HARDROCK PROJECT
Final Environmental Impact Statement / Environmental Assessment

Chapter 6.0:
Environmental Effects Assessment Methods

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6.0 ENVIRONMENTAL EFFECTS ASSESSMENT METHODS

As described in the evaluation of alternatives (Chapter 4.0), an assessment of "alternative methods" for each Project component was conducted using a phased approach, narrowing progressively to a preferred method such as a preferred technology, location, design, or method of operation. The preferred alternative methods collectively form the Project (as described in the Project description (Chapter 5.0)) and were carried forward for the effects assessment. The methods that are used to conduct the environmental effects assessment of the Project are described in this chapter.

The environmental effects assessment framework has been designed to meet the combined requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and the *Environmental Assessment Act, 1990* (EAA). These methods are based on a structured approach that:

- Considers the federal and provincial regulatory requirements outlined in Section 1.4 for the assessment of environmental effects as defined by CEAA 2012 and the EAA, with specific consideration of the requirements of the Environmental Impact Statement (EIS) Guidelines (Appendix A1) and Terms of Reference (ToR; Appendix A2). Concordance tables are provided in Appendix B1 (federal) and B2 (provincial) to demonstrate where in the Final EIS/ Environmental Assessment (EA) the requirements of both the EIS Guidelines (Appendix A1) and approved ToR (Appendix A2) have been addressed.
  - As per the ToR (Appendix A2), GGM has considered traditional knowledge (TK) within each EA decision making milestone, where appropriate. As part of the information sharing through the consultation process (discussed in Chapter 3.0), information was provided by Aboriginal communities in the form of TK and land use studies and other forms of information sharing through consultation, and considered as part of each milestone. For information on how TK was considered in the alternatives assessment see Chapter 4.0 (evaluation of alternatives). The methods used to conduct the effects assessment, including the consideration of TK, are discussed in this chapter (Section 6.1).
  - Section 5(1)(c) of CEAA 2012 requires proponents to specifically consider environmental effects on Aboriginal peoples. According to section 5(1)(c), the environmental effects that are to be taken into account with respect to Aboriginal peoples include "…an effect occurring in Canada of any change that may be caused to the environment on:
    - health and socio-economic conditions
    - physical and cultural heritage
    - the current use of lands and resources for traditional purposes, or
    - any structure, site or thing that is of historical, archaeological, paleontological or architectural significance."

In addition to these requirements, the EIS Guidelines identified additional topics within each of the section 5(1)(c) categories. The assessment of effects of the changes to the environment on Aboriginal peoples is provided in Appendix O.

- Considers the comments provided by the public, Aboriginal communities, and other stakeholders during consultation activities conducted to date.
- Focuses on issues of key concern that arise from the above considerations.
- Considers existing environmental conditions of the area, particularly historical activities and resulting environmental effects that might have affected baseline conditions.
- Integrates engineering design and programs for mitigation and monitoring into a comprehensive environmental planning and management process that will be applied during the design and implementation of the Project.
- Considers the Project in a careful and precautionary manner, to limit or avoid significant adverse environmental effects. Based on the guiding principles in the Government of Canada document, *A Framework for the Application of Precaution in Science-based Decision Making About Risk* (Government of Canada 2003), the purpose of this precautionary approach is to set out precautionary principles to guide decision-making where there is an absence of scientific certainty. This approach allows decisions to be made in a manner that effectively manages the risk of environmental effects, while acknowledging that decisions can rarely be made with zero risk.

For the purpose of the Final EIS/EA, the term "environment" includes the natural, social, economic, cultural and built components, as they relate to the Project and are required by a combination of both the federal and provincial legislation.

6.1 OVERVIEW OF APPROACH

The environmental effects assessment methods address both Project-related and cumulative environmental effects. This is based on the Project description presented in Chapter 5.0, which was determined following the evaluation of alternatives presented in Chapter 4.0.

