NATIONAL CAPITAL COMMISSION

SIXTH INTERPROVINCIAL BRIDGE CROSSING STUDY REFRESH

Summary Report

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1 INTRODUCTION

The National Capital Commission is investigating the potential for a sixth interprovincial bridge crossing to provide a link between the City of Ottawa, Ontario and the Ville de Gatineau, Quebec. WSP was retained to carry out a refresh of the environmental and technical study reports supporting Phase 2B of the 2013 Interprovincial Crossings Environmental Assessment. The update looks at the three crossing locations that received the highest potential: Kettle Island (Corridor 5), Lower Duck Island (Corridor 6), and McLaurin Bay (Corridor 7), as shown in **Figure 1-1**. The assignment covers the following disciplines: Noise & Vibration, Land Use, Air Quality, Fisheries & Aquatic Habitat, Transportation, Indigenous History, Economic Development Potential, and Natural Environment.

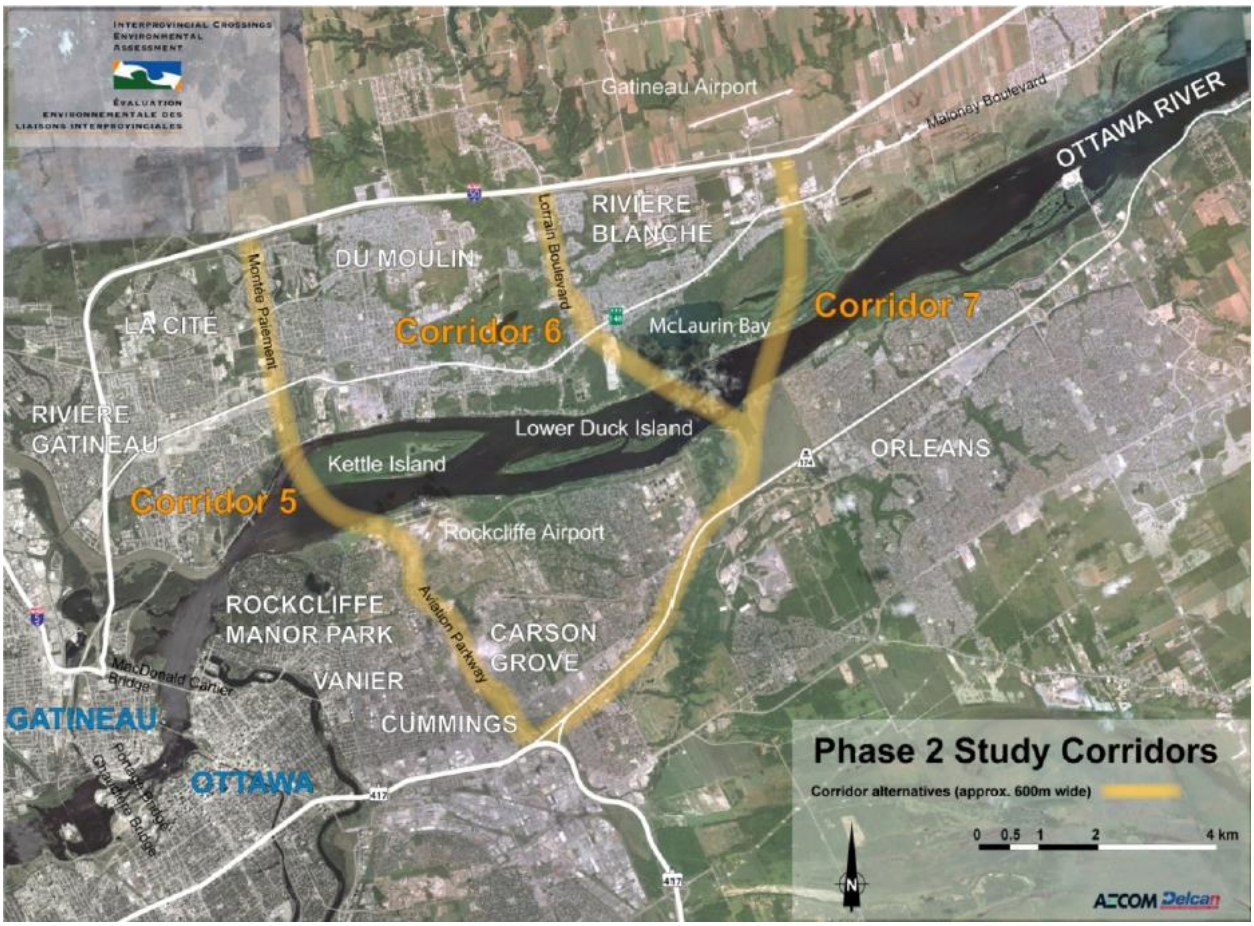

Figure 1-1: Phase 2 Study Corridors (Environmental Assessment Study Report, 2010)

The intent of this summary is not to provide a recommended corridor. Rather, it provides an overview of existing conditions within the study area, identifies baseline information and key changes that can potentially affect the 2013 findings, conclusions and recommendation directions that will assist the City in the preparation of future planning for this area. In addition, this report highlights what further studies would be required should this project proceed to the next phase of a Federal EA.

1.1 BACKGROUND

A funding partnership of the National Capital Commission, Ontario Ministry of Transportation and Ministère des Transports du Québec, forming a Steering Committee, launched an Environmental Assessment in 2006 to assess potential interprovincial crossing alternatives and their associated approach corridors. The City of Ottawa and Ville de Gatineau formed part of the Study Team with the Steering Committee who guided the project. The proposed new river crossing supported long-term transportation objectives and planned growth within the National Capital Region, was intended to support an enhanced cultural and social connection between communities as well as commercial linkages. The first phase of the project, completed in 2009, included a review of the need and justification of the crossing as well as, the evaluation of many initial crossing locations from the east to west limits of the Region. Three eastern sector corridors were identified as having potential and recommended for more detailed assessment.

The second phase of the project focused on the analysis and evaluation of the three locations which had received the highest ratings from Phase 1: Kettle Island (Corridor 5), Lower Duck Island (Corridor 6) and Gatineau Airport/McLaurin Bay (Corridor 7) and included the detailed assessment and evaluation of an extensive number of environmental, design and transportation specialties. At the completion of the Analysis and Evaluation Tasks, the recommended corridor was presented to communities, stakeholders and members of the public. Following the public consultation, the Steering Committee elected to abandon the Study in 2013.

As part of the evaluation and assessment of the three short-listed corridors, individual reports focused on specific elements that may be impacted by a proposed new crossing were prepared documenting the process and findings. For this Interprovincial Phase 2B Refresh being carried out in the current study, the NCC identified nine (9) reports to update so as to reflect potential changes in the time that has elapsed since the previous study was terminated before formal completion. It is noted that the Natural Environment Existing Conditions Report and Addendum which counted as two separate reports in the Terms of Reference, are being updated as one report. The following sections summarize the updates on these eight (8) factors/reports. This includes, but is not limited to, potential new species at risk, changes in Indigenous Protocol, changes in future long-term population and employment projections and the latest available origin-destination (O-D) survey data.

2 NOISE & VIBRATION REPORT

2.1 CONCLUSIONS FROM PREVIOUS REPORT

The results from the **Noise and Vibration Assessment Report**, dated April 2013, which was completed as part of the Environmental Assessment (EA) process for Phase 2B of the Interprovincial Crossings indicated that for the noise assessment 32 receptors out of a total of 109 receptors in Corridor 5 would experience more than 6 dBA noise level increase for 2031 "With Bridge" scenario compared to 2031 "Without Bridge" scenario, while 8 receptors out of a total of 76 receptors in Corridor 6 and 0 receptors out of a total of 30 receptors in Corridor 7 would be similarly impacted.

Two different criteria were considered when determining whether a receptor may require mitigation:

i. The sound level is equal to or exceeds 65 dBA at the receptor in the 2031 “With Bridge” scenario; and

ii. The change in sound level from 2031 “Without Bridge” to 2031 “With Bridge” exceeds 3 dBA at the receptor.

Table 2-1 below summarizes the number of receptors that do not meet the above criteria when considering equivalent sound level over a 16-hour period during the daytime (Leq 16 hr):

Table 2-1: Receptors to be Considered for Mitigation

Mitigation Requirement Criteria	Receptors		
	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
≥ 65 dBA (Leq day 16hr)	0	11	5
> 3 dBA (Leq day 16hr)	49	20	0
Total receptors to be considered for mitigation	49	31	5
Percent of receptors requiring mitigation per corridor	45.0%	37.3%	14.3%
Percent of receptors requiring mitigation in corridor compared to total receptors between all corridors	46.54%	38.67%	14.79%

As shown in the above table, the 2013 report identified that the total number of receptors requiring mitigation is highest in Corridor 5, followed by Corridor 6 and then by Corridor 7.

Table 2-2 below presents the number of receptors which may have the potential of being affected by vibration of the heavy vehicle traffic on the bridge.

Table 2-2: Receptors with 250m Radius from Bridge Edge Meeting with Land

Corridor	No. of Affected Receptors	Comments
Corridor 5	Two (2) Residential housing units: - R53 at 130 metres - R54 at 170 metres	Although these receptors are within the 250m circle if vibration influence, they may not be affected as there are no imperfections in the roads and smooth flow of heavy vehicles is ensured.

Corridor	No. of Affected Receptors	Comments
Corridor 6	None	--
Corridor 7	None	There is a Receptor R30 which will need to be removed if this corridor is chosen for the bridge

2.2 METHODOLOGY FOR REFRESH

WSP has revised the methodology for noise assessment from the original 2013 Report to remain consistent with the previous usage of ORNAMENT/STAMSON while also accounting for the complexity of the terrain and road traffic within each of the proposed corridors.

Modelling of future acoustic scenarios was achieved by inputting the following parameters into the appropriate noise modelling software:

- Vehicle speeds;
- Road traffic volumes;
- Percentage of heavy trucks/medium trucks/automobiles;
- Horizontal and vertical road receiver geometry;
- Ground absorption; and
- Screening provided by terrain, houses, or existing barriers.

The two noise modelling programs to be used in the analysis of both Ontario and Quebec roads are STAMSON, which implements the ORNAMENT calculation method, and CADNA/A, which uses the TNM algorithm. The MTO's "Environmental Guide for Noise" document approves of the use of the ORNAMENT algorithm for predicting road traffic impacts, and the usage of other traffic noise prediction models where complex studies require.

To establish the predicted future sound levels within each of the corridors, an alternate modelling method utilizing the CADNA/A noise propagation model was used. The purpose of using CADNA/A software was to allow for greater flexibility in modelling the complex road geometry present within the study area, as well as, to overcome the limitations identified with the traditional calculation and measurement methodology.

