reactor core damage and containment failure, and

- the sum of frequencies of all event sequences that may lead to a release that could require long- term relocation of the public must be less than 1:1,000,000 per reactor year.

5.4.5 Prediction of non-malevolent radiological accidents and malfunctions occurring outside the reactor core and out-of-core nuclear criticality safety

The information considered must be in line with the level of plant design information available at each licensing phase while considering later licensing risks. The application of a graded approach to safety analysis and facility design may be adequate in certain areas where the proponent can demonstrate that risk is low for the facility type being considered. (REGDOC.-1.1.1 - Appendix F.2.3)

Identification of the source, quantity, form and characteristics of nuclear and hazardous substances

To support the site evaluation case around the discussion of non-malevolent radiological accidents and malfunctions occurring outside the reactor core and out-of-core nuclear criticality safety, the proponent must provide a documented description of all major systems, other than the reactor, that contain nuclear and hazardous substances that could be released in the environment in significant quantities during an accident at or near the reactor facility. The description must include the quantity, form and characteristics of nuclear and hazardous substances that could be released.

In some cases, separate facilities on the site may be available that will support the reactor facility (for example, wet storage bay, fresh fuel storage, nuclear waste handling and storage facilities). For each of these facilities, accurate records of inventory must describe the types and quantities of nuclear and hazardous substances to be contained in the facilities.

Guidance

The proponent should also identify the radioactive sources where direct radiation may be an environmental hazard in accident conditions.

Identification of accidents and malfunctions

The proponent must characterize unplanned occurrences not involving the reactor and that may lead to releases of nuclear and hazardous substances to the environment. This characterization process includes accidents with sufficiently low frequency leading to public evacuation or relocation.

The characterization process must identify and describe the principal types of accident and their frequencies, and the rationales for selecting these sequences as representative.

For site evaluation carried out in support of licensing (including emergency planning purposes), the proponent must address severe accident sequences.

Calculation of releases to the environment

The proponent must assess the representative accident sequences in these categories of accidents to determine the potential releases of nuclear and hazardous substances from the facility. The assessment must describe:

- the radiological source terms, including the limiting source terms (for example, list of radionuclides, magnitude and timing of the release);
- the process followed to arrive to the final list of radionuclides; and
- where applicable, a justification of the basis for screening out radionuclides that were not included.

The proponent must demonstrate that the accident frequencies are well below the frequency limit of:

- 10-5 for the small release frequency safety goal for evacuation; or
- 10-6 for the large release frequency safety goal for relocation.

Additional characterization information regarding out-of-core criticality safety

The proponent must describe out-of-core criticality events, taking into account mitigation measures. Requirements for nuclear criticality safety are described inREGDOC.-2.4.3, Nuclear Criticality Safety.

Guidance

The proponent should consider the criteria in the following documents as triggers for a temporary public evacuation and relocation:

- REGDOC.-2.4.3, *Nuclear Criticality Safety*;
- REGDOC.-2.10.1, *Nuclear Emergency Preparedness and Response, Version 2*;
- CSA N1600, *General requirements for nuclear emergency management programs*;
- *Canadian Guidelines for Intervention During a Nuclear Emergency*; and
- IAEA GS-R-2, *Preparedness and Response for a Nuclear or Radiological Emergency.*

5.4.6 Prediction of accidents and malfunctions events due to malevolent acts

The proponent must consider the information in line with the level of facility design information available at each licensing phase while considering later licensing risks. (REGDOC.-1.1.1 - Appendix F2.4)

Certain information for this area may be considered to be prescribed information, as per section 21 of the *General Nuclear Safety and Control Regulations*, and require an increased level of information security and protection.

The proponent must use a systematic process to identify, assess and screen postulated malevolent acts and their consequential event sequences. The proponent must describe site-specific design-basis threats and beyond-design-basis threats, along with the appropriate safety goals and functional requirements that will be met.

, The proponent must consider the following items in the establishment and maintenance of the bounding site and facility parameters:

- while intentional malevolent acts are not accidents, environmental effects resulting from malevolent acts should be compared with the effects identified for conventional and radiological accidents and malfunctions;
- site-related information contained in the site selection threat and risk assessment (SSTRA) report that may have a bearing on the events;
- events that may involve radioactive or nuclear material in and out of the core;
- events that may involve quantities of hazardous substances, with the potential to create significant environmental effects; and,
- events that may involve the large release of energy, with the potential to create significant environmental effects.

For each of the event sequences postulated, the proponent must consider:

- source, quantity, mechanism, rate, form and characteristics of contaminants and other materials (physical, chemical and radioactive) likely to be released to the surrounding environment during the postulated event;
- mitigation means and measures, including the proponent’s policy, processes, procedures and plans to mitigate, prepare for, respond to, and recover from emergencies for malevolent act event sequences (including security needs);
- contingency, clean-up or restoration work in the surrounding environment that would be required during, or immediately following, the postulated malevolent initiated event sequence;
- measures, provisions and safeguards to protect against the postulated malevolent act event sequence;
- event or accident management policy and procedures for design basis events;
- beyond-design-basis malevolent initiated event sequences; and
- supporting infrastructure external to the site (exclusion zone).

This process may use the consequence analysis of non-malevolent events used in the assessment of the effects of the site activities on the environment.

Identification and classification of accidents

The proponent should identify and classify malevolent acts resulting in accidents in consideration of:

- conventional accidents and spills;
- fires and explosions;
- internally and externally generated missiles;
- human error;
- human manipulation of SSCs;
- equipment failure or malfunction;
- failure of pressurized components or cylinders;
- airplane crash;
- transportation initiated or related events;
- release or dispersion of radioactive or nuclear material; and
- flooding.

