DRAFT

Highway 413 – Cumulative Effects Assessment Framework

September 2024

Ontario

WSP

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Appendices

Acronyms

Acronym	Definition
CEA	Cumulative Effects Assessment
CEAA	*Canadian Environmental Assessment Act*, 2012
DPD	Detailed Project Description
EA	Environmental Assessment
EAA	*Ontario Environmental Assessment Act*, 1990
IA	Impact Assessment
IS	Impact Statement
GRT	Government Review Team
GTA	Greater Toronto Area
IAA	*Impact Assessment Act*, 2019
IAAC	Impact Assessment Agency of Canada
ITK	Indigenous Traditional Knowledge
LSA	Local Study Area
MECP	Ontario Ministry of Environment, Conservation and Parks
MTO	Ontario Ministry of Transportation
OPS	Operational Policy Statement
RSA	Regional Study Area
TISG	Tailored Impact Statement Guidelines
VC	Valued Component
ZOI	Zone of Influence

1. Purpose

As part of Stage 2 of the Environmental Assessment (EA) for the Highway 413 (formerly GTA West) Transportation Corridor Route Planning and Preliminary Design Project, various background material including federal and provincial guidance documents and samples of completed federal projects have been reviewed in order to develop a framework to assess the potential cumulative effects of the Project.

Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions. Cumulative effects are described in a similar way to other impacts, but their assessment differs in one fundamental way: cumulative effects assessments (CEAs) are valued components oriented, which is defined as any part of the environment, social, and community features that are considered important by the proponent, public, scientists, Indigenous communities and government involved in the assessment process, whereas usual environmental assessments are project oriented. In other words, the point of view is shifted from looking at all components potentially affected by a given project, to all projects or sources of impact that affect a component. EA/IAs tend to focus on a scale in which only the "footprint" or the area covered by each action or source of impact of a project is considered. A CEA further enlarges the scale of the assessment to a more regional level. For the practitioner, the challenge is determining how large an area around the action should be assessed, how long in time (past and future), and how to practically assess the often complex interactions among the actions. In all other ways, CEA is similar to EA/IA and, therefore, often relies on established EA/IA practice.

For the purposes of the Highway 413 Project, MTO is committed to completing a CEA for the project.

Based on the background review, the Project Team was able to prepare a recommended framework to complete a CEA for the Highway 413 Project. As part of developing this recommended framework, the Project Team has also prepared a proposed plan to collect feedback from relevant technical stakeholders, the public, and Indigenous communities in finalizing the framework.

2. Background

Stage 1 of the Environmental Assessment (EA) focused on taking a broad look at the transportation needs in the western Greater Toronto Area (GTA) and as part of this process, the Project Team identified transportation problems and opportunities and considered a range of potential multi-modal transportation solutions to address the problems and opportunities identified. This approach integrated the consideration of cumulative effects of significant new or improved transportation infrastructure by various proponents within a large geographical area of the Western GTA (see **Figure 2-1**) and temporally over a long planning horizon to 2031 and beyond.

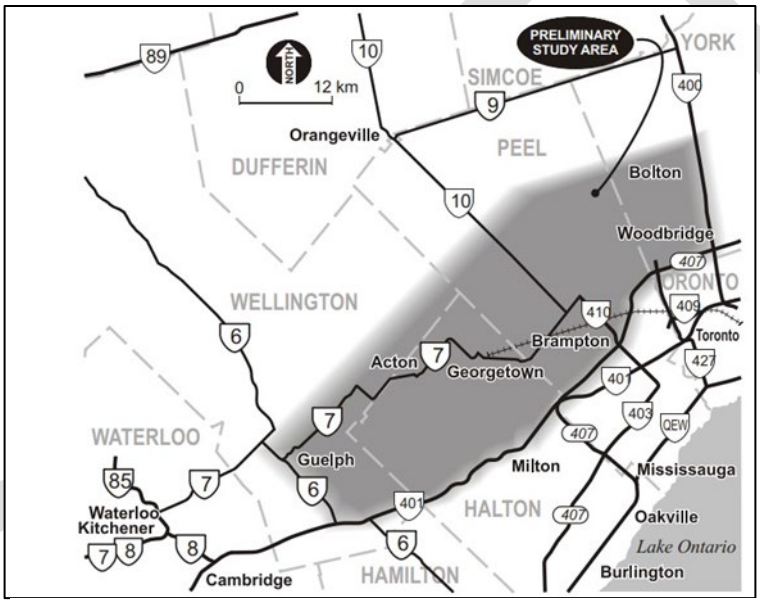
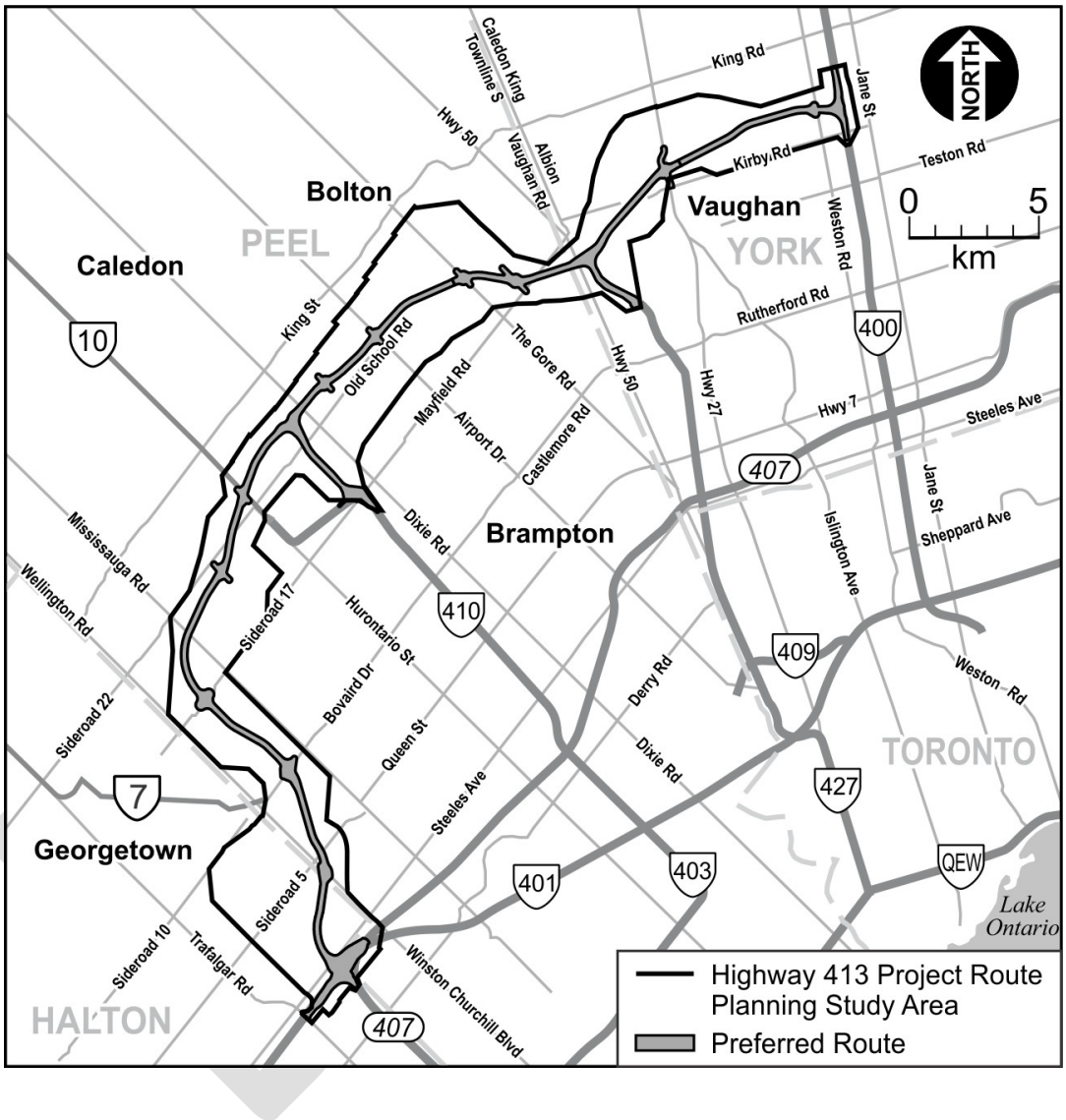


Figure 2-1: Highway 413 Preliminary Study Area

Stage 1 of the EA resulted in the development of a Transportation Development Strategy for the study area, which included the recommendation for a new transportation corridor.