The following steps were taken to create a predictive model for the study area in CADNA/A that meets the MTO objectives and allows for quantitatively determining the sound levels due to road traffic:

1. The Cadna/A model was calibrated using STAMSON predictions. For the calibration purposes reference points were selected at a distance of 15 metres, 30metres and 100 metres from the edge of the pavement of each road segment in each corridor;
2. Estimated future predicted traffic data was obtained from traffic specialists for the Interprovincial Bridge Project;
3. The sound levels at the reference points were estimated using the STAMSON software;
4. The sound level at the reference points were re-estimated using CADNA/A software;
5. Results were compared between both models, and the prediction confidence of the CADNA/A method being determined; and
6. After the prediction confidence was established, the CADNA/A model was used to calculate the future condition sound levels within the study area for each corridor for the future ambient (i.e. without bridge) and project (i.e. with bridge) scenarios.

In areas where significant noise impacts were calculated, mitigation measures to lower the noise levels produced by traffic were simulated in the model (noise barrier or mound). A sound impact is considered

significant when the variation between the sound level of the existing situation (without the project) and the projected sound level (with the project) will have a medium or strong impact.

Significant vibration impacts at the nearby vibration sensitive receptors due to the project is not expected.

2.3 WHAT HAS CHANGED

The results of the revised Noise and Vibration Assessment are summarised in **Table 2-3** below.

Table 2-3: Analysis Summary

Description	Corridor 5	Corridor 6	Corridor 7	Mitigation Required?
Overall sound Level (dBA) – Criteria: 65 dBA				
SPL < 65 dBA	44	24	10	No
SPL ≥ 65 dBA	18	10	9	Yes
Overall sound level (dBA): Criteria Δ > 5 dbA				
Δ < 5 dbA	39	31	19	No
Δ ≥ 5 dbA	23	3	0	Yes
Summary of Mitigation				
No of NSA	46	14	9	-
% NSA	74%	41%	47%	-
Estimated cost of mitigation ($)	$253,702	$149,567	$29,793	-
Average cost per benefitted NSA	$2,371	$13,597	$4,966	-

2.4 POTENTIAL IMPACTS DUE TO CHANGE

The results of the revised Noise and Vibration Analysis are generally consistent with the previously drawn conclusions. The highest number of receptors requiring mitigation will be in Corridor 5, followed by Corridor 6, then Corridor 7.

The investigation showed that all three corridors are feasible to be operated in compliance with the noise and vibration criteria with noise control. In addition, majority of the receptors in Corridor 7 that require mitigation already have current noise barriers installed.

3 LAND USE AND PROPERTY REPORT

3.1 CONCLUSIONS FROM PREVIOUS REPORT

The 2013 **Land Use and Property Report** summarizes existing land uses and policies for the three Corridors, as well as, anticipated impacts to property. The anticipated impacts to land use and property by each of the corridors includes the following high-level impacts:

Corridor 5: Number of properties impacted: 104.

Total area of properties impacted: 32.1 ha.

Corridor 6: Number of properties impacted: 189.

Total area of properties impacted: 58.32 ha.

Corridor 7: Number of properties impacted: 16.

Total area of properties impacted: 92.79 ha.

The Corridor which impacts the greatest number of people is Corridor 6, followed by Corridor 5 and then Corridor 7. Although Corridor 7 impacts the least number of land parcels it has the largest area of impact, with Corridor 5 having the least area of impact and a moderate number of land parcels. Furthermore, Corridor 5 is more in compliance with Official Plans on the Gatineau side, both because it does not introduce as much urban sprawl and because it is not included within an MRN projet de refuge faunique.

3.2 METHODOLOGY FOR REFRESH

The methodology for the refresh of the Land Use and Property Report included identifying the 2013 resources used in the initial study and reviewing the resources to determine what updates (if any) had been made to land use plans and policies since 2013. These updated plans and polices were used to bring up to date the written component of the report. A list of updated resources included:

- The City of Gatineau's Land Use and Development Plan (2050-2016), Strategic Plan, Planning Program (500-2005), Zoning By-law (502-2005);
- *Plan d'affectation de l'Outaouais du territoire public* of the ministère des Ressources naturelles et de la faune (MRNF) du Québec;
- Agricultural zone plans from the Québec Agricultural Land Protection Commission;
- The City of Ottawa's Official Plan and Greenspace Master Plan;
- The NCC's Greenbelt Master Plan;
- Ontario Ministry of Agriculture, Food, and Rural Affairs and Agriculture and Agri-Food Canada- Soil Surveys from the Province of Ontario; and
- A City of Gatineau / City of Ottawa site visit conducted during the summer of 2019 to confirm existing land use data provided by both municipalities.

The following data was used to develop supporting mapping. All figures throughout the updated report have been revised to reflect current available data or to provide consistency in presentation:

- Study Area Corridors and Greenbelt Master Plan data from the NCC;
- Ontario Ministry of Agriculture, Food, and Rural Affairs and Agriculture and Agri-Food Canada- Soil Surveys data from the Province of Ontario (obtained online);

- Official Plan, Zoning By-law, Greenspace Master Plan, and existing land use (2016) data from the City of Ottawa;
- Zoning By-law, Development Activity, and existing land use (2019) data from the City of Gatineau;
- Within the City of Ottawa, a combination of WSP's in-house PRIME for Cities database and the City's Development Application Search Tool was used to identify development activity within the study areas at the time of writing this report; and
- GeoOttawa was used to confirm utilities in the City of Ottawa.

As was done for the 2013 report, each corridor was evaluated based on anticipated property impacts. Property impacts are characterized in terms of the total area (in hectares) of a specific land use type impacted, based on updated existing land use mapping provided by the City of Ottawa and the City of Gatineau. Property impacts are also characterized by number of properties impacted by land use type, based on property fabric data. The latest available alignment information was used to determine the area and number of properties impacted. Impact in this context means that a specific land use type or property is within the footprint of the alignment, either fully or in part.

3.3 WHAT HAS CHANGED

The Land Use and Property Report has been updated throughout to be as current as possible, given that updates to policy and new development in Ottawa and Gatineau have occurred since 2013.

High-level property impacts, characterized in terms of the total land area (in hectares) and number of properties impacted for each corridor, are summarized in comparison to the 2013 report results below.

Corridor 5: Total land area impacted: 53.33 ha as compared to 32.1 ha.
Total number of properties impacted: 173[1] as compared to 104.

Corridor 6: Total land area impacted: 36.84 ha as compared to 58.32 ha.
Total number of properties impacted: 227[2] as compared to 189.

Corridor 7: Total land area impacted: 46.29 ha as compared to 92.79 ha.
Total number of properties impacted: 54[3] as compared to 16.

The following table provides a more detailed summary of land area impacts by various land use types.

Table 3-1: Potential Lands Impacted by Land Use Type

EXISTING LAND USE	AREAS OF LANDS IMPACTED (ha)		
	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
City of Gatineau			
Residential	0.80	8.82	0.18
Manufacturing Industrial	0.14	4.21	0.35
Commercial	1.18	1.09	1.35
Institutional and Services	0.90	0.06	N/A
Recreation	7.22	0.47	2.44

[1] Impacted properties larger than .001 ha: 152
[2] Impacted properties larger than .001 ha: 211
[3] Impacted properties larger than .001 ha: 51

EXISTING LAND USE	AREAS OF LANDS IMPACTED (ha)		
	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
Natural Resources Industry	0.00[4]	N/A	0.69
Vacant Land	2.86	1.01	17.18
City of Ottawa			
Active Recreation	1.98	N/A	N/A
Agriculture	N/A	3.51	11.59
Forest	N/A	1.18	0.04
Hospital, Rehabilitation, Nursing Home	0.08	N/A	N/A
Idle and Shrub land	N/A	2.79	0.56
Industrial	N/A	0.04	0.04
Industrial Condominium	N/A	0.02	0.02
Office	0.0	0.16	0.16
Other Commercial	0.02	N/A	N/A
Other Institution	22.32	0.50	0.50
Open Space	3.90	9.74	9.84
Single-detached Residential	0.05	N/A	N/A
Passive Recreation	13.20	3.24	1.35
Utility – Major Hydro Corridor or ROW	0.09	N/A	N/A
Vacant Land	0.52	N/A	N/A

The Corridor which impacts the greatest total land area is Corridor 5, followed by Corridor 7, then Corridor 6. However, Corridor 6 impacts the greatest number of unique properties, followed by Corridor 5, then Corridor 7.

3.4 POTENTIAL IMPACTS DUE TO CHANGE

The potential land area and number of properties impacted for each of the three Corridors has changed between the 2013 report and the 2019 report refresh. This is potentially due to differences in methodologies used and inconsistent application of methodologies in the 2013 report; based on a review of mapping in the 2013 report, it appears that different thresholds were used in determining impacted properties .

Corridor 5 impacts the greatest potential land area in the 2019 refresh, followed by Corridor 7, then Corridor 6. This is inconsistent with the 2013 report. In 2013, Corridor 7 impacts the greatest potential land area, followed by Corridor 6, then Corridor 5. Compared to the 2013 report, total lands impacted as an evaluation criterion would therefore have some impact on the overall evaluation of alternatives; however, this would be one consideration among numerous other environmental and technical factors. Although the number of properties impacted has changed since the 2013 report, the Corridors rank exactly the same. In both the 2013 report and the 2019 refresh, Corridor 6 impacts the highest number of properties followed by Corridor 5 then Corridor 7. However, an analysis based on a more granular level of detail would likely yield a more accurate reflection of specific property impacts. It is suggested that this level of detail will be required during an impact assessment study, to determine the precise property impacts associated with the preferred

[4] Area of Lands Impacted are rounded to the nearest hundredth decimal place.

corridor. Furthermore, as the design of the project continues to evolve from preliminary to detailed design, it is possible that property requirements may change, including full and partial requirements, and also permanent and temporary requirements for activities such as construction staging and laydown areas.