Calculation of accident consequences

The proponent must calculate releases of nuclear or hazardous substances for a limited number of events representative of bounding or limiting credible accidents and malfunctions of malevolent origin. The proponent must perform consequence analyses as part of demonstrating that safety goals are met.

6. Security Baseline Data – Security Risks Presented by the Site's Location

Characterization information related to this topic must be considered to be prescribed information under the *Nuclear Safety and Control Act* (NSCA) and be adequately protected. (Appendix D of REGDOC.-1.1.1 has been incorporated into section 6)

The Agency will collaborate with the CNSC to ensure submission of the SSTRA report and management of this information for the purpose of the integrated assessment, complies with its nature as prescribed information and is adequately protected.

Guidance and requirements for the development of the SSTRA are integrated in Part 1 – Tailored Impact Statement Guidelines, section 11. *Security Considerations*.The following subsections provide additional guidance for the development and management of SSTRA information.

Guidance

For guidance on the proposed format of the SSTRA report, the proponent's security organization should contact the CNSC's Directorate of Security and Safeguards at cnsc.info.ccsn@cnsc-ccsn.gc.ca.

6.1 Site selection threat and risk assessment management

The SSTRA report must describe the proponent's organization that provided oversight for the SSTRA process.

Guidance

The description should demonstrate the organization's technical capability to perform the assessment and assess mitigation measures, and include:

- the composition of the team, member names, titles, position in the organization, area of expertise or input to the report, relevant qualifications and experience; and
- contributing organizations or subject matter experts not identified as team members or intelligence sources.

6.2 Quality assurance of the site selection threat and risk assessment

The SSTRA report must describe how the SSTRA was developed under a quality assurance or management system that is designed to continually improve performance based on established principles.

Guidance

The SSTRA report should describe the following elements necessary for verifying the quality of the SSTRA:

- methods of verifying accuracy and completeness of data;
- descriptions of assumptions and interpretations of legal guidance;
- methods of documenting storing and retaining SSTRA basis records for future security analyses; and,
- details of the program or process to periodically review and update the SSTRA with a goal of merging processes into the future site threat and risk assessment analysis process.

6.3 Policies and procedures

The SSTRA report must identify security policies, procedures, standards, guides or related documentation that provide the basis for the management and conduct of the SSTRA.

Guidance

The SSTRA report should identify procedures and processes that may require development based on SSTRA findings.

6.4 Description of the site selection threat and risk assessment methodology

6.4.1 Analysis methods

Methods of performing the SSTRA must be described, including:

- process flowcharts, with SSTRA critical phases identified and described;
- descriptions of the theoretical frameworks or types of risk analysis methodologies used (for example, fault trees, CARVER or other attack modelling software); and
- descriptions of assessment considerations or limitations.

6.4.2 Intelligence sources

Intelligence sources used to gather threat related data in support of the SSTRA should be identified, including:

- government sources,
- threat trending and analysis,
- local sources,
- law enforcement sources, and
- non-governmental sources of intelligence-related data.

6.5 Results of the analysis

6.5.1 Information about the site

Guidance

The site location should be described using illustrations (including topographical maps) of all threat environments, risks or vulnerabilities presented by the location of the site.

Information about the site should include:

- for the application for a licence to prepare site:
  - a layout of all configurations of site structures being considered,
  - proximity to provincial or national borders, and
  - location of the nearest communities.
- for all licensing phases:
  - a description of safeguard requirements,
  - landscape features overlooking the site (topographical details),
  - proximity to access roads (including road size, traffic patterns and bounding vehicle types),
  - proximity to rail corridors (including traffic patterns and cargo characteristics),
  - proximity to water and navigable water routes (including traffic patterns, and cargo characteristics and bounding ship types),
  - proximity to airports and air access routes (including traffic patterns and bounding aircraft types)
  - proximity to publicly accessible areas or buildings around the site, and
  - specific details of industrial operations surrounding the site and threats they may present to the site.

6.5.2 Identification of threats and resulting risks that could affect the site

Descriptions of threats and resulting risks must be documented with the full-project lifecycle in mind for areas on or near the site including vulnerabilities due to forecasted changes in land use:

- vulnerabilities from landscape features,
- vulnerabilities from water approaches,
- vulnerabilities from land approaches,
- areas where visibility or detection methods may be affected by weather-related events such as snow and fog,
- areas where blind approaches require additional security mitigation,
- areas where blockades might make the site vulnerable, and

- areas where normal public access might distract security staff with nuisance alarms/alerts that provide unnecessary diversion of security personnel from other areas.

For deliberate threat events to the site, a description of the various threat agents must be documented, including an assessment of organizational capabilities, motivations, and equipment. The likelihood of the threat events being realized by threat agent action must be analyzed.

The SSTRA report must contain all relevant intelligence data related to threat agents and events to support conclusions. For non-deliberate threat events, a brief description of the event must be documented, including a description of the potential vulnerability concerns and estimates of event occurrence based upon historical and statistical data.

Guidance

Consideration should be given to the target suitability, feasibility of the action, and acceptability to the threat agent.

Postulated events should be identified for each threat, including events that could cause loss of or harm in the site preparation or construction phase. These events should be categorized as deliberate or non-deliberate. The bounding postulated events and accompanying rationale should be identified.

6.5.3 Mitigation of identified threats and risks

The SSTRA report must identify:

- risk acceptance criteria developed and employed to manage the threat; and
- at a high level, possible mitigation measures and countermeasures for each threat, as appropriate for the likelihood of the threat events.

