Ontario

Ministry of Transportation

TRANSPORTATION ENVIRONMENTAL STUDY REPORT

Technical Appendices – Volume II

Preliminary Design and Environmental Assessment for the Rehabilitation / Replacement of Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street

GWP 4170-13-00

City of Ottawa

May 2024



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Technical Appendices Volume II

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Analysis and Evaluation Report

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Ottawa Queensway Downtown Bridges
Preliminary Design and Environmental Assessment Study for Rehabilitation/Replacement from Metcalfe Street to Main Street
GWP 4170-13-00

Analysis and Evaluation Report

Final





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EXECUTIVE SUMMARY

A Group 'B' Environmental Assessment (EA) is being undertaken by the Ministry of Transportation (MTO), under their Class Environmental Assessment for Provincial Transportation Facilities (July 2000), for a bridge management plan for structural improvements (rehabilitation or replacements) to bridges on the Ottawa Queensway (Highway 417) from Metcalfe Street easterly to Main Street. The project is being described as the Ottawa Queensway Downtown Bridges Project.

The MTO's Provincial Class EA is a planning process developed to ensure that all potential natural, social/cultural and economic environments as well as property and land use effects are considered in undertaking Ministry Class EA projects.

This document summarizes the analysis and evaluation process used to select Technically Preferred Alternatives (TPAs) for the bridge management plan for the 7 bridges under study. This evaluation methodology includes community and stakeholder input at all key stages of the study. The effects and mitigation plan carried forward for each TPA for each bridge site may be modified during subsequent stages of public consultation and will be further defined at the detail design stage. This document will become a component of the single Transportation Environmental Study Report (TESR) which will address all 7 bridges.

This report reflects the technical evaluation process up to the preliminary identification of Technically Preferred Alternatives (TPA's). The preliminary TPA's were presented to the public at PIC No. 2 and refinements were made to address comments and concerns from agencies, stakeholders and the public. The Technically Preferred Plan will be presented to the public at PIC No. 3.

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GLOSSARY OF TERMS

AASHTO	American Association of State and Highway Transportation Officials
Adjacent	Adjacent indicates lying near MTO or Municipal roadway rights-of-way, although not necessarily contiguous to them.
Aesthetics	Methods of providing visual relief and appealing characteristics to planned noise barriers thorough the application of landscaping designs.
Alternative	Well-defined and distinct course of action that fulfills a given set of requirements. The EA Act distinguishes between Alternatives to the Undertaking and Alternative Methods of Carrying out the Undertaking.
Coarse Screening	Initial screening of a group of alternatives. Also see Screening.
Criterion(a)	Explicit feature or consideration used for comparison of alternatives.
Dichotomous Utility Function	A utility function that represents a desirable or undesirable response from a criterion (yes/no, present/absent, true/false).
Dimensionless Number	A number that does not have a unit of measurement, such as length (m), time (s), mass (kg) associated with it. Examples include Utility Score and Overall Score.
Do Nothing Alternative	This alternative is a mandatory requirement of the Class EA. This option is the null or no action alternative and it becomes the baseline to which all alternatives are compared.
Double Counting	Unintentional accounting for a particular factor or attribute more than once in the evaluation.
EA	Environmental Assessment
Evaluation	The outcome of a process that appraises the advantages and disadvantages of alternatives.
Evaluation Criteria	See Criteria.
Evaluation Process	The process involving the identification of criteria, rating of predicted impacts, assignment of weights to criteria, aggregation of weights, and rating to produce an ordering of preference of alternatives.
FAC	Federal Advisory Committee
Factor	See Global Factors.
Freeway	Freeway is defined as an existing completed, partially developed (staged) or proposed divided highway with full control of access and grade separated intersections. This definition may include some highways that are not officially designated as freeways.
Function Form	See Utility Function
Global Factors	The main categories of factors, (i.e. Transportation, Economic Environment, Natural Environment, Social and Cultural, Land Use and Property and Cost). All sub-factors are components or a subset of global factors.
Jack and Slide	An accelerated bridge method which laterally moves a replacement bridge in place from an adjacent staging area.
Linear Utility Function	A function that can be defined using a linear equation of the form: $y = a + bx$, where y is the dependent variable (raw score) x is the independent variable (measurement) b is the slope of the function, and a is the y intercept, normalized in this study to be equal to one or zero
Matrix	A rectangular array of criteria and values.
Mitigation	Taking actions that either remove or alleviate to some degree the negative impacts associated with the implementation of alternatives.
MECP	Ministry of the Environment, Conservation and Parks
MTAC	Municipal Technical Advisory Committee
MTO	Ministry of Transportation of Ontario
NCC	National Capital Commission
Overall Score	The final value of an alternative's score derived by summing all of the weighted scores.
Performance Factor	See Utility Function

PIC	Public Information Centre
Ranking	The ordering of alternatives from first to last for comparison purposes.
Raw Data	The measurement of the impact, or measured data, under each criterion.
RBR	Rapid Bridge Replacement
Risk	Probability that a given outcome will or will not materialize. Distinct from uncertainty in that the alternative outcomes are known or defined and that the probability of each is measurable.
Screening	Process of eliminating alternatives from further consideration, which do not meet minimum conditions or categorical requirements.
Semi Integral abutments	A bridge superstructure design that removes the use of expansion joints for a simply supported bridge deck.
Step Function	A utility function can be defined by several linear functions within separate ranges that have a slope equal to zero. For this study, two step functions are used: Case A: y = 1, for x = desirable and y = 0, for x = undesirable Case B: y = 1 for x = desirable, y = 0.5 for x = medium performance and y = o for x = undesirable
Sub-factor	A single criterion used for the evaluation. Each sub-factor is grouped under one of the factors.
TAC	Technical Advisory Committee
TPA	Technically Preferred Alternative
Traceability	Characteristic of an evaluation process which enables its development and implementation to be followed with ease.
Transportation Environmental Study Report (TESR)	This report is prepared in compliance with the EA Act requirements and the Ministry of the Environment, Conservation and Parks for acceptance, approval, informational or monitoring purposes and the public record.
Utility Function	A function (linear, step, dichotomous) that represents the Utility Score versus the criterion measurement or desirableness.
Utility Score	The “y” value derived from the Utility Function of the measurement of the impact induced by a particular alternative’s criterion. A measurement of the usefulness or attractiveness of an alternative with respect to an individual evaluation criterion based on its measured effect (a number between 0 and 1). The utility score is dimensionless.
Weight	The importance attributed to a criterion relative to other criterion. The value of the weight is expressed in a percentage and the sum of all criterion weights is equal to 100%.
Weighted Additive Method	The method used in the quantitative evaluation of alternatives, which reduces the project’s numerous criteria into a dimensionless number for each alternative suitable for comparison.
Weighted Score	A raw score that has been multiplied by the criterion weights. The weighted scores reflect the social value or importance of the specific group providing weights.

1 INTRODUCTION

The purpose of this report is to summarize the analysis and evaluation of structural alternatives for 7 bridge sites along the Ottawa Queensway (Highway 417) from Metcalfe Street easterly to Main Street in the City of Ottawa, including the Rideau Canal Bridge. This report is a component of the Group B Provincial Class Environmental Assessment (EA).

The EA process requires that all preliminary alternatives be evaluated in a manner that is systematic, traceable and transparent. This includes a commitment to open and meaningful public consultation. The analysis and evaluation process must recognize public and agency input as well as MTO standards and requirements. This report documents the decision-making process used to select the Technically Preferred Alternative (TPA), including the following activities:

- Assessment of Alternatives to the Undertaking;
- Development of a long list of structural and highway staging alternatives for each roadway section and bridge site;
- Screening out of alternatives which do not achieve the basic project requirements and/or do not comply with MTO standards/requirements (refer to **Section 5.1**);
- Identification of the preliminary long list of assessment factors and sub-factors and screening out those where there were no meaningful and measurable differences among the alternatives as well as those that do not apply to the study area, based on the site inventories carried out;
- Identification of the benefits and potential impacts for the short-listed alternatives;
- Evaluation of short-listed alternatives using a recognized evaluation technique including weighting the relative importance of criteria;
- Ranking alternatives;
- Sensitivity testing to assess the robustness of the evaluation and alternative scores;
- Selection of the TPA based on the evaluation results; and
- Refinements to the TPA, if required.

2 STUDY PURPOSE

The context for the overall network “planning” for the Queensway corridor was previously reviewed and defined as part of an EA Study completed in 2007. That study concluded that there would be widening for additional lanes on the north side of the Queensway within the current study area being considered in this EA. The 2007 EA study completed the “planning” phase of the Queensway corridor plan. Subsequent post-2007 EA studies are being undertaken to consider the follow-up preliminary design of site-specific projects within the corridor. This current preliminary design study will define the bridge management plan for 7 bridges in the Study Area (**Figure 3.1**). Other projects are also being implemented for ramp operational improvements and bridge replacements (e.g. the previous Kent Street Bridge superstructure replacement to the west of this project).

2.1 Scope

This project will identify a bridge management strategy to address the structural needs of the Queensway Downtown bridges. These overpass bridges include:

- Site No. 3-065 Highway 417 Metcalfe Street Overpass
- Site No. 3-066.1 Highway 417 Eastbound Lanes (EBL) over Elgin Street
- Site No. 3-066.2 Highway 417 Westbound Lanes (WBL) over Elgin Street
- Site No. 3-067.1 Highway 417 EBL over Rideau Canal
- Site No. 3-067.2 Highway 417 WBL over Rideau Canal
- Site No. 3-068.1 Highway 417 EBL over Main Street
- Site No. 3-068.2 Highway 417 WBL over Main Street

For the purposes of the evaluation, each bridge site was evaluated as a whole and not as individual bridges (i.e. one combined alternative for the Elgin Street overpass structure was used in the evaluation). It was determined that there were no differences between the EBL or the WBL for this evaluation based on the condition surveys completed in the study and the structural evaluation of the bridges.

This study is following the Class EA process for Group B projects under MTO’s Class Environmental Assessment for Provincial Transportation Facilities, 2000. At the completion of this study, a Transportation Environmental Study Report (TESR) will be prepared and published for public review.

Several alternatives will be reviewed for each bridge site including structural and construction staging alternatives in order to minimize disruption to the Queensway and the modes of travel that use the municipal streets under the Queensway. In addition, engineering, environmental, and property requirements will be established, along with the identification of mitigation measures to reduce or negate short- and long-term residual effects.

3 STUDY AREA

The preliminary design and environmental assessment study for the rehabilitation and/or replacement of seven bridges (four locations) on the Ottawa Queensway extends from Metcalfe Street to Main Street. This study will determine the appropriate strategy for the rehabilitation or replacement of the bridges. The Study Area, as shown in **Figure 3.1**, is located in the City of Ottawa.

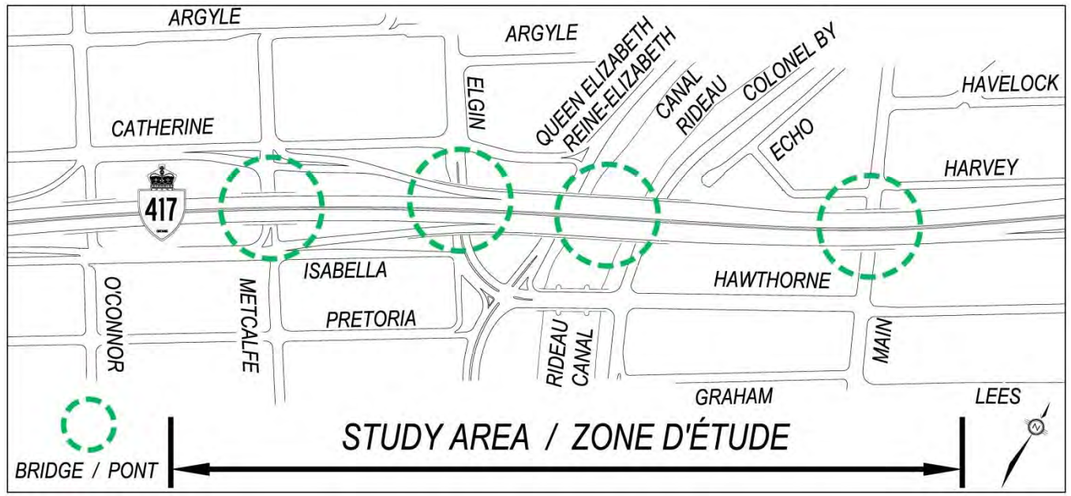


Figure 3.1: Study Area

4 ASSESSMENT OF ALTERNATIVES TO THE UNDERTAKING

The analysis and evaluation process involves a 2-step decision-making process. Initially the study documents the analysis and evaluation of Alternatives to the Undertaking (Alternative Planning Solutions, i.e. different strategies) and then this is followed by the subsequent analysis and evaluation of preliminary design alternatives ("Alternative Methods" of carrying out the preferred Alternative Undertaking).

The generalized planning process is presented in **Figure 4.1** illustrating the step where the assessment of Alternatives to the Undertaking is undertaken. The documentation of this assessment is presented in a separate report in **Appendix A: Assessment of Alternatives to the Undertaking**.

From this initial assessment, the recommendation was to carry forward both replacement and rehabilitation alternatives for all rigid frame bridges and the Rideau Canal Bridge. During this stage of the evaluation, the study recommendation was to not carry forward the Do Nothing alternative which would not have defined a future bridge management strategy.

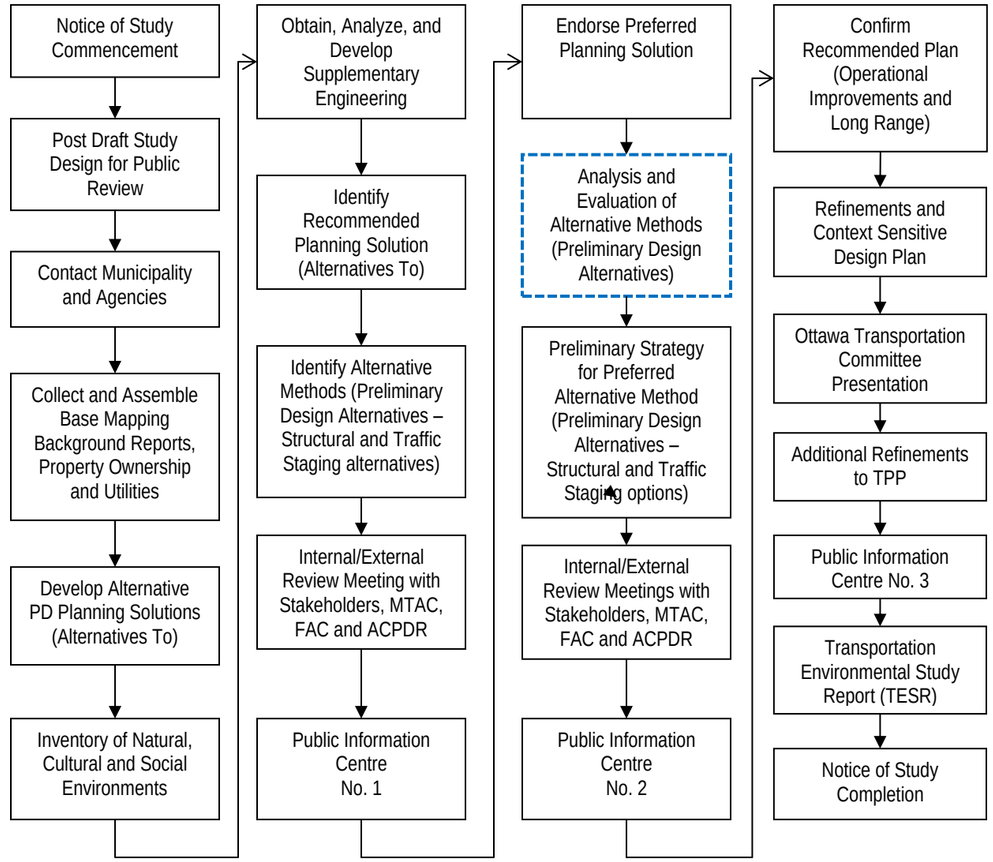


Figure 4.1: Generalized Preliminary Design (PD) Planning Process

5 GENERATION AND ASSESSMENT OF PRELIMINARY DESIGN ALTERNATIVES (ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKING)

Within each of the study area sub-sections, several alternatives have been generated for consideration. The long list of alternatives, a description of each alternative, as well as a coarse screening of the alternatives, are found in this section of the report.

Details of the bridge sites as well as drawings of the alternatives are provided in separate technical reports as follow:

- Structural Design Reports (SDRs) – one for each of the individual sites (Metcalfe Street, Elgin Street, Rideau Canal and Main Street). Where two bridges are located at a crossroad, both the eastbound and westbound bridges are described in the same report.
- Preliminary Highway Engineering Traffic Staging Report.

Within each of the above technical reports several alternatives have been identified. These include:

Bridge Alternatives - Rigid Frame Sites:

- Alternative A: Rehabilitation
- Alternative B: Replacement

Each bridge was evaluated for the existing span.

Bridge Alternatives – Rideau Canal:

- Alternative A: Replacement constant depth precast on existing pier location
- Alternative B: Replacement variable depth on existing pier location
- Alternative C: Extrados concrete on new pier location
- Alternative D: Replacement variable depth girder on new pier location
- Alternative E: Single span replacement (arch bridge)
- Alternative F: Conventional Rehabilitation

Traffic Staging Alternatives on Freeway – Rigid Frame Sites:

- Alternative 1 – Rehabilitation conventional with 2 lanes/direction
- Alternative A1 – Rapid rehabilitation involving a 5-stage rehabilitation sequence
- Alternative A2 – Conventional rehabilitation involving a 4-stage rehabilitation sequence
- Alternative 3 – Conventional rehabilitation involving battleship traffic staging
- Alternative 4 – Conventional rehabilitation with median crossover
- Alternative B1 – Conventional replacement diversion of freeway traffic
- Alternative C1 – Rapid replacement with full eastbound and westbound closure (short term)

Traffic Staging Alternatives on Freeway – Rideau Canal Bridge Site:

- Alternative 1 – Barge transportation of structure
- Alternative 2A – Conventional construction in strips
- Alternative 2B – Conventional construction in strips allowing wheel tracking on the joint between the bridges
- Alternative 2C – Conventional staging in strips with additional work (to widen the Queensway north side following 2007 TESR recommendations) completed prior to construction
- Alternative 3A – Complete superstructure rapid replacement using SPMTs (complete structure replacement)
- Alternative 3B – Complete superstructure rapid replacement using SPMTs (individual bridges for each span with all six bridge staging sites to the north of the Queensway)
- Alternative 3C – Complete superstructure rapid replacement using SPMTs (individual bridges for each span with four bridge staging sites north of the Queensway and two bridge staging sites within Ballantyne Park)
- Alternative 3D – Complete superstructure rapid replacement using SPMTs (individual bridges for each span with two bridge staging sites north of the Queensway and four bridge staging sites within Ballantyne Park)
- Alternative 4 – Demolish in place and jack and slide new bridges from slides (2 bridges replaced on the same weekend)
- Alternative 5 – Sequential jack and slide (removing one bridge at a time)
- Alternative 6 – SPMT transport to Nicholas (individual bridges for each span)

A standalone report was prepared for the Highway Staging alternatives for the rigid frames and the Rideau Canal bridges.

Staging Area Alternatives for Temporary Works

At each of the 7 bridge sites an initial review of feasible Rapid Bridge Replacement (RBR) staging areas was undertaken and a staging area that would be preferred with the RBR bridge alternative was recommended. This assessment is presented in **Appendix C**. This initial screening was presented at PIC No. 1 for public review and comments.

5.1 Coarse Screening of Alternatives

The long list of alternatives was generated in an attempt to consider a wide range of alternatives to address the structural needs identified (i.e. all reasonable alternatives). This wide range of alternatives was subjected to a coarse screening analysis before proceeding with a detailed evaluation of the alternatives.

This screening eliminated those alternatives with significant negative impacts in comparison to the other alternatives carried forward. All bridge alternatives for both the rigid frame sites and the Rideau Canal Bridge were carried forward for evaluation.

Traffic Staging Alternatives on Freeway – Rigid Frame Sites:

The initial list of alternatives was reviewed and the following alternatives were recommended to not be carried forward because of poorer performance relative to the other alternatives being carried forward.

- Alternative 1 was recommended not to be carried forward because in comparison with the alternatives that reduce the Queensway to 2 lanes of traffic (Alternatives 1, A1 and A2), it requires a substantially longer duration of 2-lane operation (8 weeks in comparison to the 4 weekends required by Alternatives A1 and A2). In addition, Alternative 1 has a substantially higher capital cost associated with a median crossover which is not required in Alternatives A1 and A2. Based on it

having significantly higher capital cost and significantly higher impacts associated with travel time delays, with no advantages, Alternative 1 was recommended not to be carried forward. Alternatives A1 and A2 will be carried forward as lower cost and lower impact rapid rehabilitation alternatives.

- Alternatives 3 and 4 are also recommended not to be carried forward. These alternatives have significantly higher capital cost when compared to Alternative A1 but do not provide significant advantages. They require the use of the unconventional hourglass division of traffic lanes which is considered less safe for drivers and only reduces the duration of 2-lane closure by 2 weeks. Based on higher capital costs and reduced safety, these alternatives are recommended not to be carried forward.

Traffic Staging Alternatives on Freeway – Rideau Canal Bridge Site:

Based on the comparative analysis shown in **Appendix D,** the initial list of alternatives was reviewed and the following alternatives are recommended to not be carried forward because of poorer performance relative to the other alternatives being carried forward.

- **Alternative 1** is not considered feasible at this location because barge transportation on the existing Canal is limited by the upstream Pretoria Bridge lift bridge and the downstream locks at the Ottawa River. This approach would be suitable for a larger waterbody that would allow the transportation of the large bridge superstructures and larger barges to drop the existing bridges onto. Based on these site-specific constraints the preliminary recommendation is to not carry forward this alternative.
- **Alternative 2A** uses AASHTO “battleship” staging and it has not been used previously on the Queensway. The advantage of this alternative is that it avoids wheel tracking of vehicles on the joint between eastbound and westbound bridges. Following consideration, the Technical Advisory Committee has concluded that a temporary linkage between bridges is possible and is more attractive than introducing the battleship traffic operation which would be unfamiliar to local drivers. This alternative is not recommended to be carried forward.
- **Alternative 3A** has large scale community impacts due to the requirement for sufficiently large staging areas and for transportation and storage of the removed structures before the new bridges are driven into place. Due to these large scale impacts, this alternative is not recommended to be carried forward.
- **Alternative 3B** requires full closure of Catherine Street from Queen Elizabeth Drive to Elgin Street and a partial closure of Catherine Street from Elgin Street to Kent Street. In addition, it will require the closure of the Metcalfe Street off-ramp. The closures will be for approximately 8 months. It will also require a larger canal infill for the storage of the demolition debris, and the bridges will require expansion joints. Due to these closures the alternative is not recommended to be carried forward.
- **Alternative 3C** requires closure of Catherine Street from O’Connor Street to Metcalfe Street, Elgin Street to Queen Elizabeth Drive and the purchase of six properties. Due to the municipal road closures and significant property impacts, this alternative is not recommended to be carried forward.
- **Alternative 3D** requires closure of Catherine Street from O’Connor Street to Metcalfe Street and the purchase of eight properties. Due to the municipal road closures and significant property impacts, this alternative is not recommended to be carried forward.

5.1.1 *Conclusions:*

Following the coarse screening analysis, the following were carried forward:

- All structural alternatives (replacement and rehabilitation for rigid frames and Rideau Canal)
- Existing structural span alternatives only carried forward for evaluation
- Traffic staging alternatives only carried forward for alternatives which minimized traffic delays and avoided use of unconventional traffic staging, and/or minimized property impacts when possible.

5.2 Agency Input

Consultation with municipal and federal agencies has been undertaking throughout the study and two committees were formed: a Municipal Advisory Committee (MTAC) and a Federal Advisory Committee (FAC).

The MTAC includes City of Ottawa staff with an interest in the project including: Planning, Operations, Engineering and Emergency Services staff. The FAC includes Parks Canada and National Capital Commission (NCC) staff including: Planning, Operations and Heritage staff.

The Project Team also presented the preliminary coarse screening to the NCC Advisory Committee on Planning, Design and Realty (ACPDR).

Both committees have been included as part of the decision-making process for alternatives carried forward for evaluation. Direction from ACPDR was to carry forward all 6 Rideau Canal Bridge alternatives (Alternatives A to F) for evaluation and to consider context sensitive design of the Rideau Canal Bridge. The long list of evaluation criteria was also presented to the MTAC and FAC for comments.

5.3 Short Listed Alternatives

5.3.1 *Rigid Frame Bridge Sites*

The combined short list of alternatives involves a combination of a structural alternative for the bridge + traffic staging alternative + a bridge span alternative for each of the rigid frame sites. The generic combination of the 4 combined alternatives is illustrated in **Figure 5.1** for the rigid frame sites. The replacement bridge alternatives are illustrated in **Figure 5.2** and **Figure 5.3** and the traffic staging short-listed alternatives for all sites are illustrated in **Figure 5.4** to **Figure 5.12**.

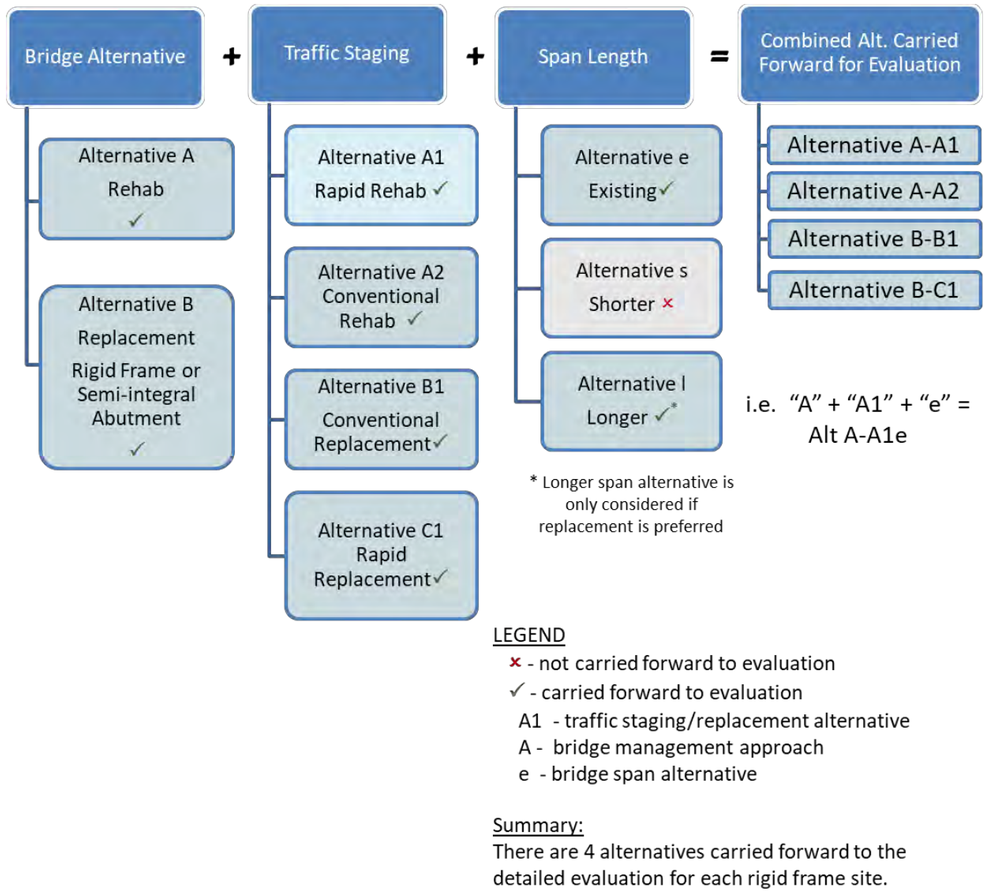


Figure 5.1: Rigid Frame Bridge Site Alternatives Coarse Screening Decision Flowchart

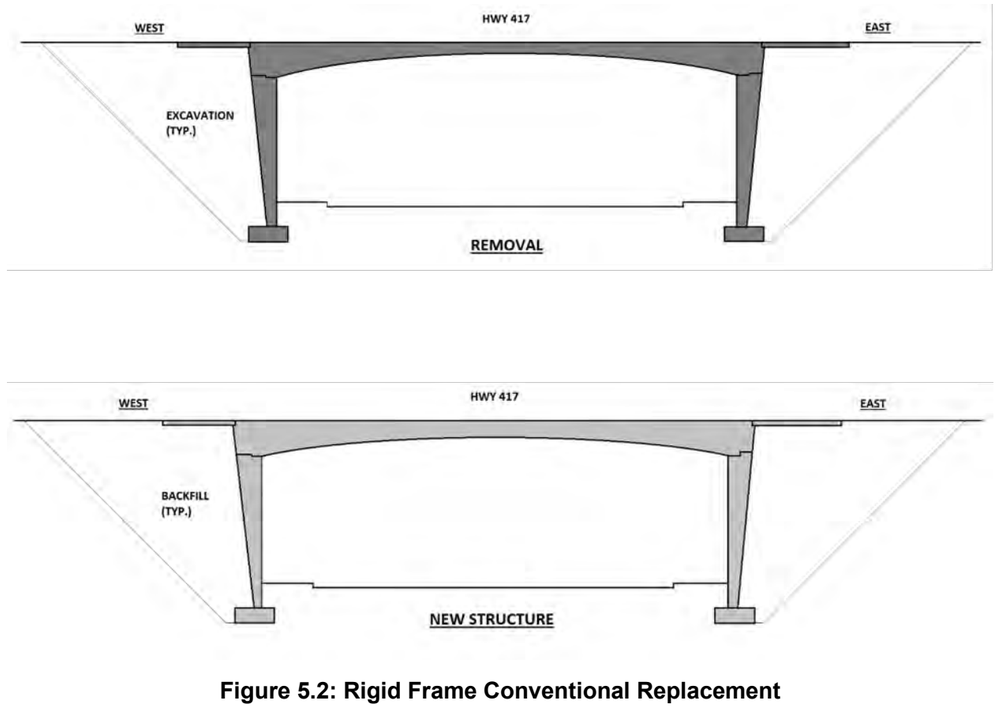


Figure 5.2: Rigid Frame Conventional Replacement

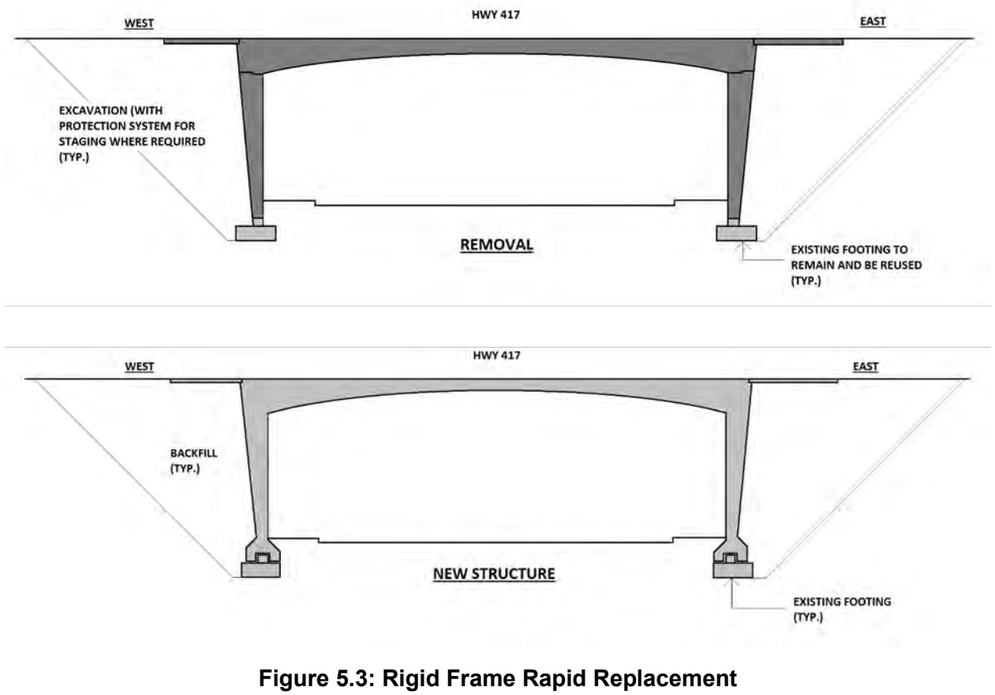


Figure 5.3: Rigid Frame Rapid Replacement

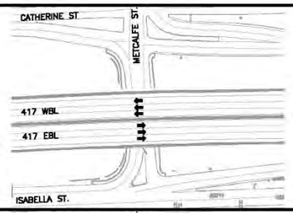
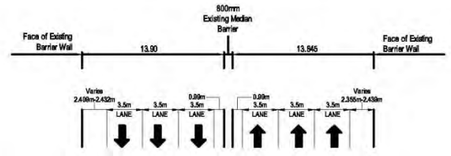
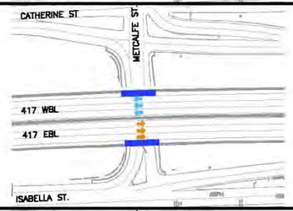
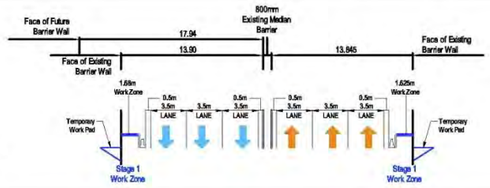
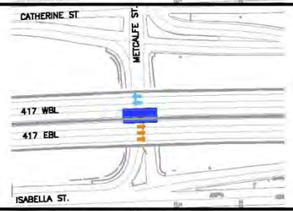
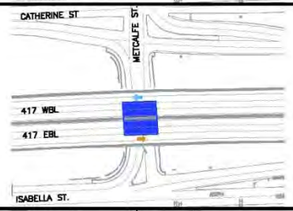
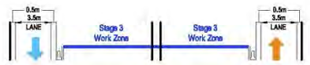
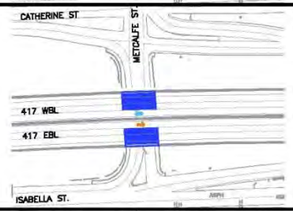
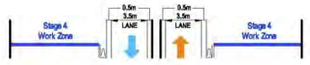
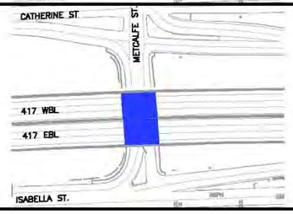
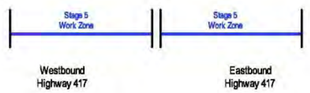
Legend: Work Zone Westbound Lanes Open Eastbound Lanes Open **Note:** Traffic staging and temporary closure durations shown are initial estimates only (at a Preliminary Design level of detail) and may be subject to change.		Existing Conditions 
		Stage 1 Lane 4 (Outside Barrier)  Work: - replace outside barrier wall Duration: **- 4 WEEKS** Ramp Closure: - no ramp closures
		Stage 2 Lane 1 (Median Barrier)  Work: - replace median barrier wall deck repairs Lane 1 - all asphalt and waterproofing on deck to provide travel surface on milled concrete overlay at the end of Stage 2 Duration: **- 4 WEEKS** Ramp Closure: - no ramp closures
		Stage 3 Lane 1 & 2  Work: - rapid deck repairs Lane 2 - concrete overlay Lanes 1 & 2 Duration: **- WEEKEND** **- OPEN TO LIVE TRAFFIC MONDAY AT 5am** Ramp Closure: - no ramp closures
		Stage 4 Lane 3  Work: - scarify Lane 3 - rapid deck repairs Lane 3 - concrete overlay Lane 3 Duration: **- WEEKEND** **- OPEN TO LIVE TRAFFIC MONDAY AT 5am** Ramp Closure: - Westbound on ramp closed at Nicholas
		Stage 5  Work: - waterproof and pave entire deck. Duration: **- WEEKEND** Ramp Closure: - see Temporary Off-Site Detour Exhibits

Figure 5.4: Rapid Rehabilitation Traffic Staging for Metcalfe Street

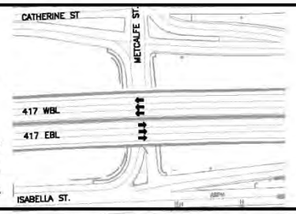
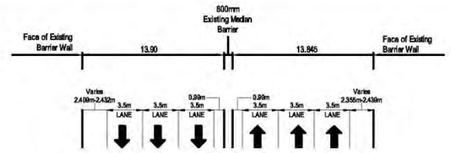
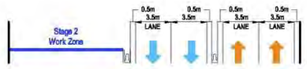
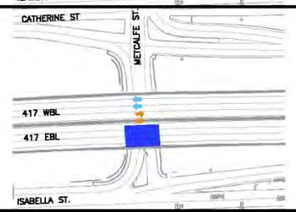
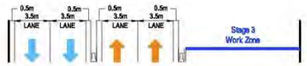
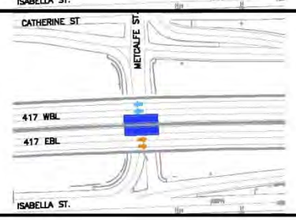
Legend: Work Zone Westbound Lanes Open Eastbound Lanes Open **Note:** Traffic staging and temporary closure durations shown are initial estimates only (at a Preliminary Design level of detail) and may be subject to change.		**Existing Conditions** 
		**Stage 1**  Work: - median barrier and lighting removal - adjust drainage - add temporary lighting - deck scarify and deck repairs - deck overlay - 7 day cure - waterproof and pave Duration: **- 5 WEEKS** Ramp Closure: - no ramp closures
		**Stage 2**  Work: - barrier wall replacement - deck scarify and deck repairs - deck overlay - 7 day cure - waterproof and pave Duration: **- 3 WEEKS** Ramp Closure: - no ramp closures
		**Stage 3**  Work: - barrier wall replacement - deck scarify and deck repairs - deck overlay - 7 day cure - waterproof and pave Duration: **- 3 WEEKS** Ramp Closure: - no ramp closures
		**Stage 4**  Work: - median barrier replacement - new median lighting - adjust drainage - add temporary lighting - deck scarify and deck repairs - deck overlay - 7 day cure - waterproof and pave Duration: **- 5 WEEKS** Ramp Closure: - no ramp closures

Figure 5.5: Conventional Rehabilitation Traffic Staging for Metcalfe Street

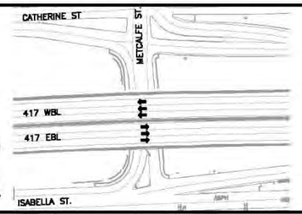
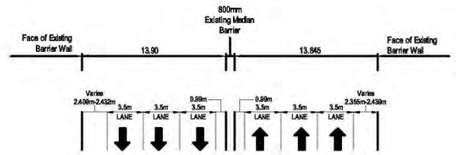
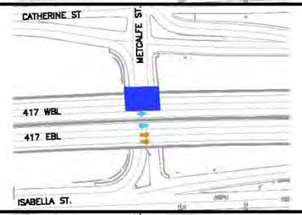
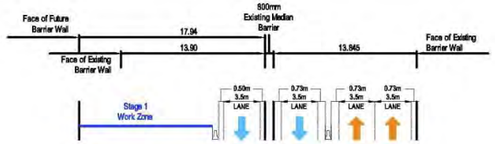
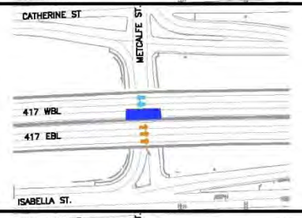
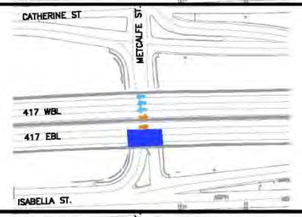
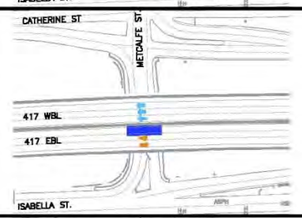
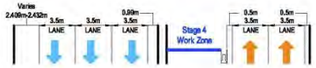
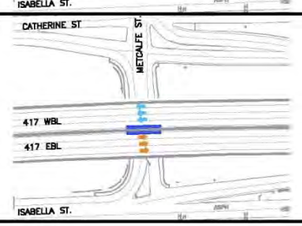
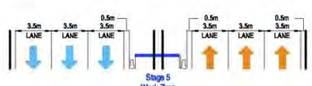
Legend: Work Zone Westbound Lanes Open Eastbound Lanes Open **Note:** Traffic staging and temporary closure durations shown are initial estimates only (at a Preliminary Design level of detail) and may be subject to change.		Existing Conditions 
	Stage 1 	Work: - widening, remove and replace 30% of existing deck plus barrier wall Duration: **- 20 WEEKS** Ramp Closure: - no ramp closures
	Stage 2 	Work: - remove and replace 20% of existing deck Duration: **- 14 WEEKS** Ramp Closure: - no ramp closures
	Stage 3 	Work: - remove and replace 30% of existing deck plus barrier wall Duration: **- 16 WEEKS** Ramp Closure: - no ramp closures
	Stage 4 	Work: - remove and replace 20% of existing deck Duration: **- 14 WEEKS** Ramp Closure: - no ramp closures
	Stage 5 (Median Barrier) 	Work: - median barrier replacement - adjust drainage - surface course asphalt Duration: **- 2 WEEK** Ramp Closure: - no ramp closures

Figure 5.6: Conventional Replacement Traffic Staging for Metcalfe Street

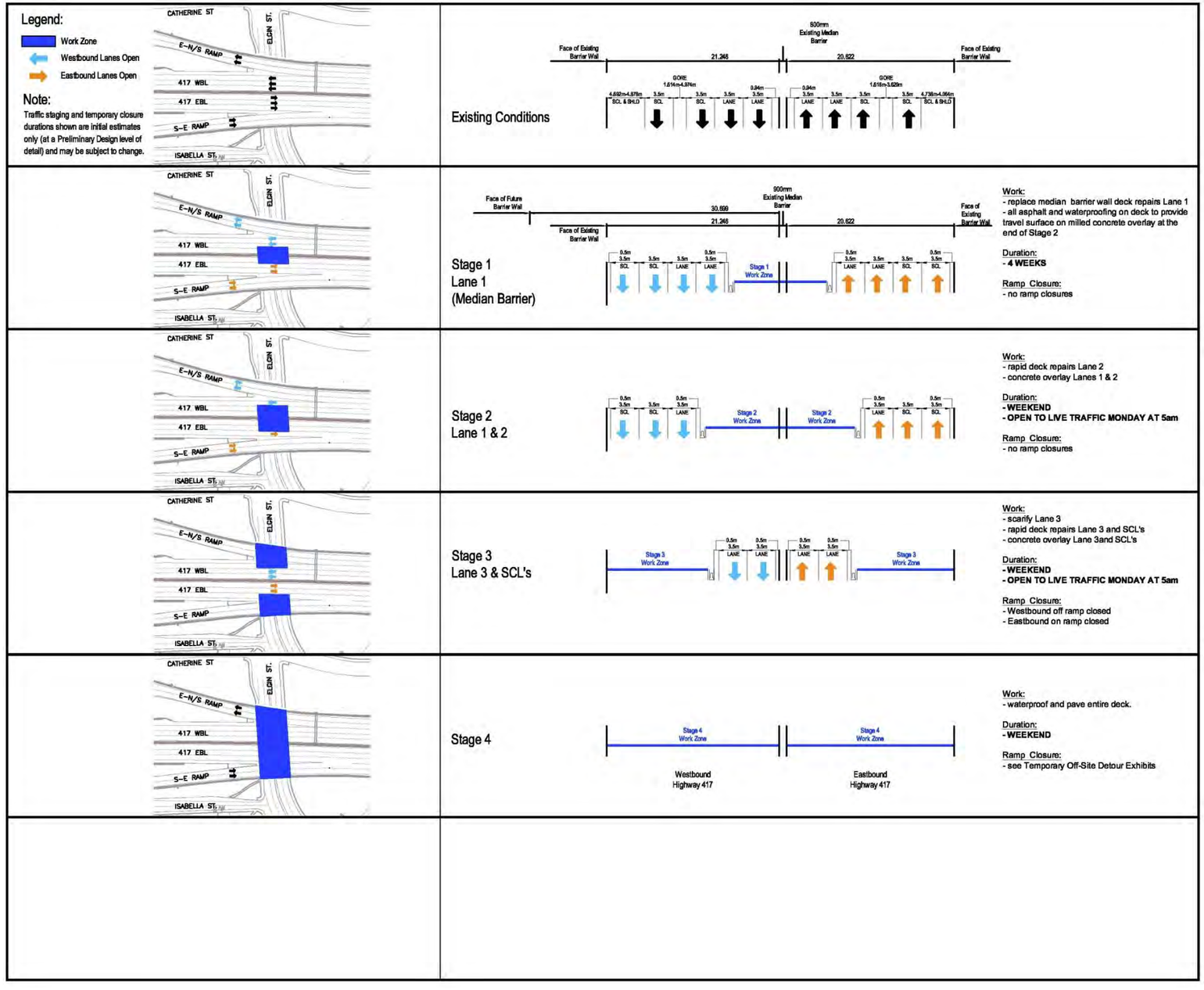


Figure 5.7: Rapid Rehabilitation Traffic Staging for Elgin Street

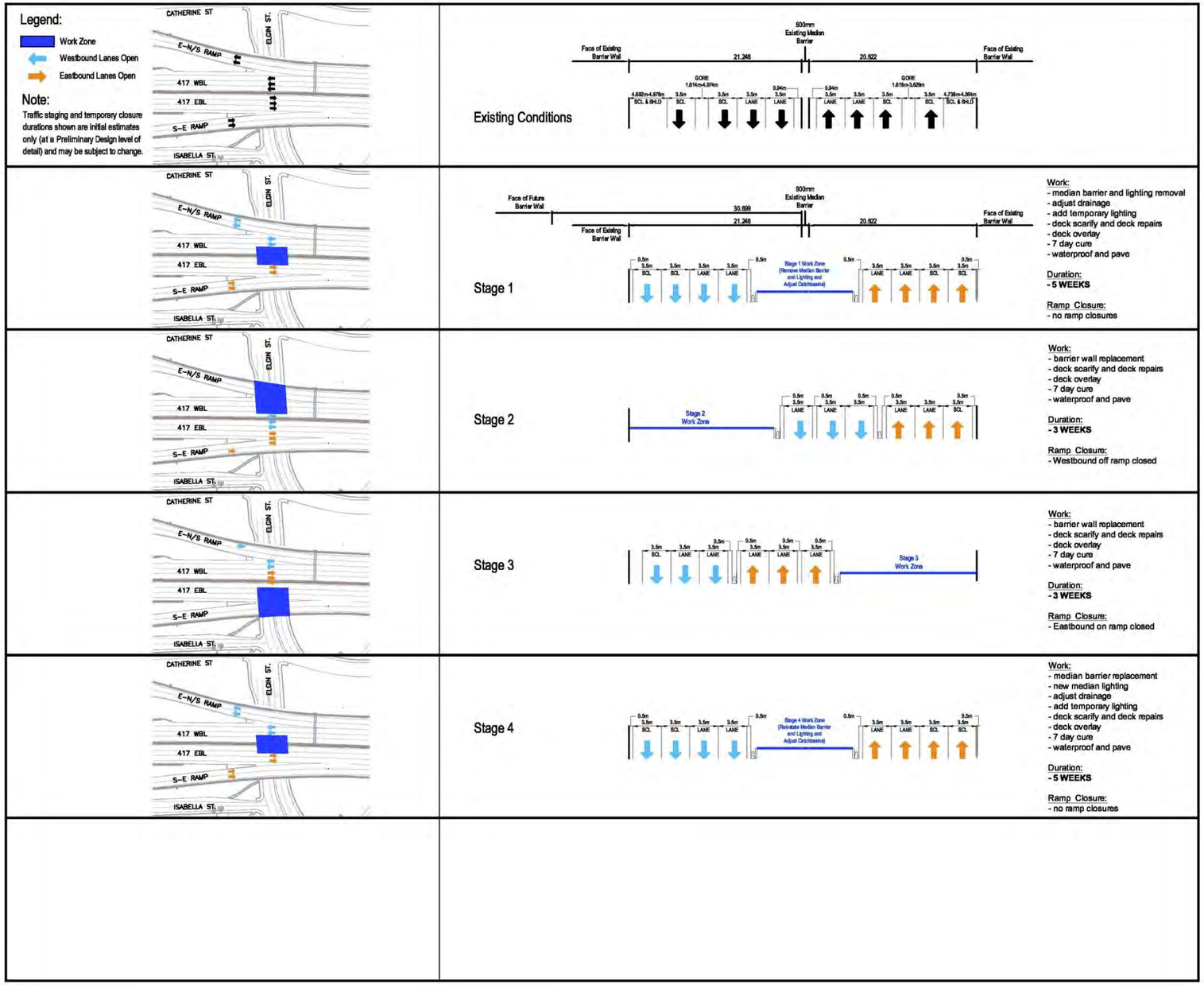


Figure 5.8: Conventional Rehabilitation Traffic Staging for Elgin Street

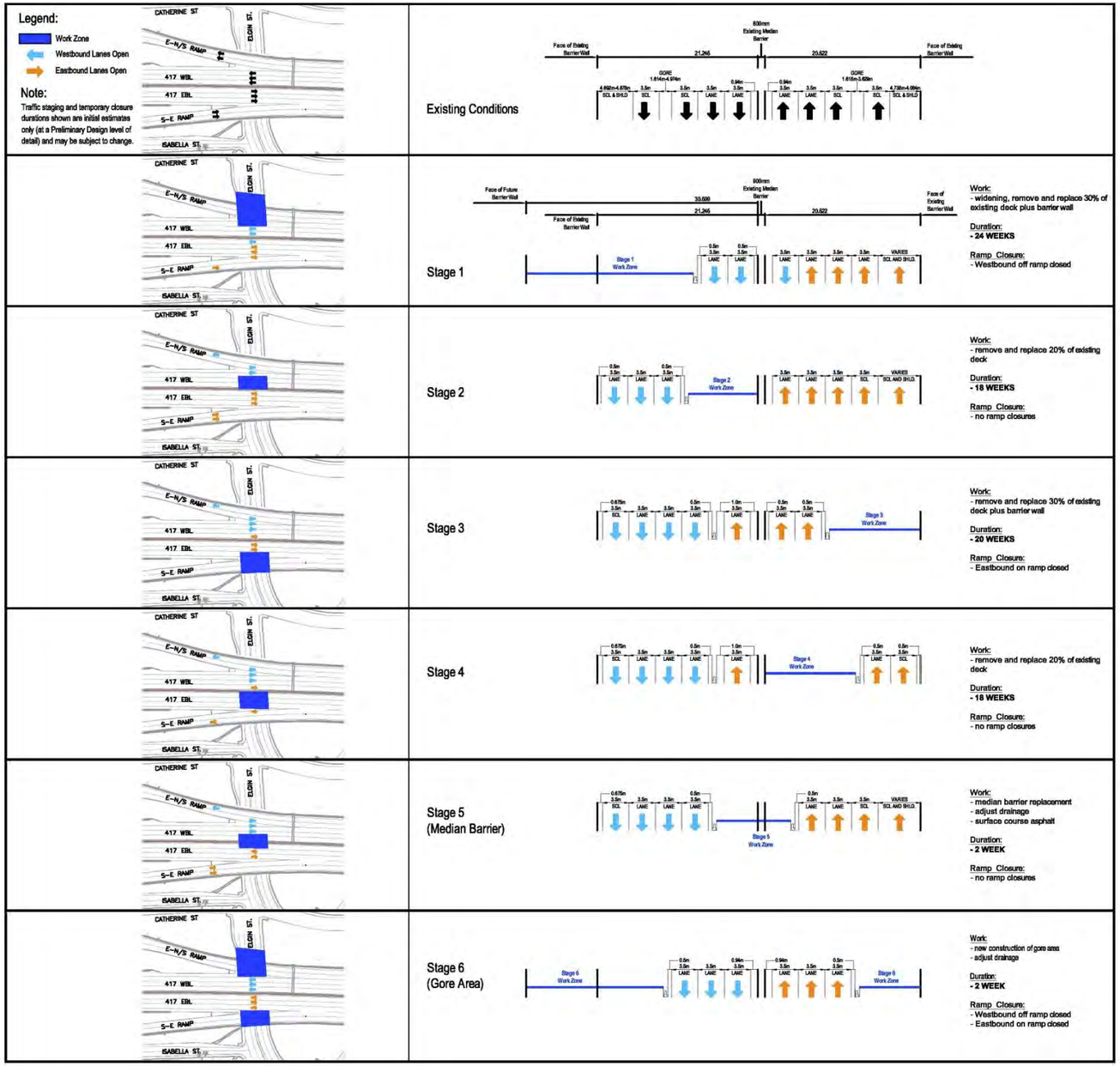


Figure 5.9: Conventional Replacement Traffic Staging for Elgin Street

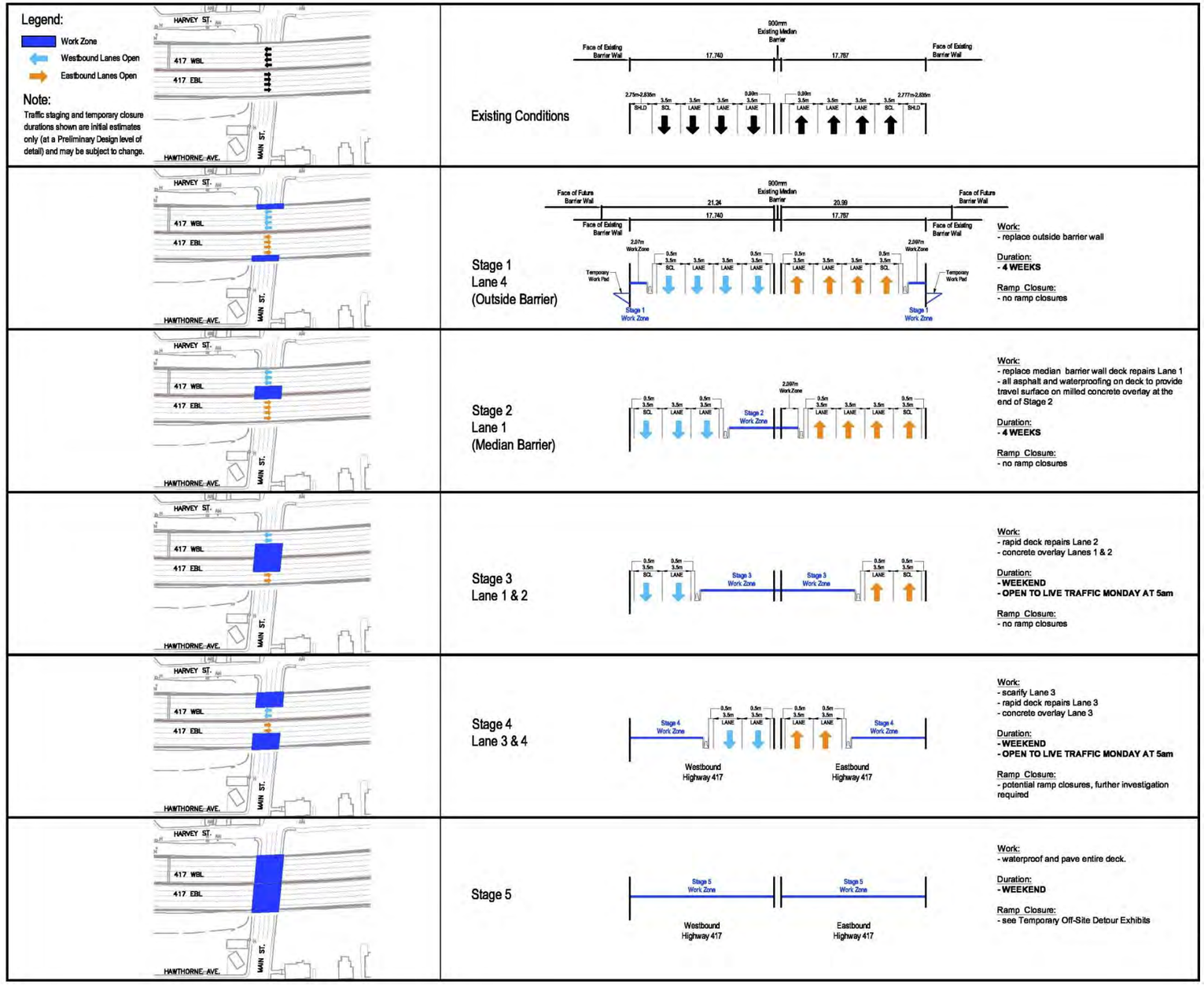


Figure 5.10: Rapid Rehabilitation Traffic Staging for Main Street

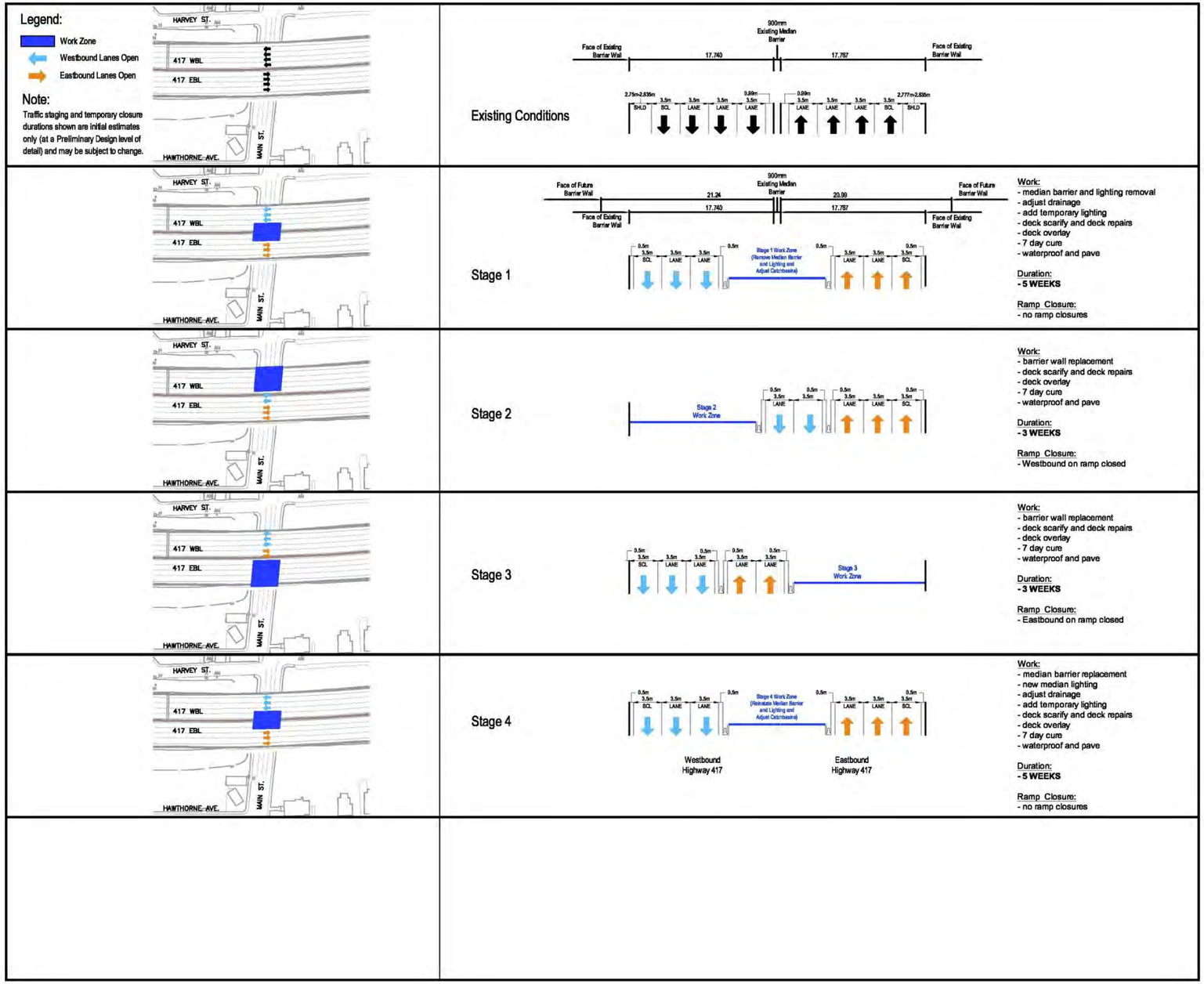


Figure 5.11: Conventional Rehabilitation Traffic Staging for Main Street

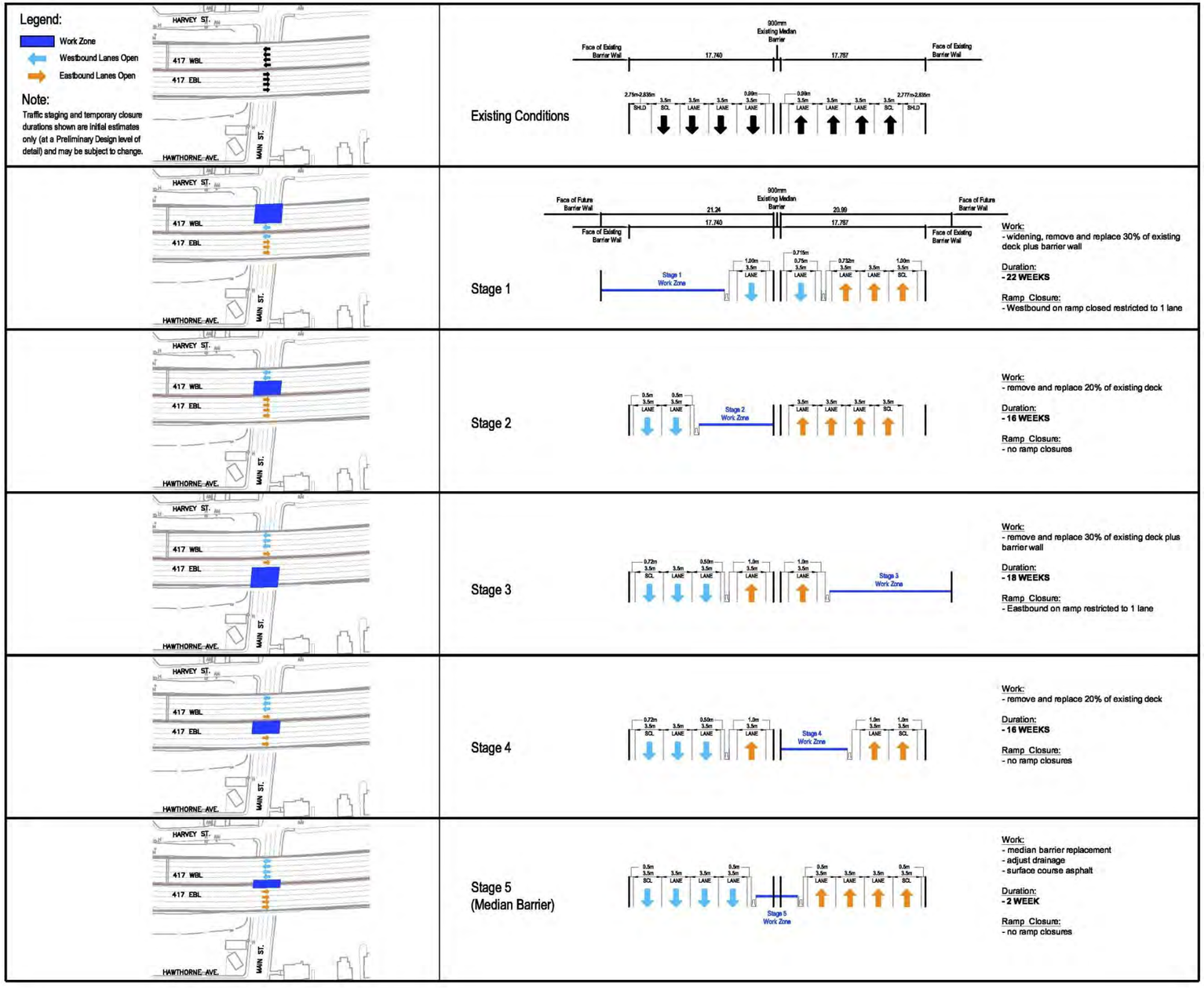


Figure 5.12: Conventional Replacement Traffic Staging for Main Street

5.3.2 *Rideau Canal Bridge*

The combined short list of alternatives for the Rideau Canal involves a combination of a structural alternatives + traffic staging alternatives**.** The combination of all available alternatives is shown in **Figure 5.13**. The short-listed bridge alternatives are illustrated in **Figure 5.14** to **Figure 5.18**. The traffic staging short-listed alternatives for the Rideau Canal Bridge site are shown in **Figure 5.19** to **Figure 5.23**.

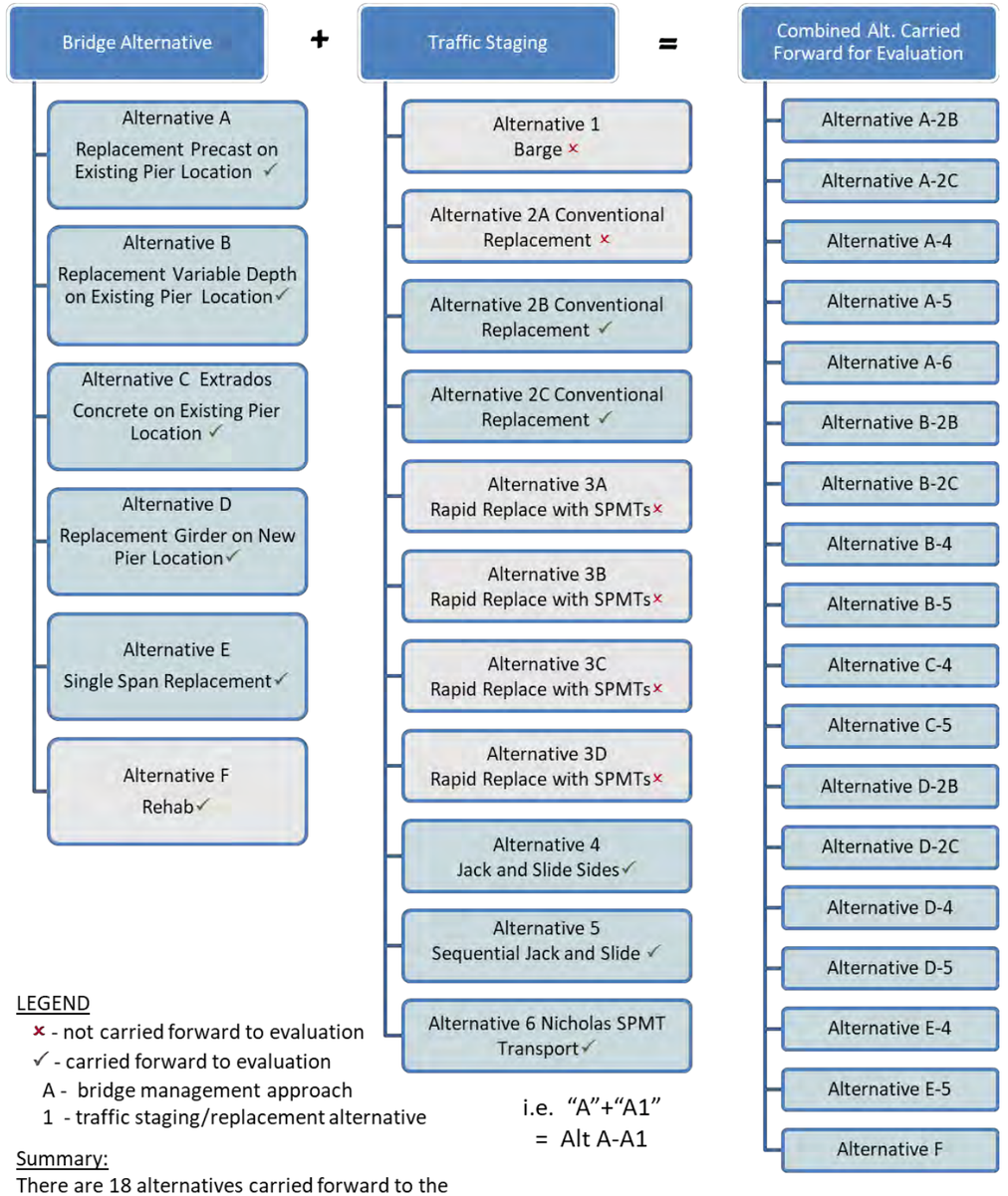


Figure 5.13: Rideau Canal Bridge Site Alternative Coarse Screening Decision Flowchart

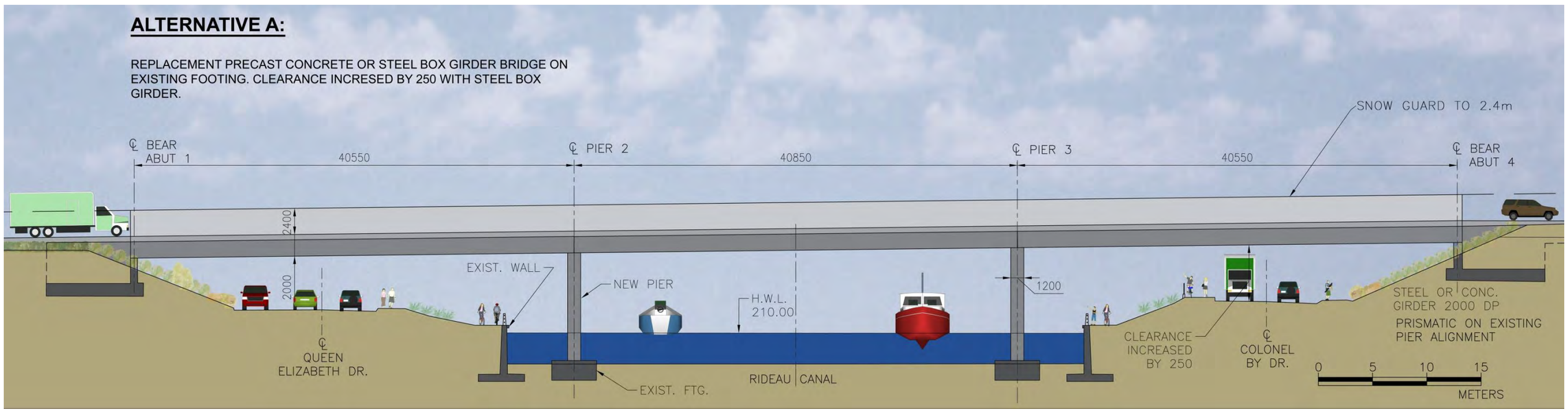


Figure 5.14: Rideau Canal Bridge Replacement Alternative A

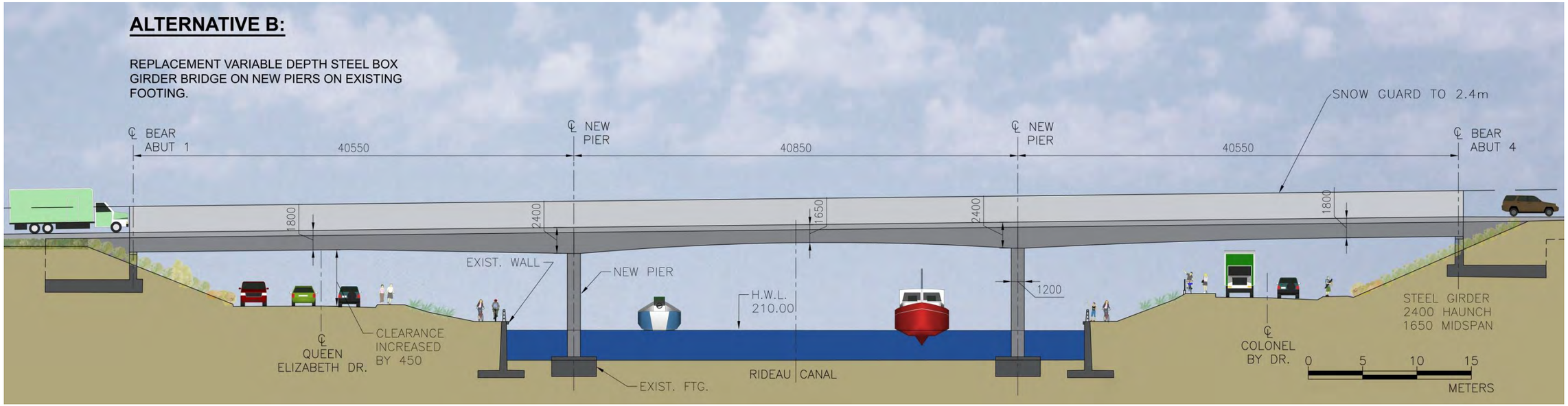


Figure 5.15: Rideau Canal Bridge Replacement Alternative B

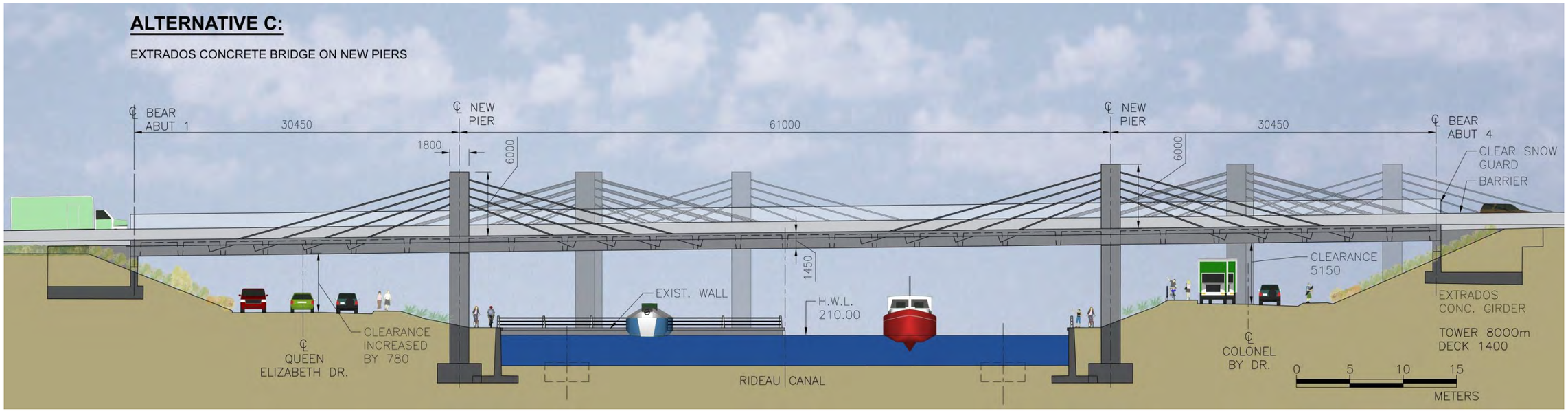


Figure 5.16: Rideau Canal Bridge Replacement Alternative C

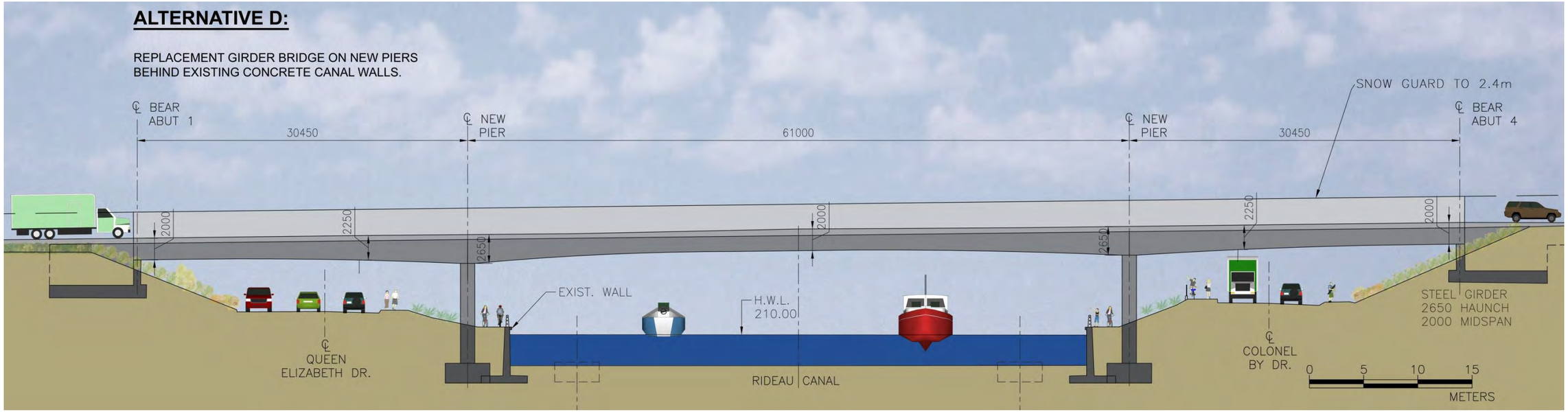


Figure 5.17: Rideau Canal Bridge Replacement Alternative D

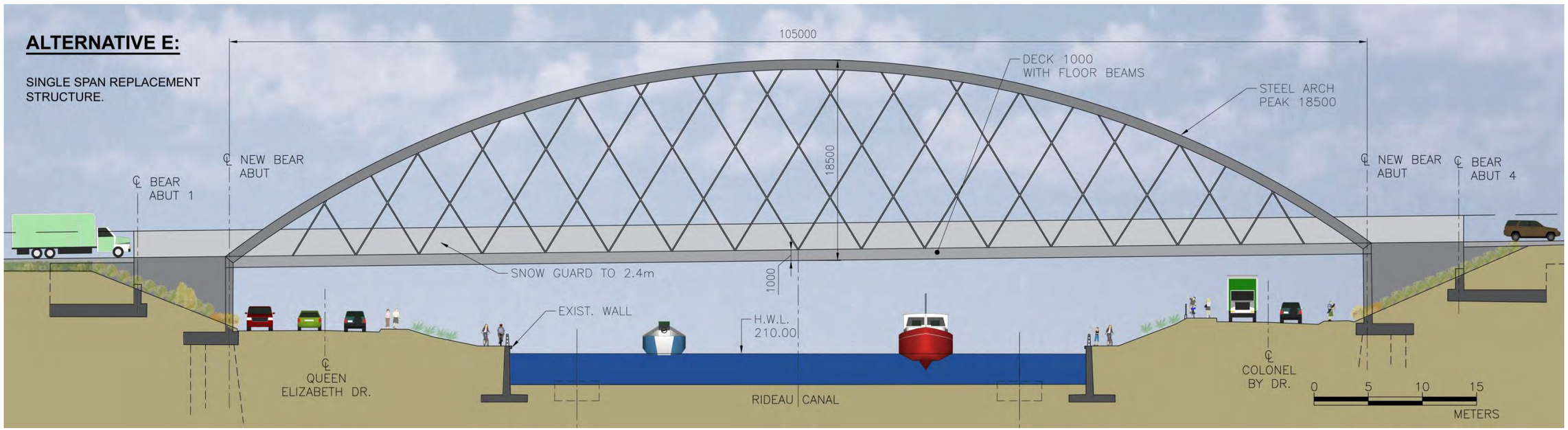


Figure 5.18: Rideau Canal Bridge Replacement Alternative E

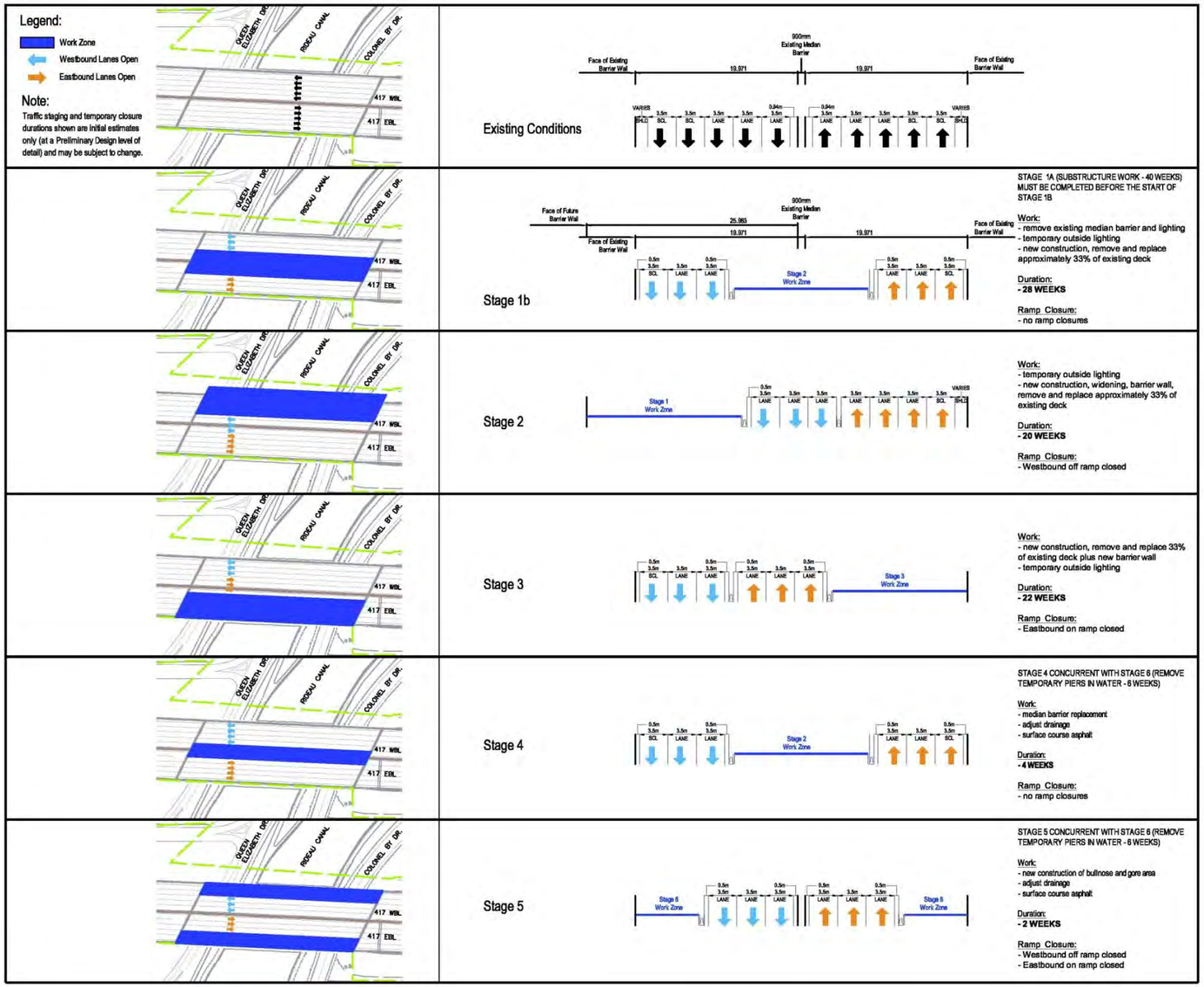


Figure 5.19: Rideau Canal Traffic Staging Alternative 2B

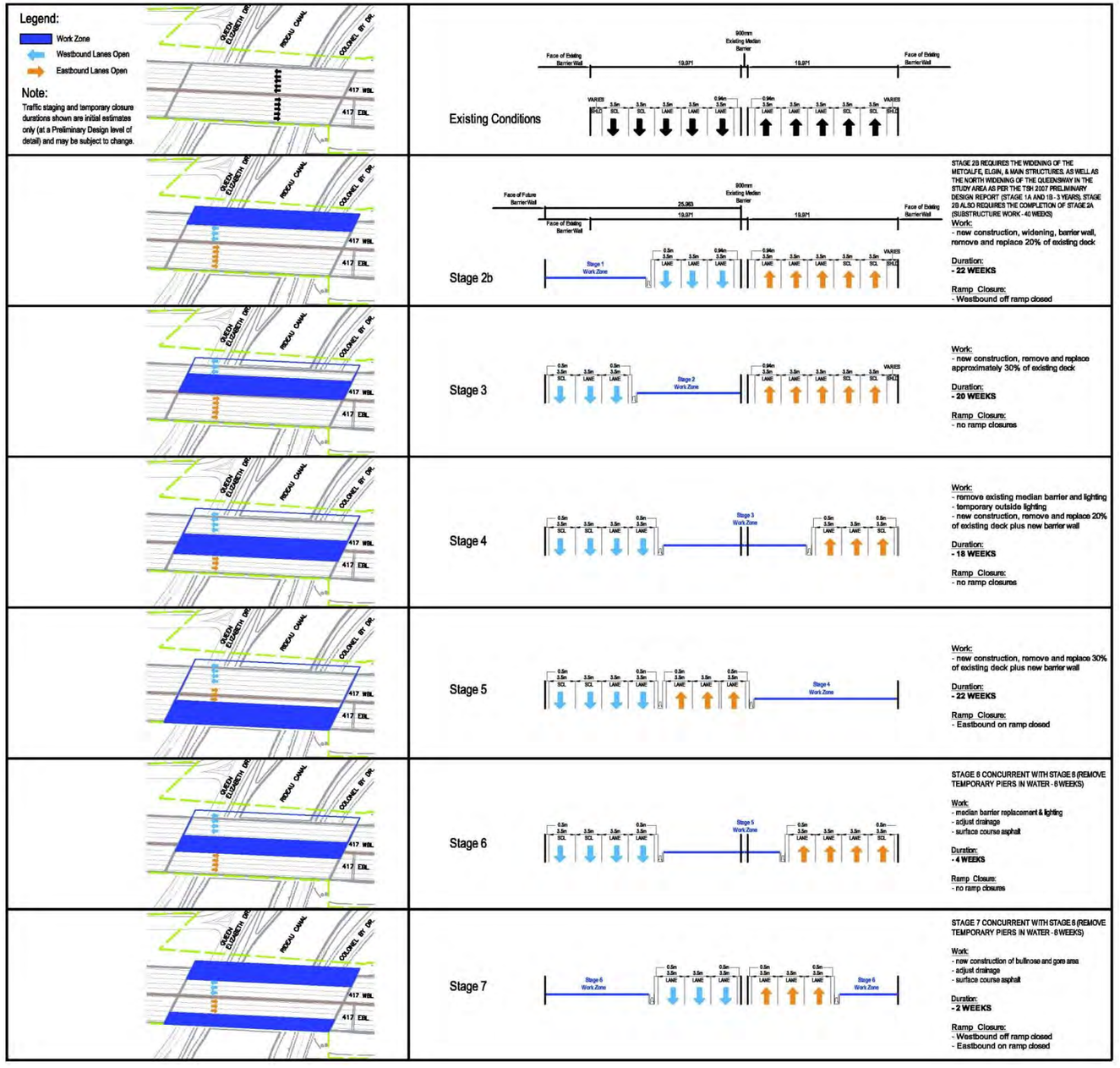


Figure 5.20: Rideau Canal Traffic Staging Alternative 2C



Figure 5.21: Rideau Canal Traffic Staging Alternative 4

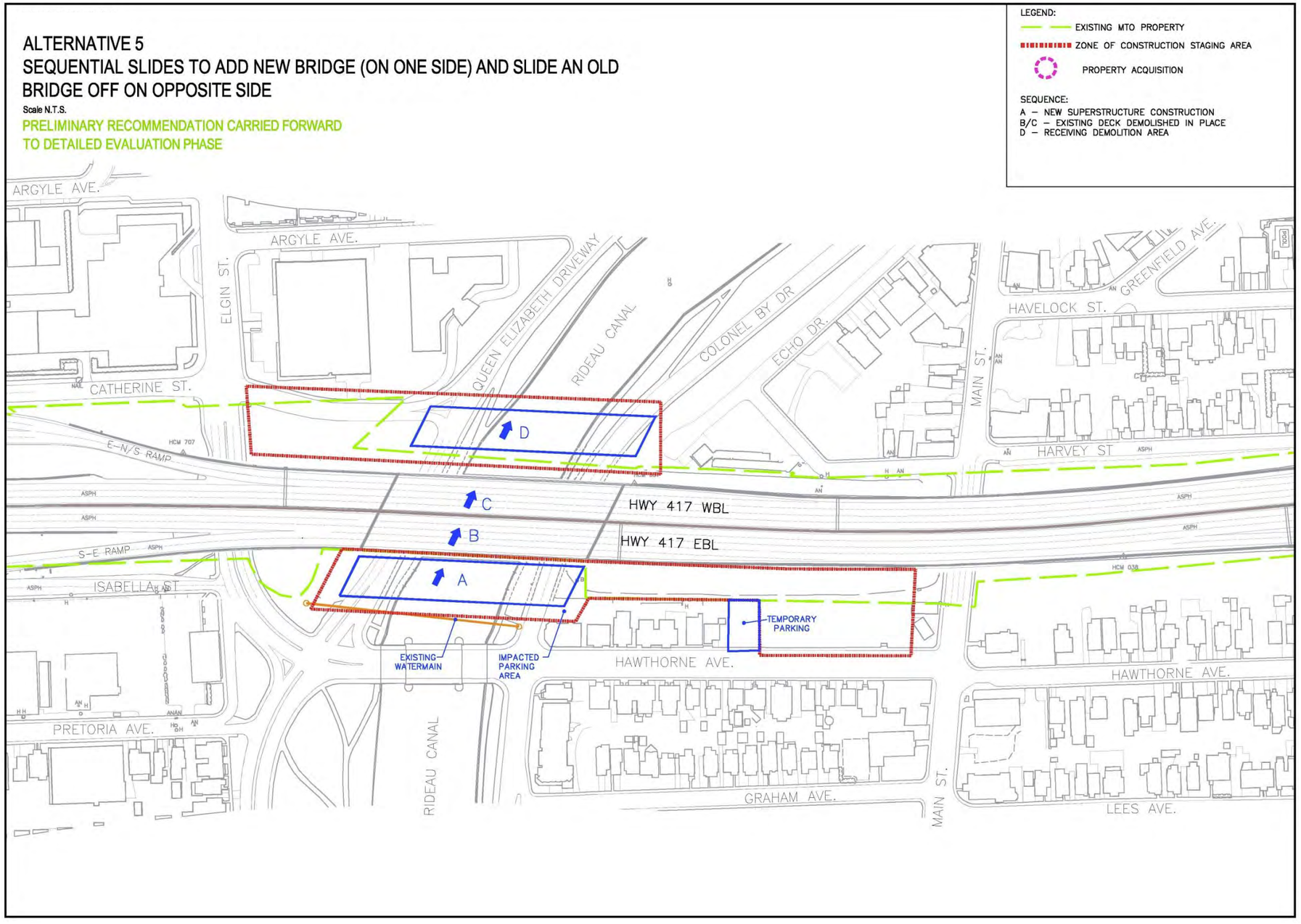


Figure 5.22: Rideau Canal Traffic Staging Alternative 5

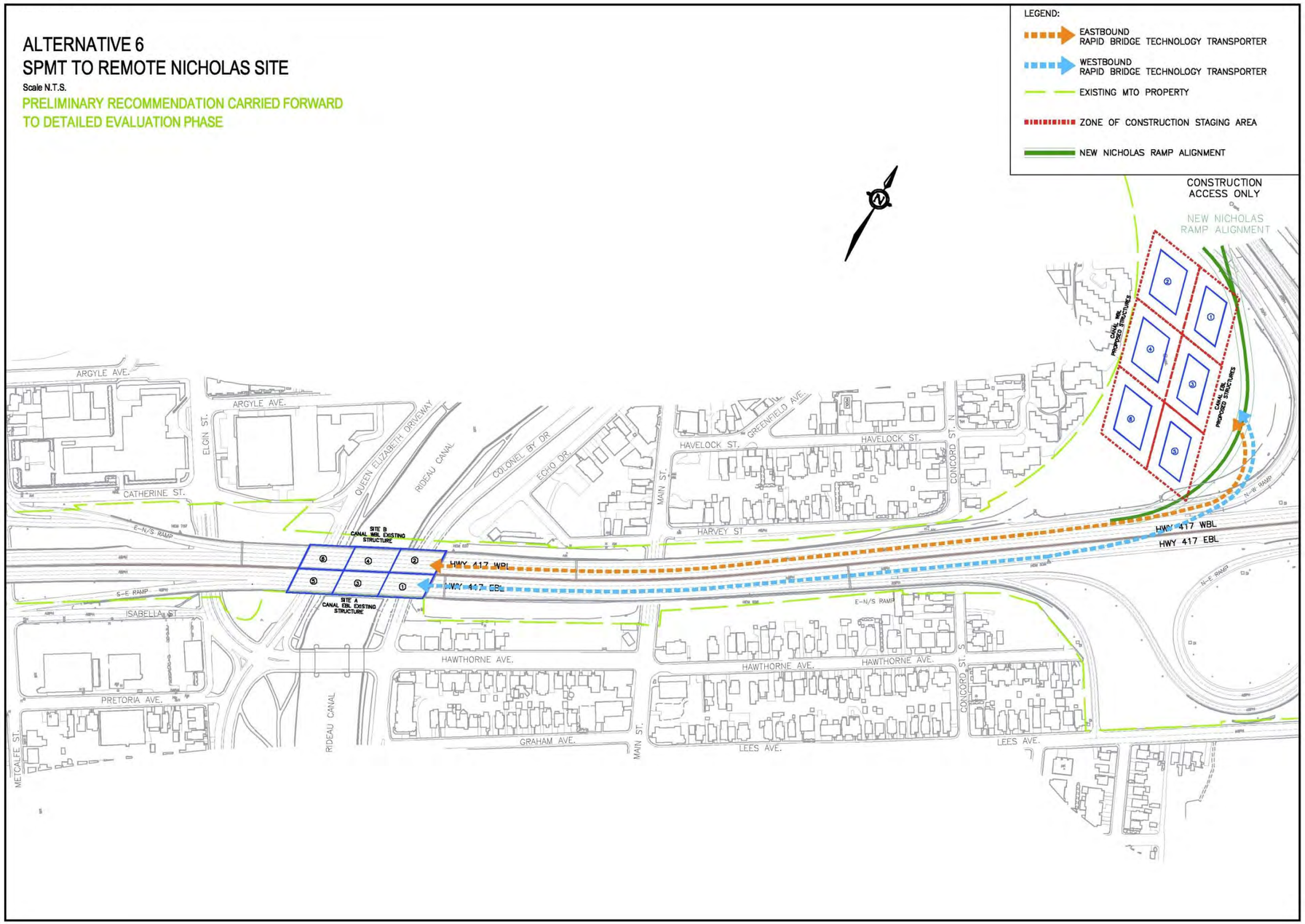


Figure 5.23: Rideau Canal Traffic Staging Alternative 6

6 ANALYSIS AND EVALUATION PROCESS

This section describes the formal evaluation approach used in this study for selecting a Technically Preferred Alternative (TPA) for each bridge site.

The analysis and evaluation process is a central requirement of the EA process and has been the subject of review by the Ministry of the Environment, Conservation and Parks (MECP). MECP's review of *Evaluation Methods in Environmental Assessment* provided the framework for the detailed evaluation processes to be followed for this study.

6.1 Qualitative Assessment

Where there are a limited number of alternatives or a limited number of evaluation criteria when comparing alternatives, a qualitative method/approach is typically chosen as the evaluation methodology. This can be documented as a narrative assessment or using a tabular qualitative assessment. The qualitative methodology is an accepted approach for the evaluation of alternatives where there are few alternatives, criteria and trade-offs and there is substantial agreement for the recommendations. The qualitative assessment method was applied to the analysis of Alternatives to the Undertaking and the coarse screening phase of the evaluation of Alternative Methods / Preliminary Design Alternatives.

6.2 Quantitative Assessment

This evaluation approach is based on the "Weighted Additive Method" which focuses on the differences between the alternatives, addresses the complexity of the base data collected, and provides a traceable decision-making process. In addition, the method allows quick sensitivity tests to be performed because of the matrix configuration of the assessment and the use of numerical scores to measure the impact of the alternatives. The sensitivity tests are also documented in this report. This approach is consistent with the MTO and MECP practices for the evaluation of numerous and complex alternatives. Using the "Weighted Additive Method", overall scores are assigned to each alternative and the alternative with the highest score is selected as the preferred alternative to complete the evaluation.

The steps shown below, as described in the Evaluation Methodology report included in **Appendix B**, are being followed by the Technical Advisory Committee (TAC) to arrive at an overall score for each alternative.

- Collection of data/environmental inventories
- Development of a long list of reasonable alternatives (including coarse screening options that are unfeasible or unreasonable in comparison to those being carried forward)
- Development of a long list of global evaluation criteria/performance sub-factors
- Short listing of sub-factors to those where there are meaningful differences among the alternatives to be compared
- Establishing Social Utility Functions (Performance Factors or Function Forms) for the short-listed sub-factors
- Weighting of Evaluation Criteria (assigning importance based on the specific set of alternatives)
- Rating of Alternatives (based on average TAC weights)
- Sensitivity Testing
- Selection of TPAs
- Public Review (PIC No. 2),
- Refinements to the Technically Preferred Plan (TPP)
- Public Review (PIC No. 3)
- Recommendations and presentation of a Recommended Plan.

This systematic approach is consistent with MECP practices for the evaluation of numerous and complex alternatives. The approach avoids many of the pitfalls associated with qualitative assessments by using an analytical approach that measures scores based on a mathematical relationship, i.e. the degree of subjectivity by the TAC is minimized. This traceable process allows the TAC and the public an opportunity to assess trade-offs involved in the evaluation and use of this information in the decision-making process. These steps are briefly described in the following sections.

6.3 Evaluation Criteria

The initial task in the evaluation is to develop evaluation criteria from which alternatives will be assessed. This process includes the identification of "global" groups of factors followed by the selection of a number of "local" sub-factors under the global groups.