MTO is currently undertaking Stage 2 of the EA. Building on the recommendations of Stage 1, the EA will identify the route (within a refined Route Planning Study Area, as illustrated in **Figure 2-2**), to determine interchange locations and complete the preliminary design for the new transportation corridor. The new multimodal transportation corridor will include: a 400-series highway, transitway and potential goods movement priority features.

For the purposes of the CEA, only the 400-series highway configuration will be assessed. As the transitway component of the project will require additional EA approvals (via a future Transit Project Assessment Process following Ontario Regulation 231/08) and funding, it will be considered a future project in the CEA.



As part of Stage 2 work, various background material including federal and provincial guidance documents and samples of completed federal projects have been reviewed in order to develop a framework to assess potential cumulative effects of the Project.

Background documents reviewed and summarized in the upcoming sections include:

- *Ontario Environmental Assessment Act* (EAA, 1990)

- Ontario Ministry of Environment, Conservation and Parks (MECP) Code of Practice “Preparing and Reviewing Environmental Assessments in Ontario” (MECP, 2014)
- *Impact Assessment Act* (IAA, 2019);
- Tailored Impact Statement Guidelines Template for Designated Projects Subject to the *Impact Assessment Act* (IAAC, 2020);
- Operational Policy Statement, Assessing cumulative environmental effects under the *Canadian Environmental Assessment Act, 2012* (IAAC, 2015);
- Interim Technical Guidance Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012*, Draft Version 2 (IAAC, 2018);
- Examples of Guidelines for the Preparation of an Environmental Impact Statement pursuant to the *Canadian Environmental Assessment Act*, 2012 for the:
    - West Flemish Pass Exploration Drilling Project, Chevron Canada Limited (Chevron Canada Limited, 2018); and,
    - Lake Manitoba and Lake St. Martin Outlet Channels Project, Manitoba Infrastructure (Monitoba Infrasturcture, 2018).
- Examples of Environmental Impact Statement (following CEAA 2012) of a completed project:
    - Near Surface Disposal Facility Deep River, Renfrew County, Ontario, Environmental Impact Statement (Golder Associates, 2021)
    - James Bay Lithium Mine, Environmental Impact Assessment Report, Eastmain Cree Village, Quebec (WSP, 2018)
    - Rose Lithium-Tantalum Project, Summary of the Updated Environmental Impact Assessment, Territory of Eeyou Istchee James Bay, Quebec (WSP, 2019)
    - Report of the Joint Review Panel, Site C Clean Energy Project (B.C. Hydro and Power Authority, 2014)
    - Ajax Mine Project, Joint Federal Comprehensive Study/ Provincial Assessment Report (CEAA, 2017)

The following section includes a summary of key findings from each of the reviewed background documents. Additional documents were reviewed but were deemed irrelevant to this CEA framework; a summary of these documents is included in **Section 2.1.**

2.1 Summary of Background Review

Reference Document	Applicable to the CEA Framework (Y/N)	Studied as part of background review? (Y/N	Key Findings/Rationale
Ontario *Environmental Assessment Act*, 1990	Yes	Yes	The OEAA does not include requirements for assessing cumulative effects; however, through the Codes of Practice, proponents are encouraged to consider cumulative impacts to the extent possible. Therefore, it may be considered applicable to the CEA framework, although not technically required.
Code of Practice "Preparing and Reviewing Environmental Assessments in Ontario" (MECP, 2014)	Yes	Yes	The Code of Practice recommends including information about potential cumulative effects of the project in the EA documentation. It also recommends proponents to consult with government agencies to identify any already-approved projects that will be built in the future, and to consider these projects in the cumulative effects assessment. It recommends assessing potential cumulative impacts through a qualitative assessment during the preparation of the EA documentation. Lastly, it recommends reviewing the Technical Guidance Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act* (CEAA), 2012, prepared by the federal government as it may be useful in conducting a CEA.
***Impact Assessment Act* (IAA, 2019)**	Yes	Yes	Paragraph 6(1) of the IAA: *"(m) to encourage the assessment of the cumulative effects of physical activities in a region and the assessment of federal policies, plans or programs and the consideration of those assessments in impact assessments."* Paragraph 22(1) requires proponents to consider the following factors: ■ "(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: ○ (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"
Tailored Impact Statement Guidelines Template for Designated Projects Subject to the *Impact Assessment Act* (IAAC, 2020)	Yes	Yes	Section 22 of the TISG Template includes general requirements for proponents to identify and assess the designated project's cumulative effects using the approach described in IAAC's guidance documents and summarized

Reference Document	Applicable to the CEA Framework (Y/N)	Studied as part of background review? (Y/N	Key Findings/Rationale
			in the following sections. According to the TISG Template, cumulative effects are to be assessed in relation to cumulative environmental, health, social and economic effects.
Operational Policy Statement, Assessing cumulative environmental effects under the *Canadian Environmental Assessment Act*, 2012 (IAAC, 2015)	Yes	Yes	This document was created to support implementation of the previous CEAA 2012 and has been adopted under the IAA. It sets out the general requirements and 5-step approach to consider the cumulative environmental effects of designated projects under CEAA 2012. According to the OPS, all cumulative environmental effects assessments should consider the following five steps: 1. scoping, 2. analysis, 3. mitigation, 4. significance, and 5. follow-up. As well, it states that all EAs must clearly explain and justify the methodologies that have been used to assess cumulative environmental effects.
Interim Technical Guidance: Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act*, 2012, Draft Version 2 (IAAC, 2018)	Yes	Yes	This document was created to support implementation of the previous CEAA 2012 and has been adopted under the IAA. The guide provides the recommended generic approach and methodologies for completing Step 1 and Step 2 presented in the OPS. It also breaks down each step into a series of sub-steps that together allow practitioners to complete Step 1 and Step 2. Step 1: Scoping: ■ Step 1.1: Identifying Valued Components ■ Step 1.2: Determining Spatial Boundaries ■ Step 1.3: Determining Temporal Boundaries ■ Step 1.4: Examining Physical Activities that have been and will be carried out Step 2: Analysis ■ Step 2.1: Analyzing various types of data and information ■ Step 2.2: Addressing Data Limitations and Uncertainty in The Analysis