As discussed in Chapter 4.0 (evaluation of alternatives), alternative methods for key Project components were identified and evaluated by following a three-step decision-making process narrowing progressively to a preferred alternative for each Project component that had the greatest balance of advantages to disadvantages. The alternatives assessment took a conservative approach to consider traditional land and resource use (TLRU) in the Draft EIS/EA assuming use in potential areas of development. The approach, including the list of criteria and indicators, was verified and refined in the Final EIS/EA with additional consultation feedback and receipt of additional Project-specific TK studies. The preferred alternatives for Project components taken together make up the Project as described in Chapter 5.0 (Project description). Following the identification of preferred Project components (the Project) a more

focused assessment of environmental effects is completed. Project-related environmental effects may result from changes to the biophysical or human environment that are caused by an activity arising as a result of the Project. Cumulative environmental effects are changes to the biophysical or human environment that are caused by an activity associated with the Project, in combination with other past, present or reasonably foreseeable future projects or activities that have been or will be carried out.

Project-related environmental effects and cumulative environmental effects are assessed using a standardized methodological framework for each valued component (VC), with standard tables and matrices used to facilitate the evaluation. Where appropriate, TK (including information received from Aboriginal consultation and project-specific TK studies) has been considered in the assessment including baseline studies, assessment methods, mitigation and monitoring. The residual Project-related environmental effects (e.g., after mitigation has been applied) are characterized using specific criteria (e.g., direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological / socio-economic context). The significance of the Project-related environmental effects is then determined based on pre-defined criteria or thresholds (also called significance criteria) that reflect a variety of considerations based on these criteria and other relevant considerations.

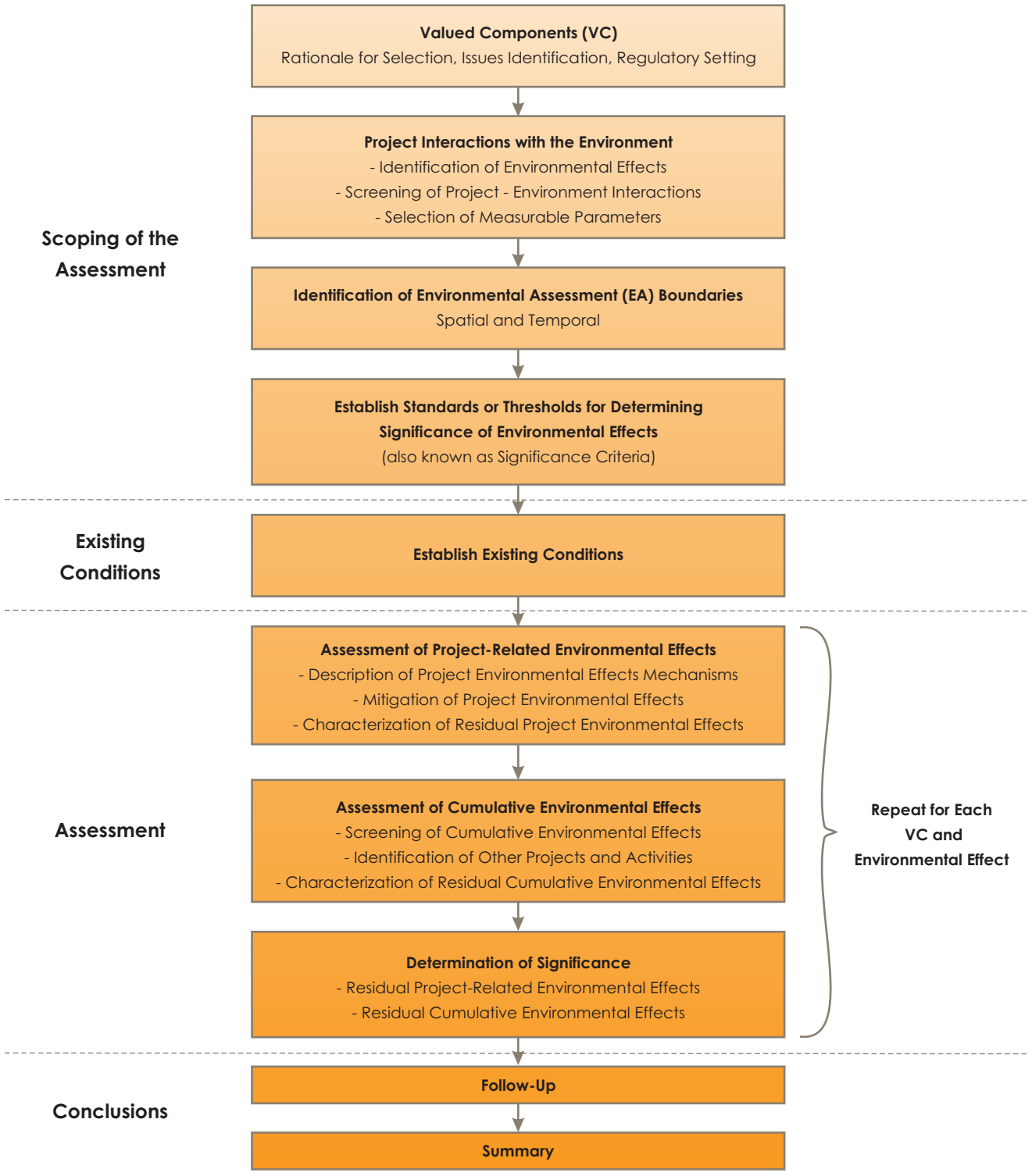
If there is overlap between the environmental effects of the Project and those of other projects or activities that have been or will be carried out, cumulative environmental effects are assessed to determine whether they could be significant, and to consider the contribution of the Project to them.