An explanation of the amount of risk reduction expected when proposed countermeasures or security measures are implemented to reduce the risk to an acceptable level must be documented.

Guidance

For each proposed mitigation measure, the explanation should include residual security risks remaining after mitigation, so as to ensure that residual risks will not present unreasonable challenges to the future site security program (for example, mitigation may result in new security enhancements that were not anticipated).

6.6 References used in the site selection threat and risk assessment

Guidance

All references used as the basis for the SSTRA should be listed and include:

- policies, procedures and guidelines;
- industry references; and
- contributory reports.

Classified source information should be listed by referencing the title, author, date and source agency.

Appendix 1 – Additional Guidance

[This appendix may be removed from project-specific TISGs.]

This appendix contains guidance on how to address the requirements outlined in the main body of the Guidelines. As relevant, the proponent should demonstrate how guidance or technical recommendations were used or provide a rationale as to why it is not applicable, feasible, or why different approaches were found more adequate.

List of project components & activities

The list of project components and activities, as required in section 3.4 Project components and activities, should focus on those with the greatest potential to have environmental, health, social 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 population groups within communities.

Project components and activities should include the following elements, as relevant:

6.6.1 Project components

Common project components

- water management infrastructure to divert, control, collect and discharge surface drainage and groundwater discharges to the receiving environment, including collector ditches, groundwater interception wells, sedimentation ponds, sumps, and pump and pipeline systems;
- treatment facilities for potable water, sewage, wastewater and effluent (including proposed treatment technologies, footprint, location, discharge locations);
- material stockpiles including hazardous waste, fuel storage tanks, and explosives warehouses;
- waterbody diversions or realignments;
- crossings of waterbodies and watercourses, including bridges and culverts;
- construction workspace and laydown areas;
- temporary or permanent infrastructure, including administration buildings, warehouse, garages, maintenance offices);
- sources of drinking and industrial water;
- energy supply source;
- waste disposal (types of waste, methods of disposal, quantity, disposal sites or facilities);
- site access roads or routes;

- temporary or permanent worker accommodations;
- borrow pits and quarries;
- fences and barriers; and
- any other infrastructure relevant to the project.

Onshore linear Infrastructures

- permanent and temporary linear infrastructures such as road, railroad, pipelines, power supply, primary electrical transmission lines;
- compression and pumping stations; and
- bridges, stream and river crossings.

Nuclear facilities

- nuclear generating stations;
- water cooling systems for nuclear reactors, including intake and discharge structure
- nuclear waste transfer and storage; and
- waste management and storage facilities for low and intermediate level radioactive waste and used fuel.

Marine

- breakwaters and erosion protection structures;
- floating or bottom-fixed drilling installations and/or production platforms;
- work over and intervention vessels;
- subsea installations, including subsea templates, production wells and gathering flow lines;
- breakwaters and erosion protection structures;
- marine transportation;
- mooring systems;
- port or marine terminal infrastructure and facilities, including any components that will be constructed in support of the project; and
- navigation activities, size and type of product transport and supply vessels.

6.6.2 Project activities

Site preparation and construction

- construction staging;

- surveying and staking;
- site grubbing, clearing and excavation, including tree and vegetation removal;
- excavation and salvage of topsoil, soil and bedrock, and rocky substrates including potentially acid-generating and metal-leaching materials;
- management of excavated materials, including potentially acidogenic or leachable materials;
- blasting (frequency, duration, time of year, time of day and methods);
- explosives manufacture, transportation, storage and management;
- construction of access roads;
- clearing of transmission corridor and construction of powerline to site;
- construction of site fencing;
- changes to existing infrastructure (e.g. relocation of pipelines);
- transportation and management of borrow materials requirement (source and quantity);
- storage areas for material stockpiles;
- water management, including water diversions, dewatering or deposition activities, storm water management, site drainage, runoff management and sediment or erosion control;
- water management to divert, control, collect and discharge surface drainage and groundwater seepage to the receiving environment, including collector ditches, groundwater interception wells, sedimentation ponds, sumps, and pump and pipeline systems;
- construction of nuclear facility foundation structures (including support pilings);
- construction of nuclear facility intake and outlet channels and structures (e.g. cooling ponds, cooling towers and related connections to the ultimate heat sink);
- construction of non-nuclear facility structures, systems and components for which the design will be independent of the reactor technology (or technologies) being considered and sufficient for any reactor technology proposed for the site.
- water requirements for project construction, operation, decommissioning and closure, including estimate of quantities needed;
- management and treatment of wastewater and discharge points;
- water for pressure testing;
- operation of light duty, heavy-duty and mobile off-road equipment (type, quantity);
- construction of temporary or permanent infrastructure;
- establishment of worker accommodations (capacity, wastewater treatment);
- transportation of employees;
- storage, gestation, disposal and management of hazardous materials, fuels and waste (indicate types, methods and amounts); and

- marine and/or port related dredging.

Include for capital and maintenance dredging:

- the location, depth, surface area, volume and nature of the sediment (physical and chemical characteristics) to be dredged;
- dredging methods (e.g. equipment used, duration and frequency);
- management of anticipated dispersion plume of sediment that could be re-suspended during dredging or open-water disposal (if applicable);
- measures to prevent sediment resuspension;
- sediment management plans (open-water or terrestrial disposal); and
- sediment transportation modes to the construction or disposal sites, including management of dewatering basins, if necessary.

Include for open-water disposal activities of dredged sediments, if applicable:

- rationale for the choice of the site and specifying the land area used;
- particle size distribution; and
- the nature of sediments (physical and chemical characteristics).

Include for terrestrial disposal sites or dewatering basins, if required:

- the size, location, type, volume and the level of contamination of sediments to be stored.