Reference Document	Applicable to the CEA Framework (Y/N)	Studied as part of background review? (Y/N	Key Findings/Rationale
Considering Aboriginal traditional knowledge in environmental assessments conducted under the *Canadian Environmental Assessment Act* (IAAC, 2015A)	Yes	No	This document provides guidance on how community knowledge and Aboriginal Traditional Knowledge (ATK), or Indigenous Traditional Knowledge, available to the project team could be used for the assessment of cumulative effects and be included as part of the selected methodological approach, without breaking obligations of confidentiality, if any, while also maintaining appropriate ethical standards.
Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012 (IAAC, 2015B)	Yes	Yes	This document was created to support implementation of the previous CEAA 2012 and has been adopted under the IAA. It supports the implementation of CEAA 2012 provisions related to determining whether a designated project is likely to cause significant adverse environmental effects (i.e., Step 4 in the IAAC generic approach). Specifically, it provides guidance on how to apply the provisions when the Canadian Environmental Assessment Agency is the responsible authority. The approach described in this document will be followed in the Highway 413 recommended framework and is summarized in Section 3.1.4.
A Reference guide for the *Canadian Environmental Assessment Act* Assessing Environmental Effects on Physical and Cultural Heritage Resources (IAAC, 1996)	Yes	No	This guide is not intended to replace any methodological manual. It is one of several reference guides intended to provide the supporting documentation for the Interim Technical Guidance prepared by IAAC. This reference guide is complimentary to the Technical Guidance but goes into more detail on individual, cross-cutting issues specifically related to: ■ discussing the relevant requirements of the IAA to consider the effects of a project on tangible cultural heritage resources ■ reviewing the concept of cultural heritage resources ■ listing key principles in the assessment of cultural heritage resources ■ proposing a framework to assess a project's environmental effects on cultural heritage resources under the IAA ■ provides a list of key references on assessing cultural heritage resources
Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing (IAAC, 2015C)	Yes	No	This document was created to support implementation of the previous CEAA 2012 and has been adopted under the IAA. It supports the implementation of CEAA 2012 provisions related to the effects of any changes to the environment on physical and cultural heritage or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Reference Document	Applicable to the CEA Framework (Y/N)	Studied as part of background review? (Y/N	Key Findings/Rationale
			It provides preliminary guidance on how to conduct the assessment when IAAC is the responsible authority.
Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012 (IAAC, 2015D)	Yes	No	This document was created to support implementation of the previous CEAA 2012 and has been adopted under the IAA. It supports the implementation of CEAA 2012 provisions related to the effects of any changes to the environment on the current use of lands and resources for traditional purposes by Aboriginal peoples. It provides guidance on how to conduct the EA of a designated project when IAAC is the responsible authority or supports an EA conducted by a review panel.
Summary of Guidance: Describing Effects and Characterizing Extent of Significance (IAAC, 2023)	Yes	Yes	The guidance explains how to assess a designated project's potential effects and applies to projects under the IAA. The guidance specifically outlines the approach to: ■ describing the environmental, health, social and economic effects that are likely to be caused by the carrying out of a project; and ■ characterizing the extent to which the likely adverse effects within federal jurisdiction, and those that are adverse direct or incidental effects ("adverse federal effects"), are significant[1]. This document is intended to support proponents of designated projects with the preparation of an Impact Statement and is meant to be used in conjunction with other Impact Assessment Agency of Canada (Agency) policy and guidance instruments. This document informs the preparation of the Agency's Impact Assessment Report.
Waterloo Airport Runway Project, Runway 14-32 Extension, Detailed Project Description, Region of Waterloo International Airport (MTE, 2021)	No	No	A CEA was not completed for the Waterloo project. The project assessed potential impacts only. A Scoped Environmental Impact Study was completed and studied impacts to the natural environment only. This study included an analysis of "Residual Impacts after Mitigation" and concluded that the project has no significant impacts.
Proposed regulation for a streamlined environmental assessment process for the	No	No	The regulation does not include any requirements/guidelines for conducting a CEA for the Highway 413 Project.

[1] *In this guidance, the term "adverse federal effects" is used to refer to a project's adverse effects within federal jurisdiction and the adverse direct or incidental effects. Effects within federal jurisdiction are defined in section 2 of the IAA. Direct or incidental effects are defined as effects that are directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of a physical activity or designated project, or to a federal authority's provision of financial assistance to a person for the purpose of enabling that activity or project to be carried out, in whole or in part.*

Reference Document	Applicable to the CEA Framework (Y/N)	Studied as part of background review? (Y/N	Key Findings/Rationale
Ministry of Transportation's Greater Toronto Area West Transportation Corridor project			
West Flemish Pass Exploration Drilling Project, Chevron Canada Limited, Environmental Impact Statement Guidelines (Chevron Canada Limited, 2018)	Yes	Yes	In these Guideline documents, IAAC provided the proponents with key steps to complete the CEA for their respective project. These steps follow the approach described in the Agency's guidance documents related to cumulative environmental effects. Although this was not included as a specific requirement for the Environmental Impact Statement, the guideline encouraged the proponent consult with key stakeholders and Indigenous communities prior to finalizing the choice of VCs and the appropriate boundaries to assess cumulative effects.
Lake Manitoba And Lake St. Martin Outlet Channels Project, Manitoba Infrastructure, Environmental Impact Statement Guidelines (Monitoba Infrasturcture, 2018)	Yes		
Near Surface Disposal Facility Deep River, Renfrew County, Ontario, Environmental Impact Statement (Golder Associates, 2021)	Yes	Yes	This document provides a comparable example of how the approach described by IAAC in the Interim Technical Guidance: Assessing Cumulative Environmental Effects can be utilized and adjusted to fit the scope of the project. The documents explains the methodology for completing Steps 3-5 of the IAAC general approach, which are not described in the Interim Technical Guidance. It provides examples of follow-up programs that can be implemented to ensure the project does not cause significant impacts in the long term.
James Bay Lithium Mine, Environmental Impact Assessment Report, Eastmain Cree Village, Quebec (WSP, 2018)	Yes	Yes	This assessment serves as an example on how to assess cumulative effects related to the traditional use of land by Indigenous communities. Specifically, the assessment analyzed cumulative effects on the traditional use of the Cree territory and overall traditional practices, which mainly include the hunting, fishing and trapping activities of desired species, but also all other activities using the territory and its resources for ritual or social purposes. The assessment determined that no significant cumulative effects were anticipated on the traditional use of the territory by the Cree communities, therefore, no mitigation, monitoring, or follow-up was required.
Rose Lithium-Tantalum Project, Summary of the Updated Environmental Impact Assessment, Territory of Eeyou Istchee James Bay, Quebec (WSP, 2019)	Yes	Yes	Similar to the James Bay Lithium Mine project, this project also serves as an example of how to assess cumulative effects related to the traditional use of land by Indigenous communities. As well, this project provides examples of how to mitigate residual cumulative effects since it was determined that this project could result in residual cumulative effects on the Cree communities' use of lands and resources. As such, key mitigation measures, monitoring and follow-up programs were determined through consultation with the Cree communities, and the advice of government experts (federal, provincial, and municipal). This allowed the project to move forward as planned without significantly impacting the Cree communities use of the land and its resources.

Reference Document	Applicable to the CEA Framework (Y/N)	Studied as part of background review? (Y/N	Key Findings/Rationale
Site C Clean Energy Project, Joint Review Panel Report (B.C. Hydro and Power Authority, 2014)	Yes	No	This project serves as a great example of projects having residual effects on physical heritage resources caused by the proposed project activities that would be adverse and significant. The panel documented its conclusions and rationale as part of the report, and established three temporal boundaries as part of their assessment which are notable[2]. For this project spatial Regional Assessment Area boundaries for each VC were set out, and three temporal boundaries were established as follows: ■ A **baseline case** describing the current status of a VC, reflecting the residual effects of projects and activities that have been and are presently being carried out ■ A **future case** without the Project, identifying the potential adverse effects of other projects and activities that will be carried out, in order to predict the status of the VC by taking into account the baseline case and projects and activities that are at least as foreseeable as the Project. September 5, 2012 was chosen to demarcate the baseline case from the future case ■ A **Project case** demonstrating the predicted status of the VC, taking into account the residual effects of the Project combined with those due to other projects and activities as identified in the future case without the Project
Ajax Mine Project, Joint Federal Comprehensive Study/ Provincial Assessment Report (CEAA, 2017)	Yes	No	The project serves as an example on how to assess cumulative effects related to Aboriginal interests and rights. IAAC and the BC Environmental Assessment Office (EAO) concluded that the Ajax Mine Project would result in adverse impacts on Aboriginal Interests, with the most serious potential impacts on Stk'emlupsemc te Secwépemc Nation 's asserted Aboriginal right to practice cultural and spiritual customs, ceremonies, and traditions in the area known as *Pípsell*, which overlaps the mine site.