6.3.1 *Global Evaluation Factors*

As an initial step, the evaluation criteria were grouped into broad categories, or factors, established to describe the study specific engineering and environmental concerns. Nine factors were selected which were used for each evaluation.

These global factors were:

- Transportation
- Natural Environment
- Social Environment
- Context Sensitive Design
- Heritage Resources
- Economic Environment
- Land Use and Property
- Structural, and
- Cost

6.3.2 *Evaluation Sub-Factors*

Under each of the 9 general global factors listed above there were a number of sub-factors selected under which measurements could be made. These sub-factors, under one of the applicable global factors, were the individual descriptors for the evaluation. The selection of the sub-factors is very important to the

decision-making process because they must adequately describe the issue or aspect of the environment to be evaluated and the unique features of each alternative. Any information regarding an alternative, where there are differences among alternatives, is incorporated into the decision-making process by including it as a sub-factor. Generally, the process begins by establishing a long list of potential sub-factors through discussions with the TAC, Stakeholders (MTAC and FAC) and the Public. Then, for each group of alternatives being evaluated, the sub-factors are reviewed and screened by eliminating those that were considered equal or not applicable among the alternatives. **Appendix E** documents this long and short list screening. This was presented at the initial PIC for public review and comment.

Table 6.1 illustrates the long list and short-listed sub-factors carried forward to the analysis for each bridge site. Each bridge site is unique and not all sub-factors were carried forward for all bridges.

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
1.0 Transportation						
Maximum Peak Queue Length on Queensway	km*days (peak hour)	✓	✓	✓	✓	
Delays (during construction)	veh-h	✓	✓	✓	✓	Includes consideration for travel time, fuel consumption and movement of goods
Delays to Emergency Vehicles	days	✓	✓	✓	✓	
Future Traffic Delays	Yes/No	✓	✓	✓	✓	
Ramp Closures	veh-day (peak hour)	✓	X	✓	X	
Travel Time	min	X	X	X	X	See Delay Criteria
Fuel Consumption	l	X	X	X	X	See Delay Criteria
Road User Costs	$	X	X	X	X	See Delay Criteria
Movement of Goods	h	X	X	X	X	See Delay Criteria
Ability to Bundle Bridges	Yes/No	X	X	X	X	All considered equal
Highway Safety - Collision Potential on Queensway (Queuing)	days	X	X	X	X	See Max Peak Queue Length
Highway Safety – Design Consistency of Traffic Staging Design	Yes/No	X	X	X	X	All considered equal
Pedestrian – Delay and Out-of-Way Travel	m-days	✓	✓	✓	✓	
Bicycle – Delay and Out-of-Way Travel	m-days	✓	✓	✓	✓	
Pedestrian/Bicycle Safety	High/Low	X	X	X	X	All considered equal
Multi-use Pathway – Temporary Construction Effects for Safety and Personal Security Level	High/Medium /Low	✓	X	X	X	
Transit Operations Delay – Out-of-Way Travel	m-days	✓	X	✓	X	

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
General Traffic Municipal Street Delay	m-days	X	✓	✓	✓	
Municipal Street Traffic Signals Operations	Yes/No	X	X	X	X	All considered equal
General Traffic Federal Parkways Delay (Colonel By Drive and Queen Elizabeth Drive)	m-days	✓	X	X	X	
Federal Parkways Traffic Signal Operations	Yes/No	X	X	X	X	No impact
Flexibility for Future Queensway Widening	Yes/No	✓	X	X	X	
Construction Duration	days	X	X	X	X	See Delays
Impact to City of Ottawa Watermain	Yes/No	X	X	X	X	All considered equal
Safety – Lateral Hazard	m	✓	X	X	X	
Associated Effects Adjacent to Rigid Frame Bridge Projects	Yes/No	✓	X	X	X	
Traffic Staging of Multiple Projects	Yes/No	✓	X	X	X	
2.0 Natural Environment						
Air Quality	Tonnes/year	X	X	X	X	See Note 1
Endangered Species	No.	X	X	X	X	No endangered species
Cold Water Fish Habitat Impacted	m^2	X	X	X	X	No cold water fish habitat.
Cool Water Fish Habitat Impacted	m^2	X	X	X	X	No cool water fish habitat.
Permanent Warm Water Fish Habitat Created	Yes/No	✓	X	X	X	
Water Quality (Stormwater Surface Runoff)	m^3	X	X	X	X	
Species at Risk	Yes/No	X	X	X	X	No SAR
Archaeological Potential	Yes/No	X	X	X	X	See Social Environment
Wildlife Habitats and Movement/Corridor	Yes/No	X	X	X	X	
Migratory Bird Nesting Impact	Yes/No	X	X	X	X	
Provincially Significant (PS) Natural Areas and Habitat	ha	X	X	X	X	No PS natural areas or habitat
Regionally Significant Natural Areas and Habitat	ha	X	X	X	X	No natural areas or habitat
"Natural" Habitat Impacted	m^2	X	X	X	X	No natural areas or habitat
Specimen Trees Removed	Yes/No	X	X	X	X	See Cultural Heritage Landscape
Landscape Vegetation Removed	Yes/No	✓	X	✓	✓	
Woodlot at Nicholas Street On-Ramp Impacted	Yes/No	✓	X	X	X	
Wildlife Habitat Reptiles, Mammals and	m^2	X	X	X	X	No impact

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
Insects, Amphibians						
Climate Change	Yes/No	X	X	X	X	See Note 1.
Wetlands	m²	X	X	X	X	No wetlands
Woodlands and Other Vegetated Areas	m²	X	X	X	X	No impact
Groundwater	Yes/No	X	X	X	X	No impact
Designated Areas	Yes/No	X	X	X	X	No impact
Associated Effects to Adjacent Rigid Frame Projects	Yes/No	✓	X	X	X	
3.0 Social Environment						
Noise Impacts	No.	X	X	X	X	
Vibration Impacts	No.	X	X	X	X	
Community Cohesion	High/Medium /Low	X	X	X	X	
Green Spaces Impacted	m²	X	✓	✓	X	Excluding Ballantyne Park
Community Festivals	Yes/No	X	X	X	X	No impact during festival season.
Contamination/Pollution	Yes/No	X	X	X	X	All considered equal
Impact to Emergency Response	days	X	X	X	X	See Transportation
Short Term Loss of Recreational Space In Ballantyne Park	m²	X	X	X	✓	All considered equal
Impact To Community Uses	High/ Medium/ Low	✓	X	X	X	
Impact to Nearby Residential Properties	Yes/No	X	X	X	X	No impact
Natural Lighting and Visual Safety	m	✓	X	X	X	
Openness of Canal	Impact 0-10	✓	X	X	X	
Intrusion to Adjacent Residents	High/Medium /Low	✓	X	X	X	
Water Wells Impacted	No.	X	X	X	X	No impact.
Excess Materials Management	Yes/No	X	X	X	X	All considered equal
4.0 Context Sensitive Design						
4.1 Urban Design/Context: Capital Context	High/Medium /Low	✓	X	X	X	
4.1 Urban Design/Context: City Context	High/Medium /Low	✓	X	X	X	
4.1 Urban Design/Context: Fabric and Texture of Surrounding Built Form	0-10	X	X	X	X	See City Context
4.1 Urban Design/Context: General Topography and Landscape of Surrounding Area	0-10	X	X	X	X	See City Context
4.1 Urban Design/Context: Ability to Improve Experience along the Queensway Transportation Corridor	0-10	X	X	X	X	See Travelling User Experience
4.1 Urban Design/Context: Impact to NCC Parkway Corridors	days	X	X	X	X	See Transportation

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors		Unit of Measure	Carried Forward				Remarks
			Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
	Impact to Municipal Roadways	days	X	X	X	X	
	Impact to Rideau Canal Navigable Waterway	days	X	X	X	X	See Social Environment
	Soft Landscape Elements Park and Naturalized Vegetation	days	X	X	X	X	See Natural Environment
	Slenderness of Mid-span Deck Depth	m	✓	X	X	X	
	Height above Parkways	mm	✓	X	X	X	
	Hawthorne Avenue Architectural Streetscape	0-10	X	X	X	X	
	Treed Queensway Buffer	0-10	X	X	X	X	
	Street Layout	0-10	X	X	X	X	
4.2 Travelling User Experience	Experience on Queensway	High/ Low	✓	X	X	X	
4.2 Travelling User Experience	Experience on NCC Parkways	High/Medium /Low	✓	X	X	X	
4.2 Travelling User Experience	Active Traveller Experience – Sidewalks and NCC Trails	High/Medium /Low	✓	X	X	X	
4.2 Travelling User Experience	Experience of Pedestrians	0-10	X	X	X	X	See 4.2 Active Traveller Experience
4.2 Travelling User Experience	Experience of Cyclists	0-10	X	X	X	X	See 4.2 Active Traveller Experience
4.2 Travelling User Experience	Experience of Boaters	0-10	X	X	X	X	See 4.2 Active Traveller Experience
4.2 Travelling User Experience	Experience of Skaters	0-10	X	X	X	X	See 4.2 Active Traveller Experience
4.2 Travelling User Experience	Night Experience and Lighting	0-10	X	X	X	X	See 4.3 Design Quality
4.2 Travelling User Experience	Availability of Natural Light	0-10	X	X	X	X	See Social Environment
4.3 Design Quality	Sense of Place	0-10	✓	X	X	X	
4.3 Design Quality	Night Quality and Lighting	0-10	✓	X	X	X	
4.3 Design Quality	Heritage Conservation Repairability	0-10	X	X	X	X	
4.3 Design Quality	Design Principles, Architectural Concept and Visual Quality	0-10	✓	X	X	X	
4.3 Design Quality	Materiality	High/Medium /Low	✓	X	X	X	
4.3 Design Quality	Structural Elegance and Proportion to Site	0-10	✓	X	X	X	
4.3 Design Quality	Sculptural Interest	High/Medium	✓	X	X	X	

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors		Unit of Measure	Carried Forward: Rideau Canal	Metcalfe Street	Elgin Street	Main Street	Remarks
		/Low					
	Awareness of Canal Crossing	0-10	X	X	X	X	See 4.1 Urban Context
5.0 Heritage Resources							
5.1 Built Heritage	Pretoria Bridge	0-10	✓	X	X	X	
	Former Gas Station	Yes/No	✓	X	X	✓	
	Former Old Town Hall	0-10	X	X	X	X	No impact
	Historic Commercial Areas of Ottawa East	0-10	X	X	X	X	No impact
	Nearby Designated Properties	0-10	X	X	X	X	No impact
	Rideau Canal Structure	0-10	X	X	X	X	No impact
	Remains of Old Residential Areas of Ottawa East	0-10	X	X	X	X	No impact
	Centretown Heritage Conservation District	0-10	X	X	X	X	See Nearby Designated Properties
	Royal Oak Pub	Yes/No	✓	X	X	X	
5.2 Cultural Heritage Landscapes	Rideau Canal WHS/NHSC, Standards and Guidelines	0-10	✓	X	X	X	
	Landforms – Raised Elevation of Highway 417 following Early Railway	0-10	X	X	X	X	No Impact
	Landforms – Designed and Graded Terraces and Trails below	0-10	X	X	X	X	No Impact
	Vegetation – Designed Parkland, Ballantyne Park	High/Medium /Low	✓	X	X	X	
	Vegetation – NCC Parkland and Plantings	High/Low	✓	X	X	X	No Impact
	Circulation – Sidewalk (east side)	0-10	X	X	X	X	No Impact
	Circulation – Sidewalk (west side)	0-10	X	X	X	X	No Impact
	Circulation – Multi-use Trail (east side)	0-10	X	X	X	X	No Impact
	Circulation – Multi-use Trail (west side)	0-10	X	X	X	X	No Impact
	Circulation – NCC Parkway – Colonel By Drive	0-10	X	X	X	X	No Impact
	Circulation – NCC Parkway – Queen Elizabeth Driveway	0-10	X	X	X	X	No Impact
	Visual Relationships	High/Medium /Low	✓	X	X	X	
5.3 Archaeology	Pre-contact Sites	ha	X	X	X	X	No potential
	Post-contact Sites	ha	X	X	X	X	No potential
	Sites of Archaeological Potential	ha	X	X	X	X	No potential

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors	Unit of Measure	Carried Forward: Rideau Canal	Metcalfe Street	Elgin Street	Main Street	Remarks
6.0 Economic Environment						
Business Buyout	0-2	X	X	X	✓	
Loss of Parking - Permanent	Yes/No	X	X	X	X	
Loss of Parking - Temporary	No.	X	X	X	X	
Main Street Business Effects	Yes/No	X	X	X	X	See 5.1 Built Heritage
Supports Tourism (Province Branding)	Yes/No	X	X	X	X	See 4.2
Associated Downstream Effects to Rigid Frame Projects	Yes/No	X	X	X	X	
7.0 Land Use and Property						
Temporary Property Impacts – Parks Canada	m²	✓	X	X	X	
Temporary Property Impacts - Federal (NCC)	m²	✓	X	X	X	
Supports Ottawa TMP	Yes/No	X	X	X	X	All alternatives support the TMP
Agricultural Lands Required	m²	X	X	X	X	
Recreation and Natural Areas of Provincial Significance Property Required	m²	X	X	X	X	
Aggregates/Mines Property Impacts	m²	X	X	X	X	
Permanent Property Impacts	Yes/No	X	X	X	X	No permanent impacts
Environmental Impacts along Queensway	High/Medium /Low	X	X	X	X	See Natural Environment
Associated Downstream Effects to Rigid Frame Projects	Yes/No	X	X	X	X	
8.0 Structural						
Durability of Structure	High/Medium /Low	✓	✓	✓	✓	
Certainty in Property to Implement Project	High/ Low	✓	X	X	✓	
Risk of Significant Damage	High/ Low	✓	✓	✓	✓	
Risk of Isolated Spalling from Soffit	High/ Low	✓	X	X	X	
Risk of Falling Ice onto Highway	High/ Low	✓	X	X	X	
Certainty of Construction Method (risk)	High/Medium /Low	✓	✓	✓	✓	
Risk of Damage to Superstructure	0-10	✓	X	X	X	
Use of Link Slabs	Yes/No	✓	X	X	X	
Ongoing Maintenance (i.e. Painting)	0-10	✓	X	X	X	
Minimization of Construction Impacts	0-10	X	X	X	X	See Transportation
Wheel Tracking over Centreline Joint	Yes/No	✓	X	X	X	
Functional Requirement to Widen Structure Triggering Replacement	Yes/No	✓	✓	✓	✓	
Structure Condition – Corrosion Potential	High/Low	X	X	✓	✓	
Structural Deterioration	High/Low	X	X	✓	✓	
9.0 Cost						

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
Capital Cost	$	X	X	X	X	See LCC
Operational and Maintenance Costs	$	X	X	X	X	See LCC
Life Cycle Cost	$	✓	✓	✓	✓	
Rigid Frame Replacement Costs	$	✓	X	X	X	

Table 6.1: Long List of Sub-factors

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
Structural Management	Yes/No	X	X	X	X	See LCC

6.4 Social Utility Function

The evaluation method (Weighted Additive Method) used to evaluate alternatives related the performance or attractiveness of alternatives using a mathematical relationship. This included two variables. The first was the raw, measured or modelled data, and the second was the utility score. The utility score is the measure of the attractiveness of the alternative under the particular sub-factor. For this study, the relationship between these two variables was described by either a linear, stepped or a dichotomous social utility function. These utility functions assigned a dimensionless score between 0 and 1 to an alternative for each sub-factor.

Examples of dichotomous, stepped and linear functions used in this study are explained in the following sections.

6.4.1 *Dichotomous Utility Function*

The dichotomous utility function, shown in **Figure 6.1**, permits the decision-makers to establish criteria that present an “either-or” situation (desirable or undesirable, negative or positive, present or absent, etc.). If a “no” answer is desirable, then a utility score of ‘one’ would be assigned to this criterion, otherwise a value of ‘zero’ would be assigned; no other utility score being available.

6.4.2 *Stepped Utility Function*

The stepped utility function, shown in **Figure 6.1**, permits the decision-makers to assess criteria when the sub-factor presents more than one level of impact. An example of this situation is where the sub-factor can be categorized into “high, medium or low” degrees of impact. If a “high” answer is undesirable then a utility score or zero is assigned to this criterion, a “medium” answer would be 0.5 and “low” would have a value of 1.0 assigned to it. The stepped function may have more than three categories, with each category assigned a value between one and zero.

The value for each step is determined by the subject area specialist (expert). The maximum value found within the group is either the highest or lowest step. If the maximum value is undesirable, it is given a value of zero and conversely the lowest value is desirable and is assigned a value of one.

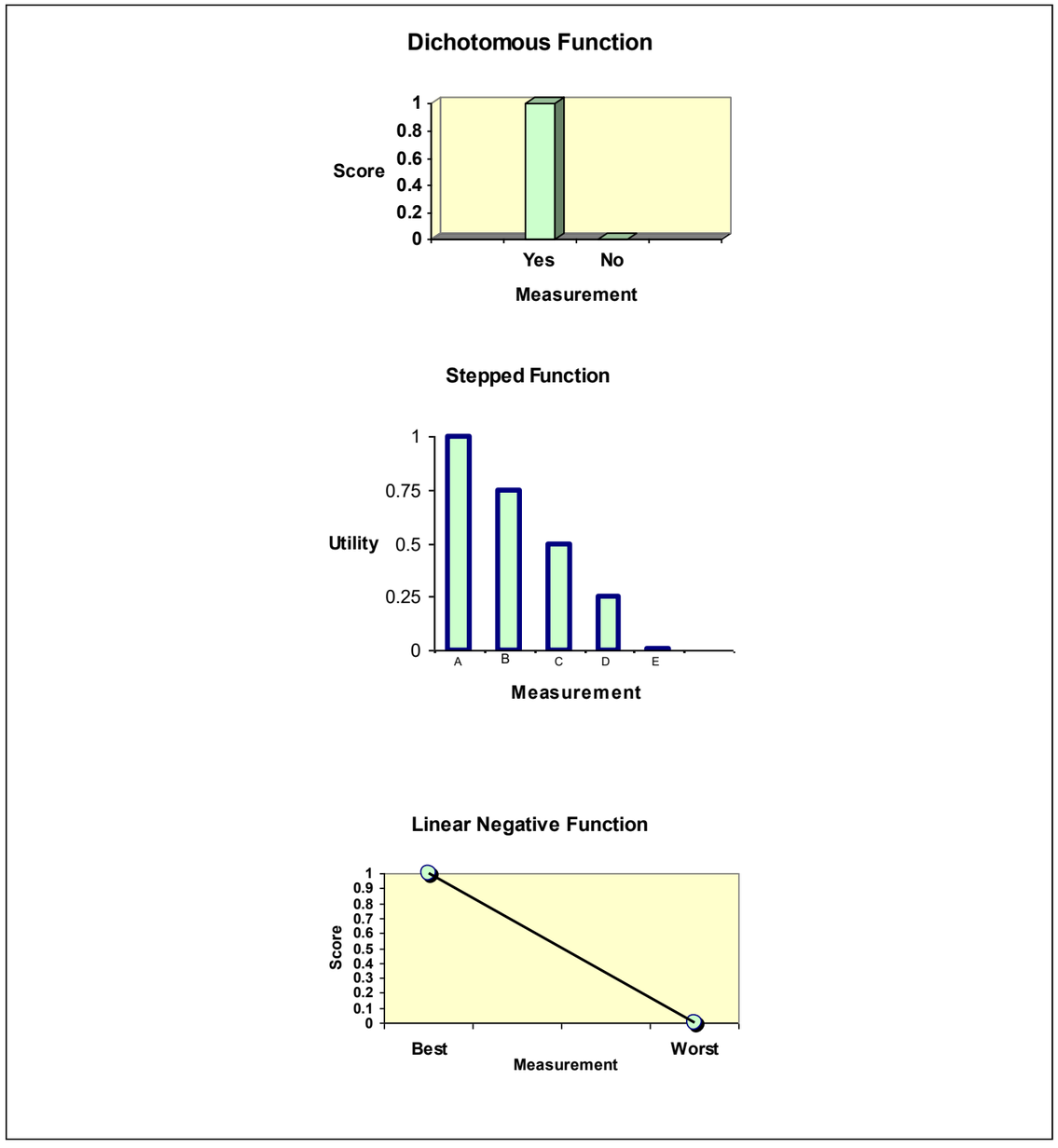
6.4.3 *Linear Utility Function*

The linear function, shown in **Figure 6.1**, was used to convert scores for sub-factors that had varying measurements. Given a measurement, a unique score between zero and one could be assigned to a sub-factor.

The slope of the linear utility function is either negative or positive depending on the desirability of the impact. In the example below, the slope of the function is negative.

The short-listed criteria, including definitions and their respective social utility functions are included as **Appendix F**.

Figure 6.1: Sample Utility Functions



6.5 Weighted Factors and Sub-Factors

Factors were eliminated where they were not applicable (because there was no difference between alternatives or they were considered equal). The selection of weights for the factors and sub-factors were based on assessments by the Technical Advisory Committee (TAC). Within a group of factors, inevitably there was an ordering with some sub-factors having more importance than others. This is accounted for by each individual assigning a weight to each factor and sub-factor, which is reflected in the "Factor Weight" and "Sub-factor Weight" columns in **Table 6.2, Sample Factor / Sub-factor Weights**.

Table 6.2: Sample Factor / Sub-Factor Weights (Sample)

Factors	TAC	
	Factor Weight	Sub-Factor Weight
Traffic and Transportation	40.9%	
• Level of Service (LOS)		27.6%
• Number of conflicts		13.5%
• Number of intersections		7.3%
• Number of entrances		6.1%
• Out-of-way travel		2.6%
• Flexibility for staged construction		9.6%
• Ease to implement detour for new structure		13.9%
• Design consistency		9.2%
• Ability to stage construction		10.2%
	Total	**100%**

The percentage weight for all global factors totalled, considered as global weights, is 100%. As well, the percentage weight for the sub-factors under each factor, described as local weights, must total 100%. There is a degree of subjectivity in deciding which global factor is the most important and which is the least important factor. Every person assigning weights has a personal bias and understanding of the scope of the project and life experience. Hence, there is an advantage to having a diversified team of professionals with varied backgrounds performing the evaluation. The members of the TAC consisted of a diverse group of transportation planners, environmental planners, structural and transportation engineers and technicians.

Each member assigns percentage weights to each global factor and sub-factor based on their opinion of the relative importance of each after a presentation by each specialist to TAC members. Their individual weights were then averaged to determine the TAC weight for each global factor and sub-factor.

The results of the weighting exercise for each structure site under review are provided in the following sections.

6.5.1 *Weighting Results*

The weighting exercises were carried out by the TAC. The results of the weighting exercises and the sensitivity tests have been included in the following summary tables. The sensitivity tests provided the Project Team with an indication of possible trade-offs between indicators.

The Multi Attribute Trade-off System (MATS) evaluation method is a numerical quantitative evaluation methodology based on the Weighted Additive Method. For the purpose of this report, they can be treated as identical terms.

6.5.1.1 Metcalfe Street

The results of the weights and rankings for Metcalfe Street are illustrated on **Figure 6.2** and **Figure 6.3**, respectively, with the results of the weights for each sub-factor shown in **Table 6.3** for the Metcalfe Street structure.

The MATS evaluation ranked Alternative B-C1, Rapid Bridge Replacement, as the Technically Preferred Alternative (TPA). The Evaluation Committee recommended that the TESR, which will describe the project to be carried forward, be refined to allow flexibility in the project to be delivered. Although the project should be implemented as rapid replacement, the MTO should retain the flexibility to rapid rehabilitate the existing structure, should funding be limited or if there are changes to Provincial priorities. This will be noted as a Statement of Flexibility in the TESR.

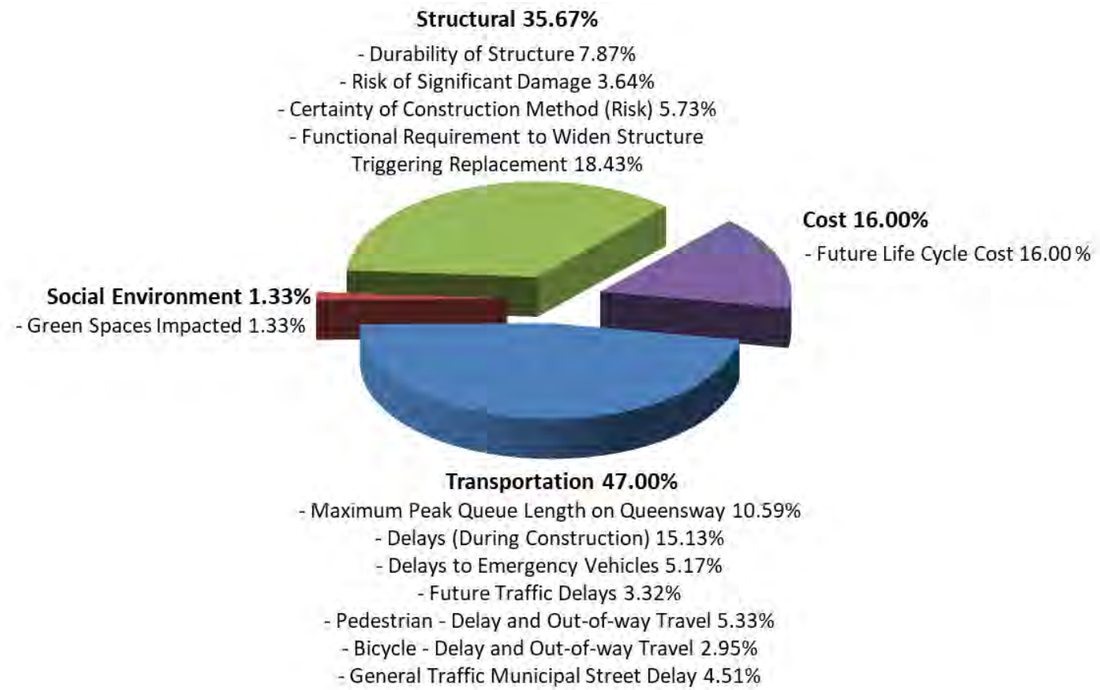


Figure 6.2: Metcalfe Street MATS Weights

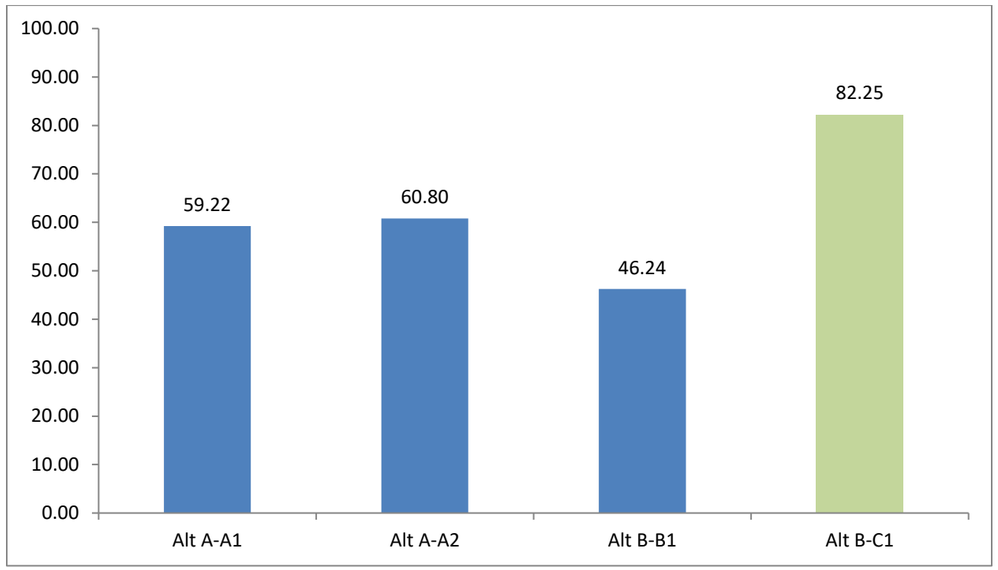


Figure 6.3: Metcalfe Street MATS Ranking

Table 6.3: Summary of Metcalfe Street MATS Weighted Scores

	Alt A-A1	Alt A-A2	Alt B-B1	Alt B-C1
Transportation				
Maximum Peak Queue Length on Queensway	9.96	8.05	0.00	10.59
Delays (During Construction)	14.38	11.50	0.00	15.13
Delays to Emergency Vehicles	4.86	3.93	0.00	5.17
Future Traffic Delays	0.00	0.00	3.32	3.32
Pedestrian - Delay and Out-of-way Travel	5.33	5.33	0.00	5.06
Bicycle - Delay and Out-of-way Travel	2.95	2.95	0.00	2.80
Social Environment				
Green Spaces Impacted	1.33	1.33	1.33	0.00
Structural				
Durability of Structure	0.00	4.72	7.87	7.87
Risk of Significant Damage	0.00	0.00	3.64	3.64
Certainty of Construction Method (Risk)	0.00	2.87	5.73	5.73
Functional Requirement to Widen Structure Triggering Replacement	0.00	0.00	18.43	18.43
Cost				
Future Life Cycle Cost	16.00	15.84	5.92	0.00
Final Score	**59.22**	**60.80**	**46.24**	**82.25**

6.5.1.2 Elgin Street

The results of the weights and rankings for Elgin Street are illustrated on **Figure 6.4** and **Figure 6.5**, respectively, with the results of the weights for each sub-factor shown in **Table 6.4** for the Metcalfe Street structure.

The MATS evaluation ranked Alternative B-C1, Rapid Bridge Replacement, as the Technically Preferred Alternative (TPA). The Evaluation Committee recommended that the TESR, which will describe the project to be carried forward, be refined to allow flexibility in the project to be delivered. Although the project should be implemented as rapid replacement, the MTO should retain the flexibility to rapid rehabilitate the existing structure, should funding be limited or if there are changes to Provincial priorities. This will be noted as a Statement of Flexibility in the TESR.

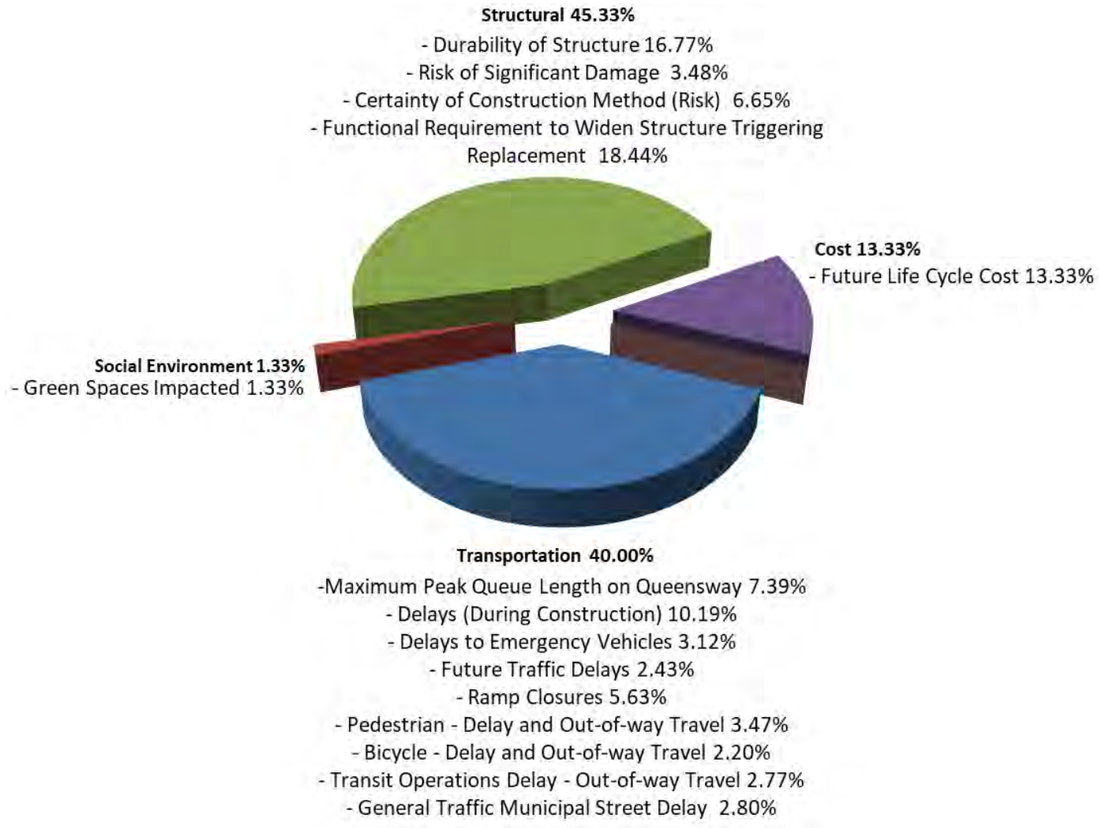


Figure 6.4: Elgin Street MATS Weights

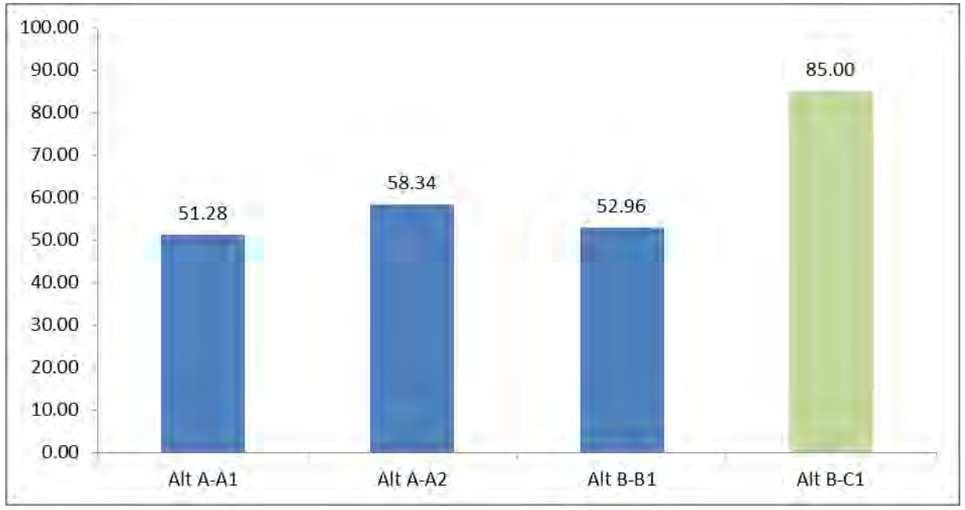


Figure 6.5: Elgin Street MATS Ranking

Table 6.4: Summary of Elgin Street MATS Weighted Scores

	Alt A-A1	Alt A-A2	Alt B-B1	Alt B-C1
Transportation				
Maximum Peak Queue Length on Queensway	7.02	5.98	0.00	7.39
Delays (During Construction)	9.78	8.35	0.00	10.19
Delays to Emergency Vehicles	0.00	0.00	2.43	2.43
Future Traffic Delays	3.47	3.47	0.00	3.33
Ramp Closures	2.21	2.21	0.00	2.12
Pedestrian - Delay and Out-of-way Travel	2.77	2.77	0.00	2.66
Bicycle - Delay and Out-of-way Travel	2.77	2.69	0.00	2.80
Transit Operations Delay - Out-of-way Travel	7.02	5.98	0.00	7.39
General Traffic Municipal Street Delay	9.78	8.35	0.00	10.19
Social Environment				
Green Spaces Impacted	1.33	1.33	1.33	0.00
Structural				
Durability of Structure	0.00	8.39	16.77	16.77
Risk of Significant Damage	0.00	0.00	3.48	3.48
Certainty of Construction Method (Risk)	0.00	3.32	6.65	6.65
Functional Requirement to Widen Structure Triggering Replacement	0.00	0.00	18.44	18.44
Cost				
Future Life Cycle Cost	13.33	12.40	3.87	0.00
Final Score	**51.28**	**58.34**	**52.96**	**85.00**

6.5.1.3 Main Street

The results of the weights and rankings for Main Street are illustrated on **Figure 6.6**, with the results of the weights for each sub-factor shown in **Figure 6.7** and **Table 6.5** for the Main Street structure.

The MATS evaluation ranked Alternative B-C1, Rapid Bridge Replacement, as the Technically Preferred Alternative (TPA). The Evaluation Committee recommended that the TESR, which will describe the project to be carried forward, be refined to allow flexibility in the project to be delivered. Although the project should be implemented as rapid replacement, the MTO should retain the flexibility to rapid rehabilitate the existing structure, should funding be limited or if there are changes to Provincial priorities. This will be noted as a Statement of Flexibility in the TESR.

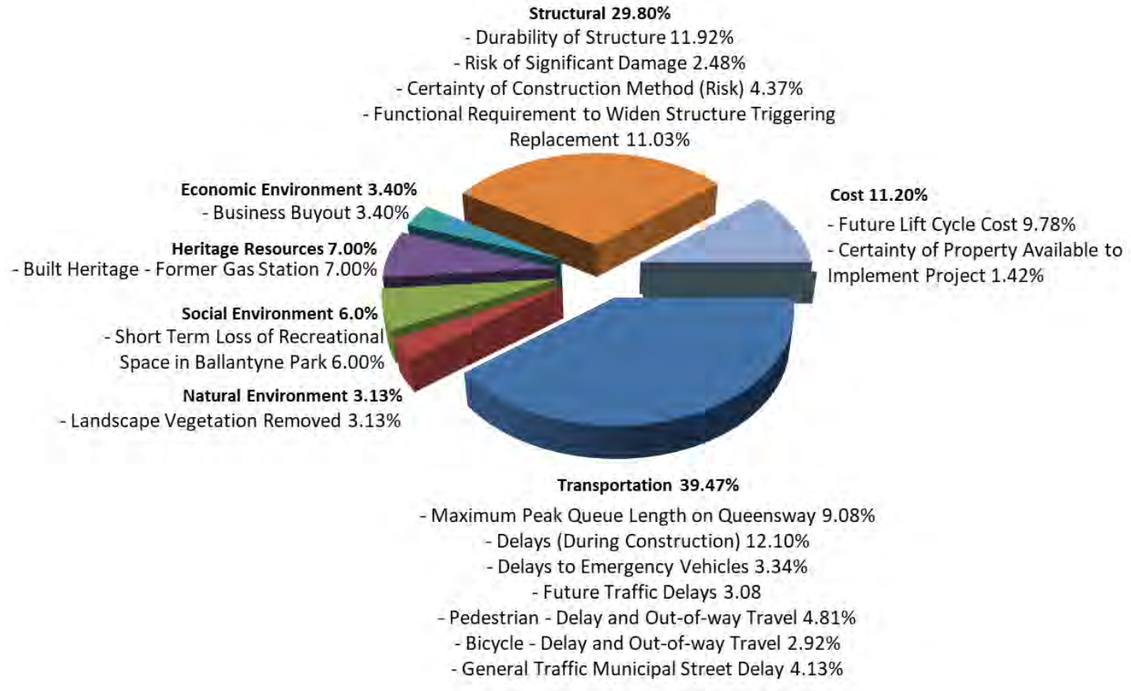


Figure 6.6: Main Street MATS Weights

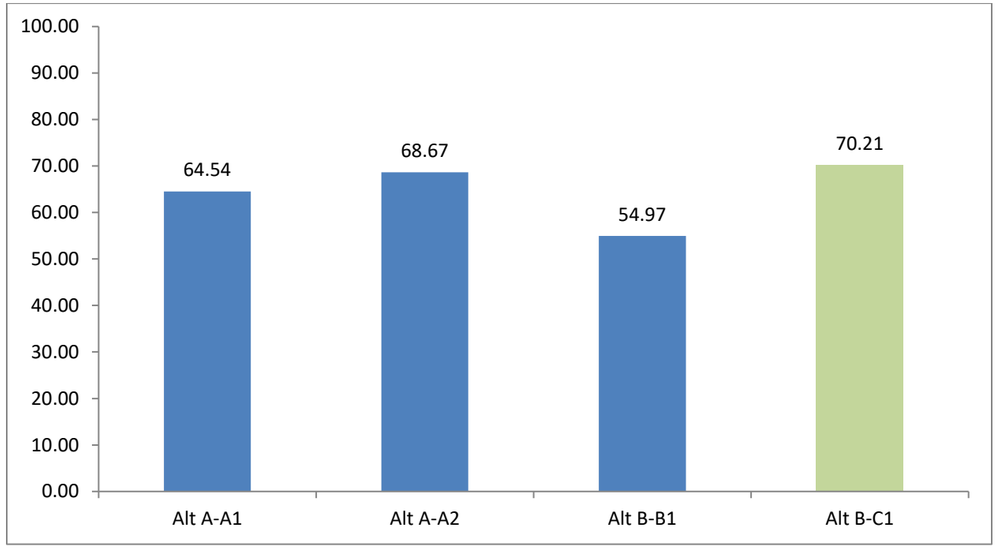


Figure 6.7: Main Street MATS Ranking

Table 6.5: Summary of Main Street MATS Weighted Scores				
	Alt A-A1	**Alt A-A2**	**Alt B-B1**	**Alt B-C1**
Transportation				
Maximum Peak Queue Length on Queensway	8.62	7.08	0.00	9.08
Delays (During Construction)	11.50	9.56	0.00	12.10
Delays to Emergency Vehicles	3.24	2.71	0.00	3.34
Future Traffic Delays	0.00	0.00	3.08	3.08
Pedestrian - Delay and Out-of-way Travel	4.81	4.81	0.00	4.62
Bicycle - Delay and Out-of-way Travel	2.92	2.92	0.00	2.80
General Traffic Municipal Street Delay	4.13	4.13	0.00	3.97
Natural Environment				
Landscape Vegetation Removed	3.13	3.13	3.13	0.00
Social Environment				
Short Term Loss of Recreational Space in Ballantyne Park	6.00	6.00	6.00	0.00
Heritage Resources				
Built Heritage – Former Gas Station	7.00	7.00	7.00	0.00
Economic Environment				
Business Buyout	3.40	3.40	3.40	0.00
Structural				
Durability of Structure	0.00	5.96	11.92	11.92
Risk of Significant Damage	0.00	0.00	2.48	2.48
Certainty of Construction Method (Risk)	0.00	2.19	2.19	4.37
Functional Requirement to Widen Structure Triggering Replacement	0.00	0.00	11.03	11.03
Cost				
Future Life Cycle Cost	9.78	9.78	3.33	0.00
Certainty of Property Available to Implement Project	0.00	0.00	1.42	1.42
Final Score	**64.54**	**68.67**	**54.97**	**70.21**

6.5.1.4Rideau Canal

The results of the weights and rankings for Rideau Canal are illustrated on **Figure 6.8**, with the results of the weights for each sub-factor shown in **Figure 6.9** and **Table 6.6** for the Rideau Canal Bridge.

The MATS evaluation ranked Alternative D-4, Jack and Slide from Sides Bridge Replacement, as the Technically Preferred Alternative (TPA).

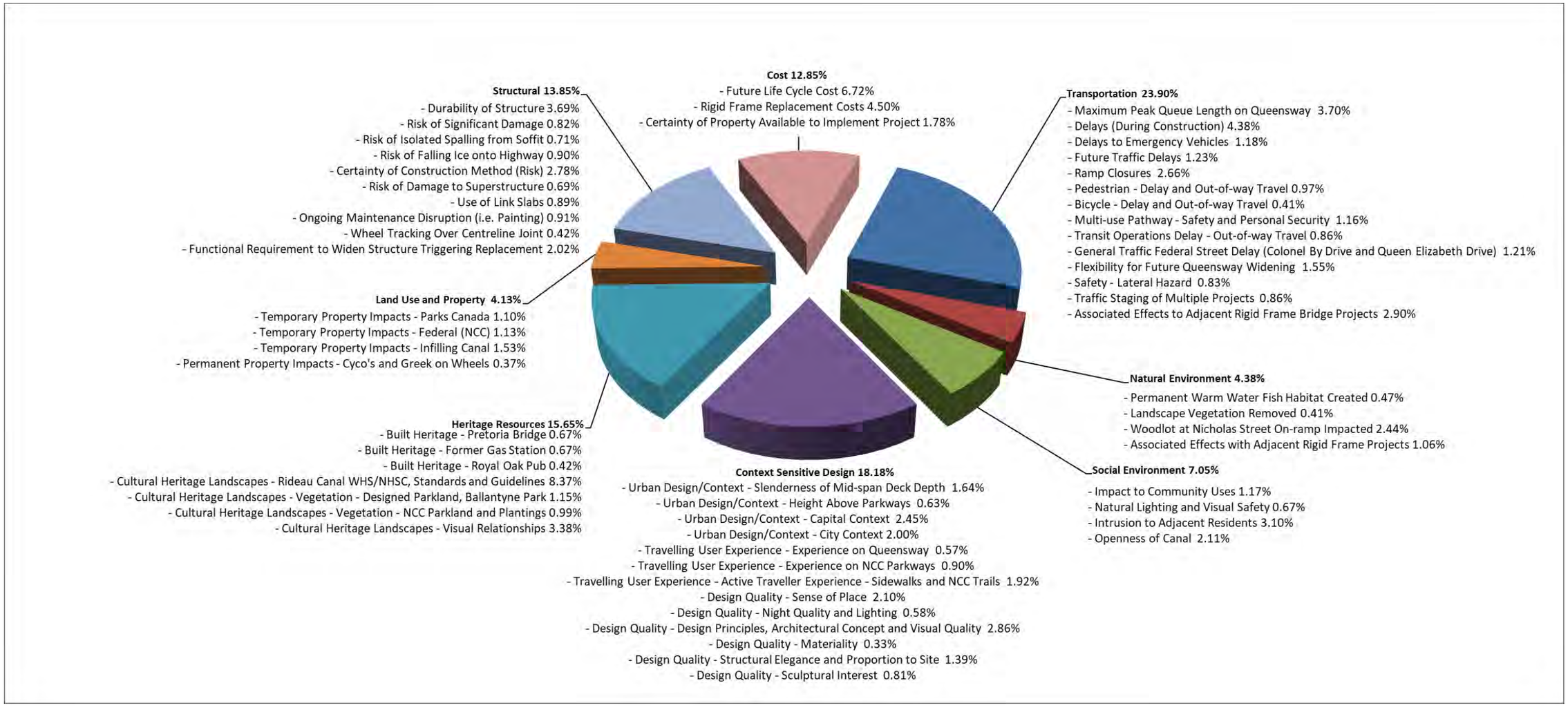


Figure 6.8: Rideau Canal Bridge MATS Weights

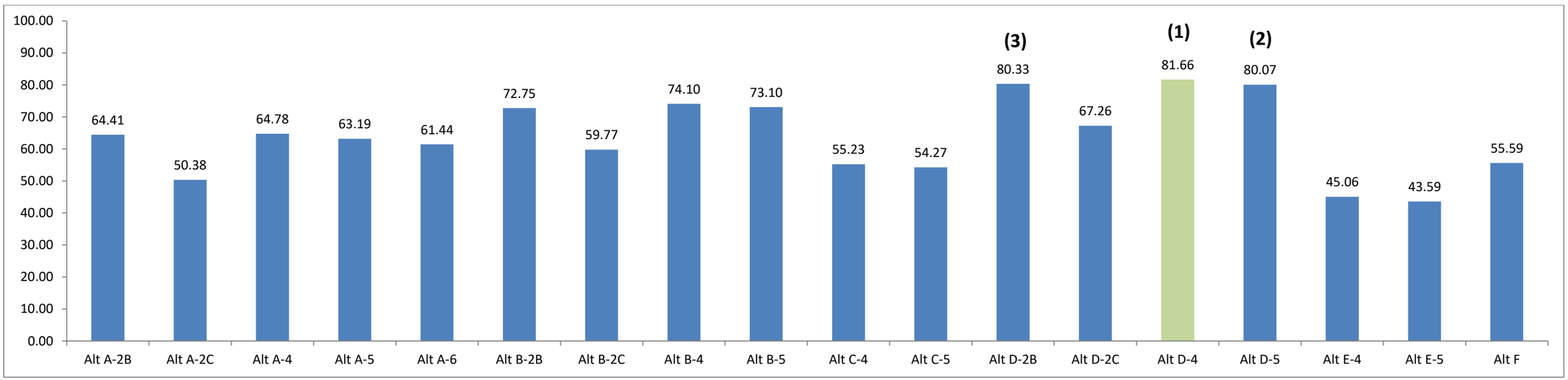


Figure 6.9: Rideau Canal Bridge MATS Ranking

Table 6.6: Summary of Rideau Canal Bridge MATS Weighted Scores

	Alt A-2B	Alt A-2C	Alt A-4	Alt A-5	Alt A-6	Alt B-2B	Alt B-2C	Alt B-4	Alt B-5	Alt C-4	Alt C-5	Alt D-2B	Alt D-2C	Alt D-4	Alt D-5	Alt E-4	Alt E-5	Alt F
Transportation																		
Maximum Peak Queue Length on Queensway	1.85	0.48	3.70	3.70	3.70	1.85	0.48	3.70	3.70	3.70	3.70	1.85	0.48	3.70	3.70	3.70	3.70	0.00
Delays (During Construction)	2.10	0.48	4.38	4.34	4.38	2.10	0.48	4.38	4.34	3.15	3.15	2.10	0.48	4.38	4.34	3.15	3.15	0.00
Delays to Emergency Vehicles	0.61	0.18	1.18	1.12	1.18	0.61	0.18	1.18	1.12	0.74	0.68	0.61	0.18	1.18	1.12	0.74	0.68	0.00
Future Traffic Delays	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	0.00
Ramp Closures	1.81	0.32	2.66	2.66	2.66	1.70	0.32	2.66	2.66	0.00	0.59	1.70	0.32	2.66	2.66	1.09	1.17	1.49
Pedestrian - Delay and Out-of-way Travel	0.00	0.00	0.62	0.28	0.62	0.00	0.00	0.62	0.28	0.62	0.28	0.00	0.00	0.62	0.28	0.62	0.28	0.97
Bicycle - Delay and Out-of-way Travel	0.00	0.00	0.27	0.12	0.27	0.00	0.00	0.27	0.12	0.27	0.12	0.00	0.00	0.27	0.12	0.27	0.12	0.41
Multi-use Pathway - Safety and Personal Security	1.16	1.16	0.00	0.58	1.16	1.16	1.16	0.00	0.58	0.00	0.58	1.16	1.16	0.00	0.58	0.00	0.58	1.16
Transit Operations Delay - Out-of-way Travel	0.86	0.86	0.43	0.00	0.43	0.86	0.86	0.43	0.00	0.43	0.00	0.86	0.86	0.43	0.00	0.43	0.00	0.86
General Traffic Federal Street Delay (Colonel By Drive and Queen Elizabeth Drive)	1.21	1.21	1.02	0.63	0.00	1.21	1.21	1.02	0.63	1.02	0.63	1.21	1.21	1.02	0.63	1.02	0.63	1.02
Flexibility for Future Queensway Widening	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	0.00	0.00	1.55	1.55	1.55	1.55	0.00	0.00	1.55
Safety - Lateral Hazard	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.55	0.55	0.83	0.83	0.83	0.83	0.00	0.00	0.83

Table 6.6: Summary of Rideau Canal Bridge MATS Weighted Scores

	Alt A-2B	Alt A-2C	Alt A-4	Alt A-5	Alt A-6	Alt B-2B	Alt B-2C	Alt B-4	Alt B-5	Alt C-4	Alt C-5	Alt D-2B	Alt D-2C	Alt D-4	Alt D-5	Alt E-4	Alt E-5	Alt F
Traffic Staging of Multiple Projects	0.00	0.00	0.86	0.86	0.00	0.00	0.00	0.86	0.86	0.86	0.86	0.00	0.00	0.86	0.86	0.86	0.86	0.86
Associated Effects to Adjacent Rigid Frame Bridge Projects	2.90	0.00	2.90	2.90	2.90	2.90	0.00	2.90	2.90	0.00	0.00	2.90	0.00	2.90	2.90	0.00	0.00	2.90
Natural Environment																		
Permanent Warm Water Fish Habitat Created	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.00
Landscape Vegetation Removed	0.41	0.41	0.00	0.00	0.41	0.41	0.41	0.00	0.00	0.00	0.00	0.41	0.41	0.00	0.00	0.00	0.00	0.41
Woodlot at Nicholas Street On-ramp Impacted	2.44	2.44	2.44	2.44	0.00	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44
Associated Effects with Adjacent Rigid Frame Projects	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	0.00	0.00	1.07	1.07	1.07	1.07	0.00	0.00	1.07
Social Environment																		
Impact to Community Uses	1.17	1.17	0.58	0.58	1.17	1.17	1.17	0.58	1.17	0.00	0.00	1.17	1.17	0.58	0.58	0.00	0.00	1.17
Natural Lighting and Visual Safety	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.00	0.00	0.42	0.42	0.42	0.42	0.00	0.00	0.67
Intrusion to Adjacent Residents	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	0.00	0.00	3.10
Openness of Canal	0.00	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	1.99	1.99	2.12	2.12	2.12	2.12	1.99	1.99	0.00
Context Sensitive Design																		
Urban Design/Context - Slenderness of Mid-span Deck Depth	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.43	0.43	0.36	0.36	0.36	0.36	1.64	1.64	0.02
Urban Design/Context - Height Above Parkways	0.06	0.06	0.06	0.06	0.06	0.37	0.37	0.37	0.37	0.61	0.61	0.37	0.37	0.37	0.37	0.63	0.63	0.00
Urban Design/Context - Capital Context	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	2.45	2.45	1.62	1.62	1.62	1.62	2.45	2.45	0.00
Urban Design/Context - City Context	0.66	0.66	0.66	0.66	0.66	2.00	2.00	2.00	2.00	1.32	1.32	2.00	2.00	2.00	2.00	0.00	0.00	0.66
Travelling User Experience - Experience on Queensway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.57	0.00	0.00	0.00	0.00	0.57	0.57	0.00
Travelling User Experience - Experience on NCC Parkways	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.90	0.90	0.00	0.00	0.00	0.00	0.90	0.90	0.00
Travelling User Experience - Active Traveller Experience - Sidewalks and NCC Trails	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92	1.92	0.96	0.96	0.96	0.96	1.92	1.92	0.00
Design Quality - Sense of Place	0.21	0.21	0.21	0.21	0.21	0.63	0.63	0.63	0.63	2.10	2.10	1.68	1.68	1.68	1.68	1.26	1.26	0.00
Design Quality - Night Quality and Lighting	0.06	0.06	0.06	0.06	0.06	0.17	0.17	0.17	0.17	0.58	0.58	0.29	0.29	0.29	0.29	0.52	0.52	0.00
Design Quality - Design Principles, Architectural Concept and Visual Quality	0.29	0.29	0.29	0.29	0.29	0.86	0.86	0.86	0.86	2.86	2.86	2.00	2.00	2.00	2.00	0.57	0.57	0.00
Design Quality - Materiality	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.33	0.33	0.33	0.33	0.33	0.33	0.22	0.22	0.00
Design Quality - Structural Elegance and Proportion to Site	0.00	0.00	0.00	0.00	0.00	0.56	0.56	0.56	0.56	1.39	1.39	0.98	0.98	0.98	0.98	0.70	0.70	0.00
Design Quality - Sculptural Interest	0.08	0.08	0.08	0.08	0.08	0.25	0.25	0.25	0.25	0.82	0.82	0.66	0.66	0.66	0.66	0.49	0.49	0.00
Heritage Resources																		
Built Heritage - Pretoria Bridge	0.00	0.00	0.00	0.00	0.00	0.13	0.13	0.13	0.13	0.67	0.67	0.53	0.53	0.53	0.53	0.33	0.33	0.00

Table 6.6: Summary of Rideau Canal Bridge MATS Weighted Scores

	Alt A-2B	Alt A-2C	Alt A-4	Alt A-5	Alt A-6	Alt B-2B	Alt B-2C	Alt B-4	Alt B-5	Alt C-4	Alt C-5	Alt D-2B	Alt D-2C	Alt D-4	Alt D-5	Alt E-4	Alt E-5	Alt F
Built Heritage - Former Gas Station	0.67	0.00	0.67	0.67	0.67	0.67	0.00	0.67	0.67	0.00	0.00	0.67	0.00	0.67	0.67	0.00	0.00	0.67
Built Heritage - Royal Oak Pub	0.42	0.42	0.00	0.00	0.42	0.42	0.42	0.00	0.00	0.00	0.00	0.42	0.42	0.00	0.00	0.00	0.00	0.42
Cultural Heritage Landscapes - Rideau Canal WHS/NHSC, Standards and Guidelines	4.18	4.18	4.18	4.18	4.18	8.37	8.37	8.37	8.37	0.00	0.00	8.37	8.37	8.37	8.37	0.00	0.00	8.37
Cultural Heritage Landscapes - Vegetation - Designed Parkland, Ballantyne Park	0.57	0.00	0.57	0.57	0.57	0.57	0.00	0.57	0.57	0.00	0.00	0.57	0.00	0.57	0.57	0.00	0.00	1.15
Cultural Heritage Landscapes - Vegetation - NCC Parkland and Plantings	0.99	0.99	0.00	0.00	0.99	0.99	0.99	0.00	0.00	0.99	0.99	0.99	0.99	0.00	0.00	0.99	0.99	0.99
Cultural Heritage Landscapes - Visual Relationships	2.54	1.70	1.70	1.70	1.70	3.39	3.39	3.39	3.39	0.85	0.85	3.39	3.39	3.39	3.39	0.00	0.00	3.39
Land Use and Property																		
Temporary Property Impacts - Parks Canada	1.03	1.03	0.16	0.16	1.10	1.03	1.03	0.16	0.16	0.00	0.00	1.03	1.03	0.16	0.16	0.00	0.00	1.10
Temporary Property Impacts - Federal (NCC)	1.07	1.07	0.16	0.16	1.13	1.07	1.07	0.16	0.16	0.00	0.00	1.07	1.07	0.16	0.16	0.00	0.00	1.13
Temporary Property Impacts - Infilling Canal	0.77	0.77	0.77	0.00	0.77	0.77	0.77	0.77	0.00	0.77	0.00	0.77	0.77	0.77	0.00	0.77	0.00	1.53
Permanent Property Impacts - Cyco's and Greek on Wheels	0.37	0.37	0.00	0.00	0.37	0.37	0.37	0.00	0.00	0.00	0.00	0.37	0.37	0.00	0.00	0.00	0.00	0.37
Structural																		
Durability of Structure	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	0.00
Risk of Significant Damage	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.00
Risk of Isolated Spalling from Soffit	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.00
Risk of Falling Ice onto Highway	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.00	0.00	0.90	0.90	0.90	0.90	0.00	0.00	0.90
Certainty of Construction Method (Risk)	2.78	2.78	2.78	2.78	0.00	2.78	2.78	2.78	2.78	2.78	2.78	2.78	2.78	2.78	2.78	2.78	2.78	1.39
Risk of Damage to Superstructure	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.14	0.14	0.69	0.69	0.69	0.69	0.00	0.00	0.69
Use of Link Slabs	0.89	0.89	0.89	0.89	0.00	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Ongoing Maintenance Disruption (i.e. Painting)	0.55	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.91	0.91	0.64	0.55	0.55	0.55	0.00	0.00	0.91
Wheel Tracking Over Centreline Joint	0.00	0.42	0.42	0.42	0.42	0.00	0.42	0.42	0.42	0.42	0.42	0.00	0.42	0.42	0.42	0.42	0.42	0.42
Functional Requirement to Widen Structure Triggering Replacement	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	0.00
Cost																		
Future Life Cycle Cost	6.64	6.64	6.57	6.57	5.38	6.31	6.31	6.17	6.17	2.52	2.52	5.91	5.91	5.84	5.84	0.00	0.00	5.24
Rigid Frame Replacement Costs	4.45	0.00	4.45	4.45	4.45	4.45	0.00	4.45	4.45	0.00	0.00	4.45	0.00	4.45	4.45	0.00	0.00	4.45
Certainty of Property Available to Implement Project	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	0.00
Final Score	64.41	50.38	64.78	63.19	61.44	72.75	59.77	74.10	73.10	55.23	54.27	80.33	67.26	81.66	80.07	45.06	43.59	55.59

6.6 Sensitivity Testing

It should be recognized that the scope of the evaluation and determination of weights for the evaluation criteria are a matter of professional judgment. Accordingly, it is considered essential to conduct sensitivity testing to determine if the nature of the evaluation is sensitive to the weights assigned to each criterion.

There is a spread of values among the groups of evaluators for the selection of weights. The range is dependent on the value judgment of individuals and specialists. Using the average of the group does not necessarily capture what the standard deviation was among the individual scores. Therefore, sensitivity testing is conducted to test a range of weights either higher or lower than the group's average.

For this study an independent test was undertaken which placed greater or less emphasis on a global factor and redistributing the weight to the other factors using the average values of the TAC. A separate test was completed for each factor using the highest weight given by anyone in the TAC as well as the lowest weight.

Following this methodology a series of tests were completed varying the weight for each global factor. The three tests included:

- Average TAC Weight
- Highest Weight in a factor group by any TAC member
- Lowest Weight in a factor group by any TAC member

Following this series of tests, the results were reviewed to assess whether the preferred alternative changed when the weights were varied.

This information alone is not the only justification for selecting a particular alternative, but it provides a level of confidence in the selection and the ability to assess trade-offs. This information is considered and used in the decision-making process before a TPA is recommended to be carried forward. The sensitivity testing will be presented at PIC No. 2.

6.6.1 *Metcalfe Street Sensitivity Testing Results*

The sensitivity test results for the Metcalfe Street overpass structure showed that the preferred alternative, Alternative B-C1, was affected only by the highest cost weight test. Alternative A-A2 (conventional replacement) becomes the preferred alternative only when the high cost weights sensitivity test was undertaken. This reflects that there is a trade-off between cost and the other evaluation criteria. However, the evaluation team recognizes this trade-off and endorsed carrying forward alternative B-C1 as the best balanced alternative for the site. **Table 6.7** tabulates the results of the sensitivity tests for Metcalfe Street.

Table 6.7: Summary of Metcalfe Street Sensitivity Testing Results

ALTERNATIVE		Alt A-A1	Alt A-A2	Alt B-B1	Alt B-C1
SCORE		59.22	60.80	46.24	82.25
TAC Weights		3	2	4	1
Transportation	High	3	2	4	1
	Low	4	2	3	1
Social	High	3	2	4	1

Table 6.7: Summary of Metcalfe Street Sensitivity Testing Results

ALTERNATIVE		Alt A-A1	Alt A-A2	Alt B-B1	Alt B-C1
Environment	Low	3	2	4	1
Structural	High	4	3	2	1
	Low	2	3	4	1
Cost	High	2	1	4	3
	Low	3	2	4	1

6.6.2 *Elgin Street Sensitivity Testing Results*

The sensitivity test results for both Elgin Street eastbound and westbound structures showed that the preferred alternative, Alternative B-C1, was not affected by the highest or lowest weight in any factor group by any TAC member. **Table 6.8** tabulates the results of the sensitivity test for Elgin Street eastbound and westbound structures.

Table 6.8: Summary of Elgin Street Sensitivity Testing Results

ALTERNATIVE		Alt A-A1	Alt A-A2	Alt B-B1	Alt B-C1
SCORE		51.28	58.34	52.96	85.00
TAC Weights		4	2	3	1
Transportation	High	3	2	4	1
	Low	4	3	2	1
Social Environment	High	4	2	3	1
	Low	4	2	3	1
Structural	High	4	3	2	1
	Low	3	2	4	1
Cost	High	3	2	4	1
	Low	4	3	2	1

6.6.3 *Main Street Sensitivity Testing Results*

The sensitivity test results for the Main Street eastbound and westbound structures showed that the preferred alternative, Alternative B-C1, was affected by a high weight for Natural Environment, Social Environment, Heritage Resources and Economic Environment and Cost, as well as a low weight for Transportation and Structural. Alternative A-A2 (conventional rehabilitation) rates highest for a high weight on Natural Environment, Social Environment, Heritage Resources, Economic Environment and Cost. Alternative A-A2 (conventional rehabilitation) does not require removal and reinstatement of the Former Gas Station/Salon and requires a smaller area of Ballantyne Park as a laydown area for construction (rather than a bridge staging site for the rapid replacement), which is why it rates highest for these global factors. The effects can be completely mitigated for the overall preferred alternative (Alternative B-C1 rapid replacement). Alternative B-B1 (conventional replacement) rates highest for a low weight on transportation and Alternative A-A1 (rapid rehabilitation) rates highest for a low weight on structural. The team recognizes these trade-offs and endorses carrying forward Alternative B-C1 as the best-balanced alternative. **Table 6.9** tabulates the results of the sensitivity test for the Main Street structures.

Table 6.9: Summary of Main Street Sensitivity Testing Results					
ALTERNATIVE		**Alt A-A1**	**Alt A-A2**	**Alt B-B1**	**Alt B-C1**
SCORE		64.54	68.67	54.97	70.21
TAC Weights		3	2	4	1
Transportation	High	3	2	4	1
	Low	4	2	1	3
Natural Environment	High	2	1	4	3
	Low	3	2	4	1
Social Environment	High	2	1	4	3
	Low	3	2	4	1
Heritage Resources	High	2	1	4	3
	Low	3	2	4	1
Economic Environment	High	2	1	4	3
	Low	3	2	4	1
Structural	High	4	3	2	1
	Low	1	2	4	3
Cost	High	2	1	4	3
	Low	3	2	4	1

6.6.4 *Rideau Canal Sensitivity Testing Results*

The sensitivity test results for the Rideau Canal eastbound and westbound structures showed that the preferred alternative, Alternative D-4, was affected by a high weight on Social Environment and Heritage Resources. The preferred alternative, Alternative D-4, has short term impacts on Ballantyne Park (construction laydown area, impacts will be mitigated by providing a small area for dog walkers and reinstatement of landscaping). The Royal Oak Pub is also impacted by the preferred alternative (acquisition and removal of building from property) and therefore rated second when a high weight is given to Social Environment and Heritage Resources. The team recognizes these trade-offs and endorses carrying forward Alternative D-4 as the best-balanced alternative. **Table 6.10** tabulates the results of the sensitivity test for the Rideau Canal eastbound and westbound structures.

Table 6.10: Summary of Rideau Canal Sensitivity Testing Results																		
		Alt A-2B	**Alt A-2C**	**Alt A-4**	**Alt A-5**	**Alt A-6**	**Alt B-2B**	**Alt B-2C**	**Alt B-4**	**Alt B-5**	**Alt C-4**	**Alt C-5**	**Alt D-2B**	**Alt D-2C**	**Alt D-4**	**Alt D-5**	**Alt E-4**	**Alt E-5**	**Alt F**
FACTORS	WEIGHT	64.41	50.38	64.78	63.19	61.44	72.75	59.77	74.10	73.10	55.23	54.27	80.33	67.26	81.66	80.07	45.06	43.59	55.59
TAC Weights		9	16	8	10	11	6	12	4	5	14	15	2	7	1	3	17	18	13
Transportation	High	10	17	6	8	9	7	15	3	4	12	14	5	11	1	2	16	18	13
	Low	8	16	9	10	12	5	11	4	6	14	15	2	7	1	3	17	18	13
Natural Environment	High	8	16	9	10	12	5	11	4	6	14	15	2	7	1	3	17	18	13
	Low	9	16	8	11	10	6	12	4	5	13	15	3	7	1	2	17	18	14
Social Environment	High	8	16	9	10	11	6	12	5	4	14	15	1	7	2	3	17	18	13
	Low	9	16	7	10	11	6	12	4	5	13	14	3	8	1	2	17	18	15
Context Sensitive Design	High	11	18	10	12	14	6	13	4	5	8	9	2	7	1	3	16	17	15
	Low	8	14	7	9	10	6	13	4	5	15	16	2	11	1	3	17	18	12
Heritage Resources	High	9	14	11	13	12	4	8	5	6	15	16	1	7	2	3	17	18	10
	Low	9	15	7	8	11	6	14	4	5	12	13	3	10	1	2	17	18	16
Land Use and Property	High	8	16	9	10	11	5	12	4	6	14	15	2	7	1	3	17	18	13
	Low	10	16	8	9	11	6	12	4	5	13	14	3	7	1	2	17	18	15
Structural	High	9	15	8	10	12	6	11	4	5	13	14	3	7	1	2	17	18	16
	Low	9	16	8	11	10	6	13	4	5	14	15	2	7	1	3	17	18	12
Cost	High	8	14	7	9	10	6	12	4	5	15	16	2	11	1	3	17	18	13
	Low	10	17	8	12	14	6	9	4	5	11	13	2	7	1	3	16	18	15

7 SELECTION OF INITIAL TECHNICALLY PREFERRED ALTERNATIVE

The initial Technically Preferred Alternatives (TPA's) identify the preferred rehabilitation or replacement approach at all the bridge sites, taking into account the technical analysis, environmental considerations and comments of all study participants.

The initial TPA's were presented to the public and external stakeholders at the second PIC in August 2019.

Rigid Frame Sites

The analysis and evaluation of alternatives for the future bridge management plan for the rigid frame structures was undertaken using the Multi-Attribute Trade-off System (MATS) evaluation process. This process characterizes the performance and effects of alternatives considering environmental effects (natural, social and cultural environments), societal transportation performance (safety and delays) and costs (capital and life cycle costs). The MATS process provides a traceable tool for quantifying differences among alternatives and ranking the preference of these alternatives. In this review it assessed whether the bridge management approach would include a second major rehabilitation (the first rehabilitations occurred in 1984/85) of the existing rigid frame bridges in approximately 2028 followed by replacement (possibly in the 2050 planning horizon), or replacement (in approximately 2028) as the next cycle of bridge management.

Based on the MATS evaluation, the technical evaluation generally rated the rapid replacement project in 2028 followed by future rehabilitation as the preferred approach for the bridge management plan for these bridges. The MATS ranking and evaluation approach was only one tool used in making the decision to replace the bridges.

The MATS evaluation and ranking was used to assess bridge management strategies. As described above, the evaluation consistently recommended replacing the existing bridges, since the bridges are nearing the end of their service lives and property is available today for replacement alternatives.

Based on the decision-making process, the Technical Advisory Committee endorsed **Rapid Replacement** as the project to carry forward at Metcalfe Street, Elgin Street and Main Street. The summary of the evaluation, Technically Preferred Alternative (TPA), and where the TESR will identify a statement of flexibility is shown in **Section 9**.

Rideau Canal Structure Recommendations

Both rapid replacement and conventional rehabilitation alternatives were considered at the Rideau Canal Bridge site. A wide range of potential bridge structure alternatives were considered, including two "high level" bridges (an extrados and an arch type). Construction methodology alternatives considered rapid replacement technology including a jack and slide method, and an "SPMT elevator" method. The alternatives considered effects to federal lands, such as the Rideau Canal (owned by Parks Canada) and the two parkways (owned by NCC) as well as impacts to year-round users of the Canal. The technical evaluation ranked the single Jack and Slide from the Sides alternative as the preferred alternative. The preferred bridge replacement alternative removes piers from the Canal (which provides a greater navigational clearance) as well as providing a more slender deck to improve the experience along the Canal at this location. Furthermore, the preferred bridge replacement alternative complies with the *Standard and Guidelines for Conservation of Historic Places in Canada* Standard 11 in that it is compatible with, subordinate to and distinguishable from the existing surroundings (including the Pretoria Bridge), providing the best-balanced solution for the location. The selection criteria included input from the FAC (Parks Canada and NCC).

Additionally, Alternative D provides a canvas to add architectural detailing such as end treatments or surface treatments (such as a decorative façade) to enhance the bridge within the surroundings, without detracting from the World Heritage Site/National Historic Site of Canada that is the Rideau Canal.

The TPA for the Rideau Canal site is illustrated in **Figure 7.1**.

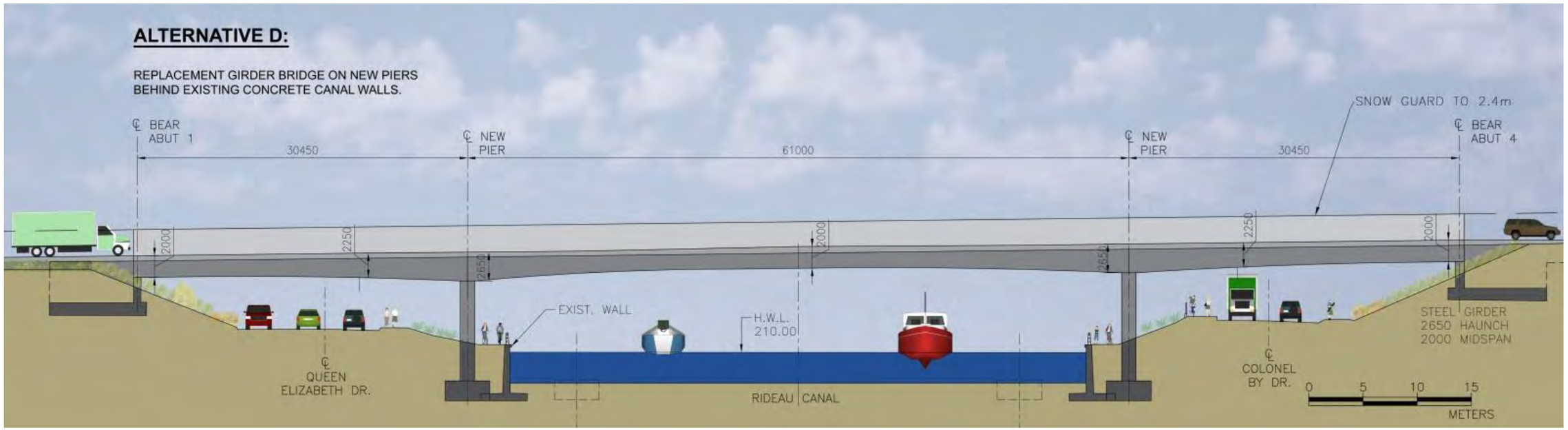


Figure 7.1: Technically Preferred Rideau Canal Replacement Alternative shown at PIC No. 2

8 RIDEAU CANAL BRIDGE REFINEMENTS

The TPA's were presented to the public, stakeholders and agencies at PIC No. 2 (August 2019) and the City of Ottawa Transportation Committee (October 2019). The following concerns were raised during the consultation period:

1. High voltage transmission hydro ducts are buried on the east and west sides of the Rideau Canal and are impacted by the placement of the piers.
2. Acquisition and possible demolition of 221 Echo Drive and 3/5 Hawthorne Avenue. 221 Echo Drive is a community asset and 3/5 Hawthorne Avenue is on the City of Ottawa's Heritage Register for potential heritage value.

This chapter describes the refinements that were developed, analyzed and evaluated following the second PIC to reduce the residual impacts of the project. These refinements were reviewed by technical staff of the NCC, Parks Canada and City of Ottawa as well as the public at a third PIC in the fall of 2022. The following sections describe the two refinements to the TPA:

- Pier location modifications to avoid the Hydro One high voltage transmission cables; and
- Construction staging modification for the Rideau Canal Bridges.

No refinements were considered for the rigid frame bridges recommendations post PIC No. 2.

8.1 Pier Location Refinements

Further technical investigations were completed to define the alignment of the existing 115 kV Hydro One high voltage buried cables along the Colonel By Drive and Queen Elizabeth Driveway parkways. The Hydro cables follow a variable alignment on each side of the canal (behind the existing canal walls), which is in direct conflict with the columns/footings of the new piers illustrated at PIC No. 2. Cost estimates from Hydro One estimated the relocation of the cables to be in the order of $12 million per cable. Therefore, the locations of the piers were re-evaluated, without changing the overall structural design philosophy.

The following pier refinement alternatives were developed and evaluated:

- Alternative 1a: Shift the piers immediately behind the canal walls.
- Alternative 1b: Shift the piers in front of canal walls in-water.
- Alternative 1c: Shift the piers to allow minimum offsets to hydro ducts and relocate canal walls (approx. 1 m shift on a smooth alignment of walls in a new location).
- Alternative 1d: Shift the piers to be integrated with the canal walls either centred on the wall or immediately inside the canal walls.
- Alternative 1e: Piers to remain in existing location in the canal (no conflict with hydro lines or retaining walls).

The rationale for not carrying forward alternatives is described as follows:

- Alternative 1a conflicts with the hydro ducts due to insufficient clearances as required by Hydro One and therefore **not recommended to be carried forward**.
- Alternative 1b conflicts with the pile locations of the existing piers which must remain in place until the new bridge is installed and therefore **not recommended to be carried forward**.
- Parks Canada is not in support of Alternative 1c to shift the canal walls because the wall locations are part of the UNESCO World Heritage Site application and approved designation. Major justification and documentation would be required to demonstrate the need to move the canal walls and would set a precedent for national cultural heritage assets. Alternative 1c is therefore **not recommended to be carried forward**.
- Alternative 1e is **not recommended to be carried froward** as Parks Canada's main goal as a participant in the study was to have the piers relocated from the water.

Alternative 1d received support from Parks Canada and NCC as a compromise approach to maintain the canal walls in their current position with either the pier alignment being centred on the wall, or expanding for the width of the pier inside the canal walls (in-water). Benefits of Alternative 1d include:

- Integrated walls/piers design;
- Maintains the existing location of the walls reflected in the UNESCO World Heritage Site designation of the canal;
- Avoids the impact to the Hydro One high voltage 115 kV lines;
- Offsets the new piles from the piles of the existing piers (that are in the water);
- Piers can be designed as part of the landscape; and
- The preliminary design reflects a concept that will be further refined in detail design but as part of the EA Parks Canada and the NCC accepted approval in principle of this approach.

Additional design and rendering drawings of this alternative are illustrated in **Figure 8-1** and **Figure 8-2**.



Figure 8-1: Alternative D New Pier Location Rendering



Figure 8-2: Alternative D New Pier Location Rendering

8.2 Construction Staging Refinement Alternatives

Based on the comments received during the consultation period for PIC No. 2, the Project Team then reviewed the possible staging alternatives for the Rideau Canal Bridge to minimize impacts to the existing buildings along Echo Drive and Hawthorne Avenue. The refinement alternatives include:

1. Alternative 1: Original TPA shown to the public at PIC No. 2, see **Figure 8-3**.
2. Alternative 2: Minor revisions to Alternative 1 to reduce impacts to property owners, see **Figure 8-4**.
3. Alternative 3: Stage both bridges to the north of the existing Queensway to avoid impacts to properties on Echo Drive and Hawthorne Avenue, see **Figure 8-5**.

The evaluation of the construction staging refinement alternatives is illustrated in **Table 8.1**. Alternative 3 (stage both bridges to the north of the existing Queensway) is recommended to be carried forward as the recommended Construction Staging alternative. Alternative 3 mitigates permanent impacts to community buildings and avoids spanning the 1220 mm diameter regional watermain. The temporary loss of parking for the Tiffany Apartments (from outdoor parking to Catherine Street) and short term (2-year) closure of the parkways will be mitigated.

Table 8.1: Evaluation of Construction Staging Refinement Alternatives

Issue	Alternative 1	Alternative 2	Alternative 3
Permanent Impacts to Community Buildings	Poor (2 properties)	Fair (1 property)	Good (0 properties)
Risk of Impact to Regional Watermain	Yes	Yes	No
Duration of Queensway Closure	4 days	4 days	4 days
Closures of Parkways (Roads and Pathways)	Required	Required	Required
Impact to Marine Navigation	Minimized/ mitigated (25 m navigation channel to be maintained)		
Technical Recommendation	**Not carried forward**	**Carried forward (Statement of Flexibility)**	**Preferred Alternative**

Alternative 3 is the Preferred Alternative for the construction staging of the Rideau Canal Bridge works. Alternative 2 was recognized as feasible and has greater impacts to the community. The EA has incorporated this as a Statement of Flexibility should conditions during the detail design require a change in the construction methodology due tor a constraint unforeseen during the EA.

Construction Staging and Multi-use Path Detours

Scale 1:2000

February 15, 2019

LEGEND:

- EXISTING MTO PROPERTY
- PROPERTY ACQUISITION
- PROPOSED BRIDGE CONSTRUCTION

ARGYLE AVE.

ELGIN ST.

EXISTING PARKING GARAGE ENTRY AND EXIT

EXISTING PARKING LOT

EXISTING PARKING GARAGE (EXIT ONLY)

CLOSE ONE LANE ON CATHERINE ST. (SOUTH SIDE PARKING LANE)

CATHERINE ST.

CLOSE

QUEEN ELIZABETH DRIVEWAY

RIDEAU CANAL

CLOSE PATH

COLONEL BY DR

ECHO DR.

UTILIZE EXISTING PATH

MAIN ST.

GREENFIELD AVE.

HAVELOCK ST.

HARVEY ST

CONTRACTOR LAYDOWN AREA

UTILIZE EXISTING SIDEWALK

E-N/S RAMP

CRANES

HWY 417 WBL

HWY 417 EBL

S-E RAMP

CONTRACTOR SITE ACCESS

TEMPORARY AUXILIARY (LOW HEIGHT) SIGNAL HEAD

ISABELLA ST

CONTRACTOR LAYDOWN AREA

HAWTHORNE AVE.

PRETORIA AVE.

CLOSE PATH

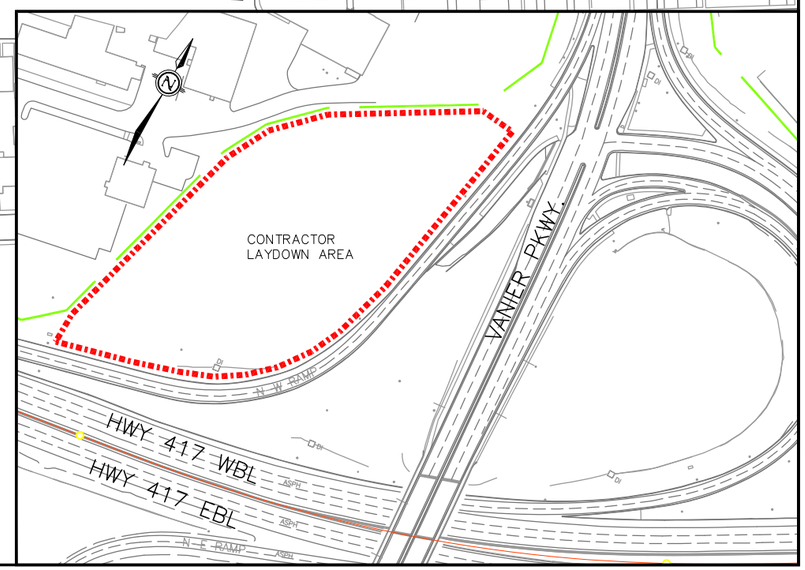
UTILIZE EXISTING PATH

RIDEAU CANAL

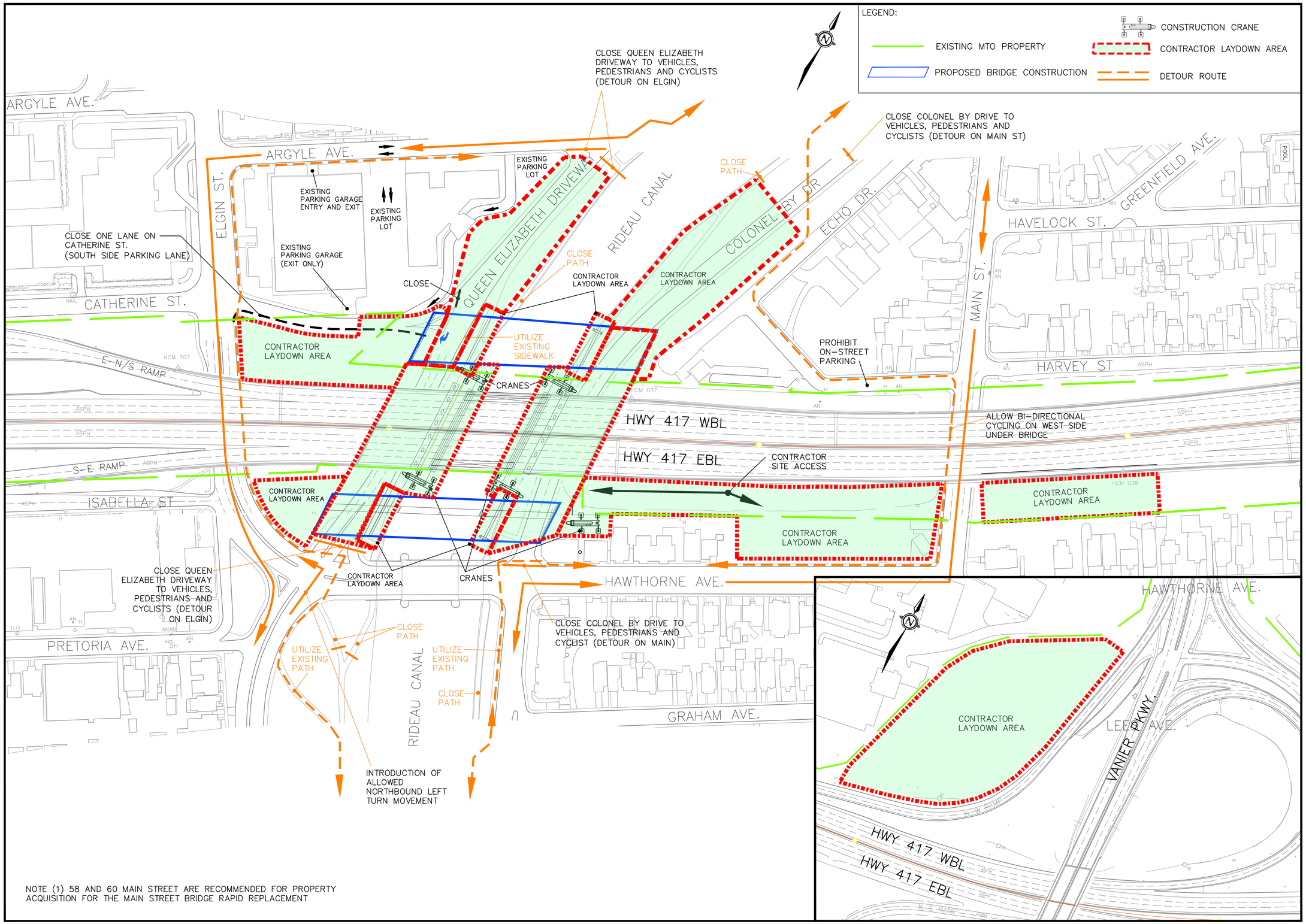
UTILIZE EXISTING PATH

CLOSE PATH

GRAHAM AVE.

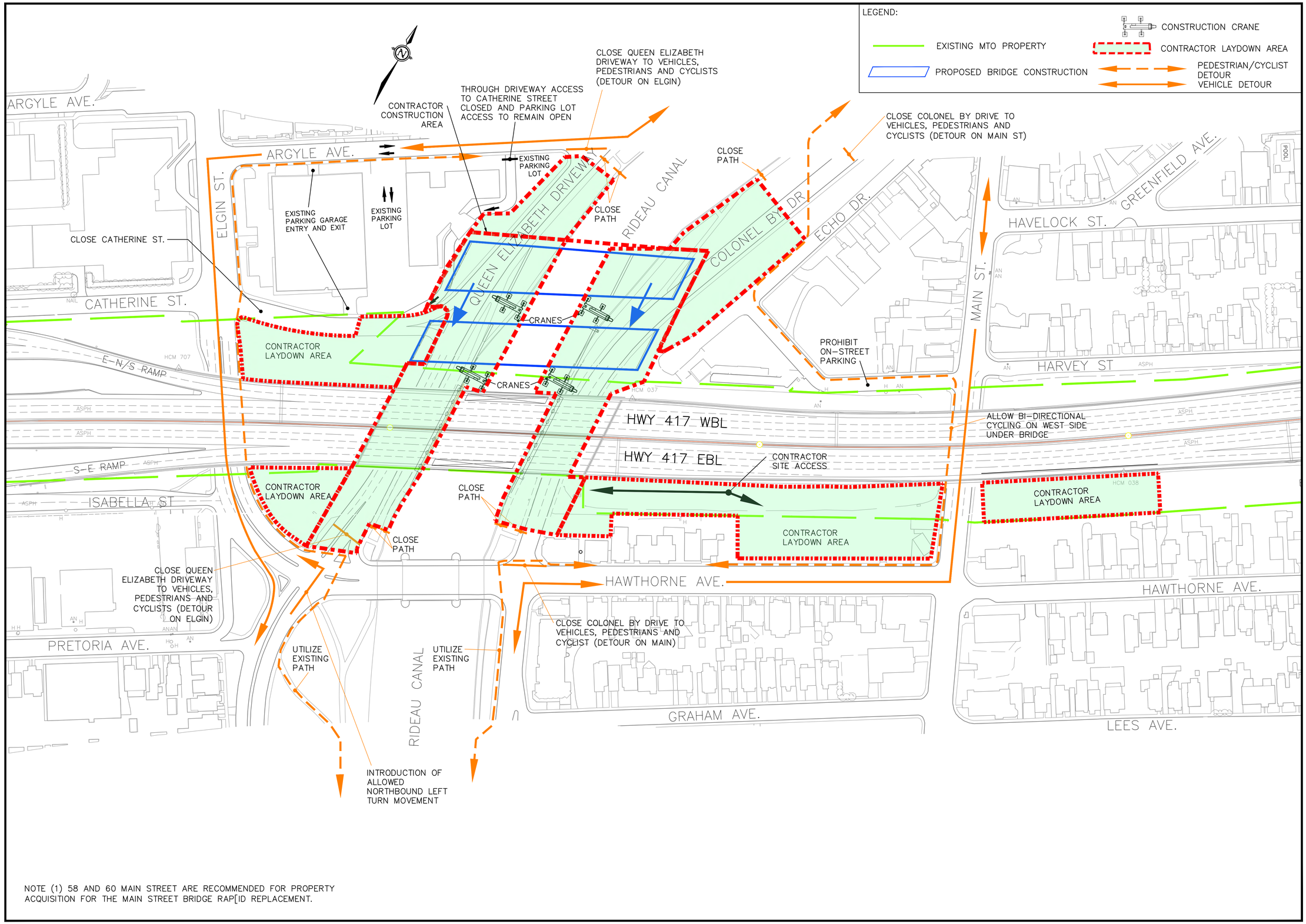


Alternative 2
Construction Staging and Multi-use Path Detours



NOTE (1) 58 AND 60 MAIN STREET ARE RECOMMENDED FOR PROPERTY ACQUISITION FOR THE MAIN STREET BRIDGE RAPID REPLACEMENT

Alternative 3 (TPA)
Construction Staging and Multi-use Path Detours



NOTE (1) 58 AND 60 MAIN STREET ARE RECOMMENDED FOR PROPERTY ACQUISITION FOR THE MAIN STREET BRIDGE RAP[ID REPLACEMENT.

9 TECHNICALLY PREFERRED PLAN (PIC NO. 3) AND STATEMENT OF FLEXIBILITY

9.1 Technically Preferred Plan

The Technically Preferred Plan (TPP) is presented in this section for two separate groups of bridges with similar structural designs. It describes the group of three medium span rigid frame bridge sites (five structures) and the Rideau Canal Bridge site (two longer 3-span structures).

9.2 Rigid Frame Bridges (Metcalfe Street, Elgin Street and Main Street)

The rigid frame bridge replacement strategies include:

- Metcalfe Street: rapid bridge replacement
- Elgin Street: rapid bridge replacement
- Main Street: rapid bridge replacement

9.3 Rideau Canal Bridge

The Rideau Canal bridges are recommended for replacement using a combination of complete closures of the Queensway for the traffic management on an extended weekend in combination with accelerated bridge construction techniques. The replacement type is a replacement bridge with variable depth girder on new pier location and the construction staging will utilize staging sites on the north side of the Queensway using the jack and slide replacement method to replace the existing bridges.

9.4 Statement of Flexibility

The TAC, along with the MTAC and FAC, has supported an approach within the TESR that will allow the Ministry flexibility in the structural management plan. Acknowledging that the Province may have other competing priorities which could affect this large capital investment plan, the TESR has included a statement of flexibility for the bridges. This is to allow the MTO to modify individual bridge site recommendations in future as required by funding availability or other considerations. The statement of flexibility was presented to the public at PIC No. 2 and PIC No. 3. The bridges and their corresponding recommendations are presented in **Table 9.1**.

The summary of the evaluation, Technically Preferred Alternative (TPA), and where the TESR will identify a statement of flexibility is illustrated in **Table 9.1**.

Table 9.1: Ottawa Queensway Downtown Bridges Summary of Evaluation Results

Bridge Site	MATS Evaluation Rankings/Scores			TPA (based on MATS rankings and Implementation Considerations)	Statement of Flexibility within TESR for Alternate TPA
	1st	2nd	3rd		
Metcalfe Street	Alt B-C1/ 82.25	Alt A-A2/ 60.80	Alt A-A1/ 59.22	Rapid Replacement (Alt B-C1)	Conventional Rehabilitation (Alt A-A2)
Elgin Street	Alt B-C1/ 85.00	Alt A-A2/ 58.34	Alt B-B1/ 52.96	Rapid Replacement (Alt B-C1)	Conventional Rehabilitation (Alt A-A2)
Main Street	Alt B-C1/ 70.21	Alt A-A2/ 68.67	Alt A-A1/ 64.54	Rapid Replacement (Alt B-C1)	Conventional Rehabilitation (Alt A-A2)
Rideau Canal	Alt D-4/ 81.66	Alt D-2B/ 80.33	Alt D-5/ 80.07	Jack and Slide Replacement (Alt D-4)	Conventional Rehabilitation (Alt F)
Rideau Canal Staging				Staging sites on the north side of the Queensway	Staging sites on both the north and south sides of the Queensway

Appendix A
Assessment of the Alternatives to the Undertaking

Ce document hautement spécialisé n'est disponible qu'en anglais en vertu du règlement 671 / 92, qui en exempte l'application de la Loi sur les services en français. Pour de l'aide en français, veuillez communiquer le ministère des Transports au (416) 585-6310.

Ottawa Queensway Downtown Bridges Preliminary Design and Environmental Assessment Study for Rehabilitation/Replacement GWP 4170-13-00

Assessment of Alternatives to the Undertaking

October 13, 2017



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1.0 Introduction

The Ontario Ministry of Transportation (MTO) has retained BT Engineering Inc. (BTE) to undertake a Preliminary Design and Environmental Assessment Study for the rehabilitation and / or replacement of 7 bridges (4 locations) on Highway 417 (Ottawa Queensway) from Metcalfe Street to Main Street. This study will determine the appropriate strategy for the rehabilitation or replacement of the bridges. The Study Area, as shown in **Figure 1**, is located in the City of Ottawa. The effects of detours during construction will be considered within a Broader Study Area, as shown in **Figure 2**.

Several alternatives will be reviewed for each bridge including structural and construction staging options in order to minimize disruption to Highway 417. In addition, engineering, environmental, and property requirements will be established, along with the identification of mitigation measures to reduce or negate short and long term residual effects.

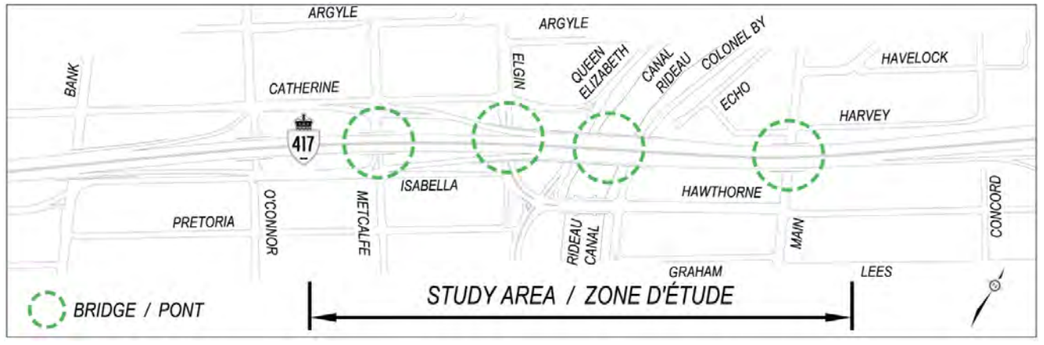


Figure 1: Study Area

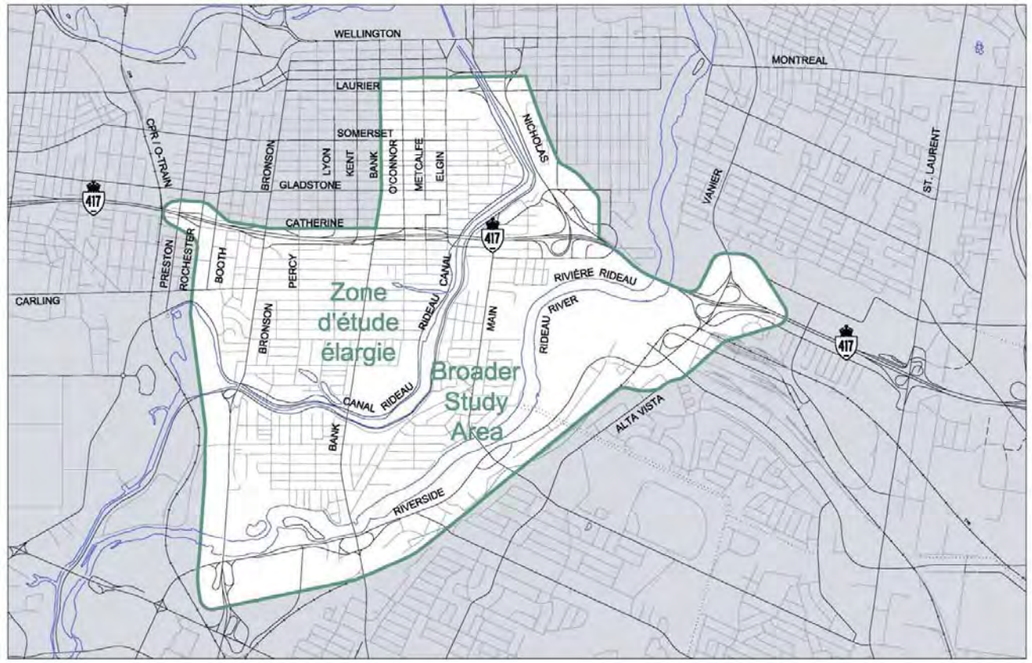


Figure 2: Broader Study Area

G.W.P. 4170-13-00 Preliminary Design and Environmental Assessment Study for the Rehabilitation/
Replacement of Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Assessment of Alternatives to the Undertaking
Revision 2: October 12, 2017

2.0 Background

The overall network planning for the Queensway corridor was previously defined as part of an Environmental Assessment (EA) Study completed in 2007. That study concluded that there would be only limited expansion (widening) within the study area being considered as part of this current EA. The 2007 recommendations included extension of the westbound auxiliary lane to the Metcalfe Street exit which includes a widening over the Rideau Canal structure. Subsequent post-2007 studies are being undertaken to consider preliminary design projects for bridge rehabilitations or replacements. This current study is a preliminary design study that focuses on 7 bridges in the Study Area. Other projects are also being implemented that focus on ramp operational improvements and bridge replacements.