The environmental effects assessment method used in the Final EIS/EA is shown graphically in Figure 6-1. This method, which includes the consideration of TK, involves the following generalized steps:

- **Scope of Assessment –** Scoping of the assessment includes the selection of VCs (and, if required, key indicators for the VC) and the rationale for their selection; identification of the potential environmental effects; description of measurable parameters; description of temporal and spatial boundaries; and selection of thresholds of significance for residual effects. Consultation input, including receipt of TK studies, that informed the scope of assessment is discussed in Chapter 3.0 (community and stakeholder consultation).
- **Existing Conditions –** Existing (baseline) environmental conditions are established for each VC. In many cases, existing conditions implicitly include those environmental effects that may have been or may be caused by other past or present projects or activities that have been or are being carried out. Project-specific TK information has been considered in the existing conditions section of the VC Chapters (Chapters 7.0 through 19.0). Where appropriate, baseline information has been refined/enhanced or verified as a result of the information received. Consultation input that informed the baseline field surveys is discussed in Chapter 3.0 (community and stakeholder consultation).

- **Assessment of Project-Related Environmental Effects –** The assessment of Project-related effects includes descriptions of how an environmental effect will occur or how the Project will interact with the environment, the mitigation and environmental protection measures proposed to reduce or eliminate the environmental effect, and the characterization of the residual environmental effects of the Project. The influence of consultation on the identification of issues and the assessment process, and the consideration of Aboriginal information and TK sections provided in each VC Chapter (Chapters 7.0 through 19.0) explain how key consultation input and TK was considered and used to modify/verify/refine the effects assessment.
- **Assessment of Cumulative Environmental Effects –** Cumulative environmental effects of the Project are identified in consideration of other past, present or reasonably foreseeable future projects or activities that have been or will be carried out. The residual cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out are then evaluated, including the contribution of the Project to those cumulative environmental effects (as applicable). This item is described separately from the assessment of Project-related effects, in Chapter 20.0 (cumulative effects assessment).
- **Determination of Significance –** The significance of residual Project-related and residual cumulative environmental effects, including the contribution of the Project to those effects, is then determined, in consideration of the significance criteria.
- **Follow-up and Monitoring Programs–** Follow-up and monitoring programs that are required to verify key environmental effects predictions or to verify the effectiveness of the key mitigation, as well as required monitoring, are proposed where appropriate and applicable. This item is covered in Chapter 23.0 (follow-up and monitoring and environmental management plans). Information sharing with Aboriginal communities through the consultation process (discussed in Chapter 3.0), was used to inform the follow-up and monitoring program.