[2] *The panel's rationale for this conclusion is available online here: https://www.ceaa.gc.ca/050/documents/p63919/99173E.pdf. Please see section 12.1.1.6 (p. 230), and section 12.1.3.1 (p. 233-234).*

3. CEA Framework

Based on the background review summarized in the previous section, the following is the recommended framework for completing a cumulative effects assessment (CEA) for the Highway 413 Project. It is proposed that the CEA be carried out as part of the provincial environmental assessment process for individual projects if residual effects are predicted for the Project.

The approach described in the following sections will be completed in consultation with technical and reference guidance documents prepared by IAAC that support the CEA. Some of these guidance documents include, but are not limited to:

- Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012 (IAAC, 2015B);
- Considering Aboriginal Traditional Knowledge in Environmental Assessments Conducted Under the CEAA 2012 (IAAC, 2015A);
- A Reference Guide for the CEAA 2012: Assessing Environmental Effects on Physical and Cultural Heritage Resources (IAAC, 1996);
- Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing (IAAC, 2015C);and
- Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012 (IAAC, 2015D).

3.1 5-Step Approach

Step 1 – Scoping

Scoping for the CEA should be started after the assessment of potential project-specific environmental effects. During this step, a 5-step process will be completed to set the parameters that will define the scope of the assessment. This includes:

- Identifying VCs for which residual environmental effects are predicted;
- Determining spatial and temporal boundaries to capture potential cumulative effects on these VCs; and

- Examining the relationship of the residual environmental effects of the project with those of other physical activities.

At the end of this step, the VCs identified will be carried forward to Step 2: Analysis.

The following sections describe the recommended methodologies to complete each of the 5 steps required to complete the scoping process.

3.1.1.1 Step 1.1: Identifying Valued Components (VCs)

To ensure consistency throughout the Project, the factors and sub-factors previously used in the route alternatives assessment (**Appendix A**) will be considered as the initial list of VCs and will be reviewed and evaluated using the criteria recommended by IAAC in the Interim Technical Guidance: Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act,* 2012, Draft Version 2 (IAAC, 2018)**.** Additional criteria were added from the different project examples reviewed as summarized in **Section 2.1**. The rationale for adding each of the additional criterion is explained below. The table below includes the combined list of criteria as recommended by IAAC and those used in similar projects.

Table 3-1: Criteria for selecting VCs for the Highway 413 Project

Criteria	Source	Rationale
1. **Has residual environmental effects resulting from the potential environmental impacts**	Interim Technical Guidance: Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act*, 2012, Draft Version 2 (IAAC, 2018)	IAAC recommended generic approach to identifying VCs
2. **Are highly valued by experts or by the public, stakeholders, and Indigenous communities**	James Bay Lithium Mine, Environmental Impact Assessment Report, Eastmain Cree Village, Quebec (WSP, 2018)	To ensure major concerns expressed by stakeholders, public, and Indigenous communities are properly addressed.
3. **Are identified or protected by law/regulations**	Near Surface Disposal Facility Deep River, Renfrew County, Ontario, Environmental Impact Statement (Golder Associates, 2021) And James Bay Lithium Mine, Environmental Impact Assessment Report, Eastmain Cree Village, Quebec (WSP, 2018)	To ensure features/species of conservation status or concern (e.g., rarity, sensitivity, uniqueness, heritage value, etc.) are protected, as much as possible, or that protection measures described in the relevant laws/regulations are met.
4. **Are analyzable, based on reliable and adequate data, in terms of both the**	Rose Lithium-Tantalum Project, Summary of the Updated Environmental Impact Assessment,	Measurement indicators represent properties of the environment and VCs that, when changed, could result in or

Criteria	Source	Rationale
reference case and historical information	Territory of Eeyou Istchee James Bay, Quebec (WSP, 2018)	contribute to an effect on assessment endpoints. Assessment endpoints are qualitative expressions used to assess the significance of residual effects on VCs and represent the key properties of the VC that should be protected for future human generations. This ensures the same systematic and rigorous approach is applied to each VC. E.g., changes in habitat quantity and quality (measurement indicators) are used to assess the significance of residual effects from the Project on the ability of a wildlife population to remain self-sustaining and ecologically effective (an assessment endpoint.

For each of the VCs, the team will gather information on the VCs of particular relevance to the CEA. The team will develop a registry of VCs that may have residual effects based on the results of the project-specific effects assessment.

Once the list of VCs having residual effects is compiled, the team will begin gathering VC information of specific interest to the CEA through the following data and information sources:

- scientific and science-based literature;
- current legislation;
- completed or in-progress EAs (federally or any other jurisdiction);
- available mapping (e.g., historical air photos, geomorphological data, hydrological data, vegetation mapping, or topographical maps);
- government websites (e.g., for land use plans, development strategies, or open data);
- regional studies conducted under CEAA 2012 and IAA, 2019;
- other regional studies (e.g., conducted by a province);
- monitoring information, status assessments, or management plans from resource management agencies; and
- baseline studies.

Refer to **Appendix B** for the initial list of data and information sources anticipated to be utilized for this assessment.

Documentation of the scoping step will take the form of two lists of VCs: those that are carried forward to Step 2, and those that are not carried forward, supported by a rationale.

3.1.1.2 Step 1.2: Determining Spatial Boundaries

The VC-centered spatial boundaries method is the recommended method for determining the spatial boundaries for each of the VCs identified in Step 1.1.

Under this approach, spatial boundaries are based primarily on the VC's geographic range and the zone of influence (ZOI) of the project for the VC. Typically, spatial boundaries will vary according to the VC, either based on ecosystem or urban planning

considerations, which will, in turn, facilitate the data collection and historical trend analysis. Similar to the potential environmental effects assessment, a ZOI will be determined for each VC in accordance with the relevant regulation. For example, for identified archeological features, the Ontario Heritage Act will be used to define the ZOI.

3.1.1.3 Step 1.3: Determining Temporal Boundaries

Time horizons for the project or selected physical activities should include timelines associated with **construction, operation, decommissioning and abandonment**. However, decommissioning and abandonment timelines are not applicable to the project since highways are considered permanent infrastructure and therefore there are no plans for closure or post-closure.

Temporal boundaries will support the consideration of cumulative effects for **each VC** identified for the CEA. Past and present temporal boundaries will be determined for each VC through analyzing available information in order to determine a reasonable time range. Past temporal boundaries will be based on available historic information for each VC.

Future temporal boundary will be set based on the following two phases, as explained above, with some exceptions to certain disciplines:

- **Construction phase:** This phase includes site preparation and all activities associated with the construction of the Project. A detailed list of physical activities to be completed during this phase will be developed according to the anticipated construction schedule.
- **Operations phase:** This phase includes all activities associated with the operations and maintenance of the highway. Exact timing will be developed based on the construction end date.

3.1.1.4 Step 1.4: Examining Physical Activities that have been carried out

The following methodology has been identified as the recommended method to determine which past and existing physical activities to include in the Highway 413 CEA.

Using direct evidence relating to past and existing physical activities with VCs

Reasonable effort should be made to identify past and existing physical activities based on direct evidence available from the historical record and other reliable sources, such as reports, community knowledge or ITK.

Data and information on physical activities that occurred in the distant past is often limited. The challenge generally increases as the study extends into the past. In such circumstances, the information may still provide some insight determining physical past physical activities in relation to each VC.

Data and information on existing physical activities, or those that occurred in the recent past, are much easier to find. Sources include recent EA reports and land-use planning documents. Refer to **Appendix B** for the initial list of data and information sources anticipated to be utilized for this assessment.

In some cases, information on past or existing physical activities may help identify appropriate mitigation measures. Information on existing physical activities should cover their full lifecycles, particularly if decommissioning is certain or reasonably foreseeable.

It would also be useful to consider another type of past action that is not presently specified in the IAAC guidance documents, which is the effect of regulations. For example, species protection, urban planning or pollution regulations. These affect a "physical" component but are not "physical activities" as such. In an area like the one affected by this project, they may be important factors to consider either in past, present or future effects.