2.1 Purpose of the Report

The purpose of this report is to document the analysis and evaluation of Alternatives to the Undertaking (Alternative Planning Solutions) for this preliminary design project that will be carried forward to address the problem of aging bridge infrastructure. This report is concerned with the bridges and does not review the broader alternative planning strategies for the overall corridor that were considered in 2007.

2.2 Scope

This project will identify a bridge management strategy to address the structural needs of the Queensway Downtown bridges. These overpass bridges are:

- Site No. 3-65 - Highway 417 over Metcalfe Street
- Site No. 3-66.1 - Highway 417 EBL over Elgin Street
- Site No. 3-66.2 - Highway 417 WBL over Elgin Street
- Site No. 3-67.1 - Highway 417 EBL over Rideau Canal
- Site No. 3-67.2 - Highway 417 WBL over Rideau Canal
- Site No. 3-68.1 - Highway 417 EBL over Main Street
- Site No. 3-68.2 - Highway 417 WBL over Main Street

This assignment is following the Class Environmental Assessment process for Group B projects under MTO's Class Environmental Assessment for Provincial Transportation Facilities, 2000. At the completion of this study, a Transportation Environmental Study Report will be prepared and published for public review.

The assessment of the Alternatives to the Undertaking is a mandatory requirement of the Class EA and is completed early in the preliminary design process, as shown in **Figure 3**.

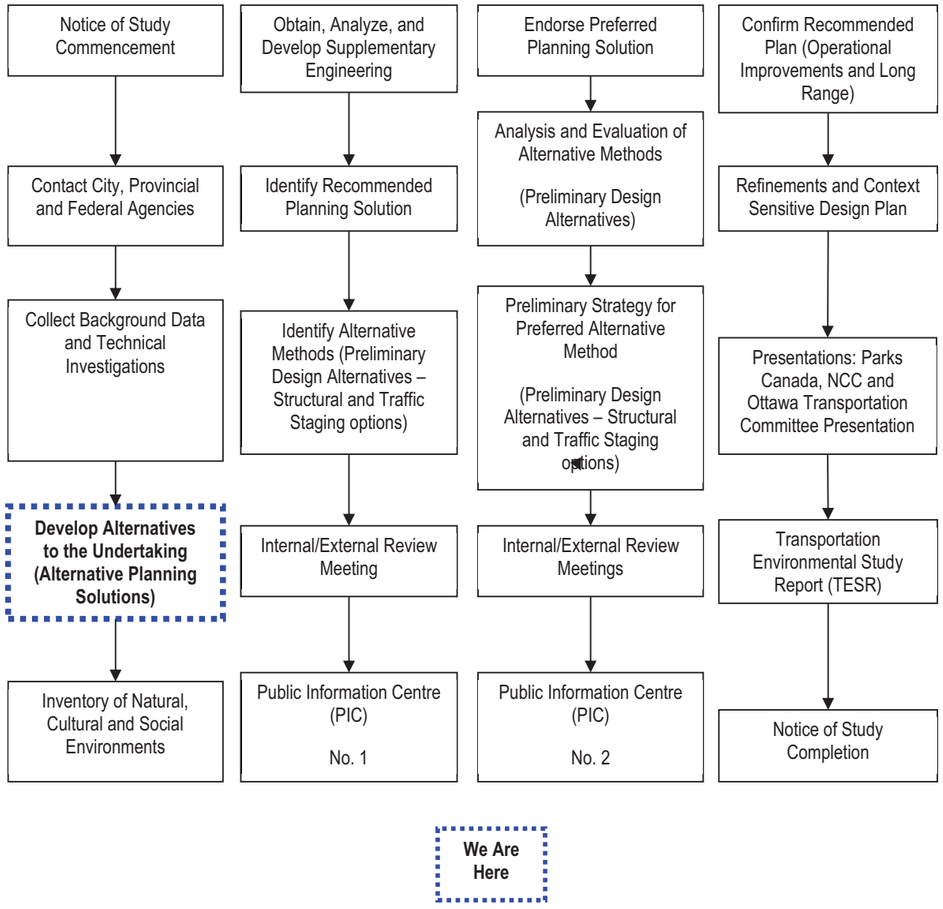


Figure 3: Generalized Preliminary Design (PD) Planning Process

3.0 Problem/Opportunity Statement

The 7 Ottawa Queensway Downtown bridges reflect two overpass bridge types from the original Queensway construction during the 1959 to 1968 period. The Queensway Rideau Canal bridge is a three-span post tensioned concrete girder bridge and the remaining 5 bridges are rigid frame type bridges which are jointless and continuous from the deck to the footings, making them a more durable bridge type. An overall study is required to determine the most feasible rehabilitation / replacement strategy, with emphasis on the Rideau Canal Bridge. The Rideau Canal Bridge is nearing the end of its service life and the plan for this bridge may influence or govern the traffic staging plan for the adjacent rehabilitation or replacement of the rigid frame bridges. Consequently, all 7 bridges may have a common traffic staging component.

Based on the engineering assessments completed to date, the Problem / Opportunity Statement for this study is as follows:

- A bridge management plan is to be established for 7 bridges on the Ottawa Queensway with consideration of traffic staging alternatives and impacts.
- The Rideau Canal Bridge is nearing the end of its service life and is also in need of design upgrades (seismic).
- Replacement or rehabilitation of the adjacent rigid frame bridges to the east and west of the Rideau Canal Bridge is required and may be staged to coincide with the Rideau Canal bridge improvements, which may dictate the overall traffic staging strategy.
- Rigid frame bridges require seismic assessment and assessment of soil pressure on abutment walls.

4.0 Alternatives to the Undertaking

Alternatives to the Undertaking represent alternative ways or methods of addressing the Problem / Opportunity Statement specific to the study. In this study, the focus is on four bridge locations. These reflect different strategies and include the "Do Nothing" approach (maintaining the status quo but not addressing the Problem / Opportunity Statement).

Following the assessment of Alternatives to the Undertaking, those alternatives judged to address the Problem / Opportunity Statement will be carried forward and will form the Recommended Planning Solution or "Transportation Undertaking". The selected Transportation Undertaking will provide for the safety of the travelling public on these bridges and provide a cost effective bridge management plan, while providing the best overall balance between the structural and transportation engineering objectives, life cycle costs, and other environmental, cultural, socio-economic, and land use planning objectives.

In developing Alternatives to the Undertaking, a number of general principles and objectives are being considered, that take into consideration; the location, type, and number of bridge sites. They include:

- Satisfy existing code requirements of the bridges;
- Provide for the efficient movement of people and goods during the staging of the projects by minimizing or avoiding long term multi-lane closures on the Queensway;
- Ensure the safety of the travelling public;
- Ensure the technical feasibility of construction, operation and maintenance;
- Minimize the environmental impacts and the use of non-renewable natural resources such as aggregates;
- Consider community impacts of construction operations using lands available now (or in the future) for staging areas within the urban fabric to minimize effects of the project
- Minimize the number of disruptions to the travelling public by grouping of projects together in order that they occur in the same time period; and
- Consider the linkage of the communities divided by the Queensway and context sensitive design solutions that may improve the aesthetics of these bridges as viewed from the streets and avenues.

It should be noted that the assessment of broader transportation strategies, such as mass transit initiatives or other transportation modes, are more appropriately considered for larger network links in the overall provincial transportation system and were considered in the 2007 EA Study: GWP 663-930-00 Highway 417 (Ottawa Queensway) from Highway 416 to Anderson Road. This Study evaluated 10 Alternatives to the Undertaking and recommended three: do nothing; improve existing highway with strategic widening and intersection modifications; and implement transportation demand management and advanced traffic management systems for the 28 km. long Queensway corridor. These strategies are not considered applicable for bridge management studies such as the 2016 EA Study GWP 4075-11-00 Rehabilitation/ Replacement of Ottawa Mid-town Bridges from Holland Avenue to O'Connor Street with 23 bridges at 13 locations, and this study with 7 bridges at 4 locations.

The following feasible cost effective Preliminary Design Alternatives to the Undertaking were identified:

G.W.P. 4170-13-00 Preliminary Design and Environmental Assessment Study for the Rehabilitation/ Replacement of Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Assessment of Alternatives to the Undertaking
Revision 2: October 12, 2017

1. Alternative 1: The "Do Nothing" Alternative maintains the status quo of the existing bridges with no significant actions taken to manage aging infrastructure. This approach would accept further deterioration within the 20 year planning horizon and the associated structural risks of failures.
2. Alternative 2: In accordance with the MTO Class EA, the alternative would be new and/or improved (rehabilitated) Provincial Transportation Facilities. Since the bridges already exist, the alternative could be simply referred to as "Management of Bridge Infrastructure"

    Alternative 2a: Rehabilitate the existing bridges to extend their service lives including structural upgrades to meet existing code requirements.

    Alternative 2b: Replace the existing bridges with a new bridge.

The identified opportunities for enhanced safety and aesthetics through context sensitive design are important aspects of the project that will be considered as part of the criteria used for the evaluation of the above Alternatives to the Undertaking, and through the subsequent evaluation of Alternative Methods (or Preliminary Design Alternatives). Similarly, the opportunity to maintain / improve personal safety and security for users of the multi-use pathway along the Rideau Canal will be considered as part of the evaluation of the above Alternative Planning Solutions and through the subsequent evaluation of Alternative Methods.

5.0 Evaluation of Alternatives to the Undertaking

The analysis and evaluation of Alternatives to the Undertaking is a critical requirement of the Environmental Assessment process.

A qualitative evaluation process was utilized for the assessment of Alternatives to the Undertaking, as the number of alternatives and evaluation criteria were limited. The alternatives were assessed using the following evaluation factors:

- **Safety:** How well does the strategy protect the travelling public by ensuring adequate structural capacity and by meeting current seismic requirements for earthquake events?
- **Durability:** How does this strategy provide a durable structure to inhibit deterioration of the bridges for the next cycle of repairs / rehabilitation?
- **Constructability:** Is this strategy constructible in the Queensway corridor?
- **Transportation Service**: How well does the planning solution manage existing infrastructure to maintain the transportation system and accommodate local pedestrian, cyclist, vehicle and transit trips currently travelling under these bridges?
- **Environmental**: How does the solution affect the natural, cultural, and social environments including the potential for context sensitive design?
- **Cost**: What are the financial implications of the solution?

The description and assessment of the Alternatives to the Undertaking are summarized in **Table 1: Evaluation of Alternatives to the Undertaking.**

Table 1: Evaluation of Alternatives to the Undertaking

Alternative 1 - The "Do Nothing" Alternative	Alternative 2- Management of Bridge Infrastructure	
	Alternative 2a - Rehabilitate Overpass Bridges	**Alternative 2b - Replace Overpass Bridges**
• Alternative 1: The "Do Nothing" Alternative maintains the status quo of existing bridge infrastructure with no significant actions taken to manage aging infrastructure. This approach would accept further deterioration within the 20 year planning horizon.	• Alternative 2: Rehabilitate the existing bridges to extend their service lives including structural upgrades to meet existing seismic code requirements.	• Alternative 3: Replace the existing bridges.
STRUCTURAL		
• Existing design does not meet current code requirements and would accept risk of structural failure and reduced life safety	• Rideau Canal bridge to include seismic retrofit • Rigid frames to include replacement of barrier walls,	• Replacement bridges will meet current code requirements

protection.	approach slabs, removal of pavement and waterproofing and concrete overlay, deck repairs to deteriorated areas of deck (assumed to be minimum 10 %), soffit repairs and frame leg repairs	
DURABILITY		
• Does not address the deterioration of existing structures and will accelerate deterioration of structure	• Will extend the service lives of bridges to a next planned rehabilitation cycle (objective for 20 + years). The Rideau Canal bridge requires extensive repairs to extend its service life	• Will create a new 75 year service life of each bridge.
CONSTRUCTIBILITY		
• Construction risk / uncertainty associated with emergency repairs. MTO have had to conduct emergency lane closures to address structural issues on bridges on the Queensway of the same age and condition.	• Moderate constructability requirements to stage construction	• Moderate constructability requirements to stage construction
TRANSPORTATION		
• Do Nothing approach will not maintain the existing road network without continued ongoing repairs to the existing bridges. As the bridges reach the end of their service lives the risk of failure and lane closures will increase.	• This approach will manage the infrastructure asset • Limited potential for enhancement of pedestrian / cycling safety and facilities at rigid frames bridges – with higher potential at the Rideau Canal bridge • This approach does not eliminate the need to replace structures but postpones the replacement to a future rehabilitation/replacement cycle.	• This approach will manage the infrastructure asset • Higher potential for enhancement of pedestrian / cycling safety and facilities under the Rideau Canal bridge.
ENVIRONMENTAL		

• No significant negative or positive effects • Context sensitive design elements could be undertaken	• Minimal environmental effects within existing Highway 417 right-of-way • Temporary disruption to local streets / avenues and Highway 417 traffic • Potential for positive environmental effects to community through context sensitive design	• Minimal environmental effects within existing Highway 417 right-of-way • Temporary disruption to local streets / avenues and Highway 417 traffic • Potential for positive environmental effects to community through context sensitive design
COST[1]		
Magnitude of Capital Cost No cost	**Magnitude of Capital Cost:** $3 M (for rigid frames, per bridge) $7 - 10 M (for Rideau Canal, per bridge)	**Magnitude of Capital Cost:** $5.5 M (rigid frames, per bridge) conventional replacement excluding high societal delay costs for freeway lane closures $7.7 - 11.5 M (rigid frames, per bridge) for Rapid Replacement $13 M (for Rideau Canal, per bridge) conventional replacement excluding high societal delay costs for freeway lane closures $13 M (for Rideau Canal, per bridge) rapid jack and slide technology
Magnitude of Cost (Net Present Value including future rehabilitations and replacements): No cost	**Magnitude of Net Present Value Cost:** $4.5 M (rigid frames, per bridge) $15 M (for Rideau Canal, per bridge)	**Magnitude of Net Present Value Cost:** $6 M (rigid frames, per bridge) conventional replacement $8 - 12 M (rigid frames, per bridge) for Rapid Replacement $20 M (for Rideau Canal, per bridge) conventional replacement $20 M (for Rideau Canal, per bridge) rapid jack and slide technology
RECOMMENDATIONS WHETHER TO CARRY FORWARD		
Based on the significance of maintaining the provincial road network it is recommended that the "Do Nothing" approach **NOT be carried forward**.	**Rigid Frame Bridges:** Based on the condition assessments of the existing rigid frame bridges there may be additional service life available in these bridges and this	**Rigid Frame Bridges:** It is recommended that the new bridge replacement options **be carried forward for comparison with the rehabilitation alternatives**.

	may be a cost effective approach for one or more of the bridges. Therefore rehabilitation of the rigid frame bridges is **recommended to be carried forward.** **Rideau Canal Bridge:** Based on the poor condition of the existing bridge and the significant cost of seismic upgrades required for this bridge type, rehabilitation is **recommended** to be carried forward as a fall back strategy should any delays result that postpone a replacement strategy.	**Rideau Canal Bridge:** Based on the poor condition of the existing bridge and the significant cost of seismic upgrades required for this bridge type, replacement alternatives **are recommended to be carried forward**.

1. Notes:

- All costs are based on a single EB or WB structure.
- Rideau Canal rehabilitation includes northern widening to provide 2007 TESR recommended cross section.

6.0 Summary and Preliminary Recommendations

Rigid Frame Bridges:

To address the immediate needs of the Ottawa Queensway downtown bridges, it is recommended that the rigid frame bridge structures be rehabilitated or replaced and that the methods of staging the construction be considered in order to select the most preferred approach that can minimize community disruption and costs during these works. The range of environmental effects associated with staging these improvements (within the 20 year planning horizon) will be assessed. Context sensitive design features can be included.

Rideau Canal Bridge:

Based on the structural investigation, the existing multi-span bridge overpass of the Rideau Canal, Queen Elizabeth Drive and Colonel By Drive will require significant capital investment to repair the deterioration to the bridge and upgrade the structural capacity for current seismic loading. The rehabilitation strategy is recommended to be carried forward as a baseline to compare all other alternatives and as a fall back strategy should any delays result in postponing the replacement of the structure. The replacement strategy is recommended to be carried forward and alternative methods investigated. Context sensitive design features can be included.

Context Sensitive Design Treatments:

The inclusion of context sensitive design treatments, that can improve the aesthetics of each bridge site, is recommended to be considered further as part of the Assessment of Alternative Methods. These elements need to be assessed at each potential location with community input to define site specific landscaping, lighting and aesthetic elements that can be coordinated with the proposed bridge projects.

Table 2 presents the results of the preliminary evaluation of Alternatives to the Undertaking.

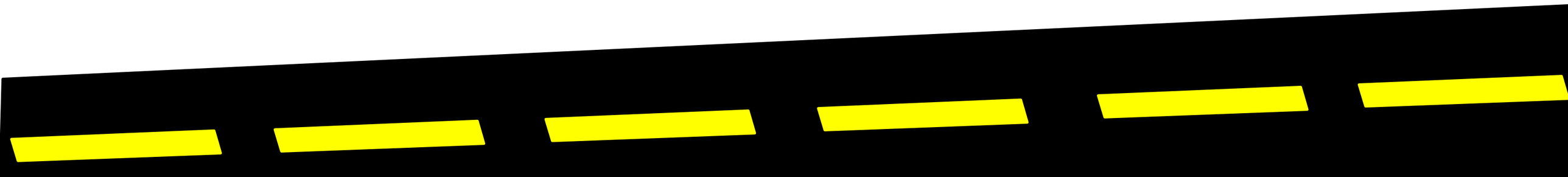
The preliminary assessment of Alternatives to the Undertaking will be presented at Public Information Centre No. 1 to solicit public input. The Recommended Undertaking may be modified, based on public input following the PIC.

Table 2: Summary of the Assessment of Alternatives to the Undertaking

Alternative 1 - The "Do Nothing" Alternative	Alternative 2 – Management of Bridge Infrastructure	
	Alternative 2a	Alternative 2b
The "Do Nothing" Alternative maintains the status quo of existing bridge infrastructure with no significant actions taken to manage aging infrastructure. This approach would accept further deterioration within the 20 year planning horizon.	Alternative 2 - Rehabilitate Overpass Bridges	Alternative 3 - Replace Overpass Bridges
X	✓	✓
DO NOT CARRY FORWARD	CARRY FORWARD (Rideau Canal Bridge and Rigid Frame Bridges)	CARRY FORWARD (Rideau Canal Bridge and Rigid Frame Bridges)

Appendix B

Evaluation Methodology Report



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Ottawa Queensway Downtown Bridges Preliminary Design and Environmental Assessment Study for Rehabilitation/Replacement GWP 4170-13-00

Evaluation Methodology Report

November 22, 2017

BT Eng Project 17-010

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1.0 Introduction

The Analysis and Evaluation process is a requirement of the Environmental Assessment (EA) process; the framework is provided by the Ministry of the Environment and Climate Change (MOECC) Evaluation Methods in Environmental Assessment.

This document describes the qualitative and quantitative methods of evaluation and which approaches will be utilized for different groups of alternatives for this study.

An evaluation method may be defined as a formal procedure for establishing an order of preference among alternatives[1]. The use of a formal evaluation method has two main advantages: it provides a better basis for decision-making than would otherwise exist and it results in reasons for decisions that, on examination, can be traced.

The selection of an evaluation method should consider the following generic factors:

- Various evaluation methods have different capabilities which support different planning processes that may be better suited to a particular project or stage of the EA.
- With any particular planning process, all the steps (such as identifying alternatives, selecting criteria, consulting and involving interested parties, as well as evaluating) must be reasonable and provide a systematic assessment of the net effects of the project.

The selection of the appropriate evaluation methodology depends upon the:

- Complexity of the decision-making;
- Number of alternatives;
- Number of criteria; and
- Sensitivity of the decision.

These issues are described in the following sections which explain the rationale for utilizing the most appropriate evaluation methodology in each stage of the EA study.

[1] Evaluation Methods in Environmental Assessment, Ministry of Environment, 1990.

2.0 Study Area

The Ontario Ministry of Transportation (MTO) has retained BT Engineering Inc. (BTE) to undertake a Preliminary Design and Environmental Assessment Study for the rehabilitation and/or replacement of 7 bridges (4 locations) on Highway 417 (Ottawa Queensway) from Metcalfe Street to Main Street. This study will determine the appropriate strategy for the rehabilitation or replacement of the bridges. The Study Area, as shown in **Figure 2-1**, is located in the City of Ottawa. The effects of detours during construction will be considered within a Broader Study Area, as shown in **Figure 2-2**.

Several alternatives will be reviewed for each bridge including structural and construction staging options in order to minimize disruption to Highway 417. In addition, engineering, environmental, and property requirements will be established, along with the identification of mitigation measures to reduce or negate short and long term residual effects.

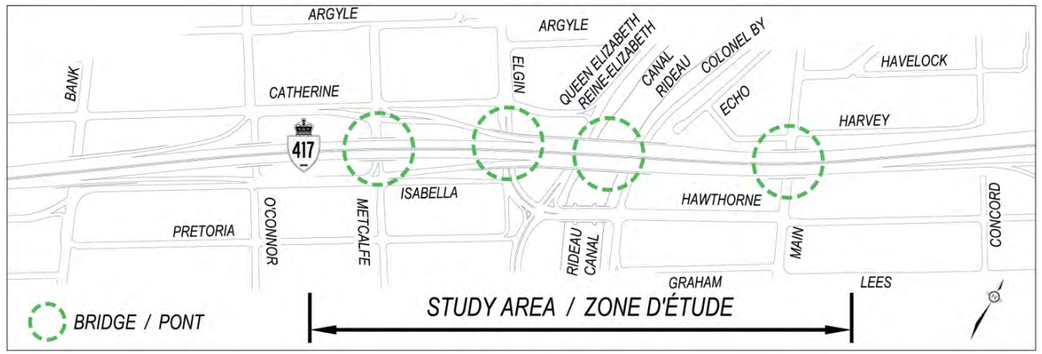

Figure 2-1: Study Area

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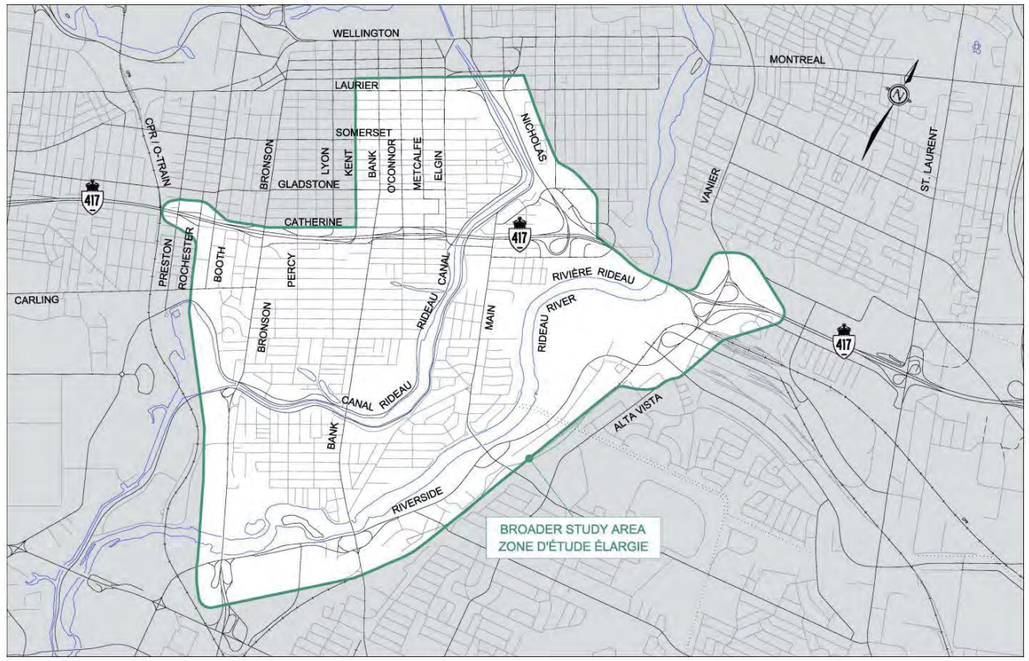

Figure 2-2: Broader Study Area

3.0 Consultation

Public participation is a key component to the success of this project. Early public involvement is encouraged to establish a sound understanding of the public's concerns and views, to identify areas of concern and major study issues, and to promote a working relationship with the public that is amicable and cooperative rather than adversarial.

3.1 Public, Property Owner and Stakeholder Consultation

The public will be engaged through the use of a study web site (Queenswaydowntownbridges.com), Public Information Centre (PIC) meetings, and one-on-one meetings with directly affected property owners. This includes meetings and consultation with businesses, interest groups and community groups that have an interest in providing comments on project elements such as evaluation criteria, context sensitive designs at each of the bridges and bridge type.

3.2 Municipal Technical Advisory Committee

Consultation with a Municipal Technical Advisory Committee (MTAC) is an on-going task during the study. The City of Ottawa will provide feedback to the Technical Advisory Committee (TAC), comprised of MTO and consultant staff, on issues concerning the general public and municipal interests.

3.3 Federal Advisory Committee

Consultation with a Federal Advisory Committee (FAC) is an on-going task during the study. The National Capital Commission, Parks Canada and Transport Canada will provide feedback to the TAC on issues concerning federal interests.

3.4 Public Information Centre (PIC) No. 1

The purpose of the initial PIC is to present the draft Study Design, background information, inventories, a preliminary list of evaluation factors and the long list of Preliminary Design Alternatives.

3.5 Public Information Centre (PIC) No. 2

The second PIC will be to present the results of the evaluation in the form of a Technically Preferred Alternative (TPA) for each bridge site and respond to questions and concerns from the public.

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4.0 Qualitative Evaluation Methodology

A qualitative evaluation method involves describing impacts in narrative terms, or through qualitative measures, without the explicit specification of criteria, ratings or weights. This method, often termed "professional judgment" is widely used in EA's to assess 'Alternative Planning Solutions'. For example, an EA involving the selection of a corridor might evaluate alternative routes in considerable detail using a formal quantitative evaluation, but the evaluation of 'Alternatives To' might be done using a qualitative approach. See **Table 4-1** for an example of the qualitative evaluation approach.

A disadvantage of the qualitative approach is the difficulty in recognizing when a comparison will have intuitive choice or universal support (public), i.e. a simple decision easily accepted. A qualitative approach may also be less defensible or subject to criticism. Risk management is an important issue and should the public or stakeholders question these early decisions, additional information may be required to substantiate or detail the rationale for the early decisions. When alternatives are not systematically compared against a specified set of criteria, it may be difficult to follow how the decision was made and what evidence supports it.

Some advantages of using a qualitative approach over a quantitative approach include: reduced cost, reduced time, and ease of presentation to the public. A qualitative approach is often used to evaluate alternatives where there is a clear conclusion and low public concern. The qualitative approach is also suitable where there are few alternatives and few criteria where there are measureable and meaningful differences between options being considered.

Table 4-1: Sample Qualitative Evaluation

Factor Group	Intersection Alternatives		
	Alternative 1 Two Leg Stop Control	**Alternative 2 Three Leg Stop Control**	**Alternative 3 Roundabout**
Transportation			
Traffic Operations	-	-	✓
Safety	-	-	✓
Property/Land Use			
Property Impacts	✓	✓	×
Natural Environment			
Impacts to Natural Environment	-	-	-
Social/Cultural			
Social Environment	-	-	✓
Cost			
Cost	✓	✓	-
Evaluation Results	×	×	✓ Carried forward
✓ Good in Comparison	- Fair/Equal in Comparison	× Poor in Comparison	Preferred Alternative

Where there are few criteria, such as in **Table 4-1**, it is generally acceptable to use a qualitative analysis because the trade-offs are clear and understandable. The more rigorous definition of the attributes of each alternative, as would be possible using a quantitative approach, is not required because there are too few variables.

For this study, the qualitative approach will be used to assess Alternatives to the Undertaking and for the Coarse Screening of the initial long list of preliminary design alternatives.

The use of a more comprehensive evaluation technique becomes necessary as the complexity increases (i.e. number of alternatives and number of criteria). In these situations, as described in **Section 5.0**, this study will utilize a quantitative approach.

5.0 Quantitative Evaluation Methodology

Key principles of the EA Act and MOECC's Guidelines on Environmental Assessment Planning and Approval are that there be accountability and traceability. A quantitative evaluation method allows both of these key principles to be maintained. A quantitative method based on the "Weighted Additive Method" will be used for this study and is also referred to as the "Multi-Attribute Trade-off System" (MATS).

The Weighted Additive Method has proven to be well suited for the evaluation of complex groups of alternatives. The methodology allows for sensitivity testing and the ability to answer "what if" questions. It is used on projects where alternatives are to be evaluated and the decision making process is faced with either a large number of alternatives or a large number of competing criteria among the alternatives being evaluated.

The Weighted Additive Method is consistent with MOECC practices for the evaluation of alternatives. It avoids many of the pitfalls associated with qualitative assessments by using an analytical approach that measures scores based on a mathematical relationship, i.e. the degree of subjectivity by the TAC is minimized. A traceable process allows the TAC and public an opportunity to assess trade-offs involved in the evaluation and use this information in the decision-making process. In addition, this quantitative method allows sensitivity tests to be performed to determine if the highest ranked alternative is affected by changing the weights (perspective of importance) of the assessment factors.

For this study, preliminary design alternatives will be compared and scores assigned to each of the various assessment factors, and a sensitivity-testing program will be completed in consultation with the public and external agency interaction.

When using the Weighted Additive Method, each member of the TAC assigns a weight to the Global Factors and sub-factors. The Average TAC Weight is assigned to each of the alternatives. The alternative with the highest score is selected as the Technically Preferred Alternative (TPA). The steps followed to arrive at an overall score for each alternative are shown in **Figure 5-1**.

This systematic approach includes the following steps:

- Collection of data/environmental inventories
- Development of a long list of reasonable alternatives (including coarse screening options that are unfeasible or unreasonable in comparison to those being carried forward)
- Development of a long list of global evaluation criteria/performance sub-factors
- Short listing of sub-factors to those where there are meaningful differences among the alternatives to be compared
- Establishing Social Utility Functions (Performance Factors or Function Forms) for the short listed sub-factors
- Weighting of Evaluation Criteria (assigning importance based on the specific set of alternatives)
- Rating of Alternatives
- Sensitivity Testing
- Selection of TPAs

- Public Review
- Refinements to the Technically Preferred Plan (TPP)
- Recommended Plan

These steps, as they relate to this project, are briefly described in the following sections.

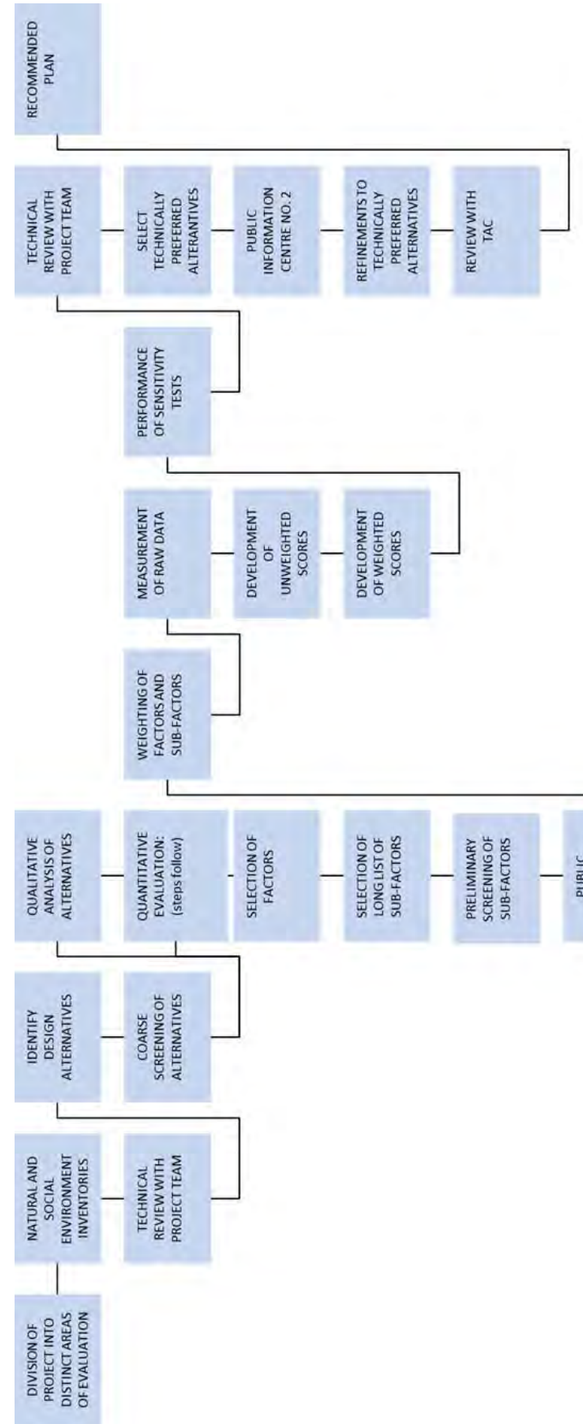

Figure 5-1: Quantitative Evaluation Process

5.1 Evaluation Criteria – Factors

The initial test in the evaluation is to develop evaluation criteria from which alternatives will be assessed. This is a two-step process that involves the selection of a "global" group of factors and a number of "local" sub-factors under the global groups.

The global factors groups will be presented to the public, and following this consultation will be accepted as describing the broad definition of the environment to be evaluated. Global factors considered for this study may include:

- Traffic and Transportation;
- Natural Environment;
- Social and Cultural Environment;
- Economic Environment;
- Cultural Environment;
- Land Use and Property; and
- Cost.

While these factor groups are the starting point for the evaluation, one or more factors could be removed if it was determined that there was no sub-factor in this category i.e. there is not a meaningful and measureable difference between the alternatives being assessed in this category. When a particular factor is carried forward, then one or more sub-factors are considered under this group. These sub-factors are the individual descriptors for the evaluation. The selection of the sub-factors is very important to the decision making process because they must adequately describe the issue to be evaluated and the alternatives being compared. See **Table 5-1** for a sample preliminary listing of sub-factors. Any information regarding an alternative, where there are differences among alternatives, is incorporated into the decision-making process by including it as a sub-factor. The benefit to incorporating two levels of evaluation criteria (global factors and local sub-factors) is the prevention of the unbalancing of the evaluation (that could occur by adding more criteria under one group). Weights are assigned to the global factors to eliminate any possibility of skewing the results by selecting a large number of sub-factors in one particular factor group.

Table 5-1: Sample Long List of Evaluation Criteria (Global Factors and Sub-factors)

Traffic and Transportation	
1. Highway 401 Safety	×
2. Highway 401 Detour Duration	✓
3. Cornwall Centre Road Detour Duration	✓
4. Out Of Way Travel	✓
5. Traffic Delay, Highway 401	×
6. Risk of Queuing	✓
7. Disruption to Bicycles and Pedestrians	✓
8. Design Standard	✓
9. Design Speed	×

Table 5-1: Sample Long List of Evaluation Criteria (Global Factors and Sub-factors)

10. Radius of Horizontal Curves	×
11. Radius of Vertical Curves	×
12. Consistency with Adjacent Highway Design Elements	×
13. Safety of Residential Entrances	×
14. Sight Distances	×
15. Level of Service on Cross Streets	×
16. Ability to be implemented for 2011 construction contract	×
17. Consistency with Southern Ontario Highways Plan	×
18. Ease of driver task	×
Natural Environment	
1. Area of Wetland Impacted	×
2. Fish Habitat Impacted	✓
3. Impact to Natural Woodland Habitat	×
4. Wildlife Corridors Impacted	×
5. Number of Watercourse Crossings	×
6. Number of Groundwater Wells Impacted	×
7. Stormwater Impact	✓
Cultural Environment	
1. Areas of Archaeological Potential Impacted	✓
2. Loss of Visual Screening along the north side of Hwy 401	✓
3. Cultural Landscape Features Impacted	×
4. Built Heritage Features Impacted	×
5. Community Cohesion	×
6. Impact to Existing Bicycle Path	×
7. Snowmobile Trails Impacted	×
8. Vibration Impacts	×
9. Bridge Aesthetics	✓
Socio-Economic Environment	
1. Out-of-way travel to businesses	✓
2. Impact to Cornwall Motor Speedway	✓
3. Impact to McGregor Grain	×
4. Impact to Cornwall Landfill	×
5. Impact to Aggregate Resources	×
6. Impact to Farming Activities	✓
7. Impact to Existing Utilities	✓
8. Number of Noise-Sensitive Areas Impacted	✓
9. Out-Of-Way Travel, Emergency Services	×
10. Out-Of-Way Travel, School Buses	×
11. Potential to Support Regional Development	×
12. Loss of Surface and Mineral Rights	×
Land Use and Property	

Table 5-1: Sample Long List of Evaluation Criteria (Global Factors and Sub-factors)	
1. Temporary Limited Interest Required	✓
2. Number of Properties Impacted (Total)	✓
3. Number of Buyouts (Total)	×
4. Area of Residential Property Required	×
5. Number of Residential Buyouts	×
6. Area of Industrial Property Required	×
7. Number of Industrial Buyouts	×
8. Area of Institutional Land Required	×
9. Number of Institutional Buyouts	×
10. Area of Public Service Facility Land Required	×
11. Number of Public Service Facility Buyouts	×
12. Area of Prime Agricultural Land Required	×
13. Number of Agricultural Buyouts	×
14. Area of Commercial Land Required	×
15. Number of Commercial Buyouts	×
16. Parks/Open Space Area Required	×
17. Utility Corridors Impacted	×
18. Potentially Contaminated Sites Impacted	×
Cost	
1. Life Cycle Cost	✓
2. Durability	✓
3. Maintenance	✓
4. Constructability	✓
5. Long Term Lighting	✓
6. Potential for Settlement	×
Legend: ✓ Carried Forward × Not Carried Forward	

Generally, the process begins by establishing a long list of potential or candidate sub-factors through discussions with the public, community associations, the TAC and interest groups or from previous studies of the same nature. Then, for each group of alternatives being evaluated, the sub-factors are reviewed and screened by eliminating those that are considered equal among alternatives being considered as well as those that do not apply to the study area, based on the site inventories carried out.

Table 5-2 provides a sample of a typical Global Factor, Sub-Factor, Unit and Utility Function Type from a Transportation Study. Similar Global Factor, Sub-factor and Utility functions will be developed for this study.

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Table 5-2: Typical Evaluation Factor and Sub-Factors			
Factor	**Sub-Factor**	**Unit**	**Utility Function Type**
Traffic and Transportation	• Level of Service (LOS)	Letter (A, B, C, D, E or F)	Stepped Function
	• Number of conflicts	Number	Linear
	• Number of intersections	Number	Linear
	• Number of entrances	Number	Linear
	• Out-of-way travel	Minutes	Linear
	• Flexibility for staged construction	Yes/No	Dichotomous
	• Ease to implement detour for new structure	Yes/No	Dichotomous
	• Design consistency	Yes/No	Dichotomous
	• Ability to stage construction	Yes/No	Dichotomous

5.2 Factor and Sub-factor Weights

The selection of weights for the factors and the sub-factors is based on assessments by the TAC of their relative importance. Within a group of factors, inevitably there is an ordering, with some factors having more importance than others. This is accounted for by each individual assigning a weight to each factor, which is reflected in the "Factor Weight" and "Sub-Factor Weight" columns. An example of typical results is shown in Table 5-3.

Table 5-3: Sample TAC Average Weights for a Factor Group and Sub-Factors in that Group		
Factors	**TAC**	
	Factor Weight	**Sub-Factor Weight**
Traffic and Transportation	40.9%	
• Level of Service (LOS)		27.6%
• Number of conflicts		13.5%
• Number of intersections		7.3%
• Number of entrances		6.1%
• Out-of-way travel		2.6%
• Flexibility for staged construction		9.6%

Table 5-3: Sample TAC Average Weights for a Factor Group and Sub-Factors in that Group		
Factors	**TAC**	
	Factor Weight	**Sub-Factor Weight**
• Ease to implement detour for new structure		13.9%
• Design consistency		9.2%
• Ability to stage construction		10.2%
	Total	**100%**

As shown in Table 5-3, in this example, the group of evaluators judged the Traffic and Transportation Factor Group to be valued at 40.9% of the overall importance of the decision between the alternatives being considered.

Within each Factor Group the sum of the percentage weights of all sub-factors listed under each factor totals 100%. As shown in **Table 5-3** several of the sub-factors were judged to be more important /less important when compared to each other for this specific evaluation of alternatives being considered.

The weights for each factor and sub-factor are determined by averaging the weights assigned by the TAC (Evaluation Committee). Each member gives a judgement of the importance of each global factor and local sub-factor (a percentage value) based on his or her personal assessment and professional judgement, considering the net effects and input of stakeholders and the public.

There is usually a range of perspectives in deciding the weights (importance) of factors and sub-factors. Every person assigning weights has a personal perspective and understanding of the scope of the project. Hence, there is an advantage to having a diversified team of professionals with varied backgrounds performing the evaluation.

An example of the weighting of each of the global factors is shown in **Figure 5-2**. The weighting of sub-factors within each factor group would be a similar distribution among the available sub-factors.

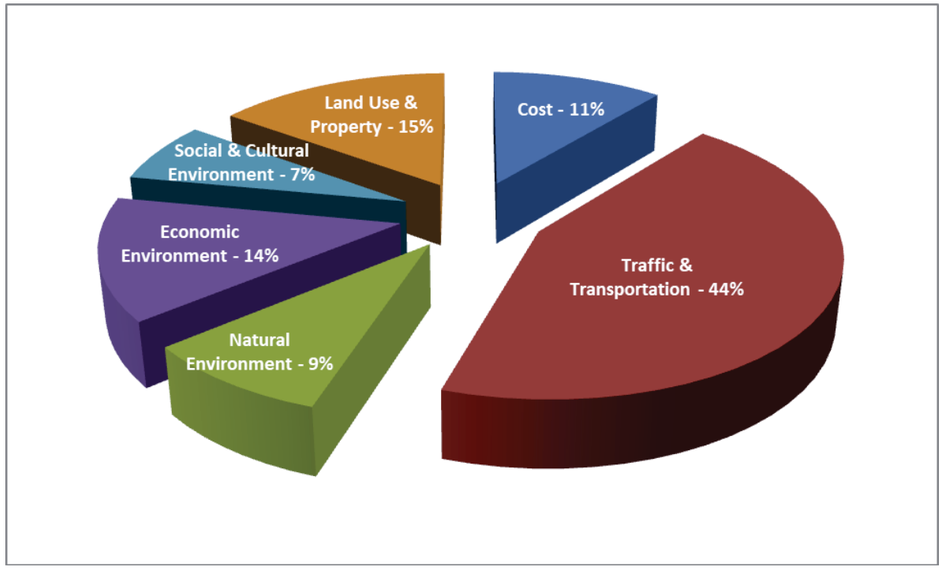

Figure 5-2: Sample Weighting of Global Factors

5.3 Social Utility Functions

The Weighted Additive Method used to evaluate alternatives relates the performance or attractiveness of alternatives using a mathematical relationship. This includes two variables: the first is the raw data or measured or modelled data and the second is the utility or utility score, which is the measure of attractiveness of the alternative.

For this project, the relationship between these two variables was described, as shown in **Figure 5-3**, by either a dichotomous, stepped, or linear social utility function. A dimensionless utility score between zero (0) and 1 is assigned to an alternative for each sub-factor. The shape of this function can vary from linear to stepped or exponential, and is defined by a subject area specialist.

The use of utility curves or functions is a step that transforms each of the measured effects to a dimensionless number and measure of utility. This step is required because the effects of each sub-factor are measured in different units (length, area, time, volume, dollars etc). To produce a mathematical measure of the performance, each effect is transformed to a measure of utility. The combined effect or performance of each alternative is a measure of utility (attractiveness) which is a dimensionless measure. The utility function (also commonly described as performance factor or function form) defines the relationship of effect to the attractiveness (utility). These utility functions are defined by subject area specialists in their field of study.

Examples of Social Utility Functions for the 'Ease of Maintenance' sub-factor definition are shown in **Figure 5-4**.

A dichotomous utility function enables the decision-maker to establish criteria that presents an "either–or" situation (desirable or undesirable, negative or positive, present or absent). If it were decided beforehand that a "yes" answer is desirable, then a utility score of one would be assigned to this criterion, otherwise zero would be assigned. One or zero are the available options; no other utility score is available.

A linear function is used to convert scores for sub-factors that have varying measurements. Given a measurement, a unique utility score between zero and one can be assigned to a sub-factor. The slope of the linear utility function can be negative or positive depending on the desirability of the impact.

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Figure 5-3: Sample Utility Functions

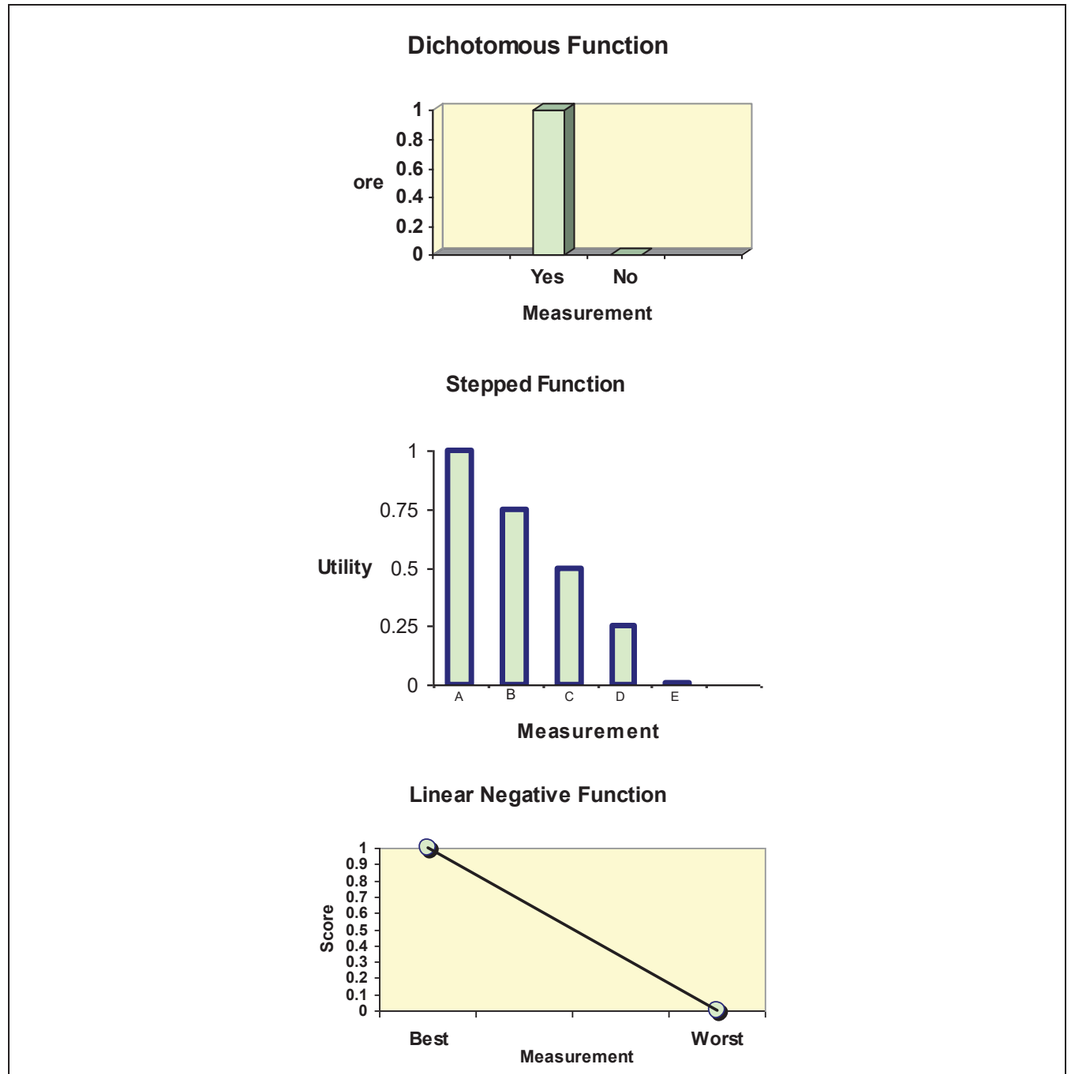
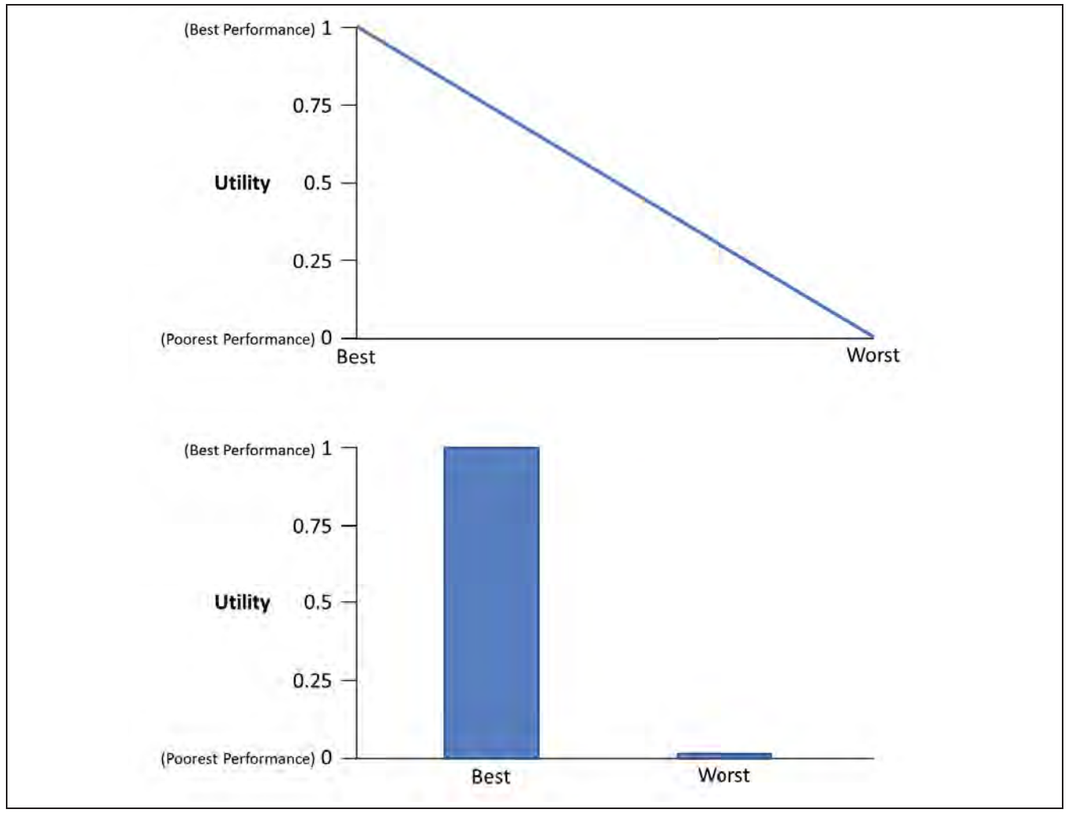


Figure 5-4: Social Utility Function



5.4 Weighted Score

The total un-weighted utility score of a given alternative can be expressed as:

U (Alternative A) = $\varnothing_1X_1 + \varnothing_2X_2 ..... + \varnothing_nX_n$, where

U (A) = Total un-weighted utility score for Alternative A

$\varnothing_1$ = attractiveness with respect to parameters

X_1 = measurement of parameter X

Weighted scores are computed using the weights selected by the TAC. The weighted score for each alternative under a specific sub-factor is calculated as follows:

(weighted score) = (utility score x [(factor weight) x (sub-factor weight)])

Using this approach, a generic weighted attractiveness function can be expressed as:

U_w (Alternative A) = $U_1W_1 + U_2W_2 + ... + U_nW_n$

OR

U_w (Alternative A) = $W_1\varnothing_1X_1 + W_2\varnothing_2X_2 .... + W_n\varnothing_nX_n$

Where: U = Total un-weighted utility score for Alternative A

U_w (A) = Total weighted utility score for Alternative A

W_1= Weighted parameter (factor weight x sub-factor weight)

$\varnothing_1$ = Attractiveness with respect to parameter 1

X_1 = Measurement of parameter

The weighted scores of all the sub-factors are then added to give total score for each alternative.

$$U_w(A) = \sum_{X=1}^{n} W_n\varnothing_nX_n$$

5.5 Rating Alternatives

Following the selection of evaluation factors and sub-factors, measurements of the impacts are made using topographic plans, field surveys, and numerical modelling. These measurements result in data being available under each of the evaluation criteria from which ratings are made for each alternative.

The Weighted Additive Method focuses on the differences of the alternative, addresses the complexity of the base data collected and provides a traceable and defensible decision-making process. This process is a numerical calculation where alternative scores are determined through the use of a mathematical relationship to equate impacts to scores. It eliminates any possible subjective opinions of scores for alternatives because the team does not estimate the score for an alternative.

The scores for each alternative under each of the respective sub-factors are normalized based on measured impacts. Social utility functions are defined to relate impacts to the attractiveness of an alternative. This means that under each sub-factor, the alternative receives an un-weighted rating of between zero and one based on these measurements. The mathematical relationships for calculating scores are developed in consultation with the TAC.

5.6 Sensitivity Testing Program

It should be recognized that the scope of the evaluation and determination of weights for the evaluation criteria are a matter of personal and professional judgement. Accordingly, it is considered essential to conduct sensitivity testing to determine the effect of changing weights assigned to each criterion.

To test how sensitive the outcome of the evaluation is with respect to the assigned weights (i.e. would the result have changed if different weights were used), a sensitivity testing program is undertaken. This results in greater confidence in the selection process and reduces the potential that the average weights bias the outcome of the evaluation.

Often, there is a diversity of opinion in the group as to what weight is appropriate for a factor or sub-factor. When an average weight is used to capture the preferences of the group it loses valuable information on the range of values of the group. To test the range of perspective of the TAC, the highest and lowest weights suggested by anyone in the group are defined as a reasonable range of weights to test. A series of sensitivity tests are performed for the evaluation of alternatives. This allows the team an opportunity to assess the outcome of the evaluation if different weights (different perspectives of importance) are assigned to the factors and sub-factors from the average weights defined by the TAC members. In this way, trade-offs can be identified, credibility can be achieved with the public, and "what if" questions can be answered quickly. See **Figure 5-5** for an example of the typical range of project team weights and Table 5-4 for a sample ranking of alternatives.

Following the above methodology, a series of tests can be performed varying the weights for each global factor. These tests include:

- Average TAC Team Weight
- Highest Weight by any Team Member
- Lowest Weight by any Team Member

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Following this series of tests, the results can be reviewed to assess whether the preferred alternative changes when the weights are varied.

Using this information alone is not the only justification for selecting a particular alternative, but it does provide a level of confidence in the selection. This information is used in the decision-making process before the TPAs are recommended to be carried forward.

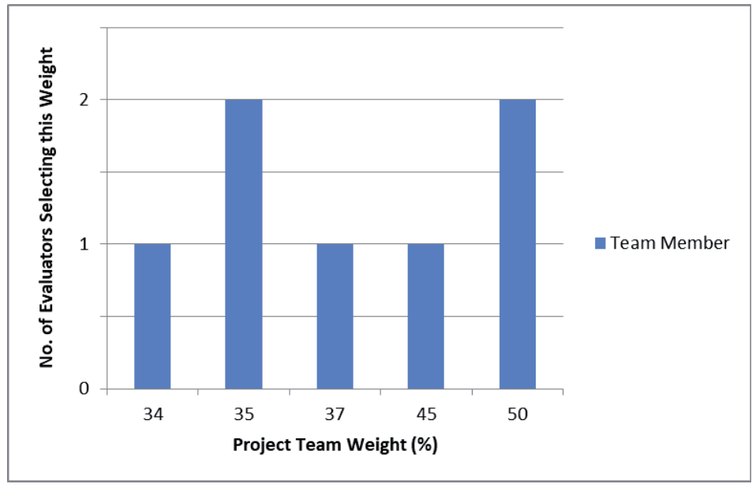


Figure 5-5: Sample Range of Weights for Traffic and Transportation

Table 5-4: Sample Ranking of Alternatives

Testing	Weight	Alt 1A	Alt 1A'	Alt 1B	Alt 1C
TAC Average Team Scores	N/A	2	1	3	4
High Traffic and Transportation	65%	2	1	3	4
Low Traffic and Transportation	30%	2	1	3	4
High Natural Environment	20%	2	1	3	4
Low Natural Environment	5%	1	2	3	4
High Economic Environment	30%	1	2	3	4
Low Economic Environment	5%	2	1	3	4

5.7 Selection of Technically Preferred Alternative(s)

The TPA('s) identifies the preferred solution by taking into account the technical analysis, environmental considerations and comments of all study participants.

The TPA('s) is then presented to the public and external stakeholders at the second PIC. This allows for any comments or questions regarding the proposed design.

It should be recognized that the information and conclusions obtained using the evaluation method are only tools used to assist in the evaluation process and identifying trade-offs. In the end, it is the TAC (Evaluation Committee) which makes the final decision on the selection of the TPA(s), using both the information obtained throughout the evaluation process and their individual experience and expertise, and through additional input from senior management on funding availability or other program constraints.

The findings of the analysis and evaluation process will be included as a component of the EA Process and documented in the Transportation Environmental Study Report. The principles and methodology of the EA process assist the TAC in the analysis and evaluation of alternatives and the selection of the TPA. The public and government agencies have the opportunity to provide input throughout the course of the study.

Glossary of Terms

AASHTO	American Association of State and Highway Transportation Officials
Adjacent	Adjacent indicates lying near MTO or Municipal roadway rights-of-way, although not necessarily contiguous to them.
Aesthetics	Methods of providing visual relief and appealing characteristics to planned noise barriers thorough the application of landscaping designs.
Alternative	Well-defined and distinct course of action that fulfils a given set of requirements. The EA Act distinguishes between "Alternatives to the Undertaking" and "Alternative Methods of Carrying out the Undertaking".
Coarse Screening	Initial screening of a group of alternatives. Also see Screening.
Criterion(Criteria)	Explicit feature or consideration used for comparison of alternatives.
Dichotomous Utility Function	A utility function that represents a desirable or undesirable response from a criterion (yes/no, present/absent, true/false).
Dimensionless Number	A number that does not have a unit of measurement, such as length (m), time (s), mass (kg) associated with it. Examples include Utility Score and Overall Score.
Do Nothing Alternative	This alternative is a mandatory requirement of the Class EA. This option is the null or no action alternative and it becomes the baseline to which all alternatives are compared.
Double Counting	Unintentional accounting for a particular factor or attribute more than once in the evaluation.
EA	Environmental Assessment
Evaluation	The outcome of a process that appraises the advantages and disadvantages of alternatives.
Evaluation Criteria	See Criteria.
Evaluation Process	The process involving the identification of criteria, rating of predicted impacts, assignment of weights to criteria, aggregation of weights, and rating to produce an ordering of preference of alternatives.
FAC	Federal Advisory Committee
Factor	See Global Factors.
Freeway	Freeway is defined as an existing completed, partially developed (staged) or

	proposed divided highway with full control of access and grade separated intersections. This definition may include some highways that are not officially designated as freeways.
Function Form	See Utility Function
Global Factors	The main categories of factors, (i.e. Transportation, Economic Environment, Natural Environment, Social and Cultural, Land Use and Property and Cost). All sub-factors are components or a subset of global factors.
Jack and Slide	An accelerated bridge method which laterally moves a replacement bridge in place from an adjacent staging area.
Linear Utility Function	A function that can be defined using a linear equation of the form: y = a + bx, where y is the dependent variable (raw score) x is the independent variable (measurement) b is the slope of the function, and a is the y intercept, normalized in this study to be equal to one or zero
Matrix	A rectangular array of criteria and values.
MATS	Multi-Attribute Trade-off System
Mitigation	Taking actions that either remove or alleviate to some degree the negative impacts associated with the implementation of alternatives.
MOECC	Ministry of the Environment and Climate Change
MTAC	Municipal Technical Advisory Committee
MTO	Ministry of Transportation of Ontario
Overall Score	The final value of an alternative's score derived by summing all of the weighted scores.
PAC	Public Advisory Committee
Performance Factor	See Utility Function
PIC	Public Information Centre
Ranking	The ordering of alternatives from first to last for comparison purposes.
Raw Data	The measurement of the impact, or measured data, under each criterion.
Risk	Probability that a given outcome will or will not materialize. Distinct from uncertainty in that the alternative outcomes are known or defined and that

	the probability of each is measureable.
Screening	Process of eliminating alternatives from further consideration, which do not meet minimum conditions or categorical requirements.
Self Propelled Mobile Transporters (SPMTs)	Mobile heavy lift transporters capable of lifting and transporting pre-assembled bridges or bridge superstructures from staging areas to the bridge site.
Semi Integral Abutments	A bridge superstructure design that removes the use of expansion joints for a simply supported bridge deck.
Sensitivity Tests	A series of tests to assess the robustness of the evaluation and alternative scores.
Step Function	A utility function can be defined by several linear functions within separate ranges that have a slope equal to zero. For this study, two step functions are used: Case A: y = 1, for x = desirable and y = 0, for x = undesirable Case B: y = 1 for x = desirable, y = 0.5 for x = medium performance and y = o for x = undesirable
Sub-factor	A single criterion used for the evaluation. Each sub-factor is grouped under one of the factors.
TAC	Technical Advisory Committee
TPA	Technically Preferred Alternative
Traceability	Characteristic of an evaluation process which enables its development and implementation to be followed with ease.
Transportation Environmental Study Report (TESR)	This report is prepared in compliance with the EA Act requirements and the Ministry of the Environment and Climate Change for acceptance, approval, informational or monitoring purposes and the public record.
Utility Function	A function (linear, step, dichotomous) that represents the Utility Score versus the criterion measurement or desirableness.
Utility Score	The "y" value derived from the Utility Function of the measurement of the impact induced by a particular alternative's criterion. A measurement of the usefulness or attractiveness of an alternative with respect to an individual evaluation criterion based on its measured effect (a number between 0 and 1). The utility score is dimensionless.
Weight	The importance attributed to a criterion relative to other criterion. The value of the weight is expressed in a percentage and the sum of all criterion weights is equal to 100%.

Weighted Additive Method	The method used in the quantitative evaluation of alternatives, which reduces the project's numerous criteria into a dimensionless number for each alternative suitable for comparison.
Weighted Score	A raw score that has been multiplied by the criterion weights. The weighted scores reflect the social value or importance of the specific group providing weights.

Appendix C
Rapid Bridge Replacement (RBR) Staging Area Construction Sites Screening Analysis

BT ENGINEERING
BTE
100 Craig Henry Drive, Suite 201
Ottawa, Ontario, K2G-5W3

MEMORANDUM

TO: File **DATE:** August 15, 2017

FROM: BT Engineering Inc. **PROJECT #:** BTE 17-010

PROJECT: Preliminary Design and Environmental Assessment Study for the Rehabilitation/Replacement of Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street GWP# 4170-13-00

SUBJECT: Preliminary Review of Staging Area Sites for Rapid Bridge Replacement Options for Metcalfe Street, Elgin Street and Main Street Bridges

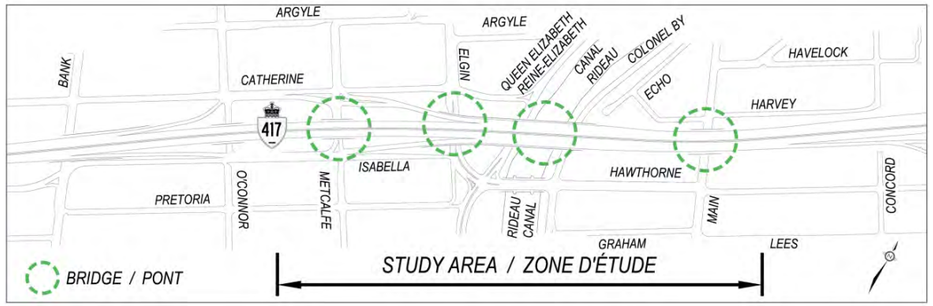
1. INTRODUCTION

The Ontario Ministry of Transportation (MTO) will, over the 5- 10 years, undertake the rehabilitation or replacement of 7 structures at 4 sites on Highway 417 located between Metcalfe Street and Main Street in the City of Ottawa. The structures are generally located within the downtown core of the City extending from Metcalfe Street to Main Street (see **Figure 1**).

The staging site locations considered during the site review included all reasonable sites between Bank Street Avenue in the west to just east of Main Street. The sites west of Metcalfe Street between Bank Street and Metcalfe Street were screened out during the site review. There is insufficient roadway width along Isabella immediately east of Bank Street (9.25m), approximately 21m(width) is required for the Metcalfe replacement structure (not including footings). There are 3 intersections that would require temporary removal and replacement of traffic signal plant. The Kent Street staging area is over 750m west of the Elgin Street structure, and would require significant overhead utility relocation. In addition the presence of the City of Ottawa 1.2m watermain that runs parallel to the Queensway (south side) should be avoided if at all possible as it introduces a possible risk of watermain damage.

The Rideau Canal Structure is unique in terms of the spans over the Rideau Canal and the limited areas for construction equipment access. This location will be reviewed as part of a separate assessment that is to focus on staging land requirements and lay-down areas for the contractor.

Figure 1: Study Area



Bridge replacement and rehabilitation options are being considered for all 7 structures under study. The rehabilitation options extend the service life of the bridge by making appropriate and targeted repairs; replacement is considered if a new bridge can be constructed as a cost effective alternative to repairing the existing bridge and extending its service life. The replacement approach considers different bridge types and construction methods. One replacement option is a Rapid Bridge Replacement (RBR) which entails the removal of the existing structure and insertion of a new structure. This process has been successfully at other bridge sites on Highway 417 immediately east and west of the study area; MTO has recently employed the RBR process for structures at Island Park, Carling Avenue (westbound), Kirkwood Avenue, Lees Avenue, and Vanier Parkway. This approach requires the closure of the freeway (eastbound and westbound lanes) while the old structure is removed and the new bridge is placed. All of the structures noted above were for concrete decks on steel superstructures, which are less complicated compared to remove/replace compared to a rigid frame.

MTO also constructed a RBR for a rigid frame bridge in Ontario (Highway 401/Cornwall Centre Road). For a rigid frame bridge, the RBR process may require a duration that exceeds most recent deck replacements on Highway 417. For example, the Highway 401/Cornwall Centre Road pilot project allows 8 weeks for the removal and installation of a new rigid frame bridge. In the case of the Ottawa Downtown bridges it is desirable to limit the freeway closure to be between Friday night and Monday morning, preferably over a long weekend. The Metcalfe, Elgin, Main Street and Canal structures all have EA approval to widen these structures on the north side, however this would only be needed to support staging needs if required.

This document summarizes the analysis and evaluation process to define staging areas that could be used to construct replacement bridges using Accelerated Bridge Construction (ABC). The staging areas would provide an area to build new structure and provide lay-down area for the contractor to utilize for supplies/equipment/site office. In addition the existing bridge will utilize the same site after it is removed for it to be demolished. The existing bridge could also be demolished in-situ, however this would not reduce the staging area needs as the new structures are to be constructed in at nearby staging area.

This memo reviews candidate staging areas for each of the bridge sites (Metcalfe/Elgin/Main) and selects a preferred location for each of the structures based on the experience of the previous ABC projects completed

by MTO on the Queensway. The review will demonstrate that ABC is achievable and then assess the temporary effects of creating a site and clearing a path from the site to the bridge, to be considered in the evaluation of alternatives. The subsequent evaluation of alternatives will be completed after Public Information Centre (PIC) No. 1, and will systematically analyze, evaluate and select the Technically Preferred Alternatives (TPA's) for the 3 bridge sites under study (Rideau Canal Bridge site will be assessed separately).

The study will include community and stakeholder input at all key milestones including consideration of the temporary staging areas. The effects and mitigation as a result of the TPA may be modified during subsequent stages of public consultation and will be further defined at the detail design stage. This Staging Site Review Memorandum will become a component of the Transportation Environmental Study Report (TESR). The use of temporary staging areas will be negotiated by the MTO Property Section, and the locations identified in this memorandum may be changed at the time of construction if other more suitable sites are found. At this point the identification of a staging area reflects the technical feasibility to implement an ABC project as an alternative using Rapid Bridge Replacement (RBR) with heavy lift technology.

Photo 1: Island Park Rapid Bridge Lift, First Heavy Lift in North America on a Freeway Project (August 2007)



The staging areas for the Queensway Bridges in this study need to be large enough to accommodate the temporary structure where the new bridge is built and the self-propelled modular transporters (SPMT's) that need to be assembled and disassembled. There is also a requirement for a construction lay-down area. There may be separate site needs in order to assemble the self-propelled modular transporters. Ideally the staging area would be large enough to construct the new structure, assemble the SPMT's and include an area for material/supplies utilized by the contractor to build the new structure.

A key consideration for the use of RBR relates to the need for a construction staging area where the new structure is constructed and prepared for insertion into the existing location (i.e. replaces the old structure). The sequencing of bridge replacement will be addressed following the structural reviews/investigations. This memorandum provides a preliminary assessment of possible RBR construction staging areas at the subject sites. Both north side and south side locations are addressed in this review.

2. DESIGN CRITERIA

The design criteria for a suitable RBR staging area should include the following:

1. Large overall area (50 m x 50 m = 2500 m^2) to accommodate the new structure, storage of old bridge when removed, lay-down area for contractor and maneuverability of SPMT's. Alternately 2 adjacent sites in close proximity to the existing bridge site may be considered for use.
2. Moderate grades (below 1.5%) on travel route to bridge site.
3. Dimensions of site to exceed the size of the new bridge and include workspace on all sides of the new bridge. Bridge dimensions are in the order of (25-36 m) x 25 m; therefore the desirable lateral dimension is 50 m and the minimum dimension must exceed the width/span of the new bridge.
4. Where no site is available on one side of the Queensway, both east and westbound bridges may be replaced on the same weekend using a larger staging area or two areas in close proximity to each other, on one side of the Queensway.

3. STAGING AREA REVIEW PARAMETERS

The following assumptions were used in this preliminary examination of potential staging sites:

- Property ownership was not explicitly considered in the review. Municipal, private, federal and/or provincial lands were all deemed acceptable.
- The expropriation of property for use as a temporary construction staging area was not considered. Any use or acquisition would be subject to property negotiations.
- The staging sites will require areas for the construction of the new structures and storage of the old structures, and must allow vehicle access/circulation.
- Ideally the RBR staging areas are located on both the north and south sides at each site (unless both bridges are replaced on the same weekend).
- Flat/minimal grades are preferred within the staging area and on the approaches to the replacement site.
- Site preparation is required under all options.
- The extension of the staging area into adjacent travel lanes was considered feasible at locations where volumes were minimal and/or multiple travel lanes are provided (unless both bridges are replaced on the same weekend).
- The proposed staging area should be generally in close proximity to the replacement structure site.
- The site should readily accommodate construction vehicles, preferably on a designated truck route.

- The staging area needs to be located such that the access and egress routes can be managed by the SPMT's.

Staging areas which meet the above guidelines are generally preferred. It is recognized that there are inherent challenges such as impacts on adjacent residents/land uses, the limited sites available to construct a new structure/store the old structure; the need to temporarily relocate and or protect utilities; vegetation, trees and other landscape features; and noise/dust issues. Although some challenges exist, the RBR process significantly reduces the amount of time required to close the freeway to traffic when compared to conventional reconstruction.

4. SITE REVIEW

4.1. Main Street Structure

Main Street is a north/south local. It has a 2-lane cross section under the structure, with sidewalks on both sides of the roadway. Potential Main Street staging sites are illustrated in **Figure 2**. The Main Street structure is shown in **Photo 2**.

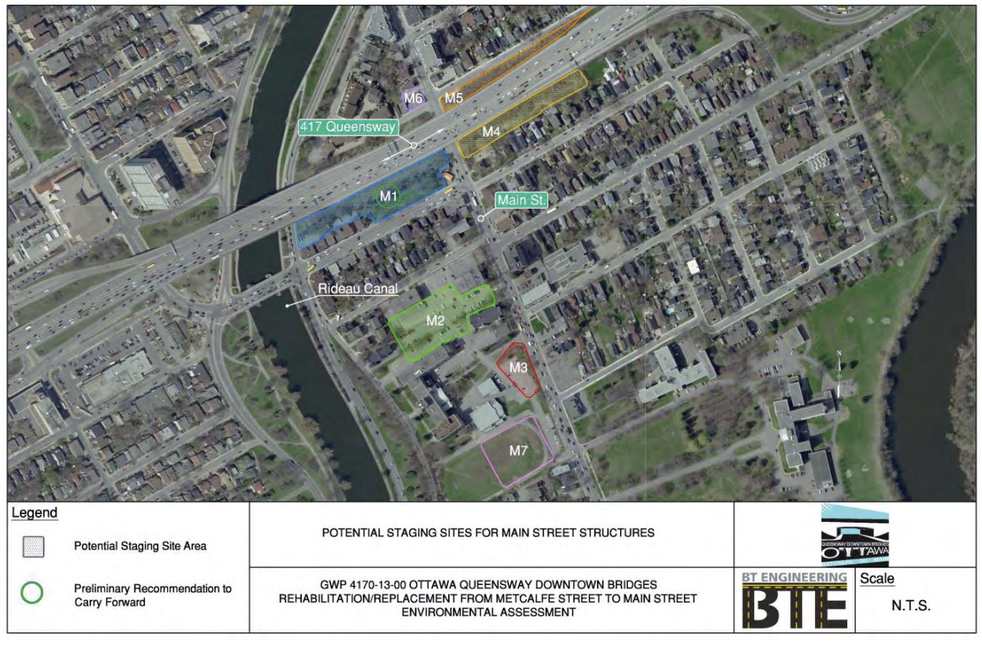


Figure 2: Potential Staging Sites for Main Street Structures



Photo 2: Main Street Structure

The availability of staging areas of the required size for the Main Street location in an urban setting such as Downtown Ottawa is challenging – the preliminary staging sites consist of: park area just west of Main Street on Hawthorne Avenue (Appendix A Figure M-1 to M-7); MTO lands adjacent to the Queensway, just east of Main Street (north and south sides of Queensway); educational institutions in the general vicinity; Immaculata High School; and the Adult Education Centre located south along the Main Street Site. The use of these sites will require the removal of some or all of the existing functions; complete reinstatement will occur following the construction activities.

Using the parameters listed in the previous section, a preliminary assessment of possible RBR locations was undertaken. The results are summarized in the following tables. It is noted that the dimensions identified in this review were scaled from online mapping services and reflect the level of detail associated with those sources. **Table 1** provides a qualitative assessment of the various RBR sites based on ratings of Good, Fair and Poor. The ratings are meant to quantify, in a broad manner, the potential of each site considering the factors listed above.

Table 1: Analysis of Potential RBR Staging Areas – Main Street Bridge Site

	Location	Discussion	RBR Potential
West Side	**M-1** Adjacent to Hawthorne Avenue just 10m west of Main Street (Ballantyne City Park / municipal park area)	• Available area approx. 38.5 m x 94.8 m = 3,651 m^2 • Staging area located adjacent to bridge site (within 30 m) • Minor temporary impact on Ballantyne Park use • Roadway protection required as approach fills will need to be removed to provide egress directly from the park area to Main Street. • Old structure to be dismantled in segments and stored on Hawthorne /Main Street south of Highway 417 while new	• **Good** → Access can be direct onto Main Street with no impact on nearby residences → Work area is acceptable → Grades to site good

		structure is being replaced (temporary very short term during weekend closure) • Access and egress maybe direct onto Hawthorne with some modifications to the Hawthorne/Main Street intersection with watermain protection and relocation of the building /former gas station and adjacent wood framed building at the corner of Hawthorne and Main (N-W quadrant);removal of overhead advertising sign/support/ • Minor sidewalk removals may be required. • Vegetation removal required in parklands • Avoids 1.2m watermain	
	M-2 Graham Street (Adult Education Building)	• Available area approx. 33.7 x 44.8 m = 1,509 m^2 • Main Street width just north of Graham Street is too narrow (approx. 15.65m) over 21m (width) is required. • Graham Street is too narrow for new structure available width is approximately 9.34 m, required is over 21 m this maybe could be provided with the relocation of the overhead utilities from the south side of Graham to the north side) • Parking area for staff and students does not meet area requirements span dimension not achieved. • Approx. 250 m from staging area to bridge structure (via Main Street/Graham Street) • Overhead utility relocations required on Main street and Graham Street • Impacts on use of Lee's avenue for detoured traffic • Would cross the 1.2m watermain located at the intersection of Main/Hawthorne Street.	• **Poor** → Does not meet area and dimension requirements → Relatively long travel route from staging area to bridge structure compared to site M-1 → Overhead utility relocations required both sides of Main Street
West Side	**M-3** (use of Immaculata High School Parking area)	• Available area approx. 40.2 m x 51.3 m = 2,065 m^2 • Main Street available width is insufficient, (available width is approximately 15.8 m, over 21m required not including footings) • Construct new structure in school parking area • Significant grade differential from parking area to Main Street, approx. 1.5 m grade difference; significant grading required • Impact to overhead utility and 2 major intersections (Lee's Avenue and Springhurst Ave) • Would impact Main Street detour route and possible detouring of local traffic to downtown/points north/east via Lee's avenue • Short term noise impacts on school and nearby condominium properties under construction (Oblate Avenue and new proposed condominium at the corner of Springhurst Avenue • Visual impacts to adjacent community • Impact on school access (main driveway entrance to school) • Would cross 1.2m watermain at the corner of Main Street/Hawthorne Avenue	• **Poor** → Does not meet area or dimension requirements → Main Street is too narrow to transport structure → To improve the profile from this site to Main Street major excavation would be required. → Impacts to overhead utilities along west/east sides of Main Street
	M-4 MTO lands east side of Main Street , immediately south of	• Available area approx. (16.5 x 75 m) = 1,238 m^2 • Adjacent to bridge site • Roadway protection required	• **Poor** → Does not meet minimum span dimension needs

	the Queensway	• Relatively direct route to structure • Visual impact on adjacent residential buildings and daycare yard located adjacent to the Old City Hall • Noise impacts to adjacent residences on Hawthorne Street and daycare facility • Visual impacts on adjacent residential community and daycare facility • Removal of vegetation/trees required	→ Construction vehicles would have difficulty to access 2 structures that would have to be built back to back.
	M-5 MTO ROW immediately north of the Queensway, east side of Main Street	• Available MTO ROW area is insufficient • Would require street closure and use of Harvey street to meet the staging area requirements • Impact on 3 storey condo building impacted (no access)-potential buy-out • Impact on 2 residents along Harvey Street (no access)-potential buyout • Emergency service providers would have to travel north to Havelock to access Harvey residents	• **Poor** → Size/dimensions of ROW site do not meet requirement → Impact on nearby residences → loss of on street parking
	M-6 Residential properties located north of Queensway west side of Main Street	• Available area approx. 120 m x 25 m = 3,000 m^2 • Adjacent to Main Street Structure ,across the roadway to bridge site • High impact to residential buildings, 4 to 6 residents would have to be purchased and removed. • Roadway approach fill removal required and protection required.	• **Poor** → Major residential impact (up to 6 residential buy-outs) → Grade requirements satisfied
	M-7 Immaculata High School football field	• Available area well in excess of required (1/2 of the football field would provide approx. 5000 m^2 • Main Street just north of Springhurst Avenue is too narrow for the replacement structure , available width of approximately 15.4m (21m required-not including footings) • Visual and Noise impacts on new development presently being constructed along Oblate Street/east side of Main Street. • Would need to cross the 1.2m diameter watermain at the Main/Hawthorne Avenue • Impacts the Lee's Avenue traffic detour route for those destined downtown /points east during the weekend closure of Main Street at the structure location •	• **Poor** • Main Street has insufficient width transportation of new structures not possible. • Loss of community use of the football field /community impacts

4.2. Elgin Street and Metcalfe Street Structures

Elgin Street is a major north/south arterial roadway. It has a 4-lane cross section with sidewalks on both sides of the roadway. The City of Ottawa has identified no planned changes to the lane or sidewalk configuration other than identifying the outer traffic lanes as mixed use for motorists and cyclists to support active transportation along Elgin Street.

Metcalfe Street is a north/south arterial roadway. It has a 2-lane cross section under the structure, with sidewalks on both sides of the roadway. The City of Ottawa has no plans to alter the span of the Metcalfe Street overpass; however, a wider sidewalk has been identified for under the existing structure.

The Elgin Street Structure is shown in **Photo 3** and the Metcalfe Street structure is shown in **Photo 4**. Potential staging sites are illustrated in **Figure 3**.



Photo 3: Elgin Street Structure



Photo 4: Metcalfe Street Structure

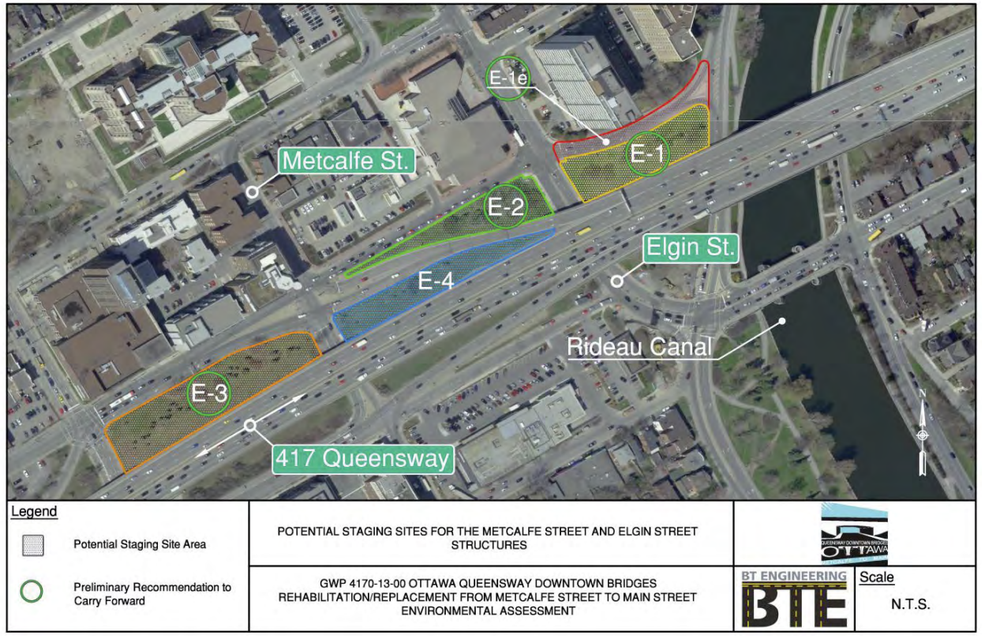


Figure 3: Potential Staging Sites for the Elgin Street and Metcalfe Street Structures

Table 2: Analysis of Potential RBR Staging Areas – Elgin Street and Metcalfe Street Bridge Sites

	Location	Discussion	RBR Potential
North Side	**E-1** Adjacent to Elgin Street, north of the Queensway just to the east of the Elgin Street Bridge site.	• Available area approx. 24 m x 93.0 m =2,208 m^2 • Staging area located adjacent to bridge site (within 30 m) • Minor temporary impact on green space • Temporary roadway protection will be required to provide egress directly to Catherine Street • Old structure to be dismantled in segments within yard east and west side of Elgin Street • Minor sidewalk removals may be required. • Has been used as a staging site for the ongoing maintenance work for the Rideau Canal Bridge • Avoids crossing the 1.2m City of Ottawa Watermain	• **Good** → Site can have direct access to Elgin Street and Catherine Street → Work area is acceptable → Short travel route → No impact on detour route while Queensway is closed → Grades to site good
	E-1e (expanded to include Catherine Street)	• Available area 122 m x 40 m = 4,880 m^2 • Would require approval to temporarily close Catherine Street from Elgin Street easterly to the canal • Would require traffic to be detoured (approx. 74 v/hr during peak hour 2023 City of Ottawa projections) • Provides a significant increase in space and greater opportunities to remove/replace Elgin Street Structure and allow for a work area for construction equipment, site office and supplies for at the Canal crossing	• **Good** → Provides better access to the canal structure for larger cranes and moving equipment

		• Avoids Crossing the 1.2m City of Ottawa Watermain	
	E-2 Adjacent to Elgin Street west side of Elgin Street	• Available area approx. triangular shaped (50 m x 25.2 m)/2 = 1,261 m^2 • Area is fenced off /MTO row • Could be a site to construct ½ of the Elgin Street Structure • Overhead utility relocation maybe required	• **Poor (for full structure)** → Does not meet area and dimension requirements for a full structure replacement site → Short travel route from staging area to bridge structure → Overhead utility relocations required → No impacts on detour route
North Side	**E-3** Adjacent to Metcalfe Street , immediately west of Metcalfe Street	• Available area approx. 138.0 m x 23.6 m = 3,262 m^2 • Staging area immediately west of the Metcalfe Street structure location • Roadway protection required for Queensway approach fill slopes • Could be used for both Elgin Street and Metcalfe Street Structures • Impact to overhead utility • May avoid impact to Catherine /Metcalfe Street intersection (to be determined in the pdr when heavy lift plan is developed • Will impact ramp terminal – short term during weekend structure replacement • May impact detour routing • Avoids crossing the 1.2m City of Ottawa watermain	• **Good** → Direct access for Metcalfe Street Structure → Can accommodate Elgin Street Structure if E-1 not available due to timing constraints → No community impacts
	E-4 MTO lands east side of Metcalfe Street, north of Queensway; adjacent to the Catherine Street exit ramp from the Queensway.	• Available area approx. (17.2 x 88.7 m) = 1,528 m^2 • Adjacent to bridge site • Roadway protection required • Relatively direct route to structure • Access maybe difficult as it would be from an off ramp from the Queensway • Removal of vegetation/trees required	• **Poor** → Does not meet min span dimension needs → Construction vehicles would have access from the off ramp from the Queensway introducing collision potentials

5. COARSE SCREENING EVALUATION OF RBR SITES

The potential candidate RBR staging areas were assessed as part of a coarse screening analysis against three criteria (size, access route gradient and access route impacts) to assess if a site was feasible to be carried forward. The conclusions of this assessment are presented in **Table 3** and **Table 4**.

Table 3: RBR Staging Area Coarse Screening Analysis
Main Street WB/EB Bridge Site

Candidate RBR Staging Area	Achieve Minimum Area requirement (2,500 m^2) Yes/No	Route Access: Meet Gradient requirement <1.5% slope	Route Access: Level of Impact on Travel Route	Comments	Carry Forward Yes/No
M-1 Ballantyne Park	Yes 94.84 m x 38.5 m = 3,651 m^2	Yes	Low	Requires temporary use of park land will require landscaping	Yes

M-2 Adult Education Centre (Graham Street)	No 33.7 x 44.8 m = 1,509 m^2	Yes	High	Travel route has high impact on educational use/ parking Graham street is narrow to travel down (Graham Street is only 9.3m wide) , would have to relocate overhead utilities along the south side of Graham Street Main Street to narrow	No
M-3 Immaculata High School Parking lot	No 40.2 m x 51.3 m = 2,065 m^2	No Parking area is approx. 1.5 m above Main Street	High – 2 signalized intersections and would impact detour route (Lees Avenue) Main Street is too narrow(15.9m) for the new structure needs (immediately north of Springhurst/Main Street Avenue)	Would require significant site grading Main Street not wide enough to accommodate the 21m span requirements New development /condo under construction along oblate way; noise and visual impacts on nearby condo/residents and high school Traffic destined north of Queensway would not be able to utilize Lee's Avenue for destinations north of the Queensway.	No
M-4 MTO ROW east side of Main Street, immediately south of the Queensway	No 16.5 m x 75 m = 1,238 m^2	Yes	Low	Adjacent to Main Street Structure Location in the backyards of several residential buildings	No
M-5 MTO ROW Harvey Street (east side)	No 12 m x 90 m = 1080 m^2	Yes	Low	Impacts on residential community along Harvey Street	No
M-6 Residential properties	No 30 m x 30.9 m = 934 m^2	Yes	Low	3 residential buyouts	No
Preliminary Recommendation: **Site M-1 is the only practical site to carry forward**					

Table 4: RBR Staging Area
Analysis of Potential RBR Staging Areas
Elgin Street and Metcalfe Street Bridge Sites

Candidate RBR Staging Area	Achieve Minimum Area requirement (2,500 m^2) Yes/No	Route Access: Meet Gradient requirement <1.5% slope	Route Access: Level of Impact on Travel Route	Comments	Carry Forward Yes/No
E-1 MTO/Municipal right-of-way	No 24 m x 93.0 m = 2,208 m^2	Yes	Low	Area is adjacent to Elgin Street and south of Catherine Street; this site likely to be used for the Rideau Canal Bridge construction site lay-down area. Timing of Elgin Street replacement likely to follow the replacement of the Canal Bridge	Structure
E-1e (expanded site)	Expanded E-1 site to include area available with a closure of Catherine Street connection to the canal be considered 122 m x 40 m = 4,880 m^2	Yes	Low	E-1 site may be expanded if the closure of Catherine Street from Elgin to the Queen Elizabeth Parkway canal can be accommodated. The additional space would be used for the Elgin Street structure and also provide working space for construction material and equipment for the Queensway structure over the canal. Both Elgin Street and the Canal bridge work could be worked on concurrently	Yes
E-2 MTO/Municipal area north of the Queensway and west side of Elgin Street	No 52.55 m x 27.65 m = 726 m^2	Yes	Low	Site could accommodate ½ the Elgin structure and part of E-1 could be used for the other ½ of the Elgin street structure. Site cannot accommodate Metcalfe Street structure.	Elgin: Carry forward only in combination of with E-1 to achieve area requirements for the Elgin Street Structure. No for Metcalfe site.
E-3 MTO ROW west of Metcalfe Street	Yes 26.2 m x 119 m = 3,112 m^2	Yes	High	Site would require roadway protection along north side of Queensway. Site can accommodate the entire Metcalfe structure. Site could also accommodate the Elgin Street structure.	Yes (for both Elgin and Metcalfe)
E-4 MTO/Municipal right-of-way	No 78.14 m x 15 m = 1,172 m^2	Yes	High - impact to utilities, mature trees and retaining walls on front yards	Irregular shaped site will /access of ramp is required extensive sheet piling along Queensway to create staging area site.	No
Preliminary Recommendation: **Carry forward E1e, and combination E1/E2 for Elgin , E-3 for Elgin and Metcalfe**					

6. TECHNICALLY PREFERRED RBR STAGING SITES

Based on this preliminary review, the technically preferred RBR staging sites are as follows:

- Main Street Bridge: Site M-1
- Elgin Street Bridge: Site E-1e (expanded) or a combination of E-1 and E-2 should staging of the Rideau Canal Structure influence the timing for replacement of the Elgin Street Bridge.
- Metcalfe Street Bridge: Site E-3

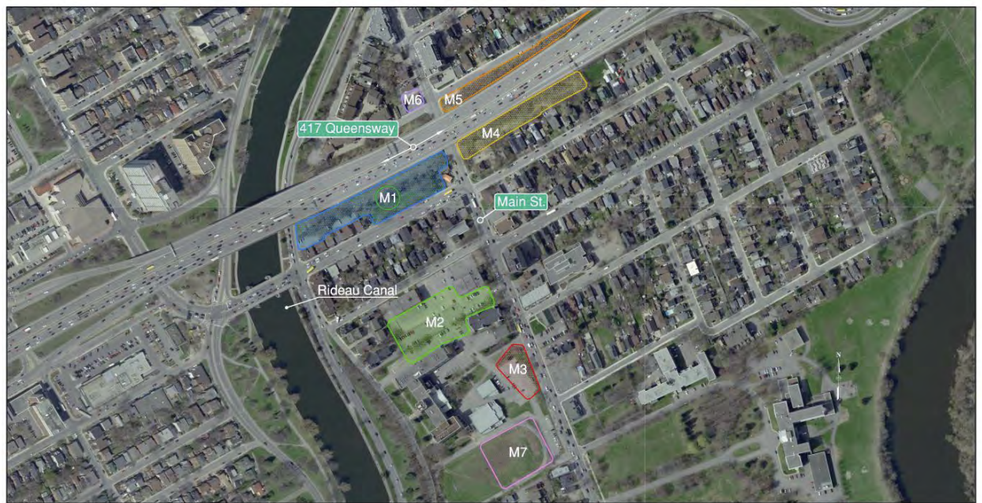
7. TECHNICALLY PREFERRED ALTERNATIVE

This technical memorandum on potential RBR staging areas will be used as input into the overall technical evaluation of bridge management alternatives.

Based on the evaluation of alternatives, Site M-1 is the technically preferred staging site alternative for the Main Street Bridge. Site E-1e is preferred (subject to construction staging needs for the Rideau Canal Bridge) for the Elgin Street Bridge. Alternatively E-2 and part of E-1 could be used for a staging area for the Elgin Street Bridge, should timing of construction activities requires part of site E-1e for the Rideau Canal Bridge laydown area.
Site E-3 is the technically preferred site for the Metcalfe Street Structure and if construction timing is such that the Site E-1 is not available due to the Rideau Canal Bridge work, E-3 could be used for the Elgin Street structure.

Further work on construction phasing will influence the above technically preferred staging areas, as the Rideau Canal Bridge timing will determine the timeline for use of the E-1 and E-2 sites.

Appendix A – Site Photos



Main Street
Site M-1(looking west)



Site M-1 (looking east)



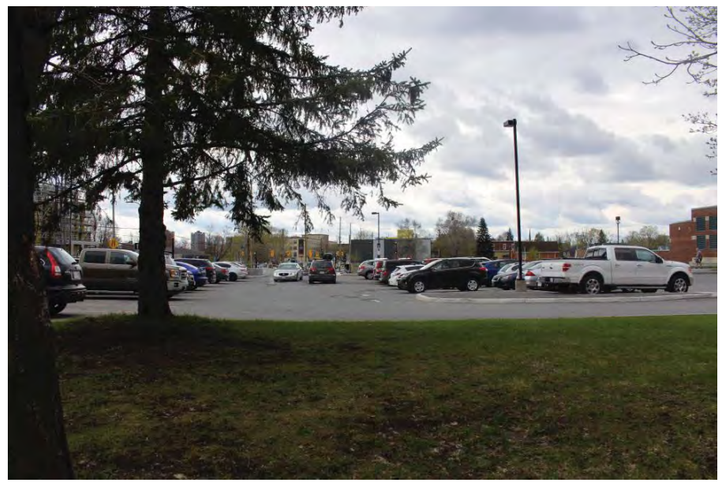
Main Street Site M-1
(Looking east)



Site M-1
Looking west from Main Street



Site M-2
Immaculata High School Parking Area



Main Street Site M-3
Parking area for St. Nicholas Adult High School



Site M-3 entrance onto Main Street (note utility challenges)



Site M-4
East Side of Main Street located just south of Queensway



Site M-5
North Side of Queensway
(Looking East)



Site M-6
North Side of Queensway
(Looking West)



Site M-7
West of Immaculata High School



Elgin Street & Metcafe Potential Staging Areas



Legend Potential Staging Site Area Preliminary Recommendation to Carry Forward	POTENTIAL STAGING SITES FOR THE METCALFE STREET AND ELGIN STREET STRUCTURES GWP 4170-13-00 OTTAWA QUEENSWAY DOWNTOWN BRIDGES REHABILITATION/REPLACEMENT FROM METCALFE STREET TO MAIN STREET ENVIRONMENTAL ASSESSMENT	BT ENGINEERING Scale N.T.S.

Site E-1 (looking east)



Site E-2 (looking south)



Site E-3(looking west)



Appendix D

Rideau Canal Construction Staging Methodology Memo

BT ENGINEERING
100 Craig Henry Drive, Suite 201
Ottawa, Ontario, K2G 5W3

TECHNICAL MEMORANDUM

TO:	File	**DATE:**	November 22, 2017
FROM:	Steve Taylor	**PROJECT #:**	BTE 17-010
PROJECT:	GWP 4170-13-00 Highway 417, Rehabilitation/ Replacement of Downtown Bridges (Metcalfe Street to Main Street) Preliminary Design and Environmental Assessment		
SUBJECT:	Rideau Canal Structure Replacement Construction Methodology Alternatives Coarse Screening Analysis		

Introduction:
This is an initial screening document for the Ministry of Transportation Class Environmental Assessment for Provincial Transportation Facilities (MTO Class EA) for the rehabilitation or replacement of 7 bridges on the Queensway from Metcalfe Street easterly to Main Street. The 7 bridges include 4 locations at Metcalfe Street, Elgin Street, Rideau Canal (including crossings of Queen Elizabeth Drive and Colonel By Drive) and Main Street. This memorandum focuses on the Rideau Canal crossing.