Further details on the methods that were used in the Final EIS/EA are provided in the following sections.



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Hardrock Project

Figure No.

6-1

Title

Summary of Environmental Effects Methodology

This method includes the consideration of TK where appropriate.

6.2 SCOPE OF THE ASSESSMENT

The scope of the environmental effects assessment to meet the requirements of the EIS Guidelines (Appendix A1) and ToR (Appendix A2) is described in this section. Consultation input, including receipt of TK studies, that informed the scope of assessment is discussed in Chapter 3.0 (community and stakeholder consultation).

6.2.1 Scope of the Project

A critical first step in scoping the environmental effects assessment is to define the nature and scope of the Project. A description of the Project is provided in Chapter 5.0, and includes a description of the facilities, equipment, and activities that will comprise the Project. Activities that are beyond the scope of the Project are also identified in Chapter 5.0 (Project description).

6.2.2 Selection of Valued Components

The Final EIS/EA considers the potential environmental effects of Project activities, after mitigation and the potential cumulative environmental effects of other projects and activities that have been or will be carried out. The specific factors required for consideration in the environmental effects assessment are outlined in CEAA 2012 and the EAA, and more specifically defined in the EIS Guidelines (Appendix A1) and ToR (Appendix A2). These requirements are summarized in the description of the regulatory framework presented in Chapter 1.0 (introduction).

The assessment of environment effects focuses on VCs, which are components or attributes of the biophysical and socio-economic environment that are important for ecological, scientific, social, cultural, economic, historical, archaeological or aesthetic reasons. VCs were selected for assessment based on the scope of the Project as prescribed by the EIS Guidelines (Appendix A1) and the ToR (Appendix A2), comments and topics raised during consultation, and the potential for interaction between the Project and the biophysical and socio-economic environments.

The following VCs have been assessed as part of the Final EIS/EA:

- Atmospheric Environment
- Acoustic Environment
- Groundwater
- Surface Water
- Fish and Fish Habitat
- Vegetation Communities
- Wildlife and Wildlife Habitat

- Labour and Economy
- Community Services and Infrastructure
- Land and Resource Use
- Heritage Resources
- Traditional Land and Resource Use
- Human and Ecological Health

The VC list has been developed through consultation with stakeholders, government agencies, and Aboriginal communities, and considers environmental and socio-economic components valued by Aboriginal communities. The Final EIS/EA provides a separate chapter to describe each VC and the rationale for its selection, summarize the comments that have been raised, and describe the linkages to other VCs. The list of VCs generally aligns with the VC/criteria and indicators used in the alternatives assessment described in Chapter 4.0. The VC-specific chapters align with the VCs/criteria used in the alternatives assessment directly based on the title of each chapter (e.g., the surface water chapter [Chapter 10.0] relates to the surface water VC/criterion used in the alternatives assessment). The criteria and indicators developed as part of the alternatives assessment methodology have advanced in detail and become more specific as the EA process has progressed from the assessment of alternatives to the assessment of environmental effects as a result of the Project.

The comprehensive assessment of VCs is provided in Chapters 7.0 to 19.0 of the Final EIS/EA, and each chapter includes specific detail on the VC-specific measurable parameters that were identified for each assessment, and the rationale for the selection of those parameters.

6.2.3 Identification of Potential Environmental Effects

For each VC, one or more measurable parameters were selected to facilitate the measurement of potential environmental effects and Project interactions with the environment, specific to the nature and scope of that VC. Where available, TK was considered in existing conditions and the identification of potential effects and Project interactions. As a standard practice, the 'do nothing' alternative to the Project was considered in the context of a benchmark against which potential effects were measured to highlight the existing environmental conditions that will experience change through the implementation of the Project.

For each VC, potential environmental effects and measurable parameters, and the rationale for their selection is presented in tabular form as shown in Table 6-1.