3.1.1.5 Step 1.5: Examining physical activities that will be carried out

A future physical activity would be considered as certain to proceed for the Highway 413 project, and would be included in a CEA if one or more of the following criteria are met:

- The physical activity has received approval in whole or in part, such as:
    - environmental assessment approval;
    - pre-development approval for early works, permits for exploration, or collection of baseline data; or
    - some other regulatory approval from a province.
- The physical activity is under construction; and/or
- The site preparation is being undertaken.

A future physical activity could be considered reasonably foreseeable and should generally be included in the Highway 413 CEA if one or more of the following criteria are met:

- The intent to proceed is officially announced by a proponent. This information could be found in news media, the proponent's website or via an announcement from the proponent directly to regulatory agencies.
- The physical activity is under regulatory review (i.e., the application is in process). This can be known, for example, if information about the review or application is available on a government website, or an EA notice has been made public.
- The submission for regulatory review is imminent. This could be known if the collection of data has already commenced, regulatory authorities have been contacted about information requirements, or through an announcement from the proponent.
- The physical activity is identified in a publicly available development plan that is approved or for which approval is anticipated.
- The physical activity supports – or is consistent with – the long-term economic or financial assumptions and engineering assumptions made for the Project's planning purposes.
- All physical activities required for the Project to proceed.
- The economic feasibility of the Project is contingent upon the future development.
- The completion of the Project would facilitate or enable the future development.

The criteria in the last three preceding bullets often relate to what is described as "**induced development**". If the induced development is certain or reasonably foreseeable, it should be considered in the CEA. To do so, the Project Team will rely extensively on stakeholder and Indigenous communities consultation and will take into consideration the mitigations suggested to reduce potential cumulative effects.

Step 2 – Analysis

This step builds on the results of scoping (Step 1) and considers how all physical activities identified during the scoping stage may affect the VCs within the spatial and temporal boundaries determined for the Highway 413 assessment of cumulative effects.

During this step, the team will complete a 2-step process to complete the analysis of the potential effects physical activities may have on the VCs.

The following describes the 2-step process:

1. Analyze available data and information within time and spatial boundaries specific to each VC and,
2. Address data limitations and uncertainty in the analysis.

The residual effects analysis is based on the environmental interactions that are determined to be primary in the **pathway analysis**. For primary pathways that require a residual effects analysis, the concept of assessment cases is applied to estimate the incremental and cumulative effects from the Highway 413 Project, as well as previous, existing, and reasonably foreseeable developments. The residual effects analysis is completed for the following assessment cases:

1. **Base Case:** This scenario represents existing conditions and characterizes effects from previous and existing developments and activities. The Base Case reflects the effects of existing disturbances, such as forestry, transportation, agricultural, mining, and residential and recreational development. Current effects from the existing operations and activities on the project site are considered part of the Base Case. Establishing a Base Case is broken down into two steps:
    I. describe a past situation for each VC within its pertinent spatial boundaries.
    II. For each VC, the effect of past actions (population decline, increase etc.) are assessed up to present.
2. **Application Case:** This scenario represents predictions of the effects of the Base Case combined up to its pertinent spatial limits with the effects that may result from the Highway 413 Project. The Application Case considers potential effects from the Highway 413 Project during construction and operations phases. For this scenario, it is important to determine if these effects contribute to the deterioration of a VC or counteract (fix) past negative effects.

3. **Reasonably Foreseeable Development Case:** This scenario represents predictions of the cumulative effects of the Application Case, which includes the Base Case, plus projects that are currently under application review or that have officially entered a regulatory application process and are therefore considered reasonably foreseeable within the VCs spatial limits, and not the regional limits. Reasonably foreseeable developments in the VCs spatial boundary that are anticipated to overlap with potential effects of the Highway 413 Project may include the future transitway, new/upgrades to research and development facilities, new support infrastructure, and on-going decommissioning and environmental remediation activities on the Project site. As well, there may be overlap of the construction period with limited construction at neighbouring development sites.

3.1.1.6 Step 2.1: Analyzing available data and information within time and spatial boundaries specific to each VC

Having access to data and information related to other physical activities and traditional and community knowledge is critical for conducting the Step 2 analysis.

To make decisions about which data is to be collected or generated, the team will need to have a clear understanding of how the data and information will be used in the assessment, how to establish a proper scale of analysis, and what methodologies and specific methods will be employed for their analysis.

A combination of the following two (2) options is identified as the recommended method for the Highway 413 Project to complete the analysis of various types of data and information.

1. Using information about current and past environmental conditions

A past baseline will be established based on available and reliable data. Establishing a valid past reference is key to determining historic trends of a given VC in relation to the present situation. A critical review of available information will be done to establish the most accurate baseline possible. Present baseline data will be compared to past conditions to reveal spatial or temporal patterns or trends so that predictions can be made. Information on past environmental conditions may also help establish if present-day VC conditions are likely to be stable.

2. Using Indigenous Traditional Knowledge (ITK) and Community Knowledge

In consultation with reference guide 'Considering Aboriginal Traditional Knowledge in Environmental Assessments Conducted Under the CEAA 2012' (IAAC, 2015A), the Project Team will collect and incorporate available community knowledge and ITK to the extent that communities are willing to share to inform the assessment of cumulative effects. The Team will also describe and include ITK as a part of the selected methodological approach, without breaking obligations of confidentiality, if any, while also maintaining appropriate ethical standards. As well, the Project will abide by existing community agreements, if any, around the assessment of cumulative effects. The agreements will help establish the key elements of VC selection, time/spatial boundaries (including determining reasonable time limits), and the braiding of the two knowledge systems (ITK and Western science). As well, the Project Team will engage the communities on the reasonable time limits for past temporal boundary to ensure the communities recognize the validity of the CEA.

3.1.1.7 Step 2.2: Addressing Data Limitations and Uncertainty in the Analysis

The Highway 413 Project Team will work to meet the requirement to assess cumulative effects in the face of data limitations and uncertainty. The assessment will present a complete picture of the potential types and scale of cumulative effects and the data required and used for their assessment, as is possible. While there are frequent data limitations in CEA that cannot be fully overcome, the uncertainties that result from these limitations will be documented.

Assumptions used in modelling and other analytical methods may limit the analysis. Where possible, it will be noted if results are sensitive to small changes in assumptions.

The following is identified as the recommended method to address data limitations and uncertainties for the Highway 413 Project.

Using various sources and types of knowledge

A variety of approaches for addressing data limitations are available, including:

- use of ITK and community knowledge to fill data gaps;
- use of surrogate data from similar areas to estimate past environmental conditions;
- use of surrogate data from similar physical activities to predict cumulative effects;
- modelling to assess possible cumulative effects over the range of future conditions; and
- inferences based on an appropriate body of knowledge, using professional judgment.

Refer to **Appendix B** for the initial list of data and information sources anticipated to be utilized for this assessment.

Step 3 – Mitigation

Once project components and/or activities with the potential to affect the surrounding environment are identified and mitigation measures are determined, a pathways analysis is used to further assess potential residual effects.

Where effects are adequately mitigated and are not forwarded for further analysis, the reasons for concluding the assessment at this stage are articulated. Primary pathways that may lead to residual effects after incorporating mitigation are carried forward to Step 4 for residual effects characterization.

Each potential pathway will be evaluated and described as follows:

- **No linkage:** Analysis of the potential pathway reveals that there is no valid linkage between the Highway 413 Project and the VC, or the pathway is removed by environmental design features or mitigation. In this case, the Highway 413 Project would not be expected to result in a measurable environmental change and would therefore have no residual effect on a VC relative to existing conditions or guideline values.
- **Secondary:** The pathway could result in a measurable minor environmental change, but would have a negligible residual effect on a VC relative to existing conditions or guideline values, and is not expected to contribute to effects of

other existing, approved, or reasonably foreseeable developments to cause a significant effect.

- **Primary:** The pathway is likely to result in an environmental change that could contribute to residual effects on a VC relative to existing conditions.