Operation

- drilling and blasting, explosives manufacture, storage and use;
- seismic and vertical seismic profiling;
- management and disposal of wastes onshore and offshore;
- at-sea transfers of bulk materials;
- nuclear waste transfer and storage;
- storage, handling and transport of materials;
- use and maintenance of access roads;
- water management, including water diversions, site drainage and runoff management, sediment and erosion controls, site dewatering, potable water, water use requirements, storm water, process water, wastewater, water recycling and effluent treatment (quantity, treatment requirements, release point(s) and receiving waterbodies);
- storage and handling of reagents, petroleum products, chemical products, hazardous materials and residual materials;
- mine waste management, including tailings, waste rock, ore, overburden and topsoil;

- waste management and recycling (other than mine waste such as tailings and waste rock);
- workforce management, including transportation, work schedules and lodging
- dredging and maintenance dredging;
- marine navigation activities; and
- ocean disposal, methods and disposal locations.

Suspension, abandonment or decommissioning

- preliminary outline of a suspension, abandonment, decommissioning or reclamation plan for any components associated with the project;
- the ownership, transfer and control of the different project components;
- site restoration;
- removal of surface contamination from facilities and equipment;
- dismantling and removal of equipment and systems;
- demolition or disposition of buildings and ancillary structures;
- long-term care, monitoring and maintaining the integrity of the site, including site drainage and water management, and any remaining structures;
- transfer of fuel and associated wastes to interim and long-term licenced storage facilities (including nuclear facilities); and
- suspension, abandonment or decommissioning for temporary or permanent facilities.

Sources of baseline information

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

- Government of Canada's Open Science and Data Platform. This online, public platform provides access to government sources of science, data, publications and information about development activities across the country that are relevant to understanding cumulative effects. The platform can help identify relevant data and scientific articles in one online location, and be a source of open data available for download;
- field studies, including site-specific survey methods;
- database searches, including federal, provincial, territorial, municipal and local data banks, including for example:
    - eBird Canada,
    - Breeding Bird Survey (BBS),

  - Christmas bird counthttps://netapp.audubon.org/CBCObservation/Historical/ResultsByCount.aspx,
  - Birds Canada's Canadian Migration Monitoring Network,
  - Nature Counts,
  - iNaturalist,
  - Neighbourhood Bat Watch, and
  - Bird Conservation Regions and strategies;
- land cover data, such as forest cover maps, or remote sensing data for important habitats features and important characteristics;
- research programs of regional industry, resource or species-specific committees;
- protected areas, watershed or coastal management plans;
- 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);
- published literature;
- environmental assessment documentation, including monitoring reports, from prior projects in the area and similar projects outside the area;
- regional studies or assessments, 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, surveys;
- qualitative information gathered from interviews, focus groups or observation;
- census data;
- human health impact assessments or risk assessments;
- information available from Canadian Institute for Health Information under Community and Health System Characteristics;
- community and regional economic profiles; and
- statistical surveys, as applicable.
- [Include any project specific data sources that the proponent may want to consult].

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

Establishing spatial and temporal boundaries

The following guidance is supplement to the requirements in section 7.3 Spatial and temporal boundaries.

The study area boundaries must encompass the spatial boundaries of the project, including any associated project components or activities, and the anticipated boundaries of the project effects. The proponent should consider the following areas in assigning appropriate spatial boundaries:

- areas potentially impacted by changes to water quality and quantity or changes in flow in the watershed and hydrologically connected waters;
- areas potentially impacted by airborne emissions or odours;
- air zone(s) and airsheds under the Air Quality Management System;
- local major emission sources;
- areas of importance to people, including recreational areas;
- International and provincial or territorial borders which require transboundary assessment;
- modelling domain size based on isopleths resulting from the project-only case that represents 10% of the appropriate jurisdictional ambient air quality criteria (within the limits of validity of the model);
- areas within the range of vision, light and sound;
- the locations and characteristics of the most sensitive receptors or areas;
- species habitat areas, usage timing and migratory patterns;
- emergency planning and emergency response zones;
- the geographic extent of local and regional services;
- any affected communities;
- all potentially affected Indigenous groups;
- areas of known Indigenous land,[18] cultural, spiritual and resource use; and
- existing affected infrastructure.

For biophysical VC, spatial boundaries should be defined using an ecosystem-centered approach. See document Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012 (2014) for more information on establishing spatial boundaries).

[18] Indigenous lands may encompass reserve lands, traditional territories and/or treaty lands.

For habitat-related VCs potentially affected by the project, a land cover analysis, including freshwater and marine environments, should be conducted to determine appropriate ecological boundaries and buffer distances around the project area. The spatial extent of habitat and habitat functions should influence the determination of an appropriate LSA and RSA. 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.

Where a VC is a species, the LSA should correspond to the project study area plus a buffer defined in consideration of direct and indirect project effects to species including habitat effects, changes to connectivity, alteration of predator/prey dynamics, mortality, sensory disturbance and pollution. Use simulation modelling to help define buffers that address the species or species group being assessed. The proponent may contact federal, provincial and/or local government authorities to verify appropriate boundaries for wildlife species.

Spatial boundaries should consider the location of sensitive receptors, which may include:

- vulnerable individuals or diverse population groups, (e.g. individuals with compromised health, children, pregnant women, seniors);
- residences, health and social services institutions (e.g. hospitals, long-term care facilities, seniors' residences);
- educational institutions (e.g. schools, daycare centres, early childhood centres);
- tourism establishments (e.g. tourism information offices, museums, ski areas, summer camps, outdoor recreation areas, camp sites);
- recreational areas (e.g. recreational land, urban parks, parks and conservation areas);
- areas for the exercise of the rights of Indigenous Peoples; and
- sensitive wildlife species or habitats (e.g. soil types or areas with historical loading or poor buffering, important areas of wildlife use, harvesting activities).