Table 6-1: Example of Potential Environmental Effects and Measurable Parameters

Potential Environmental Effect	Measurable Parameter(s) and Units of Measurement	Notes or Rationale for Selection of the Measurable Parameter
Environmental Effect 1	Measurable Parameter 1	Describe rationale for selecting the measurable parameter and how it assists to quantify the environmental effect
	Measurable Parameter 2	Describe rationale for selecting the measurable parameter and how it assists to quantify the environmental effect
Environmental Effect 2	Measurable Parameter 1	Describe rationale for selecting the measurable parameter and how it assists to quantify the environmental effect
	Measurable Parameter 2	Describe rationale for selecting the measurable parameter and how it assists to quantify the environmental effect

The scope of the factors considered in the Final EIS/EA are detailed for each VC in its respective chapter, which includes a description of the work plans, and methods and measurable parameters that were used to assess the VC and address the requirements defined in the EIS Guidelines (Appendix A1) and ToR (Appendix A2).

6.2.4 Spatial Boundaries

Spatial boundaries for the assessment were described in the approved ToR (Appendix A2) and were based on broad areas that allowed for flexibility to accommodate potential Project changes resulting from the evaluation of alternatives and advancements in Project engineering. Since the ToR, refinements have been made to the spatial boundaries as a result of ongoing studies, consultation and continued advancements in Project design. These spatial boundary refinements more accurately define the formal study areas for the Project in consideration that more detail has emerged and alternatives have been determined. Chapters 7.0 through 19.0 provide the specific spatial boundaries for each VC effects assessment.

Three geographic areas, Project, Local and Regional, were considered at each stage of the planning process, ToR, baseline reports, preparation of the Draft EIS/EA and Final EIS/EA (Table 6-2). To align with the ToR and baseline reports, the term “study area” was used to describe the physical extent of the area investigated. The Final EIS/EA makes reference to “assessment areas” which were established to capture the extent of potential Project-environment interactions, including cumulative effects. The assessment boundaries typically differ from one VC to another depending on the characteristics of the VC.

Table 6-2: Study Area Description and Context for the Hardrock EIS/EA Planning Process

Study Area	Planning Process Stages		
	ToR	Baseline Reports	EIS/EA
Project	Encompasses the proposed area for development and includes the entire physical footprint of the Undertaking.	Broader than the Project footprint Project development area (PDA) defined in the ToR and conservatively established to cover a potential development area large enough to account for changes to the Project as planning proceeded, prior to determining the final site layout.	The combined Project footprint of all facility components, as well as the anticipated area of physical disturbance associated with all phases of the Project.
Local	Extends beyond the PDA and is typically designed to measure baseline environmental conditions to inform direct effects from the PDA.	Varied between each baseline report depending on study objectives; local spatial boundaries appropriate for obtaining an understanding of the existing environment required to complete the detailed assessments in the EIS/EA was defined for each baseline report.	Encompasses the area in which both: a) there is a potential for Project-related environmental effects (direct or indirect); and b) there is a reasonable expectation that those potential effects in the local assessment area (LAA) will be a concern. The LAA encompasses the PDA and is VC-specific.
Regional	Includes the maximum geographic extent in which impacts from the Undertaking are likely to occur.	Varied between each baseline report depending on study objectives; regional spatial boundaries appropriate for obtaining an understanding of the existing environment required to complete the detailed assessments in the EIS/EA was defined for each baseline report.	Provides the broad contextual boundary within which project-specific effects were characterized. It includes land that may be relevant to the assessment of any wider-spread direct and indirect effects of the Project. It is also the area within which there is a potential for cumulative and socio-economic effects. The regional assessment area (RAA) encompasses the PDA and the LAA, and is VC-specific.

The study areas presented in this Final EIS/EA were established in consideration of findings from the baseline reports, technical data reports, the alternatives assessments, ongoing engineering details, and in accordance with the EIS Guidelines (Appendix A1). The EIS Guidelines did not identify specific spatial boundaries but indicated boundaries should be defined based on consultation and taking into account the appropriate scale and spatial extent of potential environmental effects, community and Aboriginal TK, current land and resource use by Aboriginal communities, ecological, technical, social and cultural considerations.