Step 4 – Significance

The recommended approach to determining if a project is likely to cause significant adverse environmental effects consists of three stages:

- Stage 1: Determining whether the residual environmental effects are **adverse**.
- Stage 2: Determining whether the residual adverse environmental effects are **significant**.
- Stage 3: Determining whether the significant adverse environmental effects are **likely**.

This approach is carried out for each residual adverse environmental effect using VCs to focus information gathering on each effect.

3.1.1.8 Stage 1: Adverse

Only residual environmental effects that are adverse are considered in the determination of significance. Positive effects/benefits of the project will be determined through the environmental impact assessment process but will not be considered in the CEA framework. Identification of adverse effects is the result of the scoping, analysis and mitigation steps of the CEA framework (steps 1-3 - **Section 2.5**). The identification of residual adverse environmental effects applies to the full life cycle of the project: construction, operation, decommissioning and abandonment of the project.

An adverse environmental effect can be described in qualitative or quantitative terms. It may be described using the direction of the residual effect. Direction indicates whether the residual effect on a VC is negative (i.e., less favourable), positive (i.e., improvement), or neutral (i.e., no change). Neutral and positive changes are not assessed for significance.

Examples:

- Loss of fish or fish habitat
- Migratory bird mortality

- Decline in the health, status, or condition of marine plants
- Reductions in species diversity or abundance of marine animals
- Reduction in air quality on federal lands or in another province during project operation
- Loss of, or damage to, habitats, including habitat fragmentation that would affect the current use of lands and resources for traditional purposes by Indigenous communities

3.1.1.9 Stage 2: Significant

This stage involves considering if the residual adverse environmental effects identified in Stage 1 are significant for each potentially affected VC.

Key criteria (further described below) that should be considered in this stage include:

- Magnitude;
- Geographic extent;
- Timing;
- Frequency;
- Duration; and,
- Reversibility.

These criteria are the principal factors recommended to predict significance. The magnitude of a residual environmental effect is determined by the change in a measurement indicator from a project interaction. Residual adverse effects are to be classified using discipline specific criteria and definitions. Available registries and agencies will also be utilized, and the project team will consult/seek advice on the most appropriate projects to incorporate as part of the assessment.

- **Magnitude:** Magnitude is a measure of the intensity of a residual effect, or the degree of change caused by the Highway 413 Project (and other developments, if applicable) relative to baseline conditions, guidelines, or threshold values. Magnitude is typically classified into three scales: negligible to low, moderate, and high. The scales of magnitude are specific to each VC or discipline of study and incorporate the geographic extent and duration of residual effects in context

of the properties of VC assessment endpoints. Where possible, magnitude is reported in absolute and in relative terms.

- **Geographic extent:** This criterion refers to the spatial extent of the effect, and is different from the spatial boundary (i.e., study area) for the residual effects analysis. The spatial boundary for the residual effects analysis represents the maximum area used for the assessment and is related to the spatial distribution and movement of VCs. The geographic extent of residual effects can occur on multiple scales within the spatial boundary of the assessment. Geographic extent refers to the area affected and is often categorized into three scales: local, regional and beyond regional.
- **Timing**: Timing considerations should be noted when it is important in the evaluation of the environmental effect (e.g. when the environmental effect could occur during breeding season, or during a period of species migration through the area). It may also be relevant to discuss variation in timing of project activities, such as reservoir level fluctuations, and how that may cause varying environmental effects. For non-biophysical environmental effects, it is important to take into account seasonal aspects of land and resource use and whether timing is related to Aboriginal spiritual and cultural considerations.
- **Frequency:** Frequency refers to how often a residual effect will occur and may be expressed as isolated, periodic, or continuous. Frequency is explained more fully by identifying when the residual effect occurs (e.g., once at the beginning of the Highway 413 Project). Timing was not included as a separate criterion. If the frequency is periodic, then the length of time between occurrences and the seasonality of occurrences (if present) is discussed.
- **Duration:** Duration is defined as the amount of time (usually in years) from the beginning of a residual effect on when the residual effect to a VC is reversed and is expressed relative to Highway 413 Project phases. Duration has two components. It is the amount of time between the start and end of a Project activity or stressor (which is related to Project development phases), plus the time required for the residual effect to be reversed.
- **Reversibility:** After removal of the Highway 413 Project activity or stressor, reversibility is the likelihood that the Highway 413 Project will no longer influence a VC in a future predicted period. Reversibility usually has only two alternatives: reversible or irreversible. The period is provided for reversibility (i.e., duration) if a residual effect is reversible. Permanent residual effects are considered irreversible.

Once each criterion has been defined and/or assessed for each of the potentially affected VCs, a qualitative assessment will be completed to determine overall effect significance. An important factor in determining significance is whether cumulative effects would require further monitoring and will be carried out to Step 5.

It should be noted that significance determination is a characteristic of CEAA 2012, but has been abandoned in the IAA for the more subtle “extent of significance”. Therefore, consultation with IAAC will be required to limit any potential uncertainties associated with significance determination.

3.1.1.10 Stage 3: Likely

The determination of likelihood is based on consideration of probability and uncertainty and is considered only when it is established through Stage 2 that one or more predicted residual adverse effects are significant.

Likelihood: Likelihood is the probability of an effect occurring and is described in parallel with uncertainty. This criterion may be influenced by a variety of factors, such as the likelihood of disturbance occurring or the likelihood of mitigation being successful. Four classification categories are typically used: unlikely, possible, likely, and highly likely.

Table 3-2 presents an example of assessment criteria for classifying predicted residual adverse effects to Greenhouse Gases and could form the basis for a Highway 413 significance assessment template.

Table 3-3 provides suggested criteria for extent of significance determinations and represents a sliding scale of likely adverse effects on a valued component, ranging from negligible/low to moderate to high. Adverse residual federal effects may include criteria from different levels. For example, an effect may be low in magnitude, moderate in spatial extent and irreversible. The final characterization of extent of significance should be informed by a reasonable weighing of all evidence and rationales provided (IAAC, 2023).

Table 3-2 Example of assessment criteria for classifying predicted residual adverse effects to Greenhouse Gases

Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Likelihood	Overall Significance
Positive: Maximum concentration for an indicator compound represents a decrease from Base Case. **Negative:** Maximum concentration for an indicator compound represents an increase from Base Case. **Neutral:** No change in concentrations of an indicator compound relative to Base Case.	**Negligible:** Maximum concentration for an indicator compound is less than 5% of the corresponding criteria. **Low:** Maximum concentration for an indicator compound is less than 50% of the corresponding criteria. **Moderate:** Maximum concentration for an indicator compound is above 50% and below 100% of the corresponding criteria. **High:** Maximum concentration for an indicator compound is above the corresponding criteria.	**Local:** Effect is limited to within the LSA. **Regional:** Effect extends beyond the LSA but is contained within the RSA. **Beyond Regional:** Effect extends beyond the RSA.	**Short-term:** Effects are not evident beyond the construction phase. **Medium-term:** Effects are not evident beyond the operations phase. **Long-term:** Effects are not evident beyond the closure and post-closure phases. **Permanent:** Effects are not reversible.	**Infrequent:** Effects are confined to a specific discrete period. **Frequent:** Effects occur intermittently, but repeatedly, or continuous over the assessment period.	**Reversible:** Change of state in environment is not permanent. **Irreversible:** Change of state in the environment is permanent.	**Low:** Effect is unlikely to occur. **Medium:** Effect is likely to occur. **High:** Effect is highly likely to occur.	Qualitative analysis determining overall significance and whether a monitoring program is required. The final characterization of extent of significance should be informed by a reasonable weighing of all evidence and rationales provided.