This memorandum describes the range of construction methodologies that can be considered for the replacement alternatives for the Rideau Canal structure. Initiated by MTO in April 2017, this project involves an EA and Preliminary Design for the rehabilitation/replacement of 7 structures at 4 sites on the Ottawa Queensway within the urban core of the City of Ottawa. The project location is illustrated in **Figure 1**. The individual bridge sites extend from Metcalfe Street to Main Street and are illustrated on **Figure 2**.

The Ottawa Queensway Downtown bridges date from the original Queensway construction from 1959 to 1968. The Queensway Rideau Canal Bridge is nearing the end of its service life. The study will define bridge management plans for the 7 Queensway bridges from Main Street to Metcalfe Street based on design, traffic staging and construction considerations. The construction methodologies for replacing these two large structures include demolition and rapid replacement. The effects of these construction operations and the feasibility to complete these works on a single weekend to minimize impacts to the travelling public are major considerations in the EA process. The temporary works will create the largest impact of the project and may dictate the elements of the new structure.

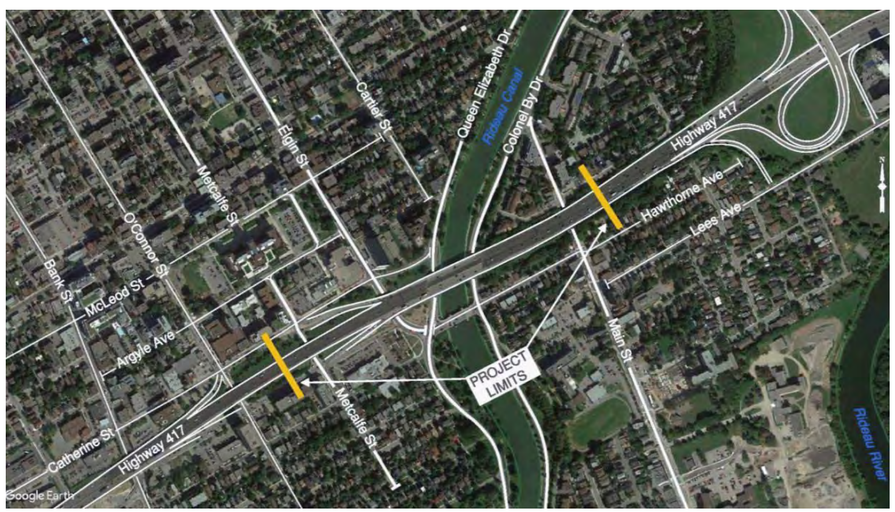


Figure 1: Project Location

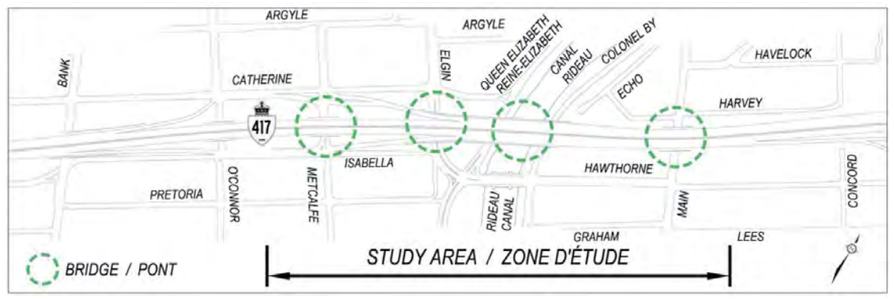
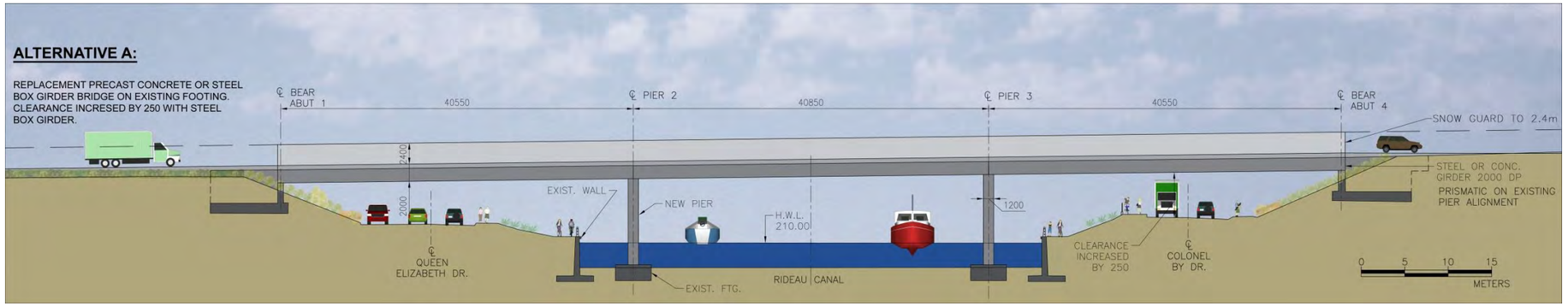


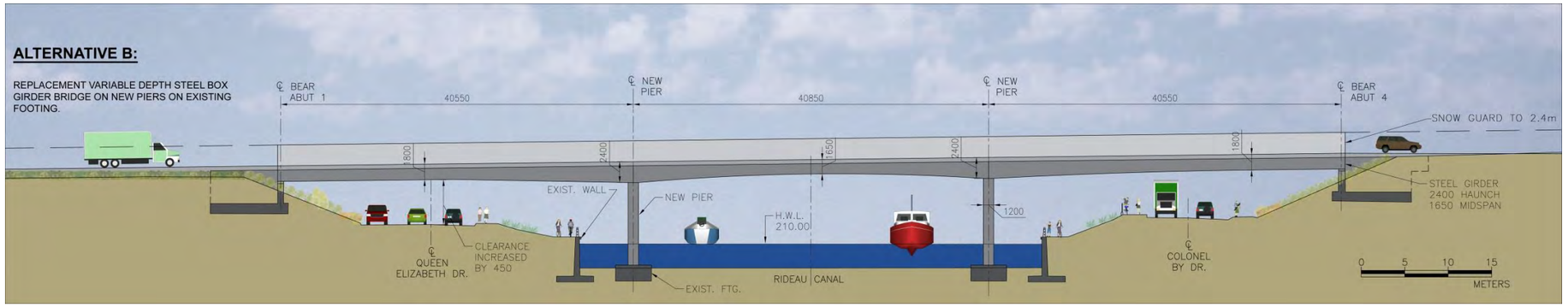
Figure 2: Structure Locations

Description of Structural Alternatives:
The structure alternatives identified to date in the Draft Study Design include the range of possible bridge types that are technically feasible to span the Rideau Canal. The screening of the long list of bridge types that will be carried forward for further detailed evaluation is documented in a separate technical memorandum. The bridge types can be described as three families of bridges including: multi span bridges (including intermediate piers with continuous construction of the decks to create thermal expansion only at the ends of the bridges; a second group (a subset of the first group) using simply supported single spans between piers utilizing expansion joints or linked slabs at the interface of each bridge; and finally a third group of single span structures (spanning the canal and Queen Elizabeth and Colonel By Drive).
The types of bridges are illustrated in **Alternatives A** to **E**.

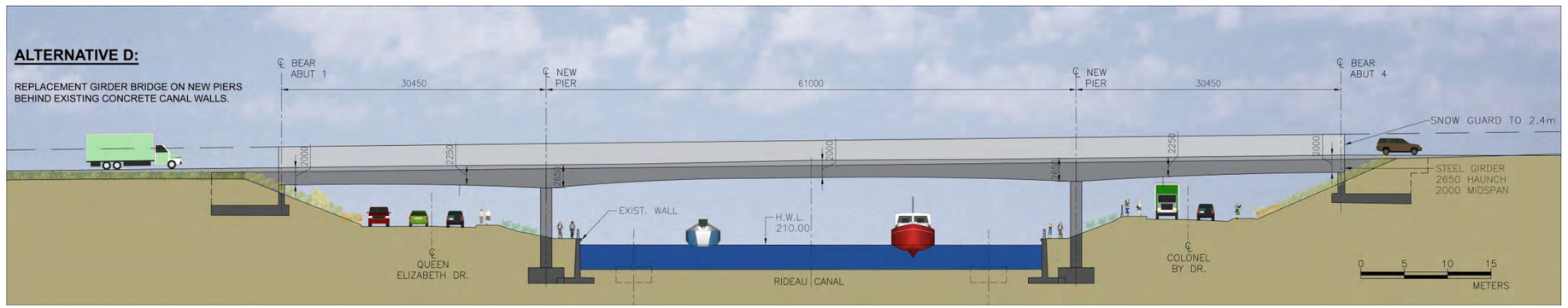
Multi Span Bridge Alternatives (Groups 1 and 2):
These alternatives include: Group 1 continuous structure to minimize superstructure depth; or Group 2 simply supported structures to ease the construction. Group 1 alternatives are illustrated below and Group 2 alternatives mirror these designs with deeper structure depths.



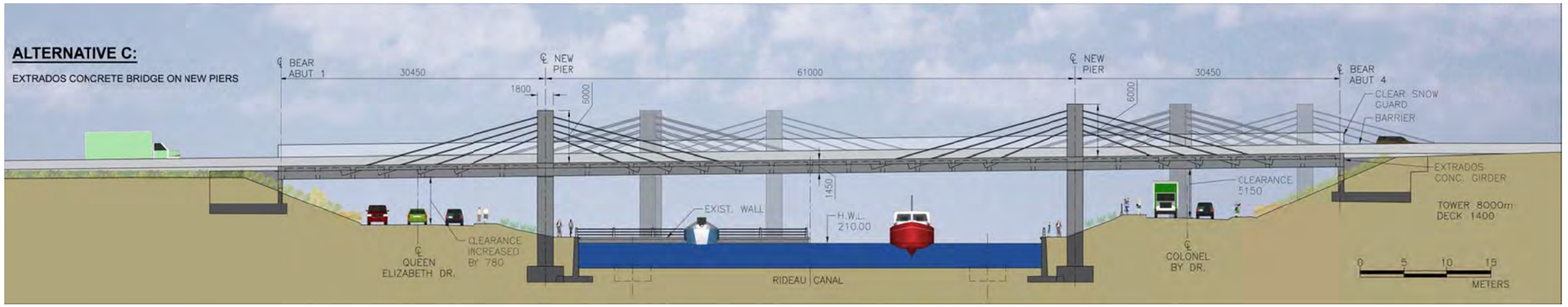
Alternative A: Precast Concrete or Steel Girder Bridge at Existing Pier Location on Existing Footing



Alternative B: Variable Depth Steel Box Girder Bridge at Existing Pier Location on Existing Footing

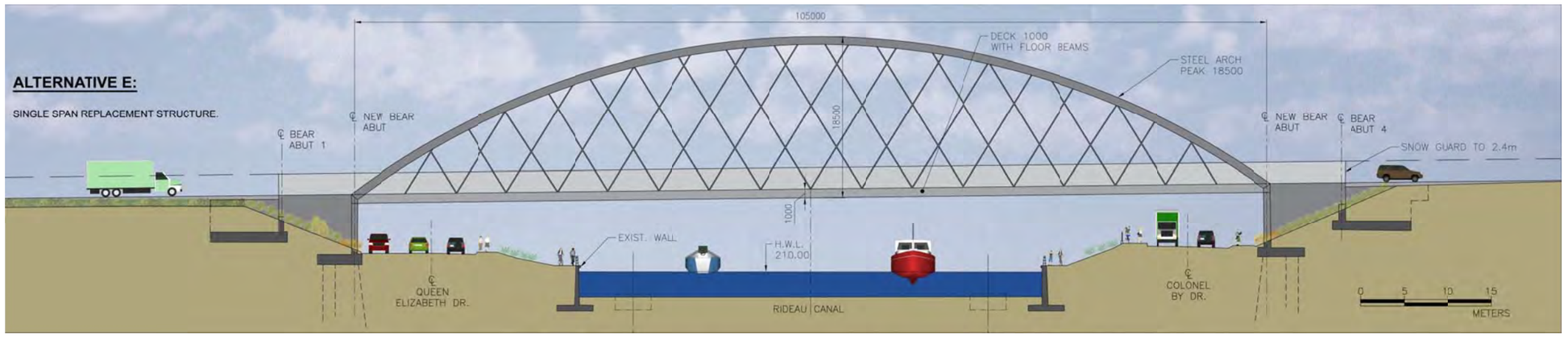


Alternative D: Girder Bridge at New Pier Location on New Footing



Alternative C: Extrados Concrete Bridge

Single Span Bridge Alternatives:



Alternative E: Single Span Replacement Structure

The major differences in the structures are described in **Table 1**.

Table 1: Rideau Canal Structural Alternatives

Alternative	Continuity of Structure	Height above deck (m)	Superstructure depth (below deck	Median Width (m)	Construction Complexity	Compatibility with heritage Rideau Canal	Cost	Safety
A	Yes	0	2.0	3	Low	High	Low	High
B	Yes	0	1.8	3	Low	High	Low	High
C	Yes	6	1.4	11	Moderate	Low	High	Moderate
D	Yes	0	2.25	3	Low	High	Low	High
E	Yes	18	1.0	11	High	Low	High	Moderate
A2 (Constant depth)	No	0	2.25	3	High	Moderate	Low	High
B2 (Constant depth)	No	0	2.25	3	High	Moderate	Low	High
D2 (Constant depth)	No	0	2.65	3	High	Moderate	Low	High

Based on Parks Canada input, structure types with slender superstructures are preferred.

Description of Construction Alternatives:
The following provides a description of the long list of potential construction approaches for the replacement of the bridges over the Rideau Canal and a discussion of the feasibility of each approach.
The existing structure is illustrated in **Photo 1**.



Photo 1: View of Southern Face of Structure

Subject: GWP 4170-13-00 Highway 417, Rehabilitation/ Replacement of Downtown Bridges (Metcalfe Street to Main Street) Preliminary Design and Environmental Assessment
Rideau Canal Structure Replacement Construction Methodology Alternatives Coarse Screening Analysis
Project: BTE 17-010, **Date:** November 22, 2017

Canal Construction Alternative 1: Barge Transportation of Structure. This alternative considers the use of remote staging area(s) using barges for removal and delivery of new superstructure. This approach would be suitable for a larger waterbody that would allow the transportation of the large bridge superstructures and larger barges to drop the existing bridges onto. Because the existing Canal is limited by the upstream Pretoria Bridge lift bridge and the downstream locks at the Ottawa River, this alternative is not considered feasible at this location. Based on these site specific constraints the preliminary **recommendation is to not carry forward this alternative.**

Canal Construction Alternatives 2A to 2C: Conventional Construction in Strips. This group of alternatives considered several approaches for conventional staged construction allowing lane reductions on the Queensway. Each is described as follows:

Canal Construction Alternative 2A: Conventional Construction in Strips. This alternative, shown in **Figure 3**, utilizes conventional construction of the Rideau Canal structure and removal of the bridge using sequential stages to remove and replace the bridge. It is based on no widening of the Queensway and use of AASHTO temporary "battleship" construction staging (traffic in one direction passing on two sides of a work zone). The staged replacement is illustrated in **Figure 3**. This alternative requires lane closures on the Queensway and would require 1 or 2 seasons to complete the works (dependent on whether both bridges are replaced in the same year). This is known technology; however, AASHTO battleship staging has not been used previously on the Queensway. The advantage of this option is that it avoids wheel tracking of vehicles on the joint between eastbound and westbound bridges. Following consideration, the Technical Advisory Committee has accepted that a temporary linkage between bridges is possible and is more attractive than introducing the battleship traffic operation which would be unfamiliar to local drivers. **This alternative is not recommended to be carried forward.**

Canal Construction Alternative 2B: Conventional Staging in Strips Allowing Wheel Tracking on the Joint between Bridges. This is a minor modification to Alternative 2A which would include a preparatory stage of construction to build a joint connection between the two bridges, shown in **Figure 4**. This may be an epoxy resin connection or a recessed steel plate. By allowing this approach, construction can avoid using AASHTO temporary battleship traffic staging. The TAC supported Alternative 2B over using Alternative 2A as a safer approach for conventional construction. Based on this endorsement, **Alternative 2B is recommended to be carried forward.**

Canal Construction Alternative 2C: Conventional Staging in Strips with Additional Work (to Widen the Queensway North Side Following 2007 TESR) Completed Prior to Construction. This alternative utilizes conventional construction of the Rideau Canal structure and removal of the bridge using sequential stages to remove and replace the bridge. This includes the construction of all north side widening of the Queensway and replacement of Main Street and Elgin Street westbound structures in advance of the construction. This will allow conventional staging without using the non-conventional battleship traffic staging approach utilized in Alternative 2A. The staged replacement is illustrated in **Figure 5**. This alternative requires lane closures on the Queensway and would require 1 or 2 seasons to complete the works (dependent on whether both bridges are replaced in the same year). This is known technology that has been used previously on the Queensway. **This alternative is recommended to be carried forward** only for consideration if the study recommendations lead to replacement of the Main Street and Elgin Street structures.

PRELIMINARY RECOMMENDATION NOT TO CARRY FORWARD
TO DETAILED EVALUATION PHASE

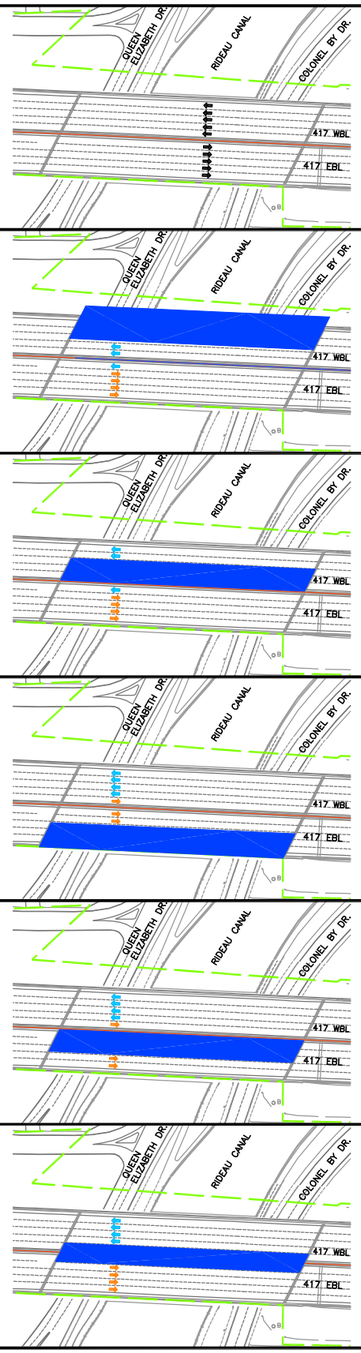
FIGURE 3
ALTERNATIVE 2-A
CONVENTIONAL STAGING OF STRIP REMOVAL AND REPLACEMENT

Legend:

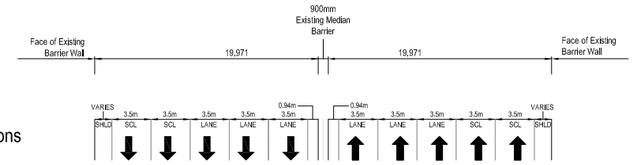
- Work Zone
- Westbound Lanes Open
- Eastbound Lanes Open

Note:

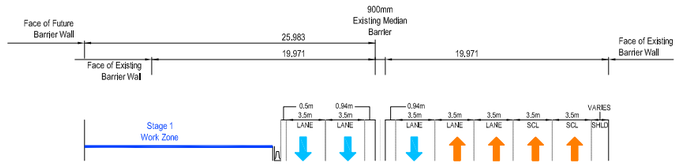
Traffic staging and temporary closure durations shown are initial estimates only (at a Preliminary Design level of detail) and may be subject to change.



Existing Conditions



Stage 1

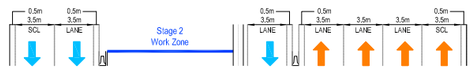


Work:
- new construction

Duration:
- **16 WEEKS**

Ramp Closure:
- Westbound off ramp closed

Stage 2

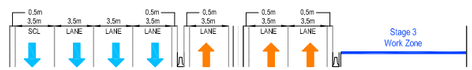


Work:
- new construction

Duration:
- **16 WEEKS**

Ramp Closure:
- no ramp closures

Stage 3

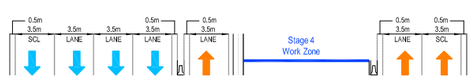


Work:
- new construction

Duration:
- **16 WEEKS**

Ramp Closure:
- Eastbound on ramp closed

Stage 4



Work:
- new construction

Duration:
- **16 WEEKS**

Ramp Closure:
- no ramp closures

Stage 5



Work:
- median barrier replacement
- adjust drainage
- surface course asphalt

Duration:
- **1 WEEK**

Ramp Closure:
- no ramp closures

PRELIMINARY RECOMMENDATION CARRIED FORWARD
TO DETAILED EVALUATION PHASE

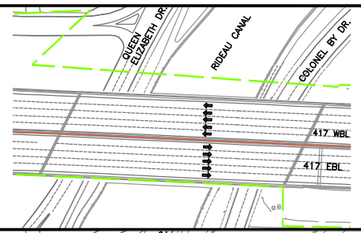
FIGURE 4
ALTERNATIVE 2-B
CONVENTIONAL STAGING OF STRIP REMOVAL AND REPLACEMENT

Legend:

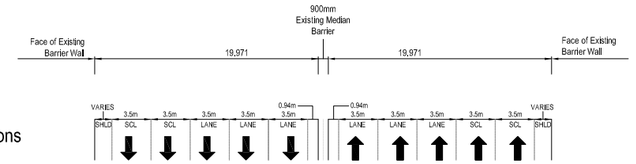
- Work Zone
- Westbound Lanes Open
- Eastbound Lanes Open

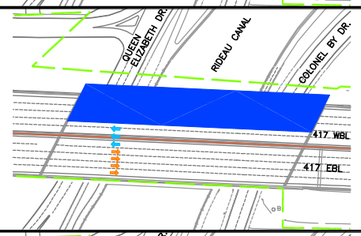
Note:

Traffic staging and temporary closure durations shown are initial estimates only (at a Preliminary Design level of detail) and may be subject to change.

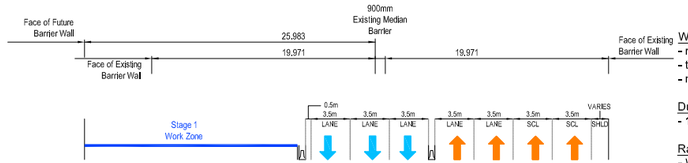


Existing Conditions





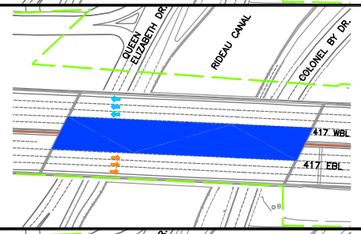
Stage 1



Work:
- remove existing median barrier and lighting
- temporary outside lighting
- new construction

Duration:
- **16 WEEKS**

Ramp Closure:
- Westbound off ramp closed



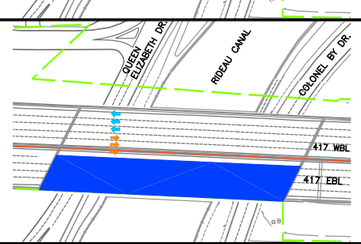
Stage 2



Work:
- new construction
- temporary outside lighting

Duration:
- **16 WEEKS**

Ramp Closure:
- no ramp closures



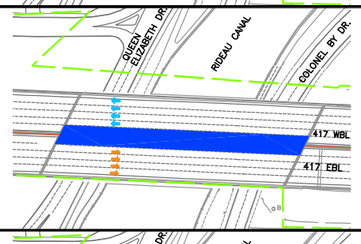
Stage 3



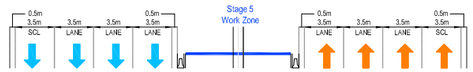
Work:
- new construction
- temporary outside lighting

Duration:
- **16 WEEKS**

Ramp Closure:
- Eastbound on ramp closed



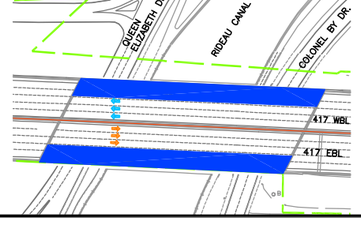
Stage 4



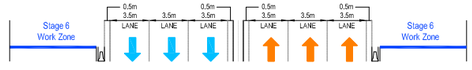
Work:
- median barrier replacement & lighting
- adjust drainage
- surface course asphalt

Duration:
- **2 WEEKS**

Ramp Closure:
- no ramp closures



Stage 6



Work:
- new construction of bullnose and gore area
- adjust drainage
- surface course asphalt

Duration:
- **2 WEEKS**

Ramp Closure:
- Westbound off ramp closed
- Eastbound on ramp closed

PRELIMINARY RECOMMENDATION CARRIED FORWARD
TO DETAILED EVALUATION PHASE

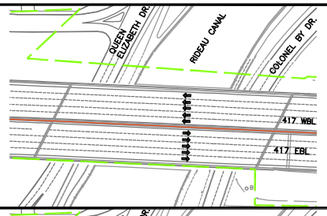
FIGURE 5
ALTERNATIVE 2-C
CONVENTIONAL STAGING OF STRIP REMOVAL AND REPLACEMENT

Legend:

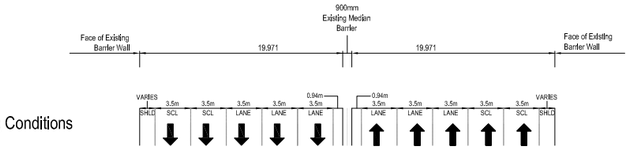
- Work Zone
- Westbound Lanes Open
- Eastbound Lanes Open

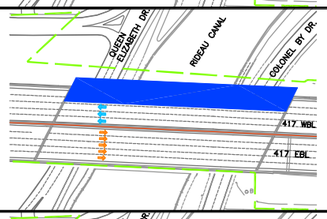
Note:

Traffic staging and temporary closure durations shown are initial estimates only (at a Preliminary Design level of detail) and may be subject to change.

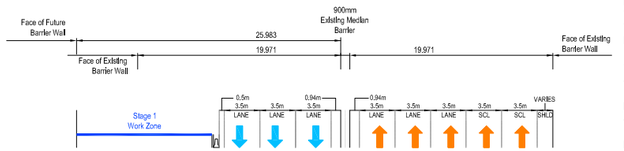


Existing Conditions





Stage 1

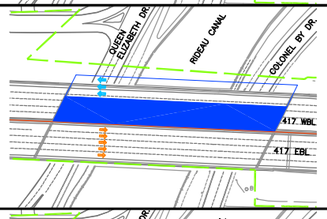


STAGE 1 REQUIRES THE WIDENING OF THE METCALFE, ELGIN, & MAIN STRUCTURES. ALSO THE NORTH WIDENING OF THE QUEENSWAY IN THE STUDY AREA AS PER THE TSH 2007 PRELIMINARY DESIGN REPORT

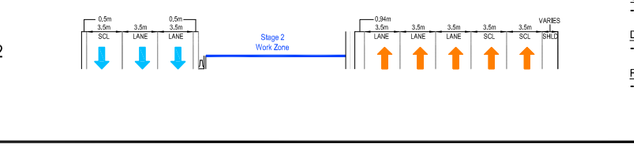
Work:
- new construction

Duration:
- 16 WEEKS

Ramp Closure:
- Westbound off ramp closed



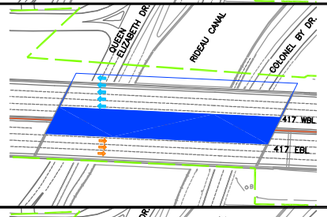
Stage 2



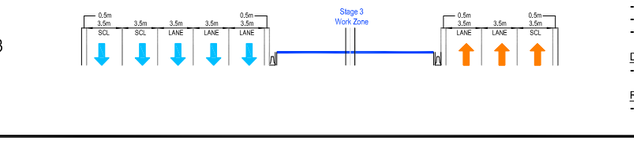
Work:
- new construction

Duration:
- 16 WEEKS

Ramp Closure:
- no ramp closures



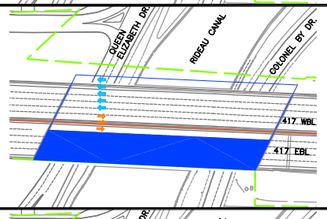
Stage 3



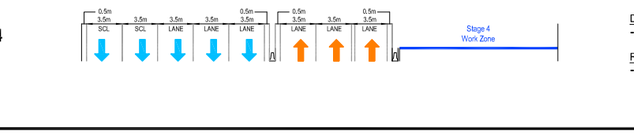
Work:
- remove existing median barrier and lighting
- temporary outside lighting
- new construction

Duration:
- 16 WEEKS

Ramp Closure:
- no ramp closures



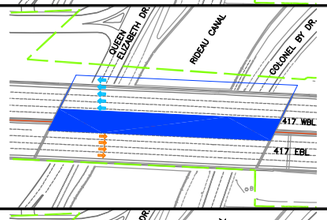
Stage 4



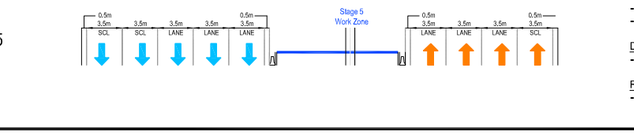
Work:
- new construction

Duration:
- 16 WEEKS

Ramp Closure:
- Eastbound on ramp closed



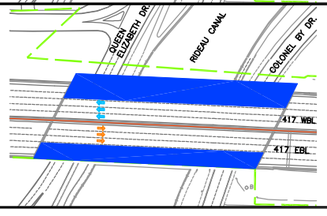
Stage 5



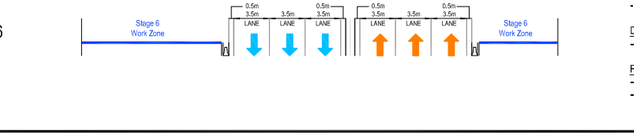
Work:
- median barrier replacement & lighting
- adjust drainage
- surface course asphalt

Duration:
- 2 WEEKS

Ramp Closure:
- no ramp closures



Stage 6



Work:
- new construction of bullnose and gore area
- adjust drainage
- surface course asphalt

Duration:
- 2 WEEKS

Ramp Closure:
- Westbound off ramp closed
- Eastbound on ramp closed

Canal Construction Alternatives 3A to 3D: Complete Superstructure Rapid Replacement using SPMTs. These alternatives involve the use of a conventional Self-Propelled Mobile Transporter (SPMT) using one of three approaches. One alternative, described as Alternative 3A, considers the transportation of a complete replacement bridge in and out of the site using a SPMT while a second variation, described below as Alternative 3B, considers the use of three separate sections to be transported. The third variation, Alternative 3C, considers the use of the City of Ottawa's Ballantyne Park (east of the Canal) as a bridge construction staging area. Alternative 3D is a variation of Alternative 3C and utilizes Ballantyne Park and allows Catherine Street to remain open between Elgin Street and Queen Elizabeth Drive. See **Photo 2** for an illustration of using an SPMT for heavy bridge lifts (photo courtesy of Mammoet Construction).



Photo 2: Typical Self-Propelled Mobile Transporter (SPMT)

Canal Construction Alternative 3A: **Complete Superstructure Rapid Replacement using SPMTs.** The Alternative 3A approach would involve constructing a complete superstructure replacement off site in a bridge farm staging site while new piers and abutment repair are completed at the Canal. This alternative will require advance fill to be placed across the Canal after the Thanksgiving weekend (Parks Canada closure of the Canal) within an approximate 5 week window before preparations for the winter skating season begin. Protection of heritage elements such as the walls would be necessary and it would require the creation of a level travel surface over the Canal and two adjacent roadways (Queen Elizabeth Drive and Colonel By Drive). This alternative would require 3 weeks in advance of the move to prepare the Canal and two adjacent streets and utilize 2 weeks following the move to remove all fill and reinstate the Canal. The closure of Queen Elizabeth Drive and Colonel By Drive would be 1 week in advance of the lift and 1 week following the lift. Traffic signals would be removed and reinstated and fill placed as needed for a level surface.

The impacts of this alternative result from creating large enough staging areas and for transportation and storage of the removed structures before the new bridges are driven into place. The impacts of this alternative are illustrated on **Figure 6.** Based on the large scale community impacts, **this alternative is not recommended to be carried forward.**

Subject: GWP 4170-13-00 Highway 417, Rehabilitation/ Replacement of Downtown Bridges (Metcalfe Street to Main Street) Preliminary Design and Environmental Assessment
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Project: BTE 17-010, **Date:** November 22, 2017

Canal Construction Alternative 3B: **Complete Superstructure Rapid Replacement using SPMTs (individual bridges for each span).** This approach, as illustrated in **Figure 7**, would involve constructing 3 separate spans for each bridge at the sites chosen as laydown areas for the Metcalfe and Elgin Street bridges while new piers and abutment repairs are complete at the canal. On the lift weekend, the existing bridge will be demolished onsite and the 3 new superstructures will be transported to the site using SPMT's. This alternative will require advance fill to be placed across the canal after the Thanksgiving weekend (Parks Canada closure of the canal) within an approximate 5 week window before preparations for the winter skating season begin. Protection of heritage elements, such as walls, would be necessary, and it would require the creation of a level travel surface over the canal and the Queen Elizabeth Drive. This alternative would use 2.5 weeks in advance of the move to prepare the canal and Queen Elizabeth Drive, and utilize 2.5 weeks following the move to remove all fill and reinstate the canal. The closure of Queen Elizabeth Drive and Colonel By Drive would be 1 week in advance of the lift and 1 week following the lift.

The impact of this alternative will result in a full closure of Catherine Street from Queen Elizabeth Drive to O'Connor Street and a partial single lane driveway access of Catherine Street from Queen Elizabeth Drive to Elgin Street to allow access to the underground parking garage of the residential block to the north. In addition it will require the closure of the Metcalfe off-ramp. The closures will be for approximately 8 to 12 months. It will also require a larger canal infill for the storage of the demolition debris, and the bridges will require expansion joints or slab links. This alternative requires longer term municipal street closures and therefore **this alternative is not recommended to be carried forward**.

Canal Construction Alternative 3C: Complete Superstructure Rapid Replacement using SPMTs (individual bridges for each span). This alternative, as illustrated in **Figure 8**, is a third variation of the individual bridge replacements in six sections using SPMTs. This variation relocates two of the bridges from Alternative 3B to the City of Ottawa's Ballantyne Park. By doing so, it reduces traffic impacts for the season of construction allowing the Metcalfe Street off-ramp to remain open. However, it will require the permanent acquisition of 5 residential properties and 1 business on Hawthorne Avenue. **This alternative is not recommended to be carried forward.**

Canal Construction Alternative 3D: Complete Superstructure Rapid Replacement using SPMTs (individual bridges for each span). This alternative, as illustrated in **Figure 9**, is a fourth variation of the individual bridge replacements in six sections using SPMTs. This variation relocates four of the bridges to the City of Ottawa's Ballantyne Park. By doing so, it reduces traffic impacts for the season of construction allowing the Metcalfe Street off-ramp to remain open and Catherine to remain open between Elgin Street and Queen Elizabeth Drive. However, it will require the permanent acquisition of 5 residential properties and 1 business on Hawthorne Avenue. **This alternative is not recommended to be carried forward.**

The four alternatives in this group are considered technically feasible; however, they have been recommended to be screened based on their larger longer term impacts. In addition, the Ministry has received input from approving agencies (City of Ottawa, NCC and Parks Canada) that has given certainty that the other alternatives that use typical Ontario construction practices are acceptable. The more typical alternatives will have significantly reduced societal effects during construction.

Canal Alternative 4: Demolish in Place and Jack and Slide from Sides (2 bridges replaced on same weekend)

This alternative would utilize advance preparatory fill within the canal and adjacent roadways. This will include advance fill to be placed across the Canal after the Thanksgiving weekend (Parks Canada closure of the Canal) within an approximate 5 week window before preparations for the winter skating season begin. Protection of heritage elements such as the walls would be necessary but not to the same extent as Alternative 3 which required a finished travel surface with compaction for SPMT's. For this alternative the canal would include rock fill and temporary protection of the two adjacent roadways (Queen Elizabeth Drive and Colonel By Drive) with mats or sand to protect them from falling concrete debris. Protection would also be required for the new piers constructed in advance of the weekend slide. This alternative would use 2-3 weeks in advance of the move to prepare the canal and two adjacent streets and utilize 1-2 weeks following the move to remove all fill and reinstate the canal. The closure of Queen Elizabeth Drive and Colonel By Drive would be 3-7 days in advance of the lift and 1-2 days following the slide.

On the weekend of the slide it is estimated the removals would be completed in 24 hours for the drop of materials down onto the surfaces below the bridge. The slide would be completed on Day 2 (16 hours) followed by paving in the remaining time to Monday morning before the 6 am opening of the Queensway. **Figure 10** illustrates the methodology for sliding new bridges into place on a single fall weekend. The advance construction of the new bridges and piers and abutment repairs would be completed in the 8-10 months of the slide weekend (fall event). This is known technology with high confidence in the construction schedule. Mitigation for potential impacts to the loss of parking for the Royal Oak business can be off-site parking within the City of Ottawa Ballantyne Park 1 block to the east. **This alternative is recommended to be carried forward.**

Canal Alternative 5: Sequential Jack and Slide (removing one bridge at a time)
This alternative would replace a single bridge on a weekend and schedule the replacement of the second bridge the next year. Both replacements would occur in the fall after the Thanksgiving weekend in the 5 week time period provided by Parks Canada for closure of the canal.
In this alternative there would be a new bridge construction area beside the freeway, in the respective staging areas, where the new structure would be built in advance of being slid out over the canal then into place on the freeway. Advance new piers will be constructed and repairs made to the existing abutments during this time. New construction would be completed 8–10 months in advance of the slide weekend.

In this alternative the areas of new construction and demolition are smaller and the trade-off is that the project extends to a second year. The sequence of slides is illustrated in **Figure 11**. In this representation sequential slides add a new bridge (on one side – Location A) and then slide an old bridge off on the opposite side of the freeway (Location D). In location D, the bridge can be demolished on a subsequent weekend (over the streets) and then dropped onto the Canal over fill. The duration of the street closures are reduced but occur on consecutive years.

This alternative would use 2-3 weeks in advance of the move to prepare the canal. The protection of the streets would occur on a weekend to place and remove all sand fill and debris.

Mitigation for potential impacts to the loss of parking for the Royal Oak business can be off-site parking within the City of Ottawa Ballantyne Park one block to the east. **This alternative is recommended to be carried forward.**

FIGURE 6
ALTERNATIVE 3A
COMPLETE SUPERSTRUCTURE RAPID BRIDGE REPLACEMENT USING SPMT'S

Scale N.T.S.

PRELIMINARY RECOMMENDATION NOT TO CARRY FORWARD
TO DETAILED EVALUATION PHASE

LEGEND:
- EXISTING MTO PROPERTY
- ZONE OF CONSTRUCTION STAGING AREA
- RAPID BRIDGE TECHNOLOGY TRANSPORTER – REMOVALS
- RAPID BRIDGE TECHNOLOGY TRANSPORTER – PLACEMENTS
- PROPERTY ACQUISITION

SEQUENCE:
1. OLD EASTBOUND BRIDGE REMOVED TO A
2. OLD WESTBOUND BRIDGE REMOVED TO B
3. NEW WESTBOUND BRIDGE INSTALLED FROM C
4. NEW EASTBOUND BRIDGE INSTALLED FROM D
5. OLD BRIDGES TRANSFERRED TO SITES C AND D

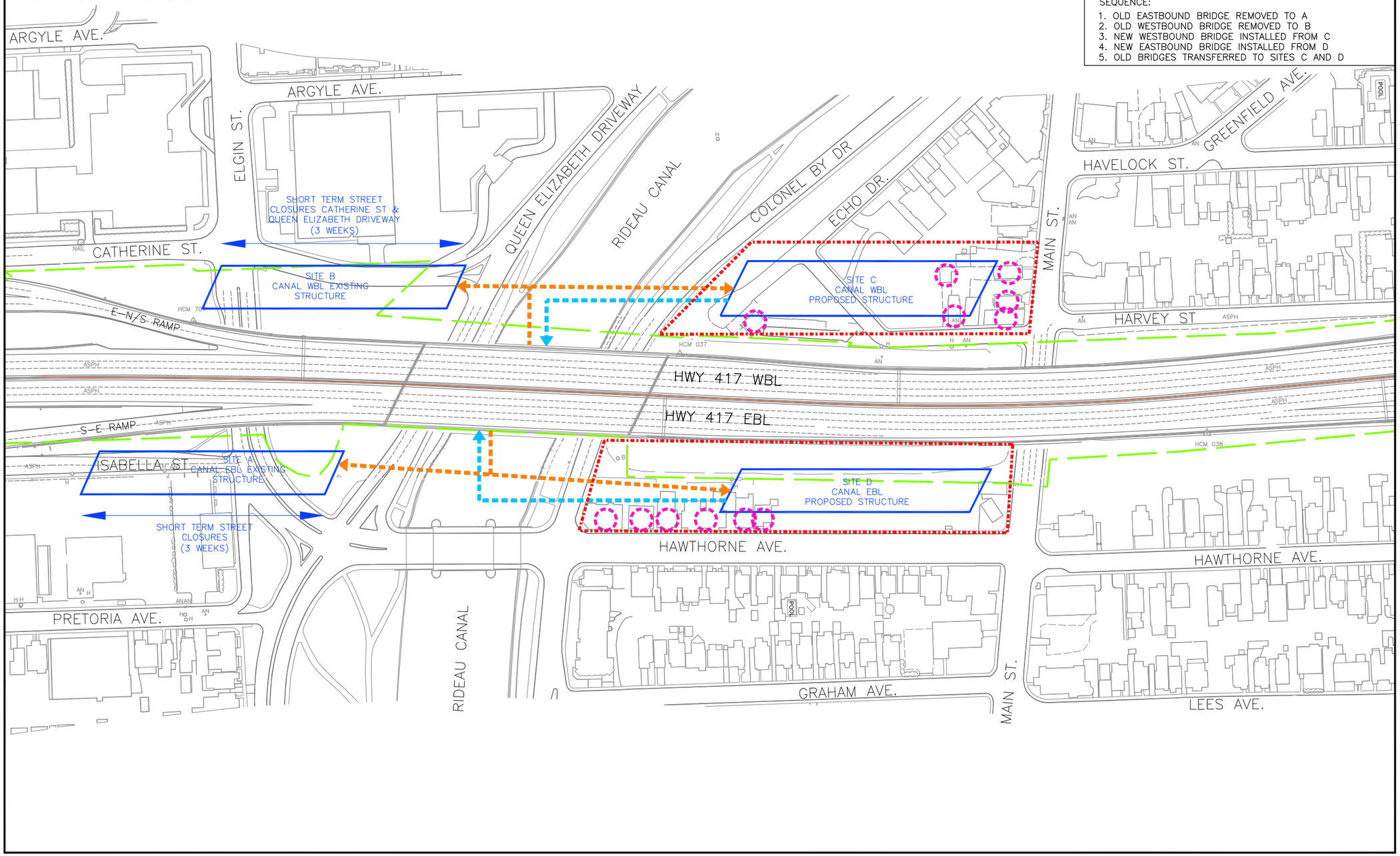


FIGURE 7
ALTERNATIVE 3B
COMPLETE SUPERSTRUCTURE RAPID BRIDGE REPLACEMENT USING SPMT'S (INDIVIDUAL BRIDGES FOR EACH SPAN)

Scale N.T.S.

PRELIMINARY RECOMMENDATION NOT TO CARRY FORWARD TO DETAILED EVALUATION PHASE

LEGEND:

- EXISTING MTO PROPERTY
- ZONE OF CONSTRUCTION STAGING AREA
- RAPID BRIDGE TECHNOLOGY TRANSPORTER – PLACEMENTS

SEQUENCE:

1. EXISTING STRUCTURE DEMOLISHED IN PLACE.
2. MOVE 1 (PROPOSED EBL) TO LOCATION 1
3. MOVE 2 (PROPOSED WBL) TO LOCATION 2
4. MOVE 3 (PROPOSED EBL) TO LOCATION 3
5. MOVE 4 (PROPOSED WBL) TO LOCATION 4
6. MOVE 5 (PROPOSED EBL) TO LOCATION 5
7. MOVE 6 (PROPOSED WBL) TO LOCATION 6

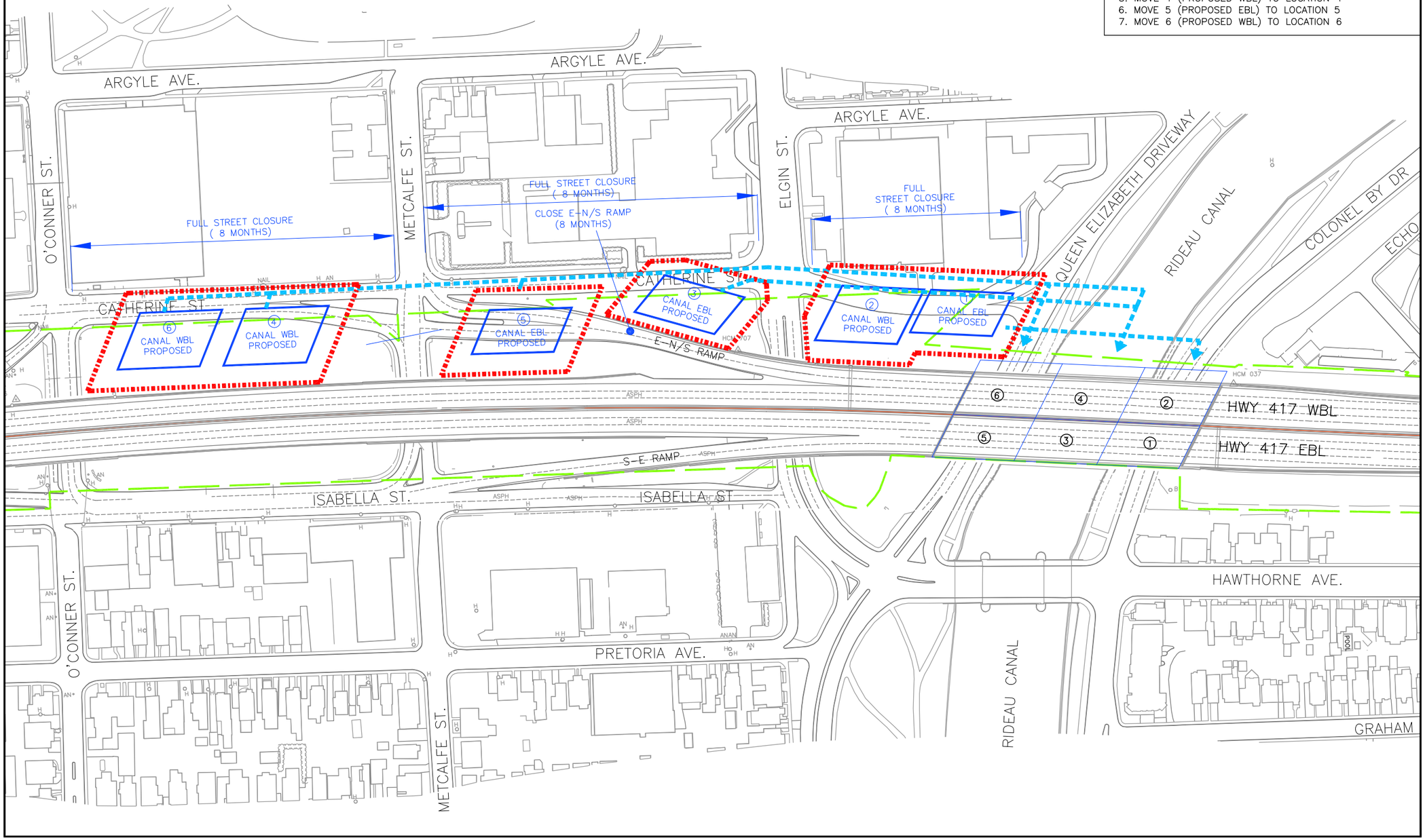


FIGURE 8
ALTERNATIVE 3C
COMPLETE SUPERSTRUCTURE RAPID BRIDGE REPLACEMENT USING SPMT'S (INDIVIDUAL BRIDGES FOR EACH SPAN)

Scale N.T.S.

PRELIMINARY RECOMMENDATION NOT TO CARRY FORWARD TO DETAILED EVALUATION PHASE

LEGEND:

- EXISTING MTO PROPERTY
- ZONE OF CONSTRUCTION STAGING AREA
- RAPID BRIDGE TECHNOLOGY TRANSPORTER – PLACEMENTS
- PROPERTY ACQUISITION

SEQUENCE:

1. EXISTING STRUCTURE DEMOLISHED IN PLACE.
2. MOVE 1 (PROPOSED EBL) TO LOCATION 1
3. MOVE 2 (PROPOSED WBL) TO LOCATION 2
4. MOVE 3 (PROPOSED EBL) TO LOCATION 3
5. MOVE 4 (PROPOSED WBL) TO LOCATION 4
6. MOVE 5 (PROPOSED EBL) TO LOCATION 5
7. MOVE 6 (PROPOSED WBL) TO LOCATION 6

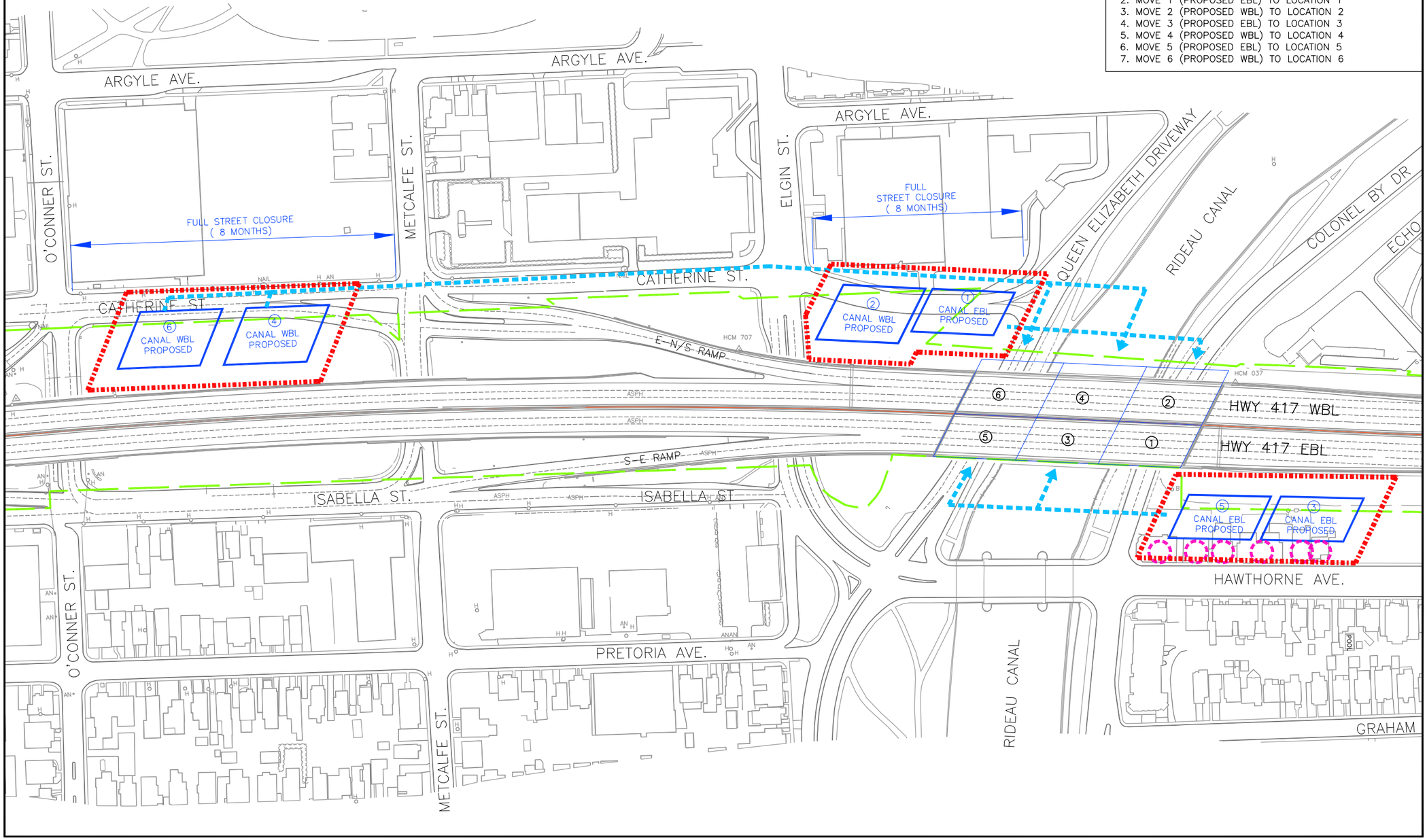


FIGURE 9
ALTERNATIVE 3D
COMPLETE SUPERSTRUCTURE RAPID BRIDGE REPLACEMENT USING SPMT'S
(INDIVIDUAL BRIDGES FOR EACH SPAN)

Scale N.T.S.

PRELIMINARY RECOMMENDATION NOT TO CARRY FORWARD
TO DETAILED EVALUATION PHASE

LEGEND:

- EXISTING MTO PROPERTY
- ZONE OF CONSTRUCTION STAGING AREA
- RAPID BRIDGE TECHNOLOGY TRANSPORTER – PLACEMENTS
- PROPERTY ACQUISITION

SEQUENCE:

1. EXISTING STRUCTURE DEMOLISHED IN PLACE.
2. MOVE 4 (PROPOSED WBL) TO LOCATION 4
3. MOVE 6 (PROPOSED WBL) TO LOCATION 6
4. MOVE 5 (PROPOSED EBL) TO LOCATION 5
5. MOVE 3 (PROPOSED EBL) TO LOCATION 3
5. MOVE 3 (PROPOSED EBL) TO LOCATION 3
6. MOVE 2 (PROPOSED WBL) TO LOCATION 2
7. MOVE 1 (PROPOSED WBL) TO LOCATION 1

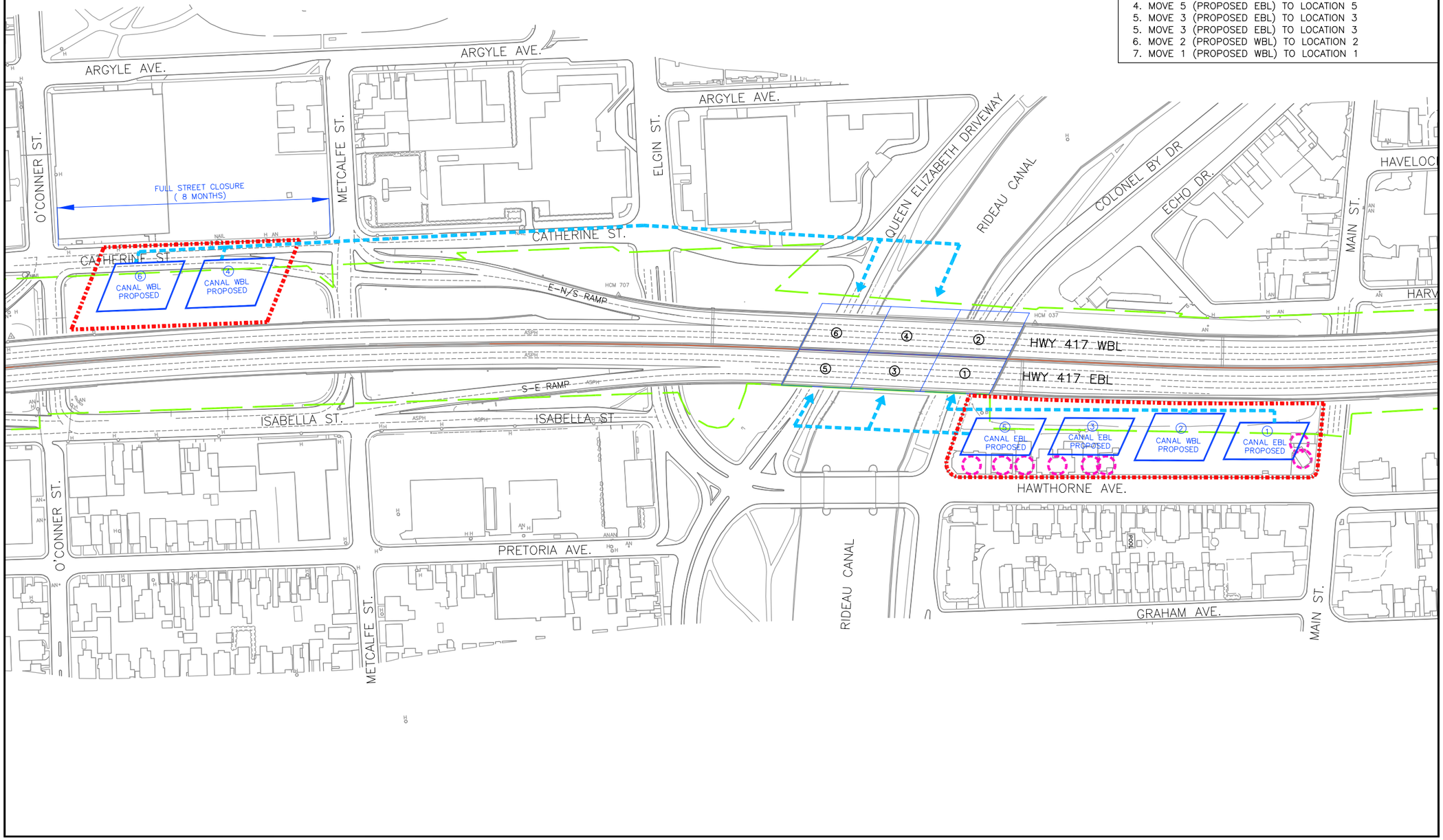


FIGURE 10
ALTERNATIVE 4
JACK AND SLIDE

Scale N.T.S.

PRELIMINARY RECOMMENDATION CARRIED FORWARD
TO DETAILED EVALUATION PHASE

LEGEND:

EXISTING MTO PROPERTY

ZONE OF CONSTRUCTION STAGING AREA

PROPERTY ACQUISITION

SEQUENCE:

A&D – NEW SUPERSTRUCTURE CONSTRUCTION
B&C – EXISTING DECK DEMOLISHED IN PLACE

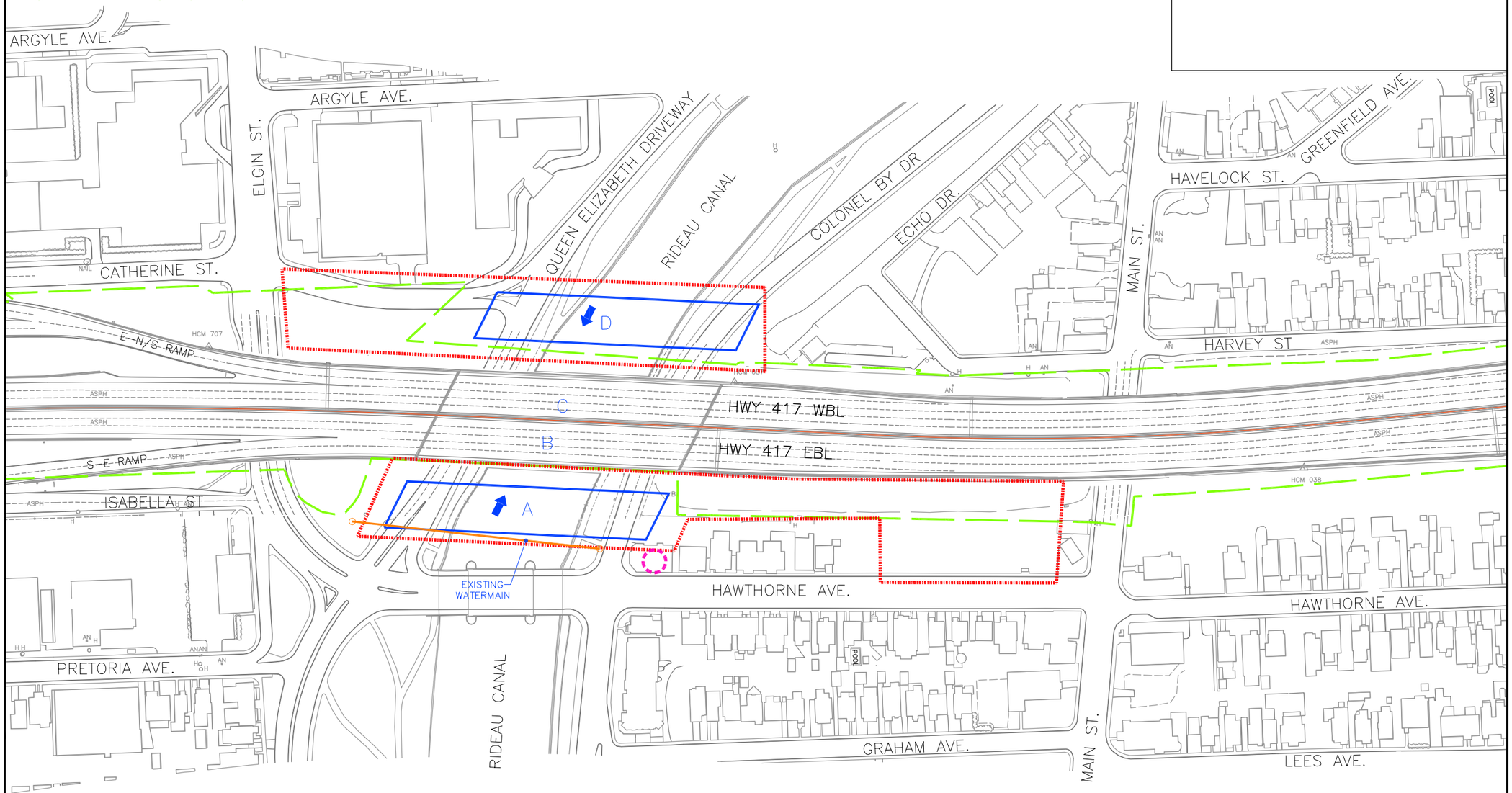


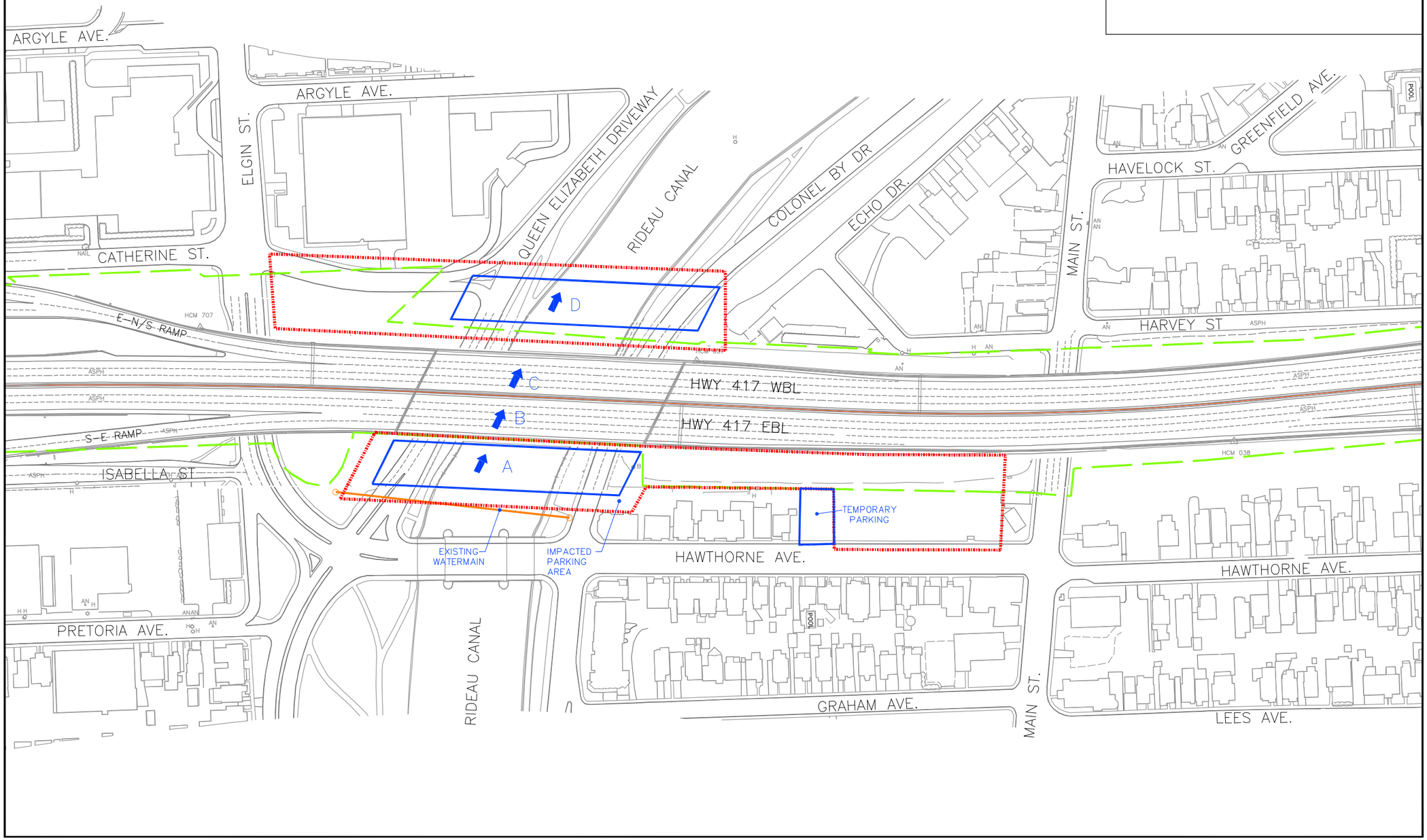
FIGURE 11
ALTERNATIVE 5
SEQUENTIAL SLIDES TO ADD NEW BRIDGE (ON ONE SIDE) AND SLIDE AN OLD BRIDGE OFF ON OPPOSITE SIDE

Scale N.T.S.

PRELIMINARY RECOMMENDATION CARRIED FORWARD
TO DETAILED EVALUATION PHASE

LEGEND:
- EXISTING MTO PROPERTY
- ZONE OF CONSTRUCTION STAGING AREA
- PROPERTY ACQUISITION

SEQUENCE:
A – NEW SUPERSTRUCTURE CONSTRUCTION
B/C – EXISTING DECK DEMOLISHED IN PLACE
D – RECEIVING DEMOLITION AREA



Canal Alternative 6: SPMT transport to Nicholas

This innovative technique would build a platform under the structures to lift the SPMT and each of the 3 spans sequentially to the elevation of the Queensway. The SPMT then drives the bridge sections to a Nicholas staging area and returns with new EBL and WBL structures. This alternative requires new piers and temporary support piers in the Canal. **Photo 3** illustrates the "elevator" type alternative that can allow SPMTs to raise and lower each structure to the elevation of the Queensway. This approach generally uses known technology but would represent the first known use for a bridge of this size. This alternative is recommended to be carried forward. **Figure 12** illustrates the travel path of the old and new structures to the Nicholas Staging area.

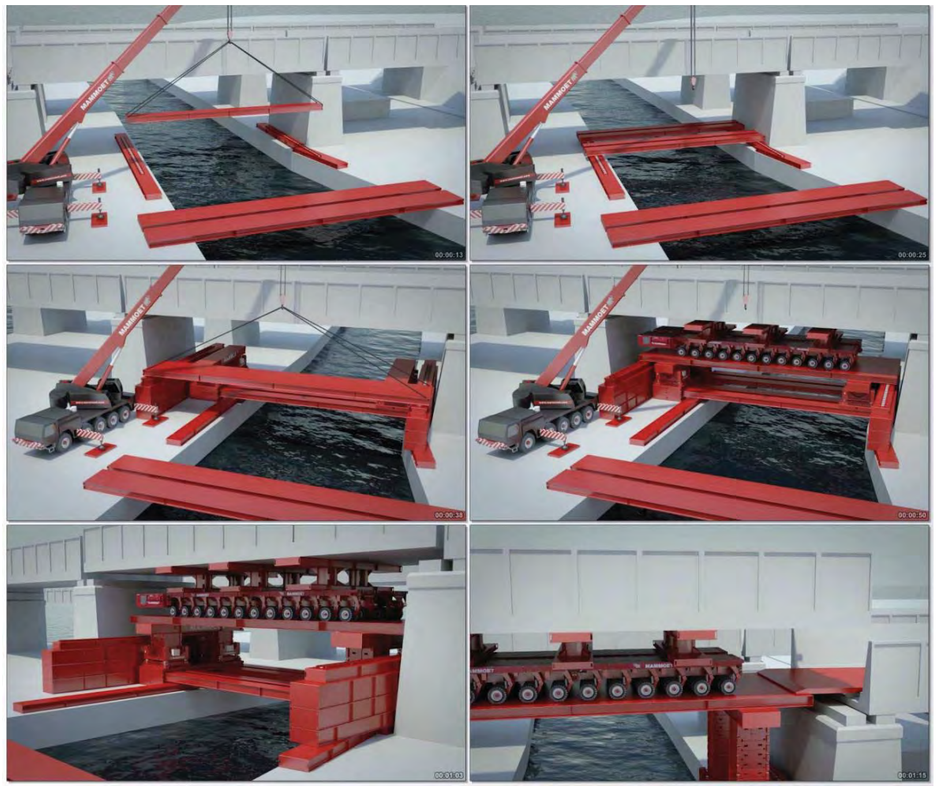


Photo 3: Alternative 6 Elevator and SPMT Construction for Rapid Removal and Replacement

FIGURE 12
ALTERNATIVE 6
SPMT TO REMOTE NICHOLAS SITE

Scale N.T.S.

PRELIMINARY RECOMMENDATION CARRIED FORWARD
TO DETAILED EVALUATION PHASE

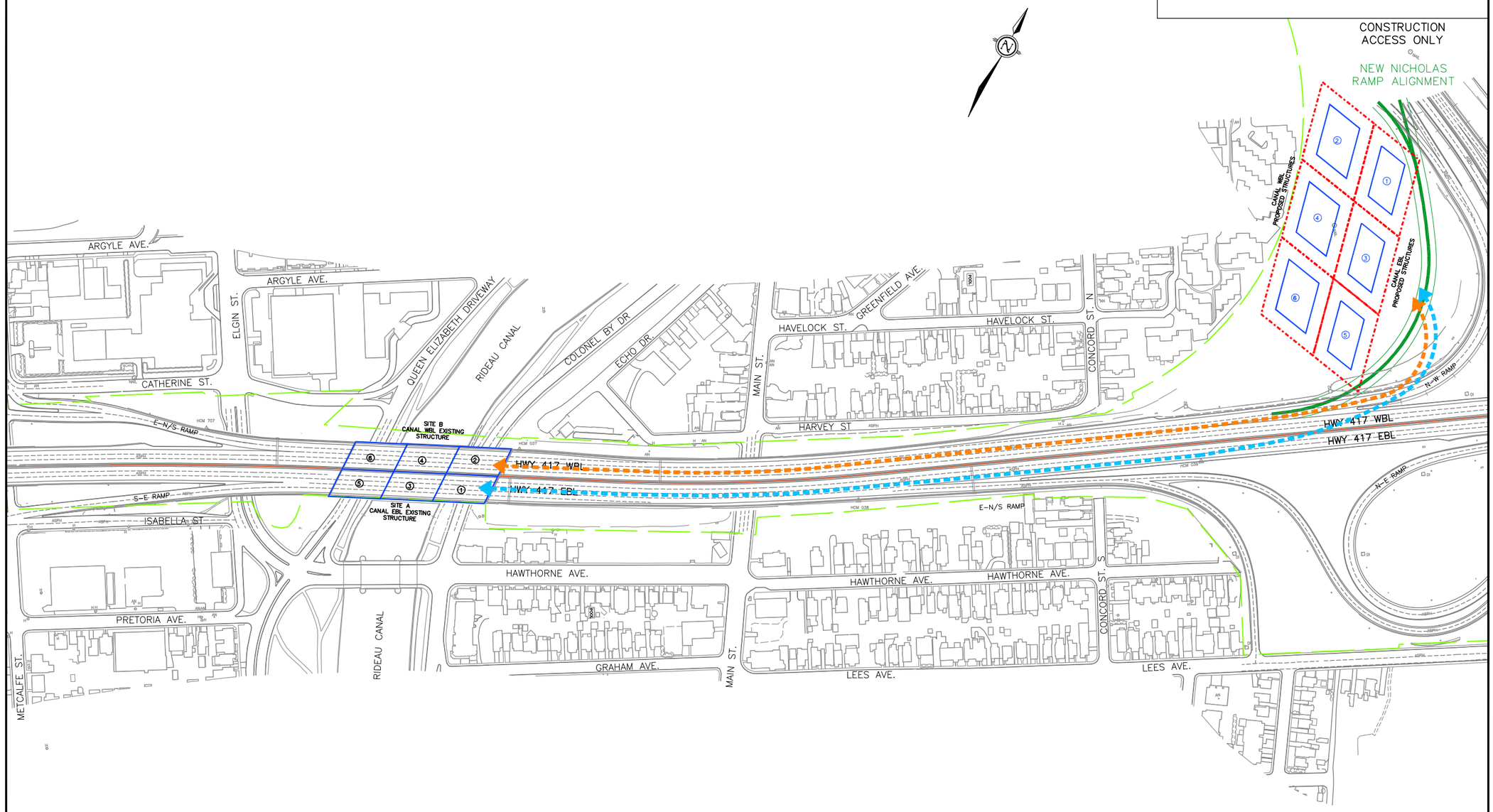


Table 2 summarizes the constructability issues with the above canal construction alternatives.

Table 2: Constructability Issues for Alternatives

Alternative	Constructability Issues
Alternative 1: Remote staging areas using barges **Not Carried Forward**	• There is no easy way to navigate the barges to and from the site. • The time of year when the barges can be used is during the canal's navigation season. • The only span that can be moved by barge is the centre span and therefore it is a complex procedure to remove the old superstructure and place the new superstructure. • Many Queensway lane closures required to disconnect and temporarily reconnect the existing bridge into 3 sections. • The bridges will need expansion joints resulting in increased maintenance costs. Also, the installation of the joints will require many lane closures on the Queensway after the move weekend.
Alternative 2A: Conventional strip construction **Not Carried Forward**	• There will be a long construction duration with traffic delays and disruptions on the Queensway. • There will be long duration ramp closures when the outside lanes are under construction. • Very difficult to maintain the required travel lanes on the Queensway when removing the various sections of the bridge. • Requires unconventional "battleship" traffic staging • It will be difficult to maintain canal traffic both along and in the canal during construction.
Alternative 2B: Conventional Strip Construction allowing Wheel Tracking on the Joint between Bridges **Carried Forward**	• There will be a long construction duration with traffic delays and disruptions on the Queensway. • Avoidance of AASHTO battleship traffic stage • Known technology therefore increasing safety of local drivers who may be unfamiliar with the alternate traffic staging • Requires preparatory stage for the joint connection between the two bridges • Supported by TAC

Subject: GWP 4170-13-00 Highway 417, Rehabilitation/ Replacement of Downtown Bridges (Metcalfe Street to Main Street) Preliminary Design and Environmental Assessment
Rideau Canal Structure Replacement Construction Methodology Alternatives Coarse Screening Analysis
Project: BTE 17-010, **Date:** November 22, 2017

Alternative 2C: Conventional Strip Construction with Additional Work Completed Prior to Construction **Carried Forward** (if replacement of Main Street and Elgin Street structures are recommended)	• There will be a long construction duration with traffic delays and disruptions on the Queensway. • There will be long duration ramp closures when the Queensway is being widened. • Triggers the requirement to replace the rigid frame bridges in advance of construction. • Known technology therefore increasing safety of local drivers who may be unfamiliar with the alternate traffic staging
Alternative 3A: Using SPMT's to remove and replace the bridge from farm sites (using rigid frames) **Not Carried Forward**	• Significant impacts (buyouts) to residential properties. • Extensive underground utilities to avoid and/or protect along the SPMT's travel routes. • May need to close down City streets to enlarge the laydown sites. • The bridges will need expansion joints resulting in increased maintenance costs. Also, the installation of the joints will require many lane closures on the Queensway after the move weekend. • There is a higher temporary fill height in the Canal relative to the other alternatives carried forward. • During the weekend work there needs to be a temporary joint/closure at the location where the permanent joints are located. • Many Queensway lane closures required to disconnect and temporarily reconnect the existing bridge into 3 sections.

Alternative 3B: Using SPMT's with onsite demolition and simple support structures ✗ **Not Carried Forward**	• Significant impacts (buyouts) to residential properties and a commercial property • Traffic impacts for a construction season include: a) a partial closure of Catherine Street from Elgin Street to O'Connor Street will be required; b) a full closure of Catherine Street from Queen Elizabeth Drive to Elgin Street will be required; and c) the closure of the Metcalfe off-ramp will be required. • The bridges will need expansion joints resulting in increased maintenance costs. Also, the installation of the joints will require many lane closures on the Queensway after the move weekend. • There is a great risk of not achieving the schedule • There is a higher temporary fill height in the Canal relative to the other options carried forward. • It will be a very complex removal operation in a very small time duration. • The move weekend requires a large amount of manpower and equipment working in a small area. • The new substructure will need to be protected during the demolition of the existing bridge.
Alternative 3C: Using SPMT's with onsite demolition and simple support structures ✗ **Not Carried Forward**	• Significant impacts (buyouts) to residential properties and a commercial property. • The bridges will need expansion joints resulting in increased maintenance costs. Also, the installation of the joints will require many lane closures on the Queensway after the move weekend. • There is a great risk of not achieving the schedule. • Traffic impacts for a construction season include: a) a partial closure of Catherine Street from Elgin Street to O'Connor Street; and b) full closure of Catherine Street from Queen Elizabeth Drive to Elgin Street. • There is a higher temporary fill height in the Canal relative to the other alternatives carried forward. • It will be a very complex removal operation in a very small time duration. • The move weekend requires a large amount of manpower and equipment working in a small area. • The new substructure will need to be protected during the demolition of the existing bridge.

Subject: GWP 4170-13-00 Highway 417, Rehabilitation/ Replacement of Downtown Bridges (Metcalfe Street to Main Street) Preliminary Design and Environmental Assessment
Rideau Canal Structure Replacement Construction Methodology Alternatives Coarse Screening Analysis
Project: BTE 17-010, **Date:** November 22, 2017

Alternative 3D: Using SPMT's with onsite demolition and simple support structures ✗ **Not Carried Forward**	• Significant impacts (buyouts) to residential properties and a commercial property • The bridges will need expansion joints resulting in increased maintenance costs. Also, the installation of the joints will require many lane closures on the Queensway after the move weekend. • There is a great risk of not achieving the schedule. • Traffic impacts for a construction season include a partial closure of Catherine Street from Elgin Street to O'Connor Street. • There is a higher temporary fill height in the Canal relative to the other alternatives carried forward. • It will be a very complex removal operation in a very small time duration. • The move weekend requires a large amount of manpower and equipment working in a small area. • The new substructure will need to be protected during the demolition of the existing bridge
Alternative 4: Demolish in place and jack and slide from sides (2 bridges replaced on the same weekend) ✓ **Carried Forward**	• There is a requirement for a temporary low height fill in the Canal. • There is a possibility of needing to purchase property. • The new substructure will need to be protected during the demolition of the existing bridge.
Alternative 5: Sequential jack and slide removing one bridge at a time ✓ **Carried Forward**	• There is a requirement for a temporary low height fill in the Canal. There is a possibility of needing to purchase property for a temporary parking area. • It is a complex operation to temporarily connect the new bridge with the existing bridge to accommodate Queensway traffic. • The new substructure will need to be protected during the demolition of the existing bridge.
Alternative 6: Using SPMT's and transporting to and from Nicholas ✓ **Carried Forward**	• It will require a large Queensway detour. • There is a large effect to the canal due to the large infill pad. • This is estimated to be a greater capital cost in comparison to other alternatives.

Conclusions:
Table 3 provides a summary of the coarse screening of alternatives.

Table 3: Summary of Canal Construction Alternative Coarse Screening of Alternatives

Canal Construction Alternative	Coarse Screening
Alternative 1: Barge Transportation of Structure.	Not Carried Forward
Alternative 2A: Conventional Construction in Strips.	Not Carried Forward
Alternative 2B: Conventional Staging in Strips allowing wheel tracking on the joint between bridges	Carried Forward
Alternative 2C: Conventional Construction in Strips with Additional Work Completed Prior to Construction	Carried Forward*
Alternative 3A: Complete Superstructure Rapid Replacement using SPMTs.	Not Carried Forward
Alternative 3B: Complete Superstructure Rapid Replacement using SPMTs.	Not Carried Forward
Alternative 3C: Complete Superstructure Rapid Replacement using SPMTs.	Not Carried Forward
Alternative 3D: Complete Superstructure Rapid Replacement using SPMTs.	Not Carried Forward
Alternative 4: Demolish in Place and Jack and Slide from Sides (2 bridges replaced on same weekend)	Carried Forward
Alternative 5: Sequential Jack and Slide (removing one bridge at a time)	Carried Forward
Alternative 6: SPMT transport to Nicholas	Carried Forward

* Only if replacement of the structure is recommended

These preliminary technical recommendations will be presented to the public and stakeholders at PIC No. 1 in the fall of 2017.

Appendix E
Preliminary Long List of Potential Evaluation Criteria and Screening

LONG LIST OF EVALUATION CRITERIA

Preliminary Design and Environmental Assessment Study for the Rehabilitation/Replacement of Ottawa
Queensway Downtown Bridges from Metcalfe Street to Main Street
GWP 4170-13-00
Analysis and Evaluation Report – Long List of Evaluation Criteria
May 24, 2018

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
1.0 Transportation						
Maximum Peak Queue Length on Queensway	km*days (peak hour)	✓	✓	✓	✓	
Delays (during construction)	veh-h	✓	✓	✓	✓	Includes consideration for travel time, fuel consumption and movement of goods
Delays to Emergency Vehicles	days	✓	✓	✓	✓	
Future Traffic Delays	Yes/No	✓	✓	✓	✓	
Ramp Closures	veh-day (peak hour)	✓	✗	✓	✗	
Travel Time	min	✗	✗	✗	✗	See Delay Criteria
Fuel Consumption	l	✗	✗	✗	✗	See Delay Criteria
Road User Costs	$	✗	✗	✗	✗	See Delay Criteria
Movement of Goods	h	✗	✗	✗	✗	See Delay Criteria
Ability to Bundle Bridges	Yes/No	✗	✗	✗	✗	All considered equal
Highway Safety - Collision Potential on Queensway (Queuing)	days	✗	✗	✗	✗	See Max Peak Queue Length
Highway Safety – Design Consistency of Traffic Staging Design	Yes/No	✗	✗	✗	✗	All considered equal
Pedestrian – Delay and Out-of-Way Travel	m-days	✓	✓	✓	✓	
Bicycle – Delay and Out-of-Way Travel	m-days	✓	✓	✓	✓	
Pedestrian/Bicycle Safety	High/Low	✗	✗	✗	✗	All considered equal
Multi-use Pathway – Temporary Construction Effects for Safety and Personal Security Level	High/Medium/ Low	✓	✗	✗	✗	
Transit Operations Delay – Out-of-Way Travel	m-days	✓	✗	✓	✗	
General Traffic Municipal Street Delay	m-days	✗	✓	✓	✓	
Municipal Street Traffic Signals Operations	Yes/No	✗	✗	✗	✗	All considered equal
General Traffic Federal Parkways Delay (Colonel By Drive and Queen Elizabeth Drive)	m-days	✓	✗	✗	✗	
Federal Parkways Traffic Signal Operations	Yes/No	✗	✗	✗	✗	No impact
Flexibility for Future Queensway Widening	Yes/No	✓	✗	✗	✗	
Construction Duration	days	✗	✗	✗	✗	See Delays
Impact to City of Ottawa Watermain	Yes/No	✗	✗	✗	✗	All considered equal
Safety – Lateral Hazard	m	✓	✗	✗	✗	
Associated Effects Adjacent to Rigid Frame Bridge Projects	Yes/No	✓	✗	✗	✗	
Traffic Staging of Multiple Projects	Yes/No	✓	✗	✗	✗	
2.0 Natural Environment						
Air Quality	Tonnes/year	✗	✗	✗	✗	See Note 1
Endangered Species	No.	✗	✗	✗	✗	No endangered species
Cold Water Fish Habitat Impacted	m^2	✗	✗	✗	✗	No cold water fish habitat.

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
Cool Water Fish Habitat Impacted	m²	✗	✗	✗	✗	No cool water fish habitat.
Permanent Warm Water Fish Habitat Created	Yes/No	✓	✗	✗	✗	
Water Quality (Stormwater Surface Runoff)	m³	✗	✗	✗	✗	
Species at Risk	Yes/No	✗	✗	✗	✗	No SAR
Archaeological Potential	Yes/No	✗	✗	✗	✗	See Social Environment
Wildlife Habitats and Movement/Corridor	Yes/No	✗	✗	✗	✗	
Migratory Bird Nesting Impact	Yes/No	✗	✗	✗	✗	
Provincially Significant (PS) Natural Areas and Habitat	ha	✗	✗	✗	✗	No PS natural areas or habitat
Regionally Significant Natural Areas and Habitat	ha	✗	✗	✗	✗	No natural areas or habitat
"Natural" Habitat Impacted	m²	✗	✗	✗	✗	No natural areas or habitat
Specimen Trees Removed	Yes/No	✗	✗	✗	✗	See Cultural Heritage Landscape
Landscape Vegetation Removed	Yes/No	✓	✗	✓	✓	
Woodlot at Nicholas Street On-Ramp Impacted	Yes/No	✓	✗	✗	✗	
Wildlife Habitat Reptiles, Mammals and Insects, Amphibians	m²	✗	✗	✗	✗	No impact
Climate Change	Yes/No	✗	✗	✗	✗	See Note 1.
Wetlands	m²	✗	✗	✗	✗	No wetlands
Woodlands and Other Vegetated Areas	m²	✗	✗	✗	✗	No impact
Groundwater	Yes/No	✗	✗	✗	✗	No impact
Designated Areas	Yes/No	✗	✗	✗	✗	No impact
Associated Effects to Adjacent Rigid Frame Projects	Yes/No	✓	✗	✗	✗	
3.0 Social Environment						
Noise Impacts	No.	✗	✗	✗	✗	
Vibration Impacts	No.	✗	✗	✗	✗	
Community Cohesion	High/Medium/ Low	✗	✗	✗	✗	
Green Spaces Impacted	m²	✗	✓	✓	✗	Excluding Ballantyne Park
Community Festivals	Yes/No	✗	✗	✗	✗	No impact during festival season.
Contamination/Pollution	Yes/No	✗	✗	✗	✗	All considered equal
Impact to Emergency Response	days	✗	✗	✗	✗	See Transportation
Short Term Loss of Recreational Space In Ballantyne Park	m²	✗	✗	✗	✓	All considered equal
Impact To Community Uses	High/ Medium/ Low	✓	✗	✗	✗	
Impact to Nearby Residential Properties	Yes/No	✗	✗	✗	✗	No impact
Natural Lighting and Visual Safety	m	✓	✗	✗	✗	

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Factors and Sub-Factors		Unit of Measure	Carried Forward				Remarks
			Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
Openness of Canal		Impact 0-10	✓	✗	✗	✗	
Intrusion to Adjacent Residents		High/Medium/ Low	✓	✗	✗	✗	
Water Wells Impacted		No.	✗	✗	✗	✗	No impact.
Excess Materials Management		Yes/No	✗	✗	✗	✗	All considered equal
4.0 Context Sensitive Design							
4.1 Urban Design/Context	Capital Context	High/Medium/ Low	✓	✗	✗	✗	
	City Context	High/Medium/ Low	✓	✗	✗	✗	
	Fabric and Texture of Surrounding Built Form	0-10	✗	✗	✗	✗	See City Context
	General Topography and Landscape of Surrounding Area	0-10	✗	✗	✗	✗	See City Context
	Ability to Improve Experience along the Queensway Transportation Corridor	0-10	✗	✗	✗	✗	See Travelling User Experience
	Impact to NCC Parkway Corridors	days	✗	✗	✗	✗	See Transportation
	Impact to Municipal Roadways	days	✗	✗	✗	✗	
	Impact to Rideau Canal Navigable Waterway	days	✗	✗	✗	✗	See Social Environment
	Soft Landscape Elements Park and Naturalized Vegetation	days	✗	✗	✗	✗	See Natural Environment
	Slenderness of Mid-span Deck Depth	m	✓	✗	✗	✗	
	Height above Parkways	mm	✓	✗	✗	✗	
	Hawthorne Avenue Architectural Streetscape	0-10	✗	✗	✗	✗	
	Treed Queensway Buffer	0-10	✗	✗	✗	✗	
	Street Layout	0-10	✗	✗	✗	✗	
4.2 Travelling User Experience	Experience on Queensway	High/ Low	✓	✗	✗	✗	
	Experience on NCC Parkways	High/Medium/ Low	✓	✗	✗	✗	
	Active Traveller Experience – Sidewalks and NCC Trails	High/Medium/ Low	✓	✗	✗	✗	
	Experience of Pedestrians	0-10	✗	✗	✗	✗	See 4.2 Active Traveller Experience
	Experience of Cyclists	0-10	✗	✗	✗	✗	See 4.2 Active Traveller Experience
	Experience of Boaters	0-10	✗	✗	✗	✗	See 4.2 Active Traveller Experience
	Experience of Skaters	0-10	✗	✗	✗	✗	See 4.2 Active Traveller Experience
	Night Experience and Lighting	0-10	✗	✗	✗	✗	See 4.3 Design Quality
	Availability of Natural Light	0-10	✗	✗	✗	✗	See Social Environment

	Factors and Sub-Factors	Unit of Measure	Carried Forward: Rideau Canal	Metcalfe Street	Elgin Street	Main Street	Remarks
4.3 Design Quality	Sense of Place	0-10	✓	✗	✗	✗	
	Night Quality and Lighting	0-10	✓	✗	✗	✗	
	Heritage Conservation Repairability	0-10	✗	✗	✗	✗	
	Design Principles, Architectural Concept and Visual Quality	0-10	✓	✗	✗	✗	
	Materiality	High/Medium/ Low	✓	✗	✗	✗	
	Structural Elegance and Proportion to Site	0-10	✓	✗	✗	✗	
	Sculptural Interest	High/Medium/ Low	✓	✗	✗	✗	
	Awareness of Canal Crossing	0-10	✗	✗	✗	✗	See 4.1 Urban Context
5.0 Heritage Resources							
5.1 Built Heritage	Pretoria Bridge	0-10	✓	✗	✗	✗	
	Former Gas Station	Yes/No	✓	✗	✗	✓	
	Former Old Town Hall	0-10	✗	✗	✗	✗	No impact
	Historic Commercial Areas of Ottawa East	0-10	✗	✗	✗	✗	No impact
	Nearby Designated Properties	0-10	✗	✗	✗	✗	No impact
	Rideau Canal Structure	0-10	✗	✗	✗	✗	No impact
	Remains of Old Residential Areas of Ottawa East	0-10	✗	✗	✗	✗	No impact
	Centretown Heritage Conservation District	0-10	✗	✗	✗	✗	See Nearby Designated Properties
	Royal Oak Pub	Yes/No	✓	✗	✗	✗	
5.2 Cultural Heritage Landscapes	Rideau Canal WHS/NHSC, Standards and Guidelines	0-10	✓	✗	✗	✗	
	Landforms – Raised Elevation of Highway 417 following Early Railway	0-10	✗	✗	✗	✗	No Impact
	Landforms – Designed and Graded Terraces and Trails below	0-10	✗	✗	✗	✗	No Impact
	Vegetation – Designed Parkland, Ballantyne Park	High/Medium/ Low	✓	✗	✗	✗	
	Vegetation – NCC Parkland and Plantings	High/Low	✓	✗	✗	✗	No Impact
	Circulation – Sidewalk (east side)	0-10	✗	✗	✗	✗	No Impact
	Circulation – Sidewalk (west side)	0-10	✗	✗	✗	✗	No Impact
	Circulation – Multi-use Trail (east side)	0-10	✗	✗	✗	✗	No Impact
	Circulation – Multi-use Trail (west side)	0-10	✗	✗	✗	✗	No Impact
	Circulation – NCC Parkway – Colonel By Drive	0-10	✗	✗	✗	✗	No Impact
	Circulation – NCC Parkway – Queen Elizabeth Driveway	0-10	✗	✗	✗	✗	No Impact
	Visual Relationships	High/Medium/ Low	✓	✗	✗	✗	

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	Factors and Sub-Factors	Unit of Measure	Carried Forward: Rideau Canal	Metcalfe Street	Elgin Street	Main Street	Remarks
5.3 Archaeology	Pre-contact Sites	ha	✗	✗	✗	✗	No potential
	Post-contact Sites	ha	✗	✗	✗	✗	No potential
	Sites of Archaeological Potential	ha	✗	✗	✗	✗	No potential
6.0 Economic Environment							
	Business Buyout	0-2	✗	✗	✗	✓	
	Loss of Parking - Permanent	Yes/No	✗	✗	✗	✗	
	Loss of Parking - Temporary	No.	✗	✗	✗	✗	
	Main Street Business Effects	Yes/No	✗	✗	✗	✗	See 5.1 Built Heritage
	Supports Tourism (Province Branding)	Yes/No	✗	✗	✗	✗	See 4.2
	Associated Downstream Effects to Rigid Frame Projects	Yes/No	✗	✗	✗	✗	
7.0 Land Use and Property							
	Temporary Property Impacts – Parks Canada	m^2	✓	✗	✗	✗	
	Temporary Property Impacts - Federal (NCC)	m^2	✓	✗	✗	✗	
	Temporary Property Impacts – Infilling Canal	High/Medium/ Low	✓	✗	✗	✗	
	Supports Ottawa TMP	Yes/No	✗	✗	✗	✗	All alternatives support the TMP
	Agricultural Lands Required	m^2	✗	✗	✗	✗	
	Recreation and Natural Areas of Provincial Significance Property Required	m^2	✗	✗	✗	✗	
	Aggregates/Mines Property Impacts	m^2	✗	✗	✗	✗	
	Permanent Property Impacts	Yes/No	✗	✗	✗	✗	No permanent impacts
	Environmental Impacts along Queensway	High/Medium/ Low	✗	✗	✗	✗	See Natural Environment
	Associated Downstream Effects to Rigid Frame Projects	Yes/No	✗	✗	✗	✗	
8.0 Structural							
	Durability of Structure	High/Medium/ Low	✓	✓	✓	✓	
	Risk of Significant Damage	High/ Low	✓	✓	✓	✓	
	Risk of Isolated Spalling from Soffit	High/ Low	✓	✗	✗	✗	
	Risk of Falling Ice onto Highway	High/ Low	✓	✗	✗	✗	
	Certainty of Construction Method (risk)	High/Medium/ Low	✓	✓	✓	✓	
	Risk of Damage to Superstructure	0-10	✓	✗	✗	✗	
	Use of Link Slabs	Yes/No	✓	✗	✗	✗	
	Ongoing Maintenance (i.e. Painting)	0-10	✓	✗	✗	✗	
	Minimization of Construction Impacts	0-10	✗	✗	✗	✗	See Transportation
	Wheel Tracking over Centreline Joint	Yes/No	✓	✗	✗	✗	

Factors and Sub-Factors	Unit of Measure	Carried Forward				Remarks
		Rideau Canal	Metcalfe Street	Elgin Street	Main Street	
Functional Requirement to Widen Structure Triggering Replacement	Yes/No	✓	✓	✓	✓	
Structure Condition – Corrosion Potential	High/Low	✗	✗	✓	✓	
Structural Deterioration	High/Low	✗	✗	✓	✓	
9.0 Cost						
Capital Cost	$	✗	✗	✗	✗	See LCC
Operational and Maintenance Costs	$	✗	✗	✗	✗	See LCC
Life Cycle Cost	$	✓	✓	✓	✓	
Rigid Frame Replacement Costs	$	✓	✗	✗	✗	
Certainty in Property to Implement Project	High/ Low	✓	✗	✗	✓	
Structural Management	Yes/No	✗	✗	✗	✗	See LCC

Notes

1. The assessment of air quality and greenhouse gases was completed for the overall Highway 416 to Anderson Road Queensway improvement plan in 2007 and is documented in the Transportation Environmental Study Report (2007). As these isolated bridge projects have no changes relative to the volume of traffic that will be carried on the freeway it has been judged that there is no air quality difference between alternatives. The short term effect of traffic congestion related to the traffic management of the repairs or replacement of an individual bridge is measured in the Delay criterion.