4 AIR QUALITY REPORT

4.1 CONCLUSIONS FROM PREVIOUS REPORT

Results from the **Air Quality Report** dated April 2013 (2013 Air Quality Report), which was completed as part of the Environmental Assessment (EA) process for Phase 2B of the Interprovincial Crossings, indicated that the lowest concentrations of the grid of receptors were almost always observed in Corridor 5. In residential areas of both Quebec and Ontario, the lowest concentrations were also observed along Corridor 5. The concentrations in Ontario residential areas close to Corridor 7 were of similar magnitude to those of Corridor 6. In residential areas in Quebec, the concentrations resulting from traffic were similar for Corridors 5 and 7. Of the three corridors, concentrations near Corridor 6 were of the largest in magnitude. The concentrations around Corridor 5 were estimated to have the highest relative increase, with additional traffic in the north-south direction in comparison to Corridors 6 and 7; however, concentrations were to remain lower for Corridor 5 than Corridors 6 and 7. Emissions of pollutants were lower for Corridor 5 including those for greenhouse gases (GHG) than for the remaining Corridors. Corridor 7 emissions were also lower than Corridor 6. Overall, the preferred corridor in terms of impact to air quality was Corridor 5.

4.2 METHODOLOGY FOR REFRESH

WSP has reviewed the existing documentation from the 2013 Air Quality Report and has revised the report to account for regulatory changes and modelling advancements that have occurred since the last study was completed in 2013.

New meteorological data and ambient air concentrations were obtained, and the existing conditions were updated to account for the latest data available. Once the annual average daily traffic (volumes) for each corridor and traffic data as a function of hour of the day and day of the week data were obtained for the future scenario, modelling was completed to revise the air quality impacts assessment. The revised impacts were predicted using dispersion modelling. The United States Environmental Protection Agency's (US EPA) Motor Vehicle Emission Simulator (MOVES) was used to estimate the emission and the dispersion modelling was conducted using the US EPA AERMOD. The revised study includes the contaminants that were assessed as part of the 2013 Air Quality Report.

The revised air quality impact assessment followed the assessment framework presented in the Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (Guide) (June 2012, Ontario Ministry of Transportation (MTO)). This approach is also consistent with the approach used in the original assessment. Results of the assessment were presented in the revised Air Quality Report (October 2019).

4.3 WHAT HAS CHANGED

The revised Air Quality assessment was completed using the update traffic data from the TRANS model, and update receptors to represent sensitive receptors along each corridor. The changes in methodology account for the rest of the changes and include regulatory changes and modelling advancements that have occurred since the original report was published in 2013. These are the use of the MOVES model to predict emission rates, and the AERMOD model for dispersion modeling. The updates to the methodology did not alter the overall outcome of the assessment, however, the magnitude of the emissions.

In the previous version of this report, emission factors were estimated using the on roads vehicles source emission factor model, MOBILE6.2C, the Canadian adaptation of the MOBILE6.2 model[5]. In this refresh report, the US EPA's state-of-the-science motor vehicle emission simulator (MOVES) was used to estimate emission rates[6]. Differences in emission estimates between the previous report and this refresh can be partially attributed to this change in model. The MOBILE6.2C model has not been updated since 2003 and as such, has its own limitations. Although the emission factor estimates from MOBILE6.2C are still reasonable, differences in these estimates are largely due to technological advances in emission control systems and new calculation methods for vehicle deterioration that are not accounted for in the MOBILE6.2C model (MOBILE6.2C assumes deterioration with is linear; however, MOVES has an updated methodology to address this limitation)[1]. For example, in the previous report, a composite emission rate for CO of 5.578 g/km was used; however, a value of 0.936 g/km was predicted for 2031 using the MOVES model. When the MOBILE6.2 model was developed, there was little information available on heavy-duty diesel crankcase evaporation and extended idling. With data from the past decade, the MOVES model was updated to contain more representative information and processes (Federal Highway Administration travel data, EPA studies, vehicle surveys conducted by the census bureau, etc.), replacing the now outdated MOBILE6.2 model in the United States[7,8]. For GHG emissions, the previous methodology included using fuel consumption to compute CO_2-equivalent emissions; however, in this refresh study an emission rate for CO_2-equivalent was predicted by the MOVES model.

Differences between this refresh study and the previous study are partially attributed to the predicted emission rates, identified in **Table 4-1**. The example emission rates for $PM_{2.5}$ are shown for Corridor 7, and include brake wear, tire wear, and resuspension emissions.

Table 4-1: Changes to Emission Rates

REPORT		EMISSION RATE (G/KM)				
		GHG (gCO_2-e/km)	CO (g/km)	NO_X (g/km)	SO_X (g/km)	$PM_{2.5}$ (g/km)
2013 Report	Speed of 45 km/h	225	5.578	0.813	0.007	0.023
	Speed of 60 km/h	205	5.574	0.819	0.007	0.023
2019 Report	2019 (composite of speeds 40-65 km/h)	583	2.073	0.129	0.005	0.085
	2031 (composite of speeds 40-65 km/h)	432	0.936	0.070	0.003	0.055

The CO_2-equivalent estimates in the previous report were computed using fuel consumption rates; however, in the refresh study these estimates were output directly from the MOVES model. A summary of the changes to the GHG results is identified in **Table 4-2**.

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[5] B. Taylor, "MOBILE6.2C Canadian Supplemental Users' Guide," Environment Canada, 2005.
[6] US EPA, "Motor Vehicle Emission Simulator (MOVES)," United States Environmental Protection Agency, 2013. [Online]. Available: https://www.epa.gov/moves.
[7] US EPA, "User Guide for MOVES2010b," United States Environmental Protection Agency, 2012. [Online]. Available: http://www.epa.gov/otaq/models/moves/documents/ 420b12001b.pdf.
[8] US EPA, "EPA Releases MOVES2010 Mobile Source Emissions Model: Questions and Answers," United States Environmental Protection Agency, 2013. [Online]. Available: http://www.epa.gov/otaq/models/moves/420f09073.pdf.

Table 4-2: Changes to GHG emission estimates

REPORT	GHG EMISSIONS BY CORRIDOR (TONNES/YEAR)		
	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
2013 Report	25 431	56 994	54 243
2019 Report	13 194	20 304	13 415

The transportation team provided the updated AADT values for the region and provided the traffic counts based on road segments. The AADT estimates for each bridge were 24,420 vehicles/day for Corridor 5, 25,870 vehicles/day for Corridor 6, and 18,740 for Corridor 7. A detailed description of the updated AADT information is available in the Transportation section of this report. Additional sensitive receptors were added in AERMOD, such as day cares, senior homes, and schools.

Dispersion modelling was conducted using the United States Environmental Protection Agency's (US EPA) AERMOD to assess the potential local air quality impacts associated with the updated transportation network and long-term population and employment projections. AERMOD has replaced the CALINE model (used in the previous version of this report) as the US EPA's preferred model for refined modeling for mobile source applications and other regulatory applications. AERMOD was developed by the American Meteorological Society (AMS) and the US EPA through the AERMOD Model Improvement Committee. The model uses Gaussian Plume dispersion and incorporates the most recent scientific developments for dispersion modelling. AERMOD undergoes continuous updates, with support from the US EPA, to improve its performance for source types, meteorological conditions, and terrain features.

As an example, the impacts of changes to the dispersion model for PM2.5 are presented in **Table 4-3** for $PM_{2.5}$ concentration estimates for each corridor.

Table 4-3: Summary of changes in $PM_{2.5}$ concentration estimates

REPORT	$PM_{2.5}$ CONCENTRATIONS BY CORRIDOR ($\mu G/M^3$)		
	CORRIDOR 5	CORRIDOR 6	CORRIDOR 7
2013 Report	0.689	2.476	2.428
2019 Report	9.63	12.17	12.58

4.4 POTENTIAL IMPACTS DUE TO CHANGE

The results of the refresh study were consistent with the previously drawn conclusions. Corridor 5 remains the preferred option for air quality and continued to have the lowest GHG emissions. Differences in the magnitude of pollutant emissions are mainly attributed to the use of the MOVES model and improved dispersion from the use a more advanced dispersion modelled used in the refresh study.

5 FISHERIES AND AQUATIC HABITAT REPORT

5.1 CONCLUSIONS FROM PREVIOUS REPORT

The previous **Fisheries and Aquatic Habitat Report** is dated Oct 2012. The three proposed corridors encompass areas of medium and high environmental constraints related to fish habitat. Kettle Island (Corridor 5) and Lower Duck Island's marshes and floodplain (Corridor 6) are fish habitats used by eight fish reproductive guilds. Marshes and swamp complexes situated on the north shore of the river, especially McLaurin Bay and Templeton Marsh (Corridors 6 and 7) show suitable spawning conditions for species that spawn in still and shallow water in flooded areas and in aquatic vegetation. Such still and shallow water bays with aquatic vegetation constitute a habitat type highly sought by most of the fish species caught in the three corridors. The extent of this type of habitat in each corridor is the most discriminating factor for the three corridors.

Lake sturgeon is the only special status species that was caught during the 2011 fisheries surveys. Almost all individuals were caught near the north shore of the Ottawa River, in Corridors 6 and 7, suggesting that they use this wide shallow area to feed on benthic organisms. Suitable spawning habitats for almost all of the other fish species at risk potentially found in the study area are not well represented in the three corridors. Consequently, the impact to these species should not be used to discriminate between the three corridors.

To reduce negative impacts on fish habitat, the bridge's footprint/layout in each corridor will need to be minimized in high constraints areas to prevent and limit impact on fish.

5.2 METHODOLOGY FOR REFRESH

The report update is based in part on fish and fish habitat information obtained from the Quebec Ministry of Forests, Wildlife and Parks, and the Ontario Ministry of Natural Resources and Forestry. We also collected information from reliable sources on the internet, such as scientific reports and MNRF data found on the Land Information Ontario website.

In addition, a one-day screening site visit on the river was done in August 2019 to compare available information versus current conditions of the aquatic habitat. This visit was meant to verify if any aquatic and riparian habitats have been significantly altered over the course of the previous 8 years. The habitats have not been characterized, but any significant discrepancy with available information has been noted and reported.

5.3 WHAT HAS CHANGED

The list of fish species found in the Dollard des Ormeaux reach of the Ottawa River, enclosed between Chaudière Falls and Carillon dams, has gained 12 new records including three species at risk (SAR): yellow bullhead, cutlip minnow, and margined madtom. Another report of fish species at risk in the study area is the occurrence of river redhorse in Green's Creek. Among those species, the margined madtom is listed as threatened under the Federal Species at Risk Act (SARA). The other special status species are either Special concern species, or provincially listed species.

The MNRF data indicates the presence of a confirmed spawning ground for smallmouth bass along the north side of Upper and Lower Duck Islands. That information supports the findings of the 2012 report indicating that the area around the north side of Duck Islands is used for spawning by numerous fish species, including smallmouth bass.