Consultation with stakeholders, government agencies and Aboriginal communities was also taken into consideration when refining the assessment areas. Based on the specific requirements of each VC, the LAAs and RAAs were further refined and modified to include the geographic extent necessary to accurately assess potential environmental effects resulting from the Project. VC-specific LAAs and RAAs are described and illustrated in each of the VC Chapters (Chapters 7.0 through 19.0). Once defined, the PDA, LAA and RAA were applied to each VC to assess the potential effects, including cumulative effects, resulting from the Project.

6.2.5 Temporal Boundaries

The temporal boundaries for the assessment are defined based on the timing and duration of Project activities and the nature of the interactions with each VC. The purpose of a temporal boundary is to identify when an environmental effect may occur in relation to specific Project phases and activities. The temporal boundaries for the Final EIS/EA include the Project phases of:

- Construction (pre-production): Years -3 to -1, with early ore stockpiling commencing after the first year of construction.
- Operation: Years 1 to 15, with the first year representing a partial year as the Project transitions from construction to operation.
- Closure:
  - Active Closure: Years 16 to 20, corresponding to the period when final decommissioning and rehabilitation activities are carried out.
  - Post-Closure: Years 21 to 36, corresponding to a semi-passive period when the Project is monitored and the open pit is allowed to fill with water creating a pit lake.

6.2.6 Methods for Determining Thresholds of Significance for Residual Environmental Effects

Threshold criteria or standards for determining the significance of environmental effects are identified for each VC, beyond which a residual environmental effect would be considered significant. These are generally selected in consideration of federal and provincial regulatory requirements, standards, objectives and guidelines that are applicable to the VC, and societal values or other planning objectives.

In some cases, and particularly where standards, guidelines or regulatory requirements do not specifically exist, qualitative thresholds can be defined for measurable parameters to support the determination of significance.

6.3 EXISTING CONDITIONS

Existing environmental conditions are based on the results of baseline studies, and reflect the effects from historical and present human activities. The baseline program included field studies carried out based on a preliminary understanding of the expected PDA, which conservatively estimated the overall footprint of the Project in the early stages of planning (approximately 2,620 ha). The PDA identified in the Final EIS/EA (approximately 2,200 ha) has since been refined to account for updated Project details collected through advances in Project design. Therefore, the preliminary PDA used for baseline studies was a conservative spatial area, measuring approximately 420 ha (or 19%) larger than the PDA in the Final EIS/EA.

The description of existing conditions in the VC Chapters (Chapters 7.0 through 19.0) is informed by a review of baseline program results, existing data sources and refined/enhanced or verified by Project-specific TK and TLRU studies and Project-specific socio-economic data from Aboriginal communities. This information is reviewed to provide a dataset that will allow for a clear understanding of the nature and extent of potential environmental effects. The level of detail used to describe existing conditions is used to:

- identify, assess and determine the significance of residual environmental effects that may be caused by the Project
- identify and characterize the beneficial effects of the Project
- identify required follow-up.

The existing conditions are described for each VC in the respective VC Chapters (Chapters 7.0 through 19.0).

6.4 ENVIRONMENTAL EFFECTS ASSESSMENT

Both the federal and provincial processes require an assessment of the environmental effects of the Project.

The influence of consultation and consideration of Aboriginal information and TK sections provided in each VC Chapter (Chapters 7.0 through 19.0), explain how key consultation input and TK was used to modify/verify/refine the effects assessment. Chapter 3.0 and the Record of Consultation (Appendix C) provide more detailed information on the consultation process. Project-specific TK studies which are not considered to be confidential are provided in the Traditional Knowledge Studies/Information available in Appendix J. The assessment of effects of the changes to the environment on Aboriginal peoples, as required by CEAA 2012, is provided in Appendix O.

The environmental effects assessment addresses both Project-related and cumulative environmental effects. Project-related environmental effects and cumulative environmental effects are assessed using a standardized methodological framework for each VC, as outlined in the sections below.