Appendix F
Utility Function Definitions and Measurements for Short Listed Evaluation Criteria

Metcalfe Street Structure Alternatives

Alternative Number	Description
Alternative A-A1	Rapid Rehabilitation
Alternative A-A2	Conventional Rehabilitation
Alternative B-B1	Conventional Replacement
Alternative B-C1	Rapid Replacement

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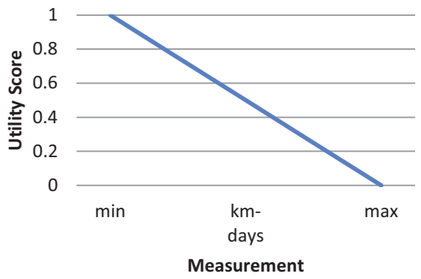
Transportation

Maximum Peak Queue Length on Queensway



Definition: This sub-factor measures the queue duration and the forecast change in queue length (after the use of mitigation). During peak hours queuing currently exists and this sub-factor will measure the additional queue length due to lane closures for the bridge rehabilitation or replacement. The measurement for this sub-factor is "length x days". This sub-factor is indicative of highway safety, and is related to: effects on ramp operations, rear end collisions influenced by stop and go traffic, and poor weaving conditions. Those alternatives with shorter queue lengths and occurring for a shorter duration are preferred.

See the Transportation Delays sub-factor for the measure of traffic congestion.

Mitigation: The use of advance advertising and advising drivers of the scheduled lane closures through Portable Variable Message Sign placement in advance of construction are measures that will reduce demand by: changing the time of travel of commuters, use of transit as an alternate mode of travel, or by inducing diversion to the municipal road system as an alternate route.

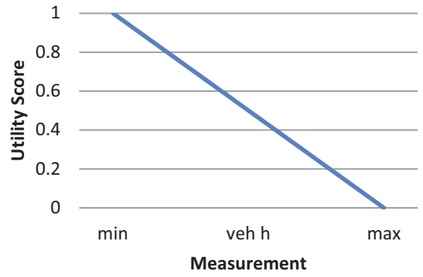
Alternatives:

Alternative	Km-days (peak hour)	Utility Score
Alternative A-A1 Rapid Rehabilitation	326	0.94
Alternative A-A2 Conventional Rehabilitation	1,304	0.76
Alternative B-B1 Conventional Replacement	5,379	0
Alternative B-C1 Rapid Replacement	3	1

Alternative	Queue (km)	Duration (days)
Alternative A-A1	16.3	20
Alternative A-A2	16.3	80
Alternative B-B1	16.3	330
Alternative B-C1	1	3

Transportation

Delays (during construction)



Definition: This sub-factor measures the total lane closure peak period delay to drivers on the Queensway during the construction period. This sub-factor is indicative of highway operations (delays to the travelling public). It includes the total peak period delay forecast for the duration of construction of the alternative. The delay sub-factor, although measuring vehicles on the Queensway, is also indicative of the delays for drivers diverted from the Queensway and operating on the municipal road system. Those alternatives that minimize delays are preferred.

Mitigation: Advance signage and media notices of construction period. Real time vehicle guidance data.

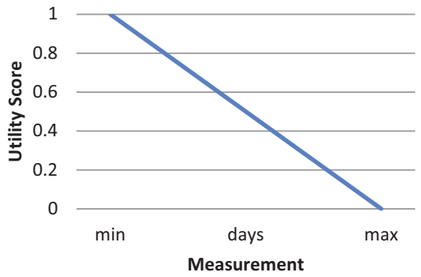
Alternatives:

Alternative	veh h	Utility Score
Alternative A-A1 Rapid Rehabilitation	134,000	0.95
Alternative A-A2 Conventional Rehabilitation	536,000	0.76
Alternative B-B1 Conventional Replacement	2,211,000	0
Alternative B-C1 Rapid Replacement	20,000	1

Alternative	Volume (veh h)	Duration (days)
Alternative A-A1	6,700	20
Alternative A-A2	6,700	80
Alternative B-B1	6,700	330
Alternative B-C1	-	-

Transportation

Delays to Emergency Vehicles



Definition: This sub-factor measures the duration of delays to emergency vehicles on the Queensway during a weekday peak hours. Those alternatives that minimize delays for emergency vehicles are preferred.

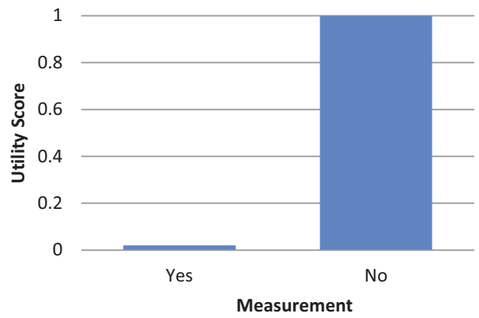
Mitigation: Advance signage and media notices of construction period. Real time vehicle guidance data.

Alternatives:

Alternative	Days	Utility Score
Alternative A-A1 Rapid Rehabilitation	20	0.94
Alternative A-A2 Conventional Rehabilitation	80	0.76
Alternative B-B1 Conventional Replacement	330	0
Alternative B-C1 Rapid Replacement	0	1

Transportation

Future Traffic Delays



Definition: This sub-factor measures delays for future replacement and associated traffic delays. Rehabilitation alternatives have significant traffic delays for future replacement of the structure (forecast 20 to 30 years) and receive a utility score of 0. This sub-factor also reflects future delays for emergency vehicles, pedestrians, cyclists, trucks, transit and general traffic associated with a future bridge replacement.

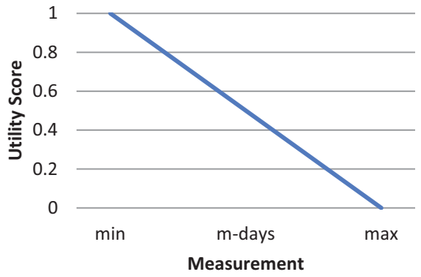
Mitigation: Rapid bridge construction for the future replacement.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	Yes	0
Alternative A-A2 Conventional Rehabilitation	Yes	0
Alternative B-B1 Conventional Replacement	No	1
Alternative B-C1 Rapid Replacement	No	1

Transportation

Pedestrian – Delay and Out-of-way Travel



Definition: This sub-factor measures the length and duration of pedestrian out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days).

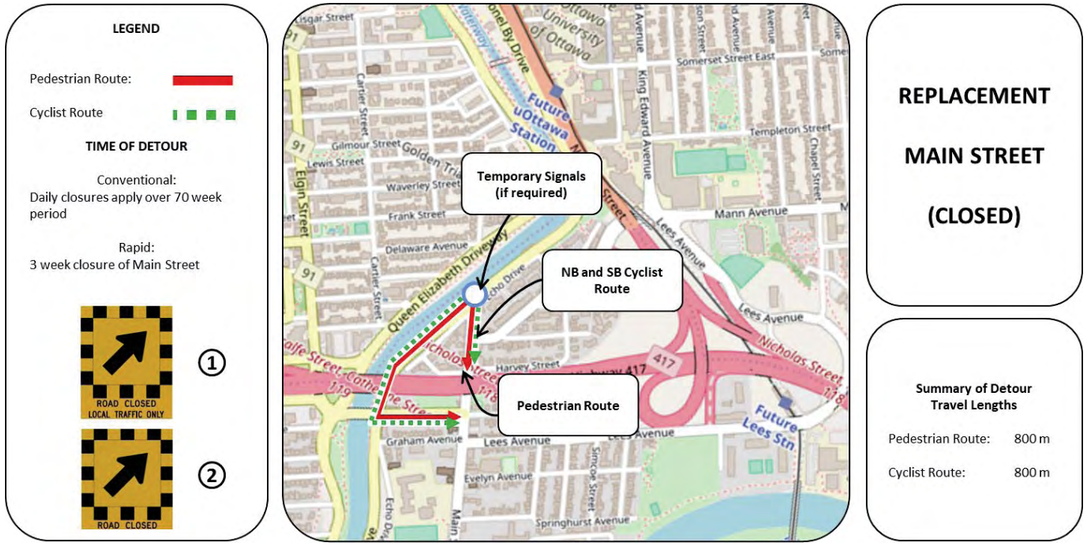
Mitigation: Advance signage and media notices for pedestrians to choose an alternate route as well as the provision of hoarding to protect existing sidewalks to limit the duration of required sidewalk closures. It should be noted that contractors may choose not to provide hoarding.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	300,800	0
Alternative B-C1 Rapid Replacement	14,100	0.95

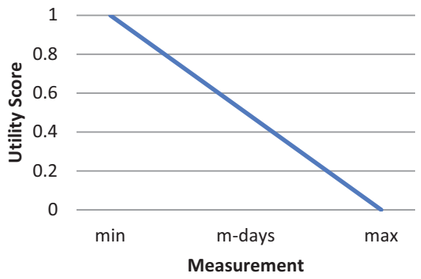
Alternative	Detour Length (m) NB + SB	Duration (days)
Alternative A-A1	940	0
Alternative A-A2	940	0
Alternative B-B1	940	320
Alternative B-C1	940	15

GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Analysis and Evaluation – May 15, 2018
Metcalfe Street Structure Alternatives
Sub-factor Definitions



Transportation

Bicycle – Delay and Out-of-way Travel



Definition: This sub-factor measures the length and duration of cyclist out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days)

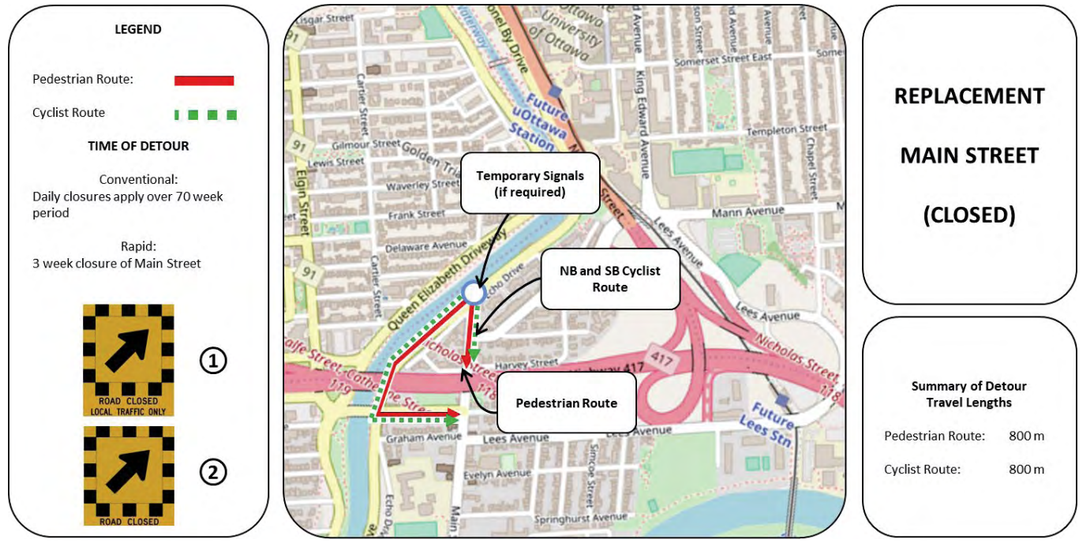
Mitigation: Advance signage and media notices for cyclists to choose an alternate route as well as advance notification to the regional cycling clubs. The provision of hoarding may be possible to protect cyclists to limit the duration of required multi-use path closures. It should be noted that contractors may choose not to provide hoarding.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	208,000	0
Alternative B-C1 Rapid Replacement	9,750	0.95

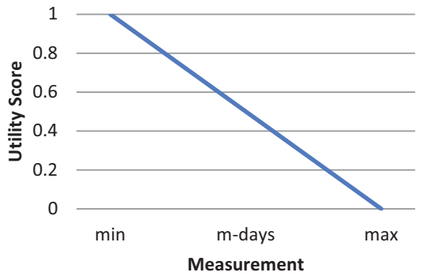
Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	650	0
Alternative A-A2	650	0
Alternative B-B1	650	320
Alternative B-C1	650	15

GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Analysis and Evaluation – May 15, 2018
Metcalfe Street Structure Alternatives
Sub-factor Definitions



Transportation

General Traffic Municipal Street Delay



Definition: This sub-factor measures the delay during construction that will affect general traffic operations. The measure of impact is the number of days estimated for full or partial closure.

Mitigation: The use of advisory signage, media notices and potential use of variable message signage to advise drivers before reaching the construction site.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	54,600	0.98
Alternative A-A2 Conventional Rehabilitation	81,900	0.95
Alternative B-B1 Conventional Replacement	873,600	0.00
Alternative B-C1 Rapid Replacement	40,950	1.00

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	2,730	20
Alternative A-A2	2,730	30
Alternative B-B1	2,730	320
Alternative B-C1	2,730	15

GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
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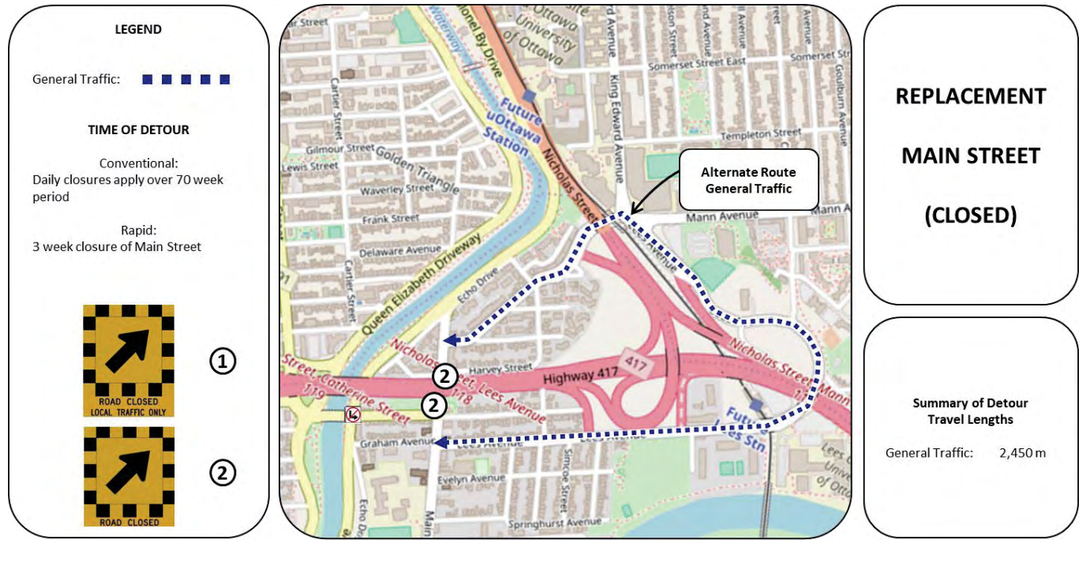
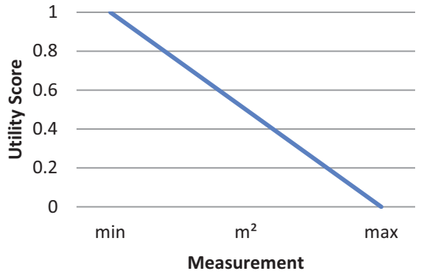


Social Environment

Green Spaces Impacted



Definition: This sub-factor measures the temporary loss of green space for staging sites. Temporary loss will be for approximately 1 year for the bridge staging sites and would be a loss to the local community. Alternatives impacting the least area are preferred.

The rehabilitation and conventional replacement alternatives require a construction laydown area of approximately half the area of a rapid replacement.

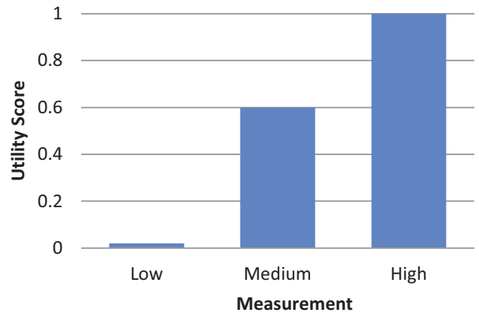
Mitigation: Replanting of disturbed green spaces.

Alternatives:

Alternative	m²	Utility Score
Alternative A-A1 Rapid Rehabilitation	1,282	1
Alternative A-A2 Conventional Rehabilitation	1,282	1
Alternative B-B1 Conventional Replacement	1,282	1
Alternative B-C1 Rapid Replacement	2,565	0

Structural

Durability of Structure



Definition: This sub-factor measures the durability (life span) of the structure.

High durability – new structures provide a high degree of certainty in durability (1.0 utility).

Medium durability – conventional rehabilitation alternatives provide a medium certainty. If additional repairs are required that were not anticipated, the contractor can add time to the schedule to complete the work. However, there may be some deterioration that is not visible and older concrete is still being used. Conventional rehabilitation still requires a high level of inspection and repairs for deterioration in isolated areas over the next 20 years (0.6 utility).

Low durability – rapid rehabilitation alternatives reflect only repairs that can fit into one weekend; therefore, the expectation of greater probability of future delamination is the highest (0.0 utility).

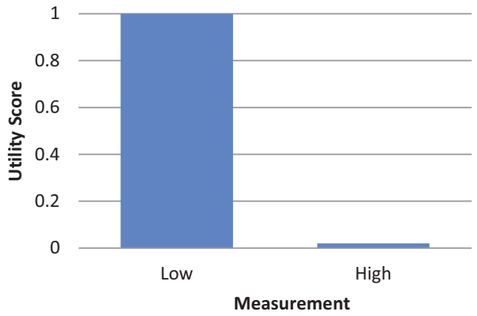
Mitigation: None.

Alternatives:

Alternative	km (peak hour)	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Medium	0.5
Alternative B-B1 Conventional Replacement	High	1
Alternative B-C1 Rapid Replacement	High	1

Structural

Risk of Significant Damage



Definition: This sub-factor measures the potential of significant damage from structural deterioration which may close a portion (lane or bridge) of the Queensway from structural deterioration. The rehabilitation alternative which retains deteriorated elements of the bridge is considered to have high potential and all new bridges low. The existing bridge has elements with no redundancy in the event of section loss/failure.

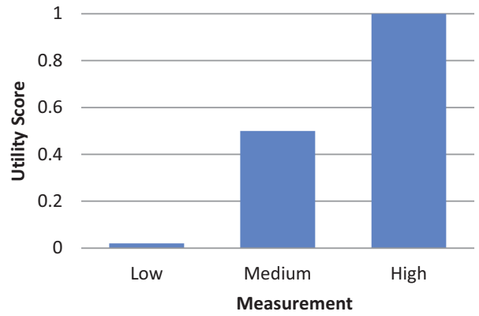
Mitigation: None.

Alternatives:

Alternative	km (peak hour)	Utility Score
Alternative A-A1 Rapid Rehabilitation	High	0
Alternative A-A2 Conventional Rehabilitation	High	0
Alternative B-B1 Conventional Replacement	Low	1
Alternative B-C1 Rapid Replacement	Low	1

Structural

Certainty of Construction Method (Risk)



Definition: This sub-factor measures the certainty for construction methods for the rigid frame alternatives.

High certainty (low risk) – the new structure construction methodologies have previously been used on the Queensway and in Ontario and provide a low risk to contractors (1.0 utility)

Medium certainty (medium risk) – conventional rehabilitation has some potential for greater repairs of deteriorated areas but has low schedule extension impact (0.5 utility)

Low certainty (high risk) – rapid rehabilitation alternatives reflect only repairs that can fit into one weekend; therefore, the expectation of greater risk (0.0 utility). An example would be the identification of greater corrosion of the negative moment reinforcement at the knee of the frame leg/abutment requiring decisions on site during the weekend closure to add temporary support(s).

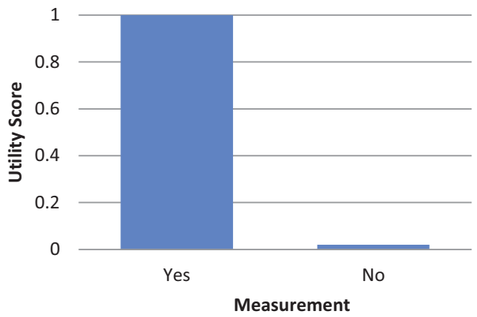
Mitigation: None.

Alternatives:

Alternative	km (peak hour)	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Medium	0.5
Alternative B-B1 Conventional Replacement	High	1
Alternative B-C1 Rapid Replacement	High	1

Structural

Functional Requirement to Widen Structure Triggering Replacement



Definition: This sub-factor measures if the alternative matches the Recommended Highway Plan (2007) i.e. the replacement alternatives will replace the bridge that reflects the wider bridge required for the highway improvement plan. It is considered desirable to have one continuous bridge wide enough for the highway plan.

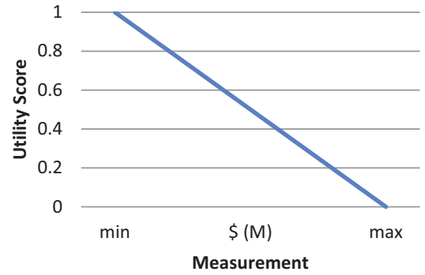
Mitigation: None.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	No	0
Alternative A-A2 Conventional Rehabilitation	No	0
Alternative B-B1 Conventional Replacement	Yes	1
Alternative B-C1 Rapid Replacement	Yes	1

Cost

Life Cycle Cost



Definition: This sub-factor measures the difference in the total life cycle cost of the alternative (construction, maintenance, operating costs and long term replacement and rehabilitation in the 40 year planning horizon). Cost estimates are for the entire bridge (both EBL and WBL) in 2025. Those alternatives with the lowest life cycle cost are preferred. A 4% discount rate is used.

Mitigation: N/A

Alternatives:

Alternative	$ (M)	Utility Score
Alternative A-A1 Rapid Rehabilitation	13.2	1
Alternative A-A2 Conventional Rehabilitation	13.2	1
Alternative B-B1 Conventional Replacement	21.1	0.35
Alternative B-C1 Rapid Replacement	25.3	0

Elgin Street Structure Alternatives

Alternative Number	Description
Alternative A-A1	Rapid Rehabilitation
Alternative A-A2	Conventional Rehabilitation
Alternative B-B1	Conventional Replacement
Alternative B-C1	Rapid Replacement

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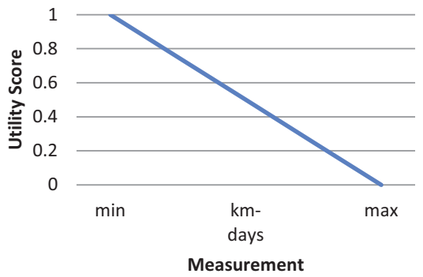
Transportation

Maximum Peak Queue Length on Queensway



Definition: This sub-factor measures the queue duration and the forecast change in queue length (after the use of mitigation). During peak hours queuing currently exists and this sub-factor will measure the additional queue length due to lane closures for the bridge rehabilitation or replacement. The measurement for this sub-factor is "length x days". This sub-factor is indicative of highway safety, and is related to: effects on ramp operations, rear end collisions influenced by stop and go traffic, and poor weaving conditions. Those alternatives with shorter queue lengths and occurring for a shorter duration are preferred.

See the Transportation Delays sub-factor for the measure of traffic congestion.

Mitigation: The use of advance advertising and advising drivers of the scheduled lane closures through Portable Variable Message Sign placement in advance of construction are measures that will reduce demand by: changing the time of travel of commuters, use of transit as an alternate mode of travel, or by inducing diversion to the municipal road system as an alternate route.

Alternatives:

Alternative	km-days (peak hour)	Utility Score
Alternative A-A1 Rapid Rehabilitation	326	0.95
Alternative A-A2 Conventional Rehabilitation	1,304	0.81
Alternative B-B1 Conventional Replacement	6,846	0
Alternative B-C1 Rapid Replacement	3	1

Alternative	Queue (km)	Duration (days)
Alternative A-A1	16.3	20
Alternative A-A2	16.3	80
Alternative B-B1	16.3	420
Alternative B-C1	1	3

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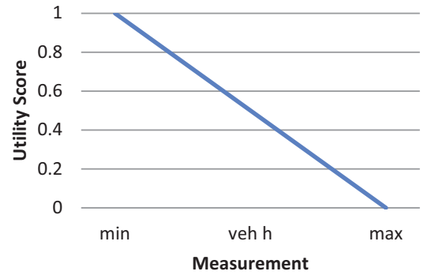
Transportation

Delays (during construction)



Definition: This sub-factor measures the total lane closure peak period delay to drivers on the Queensway during the construction period. This sub-factor is indicative of highway operations (delays to the travelling public). It includes the total peak period delay forecast for the duration of construction of the alternative. The delay sub-factor, although measuring vehicles on the Queensway, is also indicative of the delays for drivers diverted from the Queensway and operating on the municipal road system. Those alternatives that minimize delays are preferred.

Mitigation: Advance signage and media notices of construction period. Real time vehicle guidance data.

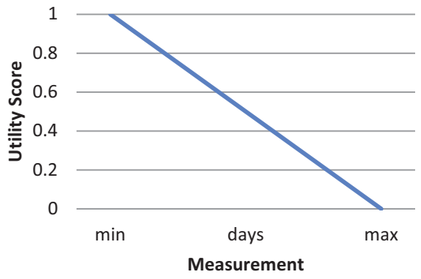
Alternatives:

Alternative	veh h	Utility Score
Alternative A-A1 Rapid Rehabilitation	134,000	0.96
Alternative A-A2 Conventional Rehabilitation	536,000	0.82
Alternative B-B1 Conventional Replacement	2,814,000	0
Alternative B-C1 Rapid Replacement	20,000	1

Alternative	Volume (veh h)	Duration (days)
Alternative A-A1	6,700	20
Alternative A-A2	6,700	80
Alternative B-B1	6,700	420
Alternative B-C1	-	-

Transportation

Delays to Emergency Vehicles



Definition: This sub-factor measures the duration of delays to emergency vehicles on the Queensway and municipal street resulting from lane closures. Those alternatives that minimize delays for emergency vehicles are preferred.

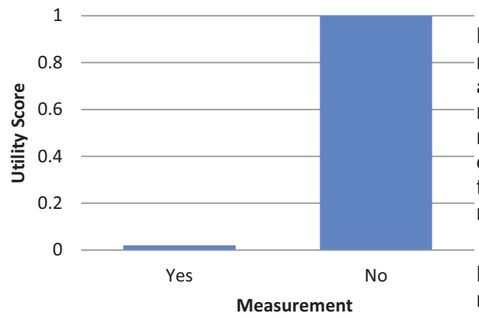
Mitigation: Advance notification to EMS and advance signage of construction period. Real time vehicle guidance data.

Alternatives:

Alternative	Days	Utility Score
Alternative A-A1 Rapid Rehabilitation	20	0.95
Alternative A-A2 Conventional Rehabilitation	80	0.81
Alternative B-B1 Conventional Replacement	420	0
Alternative B-C1 Rapid Replacement	0	1

Transportation

Future Traffic Delays



Definition: This sub-factor measures delays for future replacement and associated traffic delays. Rehabilitation alternatives have significant traffic delays for future replacement of the structure (forecast 20 to 30 years) and receive a utility score of 0. This sub-factor also reflects future delays for emergency vehicles, pedestrians, cyclists, trucks, transit and general traffic associated with a future bridge replacement.

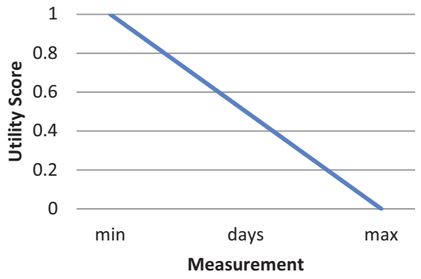
Mitigation: Rapid bridge construction for the future replacement.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	Yes	0
Alternative A-A2 Conventional Rehabilitation	Yes	0
Alternative B-B1 Conventional Replacement	No	1
Alternative B-C1 Rapid Replacement	No	1

Transportation

Ramp Closures



Definition: This sub-factor measures the impact to community access by quantifying the volume of peak hour ramp trips that will be diverted from entering or exiting from the Queensway. The sub-factor measures the peak hour ramp volume for each stage of the highway staging plan for the duration of the closure.

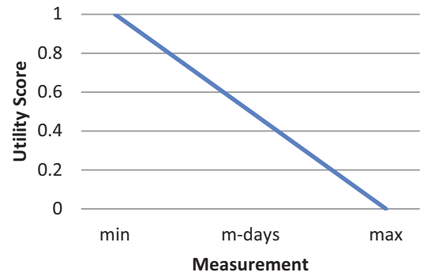
Mitigation: Ramps may be closed during construction hours and opened to allow access in non-peak hours, evenings, weekends and holidays.

Alternatives:

Alternative	days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	30	0.87
Alternative B-B1 Conventional Replacement	230	0
Alternative B-C1 Rapid Replacement	0	1

Transportation

Pedestrian – Delay and Out-of-way Travel



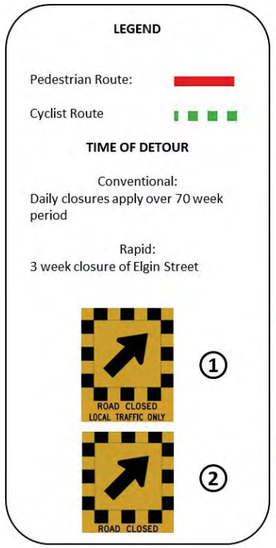
Definition: This sub-factor measures the length and duration of pedestrian out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days).

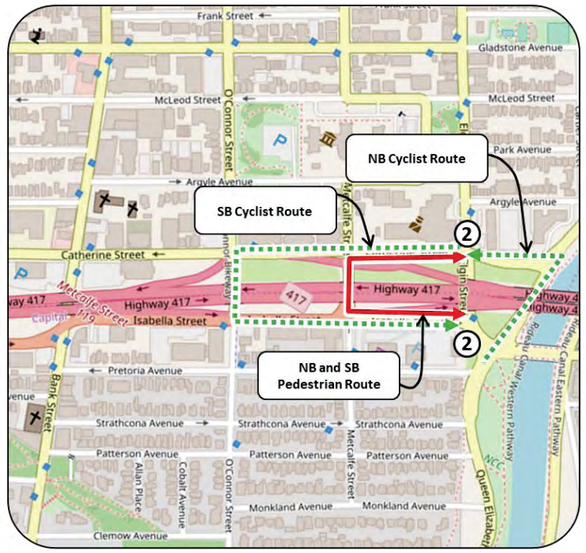
Mitigation: Advance signage for pedestrians and media notices to choose an alternate route as well as the provision of hoarding to protect existing sidewalks to limit the duration of required sidewalk closures. It should be noted that contractors may choose not to provide hoarding.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	384,000	0
Alternative B-C1 Rapid Replacement	14,400	0.96

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	960	0
Alternative A-A2	960	0
Alternative B-B1	960	400
Alternative B-C1	960	15





REPLACEMENT

ELGIN STREET

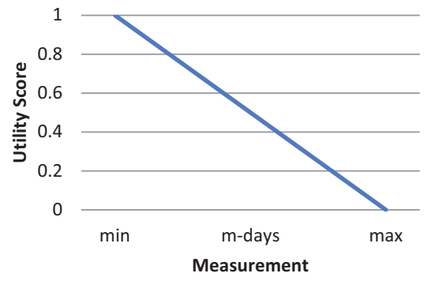
(CLOSED)

Summary of Detour Travel Lengths

Pedestrian Route:	480 m
Cyclist Route:	1,130 m

Transportation

Bicycle – Delay and Out-of-way Travel



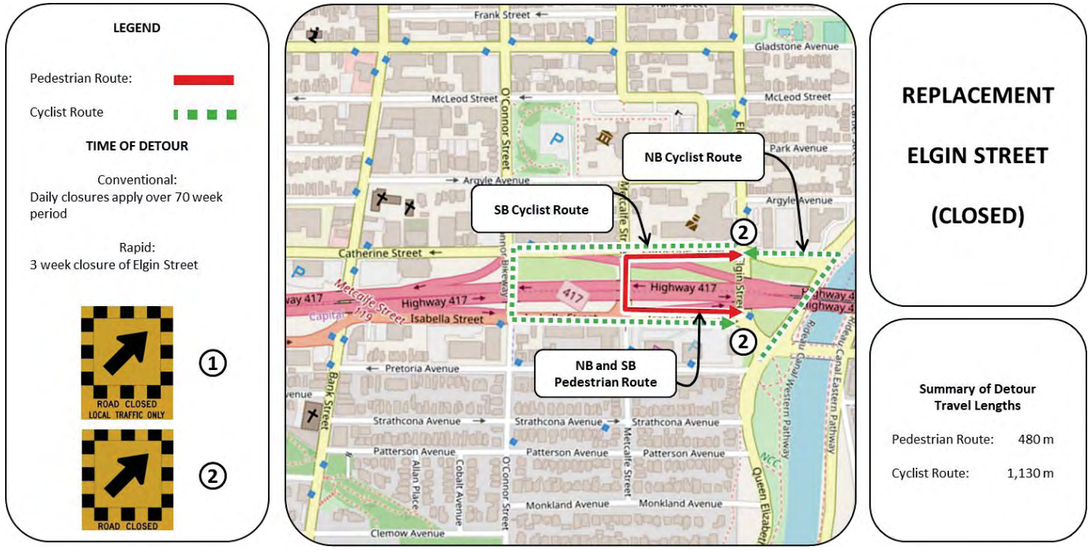
Definition: This sub-factor measures the length and duration of cyclist out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days)

Mitigation: Advance signage and media notices for cyclists to choose an alternate route as well as advance notification to the regional cycling clubs. The provision of hoarding may be possible to protect cyclists to limit the duration of required multi-use path closures. It should be noted that contractors may choose not to provide hoarding.

Alternatives:

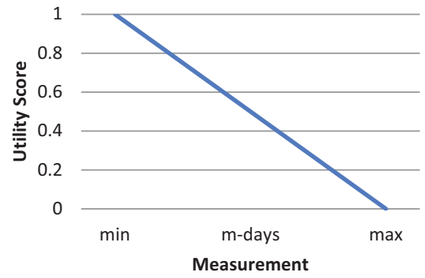
Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	452,000	0
Alternative B-C1 Rapid Replacement	16,950	0.96

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	1,130	0
Alternative A-A2	1,130	0
Alternative B-B1	1,130	400
Alternative B-C1	1,130	15



Transportation

Transit Operations Delay – Out of Way Travel



Definition: This sub-factor measures the delay during construction that will affect transit operations. Bus routes affected include Nos. 5, 14, 101, 103 and 401. The measurement of delays is the number of days of a detour. Future transit routes are not included in this evaluation.

Mitigation: Advance information to OC Transpo, media notices and temporary bus stop relocations if required.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	620,000	0
Alternative B-C1 Rapid Replacement	23,250	0.96

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	1,550	0
Alternative A-A2	1,550	0
Alternative B-B1	1,550	400
Alternative B-C1	1,550	15

TRANSIT DETOUR

NB 5
Hawthorne Avenue – Queen Elizabeth Drive – Pretoria Avenue – Metcalfe Street – Argyle Street – Elgin Street

SB 5

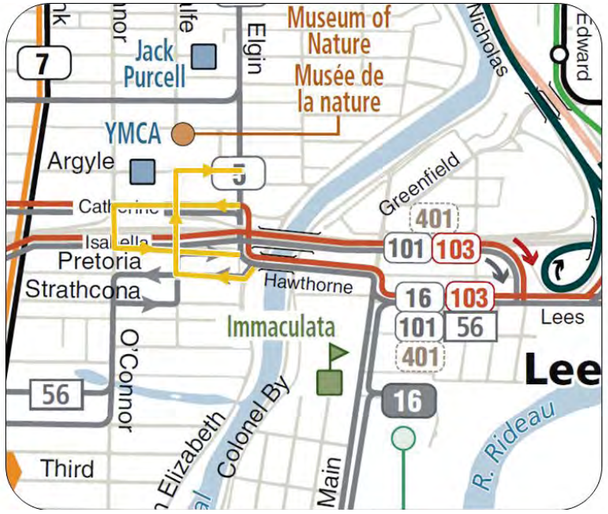
Elgin Street – Catherine Street – O'Connor Street – Isabella Street – Elgin Street

TIME OF DETOUR

3 weeks for Rapid Replacement

LEGEND

Transit Detour:



5 TRANSIT DETOUR

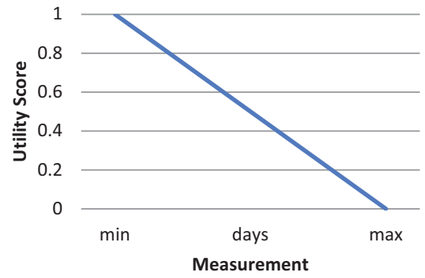
ELGIN STREET

Summary of Transit Detour Travel Length

730 m (NB)
820 m (SB)

Transportation

General Traffic Municipal Street Delay



Definition: This sub-factor measures the delay during construction that will affect general traffic operations. The measure of impact is the number of days estimated for full or partial closure.

Mitigation: The use of advisory signage, media notices and potential use of variable message signage to advise drivers before reaching the construction site.

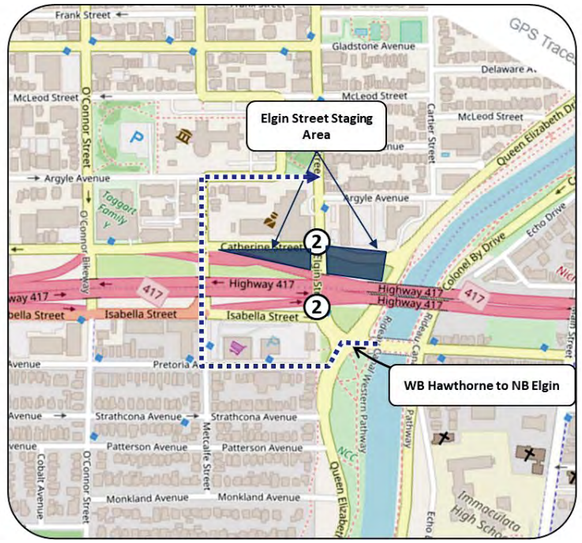
Alternatives:

Alternative	days	Utility Score
Alternative A-A1 Rapid Rehabilitation	37,300	0.99
Alternative A-A2 Conventional Rehabilitation	55,950	0.96
Alternative B-B1 Conventional Replacement	746,000	0.00
Alternative B-C1 Rapid Replacement	27,975	1.00

Elgin Street

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	1,865	20
Alternative A-A2	1,865	30
Alternative B-B1	1,865	400
Alternative B-C1	1,865	15





REPLACEMENT

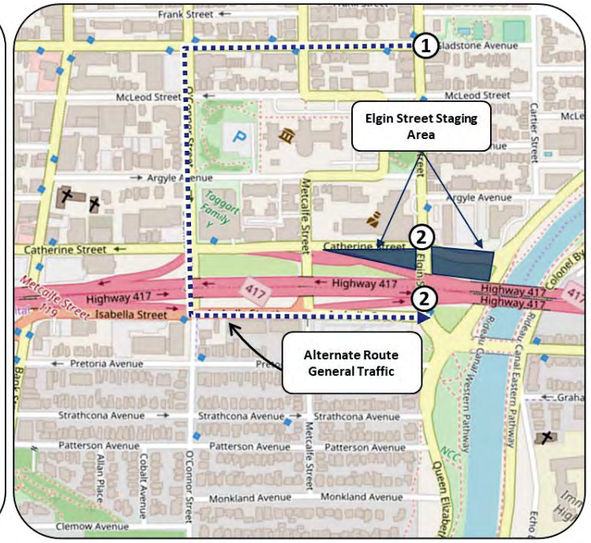
ELGIN STREET

(CLOSED)

Summary of Detour Travel Lengths

General Traffic: 725 m





REPLACEMENT

ELGIN STREET

(CLOSED)

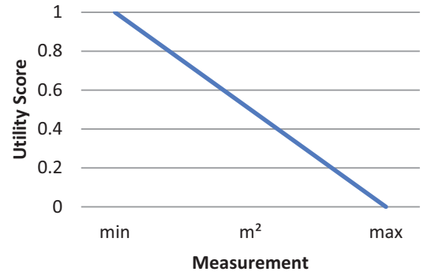
Summary of Detour Travel Lengths

General Traffic: 1,140 m

Note:
1. Rapid Replacement requires closure of Catherine Street from Metcalfe Street to Elgin Street
2. Where possible, detours from city streets to city streets is preferred.

Social Environment

Green Spaces Impacted



Definition: This sub-factor measures the temporary loss of green space for staging sites. Temporary loss will be for approximately 1 year for the bridge staging sites and would be a loss to the local community. Alternatives impacting the least area are preferred.

The rehabilitation and conventional replacement alternatives require a construction laydown area of approximately half the area of a rapid replacement.

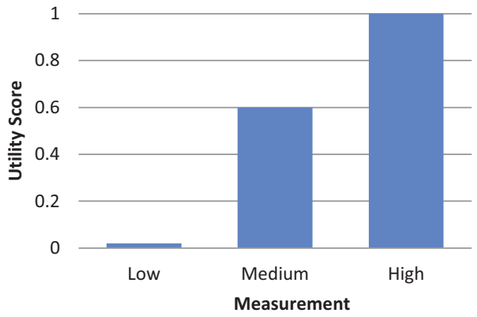
Mitigation: Replanting of disturbed green spaces.

Alternatives:

Alternative	m²	Utility Score
Alternative A-A1 Rapid Rehabilitation	1,282	1
Alternative A-A2 Conventional Rehabilitation	1,282	1
Alternative B-B1 Conventional Replacement	1,282	1
Alternative B-C1 Rapid Replacement	2,565	0

Structural

Durability of Structure



Definition: This sub-factor measures the durability (life span) of the structure.

High durability – new structures provide a high degree of certainty in durability (1.0 utility).

Medium durability – conventional rehabilitation alternatives provide a medium certainty. If additional repairs are required that were not anticipated, the contractor can add time to the schedule to complete the work. However, there may be some deterioration that is not visible and older concrete is still being used. Conventional rehabilitation still requires a high level of inspection and repairs for deterioration in isolated areas over the next 20 years (0.6 utility).

Low durability – rapid rehabilitation alternatives reflect only repairs that can fit into one weekend; therefore, the expectation of greater probability of future delamination is the highest (0.0 utility).

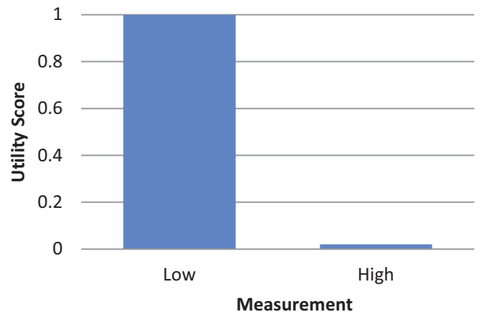
Mitigation: None.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Medium	0.5
Alternative B-B1 Conventional Replacement	High	1
Alternative B-C1 Rapid Replacement	High	1

Structural

Risk of Significant Damage



Definition: This sub-factor measures the potential of significant damage from structural deterioration which may close a portion of the Queensway from structural deterioration. The rehabilitation alternatives which retain deteriorated elements of the bridge are considered to have high potential and all new bridges low. The existing bridge has elements with no redundancy in the event of section loss/failure.

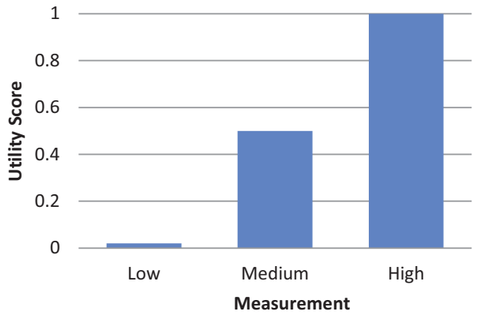
Mitigation: None.

Alternatives:

Alternative	High/Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	High	0
Alternative A-A2 Conventional Rehabilitation	High	0
Alternative B-B1 Conventional Replacement	Low	1
Alternative B-C1 Rapid Replacement	Low	1

Structural

Certainty of Construction Method (Risk)



Definition: This sub-factor measures the certainty for construction methods for the Rideau Canal alternatives.

High certainty (low risk) – the new structure construction methodologies have previously been used on the Queensway and elsewhere in Ontario and provide a low risk to contractors (1.0 utility)

Medium certainty (medium risk) – conventional rehabilitation has some potential for greater repairs of deteriorated areas but has low schedule extension impact (0.5 utility)

Low certainty (high risk) – rapid rehabilitation alternatives reflect only repairs that can fit into one weekend; therefore, the expectation of greater risk (0.0 utility). An example would be the identification of greater corrosion of the negative moment reinforcement at the knee of the frame leg requiring decisions on site during the weekend closure to add temporary support(s).

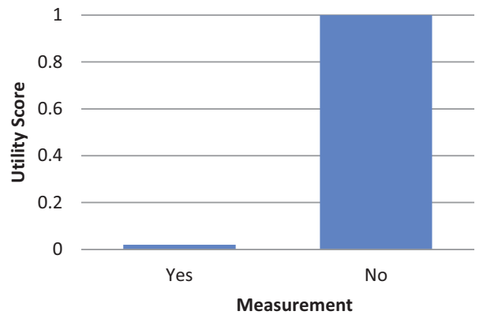
Mitigation: None.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Medium	0.5
Alternative B-B1 Conventional Replacement	High	1
Alternative B-C1 Rapid Replacement	High	1

Structural

Functional Requirement to Widen Structure Triggering Replacement



Definition: This sub-factor measures if the alternative matches the Recommended Highway Plan (2007) i.e. the replacement alternatives will replace the bridge that reflects the wider bridge required for the highway improvement plan. It is considered desirable to have one continuous bridge wide enough for the highway plan.

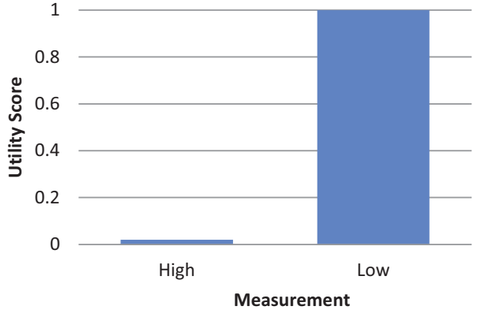
Mitigation: None.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	No	0
Alternative A-A2 Conventional Rehabilitation	No	0
Alternative B-B1 Conventional Replacement	Yes	1
Alternative B-C1 Rapid Replacement	Yes	1

Structural

Structure Condition – Corrosion Potential



Definition: This sub-factor measures the deterioration of the existing bridge from corrosion of the existing reinforcing steel. Structures with high active corrosion are candidates for replacement if rehabilitation cannot significantly reduce the ongoing corrosion. An example of corrosion is the recent Elgin Street barrier walls disconnecting from the deck because of corrosion of the reinforcing steel. This sub-factor measures the expert opinion of the need to replace the structure as an appropriate structural management plan. The measurement is defined as the ability of an alternative to reduce corrosion of the bridge. Typically values more negative than -0.35 V correspond to a greater than 90 percent probability that corrosion of the reinforcing steel is occurring.

Rehabilitation Options – High Probability of Active Corrosion (Utility = 0)

New Options – Low Probability of Active Corrosion (Utility = 1.0)

Mitigation: None.

Bridge Structure	Deck							Barrier Walls
	Concrete Strength	Air Entrainment	Corrosion Potential	Chloride Content				
Name	Exceeds Requirement	Compliance with SRM Requirements	Probability Corrosion is occurring (<-0.35 V) (%)	Threshold level exceeded at level of Reinforcing Steel	Average Depth of Asphalt (mm)	Average Depth of Concrete Overlay (mm)	Average Depth of Concrete Cover over Reinforcing Steel (mm)	
Metcalfe St. O/P	Yes	No	0	No	145	110	175	-Narrow and Medium vertical cracking
Elgin St. O/P EBL	Yes	No	0.9	Yes (2 cores)	190	95	190	-Medium vertical cracking
Elgin St. O/P WBL	Yes	No	1.0	No	210	85	170	-Medium vertical cracking on median barrier wall
Main St. O/P EBL	Yes	No	6.1	No	155	130	235	-Medium vertical cracking
Main St. O/P WBL	Yes	No	0.5	No	130	110	190	-Narrow to medium vertical cracking

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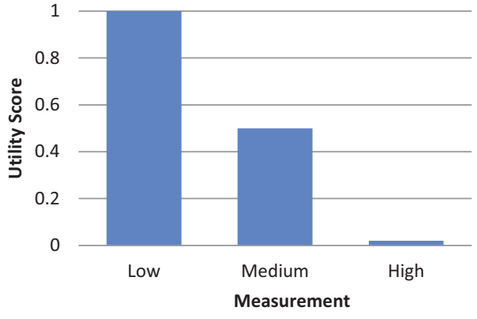
Alternatives:

Alternative	High/Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	High	0
Alternative A-A2 Conventional Rehabilitation	High	0
Alternative B-B1 Conventional Replacement	Low	1
Alternative B-C1 Rapid Replacement	Low	1

Structural

Structural Deterioration



Definition: This sub-factor measures the deterioration of the existing bridge with areas of spalling the existing surficial concrete. Structures with high areas of spalling are candidates for replacement if rehabilitation cannot significantly reduce the ongoing corrosion. This sub-factor measures the expert opinion of the need to replace the structure as an appropriate structural management plan. The measurement is defined as the ability of an alternative to reduce corrosion of the bridge. The deterioration has been defined as:

Low - less than 5% of the soffit and abutments

Medium - 5-10% of the soffit and abutments

High - where the deterioration is greater than 10% of the soffit and abutments.

New Options – Low Deterioration of concrete surfaces (Utility = 1.0)

Rehabilitation Options – High Deterioration of concrete surfaces (Utility = 0.0)

Mitigation: None.

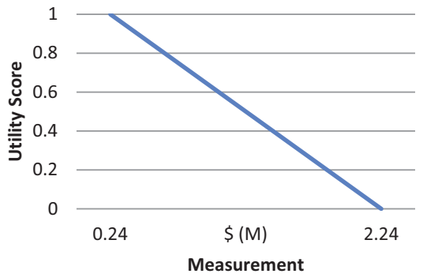
Bridge Structure	Soffit			Abutments			Wingwalls		
Name	Delamination and Spalls (%)	Patches (%)	Deterioration (%)	Delamination and Spalls (%)	Patches (%)	Deterioration (%)	Delamination and Spalls (%)	Patches (%)	Deterioration (%)
Metcalfe St. O/P	0.2	0	0.2	2.7	1.8	4.5	17.5	1.5	19
Elgin St. O/P EBL	0.7	8.0	8.7	3.7	11.5	15.2	2.6	7.6	10.2
Elgin St. O/P WBL	0.1	7.6	7.7	0.6	20.2	20.8	1.7	2.2	3.9
Main St. O/P EBL	0.4	0.3	0.7	8.9	3.5	12.4	0.0	21.8	21.8
Main St. O/P WBL	0.9	0.3	1.2	12.5	3.5	16.0	-	-	-

Alternatives:

Alternative	High/ Medium/ Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	H	0
Alternative A-A2 Conventional Rehabilitation	H	0
Alternative B-B1 Conventional Replacement	L	1
Alternative B-C1 Rapid Replacement	L	1

Cost

Life Cycle Cost



Definition: This sub-factor measures the difference in the total life cycle cost of the alternative (construction, maintenance, operating costs and long term replacement and rehabilitation in the 40 year planning horizon). Cost estimates are for the entire bridge (both EBL and WBL) in 2025. Those alternatives with the lowest life cycle cost are preferred. A 4% discount rate is used.

Mitigation: N/A

Alternatives:

Alternative	$ (M)	Utility Score
Alternative A-A1 Rapid Rehabilitation	21.7	0.93
Alternative A-A2 Conventional Rehabilitation	20.1	1
Alternative B-B1 Conventional Replacement	37.0	0.29
Alternative B-C1 Rapid Replacement	44.0	0

Main Street Structure Alternatives

Alternative Number	Description
Alternative A-A1	Rapid Rehabilitation
Alternative A-A2	Conventional Rehabilitation
Alternative B-B1	Conventional Replacement
Alternative B-C1	Rapid Replacement

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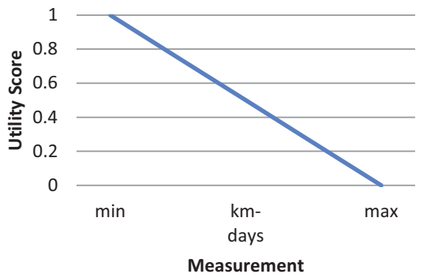
Transportation

Maximum Peak Queue Length on Queensway



Definition: This sub-factor measures the queue duration and the forecast change in queue length (after the use of mitigation). During peak hours queuing currently exists and this sub-factor will measure the additional queue length due to lane closures for the bridge rehabilitation or replacement. The measurement for this sub-factor is "length x days". This sub-factor is indicative of highway safety, and is related to: effects on ramp operations, rear end collisions influenced by stop and go traffic, and poor weaving conditions. Those alternatives with shorter queue lengths and occurring for a shorter duration are preferred.

See the Transportation Delays sub-factor for the measure of traffic congestion.

Mitigation: The use of advance advertising and advising drivers of the scheduled lane closures through Portable Variable Message Sign placement in advance of construction are measures that will reduce demand by: changing the time of travel of commuters, use of transit as an alternate mode of travel, or by inducing diversion to the municipal road system as an alternate route.

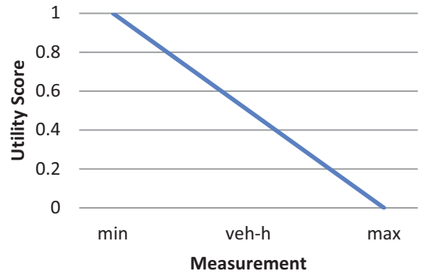
Alternatives:

Alternative	km-days (peak hour)	Utility Score
Alternative A-A1 Rapid Rehabilitation	326	0.95
Alternative A-A2 Conventional Rehabilitation	1,304	0.78
Alternative B-B1 Conventional Replacement	6,031	0
Alternative B-C1 Rapid Replacement	3	1

Alternative	Queue (km)	Duration (days)
Alternative A-A1	16.3	20
Alternative A-A2	16.3	80
Alternative B-B1	16.3	370
Alternative B-C1	1	3

Transportation

Delays (during construction)



Definition: This sub-factor measures the total lane closure peak period delay to drivers on the Queensway during the construction period. This sub-factor is indicative of highway operations (delays to the travelling public). It includes the total peak period delay forecast for the duration of construction of the alternative. The delay sub-factor, although measuring vehicles on the Queensway, is also indicative of the delays for drivers diverted from the Queensway and operating on the municipal road system. Those alternatives that minimize delays are preferred.

Mitigation: Advance signage and media notices of construction period. Real time vehicle guidance data.

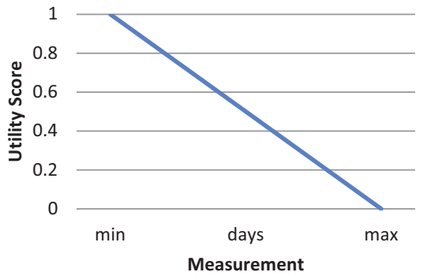
Alternatives:

Alternative	veh-h	Utility Score
Alternative A-A1 Rapid Rehabilitation	134,000	0.95
Alternative A-A2 Conventional Rehabilitation	536,000	0.79
Alternative B-B1 Conventional Replacement	2,479,000	0
Alternative B-C1 Rapid Replacement	20,000	1

Alternative	Volume (veh h)	Duration (days)
Alternative A-A1	6,700	20
Alternative A-A2	6,700	80
Alternative B-B1	6,700	370
Alternative B-C1	-	-

Transportation

Delays to Emergency Vehicles



Definition: This sub-factor measures the duration of delays to emergency vehicles on the Queensway during a weekday peak hours. Those alternatives that minimize delays for emergency vehicles are preferred.

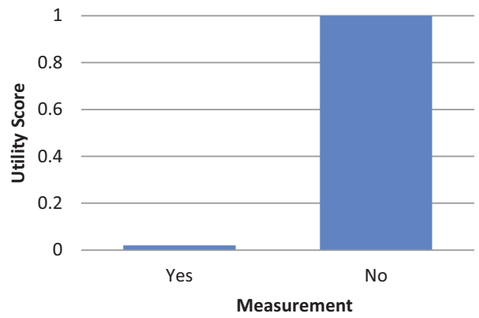
Mitigation: Advance notice to EMS and signage of construction period. Real time vehicle guidance data.

Alternatives:

Alternative	Days	Utility Score
Alternative A-A1 Rapid Rehabilitation	20	0.97
Alternative A-A2 Conventional Rehabilitation	80	0.81
Alternative B-B1 Conventional Replacement	370	0
Alternative B-C1 Rapid Replacement	0	1

Transportation

Future Traffic Delays



Definition: This sub-factor measures delays for future replacement and associated traffic delays. Rehabilitation alternatives have significant traffic delays for future replacement of the structure (forecast 20 to 30 years) and receive a utility score of 0. This sub-factor also reflects future delays for emergency vehicles, pedestrians, cyclists, trucks, transit and general traffic associated with a future bridge replacement.

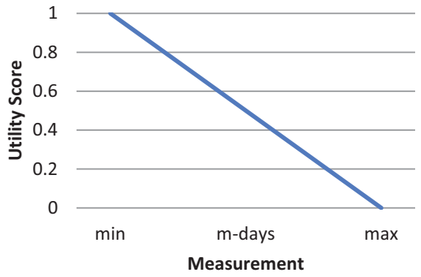
Mitigation: Rapid bridge construction for the future replacement.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	Yes	0
Alternative A-A2 Conventional Rehabilitation	Yes	0
Alternative B-B1 Conventional Replacement	No	1
Alternative B-C1 Rapid Replacement	No	1

Transportation

Pedestrian – Delay and Out-of-way Travel



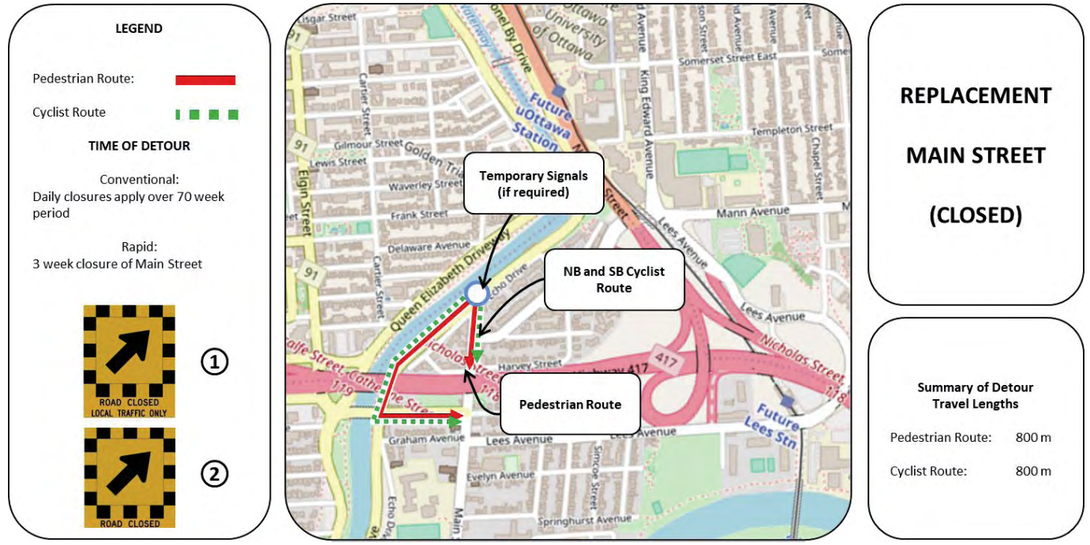
Definition: This sub-factor measures the length and duration of pedestrian out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days).

Mitigation: Advance signage and media notices for pedestrians to choose an alternate route as well as the provision of hoarding to protect existing sidewalks to limit the duration of required sidewalk closures. It should be noted that contractors may choose not to provide hoarding.

Alternatives:

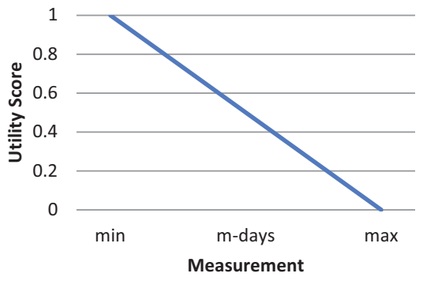
Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	576,000	0
Alternative B-C1 Rapid Replacement	24,000	0.96

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	1,600	0
Alternative A-A2	1,600	0
Alternative B-B1	1,600	360
Alternative B-C1	1,600	15



Transportation

Bicycle – Delay and Out-of-way Travel



Definition: This sub-factor measures the length and duration of cyclist out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days)

Mitigation: Advance signage and media notices for cyclists to choose an alternate route as well as advance notification to the regional cycling clubs. The provision of hoarding may be possible to protect cyclists to limit the duration of required multi-use path closures. It should be noted that contractors may choose not to provide hoarding.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	576,000	0
Alternative B-C1 Rapid Replacement	24,000	0.96

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	1,600	0
Alternative A-A2	1,600	0
Alternative B-B1	1,600	360
Alternative B-C1	1,600	15

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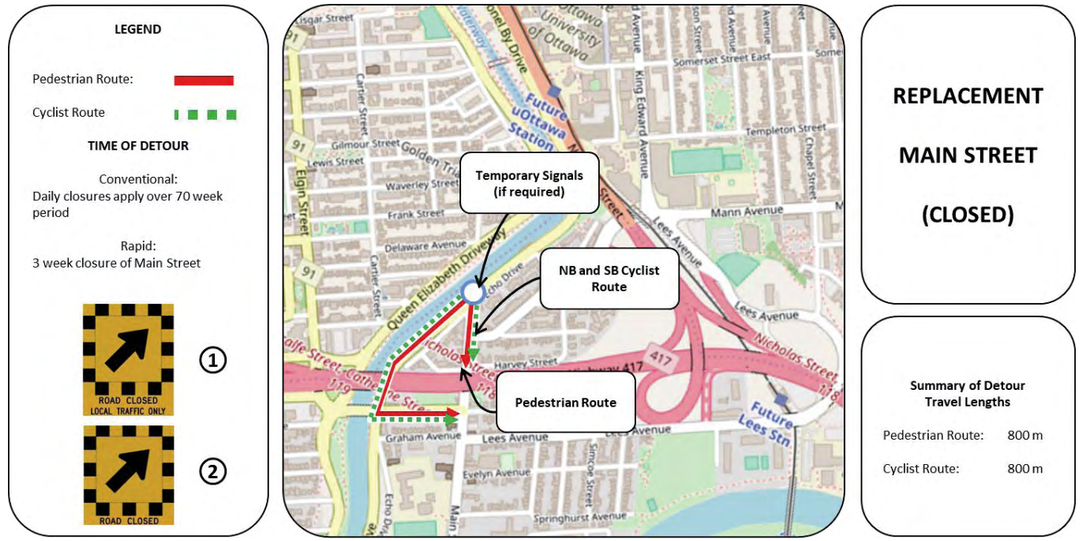
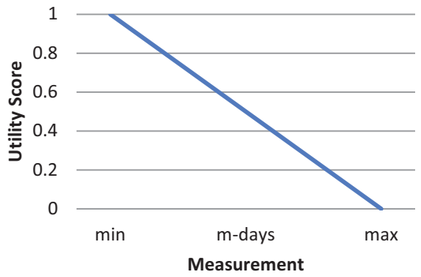


Transportation

General Traffic Municipal Street Delay



Definition: This sub-factor measures the delay during construction that will affect general traffic operations. The measure of impact is the number of days estimated for full or partial closure.

Mitigation: The use of advisory signage, media notices and potential use of variable message signage to advise drivers before reaching the construction site.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	176,4000	0
Alternative B-C1 Rapid Replacement	73,500	0.96

Alternative	Detour Length (m)	Duration (days)
Alternative A-A1	4,900	0
Alternative A-A2	4,900	0
Alternative B-B1	4,900	360
Alternative B-C1	4,900	15

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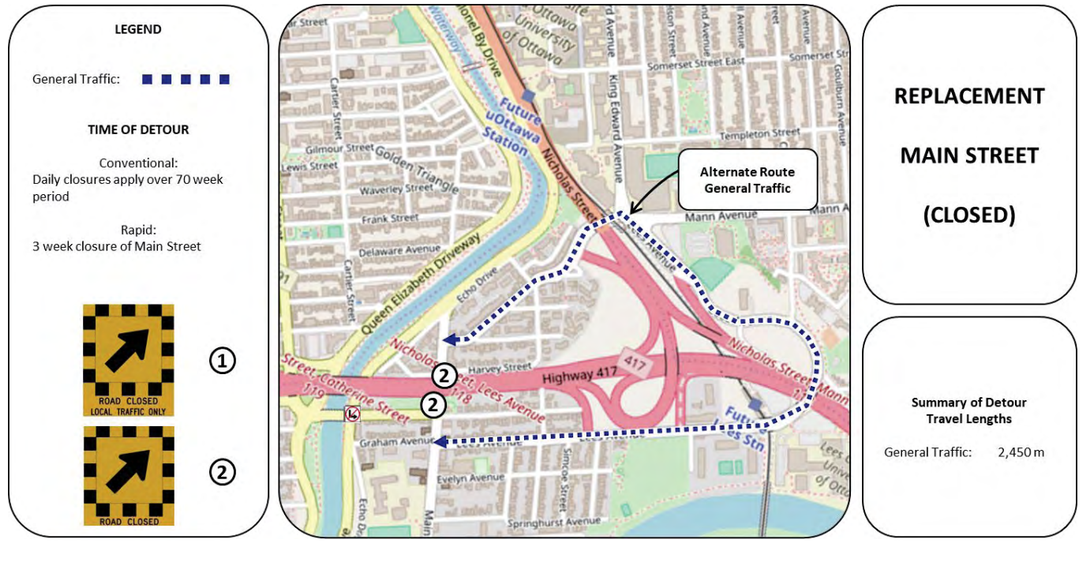
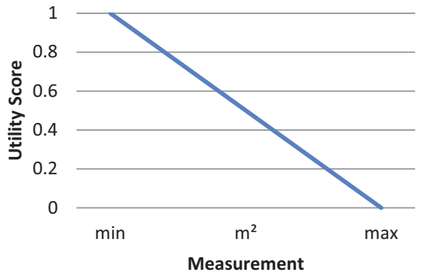
Main Street Structure Alternatives
Sub-factor Definitions



Natural Environment

Landscape Vegetation Removed



Definition: This sub-factor measures whether landscape vegetation in the Staging Areas or the buffer of vegetation in the corridor to the east of the Main Street Bridge is impacted if they are used as lay-down areas for construction. Alternatives that do not remove any landscape vegetation or which enhance the buffer with improved plantings are preferred.

Ballantyne Park includes both specimen trees along Hawthorne Avenue and vegetation along the Queensway right-of-way limit. The loss of specimen trees will be minimized to a single access point to reduce the loss of these trees.

Mitigation: Replacement of any vegetation removed.



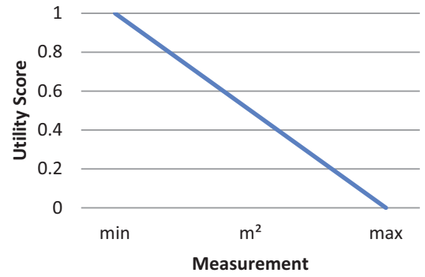
Specimen trees along Hawthorne Avenue and Queensway ROW limit. *Photo: Google Earth 2017*

Alternatives:

Alternative	m²	Utility Score
Alternative A-A1 Rapid Rehabilitation	500	1
Alternative A-A2 Conventional Rehabilitation	500	1
Alternative B-B1 Conventional Replacement	500	1
Alternative B-C1 Rapid Replacement	1,000	0

Social Environment

Short Term Loss of Recreational Space in Ballantyne Park



Definition: This sub-factor measures the short term 1-2 year loss of park space for recreational uses by the public. This use is generally passive recreational and for such things as dog walking.

The rehabilitation and conventional replacement alternatives require a construction laydown area of approximately half the area of a rapid replacement.

Mitigation: To partially mitigate the short term loss, an option would be to create a dog walk area at the west end of the park beyond the staging area.



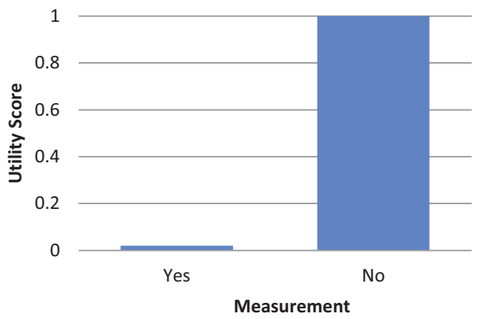
Ballantyne Park space. *Photo: Google Earth 2017*

Alternatives:

Alternative	m²	Utility Score
Alternative A-A1 Rapid Rehabilitation	2,012	1
Alternative A-A2 Conventional Rehabilitation	2,012	1
Alternative B-B1 Conventional Replacement	2,012	1
Alternative B-C1 Rapid Replacement	4,025	0

Heritage Resources

Built Heritage – Former Gas Station



Definition: This sub-factor measures the impact to the former 1930s gas station on 60 Main Street at the northwest corner of Hawthorne Avenue.

As the Former Gas Station is not designated as a heritage structure under the Ontario Heritage Act, its heritage values are not legislated. Character-defining features have been established only in a preliminary way through the following photographs and attached preliminary evaluation. The much evolved and adapted building remains a neighbourhood landmark.

Alternatives which require the removal of the Former Gas Station (yes) for staging areas receive a low utility score.

Mitigation: Removing the building temporarily from the site for staging work during construction, and returning it with landscape reinstatement is seen as a viable alternative to demolition.



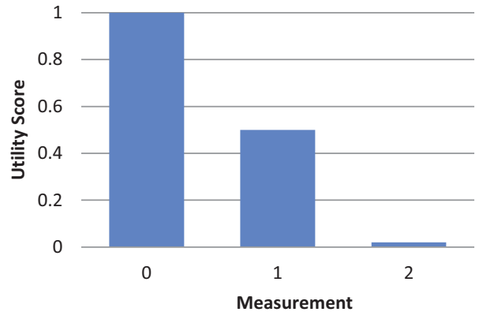
Gordon Construction (Former Gas Station) *BTE, 2017*

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	No	1
Alternative A-A2 Conventional Rehabilitation	No	1
Alternative B-B1 Conventional Replacement	No	1
Alternative B-C1 Rapid Replacement	Yes	0

Economic Environment

Business Buyout



Definition: This sub-factor measures a potential business buyout for Gordon Construction and/or the Salon on Main Street. Self-Propelled Modular Transporter (SPMT) movements may require the acquisition of the two buildings. Alternatives that do not require purchase of any business are preferred.

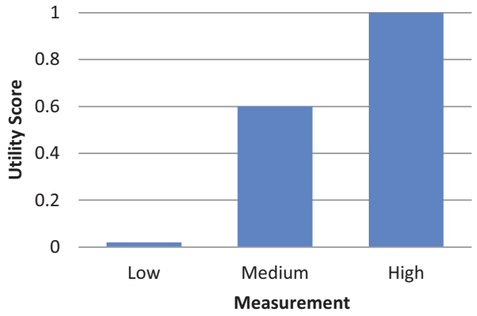
Mitigation: Compensation.

Alternatives:

Alternative	No.	Utility Score
Alternative A-A1 Rapid Rehabilitation	0	1
Alternative A-A2 Conventional Rehabilitation	0	1
Alternative B-B1 Conventional Replacement	0	1
Alternative B-C1 Rapid Replacement	2	0

Structural

Durability of Structure



Definition: This sub-factor measures the durability (life span) of the structure.

High durability – new structures provide a high degree of certainty in durability (1.0 utility).

Medium durability – conventional rehabilitation alternatives provide a medium certainty. If additional repairs are required that were not anticipated, the contractor can add time to the schedule to complete the work. However, there may be some deterioration that is not visible and older concrete is still being used. Conventional rehabilitation still requires a high level of inspection and repairs for deterioration in isolated areas over the next 20 years (0.6 utility).

Low durability – rapid rehabilitation alternatives reflect only repairs that can fit into one weekend; therefore, the expectation of greater probability of future delamination is the highest (0.0 utility).

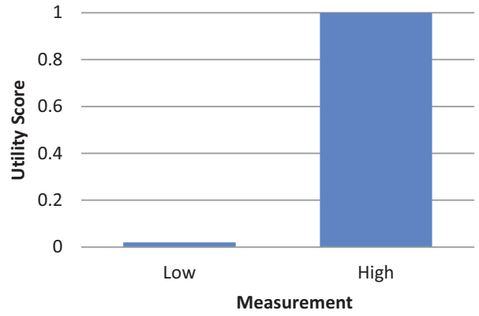
Mitigation: None.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Medium	0.5
Alternative B-B1 Conventional Replacement	High	1
Alternative B-C1 Rapid Replacement	High	1

Structural

Certainty of Property Available to Implement Project



Definition: This sub-factor measures whether there is certainty from owners that the replacement projects can be built today. The current owners who have provided input to date support the replacement project to be completed now. Future replacement will occur when new owners or legislation may preclude the use of their lands.

High – replacement alternatives have certainty that owners are likely to be willing sellers today.

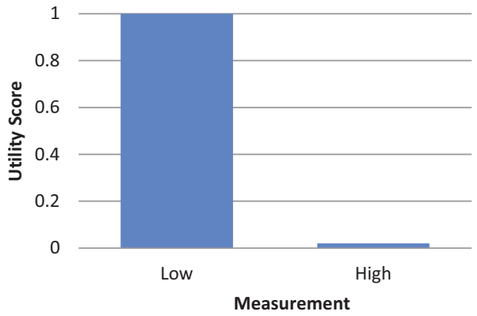
Low – rehabilitation alternatives defers requirement of property to the future and may not have willing sellers for future replacement in 15-25 years.

Mitigation: None.

Alternatives:

Alternative	High/Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Low	0
Alternative B-B1 Conventional Replacement	High	1
Alternative B-C1 Rapid Replacement	High	1

Structural
Risk of Significant Damage



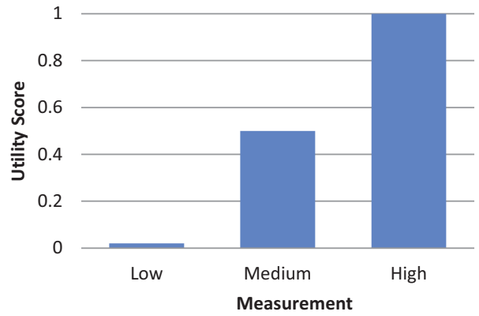
Definition: This sub-factor measures the potential of significant damage from structural deterioration which may close a portion of the Queensway from structural deterioration. The rehabilitation alternatives which retain deteriorated elements of the bridge are considered to have high potential and all new bridges low. The existing bridge has elements with no redundancy in the event of section loss/failure.

Mitigation: None.

Alternatives:

Alternative	High/Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	High	0
Alternative A-A2 Conventional Rehabilitation	High	0
Alternative B-B1 Conventional Replacement	Low	1
Alternative B-C1 Rapid Replacement	Low	1

Structural
Certainty of Construction Method (Risk)



Definition: This sub-factor measures the certainty for construction methods for the rigid frame alternatives.

High certainty (low risk) – the new structure construction methodologies have previously been used on the Queensway and elsewhere in Ontario and provide a low risk to contractors (1.0 utility)

Medium certainty (medium risk) – conventional rehabilitation has some potential for greater repairs of deteriorated areas but has low schedule extension impact (0.5 utility)

Low certainty (high risk) – rapid rehabilitation alternatives reflect only repairs that can fit into one weekend; therefore, the expectation of greater risk (0.0 utility). An example would be the identification of greater corrosion of the negative moment reinforcement at the knee of the frame leg (abutment) requiring decisions on site during the weekend closure to add temporary support(s).

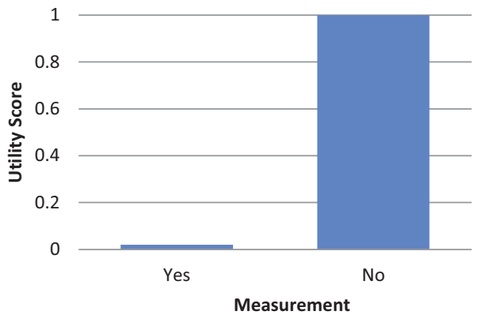
Mitigation: None.

Alternatives:

Alternative	High/ Medium/ Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	Low	0
Alternative A-A2 Conventional Rehabilitation	Medium	0.5
Alternative B-B1 Conventional Replacement	High	0.5
Alternative B-C1 Rapid Replacement	High	1

Structural

Functional Requirement to Widen Structure Triggering Replacement



Definition: This sub-factor measures if the alternative matches the Recommended Highway Plan i.e. the replacement alternatives will replace the bridge that reflects the wider bridge required for the highway improvement plan. It is considered desirable to have one continuous bridge wide enough for the highway plan.

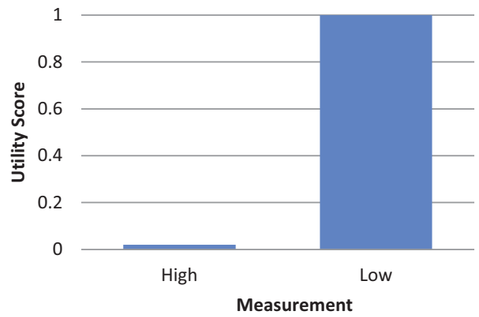
Mitigation: None.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-A1 Rapid Rehabilitation	No	0
Alternative A-A2 Conventional Rehabilitation	No	0
Alternative B-B1 Conventional Replacement	Yes	1
Alternative B-C1 Rapid Replacement	Yes	1

Structural

Structure Condition – Corrosion Potential



Definition: This sub-factor measures the deterioration of the existing bridge from corrosion of the existing reinforcing steel. Structures with high active corrosion are candidates for replacement if rehabilitation cannot significantly reduce the ongoing corrosion. An example of corrosion is the recent Elgin Street barrier walls disconnecting from the deck because of corrosion of the reinforcing steel. This sub-factor measures the expert opinion of the need to replace the structure as an appropriate structural management plan. The measurement is defined as the ability of an alternative to reduce corrosion of the bridge. Typically values more negative than -0.35 V correspond to a greater than 90 percent probability that corrosion of the reinforcing steel is occurring.

Rehabilitation Options – High Probability of Active Corrosion (Utility = 0)

New Options – Low Probability of Active Corrosion (Utility = 1.0)

Mitigation: None.

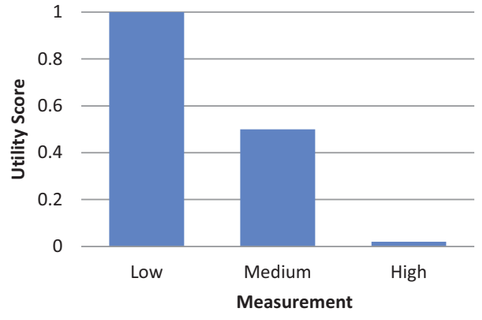
Bridge Structure	Deck							Barrier Walls
	Concrete Strength	Air Entrainment	Corrosion Potential	Chloride Content				
Name	Exceeds Requirement	Compliance with SRM Requirements	Probability Corrosion is occurring (<-0.35 V) (%)	Threshold level exceeded at level of Reinforcing Steel	Average Depth of Asphalt (mm)	Average Depth of Concrete Overlay (mm)	Average Depth of Concrete Cover over Reinforcing Steel (mm)	
Metcalfe St. O/P	Yes	No	0	No	145	110	175	-Narrow and Medium vertical cracking
Elgin St. O/P EBL	Yes	No	0.9	Yes (2 cores)	190	95	190	-Medium vertical cracking
Elgin St. O/P WBL	Yes	No	1.0	No	210	85	170	-Medium vertical cracking on median barrier wall
Main St. O/P EBL	Yes	No	6.1	No	155	130	235	-Medium vertical cracking
Main St. O/P WBL	Yes	No	0.5	No	130	110	190	-Narrow to medium vertical cracking

Alternatives:

Alternative	Average Probability of Corrosion	Utility Score
Alternative A-A1 Rapid Rehabilitation	3.3	0
Alternative A-A2 Conventional Rehabilitation	3.3	0
Alternative B-B1 Conventional Replacement	0	1
Alternative B-C1 Rapid Replacement	0	1

Structural

Structural Deterioration



Definition: This sub-factor measures the deterioration of the existing bridge with areas of spalling the existing surficial concrete. Structures with high areas of spalling are candidates for replacement if rehabilitation cannot significantly reduce the ongoing corrosion. This sub-factor measures the expert opinion of the need to replace the structure as an appropriate structural management plan. The measurement is defined as the ability of an alternative to reduce corrosion of the bridge. The deterioration has been defined as:

Low - less than 5% of the soffit and abutments

Medium - 5-10% of the soffit and abutments

High - where the deterioration is greater than 10% of the soffit and abutments.

New Options – Low Deterioration of concrete surfaces (Utility = 1.0)

Rehabilitation Options – High Deterioration of concrete surfaces (Utility = 0.0)

Mitigation: None.

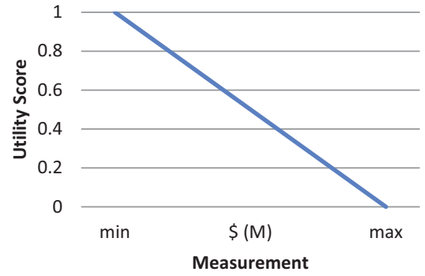
Bridge Structure	Soffit			Abutments			Wingwalls		
Name	Delamination and Spalls (%)	Patches (%)	Deterioration (%)	Delamination and Spalls (%)	Patches (%)	Deterioration (%)	Delamination and Spalls (%)	Patches (%)	Deterioration (%)
Metcalfe St. O/P	0.2	0	0.2	2.7	1.8	4.5	17.5	1.5	19
Elgin St. O/P EBL	0.7	8.0	8.7	3.7	11.5	15.2	2.6	7.6	10.2
Elgin St. O/P WBL	0.1	7.6	7.7	0.6	20.2	20.8	1.7	2.2	3.9
Main St. O/P EBL	0.4	0.3	0.7	8.9	3.5	12.4	0.0	21.8	21.8
Main St. O/P WBL	0.9	0.3	1.2	12.5	3.5	16.0	-	-	-

Alternatives:

Alternative	High/ Medium/ Low	Utility Score
Alternative A-A1 Rapid Rehabilitation	H	0
Alternative A-A2 Conventional Rehabilitation	H	0
Alternative B-B1 Conventional Replacement	L	1
Alternative B-C1 Rapid Replacement	L	1

Cost

Life Cycle Cost



Definition: This sub-factor measures the difference in the total life cycle cost of the alternative (construction, maintenance, operating costs and long term replacement and rehabilitation in the 40 year planning horizon). Cost estimates are for the entire bridge (both EBL and WBL) in 2025. Those alternatives with the lowest life cycle cost are preferred. A 4% discount rate is used.

Mitigation: N/A

Alternatives:

Alternative	$ (M)	Utility Score
Alternative A-A1 Rapid Rehabilitation	15.3	0.99
Alternative A-A2 Conventional Rehabilitation	15.1	1
Alternative B-B1 Conventional Replacement	24.1	0.38
Alternative B-C1 Rapid Replacement	29.5	0

Rideau Canal Structure Alternatives

Alternative Number	Bridge Alternative	Staging Alternative
Alternative A-2B	Replacement precast concrete/steel box girder with new piers on existing pier location	Conventional Replacement – No Highway Widening Required
Alternative A-2C	Replacement precast concrete/steel box girder with new piers on existing pier location	Conventional Replacement – Highway Widening Required
Alternative A-4	Replacement precast concrete/steel box girder with new piers on existing pier location	Jack and Slide Sides
Alternative A-5	Replacement precast concrete/steel box girder with new piers on existing pier location	Sequential Jack and Slide
Alternative A-6	Replacement precast concrete/steel box girder with new piers on existing pier location	Nicholas SPMT Transport
Alternative B-2B	Replacement variable depth steel box girder with new piers on existing pier location	Conventional Replacement – No Highway Widening Required
Alternative B-2C	Replacement variable depth steel box girder with new piers on existing pier location	Conventional Replacement – Highway Widening Required
Alternative B-4	Replacement variable depth steel box girder with new piers on existing pier location	Jack and Slide Sides
Alternative B-5	Replacement variable depth steel box girder with new piers on existing pier location	Sequential Jack and Slide
Alternative C-4	Extrados concrete bridge on new pier location (outside canal)	Jack and Slide Sides
Alternative C-5	Extrados concrete bridge on new pier location (outside canal)	Sequential Jack and Slide
Alternative D-2B	Replacement girder bridge on new pier location (outside canal)	Conventional Replacement – No Highway Widening Required
Alternative D-2C	Replacement girder bridge on new pier location (outside canal)	Conventional Replacement – Highway Widening Required
Alternative D-4	Replacement girder bridge on new pier location (outside canal)	Jack and Slide Sides
Alternative D-5	Replacement girder bridge on new pier location (outside canal)	Sequential Jack and Slide
Alternative E-4	Single span replacement structure	Jack and Slide Sides
Alternative E-5	Single span replacement structure	Sequential Jack and Slide
Alternative F	Rehabilitation	Conventional Rehabilitation

GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Analysis and Evaluation – February 21, 2019
Rideau Canal Structure Alternatives
Sub-factor Definitions

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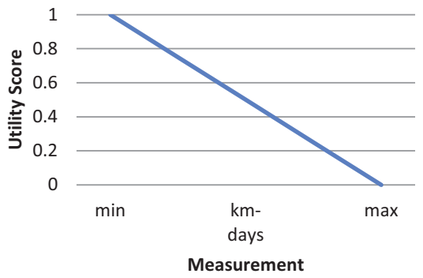
Transportation

Maximum Peak Queue Length on Queensway



Definition: This sub-factor measures the queue duration and the forecast change in queue length in the eastbound direction (after the use of mitigation). During peak hours queuing currently exists and this sub-factor measures the additional queue length due to lane closures for the bridge rehabilitation or replacement. The measurement for this sub-factor is "length x days". This sub-factor is indicative of highway safety, and is related to effects on ramp operations, rear end collisions influenced by stop-and-go traffic, and poor weaving conditions. Those alternatives with shorter queue lengths and occurring for a shorter duration are preferred.

See the Transportation Delays sub-factor for the measure of traffic congestion.

Mitigation: The use of advance advertising and advising drivers of the scheduled lane closures through Portable Variable Message Sign placement in advance of construction are measures that will reduce demand by: changing the time of travel of commuters, use of transit as an alternate mode of travel, or by inducing diversion to the municipal road system as an alternate route.

Alternatives:

Alternative	km-days (peak hour)	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	4841	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	8427	0.13
Alternative A-4 Jack and Slide Replacement Constant Depth	3	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	6	1
Alternative A-6 SPMT Transport Replacement Constant Depth	3	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	4841	0.5
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	8427	0.13
Alternative B-4 Jack and Slide Replacement Variable Depth	3	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	6	1

Alternative	km-days (peak hour)	Utility Score
Alternative C-4 Jack and Slide Extrados	3	1
Alternative C-5 Sequential Jack and Slide Extrados	6	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	4841	0.5
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	8427	0.13
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	3	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	6	1
Alternative E-4 Jack and Slide Single Span	3	1
Alternative E-5 Sequential Jack and Slide Single Span	6	1
Alternative F Conventional Rehabilitation	9682	0

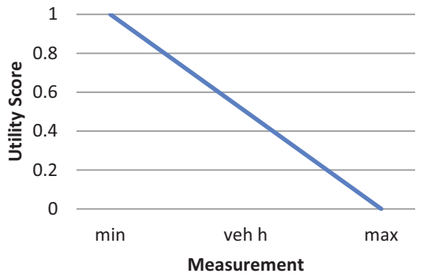
Alternative	Queue (km)	Duration (days)
Alternative A-2B	16.3	297
Alternative A-2C	16.3	517
Alternative A-4	1	3
Alternative A-5	1	6
Alternative A-6	1	3
Alternative B-2B	16.3	297
Alternative B-2C	16.3	517
Alternative B-4	1	3
Alternative B-5	1	6
Alternative C-4*	1	3
Alternative C-5*	1	6
Alternative D-2B	16.3	297

Alternative	Queue (km)	Duration (days)
Alternative D-2C	16.3	517
Alternative D-4	1	3
Alternative D-5	1	6
Alternative E-4*	1	3
Alternative E-5*	1	6
Alternative F	16.3	594

* Delays are expected on the weekend closures for rapid replacement. Delays during the highway widening for the high level bridges are expected to only have ramp closure impacts and are considered under another sub-factor.

Transportation

Delays (During Construction)



Definition: This sub-factor measures the total lane closure peak period delay to drivers on the Queensway during the construction period. This sub-factor is indicative of highway operations (delays to the travelling public). It includes the total peak period delay forecast for the duration of construction of the alternative. The delay sub-factor, although measuring vehicles on the Queensway, is also indicative of the delays for drivers diverted from the Queensway and operating on the municipal road system. Those alternatives that minimize delays are preferred.

Mitigation: Advance signage of construction period. Real time vehicle guidance data.

Alternatives:

Alternative	veh h	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	2083700	0.48
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	3557700	0.11
Alternative A-4 Jack and Slide Replacement Constant Depth	20000	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	40000	0.99
Alternative A-6 SPMT Transport Replacement Constant Depth	20000	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	2083700	0.48
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	3557700	0.11
Alternative B-4 Jack and Slide Replacement Variable Depth	20000	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	40000	0.99
Alternative C-4 Jack and Slide Extrados	1125500	0.72
Alternative C-5 Sequential Jack and Slide Extrados	1145500	0.72
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	2083700	0.48

Alternative	veh h	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	3557700	0.11
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	20000	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	40000	0.99
Alternative E-4 Jack and Slide Single Span	1125500	0.72
Alternative E-5 Sequential Jack and Slide Single Span	1145500	0.72
Alternative F Conventional Rehabilitation	3979800	0

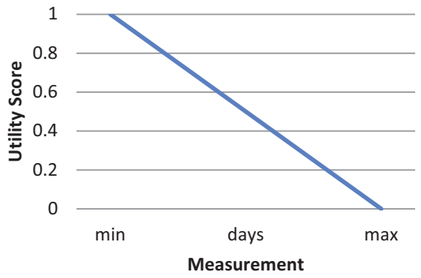
Alternative	Delay Volume (veh h)	Duration (days)
Alternative A-2B	6,700	311
Alternative A-2C	6,700	531
Alternative A-4	-	-
Alternative A-5	-	-
Alternative A-6	-	-
Alternative B-2B	6,700	311
Alternative B-2C	6,700	531
Alternative B-4	-	-
Alternative B-5	-	-

Alternative	Delay Volume (veh h)	Duration (days)
Alternative C-4*	6,700	165
Alternative C-5*	6,700	165
Alternative D-2B	6,700	311
Alternative D-2C	6,700	531
Alternative D-4*	-	-
Alternative D-5*	-	-
Alternative E-4	6,700	165
Alternative E-5	6,700	165
Alternative F	6,700	594

* High level bridges require one year advance highway construction plus an additional 20,000 veh h / year for the bridge replacement weekend.

Transportation

Delays to Emergency Vehicles



Definition: This sub-factor measures the duration of delays to emergency vehicles on the Queensway and on the federal parkways resulting from lane closures. Those alternatives that minimize delays for emergency vehicles are preferred.

Mitigation: Advance notification to EMS and signage of construction period. Real time vehicle guidance data.

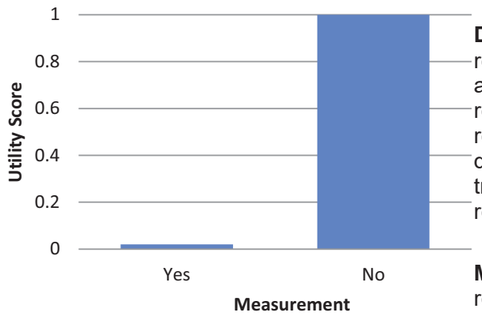
Alternatives:

Alternative	Days	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	325	0.52
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	545	0.15
Alternative A-4 Jack and Slide Replacement Constant Depth	42	1.00
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	70	0.95
Alternative A-6 SPMT Transport Replacement Constant Depth	42	1.00
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	325	0.52
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	545	0.15
Alternative B-4 Jack and Slide Replacement Variable Depth	42	1.00
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	70	0.95
Alternative C-4 Jack and Slide Extrados	262	0.63
Alternative C-5 Sequential Jack and Slide Extrados	290	0.58
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	325	0.52

Alternative	Days	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	545	0.15
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	42	1.00
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	70	0.95
Alternative E-4 Jack and Slide Single Span	262	0.63
Alternative E-5 Sequential Jack and Slide Single Span	290	0.58
Alternative F Conventional Rehabilitation	636	0.00

Transportation

Future Traffic Delays



Definition: This sub-factor measures delays for future replacement and associated traffic delays. Rehabilitation alternatives have significant traffic delays for future replacement of the structure (forecast 20 to 30 years) and receive a utility score of 0. This sub-factor also reflects future delays for emergency vehicles, pedestrians, cyclists, trucks, transit and general traffic associated with a future bridge replacement.

Mitigation: Rapid bridge construction for the future replacement.

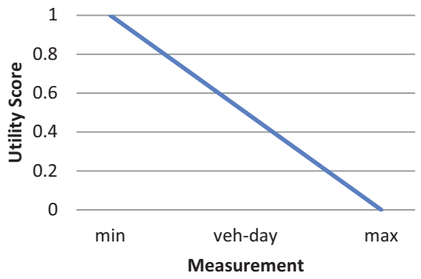
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	No	1
Alternative C-5 Sequential Jack and Slide Extrados	No	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	No	1
Alternative E-5 Sequential Jack and Slide Single Span	No	1
Alternative F Conventional Rehabilitation	Yes	0

Transportation

Ramp Closures



Definition: This sub-factor measures the impact to community access by quantifying the total volume of peak hour ramp trips for each stage of the highway staging plan that will be diverted from entering or exiting from the Queensway over the duration of any ramp closures. Those alternatives that limit the impact on community access by minimizing the duration of any required ramp closures are preferred. Ramps closed during a weekend replacement are not considered under this sub-factor: they are covered under "delays".

Mitigation: Ramps may be closed by time of day and opened to allow access in non-peak hours, and on weekends and holidays.

Alternatives:

Alternative	veh-day	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	4,282,300	0.68
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	11,827,200	0.12
Alternative A-4 Jack and Slide Replacement Constant Depth	0	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	0	1
Alternative A-6 SPMT Transport Replacement Constant Depth	0	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	4,893,900	0.64
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	11,827,200	0.12
Alternative B-4 Jack and Slide Replacement Variable Depth	0	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	0	1
Alternative C-4 Jack and Slide Extrados	13,507,200	0
Alternative C-5 Sequential Jack and Slide Extrados	10,550,400	0.22
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	4,893,900	0.64
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	11,827,200	0.12
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	0	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	0	1
Alternative E-4 Jack and Slide Single Span	7,929,600	0.41
Alternative E-5 Sequential Jack and Slide Single Span	7,593,600	0.44
Alternative F Conventional Rehabilitation	5,913,600	0.56

Alternative	WB Volume (veh)	Duration (days)
Alternative A-2B	13,900	121
Alternative A-2C	13,900	352
Alternative A-4	13,900	0
Alternative A-5	13,900	0
Alternative A-6	13,900	0
Alternative B-2B	13,900	165
Alternative B-2C	13,900	352
Alternative B-4	13,900	0
Alternative B-5	13,900	0

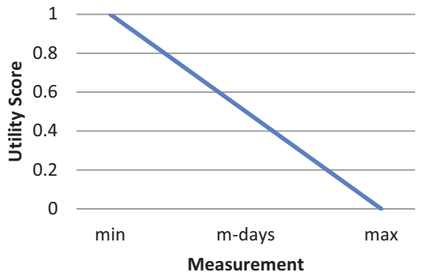
Alternative	WB Volume (veh)	Duration (days)
Alternative C-4	13,900	402
Alternative C-5	13,900	314
Alternative D-2B	13,900	165
Alternative D-2C	13,900	352
Alternative D-4	13,900	0
Alternative D-5	13,900	0
Alternative E-4	13,900	236
Alternative E-5	13,900	226
Alternative F	13,900	176

Alternative	EB Volume (veh)	Duration (days)
Alternative A-2B	19,700	132
Alternative A-2C	19,700	352
Alternative A-4	19,700	0
Alternative A-5	19,700	0
Alternative A-6	19,700	0
Alternative B-2B	19,700	132
Alternative B-2C	19,700	352
Alternative B-4	19,700	0
Alternative B-5	19,700	0

Alternative	EB Volume (veh)	Duration (days)
Alternative C-4	19,700	402
Alternative C-5	19,700	314
Alternative D-2B	19,700	132
Alternative D-2C	19,700	352
Alternative D-4	19,700	0
Alternative D-5	19,700	0
Alternative E-4	19,700	236
Alternative E-5	19,700	226
Alternative F	19,700	176

Transportation

Pedestrian – Delay and Out-of-way Travel



Definition: This sub-factor measures the length and duration of pedestrian out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days).