The Upper and Lower Duck Islands area is a Candidate Area of Natural and Scientific Interest (ANSI) for life sciences, while Green's Creek is already part of a designated ANSI for life sciences. According to the MNRF, planning authorities shall protect those representative segments of Ontario's biodiversity, natural landscapes and geological features that have been identified as ANSIs by not permitting development and site alteration in a significant ANSI, nor in adjacent lands, unless it has been demonstrated that there will be no negative impacts on the feature or its ecological function. On the Quebec side, in 2013 Kettle Island obtained the status of nature reserve on private land under the provincial Natural Heritage Conservation Act. The construction of any new infrastructure is generally prohibited in a reserve, unless authorization is obtained.

The August 2019 field visit has revealed little change in fish habitat features compared to 2012, except on the Quebec side of the Ottawa River in Corridor 5 where four minor new riverine infrastructures were observed on the banks or in the floodplain (culvert with rocky stabilization material, recent addition of stabilization material in a limited area on the bank, new access road between Jacques-Cartier and Saint-Louis streets, belvedere/rest area along the bike path).

5.4 POTENTIAL IMPACTS DUE TO CHANGE

The new records of fish species within the Ottawa River do not alter the delineation of environmental constraints areas established in 2012, as the shallow areas generally constituting the most suitable habitats for fish were already identified in the 2012 report as areas of high environmental constraint.

The three new species at risk reported from the Ottawa River are inhabitants of shallow watercourse areas. Based on the knowledge of their biology, the yellow bullhead is the only one of the three likely to be found in the study areas. This species lives in the shallow, still water, and dense-vegetated areas of warm water rivers. The potential presence of yellow bullhead reinforces the 2012 report's statement that this type of habitat is one of the most important discriminators to consider in choosing a corridor for the future bridge.

We suggest considering the entire Green's Creek ANSI as a high environmental constraint area, not only the stream itself. According to the NCC, the steep forested slopes of Green's Creek and the narrow clay-based flood plain provide an important wildlife corridor, and supports a wide variety of provincially and regionally rare species, including probably the largest Canadian population of the rare cattail sedge. The creek is also home to the river redhorse, a species of special concern in Ontario and Canada.

Finally, at this stage of the project it does not appear necessary to carry out additional inventories of fish and fish habitat. Once a corridor has been selected, more in-depth inventories can be completed to accurately direct the location of bridge piers and other footprints, thereby minimizing the project's impact on fish fauna.

6 TRANSPORTATION REPORT

6.1 CONCLUSIONS FROM PREVIOUS REPORT

The 2013 **Transportation Report** was completed to examine reasonable bridge crossing options to improve and address long-term needs for interprovincial transportation capacity across the Ottawa River. It provided results and performance data to be used for the evaluation and comparison of the three short-listed corridor alternatives.

As part of the 2013 report, a comprehensive data collection process was carried out to collect signal timing plans, turning movement counts as well as automated tube counts (ATRs) and generator data within the National Capital Region at multiple locations. This data was used to project future volumes along the corridor alternatives. A comparison of the base 'do nothing' future traffic volumes was carried out on three roadway alignments to identify future operational changes within the corridor as well as each alignments potential to attract trips, including truck trips. The three corridors being assessed are described below:

Corridor 5: Extends from Autoroute 50 in Gatineau to Highway 417 and Ottawa Road 174 in Ottawa. It integrates the existing roads of Montée Paiement on the Gatineau side and the Aviation Parkway on the Ottawa side;

Corridor 6: Extends from Autoroute 50 in Gatineau to Highway 417 in Ottawa, via Ottawa Road 174. It integrates the existing roads of Lorrain Boulevard on the Gatineau side and Ottawa Road 174 on the Ottawa side; and

Corridor 7: Extends from Autoroute 50 in Gatineau to Highway 417 in Ottawa, via Ottawa Road 174. On the Gatineau side, the future roadway is located east of the Gatineau Airport, between Granby Street and Montée Chauret. Corridor 7 crosses Maloney Boulevard West and is expected to connect to both Autoroute 50 and Ottawa Road 174 by way of interchanges.

The traffic operational analysis indicated that Corridor 5 provides the biggest shift in traffic volumes from the existing bridges. A sensitivity analysis indicated that this was still the case with the introduction of a southbound left turn prohibition from the future bridge towards Rockcliffe Parkway during the morning peak hour. Corridor 6 is nearly as effective as Corridor 5 at attracting traffic to the new bridge but not so efficient at attracting traffic away from the existing bridges – although as efficient as Corridor 5 in terms of transit ridership. Both Corridor 5 and Corridor 6 are more efficient than Corridor 7.

Overall in terms of safety, Corridor 7 is deemed to have the lower probability of collisions and therefore is more efficient under the criteria used for the road safety analysis, followed by Corridor 6, then Corridor 5.

In terms of Traffic Safety, the following conclusions were identified:

- **Land use**: Corridor 5 is located in a developed area on both sides of the Ottawa River and requires only marginal land acquisitions on the Gatineau side. Corridor 6 is located in a developed area on the Gatineau side (requiring major land acquisitions) and crosses an undeveloped area (Greenbelt) on the Ottawa side connecting after to an existing freeway corridor (Ottawa Road 174). Both Corridors 5 and 6 require service roads on the Gatineau side to ensure safe access to/from the east side existing properties. Corridor 7 is located in undeveloped areas on both sides the Ottawa River.
- **Intersections:** Corridor 5 has the highest number of intersections whereas Corridor 7 has the lowest. Therefore, the probability of collisions is highest at Corridor 5, considering that a higher number of intersections represents a higher number of conflict points which results in higher exposure to collisions.

- **Controlled-access:** Corridor 7 has the longest controlled-access segment, followed closely by Corridor 6. Therefore, the probability of collisions is highest at Corridor 5, considering that a controlled-access segment yields lower exposure to collisions than an arterial roadway with at-grade intersections.

Transit service for the three scenarios was similar whereby OC Transpo did not run any buses on the new bridges and STO used four transit routes on Corridor 5 and three transit routes on Corridors 6 and 7 in comparison to one STO transit route on each corridor for this refresh. The analysis of transit operations revealed that Corridor 5 is the most efficient at attracting transit trips to the new bridge and at limiting the modal transfer from transit to car on a regional scale (even though it is also the most efficient at attracting car traffic). Corridors 6 and 7 are not as efficient as they do not attract as many transit trips to their respective bridges and instead encourage a stronger transfer from transit to car.

Lastly in terms of connectivity and active transportation, the selected Corridor 5 provides the most connectivity due to its proximity to highly populated areas and a high connectivity with existing and planned active transportation facilities on both sides of the Ottawa River. Notably, its location will allow a direct connection to the Aviation and Ottawa River multi-use pathways (NCC) as well as the Route Verte and the Rapibus bicycle path, and may encourage not only recreational cyclists but also, potentially, commuting cyclists.

6.2 METHODOLOGY FOR REFRESH

The refresh was carried out using the same approach and methodology utilized for the 2013 analysis as documented in the Transportation Review Report and is described below.

The TRANS model was utilized to support the modelling of the different scenarios for truck, transit and traffic assignments. Technical support was provided by City of Ottawa staff, who carried out the required model runs and provided the results along with the relevant assumptions, description of model limitations, and occasionally suggested additional modifications to scenarios being modelled. Subsequent analysis carried out and interpreted by the consultant.

Truck Traffic Analysis: Per the 2013 Transportation Review Report, four truck route scenarios were assessed to estimate the impact of restricting or prohibiting trucks to varying degrees on the King Edward Rideau Waller Nicolas (KERWN) corridor. The 2013 study included a data collection program with automated traffic recorders (ATR) and video cameras installed at key locations over several days to gain an understanding of the proportion of trucks on local versus regional routes. The refresh did not include a data collection and as such, proportions of local versus regional trucks were carried forward from the previous study. The TRANS regional model was updated based on the data, as was done in the 2013 study but with the 2011 TRANS model, and the impacts of truck route scenarios with various truck prohibitions and restrictions were estimated.

Traffic Operation Analysis: The traffic operation analysis evaluates the future traffic volume-to-capacity (V/C) ratio and LOS of key intersections on and adjacent to each corridor. Traffic volumes were extrapolated using the 2011 TRANS model traffic projections for 2031 and the 2031 scenario volumes from the 2013 Transportation Review. Similar to the 2013 report, the TRANS link volumes were converted to turning movement counts using the Fratar method. The software tool Synchro 10 (based on the Highway Capacity Manual methodology) has been used to determine the operations of each intersection with the turning movements developed. This analysis generally uses the same lane configurations utilized in the 2013 report, however some adjustments have been made to improve the overall operations in some instances.

Traffic Safety Analysis: The traffic safety analysis in the 2013 Transportation Review Report was a qualitative assessment of the safety-related elements of the proposed design for each corridor. That is, the

elements to be considered are the number of intersections with arterials, collectors, and local/private roads, the length of any access-controlled (intersection-free) segments, the roadside character (land use) along each corridor, and the infrastructure provided for vulnerable road users (pedestrians and cyclists). As the refresh was for the corridors assessed in the 2013 report, there are no changes to the qualitative traffic safety analysis previously carried out.

Transit Operation Analysis: The transit operation analysis included a review of the current transit service on both sides of the Ottawa River, as well as the future planned transit projects in the NCR. An analysis of the impact of a new interprovincial crossing on transit use and operation for the 2031 horizon year was carried out based on 2011 TRANS model simulation results. Reserved lanes for buses were included on the three proposed corridors and specific transit routes were designed based on discussions with OC Transpo and Société de transport de l'Outaouais (STO).

Analysis of Connectivity to Active Transportation Infrastructure: The analysis of the connectivity to active transportation infrastructure acknowledges the current and planned active transportation facilities in Ottawa and Gatineau and provides recommendations on how the connections must be made between the future bridge and the planned active transportation network (bicycle paths, sidewalks). The refresh report incorporates the latest cycling plans within the NCR to support the vision and objectives of both the City of Ottawa and the City of Gatineau as well as the NCC.

6.3 WHAT HAS CHANGED

The analysis for the future traffic, transit and truck conditions are primarily based on projections provided by the TRANS regional simulation model. Analysis carried out for the 2019 Refresh is based on the TRANS model that utilized 2011 origin-destination data, which reflects an update from the 2005 O-D survey as well as changes in land use, population and employment projections and projects completed within the NCR since the 2013 Transportation Review. At the time of the Refresh no new data was available on truck traffic and therefore the 2007 Interprovincial Roadside Truck Survey and ATR truck data used in the 2013 report was reused for this analysis.