The temporal boundaries of the impact assessment should span all phases of the project. If potential effects are predicted after project decommissioning or abandonment, this should be taken into consideration in defining specific boundaries. Define temporal boundaries in a manner that enables detection of all species that use the Project Area, LSA and RSA throughout the year and from one year to another, and to estimate their temporal pattern of use (e.g. breeding, migrants stopping on northward and/or southward migration). Temporal boundaries spanning more than one year will enable accounting for variation due to irregular events (e.g. masting events, storms on migration, late snowfalls).

Developing mitigation and enhancement measures

The mitigation hierarchy presents three options for types of mitigation measures, in descending order of preference:

- 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; and
- 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 restore degraded habitat conditions. These include measures referred to as replacement, restoration or (financial) compensation.

As a first step, the proponent should 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.

Enhancement measures for positive effects are not necessarily required to mitigate negative effects, but are measures that may be developed to make use of opportunities presented by the project to contribute to, for example, local and regional training efforts, investment in infrastructure and services, projects to rehabilitate degraded environments. Measures are to be specific, achievable, measurable and verifiable, and described in a manner that avoids ambiguity in intent, interpretation and implementation.

The proponent is encouraged to work with the community to align project goals with an aim to enhance positive project effects. Such an approach may include the modification of the design of the project or relocation of project components.

Compensation and offset plans

Where compensatory or offset measures are proposed to mitigate effects , the Impact Statement must include the compensation or offset plans for consideration during the impact assessment process.

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 mitigation hierarchy 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 habitat functions gained at the compensation site(s);
- Provide evidence that habitat functions can be replaced by the proposed offset activities;
- 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 Peoples were involved in the development of the compensation plans. The proponent must demonstrate how the information received from Indigenous Peoples has been taken into account, including the choice of compensation ratios, if applicable. The proponent must also elaborate on how Indigenous Peoples 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 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;
- compensate lost wetland functions on-site if site conditions are suitable for 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).

For **fish and fish habitat**, each offsetting plans should include:

- an exact location for the proposed measures of the project (e.g. latitude and longitude, lot number, municipality, regional municipality county) and property rights;
- baseline information including a description of the environment (e.g. biological, hydrological, physical, chemical), an estimation of the 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 (e.g. nature, extent, method, timetable);
- 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 (e.g. parameters, frequency, duration) 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), 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.

Offsetting plans and monitoring programs for fish and fish habitat should be developed using standard Fisheries and Oceans Canada (DFO) guidance:

- A review of functional monitoring methods to assess mitigation, restoration, and offsetting activities in Canada;
- Assessing the Effectiveness of Habitat Offset Activities in Canada: Monitoring Design and Metrics;
- Equivalency metrics for the determination of offset requirements for the Fisheries Protection Program; and
- Policy for applying measures to offset adverse effects on fish and fish habitat under the Fisheries Act.

Guidance for biophysical components

6.6.3 Atmospheric, acoustic and visual environment

The following guidance should be consulted in conjunction with section 8.6 Atmospheric, acoustic and visual environment:

- project sources of air pollutant emissions should include the following types of sources:
  - point sources: including but not limited to power generation equipment (i.e. gensets), turbines, compressor engines, incinerators, exhaust vents and stacks from processing facilities, ventilation vents, boilers and other heating equipment, flares, docked marine vessels, idling train engines and other transport vehicles, fugitive emissions from storage tanks and leaks for gas pipes and other equipment. This should also include start-up and shut-down emissions, as appropriate,
  - area sources: including drilling and blasting activities, material handling (e.g., loading and unloading of transport trucks), material transport, wind erosion of waste rock piles and stockpiles, fugitive emissions from exposed mine faces, fugitive emissions from process areas and tailings management areas, and dust emissions from paved and nonpaved roads. Fugitive dust emission factors and expected fugitive dust mitigation (control effectiveness) should be described and justified to the extent practicable,
  - mobile/road sources: including tailpipe emissions and fugitive dust emissions. Fugitive dust emission factors 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, and
  - emissions from project-related vessels and their tugs in transport along the entire marine shipping area, and rail transport;
- baseline data should be taken from existing or new long-term monitoring with representative monitoring data, collected over an appropriate duration (multi-year) and geographic scope;
- if long-term monitoring data are not available, then other techniques may be acceptable on a case-by-case basis – with a rationale provided – including:

- limited or short-term monitoring,
- data from a surrogate site that has similar meteorological and air quality to represent the site in question,
- results of existing large scale modelling, and
- dispersion modelling to indicate spatial distribution of contaminants;

- for requirements pertaining to the use of atmospheric dispersion modelling, the proponent should
  - assess four scenarios in the air quality assessment, namely: i) baseline conditions (i.e., the reference case); ii) project only (with and without mitigation); iii) baseline conditions plus project; and iv) cumulative effects or future development, if applicable;
  - conduct modelling for an appropriate time period to account for variability in meteorology and baseline conditions, and use the most recent meteorological and emissions data available,
  - conduct dispersion modelling for all relevant temporal scenarios i.e., construction and operation scenarios. The modeling for the construction phase should represent the conditions that will maximize the impact on air quality. For the operation phase, it is also important to select a year in which air quality impacts are at their maximum;
  - conduct modeling of fugitive emissions with and without mitigation measures to assess the impact of these measures on air quality and particulate matter deposition at sensitive receptors. In particular, modeling of particulate matter emissions from unpaved roads should be performed with and without mitigation measures. Various mitigation control efficiency scenarios should be modeled, such as with control efficiencies of 0% (no mitigation or worst case scenario), 50%, and 70%
  - use appropriate domain boundaries and identify transboundary considerations. At a minimum, the modelling domain should enclose concentrations that are 10% of relevant air quality criteria, and
  - use an air quality model that is appropriate for the complexity of the terrain, sources and meteorology.