Mitigation: Advance signage and media notices for pedestrians to choose an alternate route as well as the provision of hoarding to protect existing sidewalks and multi-use path and limit the duration of required sidewalk and multi-use path closures. It should be noted that contractors may not provide hoarding based on bidding and construction plans. Additionally, hoarding that is used could be painted to provide visual mitigation at the Rideau Canal bridge.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	14,000	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	14,000	0
Alternative A-4 Jack and Slide Replacement Constant Depth	5,000	0.64
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	10,000	0.29
Alternative A-6 SPMT Transport Replacement Constant Depth	5,000	0.64
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	14,000	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	14,000	0
Alternative B-4 Jack and Slide Replacement Variable Depth	5,000	0.64
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	10,000	0.29
Alternative C-4 Jack and Slide Extrados	5,000	0.64
Alternative C-5 Sequential Jack and Slide Extrados	10,000	0.29
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	14,000	0

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Alternative	m-days	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	14,000	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	5,000	0.64
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	10,000	0.29
Alternative E-4 Jack and Slide Single Span	5,000	0.64
Alternative E-5 Sequential Jack and Slide Single Span	10,000	0.29
Alternative F Conventional Rehabilitation	0	1

Alternative	Detour Length (m)	Duration (days)
Alternative A-2B	1000	14
Alternative A-2C	1000	14
Alternative A-4	1000	5
Alternative A-5	1000	10
Alternative A-6	1000	5
Alternative B-2B	1000	14
Alternative B-2C	1000	14
Alternative B-4	1000	5
Alternative B-5	1000	10

Alternative	Detour Length (m)	Duration (days)
Alternative C-4	1000	5
Alternative C-5	1000	10
Alternative D-2B	1000	14
Alternative D-2C	1000	14
Alternative D-4	1000	5
Alternative D-5	1000	10
Alternative E-4	1000	5
Alternative E-5	1000	10
Alternative F	1000	0

LEGEND

Pedestrian Route:

Cyclist Route:

TIME OF DETOUR

Conventional:
Daily closures apply over 110 week period

Jack and Slide Sides:
Daily closures apply over 90 week period

Sequential Jack and Slide :
Daily closures apply over 120 week period

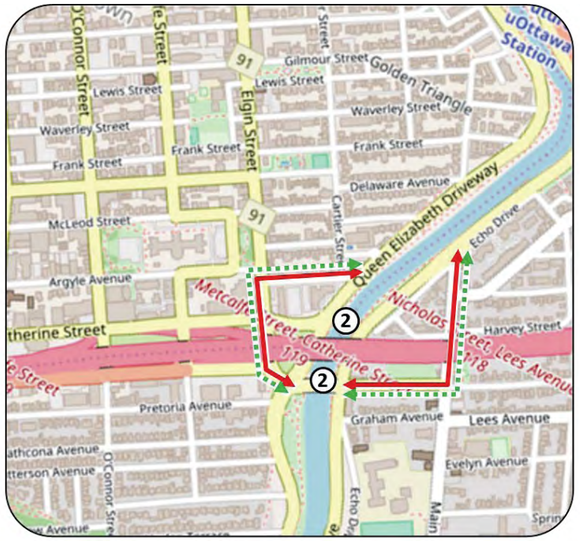
Elevator SPMT:
Daily closures apply over 80 week period



①



②



RIDEAU CANAL REPLACEMENT

COLONEL BY AND QUEEN ELIZABETH

(CLOSED)

Summary of Detour Travel Lengths

Pedestrian Route: (QED)	480 m
Cyclist Route: (QED)	480 m
Pedestrian Route: (CBD)	520 m
Cyclist Route: (CBD)	520 m

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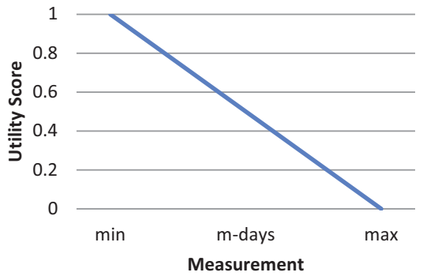
Transportation

Bicycle – Delay and Out-of-way Travel



Definition: This sub-factor measures the length and duration of cyclist out-of-way travel on the side streets while work is completed to rehabilitate or replace the structure. The sub-factor measure is length (m) x duration (days)

Mitigation: Advance signage and media notices for cyclists to choose an alternate route as well as advance notification to the regional cycling clubs. The provision of hoarding may be possible to protect cyclists and limit the duration of required multi-use path closures. It should be noted that contractors may not provide hoarding based on bidding and construction plans.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	14,000	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	14,000	0
Alternative A-4 Jack and Slide Replacement Constant Depth	5,000	0.64
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	10,000	0.29
Alternative A-6 SPMT Transport Replacement Constant Depth	5,000	0.64
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	14,000	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	14,000	0
Alternative B-4 Jack and Slide Replacement Variable Depth	5,000	0.64
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	10,000	0.29
Alternative C-4 Jack and Slide Extrados	5,000	0.64
Alternative C-5 Sequential Jack and Slide Extrados	10,000	0.29
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	14,000	0

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Alternative	m-days	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	14,000	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	5,000	0.64
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	10,000	0.29
Alternative E-4 Jack and Slide Single Span	5,000	0.64
Alternative E-5 Sequential Jack and Slide Single Span	10,000	0.29
Alternative F Conventional Rehabilitation	0	1

Alternative	Detour Length (m)	Duration (days)
Alternative A-2B	1000	14
Alternative A-2C	1000	14
Alternative A-4	1000	5
Alternative A-5	1000	10
Alternative A-6	1000	5
Alternative B-2B	1000	14
Alternative B-2C	1000	14
Alternative B-4	1000	5
Alternative B-5	1000	10

Alternative	Detour Length (m)	Duration (days)
Alternative C-4	1000	5
Alternative C-5	1000	10
Alternative D-2B	1000	14
Alternative D-2C	1000	14
Alternative D-4	1000	5
Alternative D-5	1000	10
Alternative E-4	1000	5
Alternative E-5	1000	10
Alternative F	1000	0

LEGEND

Pedestrian Route:

Cyclist Route:

TIME OF DETOUR

Conventional:
Daily closures apply over 110 week period

Jack and Slide Sides:
Daily closures apply over 90 week period

Sequential Jack and Slide :
Daily closures apply over 120 week period

Elevator SPMT:
Daily closures apply over 80 week period



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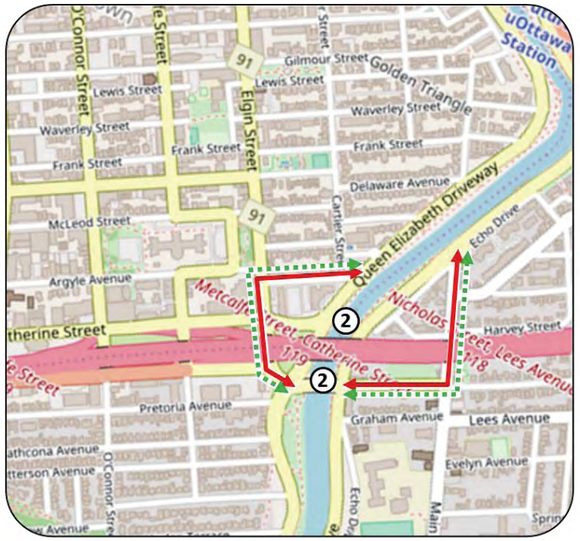

RIDEAU CANAL REPLACEMENT

COLONEL BY AND QUEEN ELIZABETH

(CLOSED)

Summary of Detour Travel Lengths

Pedestrian Route: (QED)	480 m
Cyclist Route: (QED)	480 m
Pedestrian Route: (CBD)	520 m
Cyclist Route: (CBD)	520 m

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Analysis and Evaluation – February 21, 2019
Rideau Canal Structure Alternatives
Sub-factor Definitions

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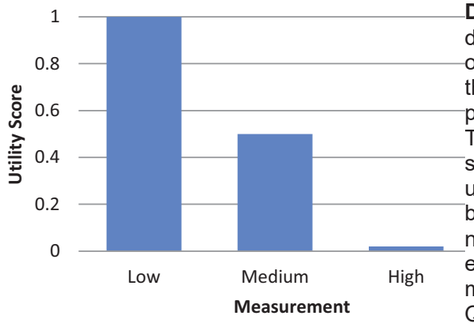
Transportation

Multi-use Pathway – Temporary Construction Effects for Safety and Personal Security Level



Definition: This sub-factor measures short term effects during construction of the temporary increased width of overpass structures and length of travel with hoarding under the construction site, and is indicative of the safety and personal security for pedestrian and cyclists of alternatives. Those alternatives that temporarily require wider bridge structures create more dark space under the bridge for multi-use path users. Alternatives using the Jack and Slide from both sides method requires a longer structure on both the north and south side of the Queensway and are rated as high effects. Alternatives using the Jack and Slide sequential method requires a longer structure on the south side of the Queensway and are rated as medium effects. All other alternatives require not additional width and are rated as low effects. The effect of **long term** changes for path users is measured in the Context Sensitive Design criteria. Those alternatives which close the pathways are measured under pedestrian and cyclist out-of-way travel.

Mitigation: Lighting.

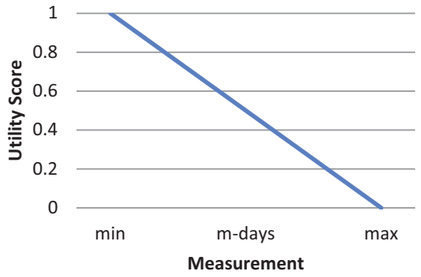
Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	1
Alternative A-4 Jack and Slide Replacement Constant Depth	High	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	1
Alternative B-4 Jack and Slide Replacement Variable Depth	High	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Medium	0.5

Alternative	H/M/L	Utility Score
Alternative C-4 Jack and Slide Extrados	High	0
Alternative C-5 Sequential Jack and Slide Extrados	Medium	0.5
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	High	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative E-4 Jack and Slide Single Span	High	0
Alternative E-5 Sequential Jack and Slide Single Span	Medium	0.5
Alternative F Conventional Rehabilitation	Low	1

Transportation

Transit Operations Delay – Out-of-Way Travel



Definition: This sub-factor measures the out-of-way travel during construction that will affect existing transit operations. Bus routes affected include Nos. 101, 103 and 401. The measurement of delays is the number of days of a detour due to a full closure of the Queensway. There are no transit routes on the federal parkways.

Delays are measured under "Delays (Under Construction)".

Future transit routes are not included in this evaluation.

Mitigation: Advance information and media notices to OC Transpo and temporary bus stop relocations if required.

Alternatives:

Alternative	m-days	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	0	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	0	1
Alternative A-4 Jack and Slide Replacement Constant Depth	4,140	0.50
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	8,280	0.00
Alternative A-6 SPMT Transport Replacement Constant Depth	4,140	0.50
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	0	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	0	1
Alternative B-4 Jack and Slide Replacement Variable Depth	4,140	0.50
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	8,280	0
Alternative C-4 Jack and Slide Extrados	4,140	0.50
Alternative C-5 Sequential Jack and Slide Extrados	8,280	0.00

Alternative	m-days	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	0	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	0	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	4,140	0.50
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	8,280	0
Alternative E-4 Jack and Slide Single Span	4,140	0.50
Alternative E-5 Sequential Jack and Slide Single Span	8,280	0
Alternative F Conventional Rehabilitation	0	1

Alternative	Detour Length (m)	Duration (days)
Alternative A-2B	1380	0
Alternative A-2C	1380	0
Alternative A-4	1380	3
Alternative A-5	1380	6
Alternative A-6	1380	3
Alternative B-2B	1380	0
Alternative B-2C	1380	0
Alternative B-4	1380	3
Alternative B-5	1380	6

Alternative	Detour Length (m)	Duration (days)
Alternative C-4	1380	3
Alternative C-5	1380	6
Alternative D-2B	1380	0
Alternative D-2C	1380	0
Alternative D-4	1380	3
Alternative D-5	1380	6
Alternative E-4	1380	3
Alternative E-5	1380	6
Alternative F	1380	0

TRANSIT DETOUR

EB 101, 103, 401

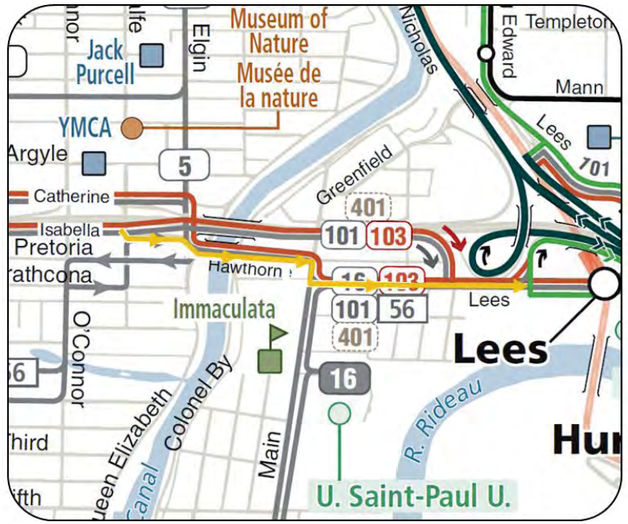
Isabella Street – Elgin Street – Hawthorne Avenue – Main Street – Lees Avenue

TIME OF DETOUR

Weekend closure for Rapid Replacement (3 days)

LEGEND

Transit Detour:



EASTBOUND QUEENSWAY TRANSIT DETOUR

Summary of Transit Detour Travel Length

1.38 km

GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
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Rideau Canal Structure Alternatives
Sub-factor Definitions

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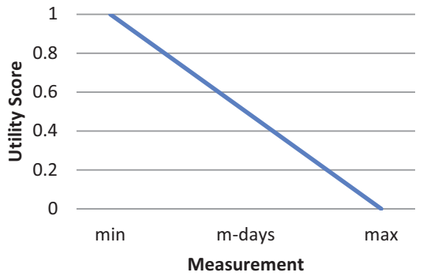
Transportation

General Traffic Federal Parkways Delay (Colonel By Drive and Queen Elizabeth Drive)



Definition: This sub-factor measures the delay during construction that will affect general traffic operations. The measure of impact is the length of delay and the number of days estimated for full or partial closure. The measurement for this sub-factor is length (m) x days.

Mitigation: The use of advisory signage and potential use of variable message signage to advise drivers before reaching the construction site.

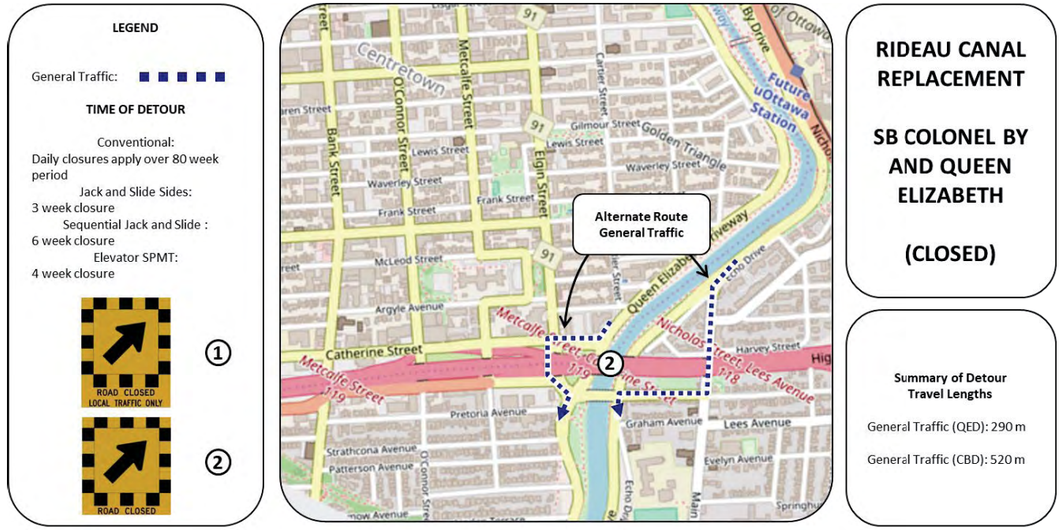
Alternatives:

Alternative	m-days	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	25,340	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	25,340	1
Alternative A-4 Jack and Slide Replacement Constant Depth	50,680	0.84
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	101,360	0.52
Alternative A-6 SPMT Transport Replacement Constant Depth	183,960	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	25,340	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	25,340	1
Alternative B-4 Jack and Slide Replacement Variable Depth	50,680	0.84
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	101,360	0.52
Alternative C-4 Jack and Slide Extrados	50,680	0.84
Alternative C-5 Sequential Jack and Slide Extrados	101,360	0.52
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	25,340	1

Alternative	m-days	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	25,340	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	50,680	0.84
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	101,360	0.52
Alternative E-4 Jack and Slide Single Span	50,680	0.84
Alternative E-5 Sequential Jack and Slide Single Span	101,360	0.52
Alternative F Conventional Rehabilitation	50,680	0.84

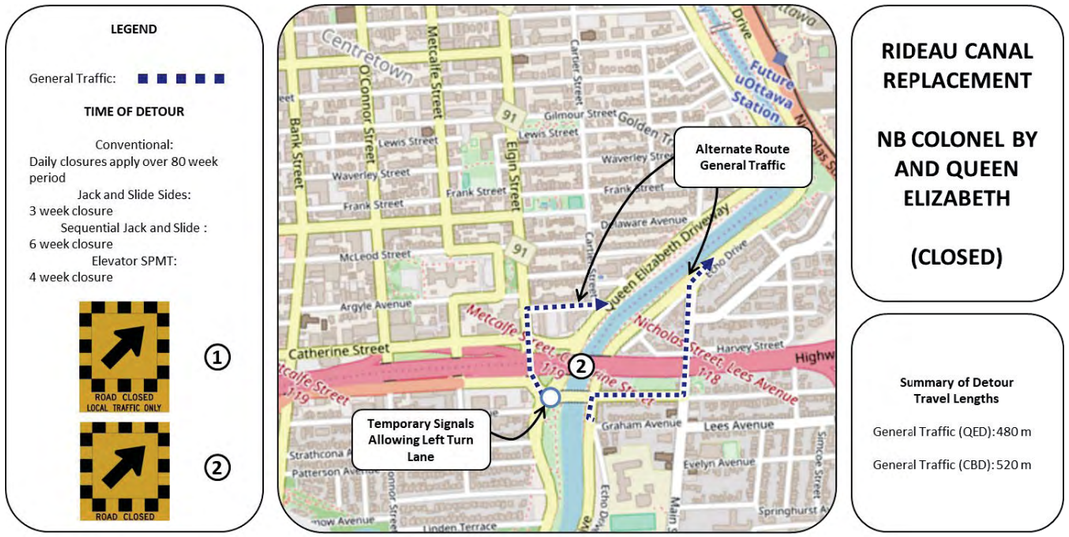
Alternative	Detour Length (m)	Duration (days)
Alternative A-2B	1810	14
Alternative A-2C	1810	14
Alternative A-4	1810	28
Alternative A-5	1810	56
Alternative A-6	6570	28
Alternative B-2B	1810	14
Alternative B-2C	1810	14
Alternative B-4	1810	28
Alternative B-5	1810	56

Alternative	Detour Length (m)	Duration (days)
Alternative C-4	1810	28
Alternative C-5	1810	56
Alternative D-2B	1810	14
Alternative D-2C	1810	14
Alternative D-4	1810	28
Alternative D-5	1810	56
Alternative E-4	1810	28
Alternative E-5	1810	56
Alternative F	1810	28



Note:

1. Construction Alternative 6 requires shoring at Main Street for the SPMTs to travel over the Main Street bridge. General traffic would not be able to use Main Street as a detour from Colonel By Drive and is therefore rerouted to Lees Avenue.



Note:

1. No southbound QED traffic allowed so temporary signals allowing left turns from QED to NB Elgin would be required

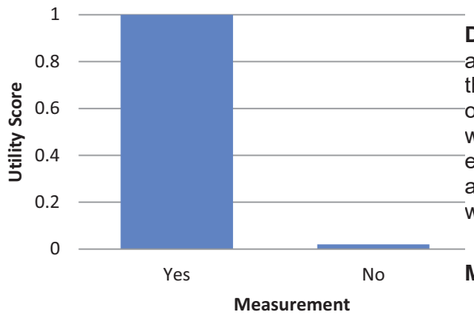


Note:

1. Construction Alternative 6 requires shoring at Main Street for the SPMTs to travel over the Main Street bridge. General traffic would not be able to use Main Street as a detour from Colonel By Drive and is therefore rerouted to Lees Avenue.

Transportation

Flexibility for Future Queensway Widening



Definition: This sub-factor measures whether an alternative allows future flexibility for widening of the Queensway beyond the approved 2007 EA recommendation for an additional lane on the north of the Queensway through this corridor, which would be accommodated for all alternatives. However, the extrados and single span bridge alternatives do not allow any additional widening in the future. Alternatives that allow future widening are preferred.

Mitigation: None.

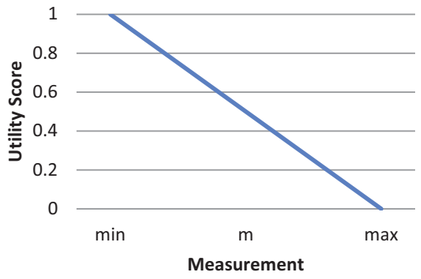
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Yes	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Yes	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Yes	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Yes	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Yes	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Yes	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Yes	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Yes	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Yes	1
Alternative C-4 Jack and Slide Extrados	No	0
Alternative C-5 Sequential Jack and Slide Extrados	No	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Yes	1

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Yes	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Yes	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Yes	1
Alternative E-4 Jack and Slide Single Span	No	0
Alternative E-5 Sequential Jack and Slide Single Span	No	0
Alternative F Conventional Rehabilitation	Yes	1

Transportation

Safety – Lateral Hazard



Definition: This sub-factor measures the risk for drivers on the Queensway induced by the view of the superstructure in their lateral peripheral vision, in an area where drivers are changing the travel path of the vehicle (minor curves on the freeway) to travel through the high level bridges which require wider median and shoulder separation. This localized change can result in higher collision potential on the freeway.

The measurement for this sub-factor is the additional height of the superstructure above the existing barrier wall along the Queensway corridor.

Mitigation: None

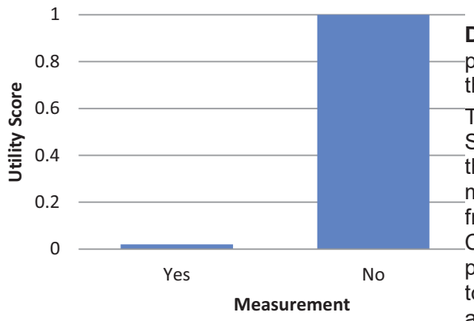
Alternatives:

Alternative	m	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	0	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	0	1
Alternative A-4 Jack and Slide Replacement Constant Depth	0	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	0	1
Alternative A-6 SPMT Transport Replacement Constant Depth	0	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	0	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	0	1
Alternative B-4 Jack and Slide Replacement Variable Depth	0	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	0	1
Alternative C-4 Jack and Slide Extrados	6	0.33
Alternative C-5 Sequential Jack and Slide Extrados	6	0.33

Alternative	m	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	0	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	0	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	0	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	0	1
Alternative E-4 Jack and Slide Single Span	18	0
Alternative E-5 Sequential Jack and Slide Single Span	18	0
Alternative F Conventional Rehabilitation	0	1

Transportation

Traffic Staging of Multiple Projects



Definition: This sub-factor measures whether an alternative precludes the ability to replace the rigid frame bridges within the same weekend.

The elevator traffic staging methodology prevents the Main Street bridge from being replaced on the same weekend as the Rideau Canal bridge replacement because the SPMTs must travel over the Main Street bridge to move the bridges from the Rideau Canal to the Nicholas Street ramp lot. Conventional replacements and rehabilitation alternatives also preclude the ability to limit the disruption of Queensway traffic to the same weekend(s) since construction will take place over an extended period.

Mitigation: None

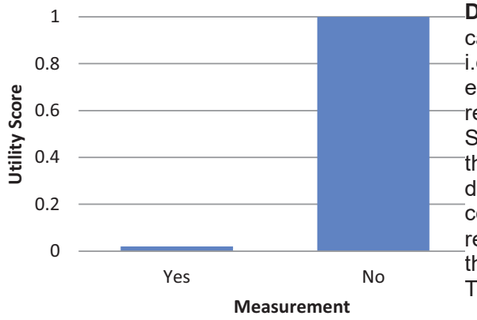
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Yes	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Yes	0
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Yes	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Yes	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Yes	0
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	No	1
Alternative C-5 Sequential Jack and Slide Extrados	No	1

Alternative	Yes/No	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Yes	0
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	No	1
Alternative E-5 Sequential Jack and Slide Single Span	No	1
Alternative F Conventional Rehabilitation	No	1

Transportation

Associated Effects to Adjacent Rigid Frame Bridge Projects



Definition: This sub-factor measures whether an alternative causes additional effects to another bridge on the Queensway i.e. adjacent rigid frame bridges within the Study Area. The extrados and single span bridge alternatives trigger the replacement of all three rigid frames (Metcalfe, Elgin and Main Street) as well as requiring additional Queensway widening through the Study Area. This will require additional traffic delays estimated to add a minimum of 1 year for Queensway construction. The transportation effects for these additional requirements are measured under this sub-factor. Alternatives that do not have adjacent downstream effects are preferred. The associated costs are measured under the cost criteria.

Mitigation: None.

Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Yes	0
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Yes	0
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	Yes	0
Alternative C-5 Sequential Jack and Slide Extrados	Yes	0

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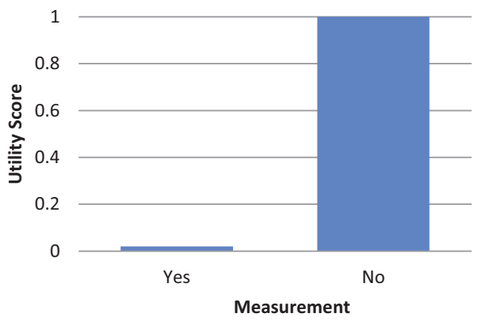
Alternative	Yes/No	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Yes	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	Yes	0
Alternative E-5 Sequential Jack and Slide Single Span	Yes	0
Alternative F Conventional Rehabilitation	No	1

Natural Environment

Permanent Warm Water Fish Habitat Created



Definition: This sub-factor measures the ability to create additional warm water fish habitat from the alternatives on the Rideau Canal. Alternatives creating the greatest increase of fish habitat are preferred. Alternatives with permanent piers within the Canal (Yes) are undesirable under this sub-factor.

Mitigation: None.

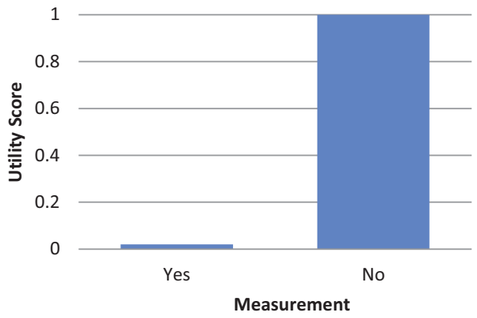
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Yes	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Yes	0
Alternative A-4 Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-6 SPMT Transport Replacement Constant Depth	Yes	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Yes	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Yes	0
Alternative B-4 Jack and Slide Replacement Variable Depth	Yes	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Yes	0
Alternative C-4 Jack and Slide Extrados	No	1
Alternative C-5 Sequential Jack and Slide Extrados	No	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	No	1
Alternative E-5 Sequential Jack and Slide Single Span	No	1
Alternative F Conventional Rehabilitation	Yes	0

Natural Environment

Landscape Vegetation Removed



Definition: This sub-factor measures whether landscape vegetation in construction laydown areas or the buffer of vegetation in the corridor to the east of the Rideau Canal Bridge is impacted if they are used as lay-down areas for construction. This area is located northeast of the Royal Oak. Alternatives that do not remove any landscape vegetation or which enhance the buffer with improved plantings are preferred.

Impact to Ballantyne Park and the landscaping along Rideau Canal are not included in this sub-factor.

Mitigation: Replacement of any vegetation removed.

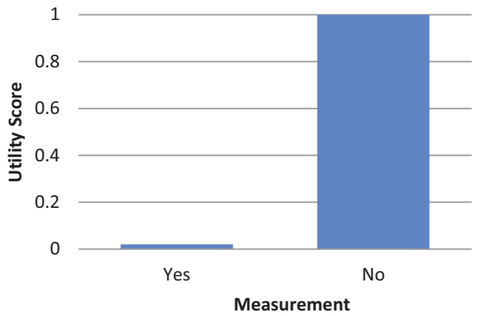
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Yes	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Yes	0
Alternative C-4 Jack and Slide Extrados	Yes	0
Alternative C-5 Sequential Jack and Slide Extrados	Yes	0

Alternative	Yes/No	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Yes	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Yes	0
Alternative E-4 Jack and Slide Single Span	Yes	0
Alternative E-5 Sequential Jack and Slide Single Span	Yes	0
Alternative F Conventional Rehabilitation	No	1

Natural Environment

Woodlot at Nicholas Street On-ramp Impacted



Definition: This sub-factor measures whether an alternative impacts the woodlot by the Nicholas Street On-ramp (northwest quadrant of Nicholas Street interchange). Alternatives that do not impact the woodlot are preferred.

Mitigation: Replant trees if removed.

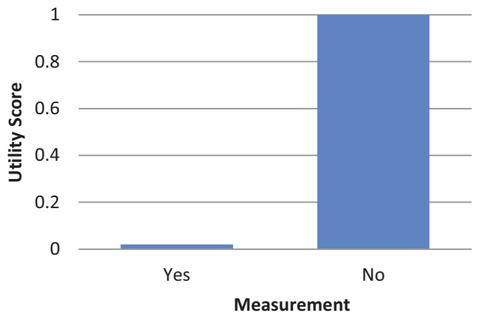
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Yes	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	No	1
Alternative C-5 Sequential Jack and Slide Extrados	No	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	No	1
Alternative E-5 Sequential Jack and Slide Single Span	No	1
Alternative F Conventional Rehabilitation	No	1

Natural Environment

Associated Effects with Adjacent Rigid Frame Projects



Definition: This sub-factor measures additional effects a bridge alternative may have on the Queensway and rigid frame bridges within the Study Area. The extrados and single span bridge alternatives trigger the replacement of all three rigid frame bridges (Metcalfe, Elgin and Main Street) and require additional Queensway widening (10 m) through the Study Area. The natural environment effects including short term and long term (specimen trees) impacts to Ballantyne Park are measured under this sub-factor. Alternatives that do not have associated downstream effects are preferred.

Mitigation: None.

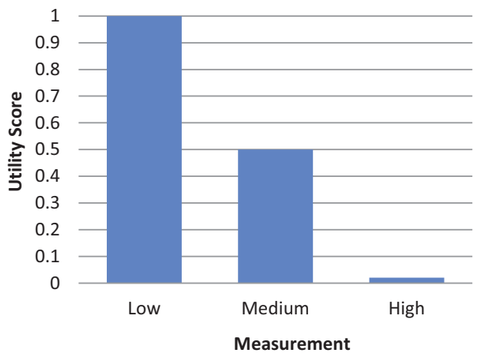
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	Yes	0
Alternative C-5 Sequential Jack and Slide Extrados	Yes	0

Alternative	Yes/No	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	Yes	0
Alternative E-5 Sequential Jack and Slide Single Span	Yes	0
Alternative F Conventional Rehabilitation	No	1

Social Environment

Impact to Community Uses



Definition: This sub-factor measures the social impacts to nearby businesses and institutions caused by construction and/or staging. For example, the impact to social 'hubs' (pubs, hair salon, etc.) where local residents regularly gather.

Preference is for options which minimize impacts to commercial and institutional areas, to allow for their continued operations, viability and social vitality.

Impacts: the Jack and Slide alternatives (4 and 5) impact the pub, Cyco's and Greek on Wheels (medium impact) and high level bridges (C and E) impact the pub, Cyco's, Greek on Wheels and the salon (high impact). All other alternatives are low impact as they do not impact any social hubs.

Mitigation: None.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No 417 Widening	Low	1
Alternative A-2C Conventional Replacement Constant Depth, 417 Widening	Low	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	1
Alternative B-2B Conventional Replacement Variable Depth, No 417 Widening	Low	1
Alternative B-2C Conventional Replacement Variable Depth, 417 Widening	Low	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Medium	0.5
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	1
Alternative C-4 Jack and Slide Extrados	High	0
Alternative C-5 Sequential Jack and Slide Extrados	High	0

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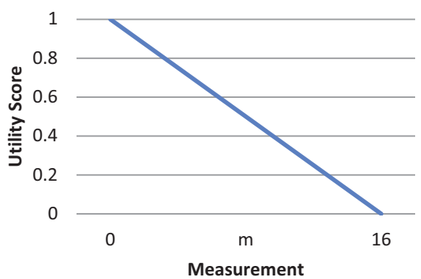
Alternative	H/M/L	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No 417 Widening, New Pier Location	Low	1
Alternative D-2C Conventional Replacement Variable Depth, 417 Widening, New Pier Location	Low	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative E-4 Jack and Slide Single Span	High	0
Alternative E-5 Sequential Jack and Slide Single Span	High	0
Alternative F Conventional Rehabilitation	Low	1

Social Environment

Natural Lighting and Visual Safety



Definition: This sub-factor measures the availability of natural light for sidewalks and pathways under the structure during the day. The unit of measure is the width of the permanent bridge using the existing structure as a baseline. Those alternatives with the narrowest bridge width provide the greatest natural light and are preferred.

Higher scores are awarded to options that create a natural well-lit environment in the day for all modes of transportation at all speeds, and use natural lighting to enhance the environment under the bridge while blending with the existing Canal parkway lighting.

Quality of the night experience and the artistic attributes of light are addressed in a separate sub-factor (night quality and lighting).

Mitigation: Artificial lighting (for day use).

Alternatives:

Alternative	m	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	6	0.63
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	6	0.63
Alternative A-4 Jack and Slide Replacement Constant Depth	6	0.63
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	6	0.63
Alternative A-6 SPMT Transport Replacement Constant Depth	6	0.63
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	6	0.63
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	6	0.63
Alternative B-4 Jack and Slide Replacement Variable Depth	6	0.63
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	6	0.63
Alternative C-4 Jack and Slide Extrados	16	0

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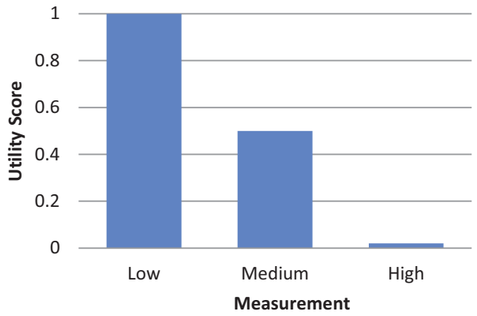
Alternative	m	Utility Score
Alternative C-5 Sequential Jack and Slide Extrados	16	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	6	0.63
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	6	0.63
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	6	0.63
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	6	0.63
Alternative E-4 Jack and Slide Single Span	16	0
Alternative E-5 Sequential Jack and Slide Single Span	16	0
Alternative F Conventional Rehabilitation	0	1

Social Environment

Intrusion to Adjacent Residents



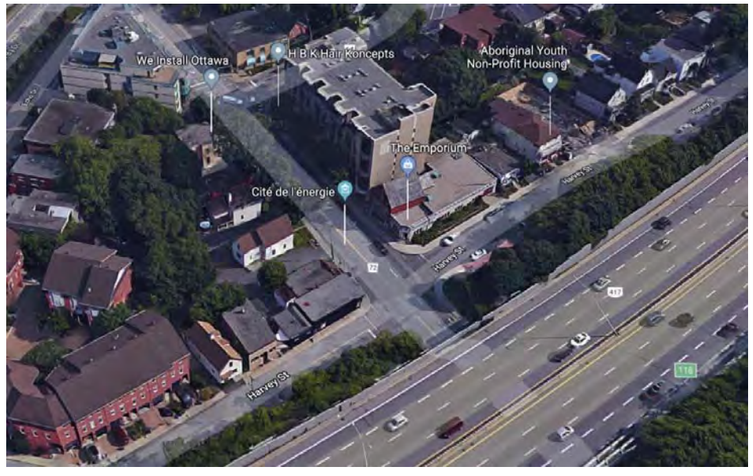
Definition: This sub-factor measures the physical and visual intrusion of Queensway widening beyond the previously approved 2007 TESR, both vertically and horizontally. This sub-factor measures the lateral shift of the retaining wall towards existing residential areas. This lateral shift reduces light and green space opportunities.

Further narrowing of Harvey Street or reducing the vegetative buffer will fundamentally alter the streetscape and sense of place that currently exists.

The greater the level of intrusion, the lower the utility score.

The visual effect of the change is illustrated on the 3D visual modelling.

Mitigation: Retaining wall treatments to enhance the intrusion with input from the Harvey Street residents.



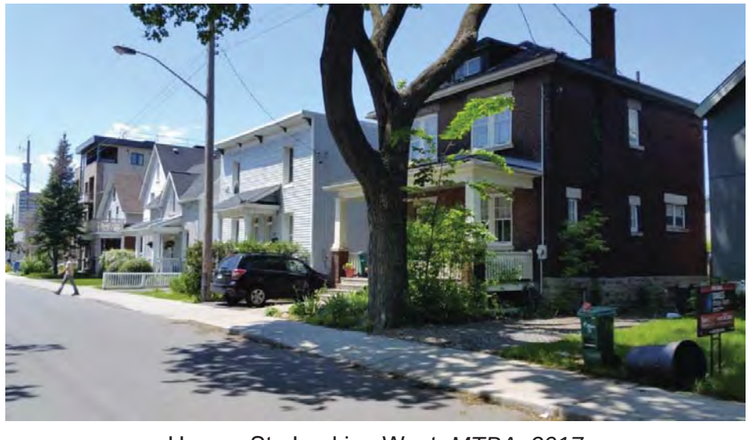
Bird's Eye view of Harvey Street, *Google Maps, 2018*



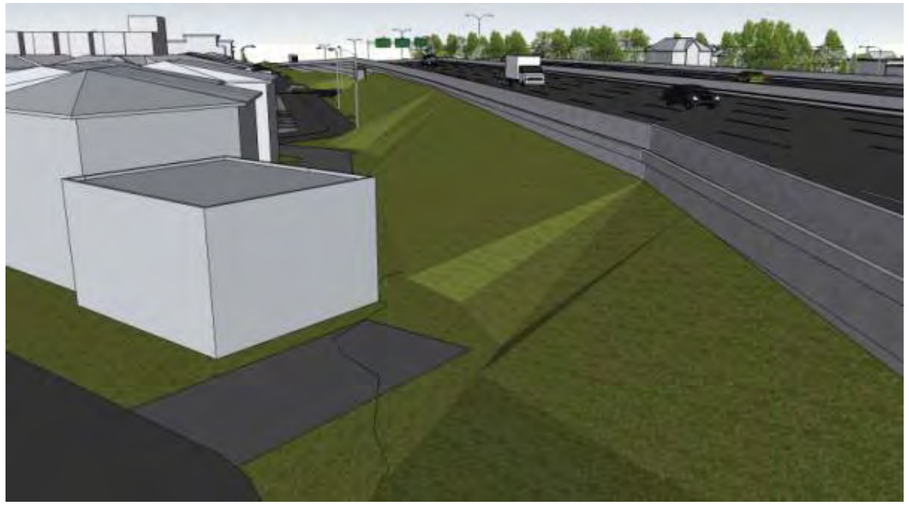
Looking West from Harvey St. and Main St. *Google Streetview, 2017*



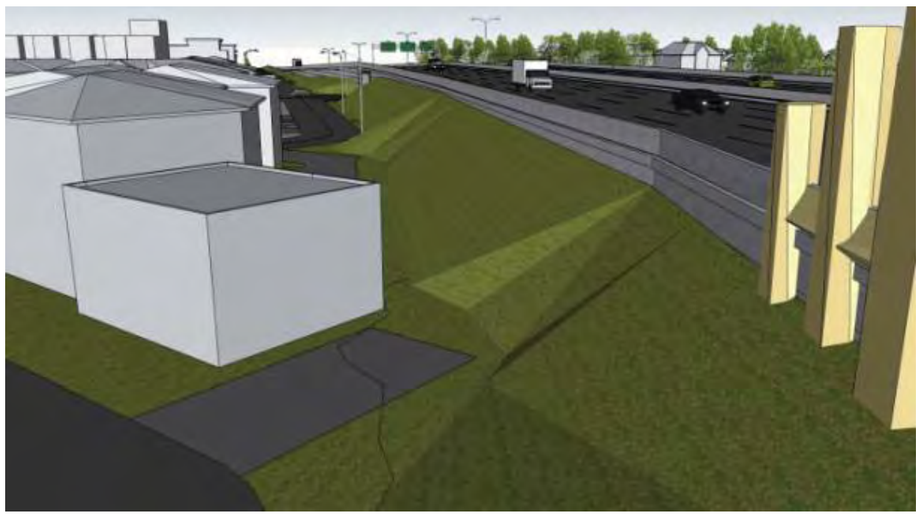
Looking East on Harvey St. *Google Streetview, 2017*



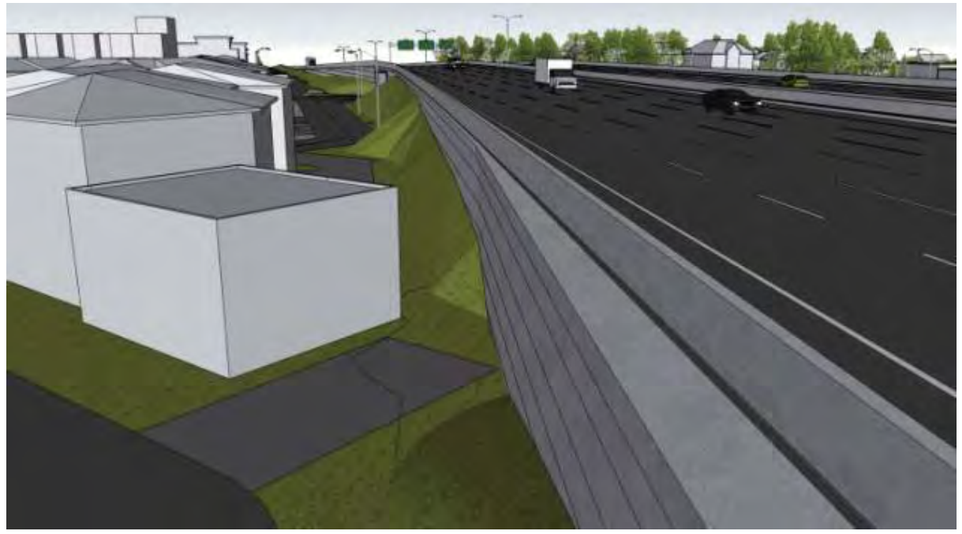
Harvey St., Looking West. *MTBA, 2017*



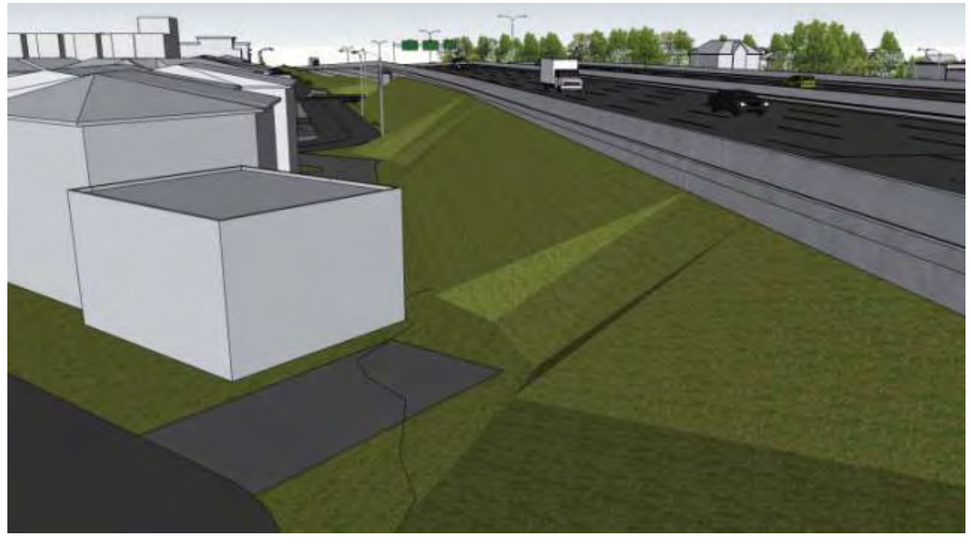
Moderate level of intrusion (Alternatives A, B & D), *MTBA 2018*



Moderate level of intrusion (Alternative D1)



High level of intrusion (Alternatives C & E)



Low level of intrusion, existing condition (Alternative F)

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	M	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	M	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	M	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	M	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	M	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	M	0.5
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	M	0.5
Alternative B-4 Jack and Slide Replacement Variable Depth	M	0.5
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	M	0.5
Alternative C-4 Jack and Slide Extrados	M	0.5
Alternative C-5 Sequential Jack and Slide Extrados	M	0.5
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	M	0.5
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	M	0.5
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	M	0.5
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	M	0.5
Alternative E-4 Jack and Slide Single Span	H	0
Alternative E-5 Sequential Jack and Slide Single Span	H	0
Alternative F Conventional Rehabilitation	L	1

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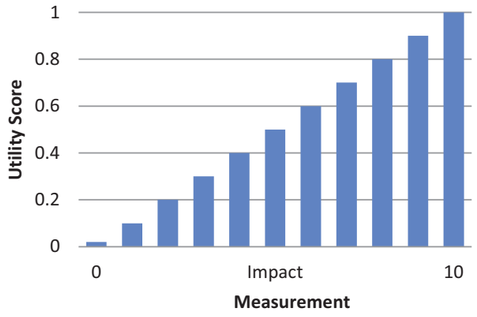
Social Environment

Openness of Canal



Definition: This sub-criterion is a combination of two sub criteria: View to the North and View to the South (described below).

Mitigation: None.

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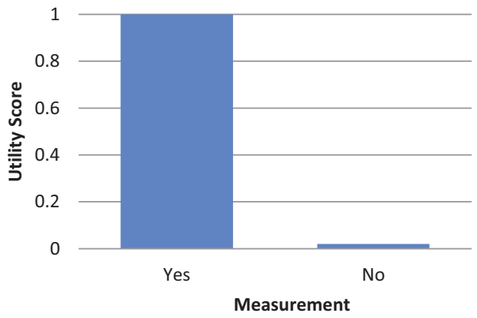
Social Environment
Openness of Canal

Sub-Criterion 1: Openness of Canal for Boating/Skating



Definition: This sub-factor is a sub-criterion of the Openness of Canal. This sub-criterion measures the lateral openness of the channel for boating and skating. Although a 25 m opening is a minimum standard, a wider opening will provide greater useable area for Canal users. The wider the channel useable area, the more preferred the alternative. This sub-factor measures the detrimental effect on the ice quality surrounding piers in the Canal where thermal effects of piers and the vibration of piers can thaw ice around a pier. An open channel (Yes) is a positive attribute.

Mitigation: None.

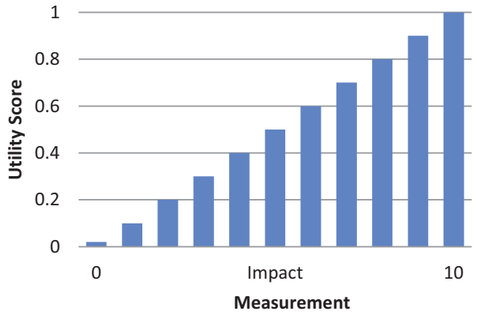
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	0
Alternative A-4 Jack and Slide Replacement Constant Depth	No	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	0
Alternative A-6 SPMT Transport Replacement Constant Depth	No	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	0
Alternative B-4 Jack and Slide Replacement Variable Depth	No	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	0
Alternative C-4 Jack and Slide Extrados	Yes	1

Alternative	Yes/No	Utility Score
Alternative C-5 Sequential Jack and Slide Extrados	Yes	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Yes	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Yes	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Yes	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Yes	1
Alternative E-4 Jack and Slide Single Span	Yes	1
Alternative E-5 Sequential Jack and Slide Single Span	Yes	1
Alternative F Conventional Rehabilitation	No	0

Social Environment
Openness of Canal

Sub-Criterion 2: Level of Comfort and Enjoyment of Space



Definition: This sub-factor is a sub-criterion of the Openness of Canal. This sub-criterion measures the level of comfort and enjoyment of the space under the bridge by tourists and locals. Higher scores are awarded to alternatives where the bridge creates a well-lit, safe, sheltered space with open views of the Canal and its surroundings. Lower scores are awarded to options that create a dark crowded space which detracts from the beauty of the Canal corridor.

Refer to 3D Model "Bridge Alternatives Comparison", views 1 and 2.

Discussion:

Alternative D scores the highest because it has the best feeling of openness, lightness, and airiness as one approaches going under the structure. Also the piers are out of the water and the arched structural elements lend an extra openness and frame the view of the Canal.

Alternative C rates the second highest because it has very few piers and they are spaced fairly far apart to provide open views of the Canal and its surroundings. (Score 9)

Although alternative E it has a long clear span, it is also wider and the lack of under-deck detailing gives it a more monolithic and heavier feel. (Score 8)

Alternative B feels more open than Option A because of the arch, however the size, quantity and location of piers still make it feel crowded and enclosed (Score 2)

Alternatives F and A rate the lowest because of the size and quantity and location of the piers which make the canal feel more enclosed and crowded. (Score 0)

Mitigation: Creating open area between piers and enjoyable space.

Alternatives:

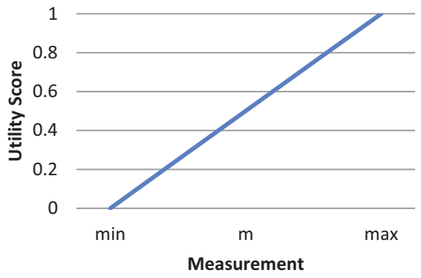
Alternative	Impact 0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	0	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	0	0
Alternative A-4 Jack and Slide Replacement Constant Depth	0	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	0	0

Alternative	Impact 0-10	Utility Score
Alternative A-6 SPMT Transport Replacement Constant Depth	0	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	2	0.2
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	2	0.2
Alternative B-4 Jack and Slide Replacement Variable Depth	2	0.2
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	2	0.2
Alternative C-4 Jack and Slide Extrados	8	0.8
Alternative C-5 Sequential Jack and Slide Extrados	8	0.8
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	10	1.0
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	10	1.0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	10	1.0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	10	1.0
Alternative E-4 Jack and Slide Single Span	8	0.8
Alternative E-5 Sequential Jack and Slide Single Span	8	0.8
Alternative F Conventional Rehabilitation	0	0

Context Sensitive Design

Urban Design/Context

Slenderness of Mid-Span Deck Depth



Definition: This sub-factor measures the attractiveness of the view with regard to how the bridge superstructure (above the piers) combines elegance with slenderness. It is desirable to create a slender profile that is subordinate to, compatible with and distinguishable from the heritage fabric so as not to detract or overwhelm the heritage setting of the Canal corridor. Slender superstructures are preferred by Parks Canada who have supported the objective of utilizing unobtrusive, open structures where possible.

The measurement reflects the mid-span-to-depth ratio. Higher ratios are preferred (longer span to smaller depth).

Mitigation: Architectural detailing to break up larger sections of the bridge façade. Sculpting the deck to create an attractive slender line.

Alternatives:

Alternative	Measurement	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	19:1	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	19:1	0
Alternative A-4 Jack and Slide Replacement Constant Depth	19:1	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	19:1	0
Alternative A-6 SPMT Transport Replacement Constant Depth	19:1	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	25:1	0.06
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	25:1	0.06
Alternative B-4 Jack and Slide Replacement Variable Depth	25:1	0.06
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	25:1	0.06
Alternative C-4 Jack and Slide Extrados	42:1	0.26

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Alternative	Measurement	Utility Score
Alternative C-5 Sequential Jack and Slide Extrados	42:1	0.26
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	38:1	0.22
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	38:1	0.22
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	38:1	0.22
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	38:1	0.22
Alternative E-4 Jack and Slide Single Span	105:1	1
Alternative E-5 Sequential Jack and Slide Single Span	105:1	1
Alternative F Conventional Rehabilitation	20:1	0.01

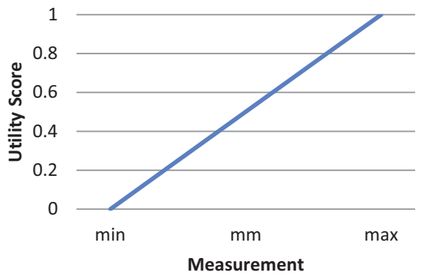
Alternative	Span (mm)	Deck Depth (mm)
Alternative A-2B	40850	2100
Alternative A-2C	40850	2100
Alternative A-4	40850	2100
Alternative A-5	40850	2100
Alternative A-6	40850	2100
Alternative B-2B	40850	1650
Alternative B-2C	40850	1650
Alternative B-4	40850	1650
Alternative B-5	40850	1650

Alternative	Span (mm)	Deck Depth (mm)
Alternative C-4	61000	1450
Alternative C-5	61000	1450
Alternative D-2B	61000	1600
Alternative D-2C	61000	1600
Alternative D-4	61000	1600
Alternative D-5	61000	1600
Alternative E-4	105000	1000
Alternative E-5	105000	1000
Alternative F	40850	2000

Context Sensitive Design

Urban Design/Context

Height above Parkways



Definition: This sub-factor measures the vertical distance between the soffit (underside of the bridge deck) and the asphalt surface of Colonel By Drive. This is used as the representative average for both NCC Parkways, including the Queen Elizabeth Driveway. Greater clearance is preferable and scores higher.

Mitigation: Architectural detailing to break up larger sections of the bridge façade. Sculpting the deck to create an attractive slender line.

Alternatives:

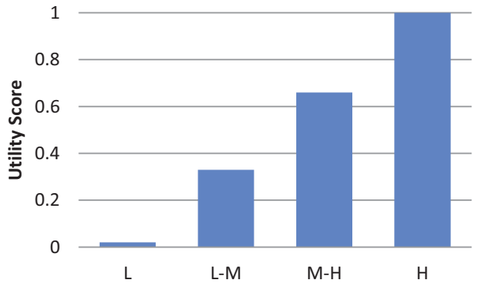
Alternative	mm	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	4623	0.09
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	4623	0.09
Alternative A-4 Jack and Slide Replacement Constant Depth	4623	0.09
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	4623	0.09
Alternative A-6 SPMT Transport Replacement Constant Depth	4623	0.09
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	4923	0.59
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	4923	0.59
Alternative B-4 Jack and Slide Replacement Variable Depth	4923	0.59
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	4923	0.59
Alternative C-4 Jack and Slide Extrados	5150	0.96
Alternative C-5 Sequential Jack and Slide Extrados	5150	0.96

Alternative	mm	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	4923	0.59
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	4923	0.59
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	4923	0.59
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	4923	0.59
Alternative E-4 Jack and Slide Single Span	5172	1
Alternative E-5 Sequential Jack and Slide Single Span	5172	1
Alternative F Conventional Rehabilitation	4572	0

Context Sensitive Design

Urban Design/Context

Capital Context



Definition: This sub-factor measures the ability of an alternative to provide or create an urban form that supports the National Capital context. The capital context for this site is that of the Canal and associated Parkways create a landmark for Canadians who visit the Capital. Those alternatives creating an attractive experience for visitors are desirable. This sub-factor focuses solely on the completed bridges and not the method of construction.

See Design Quality criterion for aesthetic attributes.

High scores are awarded to options that demonstrate enhancement of the notion of the Capital such as enhancement of views of identifiable Capital features (i.e. the Canal) and providing a visual gateway to the core of the nation's capital.

Low scores are awarded to options that do not identify with nor enhance the notion of the Capital.

Refer to 3D Model "Bridge Alternatives Comparison", views 1-4 and 7-9.

Discussion:

Alternatives C and E are rated as high because they create a gateway function.

Alternative D is rated medium-high because it removes the piers from the water and has a graceful appearance across the Canal.

Alternative A and B (low level bridges) is rated as low-medium because it does not remove the piers but is an improvement over the existing condition.

Alternative F is rated low because it maintains the piers and patchwork appearance of a rehab.

Mitigation: Mitigation can be made through design development for all alternatives considering facades, end treatments, piers, superstructure and bridge abutments. Creating new gateway elements where the bridge itself is not a gateway element.

Alternatives:

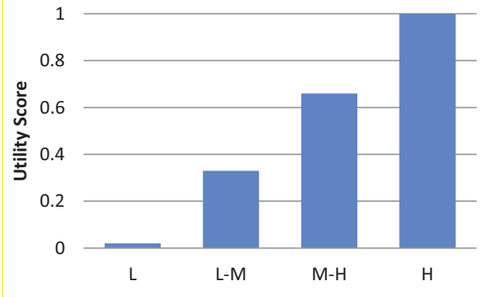
Alternative	High to Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	L-M	0.33
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	L-M	0.33
Alternative A-4 Jack and Slide Replacement Constant Depth	L-M	0.33

Alternative	High to Low	Utility Score
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	L-M	0.33
Alternative A-6 SPMT Transport Replacement Constant Depth	L-M	0.33
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	L-M	0.33
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	L-M	0.33
Alternative B-4 Jack and Slide Replacement Variable Depth	L-M	0.33
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	L-M	0.33
Alternative C-4 Jack and Slide Extrados	H	1
Alternative C-5 Sequential Jack and Slide Extrados	H	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	M-H	0.66
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	M-H	0.66
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	M-H	0.66
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	M-H	0.66
Alternative E-4 Jack and Slide Single Span	H	1
Alternative E-5 Sequential Jack and Slide Single Span	H	1
Alternative F Conventional Rehabilitation	L	0

Context Sensitive Design

Urban Design/Context

City Context



Definition: This sub-factor measures: the ability of an alternative to provide or create an urban form that supports the City's adjacent neighbourhoods and the regional assets for cycling, walking and skating trips to work or for leisure, at the parkway and Canal levels; and the impact of the bridge alternative on the built form, fabric and texture of the surrounding community including buildings along Hawthorne Avenue, Echo Drive, and Main Street. (Harvey Street is included in a different sub-factor).

Alternatives that are smaller in scale and fit within the local community/neighbourhoods rate well for this criterion.

Refer to 3D Model "Bridge Alternatives Comparison".

Discussion:

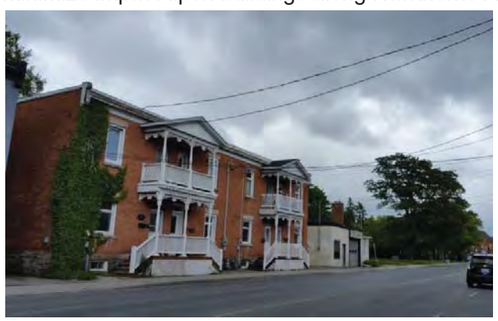
Alternatives B and D which are smaller in scale fit within the smaller grain local community/ neighbourhoods and the form fit well in the site are rated high.

Alternative C which is medium in scale and the form fits well in the site and is rated medium-high.

Alternative A and F are smaller in scale but do not fit within the smaller grain local community/ neighbourhoods and are rated low-medium.

Alternative E which is very large in scale and does not fit well within the site and is rated as low.

Mitigation: Lighting, landscaping and context sensitive treatments on the bridge façade, and opening up space adjacent to the abutments and piers can be considered. Selecting staging area alternatives that minimize impact upon buildings along Hawthorne Avenue, Echo Drive, and Main Street.



Residential buildings on Hawthorne Ave. *MTBA 2017.*



Main St. and Hawthorne Ave. *MTBA 2017.*



Main St and Harvey St, *MTBA 2017.*



Metcalfe St and Catherine St., *MTBA 2017.*

Alternatives:

Alternative	High to Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low-Medium	0.33
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low-Medium	0.33
Alternative A-4 Jack and Slide Replacement Constant Depth	Low-Medium	0.33
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low-Medium	0.33
Alternative A-6 SPMT Transport Replacement Constant Depth	Low-Medium	0.33
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	High	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	High	1
Alternative B-4 Jack and Slide Replacement Variable Depth	High	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	High	1
Alternative C-4 Jack and Slide Extrados	Medium-High	0.66
Alternative C-5 Sequential Jack and Slide Extrados	Medium-High	0.66
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	High	1

Alternative	High to Low	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	High	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative E-4 Jack and Slide Single Span	Low	0
Alternative E-5 Sequential Jack and Slide Single Span	Low	0
Alternative F Conventional Rehabilitation	Low-Medium	0.33

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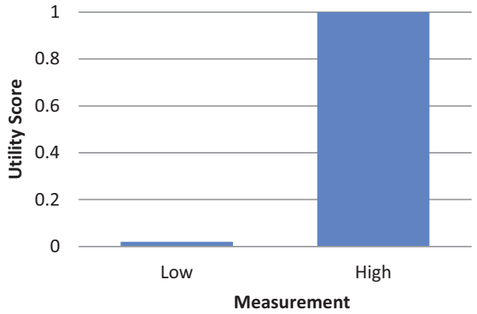
Context Sensitive Design

Travelling User Experience

Experience on Queensway



Definition: This sub-factor measures the ability of an alternative to create awareness of the crossing of the Rideau Canal at the Queensway level. Approximately 170,000 vehicles on the Queensway cross the Rideau Canal per day. The rehabilitation alternative would reflect a status quo or lack of crossing awareness and all new bridges provide an ability to create a recognizable crossing. The recognition could be made using high level superstructures and/or treatments at the abutments to create stature and canal crossing awareness, along the barrier/snow guard to create views or imprinted symbols, names or material type (aggregate, finish etc.).

Refer to 3D Model “Bridge Alternatives Comparison”, views 7 and 8.

Discussion:

Alternatives C and E are rated highly because they create an experience of crossing the Canal without the driver being distracted along their trip.

All other alternatives are rated low in comparison as they are equal in that the view is limited to the barrier wall and snow shield.

Mitigation: For the low level bridges, there is opportunity to create modest yet visible gateway elements at the sides and ends of the bridge. Refer to Alternative D1 in the attached “Bridge Alternatives Comparison.”

Alternatives:

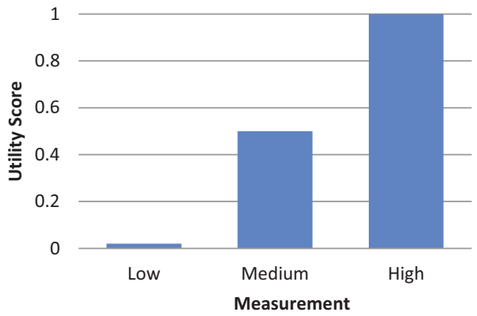
Alternative	H/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	0
Alternative A-4 Jack and Slide Replacement Constant Depth	Low	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low	0
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	0

Alternative	H/L	Utility Score
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	0
Alternative C-4 Jack and Slide Extrados	High	1
Alternative C-5 Sequential Jack and Slide Extrados	High	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	0
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	0
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	Low	0

Context Sensitive Design

Travelling User Experience

Experience on NCC Parkways



Definition: This sub-factor measures how the design of the completed new bridge could create an experience for the driving environment (architectural and landscape features, etc.) and experience of a vehicle driver and passenger on the Parkways. The new bridge should be displayed as a compatible and complimentary part of the visual character of the Canal/ Parkway experience. The continuous vehicular route paralleling the Canal should be respected as part of the historic beautification plan undertaken by the NCC's predecessor and continued management by the NCC today.

High scores are awarded to alternatives which enhance the driving environment of the Parkways while ensuring functional and heritage primacy and their character in the urban context.

Low scores awarded to alternatives which dominate the flow and primacy of the Parkways in the urban context.

The effects of the openness and daylighting of the bridge alternatives are counted under the Lighting and Visual Safety sub-factor.
Refer to 3D Model "Bridge Alternatives Comparison", views 2, 3 and 11.

Discussion:

Alternative E will enhance the experience along the parkways because it removes all lateral obstructions and Alternative C enhances the experience because it provides excellent views from the parkway.

Alternative A and B have been rated as medium as they do create the medium width of unobstructed views to the canal for drivers on the parkways.

Alternative D rates low because provides the narrowest opening for drivers on the parkways. Alternative F rates low because it maintains the existing experience and does not improve the experience (patchwork on substructure).

Mitigation: Opportunities exist to develop the design of any alternative selected from these concepts to the final design.

Alternatives:

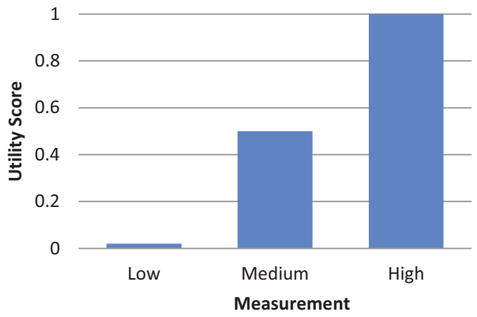
Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Medium	0.5

Alternative	H/M/L	Utility Score
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Medium	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	Medium	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Medium	0.5
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Medium	0.5
Alternative B-4 Jack and Slide Replacement Variable Depth	Medium	0.5
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Medium	0.5
Alternative C-4 Jack and Slide Extrados	High	1
Alternative C-5 Sequential Jack and Slide Extrados	High	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	0
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	0
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	Low	0

Context Sensitive Design

Travelling User Experience

Active Traveller Experience – Sidewalks and NCC Trails



Definition: This sub-factor measures how the design of the completed new bridge could create an experience for the pedestrian and cycling environment (architectural and landscape features, etc.) and user experience of the multi-use trails. The new bridge should support the compatible and complimentary character of the Canal and the NCC multi-use pathways. These continuous cycling/walking routes paralleling the Canal should be respected as part of the historic beautification undertaken by the NCC's predecessor and continued management by the NCC today.

High scores are awarded to alternatives which enhance the pedestrian/cycling environment of the NCC multi-use pathways and City sidewalks while ensuring functional and heritage primacy and their character in the urban context.

Low scores awarded to alternatives which dominate the flow and primacy of the Parkways in the urban context.

This sub-factor has taken into consideration:

a. Cycling environment
b. Pedestrian environment – NCC pathways
c. Pedestrian environment – City sidewalks

Refer to 3D Model "Bridge Alternatives Comparison", views 11, 12, 14, and 15.

Discussion:

Alternative E will enhance the experience along the paths and sidewalks (cyclists and pedestrians) because it removes all lateral obstructions and Alternative C enhances the experience because it provides excellent views from the paths and sidewalks (cyclists and pedestrians). Both Alternatives C and E perform high.

Alterative D rates medium because it obstructs the views of the canal from the sidewalk and parkway (cyclist) but provides an unobstructed view from the Multi-use Pathway (MUP).

Alternatives A, B and F are rated as the poorest performing because they maintain an obstructed view of the Canal from both the MUP and sidewalks.

Mitigation: Opportunities exist to develop the design of any alternative selected utilizing these concepts to the final design.

Alternatives:

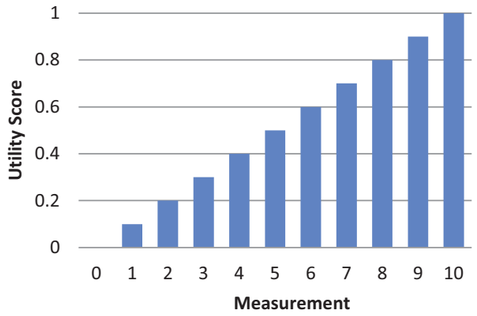
GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Analysis and Evaluation – February 21, 2019
Rideau Canal Structure Alternatives
Sub-factor Definitions

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	0
Alternative A-4 Jack and Slide Replacement Constant Depth	Low	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low	0
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	0
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	0
Alternative C-4 Jack and Slide Extrados	High	1
Alternative C-5 Sequential Jack and Slide Extrados	High	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Medium	0.5
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Medium	0.5
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	Low	0

Context Sensitive Design

Design Quality

Sense of Place



Definition:

This sub-factor measures the potential of the new bridge to contribute to "sense of place." A sense of place (sometimes called "genius loci") is a characteristic that makes a place special or unique and fosters a sense of authentic human attachment and belonging.

In the case of the new Queensway Bridge, sense of place can refer to the desirability of the area immediately around and under the bridge as a resting place or node of interest on the Canal. Qualities such as pleasant architectural character under the bridge, excellent lighting, and/or enhanced views of the Canal and its historic context can be used to create a preferred place to stop for a rest, shelter from the summer sun or winter storms.

The area by the Queensway Bridge currently has vague identity as a node on the Canal despite it being a large bridge near an access point for skaters.

Higher scores are awarded to designs which simultaneously:

- reflect the cultural presence of Ottawa and the cultural landscape of the Rideau Canal;
- create a unique and compelling space under and immediately around the bridge; and
- provide a sense of character and community.

Lower scores are awarded to designs that have no special relationship to its context and that feel like they could be "anywhere."

Refer to 3D Model "Bridge Alternatives Comparison", views 1, 12, 14, and 15.

Discussion:

Alternative C is rated as the best performing alternative because it creates a unique (only bridge of this type in the City) and compelling place (visual interest without overpowering the space) (score 10).

Alternative D is the second best performing alternative because the underside of the bridge could create a sense of place (score 8).

Alternative E is the third best because even though it is somewhat overwhelming in its surroundings, the bridge provides a sense of character (score 6).

Alternative B scores higher than Alternative A because it provides improved interest from below but the side spans are not in good proportion to the main span (score 3)

Alternative A rates second poorest because it maintains the existing conditions but as a new structure but is a generic and creates an ordinary place (score 1).

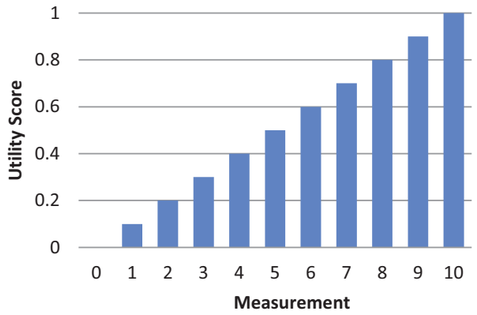
Alternative F rates poorest because it maintains the existing conditions and does not provide a sense of place (score 0).

Mitigation: Opportunities exist to develop the design of any new alternatives selected from these concepts to the final design. Provision of benches.

Alternatives:

Alternative	Impact 0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No 417 Widening	1	0.1
Alternative A-2C Conventional Replacement Constant Depth, 417 Widening	1	0.1
Alternative A-4 Jack and Slide Replacement Constant Depth	1	0.1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	1	0.1
Alternative A-6 SPMT Transport Replacement Constant Depth	1	0.1
Alternative B-2B Conventional Replacement Variable Depth, No 417 Widening	3	0.3
Alternative B-2C Conventional Replacement Variable Depth, 417 Widening	3	0.3
Alternative B-4 Jack and Slide Replacement Variable Depth	3	0.3
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	3	0.3
Alternative C-4 Jack and Slide Extrados	10	1
Alternative C-5 Sequential Jack and Slide Extrados	10	1
Alternative D-2B Conventional Replacement Variable Depth, No 417 Widening, New Pier Location	8	0.8
Alternative D-2C Conventional Replacement Variable Depth, 417 Widening, New Pier Location	8	0.8
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	8	0.8
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	8	0.8
Alternative E-4 Jack and Slide Single Span	6	0.6
Alternative E-5 Sequential Jack and Slide Single Span	6	0.6
Alternative F Conventional Rehabilitation	0	0

Context Sensitive Design
Design Quality
Night Quality and Lighting



Definition: This sub-factor measures the impact of the Rideau Canal bridge on the night-time experience and lighting character of the Canal corridor. It considers how the bridge is lit in viewing from afar and from the surrounding setting. It relates to the precepts of the NCC "Capital Illumination Plan."

Higher scores are awarded to options that use lighting to enhance the environment and promote landmark interest and artistic expression.

Lower scores are awarded to options that do not enhance the nighttime environment or promote landmark interest and do not contribute to artistic expression.

Safety and security aspects of light are addressed in a separate sub-factor.

Discussion:

Alternative C rates best as it provides a large background for illumination and variation among elements (score 10).

Alternative E, although providing a large background for illumination it does not provide as great a variation of the elements, especially from below the bridge (score 9).

Alternative D reflects an intermediate opportunity to create artistic expression (score 5).

Alternative B rates relatively low because there are limited lighting opportunities when the piers are in the water although the variable depth deck provides slightly more interest than alternative A and F (score 3).

Alternative A rates second lowest because there are limited lighting opportunities when the piers are in the water and the constant depth deck provides limited interest. (score 1).

Alternative F would rate lowest as it would not be considered for lighting for artistic expression (score 0).

Mitigation: Opportunities exist to develop the design of any alternative selected from these concepts to the final design.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	1	0.1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	1	0.1
Alternative A-4 Jack and Slide Replacement Constant Depth	1	0.1

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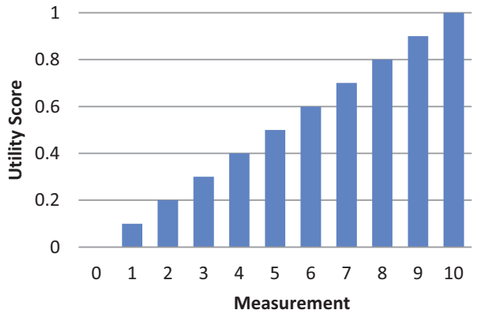
Sub-factor Definitions

Alternative	H/M/L	Utility Score
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	1	0.1
Alternative A-6 SPMT Transport Replacement Constant Depth	1	0.1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	3	0.3
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	3	0.3
Alternative B-4 Jack and Slide Replacement Variable Depth	3	0.3
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	3	0.3
Alternative C-4 Jack and Slide Extrados	10	1
Alternative C-5 Sequential Jack and Slide Extrados	10	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	5	0.5
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	5	0.5
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	5	0.5
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	5	0.5
Alternative E-4 Jack and Slide Single Span	9	0.9
Alternative E-5 Sequential Jack and Slide Single Span	9	0.9
Alternative F Conventional Rehabilitation	0	0

Context Sensitive Design

Design Quality

Design Principles, Architectural Concept and Visual Quality



Definition: This sub-factor measures the effective use of design principles to achieve clarity of expression and consistency of the architectural concept. An innovative and coherent concept gives sophistication, meaning and identity to the bridge. The architectural concept should be derived from/applied to all aspects of the design that impact visual quality, including:

- Form and its response to Function
- Proportion and Scale
- Pattern and Rhythm
- Coherence and Balance
- Contrast and Unity in Variety
- Integration of Elements (such as lighting, assembly details, safety & noise barriers, etc.)

Scores are based on how well the Design Principles are used to achieve a clear, consistent concept of high visual quality and interest.

Materiality, Texture and Surface quality are measured under the Materiality sub-factor.

Refer to 3D Model “Bridge Alternatives Comparison”, views 1-5, 9, 11-15.

Discussion:

Alternative C rates highest because it is graceful, not overwhelming, visually interesting and meets the criteria above the best (score 10).

Alternative D rates second highest because it provides an opening to the canal, frames the canal, has a shape and balance in crossing the canal (score 7).

Alternative B is a more graceful span than Alternative A but still performs poorly for criteria listed above (score 3).

Alternative E is too visually overpowering for the setting and therefore receives a low score despite achieving some of the above criteria (score 2)

Alternative A is a generic design, is not a graceful span and performs poorly for criteria listed above (score 1).

Alternative F is visually clumsy and does not perform well under any criteria listed above (score 0).

Mitigation: Opportunities exist to develop the design of any new option selected from these concepts to the final design.

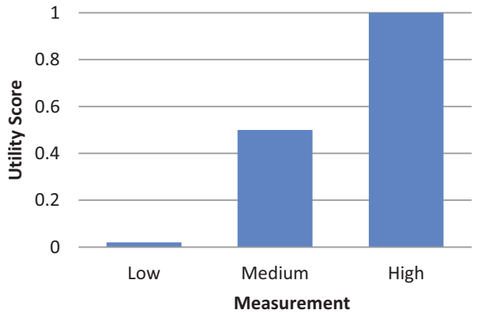
Alternatives:

Alternative	0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	1	0.1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	1	0.1
Alternative A-4 Jack and Slide Replacement Constant Depth	1	0.1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	1	0.1
Alternative A-6 SPMT Transport Replacement Constant Depth	1	0.1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	3	0.3
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	3	0.3
Alternative B-4 Jack and Slide Replacement Variable Depth	3	0.3
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	3	0.3
Alternative C-4 Jack and Slide Extrados	10	1
Alternative C-5 Sequential Jack and Slide Extrados	10	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	7	0.7
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	7	0.7
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	7	0.7
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	7	0.7
Alternative E-4 Jack and Slide Single Span	2	0.2
Alternative E-5 Sequential Jack and Slide Single Span	2	0.2
Alternative F Conventional Rehabilitation	0	0

Context Sensitive Design

Design Quality

Materiality



Definition: This sub-factor measures the appropriateness of materials being used on the structure. Special attention should be paid to the appearance and "touch" of materials in the areas close to where the pedestrians and trail users travel. For example, the thoughtfully designed concrete finishes of the Canadian War Museum are good examples of how materiality can generate interest and enhance a place. Another strategy is to add at key locations a material response to the context that integrates with the structure but is not a structural element or designed to incorporate integrated art installations.

High scores are awarded to alternatives which use materials that are both appropriate to the structure and generate interest and comfort to travellers and viewers below.

Discussion:

Material types are expected to be concrete bridges or a painted steel. The soffits of the bridge are expected to be: Alternative A (steel, most likely), Alternative B (steel), Alternative C (concrete), Alternative D (steel), Alternative E (steel), and Alternative F (concrete).

Alternatives C and D score high because of their material design sensitivity and "fit" with the context.

Alternative E scores medium-high because the entire structure is a single material that allows its otherwise visually overpowering presence to somewhat lighten.

Alternatives A and B have piers in the water and therefore score medium-low due to the material response required for durability.

Alternative F scores the lowest because of its patchy appearance as a result of the rehabilitation treatments required to maintain it.

Mitigation: Opportunities exist to develop the design of any new option selected from these concepts to the final design.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Medium-low	0.33
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Medium-low	0.33
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium-low	0.33

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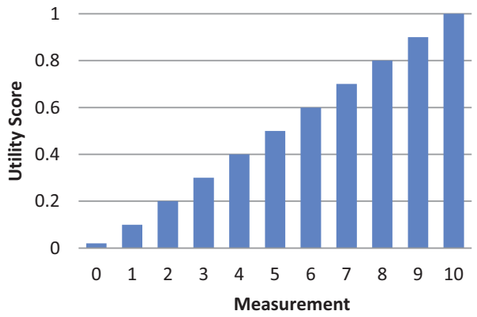
Analysis and Evaluation – February 21, 2019
Rideau Canal Structure Alternatives
Sub-factor Definitions

Alternative	H/M/L	Utility Score
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium-low	0.33
Alternative A-6 SPMT Transport Replacement Constant Depth	Medium-low	0.33
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Medium-low	0.33
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Medium-low	0.33
Alternative B-4 Jack and Slide Replacement Variable Depth	Medium-low	0.33
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Medium-low	0.33
Alternative C-4 Jack and Slide Extrados	High	1.0
Alternative C-5 Sequential Jack and Slide Extrados	High	1.0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	High	1.0
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	High	1.0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	High	1.0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	High	1.0
Alternative E-4 Jack and Slide Single Span	Medium-high	0.66
Alternative E-5 Sequential Jack and Slide Single Span	Medium-high	0.66
Alternative F Conventional Rehabilitation	Low	0

Context Sensitive Design
Design Quality
Structural Elegance and Proportion to Site



Definition: This sub-factor measures the elegance of the structure and the size of the structural components in relationship to the feature being crossed, in this case the Canal. This refers to the proportioning and detailing of the bridge structure and the quality of being structurally graceful in appearance and/or being pleasingly elegant and simple.

The proportions of the span to the height of the piers is one factor, the apparent depth of the overall structure to the span is another. Structures with too many piers would score poorly, but also structures with too few. A heavier or more prominent structural system would score poorly as well.

Structural elegance is not a strictly aesthetic criterion. It is more a measure of the perceived efficiency of the design. Unnecessary bulk or grandiose spans which are not needed detract from elegance. Visual expression of the force flow, such as haunched girders and individual piers for each box girder are often viewed positively in this regard.
Refer to 3D Model "Bridge Alternatives Comparison", views 1-5, 9, 11-15.

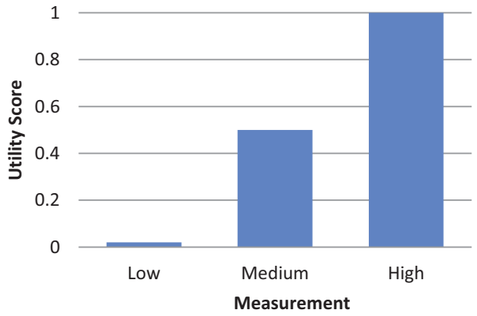
Discussion:
Alternative C has an appearance of responding to its site, is balanced, keeps the space clean, provides a shallow edge resulting in good clearance over roadways, and provides an elegance to the site. (Score 10)
Alternative D also performs well because of the nicely proportioned piers and centre spans and the elegant variable depth deck which frames the site. (Score 7)
Alternative E receives an intermediate score because although it is interesting, it has an unnecessary grandiose span and height which does not fit well with the proportions of the site. (Score 5)
Alternative B performs second poorest due to the deep pier caps although the variable depth frame responds better to the site than Alternatives A and F. (Score 4)
Alternatives A and F perform poorest due to the deep pier caps, lack of responding to its site (piers within the water) and is bulky (score 0).
Mitigation: Opportunities exist to develop the design of any new option selected from these concepts to the final design.

Alternatives:

Alternative	0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	0	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	0	0

Alternative	0-10	Utility Score
Alternative A-4 Jack and Slide Replacement Constant Depth	0	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	0	0
Alternative A-6 SPMT Transport Replacement Constant Depth	0	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	4	0.4
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	4	0.4
Alternative B-4 Jack and Slide Replacement Variable Depth	4	0.4
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	4	0.4
Alternative C-4 Jack and Slide Extrados	10	1
Alternative C-5 Sequential Jack and Slide Extrados	10	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	7	0.7
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	7	0.7
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	7	0.7
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	7	0.7
Alternative E-4 Jack and Slide Single Span	5	0.5
Alternative E-5 Sequential Jack and Slide Single Span	5	0.5
Alternative F Conventional Rehabilitation	0	0

Context Sensitive Design
Design Quality
Sculptural Interest



Definition: This sub-factor measures the visual interest of the components of the bridge. The sculptural interest may enhance or detract from the elegance of the structure. Shaping of the piers and detailing of the parapets are the two most common approaches. Features at the abutments are also used in some circumstances. At this concept stage of the design process, detailing the finer aspects of the design is minimal. Therefore, structures which offer appropriate opportunities for enhancement should score well.

The bridge as a whole, and/or individual components of it, can be viewed as a sculpture. The sculptural aspect should be viewed as one would a standalone sculpture. The balance between the overall bridge and the sculptural additions to components as well as the individual forms is important.

Refer to 3D Model “Bridge Alternatives Comparison”, views 1-5, 9, 11-15.

Discussion: Alternative C scores the highest because of the sculptural form of the extrados and cables, and further opportunities to sculpt the piers, yet still harmonizes within the composition of the setting. (Score 10)

Alternative D is a simple graceful form which could be emphasized depending on materiality (Score 8)

Alternative E scores lower than D. Its form is visually variable, depending on the viewpoint. For example, view 11 shows it as an interesting light and graceful form; whereas view 13 shows it as a visually overpowering sculpture unsuited to its setting. (Score 6)

Alternative B is a slight improvement over alternative A because of the sculpted variable depth deck (score 3)

Alternative A scores the second lowest because of its simple ordinary form and limited opportunities for improvement (score 1)

Alternative F scores the lowest because there is no opportunity to add a sculptural component when rehabilitating (Score 0)

Mitigation: Opportunities exist to develop the design of any new option selected from these concepts to the final design.

Alternatives:

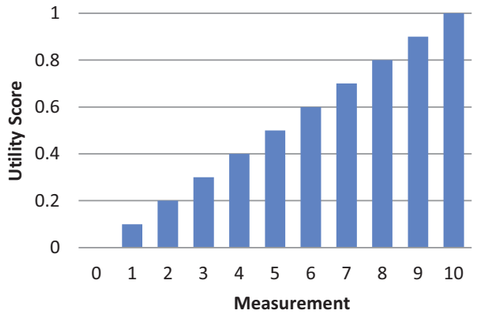
Alternative	Measurement	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No 417 Widening	1	0.1
Alternative A-2C Conventional Replacement Constant Depth, 417 Widening	1	0.1
Alternative A-4 Jack and Slide Replacement Constant Depth	1	0.1

Alternative	Measurement	Utility Score
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	1	0.1
Alternative A-6 SPMT Transport Replacement Constant Depth	1	0.1
Alternative B-2B Conventional Replacement Variable Depth, No 417 Widening	3	0.3
Alternative B-2C Conventional Replacement Variable Depth, 417 Widening	3	0.3
Alternative B-4 Jack and Slide Replacement Variable Depth	3	0.3
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	3	0.3
Alternative C-4 Jack and Slide Extrados	10	1
Alternative C-5 Sequential Jack and Slide Extrados	10	1
Alternative D-2B Conventional Replacement Variable Depth, No 417 Widening, New Pier Location	8	0.8
Alternative D-2C Conventional Replacement Variable Depth, 417 Widening, New Pier Location	8	0.8
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	8	0.8
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	8	0.8
Alternative E-4 Jack and Slide Single Span	6	0.6
Alternative E-5 Sequential Jack and Slide Single Span	6	0.6
Alternative F Conventional Rehabilitation	0	0

Heritage Resources

Built Heritage

Pretoria Bridge



Definition: This sub-factor measures the impact to the character-defining features of the Pretoria Bridge. This includes its overall form, massing, materials and placement, as well as its relationship to the Rideau Canal, adjacent parkland, parkways, and multi-use trails.

As the Pretoria Bridge is not designated as a heritage structure under the Ontario Heritage Act, its heritage values are not legislated. Character-defining features have been established only in a preliminary way through the following photographs and the attached "preliminary evaluation".

The Pretoria Bridge currently seems to disappear in the shadows of the Queensway Bridge when viewed from the south, giving the appearance of one bridge instead of two.

Higher scores are awarded to alternatives which better differentiate the two bridges and enhance the character of the Pretoria Bridge. Lower scores are awarded to alternatives which obscure or diminish its character.

Refer to 3D Model "Bridge Alternatives Comparison", views 4 and 2.

Discussion:

Alternative C scores the best because of its distinct differentiation (light in appearance, slender deck) from the Pretoria Bridge, while maintaining a compatible scale. (Score 10)

Alternative D scores second best because the variable depth and greater span is more distinct than the other low level bridges, and because it has low visual impact. (Score 8)

Although Alternative E is very distinct, it also overwhelms and dominates the Pretoria Bridge. (Score 5)

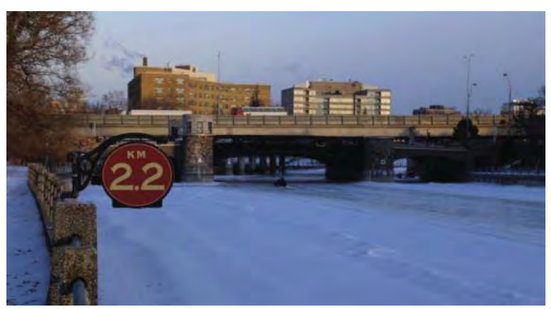
Alternative B is a slight improvement on Alternative A, because of the variable height deck. (Score 2)

Alternatives A and F receive the lowest score because the constant deck depth combined with a lack of superstructure obscures and diminishes the character of the Pretoria Bridge. (Score 0)

Mitigation: Many opportunities exist to develop the design of any alternative selected from these concepts to the final design.



North Side of Pretoria Bridge, winter 2018. Photo:



South Side of the Pretoria Bridge, winter 2018. Pretoria

MTBA



View looking west from north lookout, winter 2018, Photo: MTBA

Bridge appears "overwhelmed" by Queensway Bridge. Photo: MTBA



View looking northeast from sidewalk at centre-span, winter 2018. Photo: MTBA



View looking north from Rideau Canal East Trail showing the visual confusion of the Pretoria and Queensway Bridges, winter 2018, Photo: MTBA

Alternatives:

Alternative	0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	0	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	0	0
Alternative A-4 Jack and Slide Replacement Constant Depth	0	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	0	0
Alternative A-6 SPMT Transport Replacement Constant Depth	0	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	2	0.2
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	2	0.2
Alternative B-4 Jack and Slide Replacement Variable Depth	2	0.2
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	2	0.2
Alternative C-4 Jack and Slide Extrados	10	1.0
Alternative C-5 Sequential Jack and Slide Extrados	10	1.0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	8	0.8
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	8	0.8
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	8	0.8
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	8	0.8
Alternative E-4 Jack and Slide Single Span	5	0.5
Alternative E-5 Sequential Jack and Slide Single Span	5	0.5
Alternative F Conventional Rehabilitation	0	0

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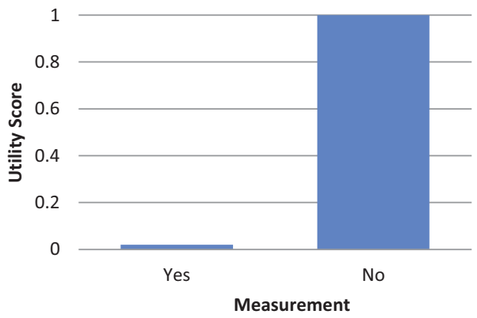
Heritage Resources
Built Heritage
Former Gas Station



Definition: This sub-factor measures the impact to the former 1930s gas station on 60 Main Street at the northwest corner of Hawthorne Avenue.

As the Former Gas Station is not designated as a heritage structure under the Ontario Heritage Act, its heritage values are not legislated. Character-defining features have been established only in a preliminary way through the following photographs and attached preliminary evaluation. The much evolved and adapted building remains a neighbourhood landmark.

Alternatives which require the removal of the Former Gas Station (yes) for staging areas receive a low utility score.

Discussion:

Mitigation: Removing the building temporarily from the site for staging work during construction, and returning it with landscape reinstatement is seen as a viable alternative to demolition.



Gordon Construction (Former Gas Station) *BTE, 2017*

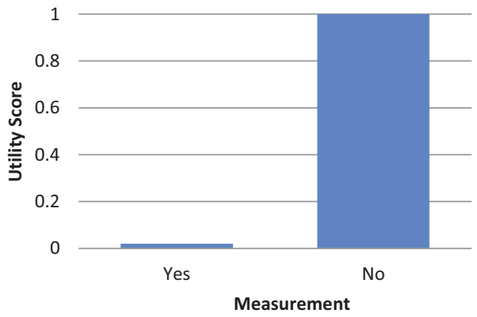
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1

Alternative	Yes/No	Utility Score
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Yes	0
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Yes	0
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	Yes	0
Alternative C-5 Sequential Jack and Slide Extrados	Yes	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Yes	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	Yes	0
Alternative E-5 Sequential Jack and Slide Single Span	Yes	0
Alternative F Conventional Rehabilitation	No	1

Heritage Resources
Built Heritage

Royal Oak Pub



Definition: This sub-factor measures the impact to 221 Echo Drive (the Royal Oak Pub) building on the northeast corner of Hawthorne Avenue and Colonel By Drive. Although it is not recognized as heritage under the Ontario Heritage Act or Municipal List, part of the property falls within the 30 m buffer zone of the Rideau Canal's World Heritage Site Designation. It has significant contextual value as a neighbourhood and canal landmark and some architectural/design value.

The World Heritage Committee is in support of strengthening visual protection beyond the buffer zone; it is therefore recommended that alternatives pay attention to specific sightlines and broader viewsheds pertinent to this sector of the canal. Furthermore, Parks Canada favours attempts to increase (or maintain) the direct experience, enjoyment and appreciation of the Canal.

High scores are awarded to alternatives which retain the building.

Mitigation: Removing the building temporarily from the site for staging work during construction, and returning it with landscape reinstatement is seen as a viable option or alternative to property purchase and demolition.



Royal Oak Pub at corner of CBD and Hawthorne. *MTBA 2018.*



North side of Royal Oak Pub. *MTBA 2018.*

Alternatives:

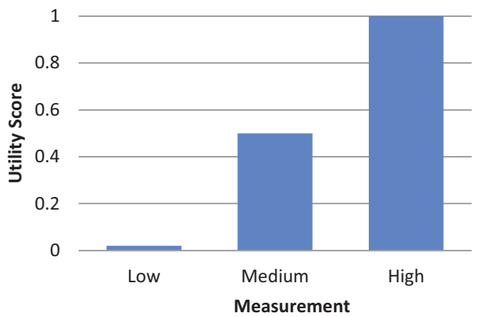
Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1

Alternative	Yes/No	Utility Score
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Yes	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Yes	0
Alternative C-4 Jack and Slide Extrados	Yes	0
Alternative C-5 Sequential Jack and Slide Extrados	Yes	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Yes	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Yes	0
Alternative E-4 Jack and Slide Single Span	Yes	0
Alternative E-5 Sequential Jack and Slide Single Span	Yes	0
Alternative F Conventional Rehabilitation	No	1

Heritage Resources

Cultural Heritage Landscapes

Rideau Canal WHS/NHSC, Standards and Guidelines



Definition: This sub-factor evaluates compliance with the federal Standards and Guidelines for the Conservation of Historic Places in Canada and current best practices for heritage conservation. The Rideau Canal and its cultural landscape context have been designated as both a National Historic Site and a World Heritage Site. The current approved management plan for this heritage resource requires consideration of appropriate design when planning alterations or additions within the designated historic place or its 30 m. wide buffer area along each side of the waterway. The Standards and Guidelines for the Conservation of Historic Places in Canada (Second Edition) provides the approach to be taken in evaluating new designs. Standard 11 states "Conserve the heritage value and character-defining elements when creating any new additions to an historic place or any related new construction Make the new work physically and visually compatible with, subordinate to and distinguishable from the historic place." The character defining elements of the Canal are its historic and ongoing use, the continuous link between the core and the outlying regions, and the designed landscape setting along its alignment within the Capital. The cultural landscape context of the Rideau Canal Bridge consists of a deliberate composition of a variety of elements including the water course, the canal walls, the maintained parkland and circulation routes along its banks. The overall context invites a variety of recreational activities year-round. Inserting a new bridge in this sensitive heritage landscape requires that the bridge become part of the overall composition, not dominating the many sequential views of the Canal. The new bridge should reflect the scale of the existing landscape. (**subordinate**). The new design must be of materials and form so as to not detract from the existing harmonious visual character of the cultural landscape setting (**complementary**). And the new design must be a product of our time, not a recreation of the past. This will ensure that in the future, the community will understand that each era has valued the Canal and its bridge crossings and has added new features in such a way that the universal heritage value of this World Heritage Site and National Historic Site are respected and not impaired. (**distinguishable**).
Alternatives that show significant of the heritage values of the cultural landscape setting in their design are preferred. Alternatives that overwhelm the setting in their design or scale are the least preferred.
Refer to 3D Model “Bridge Alternatives Comparison”, views 1-4, 9 and 11-15.

Discussion:

Alternative A has new piers in the canal similar to the existing bridge, has a constant depth of the deck and involves a small widening of Highway 417. This sub-factor measures the visual cohesion of the bridge alternatives in their WHS/NHSC setting. Therefore, the increase in the width of the bridge is not evaluated in this sub-factor because it not visible from the viewpoints identified in the cultural heritage landscape sub-factors.
Looking at these alternatives in their scale, form and massing, the changes are generally compatible with the existing landscape context with the placement of the piers in the canal in a similar location as the existing piers. The depth of the deck is wider than the existing bridge and will be a change but it still allows for a wide view below the bridge. Alternative A-2C will also have a widening of the Highway 417 but this will not significantly increase the visual impact of this alternative on the cultural heritage landscape setting.
This alternative has a medium impact (utility 0.5).

Alternative B is similar to Alternative A in that the new piers are located in the water in a similar location as the existing piers. The primary change in the design is in the variable depth of the deck resulting in a gentle curve in the bottom profile of the deck. The result of this change in depth is a greater view beneath the bridge. Alternative B-2C involves a widening of Highway 417 but like A-2C, the widening does not have a major impact on the visual composition of the bridge and its setting.
This alternative has a low impact (utility 1).
Alternative C involves six highly visible extrados structures that rise above the bridge deck. The extrados design alternative consists of 6 towers with cables connecting to the bridge deck. This design complies with part of the Standard and Guidelines for the Conservation of Historic Places in Canada in that this bridge design is entirely distinguishable from the historic context. It does not comply with the guidance that the new design be subordinate to or compatible with the heritage fabric. The location of the support towers and cables on either end of the bridge lessens the visual impact of the bridge design immediately over the canal. However, the above deck components of this design disrupt the views from all viewpoints.
This alternative places the piers outside of the canal and puts them closer to the pedestrian routes along each bank. This has the benefit of enhancing the open view beneath the bridge. However, the dominance of the towers and cables above the bridge deck draw attention away from the view of the canal and its surrounding lands.
Alternative C has a high impact (because of the highly visible and dominant superstructure of 6 towers and cables) (utility 0).
Alternative D involves new pier placement outside the canal and variable depths in the form of a gentle curve on the underside profile of the deck. The form, scale and massing of these alternatives is similar to Alternative B with an increase in the greater view below the bridge with the new placement of the piers. The addition of modest sized gateway markers at either end of the bridge does not overwhelm the view of the bridge and is an appropriate new design element that is compatible, subordinate and distinguishable from the heritage setting and therefore is low impact (utility 1).
Alternative E involves a massive superstructure that although it is distinguishable from the heritage context, it does not comply with the guidance that new design be compatible with or subordinate to the designated cultural heritage setting. The height of the superstructure is highly visible from a distance and dominates the view of the canal and its surroundings.
The bridge design has no piers and as a result there is a widened view below the bridge and the pedestrian routes are not impacted by piers in close proximity. These benefits of the design do not mitigate the dramatic impact of this superstructure design on the heritage context. It is highly visible in all views of the bridge taking away the focus and interest in the canal and its abutting parkways and parkland.
Alternative E has High impact (because of the scale, height and form of the dominate superstructure) (utility 0).
Alternative F is a refurbishment or rehabilitation of the existing bridge. The current form of the bridge was in place when the WHS/NHSC designations were put in place and as a result it is compatible with the heritage values of the heritage setting. Rehabilitation will retain the existing form and scale of the bridge and thus will create little change in the visual composition of the cultural heritage landscape setting.
Alternative F has Low impact (utility 1)

Mitigation: None.