Results of the truck updated truck traffic analysis reflected significant changes to the truck trip table within the 2011 TRANS model when compared to that used in the 2013 Transportation Review. The new bridge is expected to attract 7% to 28% of interprovincial truck traffic, with the Corridor 5 scenario with removal of the truck route designation on the KERWN Corridor expected to attract the most truck traffic. Proportions of trucks attracted were more evenly distributed across scenarios evaluated in the previous study, with more truck traffic proportionally being attracted to the Chaudière Bridge in the 2019 study compared to the 2013 study. The removal of truck routing on the KERWN corridor is expected to impact the Chaudière crossing the most significantly in terms of truck volumes in both the 2013 and 2019 analyses.

Updated traffic analysis results indicate that the Corridor 6 bridge will attract the most traffic to the new bridge of the three corridors analyzed, as well as remove the most traffic from the existing bridges. Corridor 5 is expected to be essentially as effective as Corridor 6 in attracting traffic to the new bridge, but not as effective at attracting traffic away from existing bridges. In the previous analysis, Corridor 5 was the most effective in attracting traffic to the new bridge and away from existing bridges, followed closely by Corridor 6, which was nearly as effective at attracting traffic to the new bridge but not as effective at attracting traffic away from existing bridges. In both the 2013 and 2019 analyses, Corridor 5 is expected to experience the most traffic capacity issues during peak hours on the Ottawa side due to the impacts at downstream intersections, whereas major traffic capacity issues are not expected in Corridor 6 (with a grade-separated Boulevard Lorrain Boulevard / Boulevard Maloney intersection) and Corridor 7.

Proposed transit routing, through consultation with the transit agencies, for the 2019 Refresh included a reduction in routes from the 2013 study, with a single (STO) transit route proposed for the new crossing at

a reduced frequency. Both studies found that Corridor 5 is the most effective at attracting transit trips to the new bridge. The road safety analysis did not require updating from the 2013 report. Minor modifications were made to the active transportation infrastructure recommendations, though Corridor 5 remained the preferred corridor and Corridor 7 the least favourable from an active transportation perspective.

6.4 POTENTIAL IMPACTS DUE TO CHANGE

The 2019 Transportation Review Refresh with the updated 2011 TRANS Model assignment resulted in changes in how each corridor attracted trip compared to the 2013 report: Corridor 5 is expected to attract the most truck trips (previously Corridor 6) and Corridor 6 is expected to attract the most traffic to the new bridge as well as away from the existing bridges (previously Corridor 5). However, it is noted that traffic analysis results are comparable for Corridors 5 and 6 in both the 2013 and 2019 analysis. Other major findings of the transportation review remain largely unchanged from the previous analyses.

It is also noted that TRANS has plans to carry out a new Origin-Destination Survey in the Fall of 2020 as well they are currently carrying out a detailed Truck Survey and modeling exercise (expected completion Summer 2020) to gain a better understanding on how trucks travel between provinces. In addition, the City of Ottawa has recently initiated their Transportation Master Plan (TMP) update. The results of these data collection and project efforts may be more reflective of current and future conditions within the NCR as they will capture the influence the recently opened LRT in Ottawa and new Rapibus has on the mode choice, as well as current trends and future planning initiatives for transportation within the Region.

7 INDIGENOUS HISTORY REPORT

7.1 CONCLUSIONS FROM PREVIOUS REPORT

The previous report on **Indigenous History**, dated March 2009, concluded that historical evidence shows all crossings are within areas of prior Algonquin use and occupation. It was the Crown's position that the Algonquins surrendered or were remunerated for territory claimed. This perceived settlement is not accepted by the Algonquins and they continue to contest this position.

7.2 METHODOLOGY FOR REFRESH

Land claims post-2009 were reviewed via government websites and Algonquin notices. Evidence of new or updated agreements between the Government of Canada and the Algonquins were sought out.

7.3 WHAT HAS CHANGED

Algonquins of Ontario Agreement-in-Principle was ratified and signed by the Algonquins of Ontario, Chief Federal Negotiator for Canada and Senior Negotiator for Ontario in 2016. The Final Agreement has not yet been ratified. Josiane Rochon, National Manager Indigenous Rights Federal, PSPC, specifically noted the following:

> *There are no Comprehensive Land Claims Agreement in the National Capital Area. However, the Algonquins of Ontario, Chief Federal Negotiator for Canada and Senior Negotiator for Ontario signed a non-binding Agreement-in-Principle on October 18, 2016. This is just one step in a lengthy process before a Final Agreement can be reached. Following the Agreement-in-Principle there have been ongoing negotiations toward a Final Agreement.*
>
> *Link to the Agreement-in-Principle:* http://www.tanakiwin.com/wp-system/uploads/2016/10/PASSWORD-PROTECTED_ENGLISH-AIP_WITH-SIGNATURES_OCT-26-2016.pdf

In 2012, three years after the creation of the Aboriginal History report, the National Capital Commission (NCC) entered a partnership with Kitigan Zibi Anishinabeg (KZA) and Algonquins of Pikwakanagan First Nation (AOP) for the joint management of archaeological resources in the National Capital Region. In 2017, the *Protocol for the Co-management of Archaeological Resources* was developed between the NCC, KZA, and AOP to provide a framework for the engagement of KZA and AOP for all archaeological field investigations on NCC land and, where possible, other federal lands in the National Capital Region.

7.4 POTENTIAL IMPACTS DUE TO CHANGE

Algonquins of Ontario request that they are engaged on projects within their traditional territory as part of the Duty to Consult. As well, the Agreement-in-Principle shall have no legal status and shall not create legal obligations. The *Protocol for the Co-management of Archaeological Resources* developed between the NCC, KZA, and AOP does act to provide a framework for the engagement of KZA and AOP for all archaeological field investigations on NCC land and, where possible, other federal lands in the National Capital Region. These elements have the opportunity to provide unique perspectives on how the project should be approached.

8 ECONOMIC DEVELOPMENT POTENTIAL STUDY

8.1 CONCLUSIONS FROM PREVIOUS REPORT

The **Economic Development Potential Report**, dated August 2012, assessed the potential for economic development in proximity to the three corridors. The study evaluated development potential by estimating the potential number of new jobs each alignment can create. The study found that Corridor 5 can potentially generate 1,360 new jobs (533 in Gatineau, 827 in Ottawa), Corridor 6 can potentially generate 229 new jobs (229 in Gatineau, 0 in Ottawa), and Corridor 7 can potentially generate 3,272 new jobs (3,272 in Gatineau, 0 in Ottawa). Based on these results, the 2013 report had concluded that Corridor 7 was highly preferred over the other two corridors. This was mainly due to the high economic potential in the employment area on the eastern part of the metropolitan area on the Gatineau side. Corridor 5 ranked second with a medium-level economic development potential shared on both sides.

8.2 METHODOLOGY FOR REFRESH

The approach to assess economic development potential for each corridor focused on potential job creation. In particular, the potential number of new jobs which could be generated on vacant commercial and industrial lots within an approximate 600-metre buffer zone (300 metre on each side of the corridor alignment). Information regarding land designations, zonings and identification of vacant lots were obtained from Ville de Gatineau's Land Use and Development Plan (2050-2016)[9] and Zoning By-Laws, the City of Ottawa's Official Plan[10] and Zoning By-Laws, as well as by the City of Ottawa's[11] and Ville de Gatineau's[12] vacant lots databases.

To focus on the economic development potential, only the vacant lots designated for commercial and industrial use in the Ville de Gatineau's and City of Ottawa's zoning by-laws were considered. The total surface area of each of the identified vacant lot falling within the buffer zone (partially or completely) is multiplied by a specific employment density ratio to estimate the potential number of new jobs. The employment density ratios, categorized by land use designation were taken from the original 2013 report and were increased at the same rate as the anticipated job growth from the City of Ottawa's *Residential Land Strategy 2006-2031*. The ratios from 2013 were based on a sample of employment density on developed lots with similar land uses.

Moreover, it was established in the 2013 report that the previous Study Design only considers a local impact, there are no significant differences in proximity of corridors to vacant lots. Thus, the attractiveness of new development on these lots is assumed to be equivalent if a corridor was built. This assumption is maintained for this report update.

The refresh methodology closely follows the methodology used for the 2013 report.

[9] https://www.gatineau.ca/docs/guichet_municipal/urbanisme_habitation/reglements_urbanisme/pdf-nouveau/R-2050-2016_schema/annexe_e.pdf
[10] https://documents.ottawa.ca/sites/documents/files/schedule_b_en_12.pdf
[11] https://ottawa.ca/en/city-hall/get-know-your-city/statistics-and-economic-profile/statistics/land-surveys-and-research-reports/vacant-industrial-and-business-park-lands-survey#map-inventory-vacant-industrial-and-business-park-lands
[12] Ville de Gatineau Data Request

8.3 WHAT HAS CHANGED

The employment density ratios are assumed to have increased since 2013, at the same rate as the anticipated job growth from the City of Ottawa's *Residential Land Strategy 2006-2031*. Both employment density ratios from 2013 and 2019 are summarized in **Table 8-1**.

Table 8-1: Employment Density Ratio

	OTTAWA		GATINEAU	
	Employment Density Ratio (jobs/ha2)		Employment Density Ratio (jobs/ha2)	
	Mixed Use	Employment Area	Mixed Use	Employment Area
2013	20	60	20	60
2019	**22**	**65**	**22**	**66**

In addition, the land designation, zoning by-laws, as well as the number and type of vacant lots within the buffer zone of the three corridors in Ottawa and Gatineau have also changed significantly since 2013.

Based on the changes and assumptions described above, the revised potential number of new jobs within the buffer zone for each corridor differ from 2013. Both the previous and revised potential number of new jobs from 2013 and 2019 are summarized below in **Table 8-2**.

Table 8-2: Potential Number of New Jobs

	POTENTIAL NUMBER OF NEW JOBS					
	Gatineau (2019)	Gatineau (2013)	**Ottawa (2019)**	Ottawa (2013)	**TOTAL (2019)**	TOTAL (2013)
Corridor 5	**424**	533	**0**	827	**424**	1360
Corridor 6	**73**	229	**123**	0	**196**	229
Corridor 7	**7,795**	3,272	**59**	0	**7,854**	3,272

8.4 POTENTIAL IMPACTS DUE TO CHANGE

Although the potential number of new jobs for each corridor differ from the previous report, Corridor 7 remains the preferred option with the highest potential number of new jobs out of all three corridors. With vacant lots planned for industrial and commercial use just south of the Gatineau-Ottawa Executive Airport on the Gatineau side as well as the vacant lots located within the Canotek Industrial Park on the Ottawa side, Corridor 7 demonstrates great potential for economic development and could result in an approximate total of 7,854 new jobs, which is more than double the previous economic potential of 3,272 new jobs. This emphasizes the preference of Corridor 7 in terms of economic development.