The proponent may engage with experts at ECCC to inform the choice of program to conduct regional air quality modelling of acidifying deposition rates.

6.6.4 Wetlands

The following guidance should be consulted in conjunction with section 8.8 Vegetation, riparian and wetland environments.

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

- complete this assessment for a representative selection of wetlands that the project would directly impact and 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 RSA;
- be as specific as possible to the biological characteristics of the wetland and to the ecological services and functions it provides;
- collect data from representative wetlands 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), including:
    - design surveys in support of the assessment so that they represent the spatial and temporal targets of modelling 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 effects at the appropriate spatial and temporal scales, any departures from predictions, and the effectiveness of mitigations. Justify the selection of modelling techniques based on current and recent scientific literature, and
    - plan survey protocol for representative wetlands to include modelling 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 LSA and RSA. Appropriate design of surveys will need to consider multiple survey locations in order to represent the wetland heterogeneity of the RSA, and to yield multiple survey locations per wetland type, without requiring aggregation of habitat classes post-hoc;
- incorporate the value of wetlands from an Indigenous perspective and existing disturbance when making proposals for wetland offsets;
- 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,
    - 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), and

- the 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;

- consider submitting complete data sets from any survey sites, including GIS files; 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.

6.6.5 Fish and fish habitat

- The following guidance should be consulted in conjunction with section **Error! Reference source not found.** Fish and fish habitat, as relevant to the establishment of baseline conditions:
- for watercourses, it is recommended that the description be provided on the basis of homogenous section. Parameters to be measured may include: length of the section, wetted width at the ordinary high water mark (Ordinary High Water Mark , depth, streamflow types and characteristics (depth, velocity, turbidity, peak and low flows), substrate type (shoreline and bottom), aquatic (e.g. grass flat) and riparian vegetation, natural (e.g. significant vertical drop, waterfalls, subsurface flow over large distances), and anthropogenic barriers (e.g. stream crossing structures) that impede or obstruct free passage of fish. The obstacles must be documented (e.g. size, condition) and their passability by fish must be assessed;
- Ordinary High Water Mark is the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (e.g. rivers, streams) this refers to the “active channel/bank-full level” which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water-body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (i.e. full supply level);
- for waterbodies, the parameters to be measured include, but are not limited to, size, bathymetry, littoral, sublittoral, bathyal, epipelagic, mesopelagic, bathypelagic zones, maximum 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, salinity); and
- baseline measurements of contaminants should be provided for the complete fish food web (including water, sediment, benthic invertebrates, prey fish), and include carbon and nitrogen stable isotope

measurements in fish and the complete fish food web (REGDOC.-1.1.1 - Appendix G.5.1). These measurements should then be used to inform the assessment of effects from contaminants, including bioaccumulation of contaminants, in fish downstream of the project.

- For potentially affected fish, the proponent should:
- first, use existing information (e.g. the Fish and Wildlife Internet Mapping Tool, accessible regional reports, primary literature, fisheries management objectives, information from consultation and engagement activities, Indigenous Knowledge affected by the project). Existing information should be supplemented using field data collection as necessary to support the assessment, and as relevant to validate predictions and mitigation success in the future; and
- perform field data collection programs in a representative number of locations (including reference locations where applicable), using sampling methods appropriate to the aquatic system, and should be performed in multiple seasons.

With respect to the assessment of effects on fish and fish habitat, the proponent should:

- present potential habitat alteration, disruption and destruction on maps at appropriate scales, as well as in the form of tables;
- include changes to surface water conditions resulting from changes to groundwater quantity and discharge location. The Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada should be used to guide this aspect of the effects assessment;
- refer to standard metrics for changes in habitat quality and quantity to choose an analysis that is appropriate to the type and scale of effects (see A framework for assessing fisheries productivity for the Fisheries Protection Program). For example, broader, ecosystem-wide effects may require a modelling approach. 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; and
- consider that the effects of chronic and acute disturbances to fish populations are often dependent on the state of the fish population. If the fish population is already quite depleted, the effect of an acute disturbance may have a disproportionate effect on the population.

6.6.6 Birds and bird habitat

The following guidance should be consulted in conjunction with**Error! Reference source not found.** Birds, m igratory birds and their habitat:

- the proponent should consider and assess the following groups of migratory and non-migratory birds separately: waterfowl, water birds (other than waterfowl), songbirds, shorebirds, each bird species at risk and their habitat;
- avian surveys should be designed based on a thorough review of the available scientific literature pertinent to the specific region, bird groups and anticipated effects;