Rideau Canal cultural landscape. *Wendy Shearer, 2017*

Alternatives:

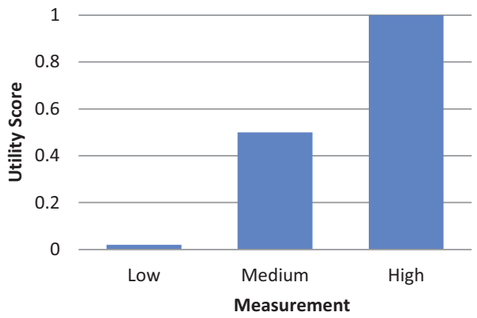
Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	M	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	M	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	M	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	M	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	M	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	L	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	L	1
Alternative B-4 Jack and Slide Replacement Variable Depth	L	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	L	1
Alternative C-4 Jack and Slide Extrados	H	0

Alternative	H/M/L	Utility Score
Alternative C-5 Sequential Jack and Slide Extrados	H	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	L	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	L	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	L	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	L	1
Alternative E-4 Jack and Slide Single Span	H	0
Alternative E-5 Sequential Jack and Slide Single Span	H	0
Alternative F Conventional Rehabilitation	L	1

Heritage Resources

Cultural Heritage Landscapes - Vegetation

Designed Parkland, Ballantyne Park



Definition: The design of the park for passive recreation added deliberate planting of specimen trees as well as retention of some former backyard trees in an expanse of open lawn. This was part of community improvements resulting from Queensway construction that required the removal of several residences. Higher scores are awarded to alternatives that enhance the existing heritage resource through restoration of features, lower scores are awarded to alternatives that remove or negatively alter the existing heritage resource.

Discussion:
Those alternatives that have the greatest avoidance of work within the park are preferred. Bridge Alternative F would have the smallest footprint (score high).
Bridge alternatives A, B and D would have use of the park and are considered medium impacts (score medium).
Bridge Alternatives C and E and traffic staging alternative 2C require replacement of the Main Street structure and the park would be used as a staging area (score low).
Mitigation: Requires restoration of tree collection and open lawn parkland.



Ballantyne Park. *Wendy Shearer, 2017*

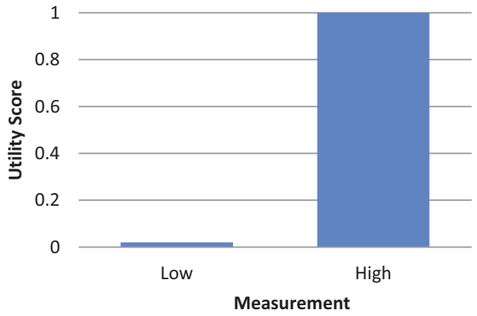
Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Medium	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	0
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	Medium	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Medium	0.5
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	0
Alternative B-4 Jack and Slide Replacement Variable Depth	Medium	0.5
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Medium	0.5
Alternative C-4 Jack and Slide Extrados	Low	0
Alternative C-5 Sequential Jack and Slide Extrados	Low	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Medium	0.5
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative E-4 Jack and Slide Single Span	Low	0
Alternative E-5 Sequential Jack and Slide Single Span	Low	0
Alternative F Conventional Rehabilitation	High	1

Heritage Resources

Cultural Heritage Landscapes - Vegetation

NCC Parkland and Plantings



Definition: The "City Beautiful" movement that inspired the design of the Canal lands added ornamental vegetation and a diverse tree collection along the canal corridor.

Discussion: The jack and slide staging alternatives have a footprint over the NCC parkland and have a temporary construction impact and are rated as low.

All other alternatives have no effect on these trees and vegetation and are rated as high.

Mitigation: Requires avoidance and vegetation protection measures and restoration replanting as mitigation.



NCC plantings. *Wendy Shearer, 2017*

Alternatives:

Alternative	High/Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	High	1

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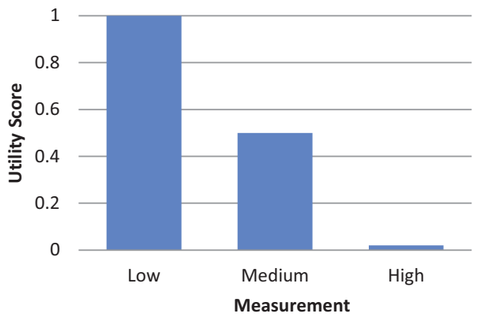
Alternative	High/Low	Utility Score
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	High	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Low	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low	0
Alternative A-6 SPMT Transport Replacement Constant Depth	High	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	High	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	High	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	0
Alternative C-4 Jack and Slide Extrados	High	1
Alternative C-5 Sequential Jack and Slide Extrados	High	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	High	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	High	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	0
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	High	1

Heritage Resources

Cultural Heritage Landscapes – Visual Relationships



Definition: This sub-criterion is a combination of two sub criteria: View to the North and View to the South (described below).

Mitigation: N/A.

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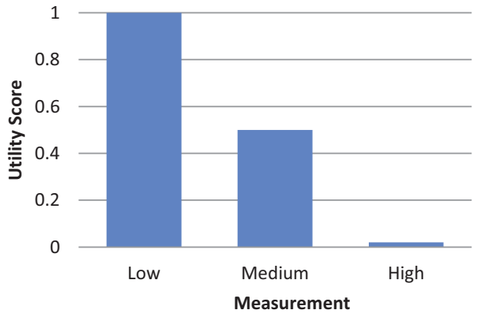
Heritage Resources

Cultural Heritage Landscapes – Visual Relationships

Sub-Criterion 1 - View to the North from Pretoria Bridge



Definition: This sub-criterion measures the views to the north (from Pretoria Bridge, Colonel By Drive and/or Queen Elizabeth Drive). There are several indicators of Visual Character that are considered in the evaluation based on the Rideau Canal WHS Evaluation. These include unity/harmony, variety/complexity, spatial characteristics, maintenance/condition, adjacent scenery, infrastructure additions and meaning.
The visual character of this area is a result of the close proximity of the 2 bridges allowing for a defined and framed view below the existing bridge of the canal as it curves to the east in the background. The various circulation routes of boaters/skaters, cyclists, pedestrians and parkway vehicles animate the view adding variety and complexity in the middle ground. The foreground of the view is accented with parkland plantings that add to the scenic value of the view. Bridge design alternatives that provide for widening of this view below the bridge are preferred. Bridge design alternatives that have dominant structures above the deck are not considered in the evaluation under this sub-factor since this sub-factor is evaluating the cultural landscape setting.

Refer to 3D Model “Bridge Alternatives Comparison”, views 13-15.

Discussion:

Alternative A: This alternative has a medium impact (utility 0.5) on the cultural heritage setting since the pier location is the same as the existing piers. The major change is that the bridge deck depth has increased lessening the view below the bridge to the canal as it curves in the background.

Alternative B: This alternative has a variable depth to the bridge deck that allows for a generous clearance below the bridge compared to Alternatives A. The bridge design with its graceful curve to the lower deck profile enhances the view of the canal by adding to the scenic quality of the bridge. This curve is an improvement to Alternative A and therefore scores higher. All alternatives have low impact (utility 1) on the visual character of the setting.

Alternative C: The extrados bridge design has a major impact (utility 0) on the view of the canal and its adjacent lands since the design removes the piers from in the water and moves them beside the pedestrian routes on either side. This widens the key view of the canal and its activities and enhances the visual character.

Alternative D: This alternative includes the removal of the piers from within the canal and placing them on the adjacent lands beside the pedestrian routes. The gentle curve on the lower profile of the bridge adds to the scenic quality of the bridge design. This alternative has low impact (utility 1) on the cultural landscape setting

because of its spacious view below the bridge and the broad curve of the lower edge of the bridge and its subtle colour.

Alternative E: The view of the canal and its adjacent lands is widened with this bridge design that requires no piers either in or beside the canal. The spacious view allows the viewer to appreciate the scenic quality of the canal and its borders. Like Alternatives C, the extrados bridge design, this sub-factor does not evaluate the impact of the superstructure above the bridge on the view. This is considered in the Rideau Canal WHS/NHSC sub-factor. The Alternative E bridge design will have a desirable high impact (utility 0) because of the widened view of the setting.

Alternative F: This rehabilitation alternative will not change the location of the piers or the form of the bridge. Therefore it will not increase nor enhance the view of the cultural landscape setting of the bridge. This alternative will have low impact (utility 1) on the sub-factor.

Mitigation: Requires mitigation through context sensitive design.



View from Pretoria Bridge looking north. *Wendy Shearer, 2017*

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Medium	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Medium	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	Medium	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	1

Alternative	H/M/L	Utility Score
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	1
Alternative C-4 Jack and Slide Extrados	High	0
Alternative C-5 Sequential Jack and Slide Extrados	High	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative E-4 Jack and Slide Single Span	High	0
Alternative E-5 Sequential Jack and Slide Single Span	High	0
Alternative F Conventional Rehabilitation	Low	1

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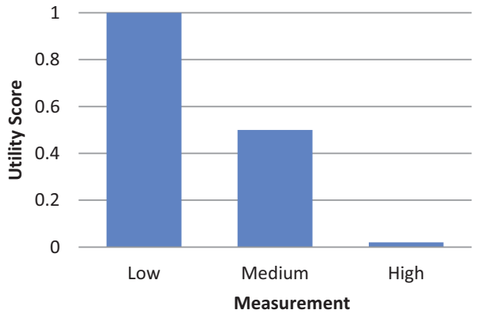
Heritage Resources

Cultural Heritage Landscapes – Visual Relationships

Sub-Criterion 2 - Views to the South from Colonel By Drive and Queen Elizabeth Drive



Definition: This location on the east side of the canal includes a foreground and middle-ground of maintained parkland with accent plantings in the form of planting beds and specimen trees. The curved alignment of the canal is part of the view allowing for an oblique view of the piers. Alternatives that widen the view below the bridge are preferred.

Refer to 3D Model "Bridge Alternatives Comparison", views 11 and 12.

Discussion:

Alternatives A: This alternative retains the piers in the water but the design of the piers change in number and size. The piers are a highly visible component of the below bridge view and as a result has a medium impact (utility 0.5) on the visual character.

Alternative B: This alternative retains the piers in the water and design of the piers. The piers are a highly visible component of the view that is mitigated by the gentle curve on the bottom profile of the bridge and the greater depth of the view below the bridge. The gentle curve of the bridge design improves the views compared to Alternative A and therefore has a low impact (utility 1) on the cultural landscape setting.

Alternative C: This alternative involves the extrados bridge design that removes the piers from the water location replacing them with 4 large towers at either end of the bridge. The towers are a highly visible part of the view of the cultural landscape setting. The view below the bridge has been widened.
This alternative has medium impact (utility 0.5) on the landscape setting. (The impact of the towers and cable above the deck are not evaluated in this sub-factor).

Alternative D: This alternative involves several support columns as piers located outside the canal on the adjacent bank. The repetition of this vertical element adds scenic interest to the visual character. The variable depth of the bridge deck increases the view below the bridge. Alternative D has low impact (utility 1) because of the enhanced view of the piers and the larger view.

Alternative E: This alternative involves a large superstructure that does not involve piers below the bridge deck. As a result the visual character of the landscape setting is spacious and unimpeded by the bridge. (This alternative does evaluate the dominant superstructure but concentrates on the impact of the bridge design on the overall composition of the context.) As a result of the larger view of the canal, its activities and adjacent features, this alternative has high impact (utility 0) on the setting.

Alternative F: The rehabilitation of the existing bridge will not change the location of configuration of the piers or the nature of the scenic view of the canal and its adjacent lands. This alternative has low impact (utility 1) on the visual character of the setting.

Mitigation: Requires reinstatement of planting beds and extensive rehabilitation work to ensure the original design intent of the NCC beautification plans is respected.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Medium	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Medium	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	Medium	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	1.0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	1.0
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	1.0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	1.0
Alternative C-4 Jack and Slide Extrados	Medium	0.5
Alternative C-5 Sequential Jack and Slide Extrados	Medium	0.5
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	1.0
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	1.0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	1.0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	1.0
Alternative E-4 Jack and Slide Single Span	High	0.0
Alternative E-5 Sequential Jack and Slide Single Span	High	0.0

Alternative	H/M/L	Utility Score
Alternative F Conventional Rehabilitation	Low	1.0

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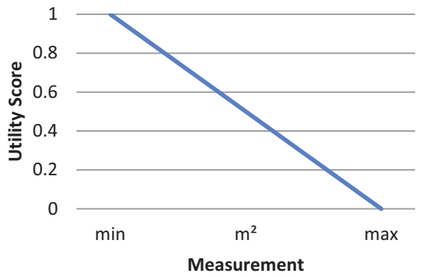
Land Use and Property

Temporary Property Impacts – Parks Canada



Definition: This sub-factor measures alternatives that require property during construction that is currently owned by Parks Canada (Rideau Canal and canal walls) either for a staging site, construction in place, or construction lay-down areas. Alternatives that do not require property are preferred.

Mitigation: Reinstatement to original state.

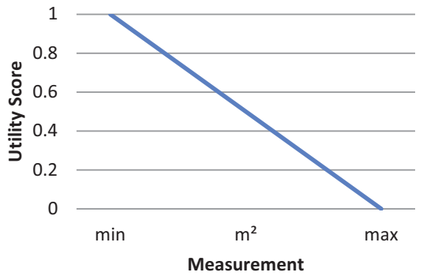
Alternatives:

Alternative	m²	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	300	0.94
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	300	0.94
Alternative A-4 Jack and Slide Replacement Constant Depth	4500	0.15
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	4500	0.15
Alternative A-6 SPMT Transport Replacement Constant Depth	0	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	300	0.94
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	300	0.94
Alternative B-4 Jack and Slide Replacement Variable Depth	4500	0.15
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	4500	0.15
Alternative C-4 Jack and Slide Extrados	5300	0
Alternative C-5 Sequential Jack and Slide Extrados	5300	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	300	0.94

Alternative	m²	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	300	0.94
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	4500	0.15
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	4500	0.15
Alternative E-4 Jack and Slide Single Span	5300	0
Alternative E-5 Sequential Jack and Slide Single Span	5300	0
Alternative F Conventional Rehabilitation	0	1

Land Use and Property

Temporary Property Impacts – Federal (NCC)



Definition: This sub-factor measure the temporary loss of the NCC lands, including staging sites required for bridge alternatives. Alternatives requiring the jack-and-slide construction alternative build the bridges in-place over the Rideau Canal and NCC parkways (Queen Elizabeth Drive and Colonel By Drive). Alternatives which do not impact federal lands are preferred.

Mitigation: Return the NCC lands to original state.

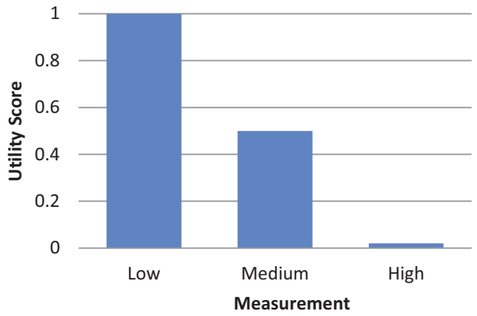
Alternatives:

Alternative	m²	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	336	0.95
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	336	0.95
Alternative A-4 Jack and Slide Replacement Constant Depth	5592	0.14
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	5592	0.14
Alternative A-6 SPMT Transport Replacement Constant Depth	0	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	336	0.95
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	336	0.95
Alternative B-4 Jack and Slide Replacement Variable Depth	5592	0.14
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	5592	0.14
Alternative C-4 Jack and Slide Extrados	5928	0
Alternative C-5 Sequential Jack and Slide Extrados	5928	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	336	0.95

Alternative	m²	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	336	0.95
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	5592	0.14
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	5592	0.14
Alternative E-4 Jack and Slide Single Span	5928	0
Alternative E-5 Sequential Jack and Slide Single Span	5928	0
Alternative F Conventional Rehabilitation	0	1

Land Use and Property

Temporary Property Impacts – Infilling Canal



Definition: This sub-factor measure the temporary impact on the Rideau Canal due to infilling the canal. Bridge replacement alternatives require some temporary fill or inwater protection in the canal when: demolishing-in-place the old structure; removal over the water; or using the fill as a causeway for the SPMTs. Alternative -5 (sequential jack and slide) requires fill in two consecutive years (score high, utility 0) while the other bridge replacement alternatives require fill in one year (score medium, utility 0.5). The bridge rehabilitation alternative does not require fill (score low, utility 1).

Mitigation: The placement of temporary protection of the canal will occur in the fall, following drawdown and will include rock or granular over a geotechnical fabric to capture demolished materials. It will be removed following the demolition. This will be a short term operation. It will then return the Rideau Canal to original state.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Medium	0.5
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Medium	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	Medium	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	High	0
Alternative A-6 SPMT Transport Replacement Constant Depth	Medium	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Medium	0.5
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Medium	0.5
Alternative B-4 Jack and Slide Replacement Variable Depth	Medium	0.5
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	High	0

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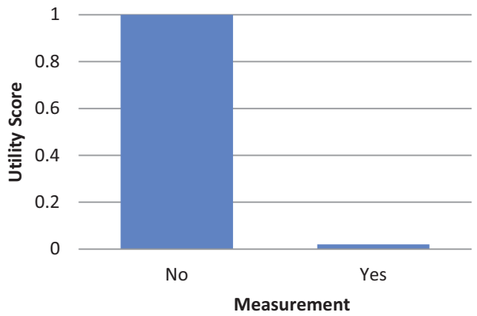
Alternative	H/M/L	Utility Score
Alternative C-4 Jack and Slide Extrados	Medium	0.5
Alternative C-5 Sequential Jack and Slide Extrados	High	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Medium	0.5
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Medium	0.5
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Medium	0.5
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	High	0
Alternative E-4 Jack and Slide Single Span	Medium	0.5
Alternative E-5 Sequential Jack and Slide Single Span	High	0
Alternative F Conventional Rehabilitation	Low	1

Land Use and Property

Permanent Property Impacts – Cyco's Cycling Shop and Greek on Wheels



Definition: This sub-factor measure the permanent loss of the Cyco's Cycling Shop and Greek on Wheels at 5 Hawthorne Avenue. Alternatives requiring the jack-and-slide construction alternative build the bridges in-place and require the acquisition of these two properties for construction. Alternatives which do not impact federal lands are preferred.

Mitigation: Compensation.

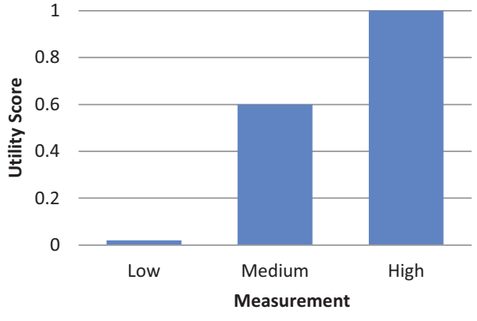
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Yes	0
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Yes	0
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Yes	0
Alternative C-4 Jack and Slide Extrados	Yes	0
Alternative C-5 Sequential Jack and Slide Extrados	Yes	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Yes	0
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Yes	0
Alternative E-4 Jack and Slide Single Span	Yes	0
Alternative E-5 Sequential Jack and Slide Single Span	Yes	0
Alternative F Conventional Rehabilitation	No	1

Structural

Durability of Structure



Definition: This sub-factor measures the durability (life span) of the structure following construction.

High – new structures provide a high degree of certainty in durability (1.0 utility).

Medium/Low – conventional rehabilitation alternatives provide a medium certainty. If additional repairs are required that were not anticipated, the contractor can add time to the schedule to complete the work. However, there may be some deterioration that is not visible and older concrete is still being used. Conventional rehabilitation still requires a high level of inspection and repairs for deterioration in isolated areas over the next 20 years (Utility = 0).

Mitigation: None.

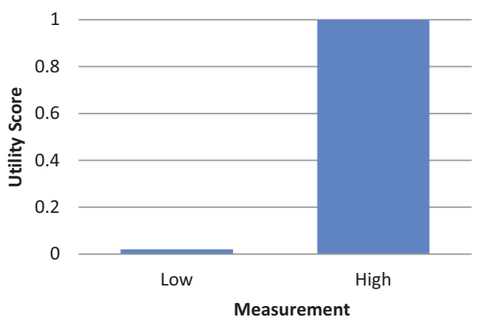
Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	High	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	High	1
Alternative A-4 Jack and Slide Replacement Constant Depth	High	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	High	1
Alternative A-6 SPMT Transport Replacement Constant Depth	High	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	High	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	High	1
Alternative B-4 Jack and Slide Replacement Variable Depth	High	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	High	1
Alternative C-4 Jack and Slide Extrados	High	1
Alternative C-5 Sequential Jack and Slide Extrados	High	1

Alternative	H/M/L	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	High	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	High	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	Low	0

Structural

Certainty of Property Available to Implement Project



Definition: This sub-factor measures whether there is certainty from owners that the replacement projects can be built today. The current owners who have provided input to date support the replacement project to be completed now (2 of the 3 buildings effected have provided input and the third owner has not provided input). Future replacement will occur when new owners or legislation may preclude the use of their lands.

High – replacement alternatives have certainty that owners are likely to be willing sellers today.

Low – rehabilitation alternatives defer requirement of property to the future and may not have willing sellers for future replacement in 15-25 years.

Mitigation: None.

Alternatives:

Alternative	High/Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	High	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	High	1
Alternative A-4 Jack and Slide Replacement Constant Depth	High	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	High	1
Alternative A-6 SPMT Transport Replacement Constant Depth	High	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	High	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	High	1
Alternative B-4 Jack and Slide Replacement Variable Depth	High	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	High	1
Alternative C-4 Jack and Slide Extrados	High	1
Alternative C-5 Sequential Jack and Slide Extrados	High	1

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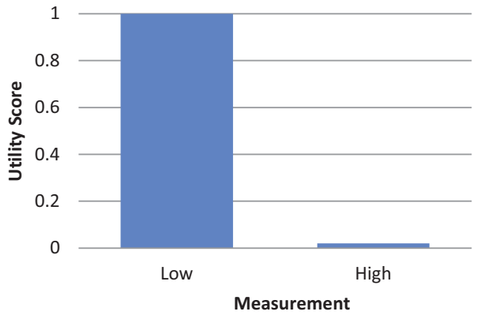
Alternative	High/Low	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	High	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	High	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	Low	0

Structural

Risk of Significant Damage



Definition: This sub-factor measures the potential of significant damage from structural deterioration which may close a portion of the Queensway (either lanes or full closure). The rehabilitation alternative which retains deteriorated elements of the bridge is considered to have high potential and all new bridges low. The existing bridge has elements with no redundancy alternative other than municipal streets and bridges in the event of section loss/failure/closure of the Queensway.

Mitigation: None.

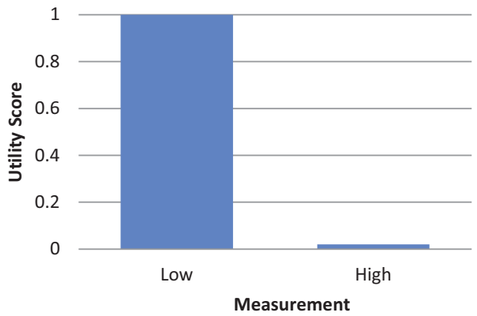
Alternatives:

Alternative	High/Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Low	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	1
Alternative C-4 Jack and Slide Extrados	Low	1
Alternative C-5 Sequential Jack and Slide Extrados	Low	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	1

Alternative	High/Low	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative E-4 Jack and Slide Single Span	Low	1
Alternative E-5 Sequential Jack and Slide Single Span	Low	1
Alternative F Conventional Rehabilitation	High	0

Structural

Risk of Isolated Spalling from Soffit



Definition: This sub-factor measures the risk of isolated spalling from the soffit of the bridge or piers. The rehabilitated alternative which maintains deteriorated sections of the bridge has a higher risk than all new bridge alternatives. All new bridge alternatives are considered low risk.

Mitigation: Continual inspection.

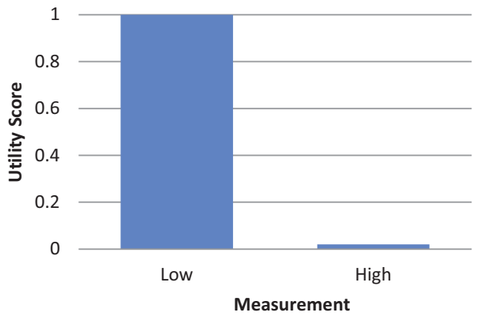
Alternatives:

Alternative	High/Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Low	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	1
Alternative C-4 Jack and Slide Extrados	Low	1
Alternative C-5 Sequential Jack and Slide Extrados	Low	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	1

Alternative	High/Low	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative E-4 Jack and Slide Single Span	Low	1
Alternative E-5 Sequential Jack and Slide Single Span	Low	1
Alternative F Conventional Rehabilitation	High	0

Structural

Risk of Falling Ice onto Highway



Definition: This sub-factor measures the risk for ice to collect and fall from the superstructure elements above the pavement surface onto the highway and travelling public.

Mitigation: None.

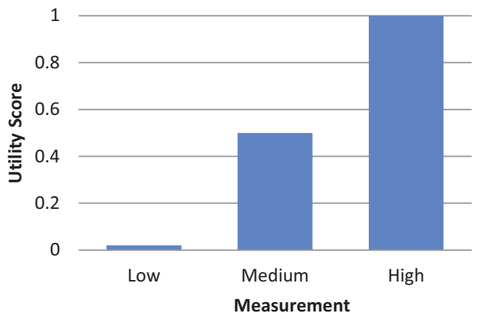
Alternatives:

Alternative	High/Low	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Low	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Low	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Low	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Low	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Low	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Low	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Low	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Low	1
Alternative C-4 Jack and Slide Extrados	High	0
Alternative C-5 Sequential Jack and Slide Extrados	High	0
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Low	1

Alternative	High/Low	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Low	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Low	1
Alternative E-4 Jack and Slide Single Span	High	0
Alternative E-5 Sequential Jack and Slide Single Span	High	0
Alternative F Conventional Rehabilitation	Low	1

Structural

Certainty of Construction Method (Risk)



Definition: This sub-factor measures the certainty for construction methods for the Rideau Canal alternatives.

High certainty (low risk) – the new structure construction methodologies for Alternatives 2B, 2C, 4 and 5 have previously been used in Ontario/on the Queensway and provide a low risk to contractors (1.0 utility)

Medium certainty (medium risk) – conventional rehabilitation has some potential for greater repairs of deteriorated areas but has low schedule extension impact (0.5 utility)

Low certainty (high risk) – the new structure elevator construction methodology (Alternative 6) has never been used for bridge structures in Ontario and provides a high risk to contractors for delays on a replacement weekend (0.0 utility)

Mitigation: None.

Alternatives:

Alternative	H/M/L	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	High	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	High	1
Alternative A-4 Jack and Slide Replacement Constant Depth	High	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	High	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Low	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	High	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	High	1
Alternative B-4 Jack and Slide Replacement Variable Depth	High	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	High	1
Alternative C-4 Jack and Slide Extrados	High	1

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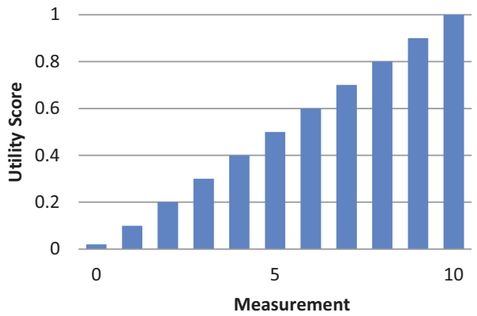
Alternative	H/M/L	Utility Score
Alternative C-5 Sequential Jack and Slide Extrados	High	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	High	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	High	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	High	1
Alternative E-4 Jack and Slide Single Span	High	1
Alternative E-5 Sequential Jack and Slide Single Span	High	1
Alternative F Conventional Rehabilitation	Medium	0.5

Structural

Risk of Damage to Superstructure



Definition: This item measures the risk of an errant vehicle striking and damaging the structural components of the superstructure. Structures with components above the roadway deck score poorly on this criterion.

Mitigation: Increase the robustness (strength) of the above deck components. Note that the above-deck components are already designed with redundancy to permit loss of individual stays. Barrier walls and wider shoulders will also protect the superstructure.

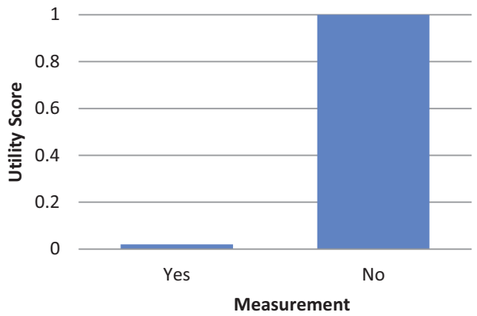
Alternatives:

Alternative	Impact 0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	10	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	10	1
Alternative A-4 Jack and Slide Replacement Constant Depth	10	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	10	1
Alternative A-6 SPMT Transport Replacement Constant Depth	10	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	10	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	10	1
Alternative B-4 Jack and Slide Replacement Variable Depth	10	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	10	1
Alternative C-4 Jack and Slide Extrados	2	.2
Alternative C-5 Sequential Jack and Slide Extrados	2	.2
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	10	1

Alternative	Impact 0-10	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	10	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	10	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	10	1
Alternative E-4 Jack and Slide Single Span	0	0
Alternative E-5 Sequential Jack and Slide Single Span	0	0
Alternative F Conventional Rehabilitation	10	1

Structural

Use of Link Slabs



Definition: Link deck slabs are components that join two simply supported spans to avoid expansion joints. They have high flexural requirements that may increase maintenance needs. Bridges built as fully continuous decks are preferred for this criterion.

Mitigation: None.

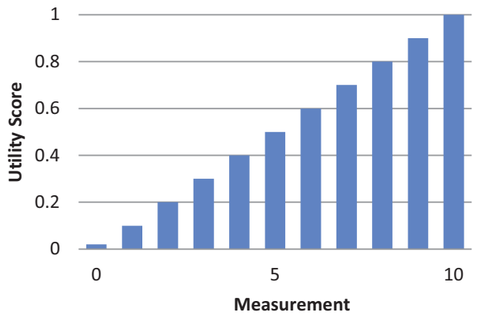
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	No	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Yes	0
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	No	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	No	1
Alternative C-5 Sequential Jack and Slide Extrados	No	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	No	1

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	No	1
Alternative E-5 Sequential Jack and Slide Single Span	No	1
Alternative F Conventional Rehabilitation	No	1

Structural

Ongoing Maintenance (i.e. Painting)



Definition: Maintenance of bridge components such as painting of steel sections, additional cleaning, replacement of aesthetic panels and similar work will require future maintenance by MTO. Steel structures are assumed to be painted in this location. Ongoing repairs of the structure anticipated for the rehabilitation alternative are captured elsewhere.

Mitigation: Use of unpainted weathering steel if permitted by NCC.

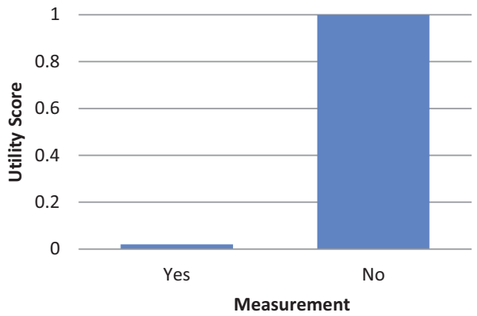
Alternatives:

Alternative	Impact 0-10	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	6	0.6
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	5	0.5
Alternative A-4 Jack and Slide Replacement Constant Depth	5	0.5
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	5	0.5
Alternative A-6 SPMT Transport Replacement Constant Depth	5	0.5
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	5	0.5
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	5	0.5
Alternative B-4 Jack and Slide Replacement Variable Depth	5	0.5
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	5	0.5
Alternative C-4 Jack and Slide Extrados	10	1
Alternative C-5 Sequential Jack and Slide Extrados	10	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	7	.7

Alternative	Impact 0-10	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	6	.6
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	6	.6
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	6	.6
Alternative E-4 Jack and Slide Single Span	0	0
Alternative E-5 Sequential Jack and Slide Single Span	0	0
Alternative F Conventional Rehabilitation	10	1

Structural

Wheel Tracking over Centreline Joint



Definition: This sub-factor measures whether an alternative requires wheel tracking over the centreline joint of the bridge during construction. It is not desirable for a driver to cross the centreline joint due to the change in elevation between the two structures (i.e. the driving comfort decreases). Alternatives that do not have wheel tracking are preferred.

Mitigation: None.

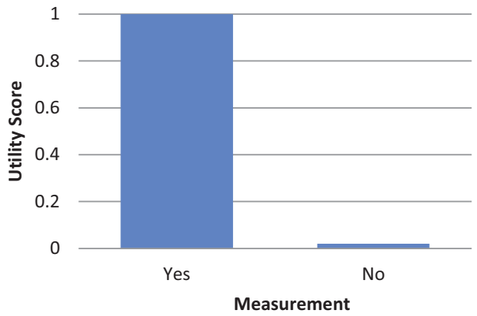
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Yes	0
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	No	1
Alternative A-4 Jack and Slide Replacement Constant Depth	No	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	No	1
Alternative A-6 SPMT Transport Replacement Constant Depth	No	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Yes	0
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	No	1
Alternative B-4 Jack and Slide Replacement Variable Depth	No	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	No	1
Alternative C-4 Jack and Slide Extrados	No	1
Alternative C-5 Sequential Jack and Slide Extrados	No	1
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Yes	0

Alternative	Yes/No	Utility Score
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	No	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	No	1
Alternative E-4 Jack and Slide Single Span	No	1
Alternative E-5 Sequential Jack and Slide Single Span	No	1
Alternative F Conventional Rehabilitation	No	1

Structural

Functional Requirement to Widen Structure Triggering Replacement



Definition: This sub-factor measures if the alternative matches the Recommended Highway Plan (2007) i.e. the replacement alternative bridge reflects the wider bridge required for the highway improvement plan. It is considered desirable to have a continuous bridge wide enough to accommodate the recommended highway plan with no need for future widening.

Mitigation: None.

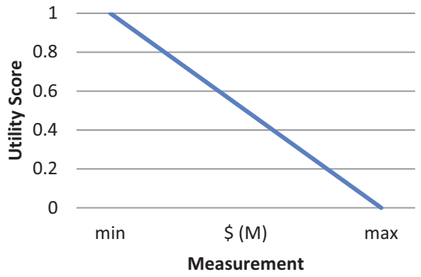
Alternatives:

Alternative	Yes/No	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	Yes	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	Yes	1
Alternative A-4 Jack and Slide Replacement Constant Depth	Yes	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	Yes	1
Alternative A-6 SPMT Transport Replacement Constant Depth	Yes	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	Yes	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	Yes	1
Alternative B-4 Jack and Slide Replacement Variable Depth	Yes	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	Yes	1
Alternative C-4 Jack and Slide Extrados	Yes	1
Alternative C-5 Sequential Jack and Slide Extrados	Yes	1

Alternative	Yes/No	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	Yes	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	Yes	1
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	Yes	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	Yes	1
Alternative E-4 Jack and Slide Single Span	Yes	1
Alternative E-5 Sequential Jack and Slide Single Span	Yes	1
Alternative F Conventional Rehabilitation	No	0

Cost

Life Cycle Cost



Definition: This sub-factor measures the difference in the total life cycle cost of the alternative (construction, maintenance, operating costs and long term replacement and rehabilitation in the 40 year planning horizon). Those alternatives with the lowest life cycle cost are preferred. A 4% discount rate is used.

Cost estimates are for replacement or rehabilitation of the entire bridge (both EBL and WBL).

Some alternatives require the replacement of the three rigid frames (due to staging or bridge type) and these costs are described in a separate sub-factor.

Mitigation: N/A

Alternatives:

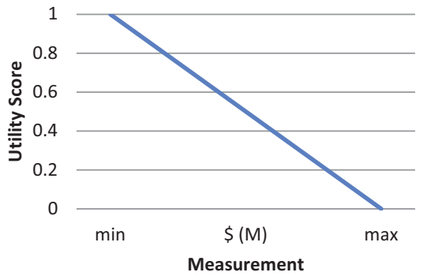
Alternative	$ (M)	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	44.5	1.00
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	44.5	1.00
Alternative A-4 Jack and Slide Replacement Constant Depth	45.4	0.99
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	45.4	0.99
Alternative A-6 SPMT Transport Replacement Constant Depth	60.5	0.81
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	49.0	0.95
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	49.0	0.95
Alternative B-4 Jack and Slide Replacement Variable Depth	50.1	0.93
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	50.1	0.93
Alternative C-4 Jack and Slide Extrados	96.9	0.38
Alternative C-5 Sequential Jack and Slide Extrados	96.9	0.38

GWP 4170-13-00 Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street
Analysis and Evaluation – February 21, 2019
Rideau Canal Structure Alternatives
Sub-factor Definitions

Alternative	$ (M)	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	53.7	0.89
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	53.7	0.89
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	54.9	0.88
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	54.9	0.88
Alternative E-4 Jack and Slide Single Span	128.9	0.00
Alternative E-5 Sequential Jack and Slide Single Span	128.9	0.00
Alternative F Conventional Rehabilitation	62.3	0.79

Cost

Rigid Frame Replacement Costs



Definition: This sub-factor measures the requirement for replacement costs for the three rigid frames. The high level bridges and traffic alternative "-2C" requires the replacement of the rigid frames to widen the structure and highway for the replacement alternatives.

This includes a replacement cost in 2025 and a future rehabilitation in 2055 (30 year horizon).

Cost estimates are for replacement of the entire bridge (both EBL and WBL).

Those alternatives not requiring the replacement of the rigid frames is preferred. A 4% discount rate is used.

Mitigation: N/A

Alternatives:

Alternative	$ (M)	Utility Score
Alternative A-2B Conventional Replacement Constant Depth, No Hwy 417 Widening	0	1
Alternative A-2C Conventional Replacement Constant Depth, Hwy 417 Widening	105.7	0
Alternative A-4 Jack and Slide Replacement Constant Depth	0	1
Alternative A-5 Sequential Jack and Slide Replacement Constant Depth	0	1
Alternative A-6 SPMT Transport Replacement Constant Depth	0	1
Alternative B-2B Conventional Replacement Variable Depth, No Hwy 417 Widening	0	1
Alternative B-2C Conventional Replacement Variable Depth, Hwy 417 Widening	105.7	0
Alternative B-4 Jack and Slide Replacement Variable Depth	0	1
Alternative B-5 Sequential Jack and Slide Replacement Variable Depth	0	1
Alternative C-4 Jack and Slide Extrados	105.7	0
Alternative C-5 Sequential Jack and Slide Extrados	105.7	0

Alternative	$ (M)	Utility Score
Alternative D-2B Conventional Replacement Variable Depth, No Hwy 417 Widening, New Pier Location	0	1
Alternative D-2C Conventional Replacement Variable Depth, Hwy 417 Widening, New Pier Location	105.7	0
Alternative D-4 Jack and Slide Replacement Variable Depth, New Pier Location	0	1
Alternative D-5 Sequential Jack and Slide Replacement Variable Depth, New Pier Location	0	1
Alternative E-4 Jack and Slide Single Span	105.7	0
Alternative E-5 Sequential Jack and Slide Single Span	105.7	0
Alternative F Conventional Rehabilitation	0	1

Appendix D

Cultural Heritage Resource Assessment Report

Cultural Heritage Resource Assessment Report

Preliminary Design and Environmental Assessment Study for the Rehabilitation or Replacement of the Ottawa Queensway Downtown Bridges from Metcalfe Street to Main Street (G.W.P. 4170-13-00)

Class Environmental Assessment for Provincial Transportation Facilities

City of Ottawa, Ontario

Draft Report

Prepared for: **Ministry of Transportation, Ontario**
1355 John Counter Boulevard, PO Box 4000
Kingston, ON K7L 5A3

Archaeological Services Inc. File: 23CH-221

March 2024 (revised May 2024)



Executive Summary

Archaeological Services Inc. was retained by Morrison Hershfield Limited, on behalf of the Ministry of Transportation, Ontario (M.T.O.) to conduct a Cultural Heritage Resource Assessment Report (C.H.R.A.R.) for the rehabilitation and/or replacement of seven bridges (four locations) on Highway 417 (Ottawa Queensway) from Metcalfe Street to Main Street, including the Rideau Canal Bridge, in the City of Ottawa (GWP 4170-13-00) (hereafter referred to as "The Project"). The C.H.R.A.R. study area includes the M.T.O. right-of-way study zone with an additional 250-metre buffer.

The study will follow the approved environmental planning process for Group "B" projects under the *Class Environmental Assessment for Provincial Transportation Facilities* (2000). The study will identify and evaluate options for rehabilitation or replacement of the identified bridges as part of M.T.O.'s ongoing review of safety and operational needs for the provincial highway network.

The purpose of the C.H.R.A.R. is to document the existing conditions of the study area and identify known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) within the study area, provide a preliminary impact assessment relating to the proposed project, and propose appropriate mitigation measures and next steps for properties where negative impacts are anticipated.

A review of federal, provincial, and municipal registers, inventories, and databases revealed that there are 165 previously identified B.H.R.s and C.H.L.s within the study area. These include:

- one United Nations Educational, Scientific and Cultural Organization World Heritage Site (the Rideau Canal is also a National Historic Site, a Canadian Heritage River System, and a study is also in-progress to recognize it as part of a larger C.H.L.);



- three properties designated under Part IV of the *Ontario Heritage Act* (one property is also a National Historic Site, has National Historic Event plaques, as well as National Historic Person plaques);
- one heritage conservation district designated under Part V of the *Ontario Heritage Act*;
- 156 properties that are included in the Municipal Register (three of these properties are also included in the Ontario Heritage Trust's Places of Worship Inventory);
- two properties included in the Ontario Heritage Trust's Places of Worship Inventory; and
- two roadways are identified by the City of Ottawa Official Plan as Scenic Capital Entry Routes and the same two roadways are also identified by the National Capital Commission (N.C.C.) as Scenic Parkways.

There are a further five potential B.H.R.s and C.H.L.s that were identified in previous reporting and during background research and field review.

Following a review of the Technically Preferred Alternative (T.P.A.) for the Project (see Section 6.0) and an assessment of potential impacts to identified B.H.R.s and C.H.L.s, one known C.H.L. (C.H.L. 1), three potential C.H.L.s (C.H.L. 2, C.H.L. 3 and C.H.L. 4) and one potential B.H.R. (B.H.R. 3) are anticipated to be directly impacted by the T.P.A. and will require further mitigation to avoid any adverse impacts. In addition, there is potential for indirect impacts to identified B.H.R.s and C.H.L.s. The following next steps, as well as general mitigations, are recommended:

1. Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified built heritage resources and cultural heritage landscapes. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified B.H.R.s and C.H.L.s, etc. Suitable mitigation measures

including post-construction rehabilitation with sympathetic plantings can also be implemented.

2. The replacement of the Rideau Canal Bridges and associated construction activities and laydown areas will result in direct impacts to the Rideau Canal. However, development of a design that avoids permanent and adverse direct impacts to the Rideau Canal and heritage attributes has been developed through regular consultation with Parks Canada and the N.C.C. Given the heritage sensitivities and complexities of the Rideau Canal Bridge crossing, it is recommended that a Heritage Impact Assessment (H.I.A.) be completed as part of the Detailed Design by a qualified heritage professional and in advance of construction. The H.I.A. will be based on the heritage attributes identified in the Rideau Canal Commemorative Integrity Statement and will ensure that the project continues to avoid adverse impacts to the Rideau Canal and its heritage attributes. The H.I.A. will also provide analysis and conservation recommendations to ensure that an appropriate bridge design is developed that is subordinate to, distinguishable from and compatible with the existing C.H.L. and respects the heritage landscapes and designation of the Rideau Canal.
    a. The H.I.A. scope and regulatory requirements should be confirmed with Parks Canada early in Detailed Design and M.T.O. should continue to meet with the N.C.C., Parks Canada, and the City of Ottawa to ensure this cultural heritage landscape is conserved.
    b. The H.I.A. should be developed in accordance with the *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2010), *Working with Cultural Landscapes: A Guide for the National Capital Region* (National Capital Commission, 2023b), the *Rideau Canal and Merrickville Blockhouse Management Plan* (Parks Canada, 2022b), and the *Rideau Canal Cultural Heritage Landscape Study* (Matrix Heritage, on-going).
    c. Given the results of this C.H.R.A.R., it is understood that there is no specific heritage permit required by Parks Canada or the N.C.C. to undertake the proposed work.

3. Direct adverse impacts to the former auto garage (B.H.R. 3 at 60 Main Street) are anticipated to include the removal of the structure and should

avoidance not be feasible, a cultural heritage evaluation report (C.H.E.R.) to determine cultural heritage value or interest (C.H.V.I.) is required as early as possible in the Environmental Assessment process.[1] As there are direct impacts anticipated, and should the C.H.E.R. determine that the property retains C.H.V.I., per Ontario Regulation 9/06 or 10/06, a resource-specific H.I.A., is to be completed. If a property is found to meet Ontario Regulation 10/06 and therefore is a provincial heritage property of provincial significance, then the Ministry of Citizenship and Multiculturalism (M.C.M.) will be contacted to advise on whether M.C.M. Minister's Consent is required. Timing of completion of the H.I.A. will be discussed with M.C.M.

4. Direct impacts to the Queen Elizabeth Driveway C.H.L. (C.H.L. 3) due to construction activities are anticipated to result in removal of several lighting fixtures along the road, and vegetation, both of which are identified as potential heritage attributes of this Scenic Parkway. These are considered temporary impacts and are not expected to result in adverse impacts to the cultural heritage value of the Queen Elizabeth Driveway or its heritage attributes as all landscape features, including vegetation and lighting standards, will be reinstated following construction, in consultation with the N.C.C.
    a. Avoidance measures may include, but are not limited to: erecting temporary fencing around vegetation or lighting fixtures that do not require temporary removal, establishing buffer zones, and issuing instructions to construction crews to avoid identified features.
    b. Consultation with the N.C.C. will also be undertaken to develop an appropriate mitigation strategy and to facilitate the return of the parkway to its pre-construction condition. This will include a strategy to safely remove, store and reinstate the lighting fixtures.

[1] At the time of report submission, a C.H.E.R is currently being prepared by a subconsultant for M.T.O.

5. Direct impacts to Colonel By Drive C.H.L. (C.H.L. 4) due to construction activities are anticipated to result in removal of some vegetation, an identified potential heritage attribute of this Scenic Parkway. These are considered temporary impacts and are not expected to result in adverse impacts to the cultural heritage value of Colonel By Drive or its heritage attributes as all landscape features, including vegetation, will be reinstated following construction, in consultation with the N.C.C.
    a. Avoidance measures may include, but are not limited to: erecting temporary fencing around vegetation that do not require removal, establishing buffer zones, and issuing instructions to construction crews to avoid identified features.
    b. Consultation with the N.C.C. will also be undertaken to develop an appropriate mitigation strategy and to facilitate the return of the parkway to its pre-construction condition.

6. Ballantyne Park (C.H.L. 2) will be used as a laydown area during construction of the Main Street Bridges and Rideau Canal Bridges. The use of the park as a staging area is anticipated to remove some features of the park including the removal of some trees, lighting standards and the James Ballantyne commemoration monument, and general disruption to this setting. As these impacts are temporary and can be mitigated, they are not considered to have adverse impacts on the potential cultural heritage value or heritage attributes of this park.
    a. To reduce impacts to Ballantyne Park, it is recommended that as many trees be retained as possible, especially along the street frontage. Trees to be retained should be protected by erecting temporary fencing and establishing buffer zones. Suitable mitigation measures including post construction rehabilitation with sympathetic plantings. A Landscape Plan will be established with City of Ottawa approval for the park reinstatement, which will mitigate the loss of any trees.
    b. The James Ballantyne commemoration monument will be salvaged and reinstated in the park following construction. This should include

a strategy to safely remove, store and reinstate the monument, in consultation with the City of Ottawa. Similarly, the lighting standards in the park that will be displaced by the laydown area should be safely removed, stored and reinstated in consultation with the City of Ottawa.

7. To ensure the following properties are not adversely impacted during construction, baseline vibration monitoring should be undertaken during detailed design:
    - Pretoria Bridge (B.H.R. 1),
    - 43 Main Street (B.H.R. 2),
    - 61 Main Street (B.H.R. 4);
    - 62-64 Main Street (B.H.R. 5);
    - 3-5 Hawthorne Avenue (B.H.R. 11),
    - 7-9 Hawthorne Avenue (B.H.R. 12),
    - 8-10 Hawthorne Avenue (B.H.R. 13),
    - 12-18 Hawthorne Avenue (B.H.R. 14),
    - 15-21 Hawthorne Avenue (B.H.R. 15),
    - 94 Hawthorne Avenue (B.H.R. 16),
    - 113 Hawthorne Avenue (B.H.R. 17),
    - 125 Hawthorne Avenue (B.H.R. 19),
    - 135 Hawthorne Avenue (B.H.R. 22),
    - 137 Hawthorne Avenue (B.H.R. 23),
    - 171 Echo Drive (B.H.R. 44),
    - 145 Echo Drive (B.H.R. 45),
    - 143 Echo Drive (B.H.R. 46),
    - 194-198 Cartier Street (B.H.R. 74), and
    - 150 Queen Elizabeth Driveway (B.H.R. 94).

   Should this advance monitoring assessment conclude that the structure(s) on these properties will be subject to vibrations, prepare and implement a vibration monitoring plan as part of the detailed design phase of the project to lessen vibration impacts related to construction.

8. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

9. All heritage reports are to be completed in accordance with the Standards and Guidelines (Ministry of Tourism and Culture, 2010) and M.T.O.'s cultural heritage conservation policy and process, by a qualified person as defined in the Standards and Guidelines. Heritage reports will be made available to interested parties upon request. Where required, H.I.A.s will be undertaken by qualified person(s) as early as possible during detailed design and prior to any ground disturbing activities. H.I.A.s will be sent to M.C.M. for review and comment and made available to other interested parties upon request. For provincial heritage properties of provincial significance, contact M.C.M. to discuss timing. A copy of the final H.I.A. prepared for the Rideau Canal bridge crossing should be sent to M.C.M. for its records.

10. A copy of this report should be submitted to the N.C.C., M.C.M., Parks Canada and City of Ottawa Heritage Staff for their review.

Report Accessibility Features

This report has been formatted to meet the Information and Communications Standards under the *Accessibility for Ontarians with Disabilities Act*, 2005 (A.O.D.A.). Features of this report which enhance accessibility include: headings, font size and colour, alternative text provided for images, and the use of periods within acronyms. Given this is a technical report, there may be instances where additional accommodation is required in order for readers to access the report's information. If additional accommodation is required, please contact Annie Veilleux, Manager of the Cultural Heritage Division at Archaeological Services Inc., by email at aveilleux@asiheritage.ca or by phone 416-966-1069 ext. 255.

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- **Principal-in-Charge**: Rebecca Sciarra, M.A., C.A.H.P., Partner, Director - Cultural Heritage Division
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- **Report Reviewer(s)**: Lindsay Graves

  Rebecca Sciarra, M.A., C.A.H.P., Partner, Director - Cultural Heritage Division

Qualified Persons Involved in the Project

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Partner, Director - Cultural Heritage Division

The Principal-in-Charge for this Cultural Heritage Resource Assessment Report is **Rebecca Sciarra** (M.A., Canadian Studies). She is responsible for the highest-level management of a busy and diverse team of heritage professionals who apply their expertise across a broad range of public and private sector clientele. Rebecca also provides oversight and quality assurance for all deliverables, maintaining responsive and prompt client communications, and providing heritage clients with a direct connection to corporate ownership. In addition to her role as Director of the Cultural Heritage Division, Rebecca is academically trained in heritage conservation principles and practices. She has led a range of high profile and complex heritage planning and conservation management projects for public and private sector clients. Her experience in both the private and public sectors has involved providing expertise around the strategic development of policies and programs to conserve Ontario's cultural heritage resources as part of environmental and land-use planning processes. She has worked with municipal, provincial, federal and private sector clients to lead heritage evaluations and assessment as part of area planning studies, including secondary plans, heritage conservation district studies, and master plans. Rebecca is a member of I.C.O.M.O.S. Canada and the Canadian Association of Heritage Professionals.

Lindsay Graves, M.A., C.A.H.P.
Senior Cultural Heritage Specialist, Assistant Manager - Cultural Heritage Division

The Senior Project Manager for this Cultural Heritage Resource Assessment Report is **Lindsay Graves** (M.A., Heritage Conservation), Senior Cultural Heritage Specialist and Assistant Manager for the Cultural Heritage Division. She was responsible for: overall project scoping and approach; development and confirmation of technical findings and study recommendations; application of relevant standards, guidelines and regulations; and implementation of quality control procedures. Lindsay is academically trained in the fields of heritage

conservation, cultural anthropology, archaeology, and collections management and has over 15 years of experience in the field of cultural heritage resource management. This work has focused on the assessment, evaluation, and protection of built heritage resources and cultural heritage landscapes. Lindsay has extensive experience undertaking archival research, heritage survey work, heritage evaluation and heritage impact assessment. She has also contributed to cultural heritage landscape studies and heritage conservation plans, led heritage commemoration and interpretive programs, and worked collaboratively with multidisciplinary teams to sensitively plan interventions at historic sites/places. In addition, she is a leader in the completion of heritage studies required to fulfill Class Environmental Assessment processes and has served as Project Manager for over 100 heritage assessments during her time at Archaeological Services Inc. Lindsay is a member of the Canadian Association of Heritage Professionals.

Kirstyn Allam, B.A. (Hon.), Advanced Dipl. in Applied Museum Studies
Cultural Heritage Analyst, Project Manager - Cultural Heritage Division

The Project Manager for this project is **Kirstyn Allam** (B.A. (Hon.), Advanced Diploma in Applied Museum Studies), who is a Cultural Heritage Analyst and Project Manager within the Cultural Heritage Division. She was responsible for day-to-day management activities, including scoping and conducting research activities and drafting of study findings and recommendations. Kirstyn Allam's education and experience in cultural heritage, historical research, archaeology, and collections management has provided her with a deep knowledge and strong understanding of the issues facing the cultural heritage industry and best practices in the field. Kirstyn has experience in heritage conservation principles and practices in cultural resource management, including three years' experience as a member of the Heritage Whitby Advisory Committee. Kirstyn also has experience being involved with Stage 1-4 archaeological excavations in the Province of Ontario. Kirstyn is an intern member of Canadian Association of Heritage Professionals.

Glossary

Built Heritage Resource (B.H.R.)

Definition: "…one or more significant buildings (including fixtures or equipment location in or forming part of a building), structures, monuments, installations, or remains associated with architectural, cultural, social, political, economic, or military history and identified as being important to a community. For the purposes of these Standards and Guidelines, "structures" does not include roadways in the provincial highway network an in-use electrical or telecommunications transmission towers" (Standards and Guidelines for Conservation of Provincial Heritage Properties, 2010).

Cultural Heritage Landscape (C.H.L.)

Definition: "…a defined geographical area of heritage significance that human activity has modified and that a community values. Such an area involves a grouping(s) of individual heritage features, such as structures, spaces, archaeological sites, and natural elements, which together form a significant type of heritage form distinct from its constituent elements or parts. Heritage conservation districts designated under the *Ontario Heritage Act*, villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trails, and industrial complexes of cultural heritage value are some examples." (Standards and Guidelines for Conservation of Provincial Heritage Properties, 2010).

Known Built Heritage Resource or Cultural Heritage Landscape

Definition: A known built heritage resource or cultural heritage landscape is a property that has recognized cultural heritage value or interest. This can include a property listed on a Municipal Heritage Register, designated under Part IV or V of the *Ontario Heritage Act*, or protected by a heritage agreement, covenant or easement, protected by the *Heritage Railway Stations Protection Act or the Heritage Lighthouse Protection Act*, identified as a Federal Heritage Building, or located within a U.N.E.S.C.O. World Heritage Site (Ministry of Citizenship and Multiculturalism, 2016).

Impact

Definition: Includes negative and positive, direct and indirect effects to an identified built heritage resource and cultural heritage landscape. Direct impacts include destruction of any, or part of any, significant heritage attributes or features and/or unsympathetic or incompatible alterations to an identified resource. Indirect impacts include, but are not limited to, creation of shadows, isolation of heritage attributes, direct or indirect obstruction of significant views, change in land use, land disturbances (Ministry of Citizenship and Multiculturalism, 2006). Indirect impacts also include potential vibration impacts.

Mitigation

Definition: Mitigation is the process of lessening or negating anticipated adverse impacts to built heritage resources or cultural heritage landscapes and may include, but are not limited to, such actions as avoidance, monitoring, protection, relocation, remedial landscaping, and documentation of the cultural heritage landscape and/or built heritage resource if to be demolished or relocated (Ministry of Citizenship and Multiculturalism, 2006).

Potential Built Heritage Resource or Cultural Heritage Landscape

Definition: A potential built heritage resource or cultural heritage landscape is a property that has the potential for cultural heritage value or interest. This can include properties/project area that contain a parcel of land that is the subject of a commemorative or interpretive plaque, is adjacent to a known burial site and/or cemetery, is in a Canadian Heritage River Watershed, or contains buildings or structures that are 40 or more years old (Ministry of Citizenship and Multiculturalism, 2016).

Significant

Definition: With regard to cultural heritage and archaeology resources, significant means "resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the *Ontario Heritage Act.* While some significant resources may already be identified and inventoried by

official sources, the significance of others can only be determined after evaluation" (Ministry of Municipal Affairs and Housing, 2020, p. 51).

Vibration Zone of Influence

Definition: Area within a 50-metre buffer of construction-related activities in which there is potential to affect an identified built heritage resource or cultural heritage landscape. A 50-metre buffer is applied in the absence of a project-specific defined vibration zone of influence based on existing secondary source literature (Carman et al., 2012; Crispino & D'Apuzzo, 2001; P. Ellis, 1987; Rainer, 1982; Wiss, 1981). This buffer accommodates the additional threat from collisions with heavy machinery or subsidence (Randl, 2001).

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1.0 Introduction

Archaeological Services Inc. was contracted by Morrison Hershfield Limited, on behalf of the Ministry of Transportation, Ontario (M.T.O.) to conduct a Cultural Heritage Resource Assessment Report (C.H.R.A.R.) for the rehabilitation and/or replacement of seven bridges (four locations) on Highway 417 (Ottawa Queensway) from Metcalfe Street to Main Street, including the Rideau Canal Bridge, in the City of Ottawa (GWP 4170-13-00) (hereafter referred to as "The Project"). The study will follow the approved environmental planning process for Group "B" projects under the *Class Environmental Assessment for Provincial Transportation Facilities* (2000). The study will identify and evaluate options for rehabilitation or replacement of the identified bridges as part of M.T.O.'s ongoing review of safety and operational needs for the provincial highway network.

The purpose of this C.H.R.A.R. is to document the existing conditions of the study area, identify known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) within the study area, provide a preliminary impact assessment relating to the proposed project, and propose appropriate mitigation measures. This C.H.R.A.R. has been prepared in accordance with the *Standards and Guidelines for Conservation of Provincial Heritage Properties* (S&Gs, 2010) and MTO's cultural heritage conservation policy and process.

1.1 Project Overview

M.T.O. has undertaken a Preliminary Design and Environmental Assessment study for the rehabilitation / replacement of seven bridges at four locations along the Ottawa Queensway (Highway 417) between Metcalfe Street and Main Street in Ottawa. The Downtown Bridges Environmental Assessment is for site specific improvements and to prepare a bridge management plan for seven bridges. The Preliminary Design study has identified a bridge management strategy to address the structural needs of the following Queensway Downtown bridges:

- Metcalfe Street Overpass (Site no. 3-065)
- Elgin Street, East Bound Lanes (EBL) (Site no. 3-066.1)

- Elgin Street, West Bound Lanes (WBL) (3-066.2)
- Rideau Canal EBL (3-067.1)
- Rideau Canal WBL (3-067.2)
- Main Street EBL (3-068.1)
- Main Street WBL (3-068.2)

All seven structures identified above were previously screened by M.T.O.'s Regional Structural Section Engineers and were determined to not retain potential for cultural heritage value or interest (see Table 1 in Section 5.5 for the results of the screening).

Based on the engineering assessments completed to date, the Problem/ Opportunity Statement for the overall study is:

- This project's goal is to establish a bridge management plan for 7 bridges on the Ottawa Queensway with consideration of traffic staging options and impacts. All 7 bridges are approximately 50 years old and in need of at least some repair work. Balancing traffic impacts–associated with bridge repairs(scheduled or unscheduled), rehabilitation or replacement–and bridge conditions / structural needs and property impacts, are very important considerations for the bridge management plan. As bridges get older and deteriorate overtime the level of upkeep on them tends to increase along with the level of traffic impact associated with this work.
- The condition of the existing bridges has been assessed during several bridge structural investigations. An Ontario Bridge Management Standards (OBMS)report conducted in 2015 was provided by the Ministry for information. In addition, Gannett Fleming conducted a visual structural inspection in June 2017 and a detailed bridge condition survey was completed by Golder Associates in January 2018.The rigid frame bridges are generally considered to be in fair condition.

- At the rigid frame bridge locations, both rehabilitation and replacement alternatives are feasible and have trade-offs and the decision at each location was subject to site-specific factors such as costs, traffic impacts and the availability of nearby construction staging areas. Short and longer term strategies were considered for these bridges as well as short term “holding strategies” to maintain the condition of the bridges at an acceptable level until more significant works (rehabilitation or replacement) are undertaken.
- The existing Rideau Canal Bridge is nearing the end of its service life with structural deficiencies in the piers. A rehabilitation holding strategy was completed to address the existing structural deficiencies and allow the study to be completed to recommend a replacement strategy.

2.0 Study Area

The study area for this C.H.R.A.R. (Figure 1) has been developed as per the *Environmental Guide for Built Heritage and Cultural Heritage Landscapes* (2007), which defines a study area as “all lands to be affected adversely either through displacement and/or disruption by the proposed highway design and construction within the existing and proposed highway right-of-way (R.O.W.) and the off-route zones adjacent or abutting the existing R.O.W. (Ministry of Transportation, 2007, p. 13).

It further describes the study area as having three zones, as follows:

1. A R.O.W. study zone comprises lands to be cleared and developed for the proposed highway R.O.W.
2. A 25-metre study zone is located immediately beside the R.O.W. and has potential for associated land clearance.
3. A 25 to 250-metre study zone further off the R.O.W. comprising an area where land clearance is unlike to occur, however, where impacts to B.H.R.s and C.H.L.s may be experienced.

The study area for this C.H.R.A.R. transects the Rideau Canal United Nations Educational, Scientific and Cultural Organization (U.N.E.S.C.O.) World Heritage Site. This recognition includes the canal structure, the associated Blockhouses, and defensive structures along its route from Ottawa to Kingston. A 30-metre buffer zone on either side of the canal is also part of the designation of the canal. The Rideau Canal was inscribed on the U.N.E.S.C.O. World Heritage List for its outstanding universal value in 2007 (ICOMOS, 2007). Parks Canada works closely with the various municipalities along the canal to protect the visual setting of it as effective management of the site goes beyond the buffer zone to include the broader setting (Parks Canada, 2022a).

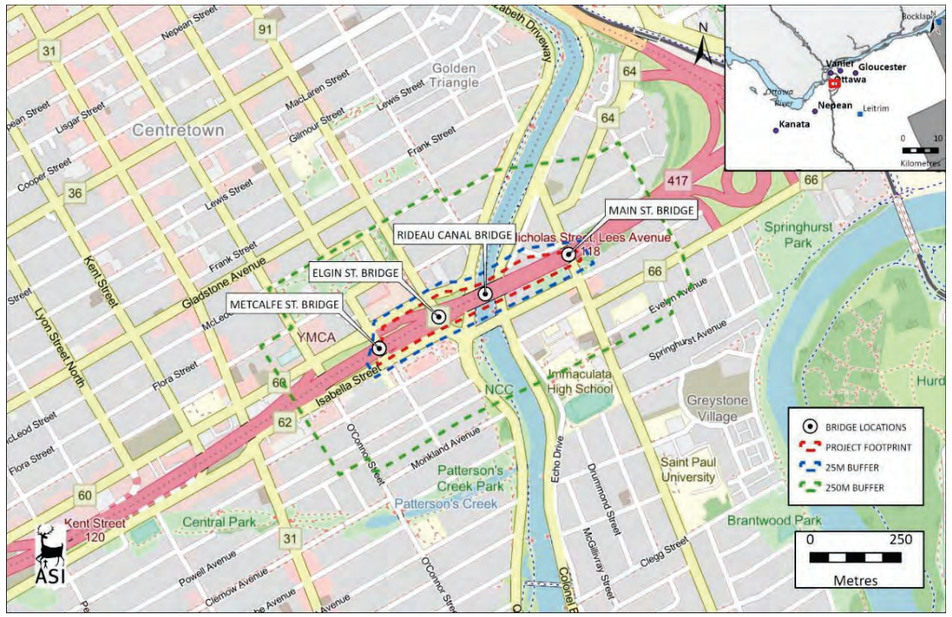

Figure 1: Location of the study area (Base Map: ©OpenStreetMap and contributors, Creative Commons-Share Alike License (C.C.-By-S.A.))

3.0 Cultural Heritage Policies and Guidelines

The Cultural Heritage Resource Assessment Report (C.H.R.A.R.) is prepared in accordance with Ministry of Transportation, Ontario (M.T.O.)'s cultural heritage conservation policy and guidelines and in particular, the following legislation and guidelines were reviewed in preparation of this report:

- *Ontario Heritage Act* (Ministry of Citizenship and Multiculturalism, 1990);
- *Standards and Guidelines for Conservation of Provincial Heritage Properties* (2010) (hereafter the Standards and Guidelines) issued under Section 25.2 of the *Ontario Heritage Act* (O.H.A.);
- *Class Environmental Assessment for Provincial Transportation Facilities* (amended, 2000) including M.T.O. technical standards and guidance documents;
- *Environmental Guide for Built Heritage and Cultural Heritage Landscapes* (MTO, 2007); and
- *Ontario Heritage Bridge Guidelines for Provincially Owned Bridges* (interim) MTO January 11, 2008 (OHBG)

Part III.1 of the O.H.A. enables the Minister of Citizenship and Multiculturalism (M.C.M.) in consultation with affected ministries and prescribed public bodies to prepare standards and guidelines that set out the criteria and process for identifying Provincial Heritage Properties (P.H.P.s) and to set standards for their protection, use and disposal. All Ontario government ministries and prescribed public bodies are required to follow the Standards and Guidelines, prepared under Section 25.2 of the O.H.A., when making any decisions affecting built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) on lands under their control.

3.1 Federal Guidelines

The C.H.R.A.R. has been prepared in consideration of the following documents which inform the portions of the study area that transect federal lands that the

National Capital Commission (N.C.C.) and Parks Canada are responsible for, which includes the Rideau Canal, the Queen Elizabeth Driveway and Colonel By Drive:

- *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2010)
  - Provides a framework for conserving cultural landscapes and Parks Canada will require that work along the Rideau Canal follow this document.
- *Rideau Canal and Merrickville Blockhouse Management Plan* (Parks Canada, 2022b)
  - This document provides a strategic guide for the management of this national historic site. It serves as a key document to inform the analysis of the Rideau Canal which transects the study area.
- Rideau Canal Corridor Landscape Strategy (Dillon Consulting Limited, 2012)
  - This document identifies key features, visual values and landscape character areas along the Rideau Canal corridor to provide effective planning and management recommendations for the landscape. This document was reviewed to inform the description and analysis of the Rideau Canal and surrounding lands.
- *Working with Cultural Landscapes: A Guide for the National Capital Region* (National Capital Commission, 2023b)
  - The guide is intended to be used to guide decision-making on N.C.C. lands and therefore it serves as a key guideline document to inform analysis of parkways that traverse the study area.

Parks Canada is tasked with the role of protecting and managing the Rideau Canal, which includes the locks, dams, canal walls and banks. Among other roles, the N.C.C. is responsible for managing natural and cultural heritage areas in the National Capital Region, including scenic parkways.

M.T.O. is required to obtain approval from N.C.C. on lands under their jurisdiction. Specific heritage permits/approvals are not required; however, heritage is considered under this approval.

3.2 Municipal/Regional Heritage Policies, Plans and Guidelines

The study area is located within the City of Ottawa. The following documents were reviewed to identify known B.H.R.s and C.H.L.s and to further understand their cultural heritage value and heritage attributes. M.T.O. is not subject to these policies:

- *City of Ottawa Official Plan* (City of Ottawa, 2021)
- *Centretown and Minto Park Heritage Conservation District Plan* (Sally Coutts Heritage Consulting Inc., 2022)

The following document were also reviewed to identify relevant objectives, definitions, policies and guidelines relating to B.H.R.s and C.H.L.s:

- *The Rideau Canal (Canada) – Advisory Body Evaluation* (ICOMOS, 2007)

The following document is currently in progress and was not reviewed:

- *Rideau Canal Cultural Landscape Study* (Matrix Heritage, on-going)[2]
  - *This study was commissioned by the N.C.C., Parks Canada and the City of Ottawa to produce a cultural landscape study of the Ottawa urban section of the Rideau Canal, between the Ottawa Locks at the Ottawa River north to Hog's Back Locks and Falls to the south, and which includes our study area.*

[2] For more information, see https://ncc-ccn.gc.ca/our-plans/rideau-canal-cultural-landscape-study

- *The purpose of the study is to create a guiding document that will outline the heritage values and character-defining elements of the landscape. The study is not replacing previous studies or statements of heritage value.*

4.0 Summary of Historical Development Within the Study Area

This section provides a brief summary of historical research. A review of available primary and secondary source material was undertaken to produce a contextual overview of the study area, including a general description of physiography, Indigenous land use, and Euro-Canadian settlement.

4.1 Physiography and Waterways

The study area is located in the Ottawa Valley Clay Plains physiographic region of southern Ontario. The Ottawa Valley clay between Pembroke and Hawkesbury consist of clay plains interrupted by ridges of rock or sand. The region divides into two parts, above and below Ottawa, with each section having its own distinctive traits. The upper section is characterized by a broad valley with the Laurentian uplands rising on both sides. The Quebec side of the valley features a steep slope with a sharp rise of approximately 600 feet, while the Ontario side is gradually sloping with some prominent scarps (Chapman & Putnam, 1984).

The physiography of the region was shaped by the deglaciation and the drainage of the Champlain Sea, and the subsequent human habitation of the area was influenced by the re-establishment of an environment which was suitable and sustainable for human occupation. The Champlain Sea at its maximum extent covered most of Ontario southeast of Pembroke (Figure 2). The Champlain Sea had receded from eastern Ontario by approximately 9,000 years before present. Following the receding of the Champlain Sea, the river and lakes in the landscape took their approximate shape and configuration including the Ottawa and Rideau Rivers (G. D. Watson, 1990).



Figure 2: Map of the extents of the Champlain Sea (Charles, 2023)

The Rideau River was engineered with the construction of the Rideau Canal in the early-nineteenth century. Much of the course of the canal was designed to take advantage of its existing alignment of the Rideau River and parts of its watershed. Sections of the Rideau River watershed were inundated in order to create navigable waters for the canal, such as the flooding of the swamp in Abraham Dow's property which led to the creation of the present-day Dow's Lake located southwest of the study area (Historical Society of Ottawa, 2024; K. Watson, 2007).

4.2 Indigenous Land Use and Settlement

Current archaeological evidence indicates that eastern Ontario has been occupied by human populations since the retreat of the Laurentide glacier approximately 13,000 years before present (B.P.) (Ferris, 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-

arctic. By approximately 10,000 B.P., the environment had progressively warmed (Edwards & Fritz, 1988) and populations now occupied less extensive territories (C. J. Ellis & Deller, 1990).

Between approximately 10,000-5,500 B.P., the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. By approximately 8,000 B.P., subsistence is believed to have shifted to an increased reliance on aquatic resources, likely anadromous fish (Wright, 2001, p. 125). It is likely that contact existed between populations in north-central Ontario and those in southern Ontario (Wright, 2001, p. 123). Such communication networks would certainly have extended into eastern Ontario. Lithic sites that likely date to the Late Palaeo or Early Archaic period have been reported for the Ottawa Valley area (e.g. Swayze, 2005; Swayze & McGhee, 2011). Polished stone and native copper implements were being produced by approximately 8,000 B.P.; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region.

Between 3,000-2,500 B.P., populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 B.P. and exchange and interaction networks broaden at this time (Spence et al., 1990, pp. 136, 138) and by approximately 2,000 B.P., evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1,500 B.P. there is macro botanical evidence for maize in southern Ontario, and it is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2,300 B.P. - it is likely that once similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch & Williamson, 2013, pp. 13–15). As is evident in detailed Anishinaabek ethnographies, winter was a period during which some families would depart from the larger group as it was easier to sustain smaller

populations (Rogers, 1962). It is generally understood that these populations were Algonquian-speakers during these millennia of settlement and land use.

Evidence for contacts with populations in New York State and New England has been found at the Morrison's Island-2 site in the Ottawa River Valley. The Morrison's Island-2 site demonstrates the continuation of this mortuary landscape as well as provides evidence for elaborate burial customs (Spence et al., 1990, p. 140). The presence of red ochre at this site is specifically implicit of ceremonialism.

In southern Ontario, from the beginning of the Late Woodland period at approximately 1,000 B.P., lifeways became more similar to that described in early historical documents. Algonquian-speaking populations in central-eastern Ontario were in contact with Iroquoian-speaking peoples to the south. This is hinted at by some analogous material culture between the two groups during this time (Fox, 1990, p. 183). Between approximately 1000-1300 Common Era (C.E.), the communal site is replaced by the village focused on horticulture. Seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson, 1990, p. 317). By 1300-1450 C.E., this episodic community disintegration was no longer practised and populations now communally occupied sites throughout the year (Dodd et al., 1990, p. 343). From 1450-1649 C.E. this process continued with the coalescence of these small villages into larger communities (Birch & Williamson, 2013). Through this process, the socio-political organization of the First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. By 1600 C.E., the communities within Simcoe County had formed the Confederation of Nations encountered by the first European explorers and missionaries.

Algonquian-speaking groups were historically documented wintering with the Huron-Wendat, some who abandoned their country on the shores of the St. Lawrence because of attacks from the Haudenosaunee (Thwaites, 1896-1901: 27: 37). Other Algonquian groups were recorded along the northern and eastern shores and islands of Lake Huron and Georgian Bay - the "Ouasouarini"

[Chippewa], the “Outchougai” [Outchougai], the “Atchiligouan” [Achiligouan] near the mouth of the French River and north of Manitoulin Island the “Amikouai, or the nation of the Beaver” [Amikwa; Algonquian] and the “Oumisagai” [Missisauga; Chippewa] (Thwaites 1896-1901, 18:229, 231). At the end of the summer 1670, Father Louys André began his mission work among the Mississagué, who were located on the banks of a river that empties into Lake Huron approximately 30 leagues from the Sault (Thwaites 1896-1901, 55:133-155).

Historically, the main Algonquin bands included the Kichesipirini or "Big River people", with their main village on Morrison Island; the Waweskarini (literally wawashkesh irini or "deer people"), or the "Petite Nation des Algonquins", who lived along the rivers immediately west of Montreal; the Matouweskarini (“Madawaska people”), who lived in the Madawaska River region west of Ottawa; the Kinouchebiriiniouek (Kinozhe sipi iriniwag or “Pike river people”), who lived in the Bonnechere River watershed near Renfrew; and the Onontchataronon, or people of Iroquet, who lived south and east of Ottawa (Morrison, 2005, pp. 14–15).

The earliest recorded form of the name ‘Algonquin’ is the name ‘Algoumequin’ which dates to 1603. The name ‘Algonquain’ appears in 1632 (Day & Trigger, 1978, p. 797). The name ‘Algonquins’ is used by the modern Algonquins of Ontario. The Algonquins were primarily hunter-fishers. While this was of the utmost economic importance, protocol was strictly guided by Algonquin cosmology and understanding of the spiritualism in the natural world. Some Algonquins also practiced limited horticulture on lots cleared by slash-and-burn (Whiteduck, 2002). Control of the waterways was also an important facet of the Algonquin economy, as sovereignty and tolls were exacted for right-of-passage. Such tolls may be seen as comparable to modern day visas and/or tariffs and were important elements of the Algonquins’ place and position in the geo-political world of the seventeenth century (Whiteduck, 2002). The Algonquin were referred to by the seventeenth century French as “la petite Nation.” This refers to a tradition that the Algonquins had previously (prior to the sixteenth century) constituted a much larger group which had been fragmented in a battle near Trois Rivières (Day & Trigger, 1978, p. 794).

In the 1640s, devastating epidemics and the traditional enmity between the Haudenosaunee and the Huron-Wendat (and their Algonquian allies such as the Nippissing and Odawa) led to the dispersal of the Huron-Wendat from southern Ontario. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. By the 1690s however, the Anishinaabeg were the only communities with a permanent presence in southern Ontario. From the beginning of the eighteenth century to the assertion of British sovereignty in 1763, there was no interruption to Anishinaabeg control and use of southern Ontario.

During this period Algonquins, Nipissings, and Hurons found refuge in various locations including French settlements at Trois-Rivières, Quebec City, Sillery, and Montreal; others went to the Lake St. John region to the east. Other Nipissings and Algonquins, remained in their traditional territories, avoiding the unsafe lower Ottawa valley in summer (Joan Holmes & Associates, 1993; Morrison, 2005). Algonquins did not completely abandon the Ottawa valley but withdrew to its interior locations between 1650 and 1675. Algonquins used the Ottawa River (Kitchi Zibi) for trade purposes from about 1654. During the last quarter of the seventeenth century, Algonquins were reported at numerous locations within the French sphere of influence.

The Algonquins are documented by the eighteenth century, to have considered early-on the need for conservation. This realisation was brought to the forefront by the extirpation of the vast majority of wild-life from eastern Ontario by the logging industry, which crippled the hunting-based economy of the Algonquins (Whiteduck, 2002).

In 1783, the British government purchased parts of eastern Ontario from Mynass, a Mississauga chief ignoring the Algonquin in the lower Ottawa Valley. Despite this, Algonquin warriors fought beside the British during the War of 1812 (1812-14) and helped defeat the Americans at the Battle of Chateauguay. Their reward for this service was the continued loss of their land to individual land sales and encroachment by American Loyalists and British immigrants moving into the valley. In 1822 the British were able to induce the Mississauga near Kingston on

Lake Ontario to sell most of what remained of the traditional Algonquin land in the Ottawa Valley, again without consultation with the Algonquin who had never surrendered their claim to the area but still received nothing from its sale (Algonquins of Ontario, 2013a).

Land records dating from 1824 indicate numerous Indigenous people who continued to live along waterways in the Mississippi, Madawaska, and Rideau watersheds (Huitema, n.d., p. 32). By the mid-nineteenth century, Algonquin and Nippissing bands were forced to petition the government for the creation of reserve lands within their traditional territories of the Ottawa Valley due to the wave of settlement (for example Algonquin Chief Pierre Shawanepinesi in Bedford township in the 1840s), however most were not successful. Some grants were even revoked to support the growing lumber industry (Algonquins of Ontario, 2013b). There are presently ten federally recognized Algonquin communities however the Algonquins of Pikwàkanagàn Reserve at Golden Lake Reserve near Renfrew is the only one in Ontario, though it is acknowledged that Wahgoshig, Matachewan and Temagami are of at least partially Algonquin descent (Morrison, 2005, p. 1). The remaining nine federally recognized Algonquin communities are located in Quebec, which includes the Kitigan Zibi (River Desert) Anishinabeg. Their reserve was established in 1851 and is located near Maniwaki, Quebec. The people of the community originally migrated from the Lake of Two Mountains (Oka area) (Kitigan Zibi, 2021; Morrison, 2005). While the Algonquin communities of the twenty-first century share some similar aspects to their histories and cultural practices, each community is unique.

The study area is within the Crawford Purchase of 1783. The territory covered by the Crawford Purchase includes the counties of Prince Edward, Hastings, Lennox and Addington, Frontenac, Leeds, Greenville, Stormont, Dundas and Glengarry, and the modern towns of Belleville, Kingston, Brockville and Cornwall. This purchase opened twenty-nine new townships for the establishment of Loyalists (Surtees, 1984, pp. 24–25).

Following the American Revolutionary War, the British Crown needed to find lands on which to settle United Empire Loyalists, including approximately 2,000

members of the Six Nations Confederacy who had fought alongside British troops. The Crown was planning on providing lands for Loyalist settlers in Québec and Southeastern Ontario, including providing land in the Bay of Quinte for Six Nations refugees. The British army also needed to transfer goods, weapons, and military personnel from Carleton Island, lost in the hands of the American revolutionaries (Murray, 2018, pp. 259–261). In the spring of 1783, Surveyor General Samuel Holland and Mohawk leaders Joseph Brant and John Deseronto were sent by Governor Frederick Haldimand to assess the land near Cataraqui (present-day Kingston). In the fall of the same year, Captain William Redford Crawford, formerly of the Royal Regiment of New York, was mandated by the Crown to acquire the land from the Mississaugas (Murray, 2018, p. 259).

There is no map, deed, formal treaty document, or wampum documenting this purchase and the names of the signees are unknown (Murray, 2018, pp. 259–260). The negotiations are, however, reported by Crawford in a letter to Haldimand dated of October 9, 1783 (Crawford, 1783). In this letter, Crawford mentions a Mississauga Chief named Old Mynass as well as three Onondaga Chiefs from Montreal. The agreement with the Mississauga Chiefs covers land between the Trent and Gananoque Rivers, including all islands, “extending from the Lake back as far as a man can travel in a day” (Crawford, 1783). The depth of the land ceded is vague in the agreement but was later interpreted by the British surveyors as equivalent to two or three townships, or approximately 45 miles (Surtees, 1984, p. 24). Crawford further reports that the Mississauga Chiefs requested clothes, guns, gun powder and bullets in exchange, which they apparently received the following year (Surtees, 1984, p. 23). Crawford negotiated a second agreement with the Chief Old Mynass who claimed that the land east to the Gananoque River up to the Ottawa River has been given to him by the French. Mynass received wampum belts to seal the agreement and the promise that the Crown would provide clothing to him, his family and descendants annually. The signing Mississauga nations include present day communities of Alderville, Curve Lake, Hiawatha, and Scugog Island First Nation.

4.3 Historical Euro-Canadian Township Survey and Settlement

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes followed existing Indigenous trails that typically followed the highlands adjacent to various creeks and rivers (Archaeological Services Inc., 2006). Early European settlements occupied similar locations as Indigenous settlements as they were generally accessible by trail or water routes and would have been in locations with good soil and suitable topography to ensure adequate drainage.

Historically, the study area is located in the former Township of Nepean, County of Carleton, in part of Lot F and Lot G, Broken Front C; and, Lot F and Lot G, Broken Front D.

4.3.1 Township of Nepean

Settlement in the Ottawa area was not actively encouraged by the colonial government until the late eighteenth century. With the end of the American Revolutionary war in 1783, an exodus of Loyalists and disbanded soldiers moving north across the St. Lawrence required the acquisition and settling of new lands. In response, the British Government sought to obtain the rights to lands in eastern Ontario by negotiating treaties with local Indigenous groups. The first such treaty, known as the “Crawford Purchase” was negotiated in 1783 with the Mississauga for a huge parcel of land that would become the Counties of Glengarry, Stormont, Dundas, Prescott, Russell, Leeds, Grenville and Prince Edward, the southern parts of Frontenac, Lennox, Addington and Hastings (Elliot, 1991).

United Empire Loyalists began settling the newly surveyed townships along the north shore of the St. Lawrence River and Lake Ontario the following year. By the late 1780s the waterfront townships were full and more land was required to meet both an increase in the size of grants to all Loyalists and grant obligations to the children of Loyalists who were now entitled to 200 acres in their own right upon reaching the age of 21 (Elliot, 1991).

The outline survey of Nepean Township was completed in preparation for George Hamilton’s settlement. In 1792 Hamilton, a veteran of the Revolutionary War, applied to the colonial government for land in the township claiming he could bring 143 settlers to the area. Although originally referred to as Township “D”, the township was named Nepean in 1798. Hamilton had difficulty attracting settlers because of the distance from the St. Lawrence River and the lack of any road communication and abandoned the settlement. His grant was revoked by the government, who decided that it was more prudent to populate the township through the granting of individual lots (Elliot, 1991).

Rice Honeywell of Prescott was a landholder in Nepean Township and gave 1,000 acres of land in Nepean to his son Ira when he became an adult. Between 1809 and 1810, Ira cleared about four acres of the land given to him by his father and the following spring, moved his family into the township, thus becoming the first Euro-Canadian settler in the township. Other Euro-Canadian settlers followed the Honeywells. In 1814, a Mr. Draper moved to the township and a pair of brothers, Roger and Martin Moore followed. Ira Honeywell built a new home by 1819 on Richmond Road and was granted a license to operate a ferry across the Ottawa River (Mika & Mika, 1983).

Municipal government for Nepean began on 1 January 1850 when a meeting was held at Bell’s Corners to elect the first township council following the Municipal Act of 1849. At that time the township included much of the western portion of what is now Ottawa. Known at the time as Bytown, Ottawa was a lumber town with desires to become the capital of the county and over time, Ottawa took over much of the township’s territory. Between 1907 and 1947, Ottawa took over 4,459 acres of Nepean Township including the areas of Bayswater, Hintonburg,

Merivale Road area, and others. An additional 7,420 acres were annexed by the now capital city in 1950. This reduced Nepean's population from 20,830 to 2,503 people living in a rural environment. Through well-planned residential and commercial development, Nepean was incorporated as a city in 1978 (Mika & Mika, 1983). Nepean's city status was short-lived as in 2001, it along with 10 other municipalities were merged into the new City of Ottawa (Welch & Payne, 2015).

4.3.2 City of Ottawa

The study area is located within the City of Ottawa. In the vicinity of what would become the City of Ottawa, Philemon Wright and his family, along with several other families settled on the north side of the Ottawa River in 1800, a few miles below the Chaudière Falls. Within a few years, Wright had erected a sawmill, grist mill, tannery, blacksmith's shop, bakery, and a shoemaker's. He was able to do this because of the area's rich timber resources and the community became known as Wight's Town, or the Town of Wrightville (as Hull would be known until its official name change in 1875) (Mika & Mika, 1983).

The first Euro-Canadian to settle on the site of present-day Ottawa was Jehiel Collins in 1809. He settled on a canoe landing on the south bank of the Ottawa River and the place was known as Collins' Landing. When he sold his property to Caleb Bellows and the name of the landing changed with the change in ownership. In 1821, Nicholas Sparks purchased 200 acres of land from John Burrows, this would be the area that makes up the present downtown core of Ottawa. Sparks surveyed his land as the newly planned Rideau Canal was to be built through his property. He built a new street, Sparks Street, and began selling lots along the street. The construction of the Rideau Canal began in 1826 and many people were attracted to the area for the work. By the following year, 1827, the areas known as Upper Town and Lower Town were hubs of activity with various businesses in the community known as Bytown. The canal was completed in 1832 and Bytown became a centre for the lumber industry (Mika & Mika, 1983).

Bytown was incorporated as a town in 1847 though this decision was revoked in 1849, only to be again reincorporated in 1850. The 1850s saw the establishment of the railway into Bytown and in 1855 it became a city and was renamed Ottawa. Subsequently it was decided in 1857 by Queen Victoria that Ottawa should be the capital of Canada. Following this, there was momentous growth within the new city. Construction began on the Parliament Buildings in 1860 and the Library of Parliament in 1876 (Mika & Mika, 1983).

As the capital of Canada, much of the economy of the City of Ottawa was driven by those who worked for the government as well as in secondary industries that were necessary to support those workers (Sally Coutts Heritage Consulting Inc., 2022; Wallace, 2012c). During the early-twentieth century the city experienced considerable growth and there was a need for planning for the capital, which is discussed in further detail in Section 4.3.4. The neighbourhoods that are within the study area are briefly discussed in the following Section 4.3.3.

As mentioned in the section above, Ottawa merged with 10 other municipalities in 2001 to form the current City of Ottawa (Welch & Payne, 2015).

4.3.3 Neighbourhoods

Many neighbourhoods within current limits of the City of Ottawa began as separate communities but over time were slowly absorbed into the expanding city. Within the study area, some of the oldest neighbourhoods in Ottawa surround Highway 417 including: Centretown to the north of the highway and west of the canal; the Glebe to the southwest; and Old Ottawa East on the eastern side of the canal. The Centretown neighbourhood is identified in the Central and East Downtown Core Secondary Plan and the Centretown Heritage Conservation District which is protected under Part V of the *Ontario Heritage Act*, Old Ottawa East identified in the Old Ottawa East Secondary Plan, and a portion of the Glebe identified in the Bank Street in the Glebe Secondary Plan. Figure 3 labels the Central and East Downtown Core Secondary Plan as 1, the Old Ottawa East Secondary Plan is 8, and Bank Street in the Glebe Secondary Plan is 'E' and the outline of the heritage conservation district is shown in Appendix A.

Much of the development in Centretown occurred following the sale of two large estates during the 1870s, the By and Stewart Estates. It was primarily a residential community for those working in civil service and many of the buildings were constructed by the early-twentieth century. Bank Street became the commercial street of the neighbourhood and buildings along it reflected that purpose. During the twentieth century, many community members living in the neighbourhood operated small businesses along Bank and Elgin Streets. The population of the community has changed over time and has been reflected in the built form, with the single detached houses that were constructed in the nineteenth century being interspersed with duplexes, row houses, and apartment buildings of the twentieth century (Sally Coutts Heritage Consulting Inc., 2022).

The Glebe was originally a portion of land set aside as a Clergy Reserve for St. Andrews Presbyterian Church in 1837. It was eventually subdivided and leased until 1875, though the land was not valuable and there was little farming. It was mostly used for market gardens to supply the urban population. The extension of Bank Street in the late-nineteenth century was the primary motivator behind the urban development of the neighbourhood and commercial buildings began to appear. The arrival of the electric streetcar, subdivision of lands east of Bank Street, and the construction of the Parkway system and park system had a large impact on the residential development of the Glebe in the late-nineteenth century and in the early-twentieth century (City of Ottawa, 2011).

Originally established as Archville during the 1870s, Ottawa East was incorporated as a village in 1888. Many of the village's residents worked in the trades or as civil servants. Connecting the village to the City of Ottawa itself was important and by 1890 a swing bridge connected Argyle Street to Cedar Street. Following the annexation of the village by the City of Ottawa in 1907, the Pretoria Bridge was constructed in 1917 which greatly increased the former village's connection with the ever-growing City of Ottawa (Lenzo, 2023; Wallace, 2012c, 2012b).

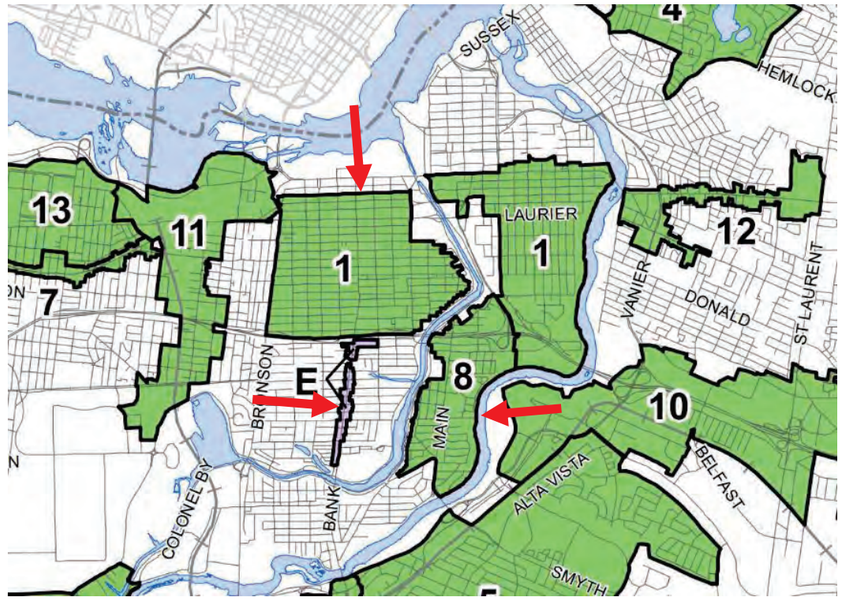

Figure 3: Portion of map of the Urban Areas Subject to a Secondary Plan from the *Ottawa Official Plan* (City of Ottawa, 2021). Red arrows added by A.S.I. indicate the Secondary Plans which the study area intersects with.

4.3.4 National Capital Region

The study area is located in the National Capital Region, an area of over 4,600 square kilometres, spanning both Ontario and Quebec and including the City of Ottawa. The National Capital Region (N.C.R.) was formally established under the *National Capital Act* in 1959 with the National Capital Commission (N.C.C.) charged with the following mandate under Section 10(1) of the Act:

> "The objects and purposes of the Commission are to prepare plans for and assist in the development, conservation and improvement of the National Capital Region in order that the nature and character of the seat of the Government of Canada may be in accordance with its national significance" (National Capital Act, 1959).

The beginnings of the NCC date back to the turn of the twentieth century when the Ottawa Improvement Commission (O.I.C.) was first established in 1899 (National Capital Commission, 2023a). Part of the impetus of the O.I.C. was the establishment of a 'capital' city landscape. The early mandate and focus of the O.I.C. was guided by the *Preliminary Report to the Ottawa Improvement Commission* (Todd, 1903) with recommendations including the showcasing of Ottawa's specific natural setting. The priorities for the O.I.C. then became the clean up of the banks of the Rideau Canal, the creation and expansion of a park system, along with the creation of a network of boulevards and parkways. The Queen Elizabeth Driveway, known at the time as the Rideau Canal Driveway, was one of the first O.I.C. projects (National Capital Commission, 2023a).

The O.I.C. was reorganized in 1927 and became the Federal District Commission (F.D.C.). As the F.D.C., the area under its control expanded to include parts of Quebec. The F.D.C. expanded the region's open spaces, began purchasing land for the development of Gatineau Park, improved Dow's Lake, and began to develop Confederation Boulevard. An additional 2,330 square kilometres came under the direction of the F.D.C. in 1945 and became known as the National Capital District. The F.D.C. hired planner Jacques Gréber to develop a plan for the Capital and in 1950 the *General Report on the Plan for the National Capital* was published (National Capital Commission, 2023a). This report would become known as the Gréber Plan and it outlined a reorganization of the rail and road networks of Ottawa, and included an east-west expressway along the former Canadian National Railway line (the present Queensway) (Gréber, 1950) (Figure 4). By 1967, all of the rail lines were removed from the downtown area of Ottawa and in their place was parkways and expressways. One of these is the Queensway (the present Highway 417). The Gréber Plan would influence urban planning in Ottawa and in what would become known as the National Capital Region for the next 50 years.



Figure 4: Map of the Touristic Circuits and the Protected Natural Scenery as Proposed on the Master Plan – from the Plan for the National Capital (Gréber, 1950).

The National Capital Region was established in 1959 along with the N.C.C. to implement the recommendations in the Gréber Plan. The region at this time had grown to 4,660 square kilometres with land on both sides of the Ottawa River and including the northern section of Gatineau Park and lands in the south which were designated for the Greenbelt (National Capital Commission, 2023a).

4.3.5 Parkways

An important component of the early planning focus of the National Capital Region and the creation of a capital landscape was development of a parkway system that included both high speed parkways as well as scenic parkway commuter routes. In the planning and development context for the parkways, city neighbourhoods were built as balanced neighbourhoods “in harmony with green and open spaces linked by scenic drives” (French, 1995, p. 13). Within the study area, the Queen Elizabeth Driveway and Colonel By Drive are two of these such planned parkways.

The Queen Elizabeth Driveway, originally known as the Rideau Canal Drive, was one of the first projects of the O.I.C. The establishment of the new parkway system started with this project and worked to convert an industrial waterfront, that was overgrown into a landscaped drive that recognized its settings and recreational value. Its route followed the western side of the Rideau Canal to Dow’s Lake. In 1965 it was officially renamed as Queen Elizabeth Driveway (French, 1995) (Figure 5 and Figure 6).

Colonel By Drive also began following a portion of a pre-existing roadway on the eastern side of the Rideau Canal. Its construction began in 1920 and it was constructed in smaller pieces and was not completed until 1967. That year it was officially opened to the public as Colonel By Drive. It serves as both a commuter and ceremonial route for those travelling around Ottawa (French, 1995) (Figure 5 and Figure 6).