9 NATURAL ENVIRONMENT EXISTING CONDITIONS UPDATE & ADDENDUM

9.1 CONCLUSIONS FROM PREVIOUS REPORT

The **Natural Environment Assessment (Existing Conditions Update) – Final Report**, dated September 2012 from Phase 2B of the Interprovincial Crossing Environmental Assessment, evaluated the sensitivity of existing natural environments within each of the potential corridors based on the results of document research and field investigations conducted in 2011. The results show that Corridor 5 - Kettle Island offers the lowest natural environment constraint, Corridor 6 - Lower Duck Island offers a moderate natural environment constraint, and Corridor 7 - Gatineau Airport provides the highest natural environment constraint.

9.2 METHODOLOGY FOR REFRESH

In order to produce an update of the 2012 report, a document research, a field investigation and an assessment of the sensitivity of the existing natural habitats within each of the potential corridors was carried out.

First, a document research was conducted with various ministries in Ontario and Quebec to determine the presence of designated wildlife species, protected habitats and protected areas in Quebec, as well as wildlife and plant species at risk and natural areas in Ontario within each of the potential corridors.

Secondly, the objective of the field investigation of the existing natural environments within each of the potential corridors carried out in August 2019 was to establish whether the natural environments have been altered since the last study and to observe if the habitats of the new species identified during the documentary research were present within the potential corridors.

Finally, an assessment of the sensitivity of existing natural environments based on the results of the document research and the field investigation conducted in 2019 has been produced to evaluate the difference with the 2012 report.

9.3 WHAT HAS CHANGED

Comparing the 2019 results with the 2012 report, some differences were identified on the Quebec side of the corridors. The differences are as follows:

- Areas of suitable habitat of the Western Chorus Frog, under the *Species at Risk Act* (L.C. 2002, c.29), have been identified along Corridor 5 - Kettle Island;
- Aquatic Bird Concentration Areas have been identified near Corridor 6 - Lower Duck Island (Upper Duck and Templeton Marsh) and near Corridor 7 - Gatineau Airport (Rivière Blanche, Baie McLaurin Secteur des Méandres and Marais des Laiches);
- The muskrat habitat of Baie McLaurin, near Corridor 7 - Gatineau Airport, has been identified; and
- The ministère des Forêts, de la Faune et des Parcs announced that it is currently working on the creation of a future wildlife refuge along the Ottawa River, from McLaurin Bay to the Plaisance National Park, which crosses Corridor 7 – Gatineau Airport.

9.4 POTENTIAL IMPACTS DUE TO CHANGE

New sensitive habitats have been identified for each of the three corridors that are being considered for the new crossing. While Corridor 7 still offers the most significant natural environment constraints and Corridor 6 moderate constraints, Corridor 5 now also presents moderate natural environment constraints, because of the Western Chorus Frog suitable habitat that has been identified along Montée Paiement, in Gatineau.

10 NEXT STEPS

10.1 APPLICATION OF THE IMPACT ASSESSMENT ACT

On August 28, 2019, the *Impact Assessment Act* (IAA) came into force to create the new Impact Assessment Agency of Canada (the Agency) and repeal the previous *Canadian Environmental Assessment Act* (CEAA 2012). Like CEAA 2012, the IAA uses a 'project list' (known as the *Physical Activities Regulations*) to initially determine if a project is subject to the requirements of the IAA. In the context of this project, the key threshold contained in the *Physical Activities Regulations* is as follows (emphasis added):

48 The construction, operation, decommissioning and abandonment of either of the following:

(a) a new international or interprovincial bridge or tunnel;

As such, this project is likely to meet the requirements of the IAA. However, as noted below, this will need to be confirmed by the Agency as an initial step of a future impact assessment study.

10.2 PRIOR TO COMMENCING THE IMPACT ASSESSMENT

The intent of the current 'refresh' scope is to identify key changes in existing environmental conditions and therefore potential changes to / or new impacts associated with the three alternative corridors. The refresh exercise will support the work previously conducted in 2013 to ultimately re-confirm, or potentially establish a new, preferred corridor, with a key factor being any revised cost implications based on the refresh exercise. The refresh exercise will support a subsequent evaluation process, as noted below, to select a preferred corridor prior to formally commencing an impact assessment study in accordance with the IAA.

Given that only three corridors have been identified for consideration, and these corridors are the same as those evaluated in 2013, the evaluation process will already commence with a relatively short list, without the need to screen out other alternatives from a long list (carried out previously). The purpose of the evaluation process will be to balance the potential positive and adverse impacts of each corridor, based upon an in-depth understanding of existing natural, socio-economic, and cultural environment conditions, as well as transportation and other technical considerations as defined in the refresh exercise. The cost estimates developed by PSPC based upon the refresh exercise will also be a key evaluation factor.

It is recommended that the evaluation process follows the same methodology as previously used in 2013 in the Final Methodology Report. The rationale for this is that it provides for complete transparency and replicability with the 2013 study, with the only variables being key updates to information such as existing environmental conditions generated from the refresh exercise. The remainder of the key factors, namely the three alternatives considered and evaluation methodology, would therefore remain controlled constants from 2013. This potentially provides a sound justification in the eventuality that the preferred corridor changes, because it may clearly be demonstrated that this is a direct outcome of new information from the refresh exercise. Similarly, if the evaluation process recommends the same preferred corridor, it provides supporting evidence to the 2013 recommendation, and may clearly demonstrate that any new information from the refresh exercise does not directly change the outcome.

It is acknowledged that feedback from the Round 2 consultations in 2013 suggests that some attendees found the Pair-wise tool and Evaluation process confusing. It is therefore recommended that additional messaging is provided in any future engagement materials to specifically clarify the process.

Understanding the project, specifically the nature of the preferred corridor, is key to developing and engaging on the Initial Project Description and Detailed Project Description required during the early planning phase of the IAA, as noted in Section 10.3 below. While the Impact Assessment itself should consider alternative means of carrying out the project, it is anticipated that the Impact Assessment would summarize the previous work undertaken in 2013, the current refresh exercise, and the subsequent evaluation process noted above, as the justification for proceeding with a preferred corridor through the IAA. It is suggested that this approach is discussed with the Agency prior to initiating IAA requirements.

NCC and PSPC, as proponents for the project, should also confirm whether it is in the public interest to conduct engagement activities to present the findings of the refresh exercise and subsequent selection of a preferred corridor prior to initiating IAA requirements. It is recommended that engagement with the public, Indigenous communities and applicable agencies in advance of an impact assessment study would serve to build consensus for the project, and potentially identify and address any key concerns outside of a formal legislated process. This may be advantageous in reducing potential schedule risks once the IAA process has formally commenced.

10.2.1 KEY STEPS PRIOR TO AN IMPACT ASSESSMENT

The following key steps are suggested to reach the point of commencing an impact assessment under the IAA:

- Complete Refresh Studies – the development of this report marks the key step of finalizing the refresh studies. It is important to note that the timing of future evaluation and impact assessment work has potential implications for the relevance of the data and information presented in some of the refresh studies. For example, in fall 2020 it is anticipated that a new O-D survey will be carried out followed by a new 2046 TRANS model update, which will require the analysis in the transportation report and its recommendations to be revisited. Similarly, new policy directions may be provided by the federal or provincial governments in the interim period, while at the municipal level, initiatives such as the City of Ottawa Official Plan and Transportation Master Plan reviews may have implications from a land use perspective.
- Confirm Evaluation Methodology – as noted above, NCC and PSPC should confirm the evaluation methodology for the evaluation process. This would include re-establishing an evaluation committee.
- Prepare Engagement Plan – an engagement plan should be developed to clearly outline the tools and methods to be used to engage the public, stakeholders and Indigenous communities during the evaluation process.
- Engagement Round 1 – it is suggested that the first round of engagement focuses on re-introducing the study, presenting the optimized corridors, summarizing the refresh studies, and consulting on the weighted criteria for the evaluation process. Based on feedback received, it may be necessary to address gaps in refresh studies, or revisit the weighting priorities to inform the evaluation process.
- Conduct Evaluation – the evaluation of the three corridors will occur to select a preferred corridor and reflect any relevant actions to come out of the first round of engagement.
- Engagement Round 2 – it is suggested that the second round of engagement focuses on presenting the results of the evaluation and the preferred corridor. Based on feedback received, additional analysis may be required if any critical issues are raised. Should this be the case, it is suggested that a third round of engagement occur to clearly demonstrate this additional analysis and what impact, if any, it had on the selection of a preferred corridor.
- Proceed to Impact Assessment – this will be the final step either directly after Engagement Round 2 (if no critical issues are raised) or after Engagement Round 3 (if critical issues need to be addressed).

These key steps are summarized in the flow chart below in **Figure 10-1**:

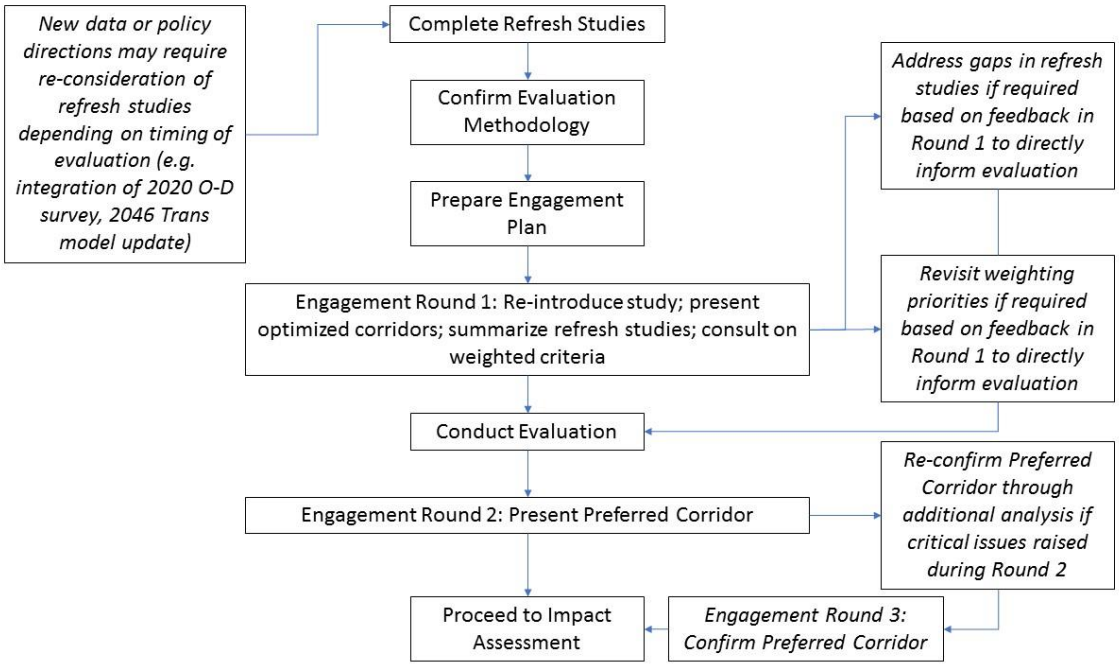

Figure 10-1: Key Steps Prior to an Impact Assessment

10.3 OVERALL IAA PROCESS

While the IAA is in force and contains clear direction on the overall process and key steps, guidance documentation associated with the IAA is still in draft form or is yet to be developed. In the interim period prior to commencing any future impact assessment study, further guidance on the application of the IAA may become available.