6.4.1 Assessment of Project-Related Environmental Effects

The assessment of Project-related environmental effects followed a sequential process whereby potential interactions between each VC and the environment were first identified, and where such interactions may exist, a more detailed assessment of those effects was completed to further characterize the effects.

6.4.1.1 Potential Project-Valued Component Interactions

To focus the assessment of effects, interactions between relevant Project activities and each environmental effect of each VC were summarized, based on the template shown in Table 6-3. This provides a tool to identify where potential effects may occur for each VC.

The potential interactions between Project activities and the environment were considered for each VC, for the construction, operation, and closure phases of the Project. The identification of Project activities and their potential interactions with VCs was based on consultation with interested parties, the professional judgment of technical specialists involved in the assessment based on experience with other similar projects, and a review of existing conditions and available TK. The table is used to identify Project-VC interactions that result in a potential effect for each Project component and physical activity for each VC as illustrated in Table 6-3.

Table 6-3: Example of Potential Project-VC Interactions

Project Components and Physical Activities	Potential Environmental Effects (prior to mitigation)			
	Effect 1	Effect 2	Effect 3	Effect 4
CONSTRUCTION				
Activity 1	✓	✓	✓	✓
Activity 2 (add more as necessary)	✓	–	✓	–
OPERATION				
Activity 1	✓	–	–	✓
Activity 2 (add more as necessary)	✓	–	–	✓
CLOSURE				
Activity 1	–	✓	–	–
Activity 2 (add more as necessary)	–	✓	–	–

NOTES:
✓ Potential interactions that might cause an effect without mitigation.
– Interactions are not expected.

The Project team took a conservative approach in assessing potential interactions, whereby interactions with a meaningful degree of uncertainty are given a check mark, allowing for more thorough consideration in the Final EIS/EA. If there is no plausible interaction between a Project activity and the VC, no check mark (–) is provided for that activity.

6.4.1.2 Assessment of Effect Pathways (Effect and Mitigation)

The assessment of potential effects begins with a description of the mechanisms whereby specific Project activities could result in a measurable change in the environment that may affect VCs. For purposes of the Final EIS/EA, a measurable change was defined as a change that is detectable and quantifiable compared with existing (baseline) conditions. Where possible, the spatial and temporal extent of these changes (e.g., where and when the environmental effect might occur) are also described.

For each potential environmental effect, mitigation measures that will reduce or eliminate an environmental effect are identified and described. Mitigation measures that are technically and economically feasible to implement were considered in the evaluation. In addition to reducing and eliminating a potential environmental effect, mitigation can also include specialized measures such as habitat offsetting/compensation, replacement, as well as planned environmental management and response measures (adaptive management).

The identification of mitigation measures also took into consideration public, Aboriginal and agency comments, along with available information on existing conditions and traditional knowledge.

6.4.1.3 Characterization of Residual Environmental Effects

Qualitative and quantitative measures, where possible, were developed to characterize residual effects (e.g., the environmental effects that remain after mitigation has been applied). Residual environmental effects are effects that remain following the consideration of mitigation measures.

Characterizations of residual environmental effects include:

- **Direction** – the relative change compared to existing conditions (i.e., positive, or adverse).
- **Magnitude** – the amount of change in a measurable parameter or variable relative to existing conditions, defined for each VC as low, moderate, high, or other qualifier as deemed appropriate.
- **Geographic Extent** – the geographic area where the residual environmental effect of a defined magnitude occurs, defined for each VC based on definitions of PDA, LAA, and RAA as appropriate.

- **Timing** - considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.
- **Frequency** – how often the residual environmental effect might occur (e.g., one time or multiple times) in a specified time period.
- **Duration** – the length of time required until the residual environmental effect can no longer be measured or perceived (e.g., short-term, mid-term, long-term).
- **Reversibility** – whether a measurable parameter or the VC can return to its existing condition or other target (such as a remediation target) after the Project activity ceases, including through active management techniques (e.g., habitat restoration).
- **Ecological/Socio-economic Context** – considers unique characteristics or value of the area, a community and/or ecosystems that may be affected by the Project and or whether the VC is important to the functioning of an ecosystem or community of people. Ecological context takes into consideration existing conditions as well as the results of consultation and traditional knowledge.