Table 3-3 Suggested criteria for characterizing extent of significance of adverse federal effects (IAAC, 2023)

Negligible* or Low	Moderate	High
Effects are likely to be negligible or minor in scale, negligible or low in magnitude, of short duration, infrequent, small in spatial extent, reversible or readily avoided, and to generate few or minor impacts in social or ecological contexts. Mitigation measures will allow baseline conditions to remain largely unchanged.	Effects are likely to be medium in scale, moderate in magnitude, of moderate duration, occasionally frequent, possibly/partially reversible, and to generate a moderate level of impacts in environmental, health, social or economic contexts. Mitigation measures may not fully eliminate, reduce, control or offset effects but should enable affected communities to maintain health, social and economic well-being, and should prevent the diminishment or loss of key components of the environment.	Effects are likely to be severe in scale, high in magnitude, permanent/long term, frequent, irreversible, and over a large spatial extent or within an area of exclusive (i.e., reserves) or preferred (e.g., traditional territory, Indigenous use or of ecological/environmental sensitivity). High levels of impacts in environmental, health, social or economic contexts are expected. There is a high degree of uncertainty of the effectiveness of mitigation measures, or mitigation measures are unable to fully address effects such that valued components are diminished or lost.

* A "negligible" effect does not mean "no effect" but that an effect is sufficiently small to likely not result in a noticeable change to the valued component. However, in the context of cumulative effects, a negligible effect may be important in understanding regional effects as a whole.

Step 5 – Follow Up

In general, monitoring is used to verify the effects predictions, identify any unanticipated effects, and provide for the implementation of adaptive management to limit these effects. Typically, monitoring includes one or more of the following categories, which may be applied during the development of the Highway 413 Project:

- **Compliance monitoring:** monitoring activities, procedures and programs undertaken to confirm the implementation of approved design standards, mitigation and conditions of approval and company commitments.
- **Environmental monitoring:** monitoring to track conditions or issues during the development lifespan of the Highway 413 Project, and to subsequently provide for the implementation of adaptive management.
- **Follow-up monitoring:** programs designed to test the accuracy of effects predictions, reduce or address uncertainties, determine the effectiveness of mitigation, or provide appropriate feedback to operations for modifying or adopting new mitigation designs, policies, and practices. Results from these programs can be used to increase the certainty of effect predictions in future environmental assessments.

Proposed monitoring and follow-up programs will be discussed within each discipline section. Where relevant, conceptual monitoring programs will be proposed to deal with the uncertainties associated with the effect predictions and mitigation.

4. Consultation and Engagement Program

As part of conducting the Cumulative Effects Assessment, multiple rounds of consultation and engagement will be conducted.

Round #1: Development of Draft CEA Framework

Complete

Round #1 consultation and engagement took place between late fall 2022 and early winter 2023. The main purpose was to allow Indigenous communities and key technical stakeholders (i.e., regulatory authorities, namely IAAC, Health Canada, Fisheries and Oceans Canada, MECP, Ontario Ministry of Citizenship and Multiculturalism (MCM)) to review and comment on the initial **draft Cumulative Effects Assessment Framework**. Meetings with technical stakeholders and Indigenous communities were offered and held upon request. In the event that no meetings were requested, consultation was limited to the review of and feedback collected on the initial draft CEA Framework. Following this review, the draft CEA Framework was updated and the list of factors and sub-factors previously used in the route alternatives assessment was revised and augmented. As a result, a number of new factors and sub-factors were added to the Initial List of Potential VCs. (See Appendix A for reference).

Round #2: Feedback on Draft CEA Framework and Valued Components (VCs)

The second round of consultation and engagement will be centered on seeking feedback from the general public and members of nearby communities. The Project Team is developing electronic learning (e-learning) modules that will explain the draft CEA Framework and will be releasing them on the Project website. In addition, the full draft CEA Framework will also be published on the Project website for a 30- day public review and comment period. This round is an opportunity for Indigenous communities, key technical stakeholders such as regulatory authorities, and the public to review the **draft Cumulative Effect Assessment Framework**. Stakeholders are invited to submit their comments to the Project Team during this period. Round #2 of consultation and engagement will also gather feedback on the proposed list of VCs to determine the VCs of particular relevance to the CEA. Feedback will be collected on the draft list of VCs,

which will be developed in accordance with Appendix A. Meetings with key technical stakeholders and Indigenous communities will be arranged upon request. Following this round of consultation and engagement, the Project Team will incorporate the feedback received throughout this process to **finalize the Cumulative Effects Assessment Framework**, ensuring it is ready for use in the comprehensive Cumulative Effects Assessment.

Round #3: Cumulative Effects Assessment

The third round of consultation and engagement will be held to collect feedback from key stakeholders and Indigenous communities on the results of the **draft Cumulative Effects Assessment** and proposed mitigation measures. The Final Cumulative Effects Assessment will be made available on the Highway 413 project website. Meetings with key technical stakeholders and Indigenous communities will be arranged as appropriate.

A

Appendix A: Initial List of Potential VCs

- This list is based on the list of Factors and Sub-Factors Included in the Assessment of Route Alternatives and will be modified and updated following the completion of the Project-Specific effects assessment.

Potential VCs		Criteria				Decision Is the VC carried over to Step 2? (Y/N)	Rationale
Factor	Sub-Factor	Are there residual environmental effects to the VC from the project? (Y/N and provide rationale)[3]	Is the VC highly valued by experts or by the public, stakeholders, and Indigenous Communities? (Y/N and provide rationale)[4]	Is the VC identified or protected by law/legislation? (Y/N and list all applicable law/legislation)[5]	Is the VC analyzable, e.g., qualitative, quantitative, measurable, etc., based on reliable and adequate data?[6] (Y/N and provide rationale)		
1.0 Natural Environment							
1.1 Fish and Fish Habitat	1.1.1 Fish Habitat	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.1.2 Fish Community	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
1.2 Terrestrial Ecosystems	1.2.1 Wildlife and Wildlife Habitat	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.2.2 Wetlands	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.2.3 Woodlands and Vegetation	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.2.4 Designated/Special/ Natural Areas	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
1.3 Ecosystem Services		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

[3] This is to be determined based on the results of the potential environmental effects analysis.
[4] This will be determined through consultation with stakeholders, Indigenous Communities, and the public.
[5] Text highlighted in this column is included to provide examples of relevant laws/regulations.

[6] This will be determined based on determining the measurement indicators and assessment endpoint for each VC (see Section 3.1.1.1)

Potential VCs		Criteria				Decision Is the VC carried over to Step 2? (Y/N)	Rationale
Factor	Sub-Factor	Are there residual environmental effects to the VC from the project? (Y/N and provide rationale)[3]	Is the VC highly valued by experts or by the public, stakeholders, and Indigenous Communities? (Y/N and provide rationale)[4]	Is the VC identified or protected by law/legislation? (Y/N and list all applicable law/legislation)[5]	Is the VC analyzable, e.g., qualitative, quantitative, measurable, etc., based on reliable and adequate data?[6] (Y/N and provide rationale)		
1.4 Groundwater	1.4.1 Areas of Groundwater Recharge or Discharge	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.4.2 Groundwater Source Areas and Wellhead Protection Areas	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.4.3 Large Volume Wells	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.4.4 Private Wells	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.4.5 Groundwater-Dependent Commercial Enterprises	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.4.6 Groundwater-Sensitive Ecosystems	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
1.5 Surface Water	1.5.1 Watershed / Subwatershed Drainage Features/ Patterns	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	1.5.2 Surface Water Quality and Quantity	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
1.6 Air Quality and Climate Change[7]	1.6.1 Local and regional air quality impacts (Air contaminants of concern)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

[7] *Following the completion of Round #1 of Consultation and Engagement during the development of the draft CEA Framework, the Project Team revised the Air Quality and Climate Change sub-factors to sub-divide GHGs and air contamianats of concern based on feedback received from the MTO Air Quality department.*