- in order to establish adequate baseline conditions for birds, the proponent should take into account the following technical recommendations:
    - collect data to account for natural variability among years, within and among seasons, and within the 24-hour daily cycle,
    - collect data in a manner to allow for reliable extrapolations in space (i.e. at a minimum in the project area, LSAs and RSAs) and in time (i.e. over the years),
    - design surveys so that they represent the spatial and temporal targets of modelling 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 modelling techniques based on current and recent scientific literature,
    - survey protocol planning should include modelling 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,
    - use spatially balanced and randomly chosen sampling sites, preferably using stratified random sampling that covers all habitat types. When major habitat edges are identified, sampling should be designed such that it is possible to sufficiently describe the importance not only of the types of habitat, but also of the edges between the types of habitat,
    - have sufficient sampling effort and sampling locations to reflect variability among habitat type in the project, LSAs and RSAs, with more intensive sampling effort:
        - in the project area;
        - in areas or habitats more likely to be affected by the project; and
        - for rare species that may be harder to detect,
    - take into account detection errors and provide unbiased estimates of abundance and distributions using, as appropriate, simulation modelling in study design, and
    - provide estimates of confidence or error for all estimates of abundance and distribution. Estimates should be defined (e.g. mean across years, mean across sites, modeled prediction) and, if appropriate, confidence or other intervals should be defined (e.g. 95% confidence intervals, credible intervals);
- where predictive modelling is required, provide the explanatory data (e.g. covariables such as associated land cover) required to predict effects on bird groupings (e.g. changes in abundance, distribution or other relevant effects) collected in such as way as to represent the following sources of variation where applicable: spatial variation in land cover composition, soil type, geomorphology, hydrological processes, and inter-annual and intra-annual climate variability;

- when selecting metrics to characterize avifauna biodiversity, it is recommended that:
  - biodiversity metrics 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 identifying areas of concentration of migratory birds, the following must be considered:
  - migratory bird concentrations can vary within a year and between years. It is therefore important to survey across the project study area, LSA, and RSA both temporally and spatially, 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;
- baseline description of bird habitats should include, at a minimum, characterization of biophysical conditions with regard to ecoregion and BCR, taking into account the specific conditions found near the borders of these regions;
  - habitat surveys need to be detailed enough within the LSAs and RSAs to provide context for local and regional habitat availability and quality, and
  - 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 with adjacent mixed wood forest are another relatively uncommon feature that should be clearly identified;
- 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,
  - explore, wherever possible, non-linear, indirect and synergistic responses to the project,
  - produce defendable forecasts of effects on bird species or groupings and of the effectiveness of mitigation measures, and

- justify any assumptions regarding relocation or temporary displacement during construction and operation of the project by using scientific references. 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.

The proponent should consult:

- *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;
- Government of Canada's guidance on the website Avoiding harm to migratory birds to characterize effects on birds in terms of amount, duration, frequency, and timing of disturbances; and
- Guidelines to reduce risk to migratory birds and ECCC's website on General nesting periods for migratory birds to inform the development and application of mitigation measures
  - note that although the nesting period dates on ECCC's website cover the main nesting periods of migratory birds, in order to reduce the risk of taking nests or eggs, it does not authorize the disruption, destruction or taking of a migratory bird, its nest or its eggs outside these periods.

The description of bird species and their habitat in the study areas may be based on existing sources, but supporting evidence is required that demonstrates that the data used are representative of the avifauna and habitats in the study areas. Existing data must be supplemented by surveys, if required to produce a representative sample of the avifauna and habitats of the study areas.

6.6.7 Wildlife and species at risk

The following guidance should be consulted in conjunction with section 8.9 Terrestrial wildlife and wildlife habitat and for section 8.10 Species at risk and their habitat.

In order to establish adequate baseline conditions for wildlife, take into account the following technical recommendations:

- collect data to represent sources of temporal variation between years, during and between seasons (e.g. spring migration, breeding, fall migration, wintering), and in the daily 24-hour cycle;
- consider that 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;
- survey protocol planning should include modelling 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,

  - if existing data are available for the study areas, it can be used to complement the data collected in the field. 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 a large number of sites to represent the heterogeneity of RSA habitat and to plan the number of sites by land cover or by habitat class so that aggregation of post hoc habitat classes is not necessary,
  - 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 species within that zone. Efforts outside the project study area should be carefully designed to ensure that estimates comparing 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;
- 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.

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; 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).

The proponent should contact provincial or local government authorities to determine additional data sources and survey methods.

A permit under SARA must be previously obtained for surveys on federal lands that are likely to harm, harass, capture or kill species at risk, other than migratory birds.

Appendix 2 – Resources and Guidance

[This appendix may be removed from project-specific TISGs.]

Atmospheric, acoustic and visual environment

Air Quality Management System (AQMS) and the Canadian Ambient Air Quality Standards (CAAQS). Canadian Council of Ministers of the Environment (CCME). Available at https://ccme.ca/en/current-activities/air

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Environmental Code of Practice for the Measurement and Control of Fugitive VOC Emissions from Equipment Leaks. Canadian Council of Ministers of the Environment (CCME). 1993. Available upon request to CCME.

A National Commitment to Pollution Prevention. Canadian Council of Ministers of the Environment (CCME). 1993. Available upon request to CCME.

ISO 12913-1:2014 Acoustics—Soundscape—Part 1: Definition and conceptual framework. International Organization for Standardization. 2014. Available at https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/standard/05/21/52161.html

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Birds, migratory birds and their habitat

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Avoiding harm to migratory birds. Environment and Climate Change Canada. Available at https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html

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Bird Conservation Regions and strategies. Environment and Climate Change Canada. Available at https://www.canada.ca/en/environment-climate-change/services/migratory-bird-conservation/regions-strategies.html

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Canada-US convention protecting migratory birds. Environment and Climate Change Canada. 1999. Available at https://www.canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-countries-regions/north-america/canada-united-states-protecting-migratory-birds.html

Canadian Migration Monitoring Network (CMMN). Birds Canada. 2019. Available at https://www.birdscanada.org/bird-science/canadian-migration-monitoring-network-cmmn/

eBird Canada. Available at https://ebird.org/canada/home

General nesting periods of migratory birds. Environment and Climate Change Canada. Available at https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods.html

A Framework for the Scientific Assessment of Potential Project Impact on Birds. Prepared by Alan Hanson et al. Available at http://www.publications.gc.ca/collections/collection_2010/ec/CW69-5-508-eng.pdf. Environment and Climate Change Canada. Technical Report Series Number 508.