Residual environmental effects (positive and adverse) are fully described using quantitative measures where appropriate and in terms of the characterization measures described above. A summary of the characterization of residual environmental effects is provided in tabular form for each VC. An example summary table is provided in Table 6-3.

Table 6-4: Example of Summary of Residual Environmental Effects

Residual Effect	Activity			Residual Environmental Effects Characterization							
	Construction	Operation	Closure	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Residual Effect 1											
Residual Effect 2											
Residual Effect 3											

Residual effects that are characterized as adverse are considered further in terms of their significance (see Section 6.4.2) and are carried forward to the cumulative effects assessment (see Section 6.4.3). Positive effects from the Project are considered further in terms of their environmental, economic, and social benefits (see Chapter 25.0).

6.4.2 Determination of Significance of Residual Adverse Effects

A determination of significance of residual adverse environmental effects is made using thresholds of significance defined for the VC and/or the measurable parameters (Section 6.2.6), beyond which a residual adverse environmental effect would be considered significant.

Thresholds for determining the significance of the environmental effects have been defined in consideration of the criteria defined in the EIS Guidelines (Appendix A1) (i.e., direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological/socio-economic context), where it is appropriate to do so. Significant thresholds may also be defined in consideration of other criteria including other measurable parameters that may better characterize significance, including legislation, and other regulatory standards or other thresholds of acceptability, as described by Barnes et al. (2012). These determinations of significance inform decision-making under both the federal and provincial processes. The level of confidence of the significance determination is identified, in consideration of factors such as the certainty of the scientific information and statistical analysis, identified technical boundaries, professional judgment, and known effectiveness of proposed mitigation.

If an environmental effect is determined to be significant, there is further consideration of the likelihood of occurrence of that significant environmental effect, based on past experience and the professional judgment of the Project team.

6.4.3 Assessment of Cumulative Effects and Determination of Significance

Past, present and reasonably foreseeable future projects or activities with potentially overlapping environmental effects were assessed as part of a five-step cumulative effects assessment methodology (scoping, analysis, mitigation, significance, and follow-up). The cumulative environmental effects assessment considers and analyzes potential types of cumulative effects that may result from potential additive effects, interactive or synergistic effects, and induced activities and their effects.

Two conditions must be met to initiate an assessment of cumulative effects on a VC:

- The Project is assessed as having adverse residual environmental effects on a VC.
- The adverse residual effects from the Project overlap spatially and/or temporally with residual effects of other physical activities on a VC.

A determination of the significance of residual cumulative environmental effects is then made using the same standards or thresholds for significance developed for the VC and/or the measurable parameters. The Project contribution to those cumulative effects is also discussed. As with residual Project environmental effects, the determination of residual cumulative environmental effects includes a discussion of the level of confidence in the prediction. The methodology and results of the cumulative effects assessment is described further in Chapter 20.0.

6.5 FOLLOW-UP AND MONITORING PROGRAM

A follow-up program is used where applicable to verify the accuracy of key predictions and effectiveness of key mitigation measures.

Compliance monitoring verifies compliance with the requirements of permit conditions, approvals or authorizations issued under laws or regulations.

Appropriate monitoring is proposed to inform adaptive management (conceptual information is provided in Chapter 23.0 and in the environmental management and monitoring plans [Appendix M]). Information sharing obtained from Aboriginal communities through the consultation process (discussed in Chapter 3.0), has been used to inform the follow-up and monitoring program presented in the Final EIS/EA. These programs will form part of the environmental management and monitoring system for the Project. If monitoring or follow-up detects effects that are different from predicted effects, or the need for improved or modified design features, then adaptive management will be implemented. This may include increased monitoring, changes to plans, or additional mitigation.

6.6 REFERENCES

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