Potential VCs		Criteria				Decision Is the VC carried over to Step 2? (Y/N)	Rationale
Factor	Sub-Factor	Are there residual environmental effects to the VC from the project? (Y/N and provide rationale)[3]	Is the VC highly valued by experts or by the public, stakeholders, and Indigenous Communities? (Y/N and provide rationale)[4]	Is the VC identified or protected by law/legislation? (Y/N and list all applicable law/legislation)[5]	Is the VC analyzable, e.g., qualitative, quantitative, measurable, etc., based on reliable and adequate data?[6] (Y/N and provide rationale)		
	1.6.2 Climate Change and Greenhouse Gas Emissions	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
2.0 Land Use / Socio-Economic Environment							
2.1 Land Use Planning Policies, Goals, Objectives	2.1.1 First Nation Land Claims	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.1.2 Provincial / Federal Land Use Planning Policies/Goals/ Objectives	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.1.3 Municipal (local and regional) Land Use Planning Policies / Goals / Objectives	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.1.4 Development Objectives of Private Property Owners	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
2.2 Land Use – Community	2.2.1 First Nation Reserves	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.2.2 Indigenous Sacred Areas	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.2.3 Urban and Rural Residential Uses and Properties	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.2.4 Commercial/ Industrial Uses and Properties	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.2.5 Recreational Areas and Tourist Attractions	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Potential VCs		Criteria				Decision Is the VC carried over to Step 2? (Y/N)	Rationale
Factor	Sub-Factor	Are there residual environmental effects to the VC from the project? (Y/N and provide rationale)[3]	Is the VC highly valued by experts or by the public, stakeholders, and Indigenous Communities? (Y/N and provide rationale)[4]	Is the VC identified or protected by law/legislation? (Y/N and list all applicable law/legislation)[5]	Is the VC analyzable, e.g., qualitative, quantitative, measurable, etc., based on reliable and adequate data?[6] (Y/N and provide rationale)		
	2.2.6 Community Facilities / Institutions	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.2.7 Municipal Infrastructure and Public Service Facilities	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
2.3 Noise Sensitive Areas (NSA's)	2.3.1 Transportation Noise	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
2.4 Land Use – Resources	2.4.1 Aboriginal and Treaty Rights and Use of Land and Resources for Traditional Purposes	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.4.2 Agriculture / Specialty Crop	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.4.3 Recreation	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.4.4 Aggregate and Mineral Resources	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
2.5 Major Utility Transmission Corridors and Pipelines	2.5.1 Major Existing Utility Transmission Corridors and Pipelines	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.5.2 Major Proposed Utility Transmission Corridors and Pipelines	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
2.6 Contaminated Property and Waste Management		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

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2.7 Landscape Composition	2.7.1 Terrain	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.7.2 Vegetation	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.7.3 Visual Impacts	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	2.7.4 Aesthetics	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
3.0 Cultural Environment							
3.1 Built Heritage and Cultural Heritage Landscapes	3.1.1 Built Heritage Resources (BHR) - These resources may be identified through designation or heritage conservation easement under the Ontario Heritage Act, listed by local, provincial or federal jurisdictions, or identified as potential Heritage Resources as part of the Environmental Assessment process	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	3.1.2 Heritage Bridges - These resources may be identified through designation or heritage	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

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	conservation easement under the Ontario Heritage Act, or listed by local, provincial or federal jurisdictions.						
	3.1.3 Cultural Heritage Landscapes (CHL) - These resources may be identified through designation or heritage conservation easement under the Ontario Heritage Act, listed by local, provincial or federal jurisdictions, or identified as potential Heritage Resources as part of the Environmental Assessment process.	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
3.2 Archaeology	3.2.1 Pre-Contact and Contact Indigenous Archaeological Sites	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	3.2.2 Historic Euro-Canadian Archaeological Sites	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	3.2.3 Indigenous Burial Sites	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	3.2.4 Cemeteries	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

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4.0 Transportation							
4.1 System Capacity & Efficiency	4.1.1 Movement of People	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.1.2 Movement of Goods	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.1.3 System performance during peak periods	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
4.2 System Reliability / Redundancy		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
4.3 Safety	4.3.1 Traffic Safety	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.3.2 Emergency Access	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
4.4 Mobility & Accessibility	4.4.1 Modal integration and balance	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.4.2 Linkages to Population and Employment Centres	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.4.3 Recreation and Tourism Travel	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.4.4 Accommodation for pedestrians, cyclists,	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

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	snowmobiles, and specialized vehicles						
4.5 Network Compatibility	4.5.1 Network connectivity	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.5.2 Flexibility for future expansion	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
4.6 Engineering	4.6.1 Constructability	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	4.6.2 Compliance with design criteria	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
4.7 Construction Cost		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
4.8 Traffic Operations		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
5.0 Other factors identified through the preliminary impact assessment process							
5.1 Species at Risk		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
5.2 Health[8]	5.2.1 Human health (mental and physical health and wellbeing)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

[8] *Following the completion of Round #1 of Consultation and Engagement during the development of the draft CEA Framework, the Project Team added Health factor and associated sub-factors based on feedback received from the Health Canada.*

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	5.2.2 Air Quality and Climate Change	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	5.2.3 Noise Levels and Vibration	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

B

Appendix B: Potential Data and Information Sources

- This list is based on available references that have been previously reviewed for the preparation of the Initial Project Description

Type of Data/Information	Atmospheric Environment	Acoustic Environment	Physiography, Geology, Terrain and Soils	Groundwater	Surface Water	Natural Environment	Fluvial Geomorphology	Cultural Heritage- Built Heritage Resources and Cultural Heritage Landscapes	Archaeology	Social, Economic, and Health
Scientific and science-based literature	•	•	•	•	•	•	•	•	•	•
Law/legislation	•	•	•	•	•	Examples may include: • *Fisheries Act* • *SARA* • *MBCA* • *ESA*	•	Examples may include: • *Heritage Act*	•	•
Completed or in-progress EAs or projects (federally or any other jurisdiction)	•	•	•	•	•	•	•	•	•	•
Available mapping (e.g., historical air photos, geomorphological data, hydrological data, vegetation mapping, or topographical maps)	•	•	•	•	•	•	•	•	•	•
Government websites (e.g., for land use plans, development strategies, or open data)	•	•	•	•	•	•	•	•	•	•

Type of Data/Information	Atmospheric Environment	Acoustic Environment	Physiography, Geology, Terrain and Soils	Groundwater	Surface Water	Natural Environment	Fluvial Geomorphology	Cultural Heritage- Built Heritage Resources and Cultural Heritage Landscapes	Archaeology	Social, Economic, and Health
Regional studies conducted under CEAA 2012	•	•	•	•	•	•	•	•	•	•
Other regional studies (e.g., conducted by a province)	•	•	•	•	•	•	•	•	•	•
Monitoring information, status assessments, or management plans from resource management agencies	•	•	•	•	•	•	•	•	•	•
Input from the public, Indigenous Communities, the scientific community, and government agencies (e.g., PIC summary report, survey results, meeting minutes)	•	•	•	•	•	•	•	•	•	•
Baseline studies	Examples may include: • Draft Overview of Environmental Conditions and Constraints	•	•	•	Examples may include: • Silver Creek Subwatershed Study: Background Report.	•	•	•	Examples may include: • Stage 1 Archaeological Assessment, GTA West Corridor	•

Type of Data/Information	Atmospheric Environment	Acoustic Environment	Physiography, Geology, Terrain and Soils	Groundwater	Surface Water	Natural Environment	Fluvial Geomorphology	Cultural Heritage- Built Heritage Resources and Cultural Heritage Landscapes	Archaeology	Social, Economic, and Health
	• Working Paper Update (2015) Environmental Conditions and Constraints Revised Draft Overview Report (2010)				Prepared for the Town of Halton Hills (Credit Valley Conservation, 2001)				Planning & EA Study—Phase 1, Regional Municipalities of Halton, Peel, and York and the County of Wellington, Ontario. Report submitted to the Ontario Ministry of Tourism, Culture and Sport, Toronto. PIF# P163-020-2007 (ASI, 2009)	

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