The overall IAA process is defined in **Figure 10-2.** Key elements of the process (assuming a Review Panel or other specific additional requirements are not required) are as follows:

10.3.1 PLANNING

The proponent submits an Initial Project Description to the Agency to confirm that the project conforms to the regulations. Upon acceptance, the Initial Project Description is posted on the Agency's Registry to start a 180-day time limit for the early planning phase. During this period, the Agency engages with authorities having jurisdiction, Indigenous communities, and the public, to determine key issues. The Agency prepares a Summary of Issues and the proponent prepares a Response to the Summary of Issues and a Detailed Project Description. The Agency develops a Public Participation Plan, Indigenous Engagement and Partnership Plan, Impact Assessment Cooperation Plan, Permitting Plan, and Tailored Impact Statement Guidelines for review. Once finalized, the Tailored Impact Statement Guidelines are provided to the proponent and documents are posted to the Registry with a Notice of Commencement, prior to the end of the 180-day time limit.

10.3.2 IMPACT STATEMENT

The proponent continues to conduct studies and the Agency continues to engage with the public and Indigenous communities to inform the Impact Statement. The Impact Statement follows the Tailored Impact Statement Guidelines and is submitted to the Agency within three years of the Notice of Commencement. The Agency invites comment on the Impact Statement and upon confirmation that it conforms to the Tailored Impact Statement Guidelines, the Impact Statement is posted on the Registry.

10.3.3 IMPACT ASSESSMENT

A 300-day time limit will begin when the Agency posts the Notice of Determination. During this period, federal authorities with specialist information or a specific mandate continue their analysis of the Impact Statement and provide advice to the Agency which is posted on the Registry. The Agency continues its review of the Impact Statement considering any comments received and continues to engage Indigenous communities and the public per the Indigenous Engagement and Partnership Plan and Public Participation Plan. The Agency develops the draft Impact Assessment Report and potential Conditions, and a Consultation Report for review. Once finalized, the Agency provides the Impact Assessment Report, Consultation Report, and potential Conditions to the Minister of Environment and Climate Change (the Minister).

10.3.4 DECISION-MAKING

The Minister determines if the adverse effects within federal jurisdiction and the adverse direct or incidental effects are in the public interest (this may be referred to the Governor in Council). The Minister or Governor in Council must be satisfied that the Crown duty to consult has been fulfilled. A Decision Statement is issued to the proponent outlining the determination and conditions. If a public determination is made by the Minister, the Decision Statement is issued no later than 30 days after the Impact Assessment Report is posted on the Registry (90 days if the determination is made by the Governor in Council). The Decision Statement will also be posted to the Registry.

10.3.5 POST-DECISION

The proponent is responsible for carrying out any Conditions including a follow-up program and mitigation measures. The Agency may also establish an Environmental Monitoring Committee. The Agency posts information relating to these activities to the Registry and is responsible for verifying compliance with the Decision Statement.

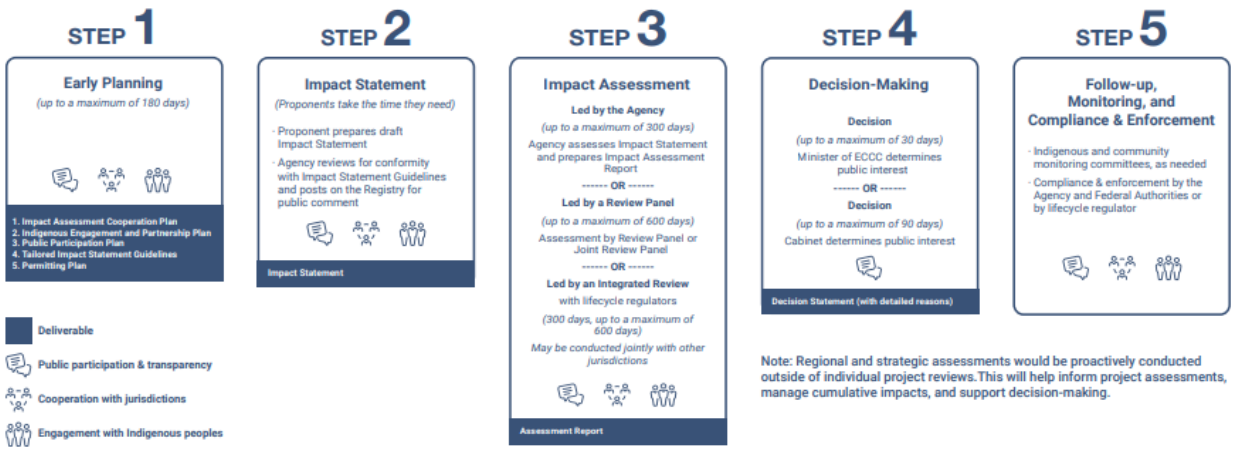

Figure 10-2: Impact Assessment Process

10.4 IMPACT ASSESSMENT STUDIES

It is recognized that the refresh exercise focused on a select group of technical studies conducted in 2013, and not the full range of technical assessments conducted in the previous study. In addition, the nature of the refresh was to update existing reports which focused at a broader level on the three alternative corridors, rather than a detailed assessment of a preferred corridor.

Furthermore, it is not possible to pre-judge the outcome of the subsequent evaluation process to understand what the preferred corridor will be. As such, the gap analysis below focuses on a high-level assessment of the types of studies anticipated as part of an impact assessment study and uses the environmental criteria as specified in the IAA guidance. One of the key elements of the impact assessment study will be to develop Tailored Impact Statement Guidelines, as noted in Section 10.3.

10.4.1 BIOPHYSICAL ENVIRONMENT

Air Quality

A detailed air quality assessment would be conducted to assess the impacts for construction and operational phases in the local and regional study areas. The detailed assessment would include dispersion and deposition modelling of the preferred alternative and follow the methodology used to update the 2013 Air Quality Report.

The predictive modelling would be completed using the United States Environmental Protection Agency's (US EPA) AERMOD model, an approved model in Ontario and Quebec and follow best practices established by air quality practitioners to assess air quality. The results of the dispersion modelling would be added to the existing background air concentration and compared to the air quality criteria in Ontario and Quebec. The deposition modelling results would be provided as inputs to the Human Health and Ecological Risk Assessments.

The detailed air quality assessment of the preferred alternative would also require the inclusion of a climate change assessment. The climate change assessment would be conducted following the framework to

quantify the GHG emissions of projects presented Draft Strategic Assessment of Climate Change document[13] until the Final Strategic Assessment of Climate Change document is released (early 2020).

The detailed air quality assessment of the preferred alternative would be documented in a Technical Supporting Document (TSD) or incorporated in the mitigations and monitoring to minimize impacts during the construction and operational phases. Air quality residual impacts and cumulative impact assessment would be assessed.

Noise and Vibration

A Noise and Vibration Assessment was conducted in 2013 and was subject to the refresh exercise.

The next steps for an impact assessment study would involve an assessment of noise impacts based on project-related noise and the characterization of potential changes in the acoustic environment due to any project activities. The project activities for an impact assessment study include both construction and operation. In addition to environmental compliance, the impact assessment study should also focus on the potential cumulative and health effects of noise and vibration. If the presence of wildlife within the study area is noted, appropriate reports should also reference sound and vibration levels and discuss species at risk.

A Construction Noise and Vibration Effect Assessment would be completed and this is comprised of three components: an assessment of noise and vibration from construction and operation activities against environmental guideline limits; a cumulative effect assessment following the IAA guidelines; and a health effect assessment using Health Canada's guidelines.

The prediction of noise impacts from the preferred corridor construction and operation activities would be conducted. The following steps would be followed: complete a baseline study for noise and vibration through field measurements and modelling; project effect assessment (noise and vibration) for construction; project effect assessment (noise and vibration) for operation; assessment of the effects against environmental guideline limits; establish cumulative effects and compare the changes in the environment (i.e. residual effects); assess for health effects using Health Canada's guidelines; and provide feedback to ecological team. Baseline vibration measurements will be completed only if sources of vibration in the study area are identified.

The third and final step is the development of a Noise and Vibration Management Plan (NVMP). An NVMP is anticipated to be required as part of an impact assessment study. This plan would include detailing the actions, including mitigation measures, that will be taken to minimize noise and vibration effects during project construction and operation. The NVMP will include a noise and vibration monitoring protocol detailing site-specific requirements.

Visual Assessment

A Visual Assessment Report was conducted in 2013, but was not subject to the refresh exercise. It is recommended that this report is reviewed and updated as necessary to confirm that its findings remain accurate and any specific gaps are addressed with respect to the nature of the preferred corridor.

Hydrogeology

It is anticipated that a hydrogeology study may be required, which would be confirmed as the impact statement guidelines are developed. The hydrogeology study may include: a review of available geological information; a search for water well records; a review and compilation of a summary table of key information (depth to bedrock, bedrock characteristics, etc.); a review of surrounding property uses and

[13] https://www.strategicassessmentclimatechange.ca/9529/documents/17911

assess potential impacts to groundwater and its functions; and a search of databases for nearby ECAs and PTTWs near the site.

Hydrology and Hydraulic

A Hydrotechnical Assessment was conducted in 2013 and will be subject to the refresh exercise. Upon selection of a preferred corridor, the hydrotechnical modelling will be refined to account for additional design details as part of the preferred corridor design refinement. This will include, but may not be limited to: hydraulic modelling of the number of piers, pier location, or pier shape, width, and skew; adjustment to the ideal location and size of stormwater management infrastructure (e.g., ponds, low impact development (LID), best management practices); and identification of opportunities to integrate existing drainage elements in and adjacent to the preferred corridor.