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North American Breeding Bird Survey Website–- Results. Available at https://wildlife-species.canada.ca/breeding-bird-survey-results/P001/A001/?lang=e

NatureCounts. Birds Canada, Avian Knowledge Network. Available at https://www.birdscanada.org/birdmon/default/searchquery.jsp

Nesting Calendar Query Tool. Birds Canada. Available at https://www.birdscanada.org/apps/rnest/index.jsp

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Fish and fish habitat

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A science-based framework for assessing the response of fisheries productivity to state of species or habitats. Fisheries and Oceans Canada. 2013. Available at: https://waves-vagues.dfo-mpo.gc.ca/Library/360944.pdf.

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A field guide to oil spill response on marine shorelines. Environment and Climate Change Canada. 2016. Available at https://publications.gc.ca/site/eng/9.820227/publication.html?wbdisable=true

*Policy for applying measures to offset adverse effects on fish and fish habitat under the Fisheries Ac*t. Fisheries and Oceans Canada. 2019. Available at https://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/policies-politiques-eng.html

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Gender-based analysis plus

By the Numbers: Gender Diversity in Canada's Natural Resource Industries and Science, Technology, Engineering and Math (STEM), Submitted Brief. Natural Resources Canada. Available at https://www.ourcommons.ca/Content/Committee/421/FEWO/Brief/BR8745320/br-external/NRC-e.pdf

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Greenhouse gases and climate change

Policy Context: Considering Environmental Obligations and Commitments in Respect of Climate Change under the Impact Assessment Act. Impact Assessment Agency of Canada. 2020. Available at https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/considering-environmental-obligations.html

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Guidance for Evaluating Human Health Impacts in Environmental Assessments: Country Foods available at http://www.canada.ca/en/health-canada/services/publications/healthy-living/guidance-evaluating-human-health-impacts-country-foods.html. Health Canada. 2017.

Guidance for Evaluating Human Health Impacts in Environmental Assessments: Noise available at http://www.canada.ca/en/health-canada/services/publications/healthy-living/guidance-evaluating-human-health-impacts-noise.html. Health Canada. 2017.

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- What are the social determinants of health? National Collaborating Centre for Determinants of Health. Available at https://nccdh.ca/resources/entry/SDH-factsheet

Indigenous participation and engagement

IAAC expects proponents to keep apprised of updated or new practitioner guidance or policies published on IAAC's website as may be the case over the course of a multi-year IA process. Best practices and current published guidance should be relied upon to the extent possible by proponents in developing their Impact Statement, and the following list of resources may be updated from time to time.

Indigenous Knowledge under the Impact Assessment Act: Procedures for Working with Indigenous Communities. Impact Assessment Agency of Canada. 2020. Available at https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/indigenous-knowledge-under-the-impact-assessment-act.html

Guidance: Assessment of Potential Impacts on the Rights of Indigenous Peoples. Impact Assessment Agency of Canada. 2020. Available at https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessm ent-act/guidance-assessm ent-potential-im pacts-rights-indigenous-peoples.html

Guidance: Collaboration with Indigenous Peoples in Impact Assessments. Impact Assessment Agency of Canada. 2020. Available at https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/collaboration-indigenous-peoples-ia.html

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Policy Context: Assessment of Potential Impacts on the Rights of Indigenous Peoples. Impact Assessment Agency of Canada. 2020. Available at https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessm ent-act/assessm ent-potential-im pacts-rights-indigenous-peoples.html

Protecting Confidential Indigenous Knowledge under the Impact Assessment Act – Supplementary Guidance to Indigenous Knowledge in Impact Assessment: Procedures for Working with Indigenous

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Nuclear

CNSC, G-219, *Decommissioning Planning for Licensed Activities*, Ottawa, Canada,2000p

CSA Group, N294, *Decommissioning of facilities containing nuclear substances*, reaffirmed2014

IAEA RS-G-1.8, Environmental and Source Monitoring for Purposes of Radiation Protection

IAEA, Safety Standards Series No. SSG-9, Vienna, Austria. 2010. *Seismic Hazards in Site Evaluation for Nuclear Installations*

IAEA, Safety Standards Series No.NS-G-1.5, Vienna, Austria. 2003. *External Events Excluding Earthquakes in the Design of Nuclear Power Plants*

IAEA, Safety Standards, Series No.NS-G-3.6, Vienna, Austria. 2004. *Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants*

IAEA, Safety Standards Series, Specific Safety Guide No. SSG-18, Vienna, Austria. 2011. *Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations*

IAEA, TECDOC-1657, *Design Lessons Drawn from the Decommissioning of Nuclear Facilities*, Vienna, Austria,2011

NEA/ OECD, *Applying Decommissioning Experience to the Design and Operation of New Nuclear Power Plants*, 2010

Nuclear Energy Agency (NEA)/ Organisation for Economic Co-operation and Development (OECD), *Decommissioning Considerations for New Nuclear Power Plants*, 2010

United States Nuclear Regulatory Commission (U.S.NRC), NUREG/CR-7046, PNNL-20091. 2011. *Design Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America*

U.S.NRC, NUREG/CR-7005. 2011. *Technical Basis for Regulatory Guidance on Design-Basis Hurricane Wind Speeds for Nuclear Power Plants*

Public participation

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Agency guidance documents are available from the Practitioner's Guide to Federal Impact Assessments under the Impact Assessment Act