Phase I Environmental Site Assessment

An Update to the Screening Phase I ESA for the three alternative corridors was conducted in 2013, but was not subject to the refresh exercise. This report recommends that, upon selection of the preferred corridor, a Phase I ESA according to the Canadian Standards Association (CSA) would be carried out as part of the preliminary design of the project. It is recommended that this Phase I ESA for the preferred corridor therefore be conducted. The Phase I ESA will make recommendations for any required Phase II ESA studies.

Ecology

A Fisheries Report and Natural Environment Assessment (Existing Conditions Update) and were subject to the refresh exercise.

Further in-depth studies of the natural environment components will be required to comply with provincial and federal laws, as well as to accurately assess and recommend measures to mitigate the anticipated impacts to natural environment features. To fulfill these requirements, it is anticipated that field surveys will be required, including, but not limited to the identification and inventory of the vegetation communities, including a tree inventory; occurrence of wildlife and their habitat, including species at risk (SAR) and their habitat; and additional natural environment features of the preferred corridor.

Riparian and wetland environments

The natural environment assessment identified the presence of wetlands within the alternative corridors. A characterization and delimitation of these features should be carried out between May and September. If work must be carried out in wetlands, an application for authorization must be filed with the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) in Quebec under section 22 of the *Environment Quality Act*. In accordance with the declaration of services to citizens, MELCC would issue an official response within 75 days of receipt of the request for a certificate of authorization. Approvals may also be required from the Ontario Ministry of Natural Resources and Forestry (MNRF) and the Rideau Valley Conservation Authority (RVCA).

Vegetation

There are specific timing requirements to follow established protocols with respect to completing surveys (i.e., Ecological Land Classification). Briefly, vegetation community inventories will be required over two periods of the year, between May and June, as well as between August and September.

The study site is within an area regulated for emerald ash borer (EAB) by the Canadian Food Inspection Agency (CFIA). In anticipation of any tree cutting work associated with the preferred corridor, an inventory of infected ash trees will have to be carried out between May and September.

Birds, migratory birds and their habitat

Field surveys will be required to inventory bird species and their habitat. The various species-specific survey protocols will be required during prescribed timing windows, generally between May and mid-July. These inventories should include (but may not be limited to): breeding bird surveys; waterfowl surveys; and crepuscular bird surveys. Migratory birds and their habitat are protected under the *Migratory Birds Convention Act* and additional bird species and their habitat are protected under the *Fish and Wildlife Conservation Act*.

Terrestrial wildlife and their habitat

Due to the presence of SAR and their habitat within the area of impact, it is anticipated that consultation and possible approvals may be required by (but may not be limited to): Environment and Climate Change Canada (ECCC) for federally protected SAR and their habitat under the *Species at Risk Act* (SARA); Ontario Ministry of Environment, Conservation, and Parks (MECP) for SAR and their habitat under the *Endangered Species Act* (ESA); Ministère des Forêt, de la Faune et des Parcs (MFFP), and the MELCC in Quebec.

There are specific timing requirements to follow established protocols with respect to completing Natural Environment surveys. Wildlife inventories such as amphibian surveys (including Western Chorus Frog inventory) and bat surveys need to be conducted between April and August depending on the species.

Finally, it would be beneficial to consult with the MFFP, if necessary, on the creation of the proposed future wildlife refuge along the Ottawa River, from McLaurin Bay to the Plaisance National Park.

Fish and fish habitat

Upon selection of the preferred alignment and to fulfill future impact assessment requirements, it is anticipated that specific aquatic habitat assessment, including field surveys, may be required to supplement the refresh report and historical fish and fish habitat records / characterizations provided by government agencies. In advance of field collections surveys, it is anticipated that approval will be required from provincial agencies to survey for, and collect fish. The results of the aquatic habitat assessment and an understanding of the project impacts, along with measures to mitigate potential impacts to fish and fish habitat would form the basis of consultation with provincial, federal, and municipal / regional regulatory agencies (i.e. Conservation Authority). It is anticipated that consultation and possible approvals may be required by (but may not be limited to): Fisheries and Oceans Canada (DFO) for the protection of fish and fish habitat under the *Fisheries Act*; ECCC for federally protected aquatic SAR and their habitat under the SARA; MECP for aquatic SAR and their habitat under the ESA, MFFP for the protection of fish and fish habitat; and RVCA for regulations associated with development and alteration of shorelines under the *Conservation Authorities Act*.

The Ontario Timing Window Guidelines in this reach of the Ottawa River (Lac Dollard des Ormeaux) specifies no in-water works from January 1 to July 15.

The Quebec Timing Window Guidelines in this region (Outaouais) specify that in-water work can be carried out from July 15 to March 31, unless specific Salmonid species are present; then the timing window is shifted to June 1 to September 30.

Note: Timing Window Guidelines are subject to revision, therefore it is recommended that the appropriate agency be contacted to confirm the timing windows before undertaking a project.

10.4.2 HUMAN HEALTH

Human Health Risk Assessment

A Human Health Risk Assessment Report was conducted in 2013, but was not subject to the refresh exercise. It is recommended that this report is reviewed to confirm that its findings remain accurate with the selected corridor.

10.4.3 SOCIAL / CULTURAL

Land Use and Property

A Land Use and Property Report was conducted in 2013 and was subject to the refresh exercise.

Due to the lack of property fabric data available for the refresh, an analysis of the number of properties impacted could not be provided. An analysis based on a more granular level of detail would likely yield a more accurate reflection of specific property impacts. It is suggested that this level of detail will be required during an impact assessment study, to determine the precise property impacts associated with the preferred corridor. Furthermore, as the design of the project continues to evolve from preliminary to detailed design, it is possible that property requirements may change, including full and partial requirements, and permanent and temporary requirements for activities such as construction staging and laydown areas.

Within the framework of the impact assessment, once specific property uses and impacts are understood, it will be possible to identify potential socio-economic and land use impacts attributable to the preferred corridor and identify appropriate mitigation measures and monitoring.

Community Impacts

A Community Impacts Report was conducted in 2013, but was not subject to the refresh exercise. It is recommended that this report is reviewed and updated as necessary to confirm that its findings remain accurate and any specific gaps are addressed with respect to the nature of the preferred corridor.

Transportation

A Transportation Report was conducted in 2013 and was subject to the refresh exercise, with a focus on the demographic growth that has occurred within the NCR and the associated rates of growth in background traffic and transit riders. The 2019 existing traffic volumes were established based upon our review of the latest available turning movement counts, as well the results obtained from the TRANS Model with updated 2011 TRANS Origin-Destination Survey data to carry out a reassessment of the influence of the three proposed bridge corridors on attracting future (2031) trips between Ottawa and Gatineau and vice versa. As noted in Section 10.2.1, while reflective of the current conditions and data availability, as the project moves forward further transportation analysis, assessment and review may be warranted to account for potential changes in trip patterns and characteristics including the ongoing continued evolution of transit systems and networks for the region such as the recent introduction of LRT in Ottawa, the continued development/expansion of the Rapibus (operational in 2013) and potential planned interprovincial transit initiatives aimed at serving residents of Gatineau and Ottawa. It is also noted that, TRANS has plans in place to initiate an update to the O-D Survey in the Fall 2020. The updated O-D Survey will document associated impacts of travel behaviour; both travel mode usage and trip distribution/patterns based on the additional transportation infrastructure including rapid transit and LRT.

The TRANS O-D Survey is planned to be updated in fall 2020 followed by the TRANS Model update to the planning horizon 2046; if the evaluation of alternatives is conducted after this information is available, then this analysis would be incorporated into the evaluation of alternatives prior to the impact assessment phase. If the evaluation of alternatives is conducted prior to the availability of this data, then it would need to be incorporated during the impact assessment phase as it pertains to an analysis of the preferred corridor. Regardless, regional growth (scale and patterns) would need to be monitored through the impact assessment phase as they may have an influence on the attraction of trips to the preferred corridor. An updated detailed traffic operations level of service (LOS) analysis using Synchro for the preferred corridor would be required during the impact assessment phase, to reflect up to date traffic volumes and ensure that any observed changes to trip patterns or travel modes (e.g. introduction of the LRT) are captured and considered. The use of updated traffic volumes also serve to provide additional credibility to the study findings and gain public support for the findings.

Recreation

A Water Use for Boating and Sailing Update Report was conducted in 2013, but was not subject to the refresh exercise. It is recommended that this report is reviewed to confirm that its findings remain accurate for the preferred corridor.

Archaeology

An Archaeological Update was conducted in 2013, but was not subject to the refresh exercise. As outlined in the 2013 report, archaeological potential exists in all three alternative corridors; as such recommendations for Stage 2 assessments should be carried out pending the selection of a preferred corridor. Should the proposed work extend beyond the current study area, then a further Stage 1 assessment must be conducted to determine the archaeological potential of the surrounding lands.

Cultural Heritage

A Cultural Landscape and Built Heritage Update was conducted in 2013, but was not subject to the refresh exercise. As outlined in the 2013 memo, following the selection of a preferred corridor and development of detailed design, the potential impacts of the proposed project on identified cultural heritage resources will be reviewed and appropriate mitigation measures recommended by a qualified heritage specialist. Additional fieldwork and consultation with the City of Gatineau may also be required.

Gender Based Analysis

Under the IAA, a Gender Based Analysis Plus (GBA+) approach would now be applied to the impact assessment to describe disproportionate effects for diverse subgroups, including Indigenous peoples, or other community relevant or vulnerable subgroups (e.g., women, youth, elders).

10.4.4 ECONOMIC

An Economic Development Potential Study was conducted in 2013 and was subject to the refresh exercise. It is anticipated that the results of this study will contribute to an impact assessment of the preferred corridor with respect to specific economic development criteria.

In addition, a Cost Estimate Summary was developed in 2013. It is understood that prior to an impact assessment study, updated cost estimates for the three alternative corridors will be prepared based on updated information from the refresh exercise. These cost estimates will support an evaluation process conducted prior to the impact assessment study.

10.4.5 INDIGENOUS PEOPLES

An Indigenous History report was conducted in 2009 and was subject to the refresh exercise. With respect to ongoing engagement with Indigenous communities, it is anticipated that as part of the Duty to Consult, the Algonquins of Ontario will continue to be engaged on projects within their traditional territory. The *Protocol for the Co-management of Archaeological Resources* developed between the NCC, KZA, and AOP does act to provide a framework for the engagement of KZA and AOP for all archaeological field investigations on NCC land and, where possible, other federal lands in the National Capital Region.

As noted above, the consideration of Indigenous peoples is a key component of the GBA+ lens through which the impact assessment study will be conducted.