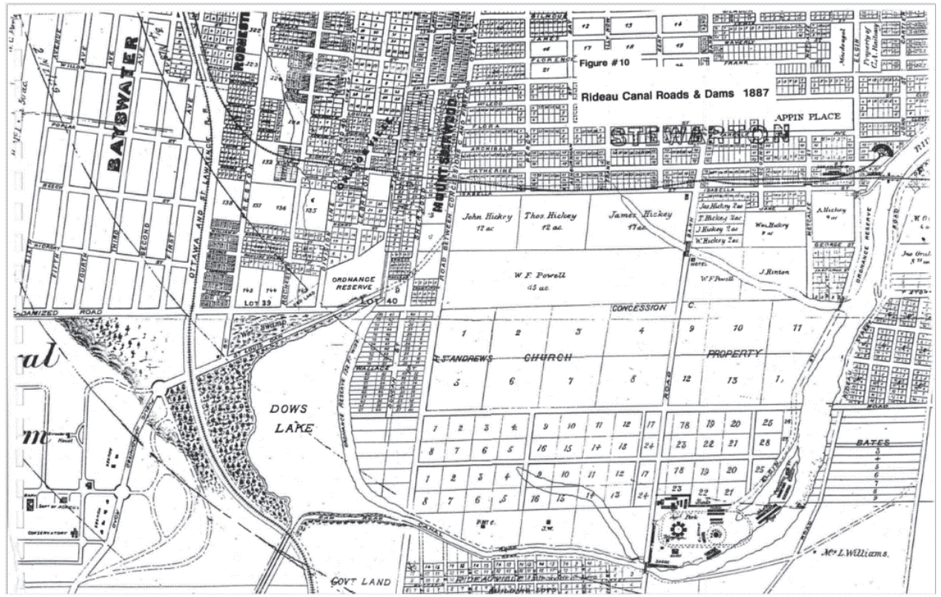

Figure 5: Map of the Rideau Canal roads in 1887 (French, 1995).

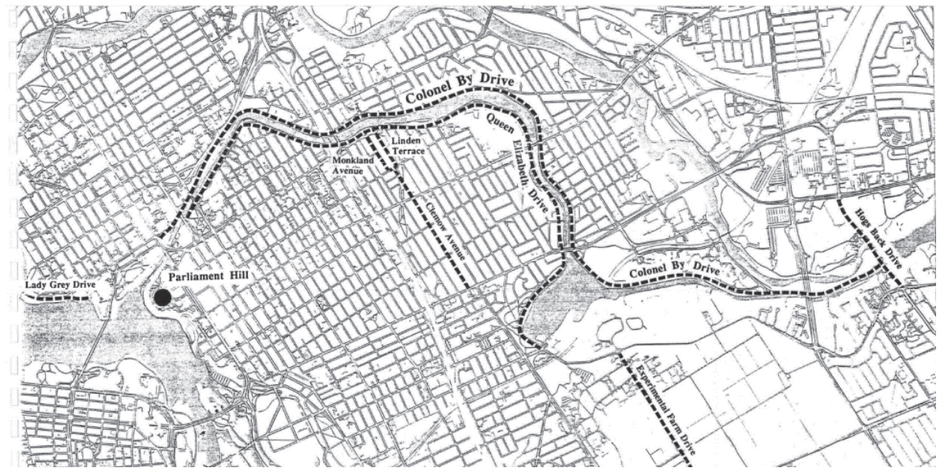

Figure 6: Map with Queen Elizabeth Driveway and Colonel By Drive identified (French, 1995).

4.3.6 Queensway and Highway 417

The study area is centred along the Queensway which is part of the larger Highway 417. The plan for the Queensway, originally called the Kingsway until the passing of King George VI, was conceived as part of the Gréber Plan and would involve the construction of the expressway following the former Canadian National Railway right-of-way through Ottawa and would connect with the scenic parkway system (Anonymous, 2010; Gréber, 1950). The 16-kilometre highway within the city was to be a four-lane freeway, with depressed grass median, and grade separated interchanges. Construction began in 1957 with an inaugural ceremony attended by Queen Elizabeth II and all sections of the highway were completed by 1967 (Unterman McPhail Associates, 2011). In the vicinity of the study area, the introduction of the Queensway did require the demolition of some buildings, though it did not greatly alter the physical limits and connective elements of the surrounding neighbourhoods. The highway was constructed within a pre-existing rail right-of-way and therefore continued to reinforce an east-west linear corridor established in the late-nineteenth century.

Highway 417 spans from the Ontario-Quèbec border northwest to Arnprior, totalling approximately 186 kilometres in length, and is a part of the Trans-Canada Highway. A sod-turning ceremony for the highway took place in 1968 and the new alignment for the 417 was completed in 1971. Within Ottawa, along the Queensway, additional traffic lanes were installed during the 1980s and 1990s resulting in the loss of the original grass median. In the 1990s, concrete barriers were added between the opposing lanes of travel (Bevers, 2023; Unterman McPhail Associates, 2011).

4.3.7 Rideau Canal

The study area crosses over the Rideau Canal. The decision to undertake the construction of the canal happened following the War of 1812 when it became apparent that another means of protection and the movement of troops and goods was needed as the St. Lawrence River was inadequate for these purposes. The design and engineering of the canal was a challenge and construction did not

begin until 1826 under the supervision of Lieutenant-Colonel John By of the Corps of the Royal Engineers. This new artificial waterway would help to further connect Upper Canada (Ontario) and Lower Canada (Québec). The construction of the canal brought an influx of immigrants to work on the canal and to settle in various communities along its route, such as what was known at the time as Bytown, now Ottawa (Mika & Mika, 1983; Parks Canada & Government of Canada, 2006).

The Rideau Canal was completed in 1832 with a total length of 202 kilometres from Ottawa to Kingston. Along the route of the canal were 47 locks, 52 dams, six blockhouses, and fortifications constructed at Kingston. While it was constructed for military purposes, by the middle of the nineteenth century, its primary purpose was commercial transportation(Marsh, 2015; Parks Canada, 2022c; Parks Canada & Government of Canada, 2006).

For the following 30 years after its completion, many settlements flourished along its pathway. With the arrival of the various railways during the 1850s, the use of the canal for the shipment of good decreased and development of the communities along its route slowed; however, by the late-nineteenth century a tourism and vacation industry developed along the canal with hotels and cottages being built in increasing numbers. This trend rapidly expanded in the early-twentieth century when road access improved to the Rideau and Cataraqui lakes (Humphreys, 1974; Parks Canada & Government of Canada, 2006).

In 1925 the Rideau Canal was designated as a National Historic Site in Canada, it was identified as a Canadian Heritage River System in 2000 (Canadian Heritage Rivers Board and Technical Planning Committee, n.d.), and in 2007 it was inscribed on the United Nations Educational, Scientific and Cultural Organization (U.N.E.S.C.O.) World Heritage List for its outstanding universal value. This recognition includes the canal structure, the associated Blockhouses, and defensive structures along its route from Ottawa to Kingston. A 30-metre buffer zone on either side of the canal is also part of the designation of the canal. As part of the management of the canal today, Parks Canada works closely with the various municipalities along the canal to protect the visual setting of it (ICOMOS, 2007; Parks Canada, 2022c, 2022a). The canal serves a recreational purpose today

with many pleasure boaters and paddlers on the water and a skating pathway in the winter. It is a major tourist destination and has a strong relationships with the Parliamentary precinct, with Lock 1 terminating in close proximity to Parliament Hill and Confederation Boulevard. The Canal and its intersection with the Highway 417 forms part of one of the major scenic entry routes in the City of Ottawa (Figure 7). The Rideau Canal is also accessible by land via road, bicycle, and hiking with self-guided walking trails at many of its lock stations and visitors can experience the parks along its route (Parks Canada, 2023a, 2023b).

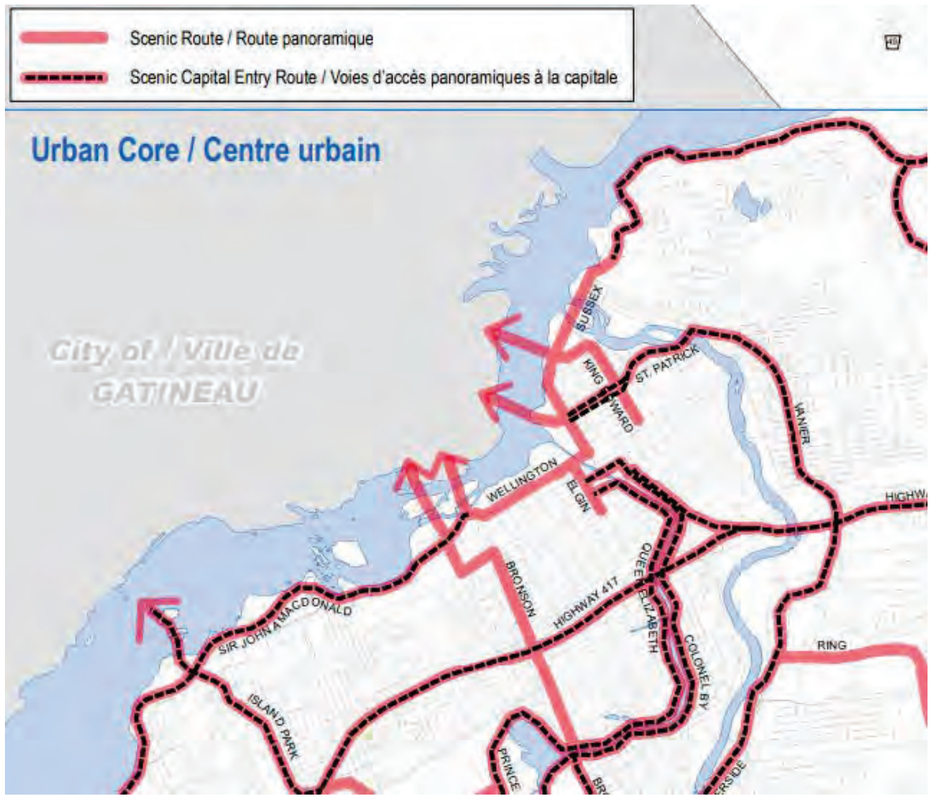

Figure 7: Urban Core of the Scenic Routes mapping from the *Ottawa Official Plan* (City of Ottawa, 2021).

4.4 Review of Historical Mapping

The 1863 *Map of the County of Carleton* (Gray, 1863) and the 1879 *Illustrated Historical Atlas of the County of Carleton* (Belden, 1879) were examined to determine the presence of historical features within the study area during the nineteenth century (Figure 8 and Figure 9). Historically, the study area is located in the former Township of Nepean, County of Carleton, in part of Lot F and Lot G, Broken Front C; and, Lot F and Lot G, Broken Front D.

It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases. For instance, they were often financed by subscription limiting the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. The use of historical map sources to reconstruct or predict the location of former features within the modern landscape generally begins by using common reference points between the various sources. The historical maps are geo-referenced to provide the most accurate determination of the location of any property on a modern map. The results of this exercise can often be imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including differences of scale and resolution, and distortions introduced by reproduction of the sources.

The 1863 map (Figure 8) depicts the study area outside of the limits of the City of Ottawa in a rural agricultural context. The Rideau Canal has been constructed and intersects with the eastern portion of the study area in a general north-south alignment. A roadway to the east of the canal also transects the study area, though it does not follow the alignment of any present roads within the study area. The 1879 map (Figure 9) shows the subdivision of the larger lots within the study area into smaller property parcels, in many instances into town lots. Areas on the map with red shading indicate dense settlement and includes the village of Stewarton on the west side of the canal. Several farmhouses are also located within the study area on the larger lots. The road that was illustrated on the earlier mapping on the east side of the canal is now more closely following the canal, this is likely the present-day Colonel By Drive. A similar road on the western

side of the canal, is likely the present-day Queen Elizabeth Parkway. The land between the canal and the roads is identified as Ordinance Land. Several other roads within the study area are depicted, following their present alignments.

In addition to nineteenth-century mapping, historical topographic mapping and an aerial photograph from the twentieth century were examined. This report presents maps from 1906, 1928, 1965, and 1991 (Figure 10 to Figure 12).

The 1906 topographic map (Figure 10) depicts the density of Ottawa extending to the northern limits of the study area. Within the study area, many of the streets on the west side of the canal have been laid out and on the east side, Main Street and several of the smaller streets to the east of Main Street are extant. There is a Y-intersection with a road branching near the southern end of Elgin Street joining with Queen Elizabeth Driveway to the north of the rail line. A variety of brick/stone and wooden houses are along the streets, as indicated by red and black squares respectively. A brick schoolhouse is east of Main Street and south of Lees Avenue. The Grand Trunk Railway bi-sects the study area in a general northeast-southwest alignment and is carried over the Rideau Canal by a bridge of unknown construction material. A second bridge is located to the north of the rail bridge, connecting Park Avenue on the west to Harvey Street on the east.

The 1928 aerial photograph (Figure 11) captures further changes within and around the study area. The original Pretoria Bridge has been constructed and crosses the Rideau Canal to the south of the rail line. Multiple rail lines are visible on the western side of the canal as part of the railway. The bridge to the north of the railway is no longer present over the canal. The Victoria Memorial Museum (the present Canadian Museum of Nature) has been completed at the western corner of the study area. The Ottawa Curling Club building has also been constructed on O'Connor Street southwest of the museum and a large building on the east side of O'Connor Street is also present. Land adjacent to the canal is lined with trees and is greenspace.

In the 1965 aerial photograph (Figure 12) the railway lines have been removed and the construction of the Queensway and its bridges over O'Connor Street,

Metcalfe Street, Elgin Street, the Rideau Canal, and Main Street has begun within the study area. The new highway follows the alignment of the former railway. Residential properties have filled out the study area. The Tiffany Apartment building at 150 Queen Elizabeth Driveway has been constructed and the school at 140 Main Street has also been built. Other apartment and large buildings have been constructed within the study area. A large parking lot with a building is located north of the intersection of Metcalfe Street and Pretoria Avenue. The study area is situated within an urban context.

The 1991 aerial photograph (Figure 13) captures the study area in the late-twentieth century in a similar context to the present. The multi-lane Queensway transects the study area with margins of greenspace on the north and south sides. North of the Queensway and west of the canal, there are several large institutional buildings as well as apartment buildings. To the south of the Queensway, on Pretoria Avenue and Metcalfe Street are apartment buildings. Additional commercial buildings have been constructed north of the intersection of Pretoria Avenue and Metcalfe Street. There are also some apartment buildings on the east side of the canal northeast and southwest of the intersection of Main Street and Echo Drive. The 1981 re-constructed Pretoria Bridge is visible in the aerial photograph (Heritage Ottawa, n.d.). Greenspace and walking trails line both sides of the Rideau Canal through the study area.



Figure 8: The study area overlaid on the 1863 *Map of the County of Carleton* (Gray, 1863).



Figure 9: The study area overlaid on the 1879 Illustrated *Historical Atlas of the County of Carleton* (Belden, 1879).

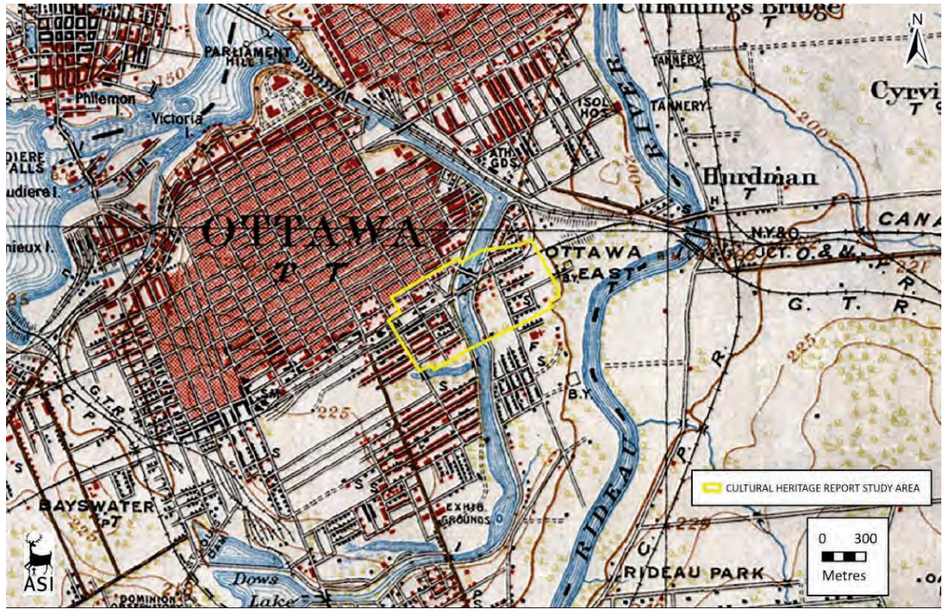

Figure 10: The study area overlaid on the 1906 topographic map of Ottawa (Department of Militia and Defence, 1906).



Figure 11: The study area overlaid on the 1928 aerial photograph of Ottawa (City of Ottawa, 2022).



Figure 12: The study area overlaid on the 1965 aerial photograph of Ottawa (City of Ottawa, 2022).

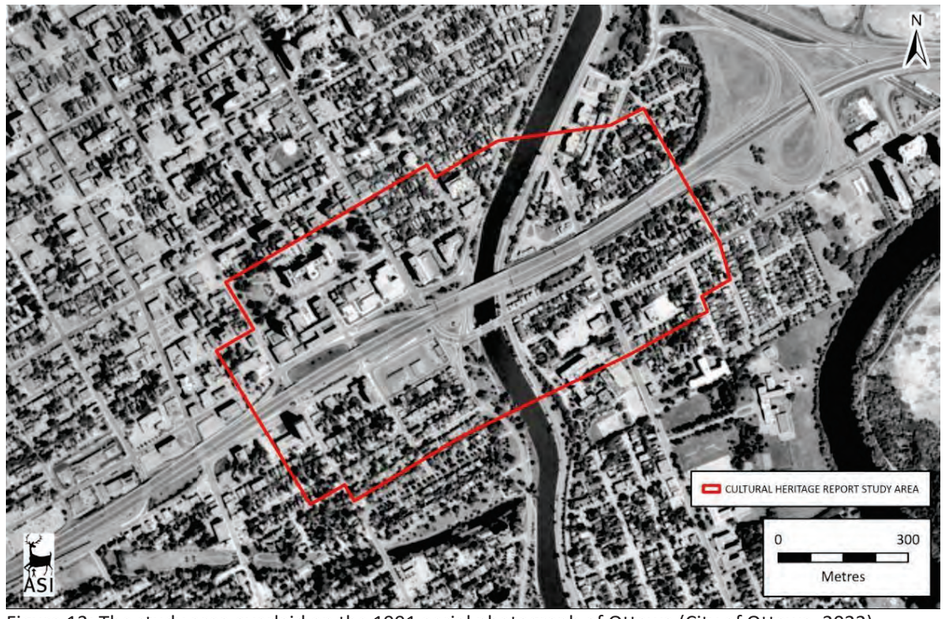

Figure 13: The study area overlaid on the 1991 aerial photograph of Ottawa (City of Ottawa, 2022).

5.0 Known and Potential Built Heritage Resources and Cultural Heritage Landscapes within the Study Area

The following sections present the results of desktop data collection, community engagement, and field review.

5.1 Review of Existing Heritage Inventories

A number of resources were consulted in order to identify previously identified built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) within the study area. These resources, reviewed on 20 December 2023, include:

- The City of Ottawa's *Individual Designation* (City of Ottawa, 2023c);
- The City of Ottawa's *Listings on the Heritage Register* (City of Ottawa, 2023d);
- The City of Ottawa's *Heritage Conservation Districts* (City of Ottawa, 2023b);
- The City of Ottawa's Heritage Character Areas (City of Ottawa, 2023a);
- The City of Ottawa's interactive mapping website, *geoOttawa* (City of Ottawa, 2022);
- The *Ontario Heritage Act Register* (Ontario Heritage Trust, n.d.b);
- The *Places of Worship Inventory* (Ontario Heritage Trust, n.d.c);
- The inventory of Ontario Heritage Trust Easements (Ontario Heritage Trust, n.d.a);
- The Ontario Heritage Trust's *An Inventory of Provincial Plaques Across Ontario*: a PDF of Ontario Heritage Trust Plaques and their locations (Ontario Heritage Trust, 2023);
- The Ontario Heritage Trust's *An Inventory of Ontario Heritage Trust-owned properties across Ontario*: a PDF of properties owned by the Ontario Heritage Trust (Ontario Heritage Trust, 2019);

- Inventory of known cemeteries/burial sites in the Ontario Genealogical Society's online databases (Ontario Genealogical Society, n.d.);
- Canada's Historic Places website: available online, the searchable register provides information on historic places recognized for their heritage value at the local, provincial, territorial, and national levels (Parks Canada, n.d.a);
- Directory of Federal Heritage Designations: a searchable on-line database that identifies National Historic Sites, National Historic Events, National Historic People, Heritage Railway Stations, Federal Heritage Buildings, and Heritage Lighthouses (Parks Canada, n.d.b);
- Canadian Heritage River System: a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage (Canadian Heritage Rivers Board and Technical Planning Committee, n.d.); and,
- United Nations Educational, Scientific and Cultural Organization (U.N.E.S.C.O.) World Heritage Sites (U.N.E.S.C.O. World Heritage Centre, n.d.).

5.2 Review of Previous Heritage Reporting

Previous cultural heritage studies undertaken within parts of the study area were also reviewed. These include:

- Queensway Ottawa Downtown Bridges: Metcalfe to Main Revitalization Project GWP-4170-13-00 Draft Cultural Heritage Assessment Report (CHAR) (MTBA Associates Inc., 2023)

5.3 Community Engagement

The following individuals, groups, and/or organizations were contacted to gather information on known and potential B.H.R.s and C.H.L.s, active and inactive cemeteries, and areas of identified Indigenous interest within the study area:

- Avery Marshall, Planner I, Heritage Planning, City of Ottawa (email communication 21 December 2023, 22 and 29 January 2024).
    - Staff provided the following information:
        - confirm the listed and designated properties within the study area;
        - provided listing reports for two properties adjacent to the Queensway (60 Main Street and 150 Queen Elizabeth Driveway);
        - flagged a designated property in relation to the project (61 Main Street);
        - indicated that the City had received notice of intention to demolish several listed properties within the study area (23 Strathcona Avenue, 12-18 Hawthorne Avenue, and 170 Pretoria Avenue);
        - called our attention to the on-going cultural landscape study for the Rideau Canal; and
        - requested a copy of the C.H.R.A.R. once available.
    - This information was acknowledged, and details from the listing reports for 60 Main Street and 150 Queen Elizabeth Driveway were incorporated into this report.
- Heritage Ottawa (email communication 26 March 2024). Email request was submitted to the organization to confirm interest in this project and whether there were any heritage concerns Heritage Ottawa would like to highlight that would not have been previously-identified by the City of Ottawa, Parks Canada, or the National Capital Commission. A response was outstanding at the time of report submission.

- The Ministry of Citizenship and Multiculturalism (email communication 12 and 13 February 2024). Email correspondence confirmed that there are no properties designated by the Minister and that the Ministry is not aware of any known Provincial Heritage Properties within the study area. A copy of the C.H.R.A.R. was requested for review.
- The Ontario Heritage Trust (email communication 17 and 19 January 2024). Email correspondence indicated that there are no conservation easements or Trust-owned properties within or adjacent to the study area.

On-going discussions regarding heritage aspects of this project between the Ontario Ministry of Transportation (M.T.O.), the National Capital Commission (N.C.C.), and Parks Canada have taken place since 2017 through a series of Technical Advisory meetings. Parks Canada and N.C.C. are primarily concerned with Rideau Canal and N.C.C. lands, which includes the parkways. During these meetings, discussion and feedback was received regarding the project impacts to the Rideau Canal, and which is documented in the Transportation Environmental Study Report (BT Engineering, 2023).

A meeting was held on January 23, 2024 between the M.T.O., Morrison Hershfield, Archaeological Services Inc. (A.S.I.), and Heather Thomson from the N.C.C. to provide a project update, confirm previously documented heritage requirements, and to get clarification on the heritage aspects of the project as part of M.T.O.'s obligations under the *Standards and Guidelines* (2010). It was communicated that no negative impacts to the Rideau Canal or N.C.C. lands (including the Queen Elizabeth Driveway and Colonel By Drive) are anticipated. A key outcome of this meeting was confirming that specific heritage approvals/permits is not required for this project. Heritage will be considered as part of the general approvals/permits required for this project. Further, it was requested that a copy of the C.H.R.A.R. be submitted to the N.C.C. for review.

It is understood that as a result of these meetings, the M.T.O. has made a commitment to continue to work with the City of Ottawa, the N.C.C., and Parks Canada during Detailed Design.

The M.T.O. distributed the environmental assessment notifications (Notice of Study Commencement, Notice of Public Information Centre) directly to the following communities:

- Indian and Northern Affairs Canada, Gatineau QC
- Ministry of Indigenous Affairs, Toronto ON
- Algonquins of Pikwàkanagàn First Nation, Golden Lake ON
- Algonquins of Greater Golden Lake First Nation
- Algonquins of Ontario Consultation Office, Pembroke ON
- Ottawa Algonquin First Nation, Wendover ON
- Kinounchepinini Algonquin First Nation, Petawawa ON
- Kijicho Manito Madaouskarin – Anishinaabe Baptiste, Maynooth ON
- Bonnechere Algonquins First Nation, Renfrew ON
- North Bay Algonquin First Nation, Mattawa ON
- Shabot Obaadjiwan First Nation, Sharbot Lake ON
- Snimikobi Algonquin First Nation, Eganville ON
- Whitney and Area Algonquin Community, Whitney ON
- Chippewas of Georgina Island First Nation, Sutton West ON
- Mississaugas of the Credit First Nation, Hagersville ON
- Mississaugas of Scugog Island First Nation, Port Perry ON
- Beausoleil First Nation, Christian Island ON
- Alderville First Nation, Alderville ON
- Hiawatha First Nation, Hiawatha ON
- Curve Lake First Nation, Curve Lake ON
- Moose Deer Point First Nation, Mactier ON
- Ottawa Métis Council, Ottawa ON
- Mohawk Council of Akwesasne, Cornwall ON
- Métis Nation of Ontario, Ottawa ON
- Williams Treaty First Nation, Barrie ON

No responses providing comments or indicating interest in this project have been received by the M.T.O. from any of these communities.

5.4 Description of Field Review

A field review of the study area was undertaken by Kirstyn Allam of Archaeological Services Inc., on 11 January 2024 to document the existing conditions of the study area from existing rights-of-way. The existing conditions of the study area are described below and captured in Plate 1 to Plate 19.

The project study area is located in the City of Ottawa and is centred on the Queensway Highway (Highway 417) from approximately 100 metres west of O'Connor Street to approximately 250 metres east of Main Street. The study area consists of the Project right-of-way (R.O.W.) with an additional 250-metre buffer around the limits of the R.O.W. The study area is located within an urban context and is surrounded by a mixture of residential, commercial, and institutional properties.

Within the study area, the Queensway is a divided freeway with three lanes of eastbound and three lanes of westbound vehicular traffic. The highway is carried over O'Connor Street by a rigid frame, cast-in-place concrete slab bridge that was constructed in 1965 (Plate 1); over Metcalfe Street by a rigid frame concrete slab bridge that was constructed in 1965 (Plate 2); over Elgin Street by a pair of rigid frame, concrete slab bridges, the eastbound lane constructed in 1965 and the westbound lane in 1963 (Plate 3); over the Rideau Canal by a pair of T-beam bridges that were constructed in 1963 (Plate 4); and over Main Street by a rigid frame T-beam bridge for the eastbound lane constructed in 1963 and a rigid frame slab bridge that was constructed in 1959 for the westbound lane (Plate 5) (BT Engineering, 2023; Ministry of Transportation, 2017).

A westbound off-ramp from the highway is located on the north side of the Queensway, exiting onto Catherine Street and Metcalfe Street (Plate 6). A westbound on-ramp is southwest of the Catherine Street and O'Connor Street intersection (Plate 7). An eastbound off-ramp from the highway is located on the

south side of the Queensway, exiting onto Isabella Street at its intersection with O'Connor Street (Plate 8). An eastbound on-ramp to the highway is located east of the intersection of Isabella Street and Metcalfe Street (Plate 9).

South of the Queensway, Elgin Street turns easterly and becomes Hawthorne Avenue. It is carried over the Rideau Canal by the Pretoria Bridge (Plate 10). The bridge was constructed in 1981 to replace an existing bridge that had been built in the early-twentieth century.

The Rideau Canal transects the study area, in a general north-south alignment from the southern end of the study are to the Queensway, at which point it re-orients to a northeast-southwest alignment (Plate 11 to Plate 12). Greenspaces and walking trail, the Rideau Canal Western Pathway and the Rideau Canal Eastern Pathway, are located on the east and west sides of the canal. Queen Elizabeth Driveway and Colonel By Drive follow the west and east sides of the canal respectively (Plate 13).

Within the study area the streets surrounding the highway are generally laid out in grid-pattern. To the north of the highway, west of the canal, and east of Elgin Street there is a mixture of detached residences and high- and low-rise apartment buildings (Plate 14). West of Elgin Street there and north of the highway is a mixture of commercial and institutional buildings, including the Canadian Museum of Nature at the northwest border of the study area (Plate 15). Immediately south of the highway on the west side of the canal are a mixture of high-rise apartment buildings, office building, and commercial properties between Isabella Street and Pretoria Avenue (Plate 16). South of Pretoria Avenue is generally a mixture of detached and semi-detached residential properties (Plate 17). To the north of the Queensway on the east side of the Rideau Canal are a mixture of townhouses, detached houses, semi-detached houses, and apartment buildings (Plate 18). There are also some commercial properties along Main Street. South of the highway and east of the canal are a mixture of residential, institutional, and commercial properties (Plate 19). Throughout the study area, the residences range from mid-nineteenth century construction to more recent twentieth to twenty-first infill development.



Plate 1: O'Connor Street Bridge, looking south from Catherine Street (A.S.I., 2024).



Plate 2: Metcalfe Street Bridge, looking north from the south (A.S.I., 2024).



Plate 3: Elgin Street Bridge, looking south from Catherine Street (A.S.I., 2024).



Plate 4: Rideau Canal Bridge, looking north from the south side of the bridge on the Rideau Canal Western Pathway (A.S.I., 2024).



Plate 5: Main Street Bridge, looking south from Harvey Street (A.S.I., 2024).



Plate 6: Westbound off-ramp, looking east from the intersection of Catharine Street and Metcalfe Street (A.S.I., 2024).



Plate 7: Westbound on-ramp, looking southwest from the intersection of O'Connor Street and Catharine Street (A.S.I., 2024).



Plate 8: Eastbound off-ramp, looking west from the intersection of O'Connor Street and Isabella Street (A.S.I., 2024).



Plate 9: Eastbound on-ramp, looking northeast from the intersection of Metcalfe Street and Isabella Street (A.S.I., 2024).



Plate 10: Pretoria Bridge, looking north from south of the bridge (A.S.I., 2024).

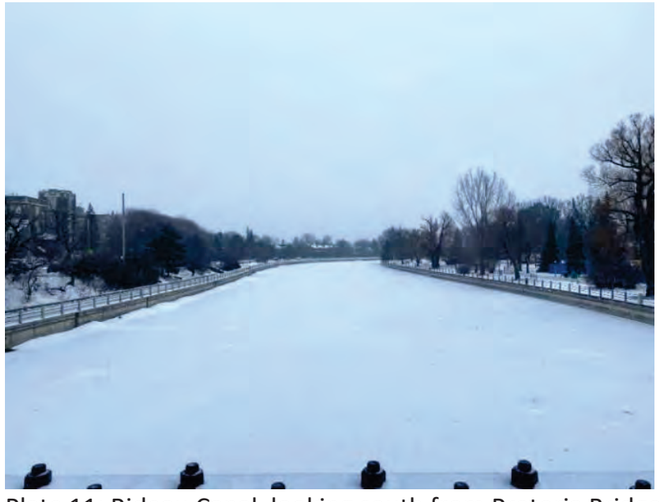

Plate 11: Rideau Canal, looking south from Pretoria Bridge (A.S.I., 2024).



Plate 12: Rideau Canal, looking north from north of the Queensway (A.S.I., 2024).



Plate 13: Rideau Canal, looking north from Pretoria Bridge (A.S.I., 2024). Queen Elizabeth Driveway is on the left and Colonel By Drive is on the right.



Plate 14: Looking southwest along Argyle Street, a variety of residence types line the street (A.S.I., 2024).



Plate 15: Canadian Museum of Nature on McLeod Street, looking southeast (A.S.I., 2024).



Plate 16: Commercial property and apartment building along the south side of Isabella Street, looking southeast (A.S.I., 2024).



Plate 17: Residences along Patterson Avenue, west of Queen Elizabeth Driveway, looking northwest (A.S.I., 2024).



Plate 18: Residences along Havelock Street, east of Greenfield Avenue, looking east (A.S.I., 2024).



Plate 19: Looking north along Main Street from south of Evelyn Avenue (A.S.I., 2024).

5.5 Identification of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes

This C.H.R.A.R. is prepared in accordance with the legislation and guidelines stated above in Section 3.0. The objective of this report is to identify known and potential B.H.R.s and C.H.L.s within the study area, identify potential impacts to known and potential B.H.R.s and C.H.L.s as a result of the proposed project, and recommend mitigation measures.

5.5.1 Cultural Heritage Screening Process

In the course of the cultural heritage assessment process, all potentially affected B.H.R.s and C.H.L.s are subject to identification and inventory. Generally, when conducting an identification of B.H.R.s and C.H.L.s within a study area, three stages of research and data collection are undertaken to appropriately establish the potential for and existence of B.H.R.s and C.H.L.s in a geographic area: background research and desktop data collection; field review; and identification.

Background historical research, which includes consultation of primary and secondary source research and historical mapping, is undertaken to identify early settlement patterns and broad agents or themes of change in a study area. This stage in the data collection process enables the researcher to determine the presence of sensitive heritage areas that correspond to nineteenth- and twentieth-century settlement and development patterns. To augment data collected during this stage of the research process, federal, provincial, and municipal databases and/or agencies are consulted to obtain information about specific properties that have been previously identified and/or designated as having cultural heritage value. Typically, resources identified during these stages of the research process are reflective of particular architectural styles or construction methods, associated with an important person, place, or event, and contribute to the contextual facets of a particular place, neighbourhood, or intersection.

A field review is then undertaken to confirm the location and condition of previously identified B.H.R.s and C.H.L.s. The field review is also used to identify potential B.H.R.s or C.H.L.s that have not been previously identified on federal, provincial, or municipal databases or through other appropriate agency data sources.

Properties were screened using the application of the criteria as set out in the following screening checklists, where applicable:

- Minister of Citizenship and Multiculturalism's (M.C.M.) screening form, Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes (Ministry of Citizenship and Multiculturalism, 2016);
- Ministry of Transportation Bridge Screening Forms; and
- Ministry of Transportation Structural Culvert Screening Forms.

The screening forms are used in conjunction with the professional judgement of the qualified person to determine if a more technical Cultural Heritage Evaluation is required. In addition, use of a 40-year-old benchmark is a guiding principle

when conducting a preliminary identification of B.H.R.s and C.H.L.s. While identification of a resource that is 40 years old or older does not confer outright heritage significance, this benchmark provides a means to collect information about resources that may retain heritage value. Similarly, if a resource is slightly younger than 40 years old, this does not preclude the resource from having cultural heritage value or interest.

This section will describe the results of background research, field review, professional judgement, and application of the criteria as set out in the above-mentioned screening checklists.

Within the study area, there are seven bridges at four locations along the Ottawa Queensway (Highway 417) between Metcalfe Street and Main Street in Ottawa These seven structures were evaluated by MTO Structural staff and were determined to have low potential for cultural heritage value or interest. The results of the screening are provided in Table 1 below.

Table 1: Results of Bridge Screening

Structure and MTO Site Number	Construction Date	Structure Type	Results of Screening for Potential C.H.V.I.
Metcalfe Street #03X-0065B0	1965	Frame, Rigid Frame, Slab	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.
Elgin Street EBL #03X-0066/B1	1965	Frame, Rigid Frame, Slab	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.
Elgin Street WBL #03X-0066/B2	1963	Frame, Rigid Frame, Slab	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.
Rideau Canal EBL #03X-0067B1	1963	Beam/Girder, T Beam	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.
Rideau Canal WBL #03X-0067B2	1963	Frame/Rigid Frame, T Beam	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.

Structure and MTO Site Number	Construction Date	Structure Type	Results of Screening for Potential C.H.V.I.
Main Street EBL #03X-0068/B1	1963	Frame/Rigid Frame, T Beam	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.
Main Street WBL #03X-0068/B2	1959	Frame, Rigid Frame, Slab	MTO's Regional Structural Section Engineers identified this structure as having low potential for cultural heritage value or interest.

5.5.2 Summary of Identified Built Heritage Resources and Cultural Heritage Landscapes

Based on the review of available municipal, provincial, and federal data, and the results of community engagement, there are 165 previously identified built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) within the study area. These include:

- one U.N.E.S.C.O. World Heritage Site (the Rideau Canal is also a National Historic Site, a Canadian Heritage River System, and a study is also in-progress to recognize it as part of a larger C.H.L.);
- three properties designated under Part IV of the *Ontario Heritage Act* (one property is also a National Historic Site, has National Historic Event plaques, as well as National Historic Person plaques);
- one heritage conservation district designated under Part V of the *Ontario Heritage Act*;
- 156 properties that are included in the Municipal Register (three of these properties are also included in the Ontario Heritage Trust's Places of Worship Inventory);
- two properties included in the Ontario Heritage Trust's Places of Worship Inventory; and
- two roadways are identified by the City of Ottawa Official Plan as Scenic Capital Entry Routes and the same two roadways are also identified by the N.C.C. as Scenic Parkways.

There are a further five potential B.H.R.s and C.H.L.s that were identified in previous reporting and during background research and field review:

- one bridge that was identified in the Queensway Ottawa Downtown Bridges: Metcalfe to Main Revitalization Project GWP-4170-13-00 Cultural Heritage Assessment Report (CHAR) (MTBA Associates Inc., 2023);
- three residential buildings of potential cultural heritage value an interest (C.H.V.I.); and

- one park that was identified in in the Queensway Ottawa Downtown Bridges: Metcalfe to Main Revitalization Project GWP-4170-13-00 Cultural Heritage Assessment Report (CHAR) (MTBA Associates Inc., 2023).

This has resulted in 164 B.H.R.s and five C.H.L.s identified within the study area. A summary of the known and potential B.H.R.s and C.H.L.s is presented in Table 2 below. A detailed inventory of the known and potential B.H.R.s and C.H.L.s is included in Appendix A in Table 4. See Figure 14 to Figure 18 for mapping showing the location of identified B.H.R.s and C.H.L.s within the study area.

Table 2: Summary of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes within the Study Area

Feature I.D.	**Address or Location**	**Heritage Status and Recognition**
B.H.R. 1	Pretoria Bridge	Potential B.H.R. – Identified in previous report (MTBA Associates Inc., 2023)
B.H.R. 2	43 Main Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 3	60 Main Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 4	61 Main Street	Known B.H.R. – Designated under Part IV of the *Ontario Heritage Act* (By-law 145-82), See Appendix B for the By-law or this link
B.H.R. 5	62-64 Main Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 6	83 Main Street	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory
B.H.R. 7	88 Main Street	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 8	100 Main Street	Potential B.H.R. – Listed in the Ontario Heritage Trust's Places of Worship Inventory
B.H.R. 9	107 Main Street	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory
B.H.R. 10	140 Main Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 11	3-5 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 12	7-9 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 13	8-10 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 14	12-18 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 15	15-21 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 16	94 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 17	113 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 18	120 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 19	125 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 20	128 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 21	130 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 22	135 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 23	137 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 24	142-144 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 25	149 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 26	159-161 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 27	163-165 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 28	167-169 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 29	20 Graham Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 30	31 Graham Avenue	Potential B.H.R. – Included in the Ontario Heritage Trust's Places of Worship Inventory
B.H.R. 31	44 Lees Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 32	52 Lees Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 33	59 Lees Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 34	63 Lees Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 35	67-71 Lees Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 36	73-77 Lees Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 37	60 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 38	62 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 39	66 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 40	78 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 41	80-82 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 42	85 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 43	253 Echo Drive	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 44	171 Echo Drive	Potential B.H.R. – Identified during background research and field review
B.H.R. 45	145 Echo Drive	Potential B.H.R. – Identified during background research and field review
B.H.R. 46	143 Echo Drive	Potential B.H.R. – Identified during background research and field review
B.H.R. 47	133 Echo Drive	Known B.H.R. – Included in the Municipal Register
B.H.R. 48	166-170 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 49	172 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 50	173 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 51	175 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 52	44-46 Havelock Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 53	76-78 Havelock Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 54	93 Harvey Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 55	125 Harvey Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 56	56 Concord Street North	Known B.H.R. – Included in the Municipal Register
B.H.R. 57	58 Concord Street North	Known B.H.R. – Included in the Municipal Register
B.H.R. 58	90 Concord Street North	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 59	6 McLeod Street	Known B.H.R. –Designated under Part IV of the *Ontario Heritage Act* (By-law 287-89), link
B.H.R. 60	38-40 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 61	44 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 62	128 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 63	132 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 64	134 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 65	136 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 66	144 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 67	150 McLeod Street	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 68	154 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 69	156 McLeod Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 70	170 Cartier Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 71	172 Cartier Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 72	178-184 Cartier Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 73	190 Cartier Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 74	194-198 Cartier Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 75	40 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 76	44 Park Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 77	47 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 78	48 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 79	50-52 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 80	54 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 81	58 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 82	62 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 83	66 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 84	65-67 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 85	70 Park Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 86	80 Park Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 87	29 Argyle Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 88	31 Argyle Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 89	33 Argyle Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 90	37 Argyle Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 91	114 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register
B.H.R. 92	116 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register
B.H.R. 93	118 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register
B.H.R. 94	150 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 95	216-218 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register
B.H.R. 96	234 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register
B.H.R. 97	8 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 98	92 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 99	95-97 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 100	96 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 101	100 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 102	104 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 103	107 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 104	108 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 105	112 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 106	154 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 107	23 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 108	40-42 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 109	46 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 110	53 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 111	54 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 112	55-57 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 113	56-58 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 114	59 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 115	70 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 116	76 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 117	80-82 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 118	98 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 119	99 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 120	100 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 121	101 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 122	103 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 123	104 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 124	106-108 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 125	107 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 126	111 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 127	112 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 128	115 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 129	116 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 130	117 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 131	119 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 132	145 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 133	151 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 134	155-157 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 135	8 Patterson Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 136	15 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 137	17-19 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 138	23 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 139	33 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 140	39 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 141	43 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 142	44 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 143	46 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 144	47-49 Patterson Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 145	50-52 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 146	54 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 147	96 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 148	98 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 149	100 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 150	102 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 151	104 Patterson Avenue	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 152	106 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 153	110-112 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 154	145 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 155	149-151 Patterson Avenue	Known B.H.R. – Included in the Municipal Register
B.H.R. 156	485-489 Metcalfe Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 157	491-493 Metcalfe Street	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
B.H.R. 158	494-498 Metcalfe Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 159	495 Metcalfe Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 160	504 Metcalfe Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 161	466-468 O'Connor Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 162	470-472 O'Connor Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 163	478 O'Connor Street	Known B.H.R. – Included in the Municipal Register
B.H.R. 164	501 O'Connor Street	Known B.H.R. – Included in the Municipal Register

Feature I.D.	Address or Location	Heritage Status and Recognition
C.H.L. 1	Rideau Canal	Known C.H.L. – U.N.E.S.C.O. World Heritage Site; National Historic Site; Canadian Heritage River System – See Appendix B for Commemorative Integrity Statement
C.H.L. 2	Ballantyne Park 31 Hawthorne Avenue	Potential C.H.L. – Identified in previous report (MTBA Associates Inc., 2023)
C.H.L. 3	Queen Elizabeth Driveway	Potential C.H.L. – Identified by the City of Ottawa Official Plan as Scenic Capital Entry Route; Identified by the N.C.C. as Scenic Parkway
C.H.L. 4	Colonel By Drive	Potential C.H.L. – Identified by the City of Ottawa Official Plan as Scenic Capital Entry Route; Identified by the N.C.C. as Scenic Parkway
C.H.L. 5	Centretown Heritage Conservation District	Known C.H.L. – Designated under Part V of the *Ontario Heritage Act* (By-law 269-97) – See Appendix B for a copy of the By-Law



Figure 14: Location of identified built heritage resources, cultural heritage landscapes, and proposed works within the study area (Key Sheet).

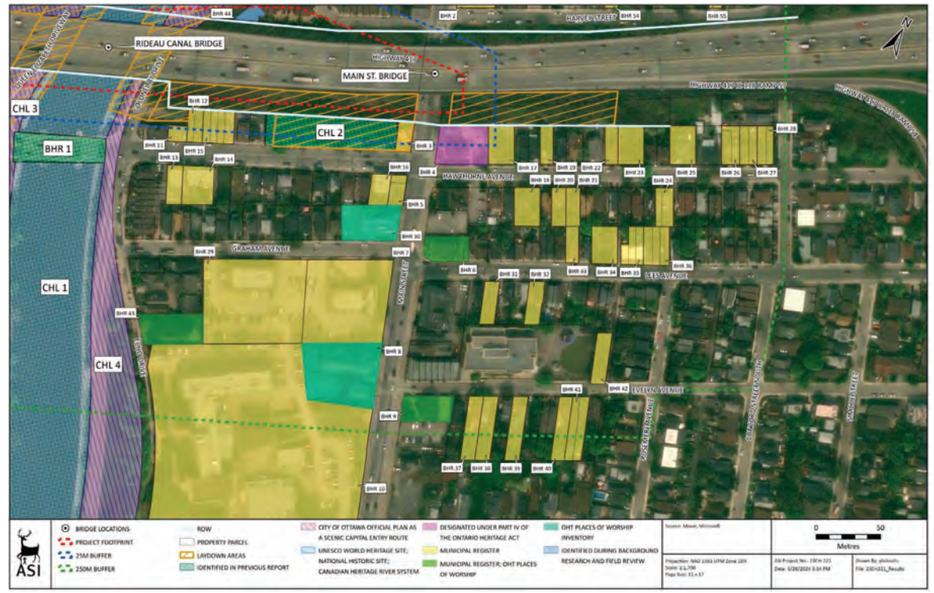

Figure 15: Location of identified built heritage resources, cultural heritage landscapes, and proposed works within the study area (Sheet 1).

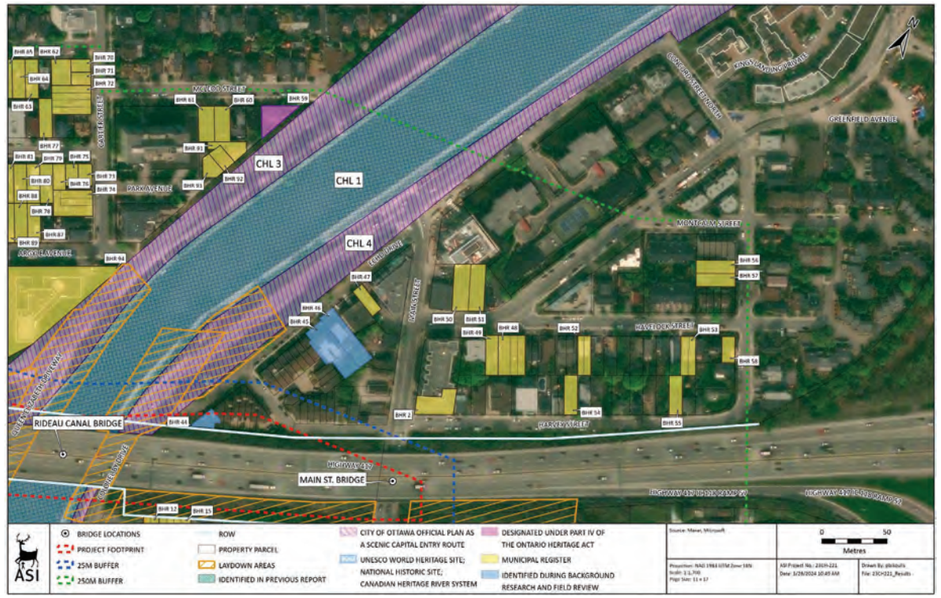

Figure 16: Location of identified built heritage resources, cultural heritage landscapes, and proposed works within the study area (Sheet 2).

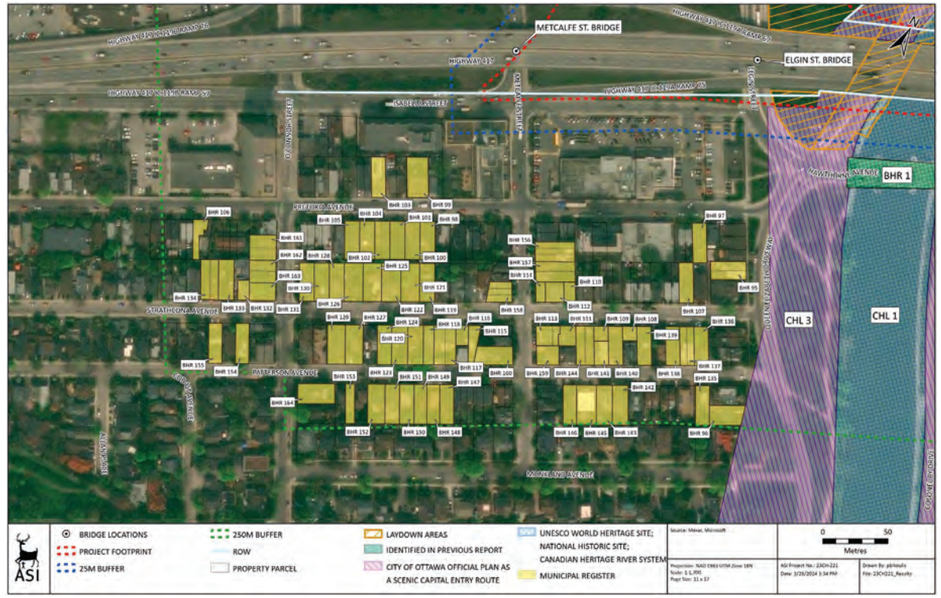

Figure 17: Location of identified built heritage resources, cultural heritage landscapes, and proposed works within the study area (Sheet 3).

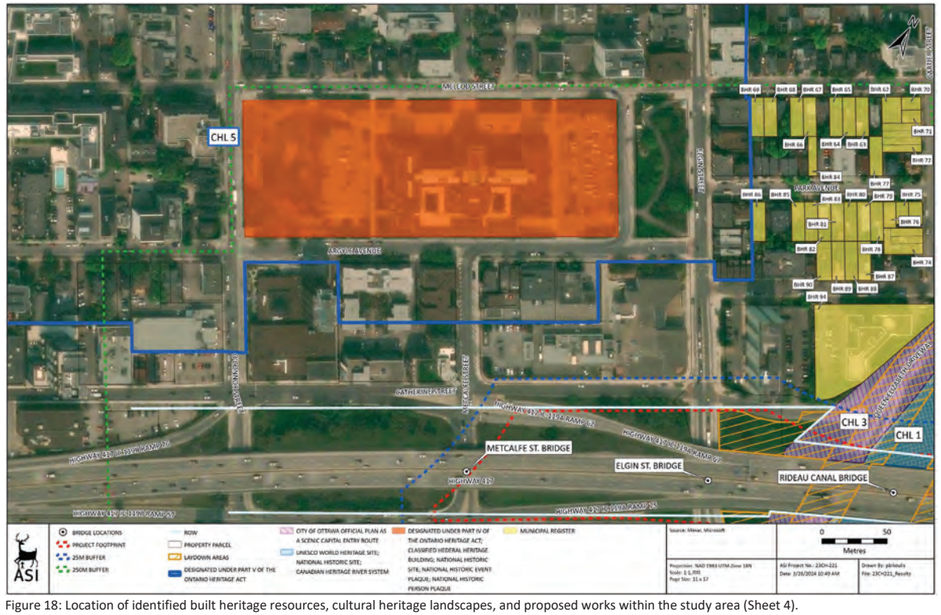

Figure 18: Location of identified built heritage resources, cultural heritage landscapes, and proposed works within the study area (Sheet 4).

6.0 Preliminary Impact Assessment

The following sections provide more detailed information regarding the proposed project undertaking and analysis of potential impacts on identified built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s).

6.1 Impact Assessment Methodology

The development of transportation facilities has the potential to impact B.H.R.s and C.H.L.s through various methods. These impacts are outlined in *Information Bulletin 3: Heritage Impact Assessments for Provincial Heritage Properties* (Ministry of Citizenship and Multiculturalism, 2017):

- removal or demolition of all or part of any heritage attribute;
- removal or demolition of any building or structure on the provincial heritage property whether or not it contributes to the cultural heritage value or interest of the property (i.e. non-contributing buildings);
- any land disturbance, such as a change in grade and/or drainage patterns that may adversely affect a provincial heritage property, including archaeological resources;
- alterations to the property in a manner that is not sympathetic, or is incompatible, with cultural heritage value or interest of the property. This may include necessary alterations, such as new systems or materials to address health and safety requirements, energy-saving upgrades, building performance upgrades, security upgrades or servicing needs;
- alterations for access requirements or limitations to address such factors as accessibility, emergency egress, public access, security;
- introduction of new elements that diminish the integrity of the property, such as a new building, structure or addition, parking expansion or addition, access or circulation roads, landscape features;

- changing the character of the property through removal or planting of trees or other natural features, such as a garden, or that may result in the obstruction of significant views or vistas within, from, or of built and natural features;
- change in use for the provincial heritage property that could result in permanent, irreversible damage or negates the property's cultural heritage value or interest;
- continuation or intensification of a use of the provincial heritage property without conservation of heritage attributes;
- shadows that alter the appearance of a heritage attribute or change the visibility of an associated natural feature or plantings, such as a tree row, hedge or garden;
- isolation of a heritage attribute from its surrounding environment, context or a significant relationship;
- vibration damage to a structure due to construction or activities on or adjacent to the property; and
- alteration or obstruction of a significant view of or from the provincial heritage property from a key vantage point.

In accordance with this document, direct adverse impacts are identified where the following resulting conditions are anticipated:

- a permanent and irreversible negative affect on the cultural heritage value or interest of a property; and
- loss of a heritage attribute on all or part of the provincial heritage property.

Indirect adverse impacts are identified where activities on or near the property may adversely affect its cultural heritage value or interest and/or heritage attributes. Positive impacts may also result where a property's cultural heritage value or interest and/or heritage attributes is conserved or enhanced.

Potential impacts are also identified in the *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2010) and the *Working*

with Cultural Landscapes: A Guide for the National Capital Region (National Capital Commission, 2023b). Should impacts be anticipated to heritage properties that are owned/managed by Parks Canada or the National Capital Commission, then mitigation measures for the properties should follow the guidelines in the previously mentioned documents.

The proposed undertaking should endeavor to avoid adversely affecting known and potential B.H.R.s and C.H.L.s and interventions should be managed in such a way that identified cultural heritage resources are conserved. When the nature of the undertaking is such that adverse impacts are unavoidable, it may be necessary to implement alternative approaches or mitigation strategies that alleviate the negative effects on identified B.H.R.s and C.H.L.s. Mitigation is the process of lessening or negating anticipated adverse impacts to B.H.R.s and C.H.L.s and may include, but are not limited to, such actions as avoidance, monitoring, protection, relocation, remedial landscaping, and documentation of the B.H.R.s and C.H.L.s if to be demolished or relocated.

Various works associated with infrastructure improvements have the potential to affect B.H.R.s and C.H.L.s in a variety of ways, and as such, appropriate mitigation measures for the undertaking need to be considered.

6.2 Description of Proposed Undertaking

The Project consists of the rehabilitation / replacement of seven bridges at four locations along the Ottawa Queensway (Highway 417) between Metcalfe Street and Main Street in Ottawa. The Preliminary Design study has identified a bridge management strategy to address the structural needs of the following Queensway Downtown bridges:

- Metcalfe Street Overpass (Site no. 3-065),
- Elgin Street, East Bound Lanes (EBL) (Site no. 3-066.1),
- Elgin Street, West Bound Lanes (WBL) (3-066.2),
- Rideau Canal EBL (3-067.1),
- Rideau Canal WBL (3-067.2),

- Main Street EBL (3-068.1), and
- Main Street WBL (3-068.2).

For the rigid frame bridges, Metcalfe Street, Elgin Street, and Main Street, the structures will be replaced and the recommended new bridge is a single-span rigid frame bridge with a similar span length to the existing structure. The technically preferred alternative is that the extant structure will be removed and the new bridge will be installed using rapid replacement technology or other accelerated bridge construction technique. The footings of the bridges will be salvaged for the foundations of the new bridge or alternatively replaced (BT Engineering, 2023).

For the Rideau Canal bridge, the recommended alternative is a three-span bridge with piers that are removed from the canal, steel girders, and a concrete deck. The technically preferred alternative for each structure involves the construction of the new deck on a temporary work platform north of the existing bridges, and then slid into position using the jack-and-slide method following the removal of the existing bridge (BT Engineering, 2023).

Other elements of this project include the following:

- The temporary use of Ballantyne Park during the construction of the Main Street bridges and the Rideau Canal bridges;
- The infill of the Rideau Canal for pile installations on the east and west sides, the complete infill across the canal for the demolition and removal of the existing bridge, and the removal of the fill;
- New five-metre-high replacement noise barriers on the north and south sides of the Queensway to the east of the Rideau Canal;
- The purchase of 58 and 60 Main Street for the Main Street bridge rapid replacement (MTO ownership 2019); and
- Landmark features and context sensitive design elements to be reviewed during Detailed Design (BT Engineering, 2023).

The contractor laydown areas are depicted in Figure 19 and include:

- Areas within the Queen Elizabeth Driveway and Colonel By Drive rights-of-way;
- The parking area of the property at 150 Elizabeth Driveway;
- Ballantyne Park; and
- Areas within the Highway 417 right-of-way.

It is understood that any impacts from the contractor laydown areas would be limited and temporary in duration.

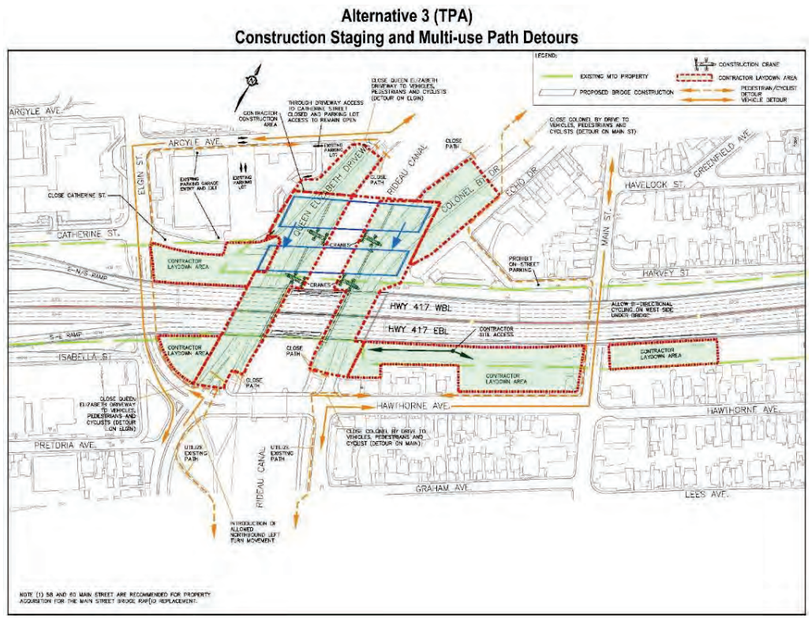

Figure 19: Construction laydown and staging areas for the Technically Preferred Alternative (BT Engineering, 2023).

6.3 Analysis of Potential Impacts

The potential impacts of the proposed undertaking were evaluated according to Ministry of Citizenship and Multiculturalism's (M.C.M.'s) *Information Bulletin 3: Heritage Impact Assessments for Provincial Heritage Properties* (2017). Table 3 outlines the potential impacts on the identified B.H.R.s and C.H.L.s within the study area and is illustrated in Figure 14 to Figure 18.

Table 3: Impacts to Known and Potential Built Heritage Resources and Cultural Heritage Landscapes and Proposed Mitigations

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 1	Pretoria Bridge	Potential B.H.R. – Identified in previous report (MTBA Associates Inc., 2023)	B.H.R. 1 is located within the 250-metre buffer of the proposed works. The proposed improvements are not anticipated to result in direct adverse impacts to the identified heritage attributes. However, construction activities as part of the Rideau Canal Bridge replacement may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid direct impacts to this structure. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 2	43 Main Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 2 is located within the 250-metre buffer of the proposed works and is located approximately 31 metres to the north of the Main Street Bridge replacement. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the Main Street Bridge replacement may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
				that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 3	60 Main Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 3 is located within the 25-metre buffer of the proposed works and overlaps with one of the contractor laydown areas. Direct adverse impacts to this property are anticipated to include the removal of the structure.	Preferred Option: Relocate laydown area to avoid encroachment on to this B.H.R. and avoid removal of the structure. Should the avoidance not be feasible, a cultural heritage evaluation report (C.H.E.R.) to determine cultural heritage value or interest (C.H.V.I.) will be completed as early as possible and within the Environmental Assessment process. Should the C.H.E.R. determine that the property retains C.H.V.I., per Ontario Regulation 9/06 or 10/06, a resource-specific heritage impact assessment (H.I.A.) should be conducted to assess potential impacts to the resource and recommend appropriate mitigation measures. If a property is found to meet Ontario Regulation 10/06 and therefore is a provincial heritage property of provincial significance, then the Ministry of Citizenship and Multiculturalism (M.C.M.) will be contacted to advise on whether M.C.M. Minister's Consent is required. Timing of completion of the H.I.A. will be discussed with M.C.M.
B.H.R. 4	61 Main Street	Known B.H.R. – Designated under Part IV of the *Ontario Heritage Act* (By-law 145-82), link See Appendix B	B.H.R. 4 is located within the 25-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction activities as part of the Main Street Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may	Preferred Option: Continue to limit encroachment on to this property and avoid impacting the known heritage attributes of this B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing,

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
			also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 5	62-64 Main Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 5 is located within the 250-metre buffer of the proposed works and is located approximately 13 metres to the south of a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 6	83 Main Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 6 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
		Also included in the Ontario Heritage Trust's Places of Worship Inventory	known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	
B.H.R. 7	88 Main Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 7 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 8	100 Main Street	Ontario Heritage Trust's Places of Worship Inventory	B.H.R. 8 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 9	107 Main Street	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory	B.H.R. 9 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 10	140 Main Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 10 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 11	3-5 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 11 is located within the 25-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
			the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction activities as part of the Rideau Canal Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 12	7-9 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 12 is located within the 25-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction activities as part of the Rideau Canal Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 13	8-10 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 13 is located within the 250-metre buffer of the proposed works and is located approximately 35 metres to the south of a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 14	12-18 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 14 is located within the 250-metre buffer of the proposed works and is located approximately 44 metres to the south of a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
				of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 15	15-21 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 15 is located within the 25-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction activities as part of the Rideau Canal Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 16	94 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 16 is located within the 250-metre buffer of the proposed works and is located approximately 16 metres to the south of a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
				that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 17	113 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 17 is located within the 25-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction activities as part of the Main Street Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 18	120 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 18 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 19	125 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 19 is located within the 250-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
			activities as part of the Rideau Canal Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 20	128 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 20 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 21	130 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 21 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 22	135 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 22 is located within the 250-metre buffer of the proposed works and adjacent to a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property and no direct adverse impacts to the identified heritage attributes are anticipated. However, construction activities as part of the Rideau Canal Bridge replacement and the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
			Zone of Influence, the area within a 50-metre buffer of construction-related activities.	To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 23	137 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 23 is located within the 250-metre buffer of the proposed works and is located approximately 14 metres to the southeast of a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area and the Main Street Bridge replacement may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 24	142-144 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 24 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 25	149 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 25 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 26	159-161 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 26 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 27	163-165 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 27 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 28	167-169 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 28 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 29	20 Graham Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 29 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 30	31 Graham Avenue	Potential B.H.R. – Included in the Ontario Heritage Trust's Places of Worship Inventory	B.H.R. 30 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 31	44 Lees Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 31 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 32	52 Lees Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 32 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 33	59 Lees Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 33 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 34	63 Lees Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 34 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 35	67-71 Lees Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 35 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 36	73-77 Lees Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 36 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 37	60 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 37 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 38	62 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 38 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 39	66 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 39 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 40	78 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 40 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 41	80-82 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 41 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 42	85 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 42 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 43	253 Echo Drive	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory	B.H.R. 43 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 44	171 Echo Drive	Potential B.H.R. – Identified during background research and field review	B.H.R. 44 is located within the 25-metre buffer of the proposed works and is located approximately 10 metres to the east of a laydown area. The proposed improvements are not anticipated to result in direct impacts to the property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area and the Rideau Canal Bridge replacement may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid this property and avoid impacting the potential heritage attributes of this B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 45	145 Echo Drive	Potential B.H.R. – Identified during background research and field review	B.H.R. 45 is located within the 250-metre buffer of the proposed works and is located approximately 22 metres to the east of a laydown area. The proposed improvements are not anticipated to result in direct impacts to this property or direct adverse impacts to the identified heritage attributes. However, construction	Preferred Option: Continue to avoid this property and avoid impacting the potential heritage attributes of this B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
			activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 46	143 Echo Drive	Potential B.H.R. – Identified during background research and field review	B.H.R. 46 is located within the 250-metre buffer of the proposed works and is located approximately 33 metres northeast of a laydown area. The proposed improvements are not anticipated to result in direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid this property and avoid impacting the potential heritage attributes of this B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 47	133 Echo Drive	Known B.H.R. – Included in the Municipal Register	B.H.R. 47 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 48	166-170 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 48 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 49	172 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 49 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 50	173 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 50 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 51	175 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 51 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 52	44-46 Havelock Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 52 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 53	76-78 Havelock Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 53 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 54	93 Harvey Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 54 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 55	125 Harvey Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 55 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 56	56 Concord Street North	Known B.H.R. – Included in the Municipal Register	B.H.R. 56 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 57	58 Concord Street North	Known B.H.R. – Included in the Municipal Register	B.H.R. 57 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 58	90 Concord Street North	Known B.H.R. – Included in the Municipal Register	B.H.R. 58 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 59	6 McLeod Street	Known B.H.R. – Designated under Part IV of the *Ontario Heritage Act* (By-law 287-89), link	B.H.R. 59 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 60	38-40 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 60 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 61	44 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 61 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 62	128 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 62 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 63	132 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 63 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 64	134 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 64 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 65	136 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 62 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 66	144 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 66 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 67	150 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 42 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 68	154 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 68 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 69	156 McLeod Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 69 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 70	170 Cartier Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 70 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 71	172 Cartier Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 71 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 72	178-184 Cartier Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 72 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 73	190 Cartier Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 73 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 74	194-198 Cartier Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 74 is located within the 250-metre buffer of the proposed works and is located approximately 49 metres to the northeast of a laydown area. The proposed improvements are not anticipated to result in direct impacts to this property or direct adverse impacts to the identified heritage attributes. However, construction activities as part of the contractor laydown area may result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to avoid impacting the known B.H.R. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 75	40 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 75 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 76	44 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 42 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 77	47 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 77 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 78	48 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 78 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 79	50-52 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 79 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 80	54 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 80 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 81	58 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 81 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 82	62 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 82 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 83	66 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 83 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 84	65-67 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 84 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 85	70 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 85 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 86	80 Park Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 86 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 87	29 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 87 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 88	31 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 88 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 89	33 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 89 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 90	37 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 90 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 91	114 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	B.H.R. 91 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 92	116 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	B.H.R. 92 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 93	118 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	B.H.R. 93 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 94	150 Queen Elizabeth Driveway	Known B.H.R. – Tiffany Apartments - Included in the Municipal Register	The Tiffany Apartments at 150 Queen Elizabeth Driveway is located within the 25-metre buffer of the proposed works and overlaps with one of the contractor laydown areas. Impacts to this property are anticipated to include temporary encroachment onto the property frontage along Queen Elizabeth Driveway for the use as a laydown area. This encroachment will result in vegetation removal, and temporary loss of parking as driveway access from Tiffany Apartments to Catherine Street will not be maintained during construction. Front door access will be maintained for pedestrians but not for vehicles except when Emergency Services are required. However, these impacts will not result in any direct adverse impacts to potential heritage attributes. Construction activities as part of the Rideau Canal Bridge replacement and the contractor laydown area will result in limited and temporary impacts to this property and its setting through disruption. It may also result in construction-related vibration impacts given identified heritage attributes are located within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	Preferred Option: Continue to limit encroachment on to this property and continue to avoid direct adverse impacts to potential heritage attributes. Mitigation: Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified B.H.R. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. Suitable mitigation measures including post-construction rehabilitation. To address the potential for indirect impacts due to construction-related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts. Should this advance assessment conclude that the structure will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.
B.H.R. 95	216-218 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	B.H.R. 95 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 96	234 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	B.H.R. 96 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 97	8 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 97 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 98	92 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 98 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 99	95-97 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 99 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 100	96 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 100 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 101	100 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 101 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 102	104 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 102 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 103	107 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 103 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 104	108 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 104 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 105	112 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 105 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 106	154 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 106 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 107	23 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 107 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 108	40-42 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 108 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 109	46 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 109 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 110	53 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 110 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 111	54 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 111 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 112	55-57 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 112 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 113	56-58 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 113 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 114	59 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 114 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 115	70 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 115 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 116	76 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 116 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 117	80-82 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 117 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 118	98 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 118 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 119	99 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 119 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 120	100 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 120 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 121	101 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 121 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 122	103 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 122 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 123	104 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 123 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 124	106-108 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 124 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 125	107 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 125 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 126	111 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 126 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 127	112 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 127 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 128	115 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 128 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 129	116 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 129 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 130	117 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 130 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 131	119 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 131 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 132	145 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 132 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 133	151 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 133 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 134	155-157 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 134 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 135	8 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 135 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 136	15 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 136 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 137	17-19 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 137 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 138	23 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 138 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 139	33 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 139 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 140	39 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 140 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 141	43 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 141 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 142	44 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 142 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 143	46 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 143 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 144	47-49 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 144 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 145	50-52 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 145 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 146	54 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 146 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 147	96 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 147 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 148	98 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 148 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 149	100 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 149 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 150	102 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 150 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 151	104 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 151 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 152	106 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 152 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 153	110-112 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 153 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 154	145 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 154 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 155	149-151 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	B.H.R. 155 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 156	485-489 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 156 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 157	491-493 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 157 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 158	494-498 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 158 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 159	495 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 159 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 160	504 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 160 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 161	466-468 O'Connor Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 161 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
B.H.R. 162	470-472 O'Connor Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 162 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 163	478 O'Connor Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 163 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
B.H.R. 164	501 O'Connor Street	Known B.H.R. – Included in the Municipal Register	B.H.R. 164 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this property.	No specific mitigations or next steps are required.
C.H.L. 1	Rideau Canal	Known C.H.L. – U.N.E.S.C.O. World Heritage Site; National Historic Site; Canadian Heritage River System Please see Appendix A for additional information regarding heritage recognitions within this C.H.L.	The Rideau Canal is located within the project footprint and will be subject to temporary impacts by the Rideau Canal Bridge replacement and associated construction activities, including: infill of the Rideau Canal for pile installations on the east and west sides, the complete infill across the canal for the demolition and removal of the existing bridge, and the removal of the fill; disruption in the recreational use and setting of the canal; and disruption to the 30 metre buffer due to construction activities. As there is potential for direct adverse impacts to the Rideau Canal, mitigation is required.	Preferred Option: The proposed design and construction activities related to this project should avoid adverse impacts to the Rideau Canal and its heritage attributes. Mitigation: Direct adverse impacts to the Rideau Canal and heritage attributes have been avoided through regular consultation with Parks Canada and N.C.C. and the development of appropriate mitigation measures. Special considerations to reduce any potential negative impacts to the Rideau Canal have been integrated into the Technically Preferred Alternative, including (BT Engineering, 2023): • The bridge replacement and new bridge maintains and protects the canal alignment and the canal walls. • The removal of the Rideau Canal Bridge piers from the water. The removal of the piers was requested by

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
				Parks Canada and is accommodated by the proposed design. Due to the alignment of two buried high voltage oil-filled hydro ducts, the piers will be integrated with the canal walls, similar to the Pretoria Bridge design. • A bridge design that is subordinate to, distinguishable from and compatible with the existing cultural heritage landscape and respects the heritage landscapes and designations of the Rideau Canal. • Improves the existing navigation channel by removing the piers from the water. • No changes to the 30-metre buffer zone of the canal. All landscape features disturbed during construction will be reinstated post construction, in consultation with Parks Canada. Additional mitigation measures and design features will be defined during the subsequent Detail Design stage. Elements will include, but not be limited to, light design treatments, landscaping, etc. All work within the Rideau Canal World Heritage Site should follow the *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2010), *Working with Cultural Landscapes: A Guide for the National Capital Region* (National Capital Commission, 2023b), the *Rideau Canal and Merrickville Blockhouse Management Plan* (Parks Canada, 2022b), and the Rideau Canal Cultural Heritage Landscape Study (Matrix Heritage, on-going). Given the heritage sensitivities and complexities of the Rideau Canal Bridge crossing, it is recommended that an H.I.A. be completed as part of the Detailed Design by a qualified heritage

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
				professional and in advance of construction. A C.H.E.R. is not required because the cultural heritage value and heritage attributes have been previously-identified and sufficiently articulated in the Rideau Canal Commemorative Integrity Statement (Appendix B), which will be used to inform the H.I.A. The H.I.A. will ensure that the project continues to avoid adverse impacts to the Rideau Canal and its heritage attributes. The H.I.A. will also provide analysis and recommendations to ensure that an appropriate bridge design is developed that is subordinate to, distinguishable from and compatible with the existing cultural heritage landscape and respects the heritage landscapes and designation of the Rideau Canal. The H.I.A. scope and regulatory requirements should be confirmed with Parks Canada early in Detailed Design and M.T.O. should continue to meet with the N.C.C., Parks Canada, and the City of Ottawa to ensure this cultural heritage landscape is conserved.
C.H.L. 2	Ballantyne Park 31 Hawthorne Avenue	Potential C.H.L. – Identified in previous report (MTBA Associates Inc., 2023)	Ballantyne Park is located within the project footprint and overlaps with one of the contractor laydown areas. This temporary use of Ballantyne Park will take place during construction of the Main Street Bridges and Rideau Canal Bridges. The use of the park as a staging area is anticipated to remove some features of the park, including the removal of some trees, lighting standards and the James Ballantyne commemoration monument, and general disruption to this setting. As these impacts are short-term and can be mitigated, they are not considered to have adverse impacts on the potential cultural heritage value or heritage attributes of this park.	Preferred Option: From a heritage perspective, the preferred option is to relocate the laydown area to avoid impacts to Ballantyne Park. However, the Technically Preferred Alternative requires this property to construct the new bridges and therefore avoidance is not feasible. Mitigation: To reduce impacts to Ballantyne Park, it is recommended that as many trees be retained as possible, especially along the street frontage. Trees to be retained should be protected by erecting temporary fencing and establishing buffer zones. Suitable mitigation measures including post construction rehabilitation with sympathetic plantings can be implemented.

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
				A Landscape Plan will be established with City of Ottawa approval for the park reinstatement, which will mitigate the loss of any trees. The James Ballantyne commemoration monument will be salvaged and reinstated in the park following construction. This should include a strategy to safely remove, store and reinstate the monument, in consultation with the City of Ottawa. Similarly, the lighting standards in the park that will be displaced by the laydown area will be safely removed, stored and reinstated in consultation with the City of Ottawa.
C.H.L. 3	Queen Elizabeth Driveway	Potential C.H.L. – Identified by the City of Ottawa Official Plan as Scenic Capital Entry Route; Identified by the N.C.C. as Scenic Parkway	The Queen Elizabeth Driveway transects with the project footprint. The road will be closed temporarily to vehicles, pedestrians and cyclists. Contractor laydown areas overlap with the road to the north and south of Highway 417, and the roadway to the north of Highway 417 will be used for bridge construction. Direct impacts due to construction activities are anticipated to result in removal of several lighting standards along the road, and vegetation, both of which are identified as potential heritage attributes of this Scenic Parkway. However, this is considered a temporary impact as all landscape features, including vegetation and lighting standards, will be reinstated following construction, in consultation with the N.C.C. Construction activities will also result in limited and temporary impacts to this parkway, scenic views to the Rideau Canal, and its setting through disruption.	Preferred Option: Avoid any impacts to this C.H.L. Mitigation: Should avoidance not be feasible, construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to the identified C.H.L. Avoidance measures may include, but are not limited to: erecting temporary fencing around vegetation or lighting standards that do not require temporary removal, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. Consultation with the N.C.C. will be undertaken to develop an appropriate mitigation strategy and to facilitate the return of the parkway to its pre-construction condition. This will include a strategy to safely remove, store and reinstate the lighting standards.
C.H.L. 4	Colonel By Drive	Potential C.H.L. – Identified by the City of Ottawa Official	Colonel By Drive transects with the project footprint. The road will be closed temporarily to vehicles, pedestrians and cyclists. Contractor laydown areas overlap with the road to the north and	Preferred Option: Avoid any impacts to this C.H.L. Mitigation: Should avoidance not be feasible, construction activities and staging should be suitably planned and

Feature I.D.	Location Name	Heritage Status and Recognition	Description of Impacts	Proposed Mitigations and Next Steps
		Plan as Scenic Capital Entry Route; Identified by the N.C.C. as Scenic Parkway	south of Highway 417, and the roadway to the north of Highway 417 will be used for bridge construction. Direct impacts due to construction activities are anticipated to result in removal of some vegetation, identified as potential heritage attributes of this Scenic Parkway. However, this is considered a temporary impact as all landscape features, including vegetation, will be reinstated following construction, in consultation with the N.C.C. Construction activities will also result in limited and temporary impacts to this parkway, scenic views to the Rideau Canal, and its setting through disruption.	undertaken to avoid unintended negative impacts to the identified C.H.L. Avoidance measures may include, but are not limited to: erecting temporary fencing around vegetation that does not require removal, establishing buffer zones, and issuing instructions to construction crews to avoid identified features. Consultation with the N.C.C. will be undertaken to develop an appropriate mitigation strategy and to facilitate the return of the parkway to its pre-construction condition.
C.H.L. 5	Centretown Heritage Conservation District	Known C.H.L. – Designated under Part V of the *Ontario Heritage Act* (By-law 269-97)	C.H.L. 5 is located within the 250-metre buffer of the proposed works. However, no direct or indirect adverse impacts to the known heritage attributes are anticipated as the proposed limits of construction are more than 50 metres from this heritage conservation district. Indirect impacts due to construction-related vibration are not anticipated given that structures within this C.H.L. are not within the Vibration Zone of Influence, the area within a 50-metre buffer of construction-related activities.	No specific mitigations or next steps are required.

7.0 Proposed Mitigation and Next Steps

This Cultural Heritage Resource Assessment Report (C.H.R.A.R.) has documented the baseline cultural heritage conditions within the C.H.R.A.R. study area and includes a historical summary of the development of the C.H.R.A.R. study area, an inventory of known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s), and a preliminary impact assessment.

Following a review of the Technically Preferred Alternative for the Project (see Section 6.0) and an assessment of potential impacts to identified B.H.R.s and C.H.L.s, next steps, as well as general recommendations, are presented as follows:

1. Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified B.H.R.s and C.H.L.s. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified B.H.R.s and C.H.L.s, etc. Suitable mitigation measures including post-construction rehabilitation with sympathetic plantings can also be implemented.

2. The replacement of the Rideau Canal Bridges and associated construction activities and laydown areas will result in direct impacts to the Rideau Canal. However, development of a design that avoids permanent and adverse direct impacts to the Rideau Canal and heritage attributes has been developed through regular consultation with Parks Canada and the National Capital Commission (N.C.C.). Given the heritage sensitivities and complexities of the Rideau Canal Bridge crossing, it is recommended that a Heritage Impact Assessment (H.I.A.) be completed as part of the Detailed Design by a qualified heritage professional and in advance of construction. The H.I.A. will be based on the heritage attributes identified in the Rideau Canal Commemorative Integrity Statement and will ensure that the project continues to avoid adverse impacts to the Rideau Canal and its heritage attributes. The H.I.A. will also provide analysis and conservation recommendations to ensure that an appropriate bridge design is developed that is subordinate to, distinguishable from and compatible with the existing C.H.L. and respects the heritage landscapes and designation of the Rideau Canal.
    a. The H.I.A. scope and regulatory requirements should be confirmed with Parks Canada early in Detailed Design and M.T.O. should continue to meet with the N.C.C., Parks Canada, and the City of Ottawa to ensure this cultural heritage landscape is conserved.
    b. The H.I.A. should be developed in accordance with the *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2010), *Working with Cultural Landscapes: A Guide for the National Capital Region* (National Capital Commission, 2023b), the *Rideau Canal and Merrickville Blockhouse Management Plan* (Parks Canada, 2022b), and the *Rideau Canal Cultural Heritage Landscape Study* (Matrix Heritage, on-going).
    c. Given the results of this C.H.R.A.R., it is understood that there is no specific heritage permit required by Parks Canada or the N.C.C. to undertake the proposed work.

3. Direct adverse impacts to the former auto garage (B.H.R. 3 at 60 Main Street) are anticipated to include the removal of the structure and should avoidance not be feasible, a cultural heritage evaluation report (C.H.E.R.) to determine cultural heritage value or interest (C.H.V.I.) is required as early as possible in the Environmental Assessment process.[3] As there are direct impacts anticipated, and should the C.H.E.R. determine that the property retains C.H.V.I., per Ontario Regulation 9/06 or 10/06, a resource-specific H.I.A. is to be completed. If a property is found to meet Ontario Regulation 10/06 and therefore is a provincial heritage property of provincial significance, then the Ministry of Citizenship and Multiculturalism (M.C.M.) will be contacted to advise on whether M.C.M. Minister's Consent is required. Timing of completion of the H.I.A. will be discussed with M.C.M.

[3] At the time of report submission, a C.H.E.R is currently being prepared by a subconsultant for M.T.O.

4. Direct impacts to the Queen Elizabeth Driveway C.H.L. (C.H.L. 3) due to construction activities are anticipated to result in removal of several lighting fixtures along the road, and vegetation, both of which are identified as potential heritage attributes of this Scenic Parkway. These are considered temporary impacts and are not expected to result in adverse impacts to the cultural heritage value of the Queen Elizabeth Driveway or its heritage attributes as all landscape features, including vegetation and lighting standards, will be reinstated following construction, in consultation with the N.C.C.
    a. Avoidance measures may include, but are not limited to: erecting temporary fencing around vegetation or lighting fixtures that do not require temporary removal, establishing buffer zones, and issuing instructions to construction crews to avoid identified features.
    b. Consultation with the N.C.C. will also be undertaken to develop an appropriate mitigation strategy and to facilitate the return of the parkway to its pre-construction condition. This will include a strategy to safely remove, store and reinstate the lighting fixtures.

5. Direct impacts to Colonel By Drive C.H.L. (C.H.L. 4) due to construction activities are anticipated to result in removal of some vegetation, an identified potential heritage attribute of this Scenic Parkway. These are considered temporary impacts and are not expected to result in adverse impacts to the cultural heritage value of Colonel By Drive or its heritage attributes as all landscape features, including vegetation, will be reinstated following construction, in consultation with the N.C.C.
    a. Avoidance measures may include, but are not limited to: erecting temporary fencing around vegetation that do not require removal, establishing buffer zones, and issuing instructions to construction crews to avoid identified features.
    b. Consultation with the N.C.C. will also be undertaken to develop an appropriate mitigation strategy and to facilitate the return of the parkway to its pre-construction condition.

6. Ballantyne Park (C.H.L. 2) will be used as a laydown area during construction of the Main Street Bridges and Rideau Canal Bridges. The use of the park as a staging area is anticipated to remove some features of the park including the removal of some trees, lighting standards and the James Ballantyne commemoration monument, and general disruption to this setting. As these impacts are temporary and can be mitigated, they are not considered to have adverse impacts on the potential cultural heritage value or heritage attributes of this park.
    a. To reduce impacts to Ballantyne Park, it is recommended that as many trees be retained as possible, especially along the street frontage. Trees to be retained should be protected by erecting temporary fencing and establishing buffer zones. Suitable mitigation measures including post construction rehabilitation with sympathetic plantings. A Landscape Plan will be established with City of Ottawa approval for the park reinstatement, which will mitigate the loss of any trees.
    b. The James Ballantyne commemoration monument will be salvaged and reinstated in the park following construction. This should include a strategy to safely remove, store and reinstate the monument, in consultation with the City of Ottawa. Similarly, the lighting standards in the park that will be displaced by the laydown area should be safely removed, stored and reinstated in consultation with the City of Ottawa.

7. To ensure the following properties are not adversely impacted during construction, baseline vibration monitoring should be undertaken during detailed design:
    - Pretoria Bridge (B.H.R. 1),
    - 43 Main Street (B.H.R. 2),
    - 61 Main Street (B.H.R. 4);
    - 62-64 Main Street (B.H.R. 5);
    - 3-5 Hawthorne Avenue (B.H.R. 11),
    - 7-9 Hawthorne Avenue (B.H.R. 12),

- 8-10 Hawthorne Avenue (B.H.R. 13),
- 12-18 Hawthorne Avenue (B.H.R. 14),
- 15-21 Hawthorne Avenue (B.H.R. 15),
- 94 Hawthorne Avenue (B.H.R. 16),
- 113 Hawthorne Avenue (B.H.R. 17),
- 125 Hawthorne Avenue (B.H.R. 19),
- 135 Hawthorne Avenue (B.H.R. 22),
- 137 Hawthorne Avenue (B.H.R. 23),
- 171 Echo Drive (B.H.R. 44),
- 145 Echo Drive (B.H.R. 45),
- 143 Echo Drive (B.H.R. 46),
- 194-198 Cartier Street (B.H.R. 74), and
- 150 Queen Elizabeth Driveway (B.H.R. 94).

Should this advance monitoring assessment conclude that the structure(s) on these properties will be subject to vibrations, prepare and implement a vibration monitoring plan as part of the detailed design phase of the project to lessen vibration impacts related to construction.

8. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

9. All heritage reports are to be completed in accordance with the Standards and Guidelines (Ministry of Tourism and Culture, 2010) and M.T.O.'s cultural heritage conservation policy and process, by a qualified person as defined in the Standards and Guidelines. Heritage reports will be made available to interested parties upon request. Where required, H.I.A.s will be undertaken by qualified person(s) as early as possible during detailed design and prior to any ground disturbing activities. H.I.A.s will be sent to M.C.M. for review and comment and made available to other interested parties upon request. For provincial heritage properties of provincial significance, contact M.C.M. to discuss timing. A copy of the final H.I.A. prepared for the Rideau Canal bridge crossing should be sent to M.C.M. for its records.

10. A copy of this report should be submitted to the N.C.C., M.C.M., Parks Canada and City of Ottawa Heritage Staff for their review.

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Appendix A: Inventory of Built Heritage Resources and Cultural Heritage Landscapes

Table 4: Inventory of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes within the Study Area

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 1	Bridge	Pretoria Bridge	Potential B.H.R. – Identified in previous report (MTBA Associates Inc., 2023)	The Pretoria Bridge carries Hawthorne Avenue over the Rideau Canal to the east of the southern terminus of Elgin Street. The potential heritage attributes include the three-span bridge that was constructed in 1981 to replicate an earlier structure built in 1918 (Heritage Ottawa, n.d.). The approach spans are concrete box beams and the central span is a movable vertical lift metal rivet-connected Pratt truss (Holth, 2024). The curved piers of the bridge are made of the original sandstone (Heritage Ottawa, n.d.). The 1991 aerial photograph (Figure 13) shows the bridge that was constructed in 1981 over the Rideau Canal.	 Plate 20: Pretoria Bridge (A.S.I., 2024).
B.H.R. 2	Commercial (Former Residence)	43 Main Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House converted to Retail, Before 1895 Front Gable style, Front Gable roof, two-and-a-half storey, Brick, Red brick house converted into a furniture shop. Windows and exterior elements have been modified to match the adjoining building. Porch across façade has cedar shingle roof and gable over doorway. Stone sills and lintels. The property illustrates the original street character of the Ottawa East neighbourhood in the early 20th century. The property now serves a commercial use, including an enclosed porch-type addition and abuts a contemporary mid-rise apartment complex.	 Plate 21: 43 Main Street (MTBA Associates Inc., 2023)

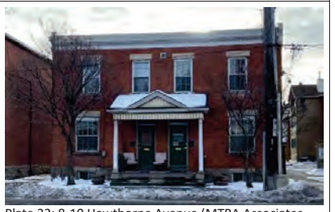
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 3	Former Auto Garage	60 Main Street	Known B.H.R. – Included in the Municipal Register	The former auto garage is located at the northwest corner of the intersection of Main Street and Hawthorne Avenue. The potential heritage attributes include the former auto garage building that was constructed circa 1918. The building features a carport, large display glass windows, and a hipped roof. The garage has elements of the Spanish Colonial Revival architectural style and Edwardian Classicism with the brick quoins, stucco cladding, and terracotta roof (City of Ottawa, 2019). The 1928 aerial photograph (Figure 11) shows a building in the vicinity of the extant structure. Note: A Cultural Heritage Evaluation Report for this property is currently in progress.	 Plate 22: 60 Main Street (A.S.I., 2024).
B.H.R. 4	Community Centre (Former Town Hall)	61 Main Street	Known B.H.R. – Designated under Part IV of the *Ontario Heritage Act* (By-law 145-82) Please see the By-law available via this link, or see Appendix B for a copy of the By-law.	The community centre building is the former Ottawa East Town Hall. It is located at the northeast corner of the intersection of Main Street and Hawthorne Avenue. The known heritage attributes include the two-and-a-half storey brick building that was constructed in 1895 for the village of Ottawa East, its truncated hipped roof, the projecting frontispiece along the western elevation with gabled roof, datestone, and front entrance, and the arched windows along the second floor. The 1928 aerial photograph (Figure 11) shows the extant structure.	 Plate 23: 61 Main Street (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 5	Commercial	62-64 Main Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Mixed Use, c.1922 Edwardian Classicism style, Flat roof, two storey, Brick, Red brick building with retail at grade and residential use above. Two cornices, one along roofline and the other between floors. Stone sills and lintels on second floor windows. Built after the reconfiguration of Hawthorne Avenue. It is unknown whether the property maintains its residential use on the second storey. The corner of Main and Hawthorne is accentuated by an inlayed vestibule. Located in Old Ottawa East	 Plate 24: 62-64 Main Street (MTBA Associates Inc., 2023)
B.H.R. 6	Place of Worship	83 Main Street	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory	The following description is from previous reporting (MTBA Associates Inc., 2023): Peace Latvian Evangelical Lutheran Church, Place of worship, 1928-1958 Vernacular style, Flat roof, two storey, Brick, Red brick church with symmetrical façade. An empty gothic niche for a statue above roofline. Brick stringcourse above second floor windows. Pier buttresses along sides of building. Located in Old Ottawa East	 Plate 25: 83 Main Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 7	School	88 Main Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): « École au Coeur d'Ottawa », School, 1928-1958 Art Deco style, Flat roof, three storey, Brick, Red brick school with symmetrical façade and large windows. Central entry with stepped parapet at roofline. Stone lintels and sills connect windows. Stonework on entrance pavilion. Decorative brickwork on sides of building. Previously École de Mazenod, the building has been continuously used as a school, with neighbouring institutional buildings forming a campus on the eastern embankment of the Rideau Canal. Located in Old Ottawa East	 Plate 26: 88 Main Street (MTBA Associates Inc., 2023)
B.H.R. 8	Church	100 Main Street	Potential B.H.R. – Listed in the Ontario Heritage Trust's Places of Worship Inventory	The Holy Canadian Martyrs Catholic Church is located on the west side of Main Street to the south of Graham Avenue. The potential heritage attributes include the church with gable roof and attached hall building to the south. The 1965 aerial photograph (Figure 12) depicts the extant church building. Located in Old Ottawa East	 Plate 27: 100 Main Street (Google Streetview, 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 9	Place of Worship	107 Main Street	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory	The following description is from previous reporting (MTBA Associates Inc., 2023): "Calvary Baptist Church" c.1910, Place of Worship Vernacular Style, side gable, one-and-a-half storeys, brick. 107 Main Street is a representative example of a vernacular red brick church built in the early decades of the twentieth century. Located in Old Ottawa East	 Plate 28: 107 Main Street (MTBA Associates Inc., 2023)
B.H.R. 10	School	140 Main Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): "Immaculata High School", School, c.1929 Collegiate Gothic style, Flat roof, four storey, Brick, Large brick building with central entry tower capped with battlements. Building faces both Main Street as well as the Rideau Canal. Architectural features include regularly spaced windows, stone cornice and stonework in central tower. The building was constructed as St Patrick's College, and later housed the Algonquin College of Applied Arts and Technology from 1973-1992. The building now functions as a high school for the Ottawa East community. Located in Old Ottawa East / South	 Plate 29: 140 Main Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 11	Residence	3-5 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1912 Vernacular/Italianate style, flat roof, two storey, Brick, Red brick building with symmetrical façade. Intact cornice. Porch has been replaced with simple design. Stone sills and lintels around windows. This building is among the first of many residential buildings to be constructed on Hawthorne Avenue prior to its re-configuration, just after the following property at 7-9 Hawthorne. It is currently used as a mixed-use residential/commercial building. Located in Old Ottawa East	 Plate 30: 3-5 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 12	Residence	7-9 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, Residential – Converted Dwelling, c.1910 Vernacular style, Flat roof, two storey, Brick, Painted brick building with cornice and original decorative wood finials. Transom window above each entrance door. Original window openings are enhanced by brick voussoirs and stone sills. Exposed stone foundation, This building was constructed on Hawthorne Avenue prior to the road's re-configuration. Located in Old Ottawa East	 Plate 31: 7-9 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 13	Residence	8-10 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1910 Vernacular/Italianate style, Flat roof, two storey, Brick, Symmetrical red brick semidetached house with a pediment above shared porch, evenly spaced vertical window openings with smooth stone lintels and sills. Original cornice with dentils and finials. Located in Old Ottawa East	 Plate 32: 8-10 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 14	Residence	12-18 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c.1912 Vernacular style, Flat roof, two storey, Brick, Symmetrical red brick building, stringcourse spanning façade underneath cornice, framed by decorative brick corbels on either side. Stone lintels and sills framing original window openings, with brick voussoirs above what were second floor balcony doors. The complex originally included four separate dwelling units. The properties maintain their residential use, though the number of units within the complex today is unknown. The rowhouses echo the units across the street at 15-19 Hawthorne Avenue in scale and style. Located in Old Ottawa East	 Plate 33: 12-18 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 15	Residence	15-21 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c.1912 Vernacular/Italianate style, Flat roof, two storey, Brick, Red brick building with symmetrical façade. Intact cornice with dentils and end brackets. Two storey pedimented porches over entryways with ornate millwork that was likely an addition. Stone sills and lintels. The rowhouses originally included four separate dwelling units. This building was constructed on Hawthorne Avenue prior to the road's re-configuration. It has been continuously used for residential use, though the number of units within the complex today is unknown. Located in Old Ottawa East	 Plate 34: 15-21 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 16	Mixed Use	94 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Mixed Use, c.1922 Vernacular/Edwardian Classicism style, Flat roof, two storey, Brick, Traditional storefronts at grade with recessed entries and wrap around glass windows. Built as all-brick mixed use building with retail at grade and apartments on second floor. Simple cornices at each level and evenly-spaced openings. The building features a shared entry for its second-storey dwelling units and commercial traditional storefronts at grade. This property was built after the reconfiguration of Hawthorne Avenue.	 Plate 35: 94 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
				Located in Old Ottawa East	
B.H.R. 17	Residence	113 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1887 The property at 113 Hawthorne Avenue is a late nineteenth-century brick residential home, prominently located adjacent to the Old Town Hall. The property is one of the first buildings constructed on Hawthorne Avenue, once conveniently located south of the Grand Trunk Railway. Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Large red brick residence with half-timbering in gable end and oriel window. Entrance is setback with large porch. Brick voussoirs over segmentally arched windows and stone sills below. Located in Old Ottawa East	 Plate 36: 113 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 18	Residence	120 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1892 Front Gable/Queen Anne Revival style, Front Gable roof, two-and-a-half storey, Brick, Red brick residence with ornate bargeboard trim, and detailed millwork on porch. Segmentally arched windows with brick voussoirs and stringcourses. Prominently located near the Old Town Hall, the property is one of the first buildings constructed on Hawthorne Avenue, once conveniently located south of the Grand Trunk Railway.	

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
				Located in Old Ottawa East	Plate 37: 120 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 19	Residence	125 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1922 Four Square style, Hipped roof, two-and-a-half storey, Brick, Red brick symmetrical residence with centre hall plan. Central dormer window, and side addition dormer. Large central porch with brick posts extends away from building. Windows have brick voussoirs and stone sills. Located in Old Ottawa East	 Plate 38: 125 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 20	Residence	128 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1902 Queen Anne Revival style, Truncated Hip roof, three storey, Brick, Large red brick residence with two storey enclosed porch. Projecting side bay with gable end containing cedar shingles, and bargeboard trim. Rounded windows with brick voussoirs and stringcourse. Oval window next to door which has transom window. Located in Old Ottawa East	 Plate 39: 128 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 21	Residence	130 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Converted Dwelling, c.1897 Queen Anne Revival style, three storey, Brick, Red brick residence with fish scale shingles in gable end, and includes a Palladian window. Dentils along roofline. Brick voussoirs above windows and stone sills below. Porch over two entrances, with pediment. Located in Old Ottawa East	 Plate 40: 130 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 22	Residence	135 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1902 Queen Anne Revival style, Truncated Hip roof, three storey, Brick, Red brick residence with large enclosed two storey porch, which is likely an early addition. Three-sided projecting bay on side. Projecting gambrel in roofline with cedar shingles. Stone lintels and sills around windows. Located in Old Ottawa East	 Plate 41: 135 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 23	Residence	137 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Converted Dwelling, c.1897 Front Gable/Queen Anne Revival style, Front Gable roof, two storey, Brick, Red brick residence with ornate bargeboard trim. Two storey porch with enclosed balcony. Brick stringcourses along second floor windows, and brick voussoirs over segmentally arched windows. Located in Old Ottawa East	 Plate 42: 137 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 24	Residence	142-144 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1907 Vernacular/Italianate style, Flat roof, two storey, Brick, Red brick semi-detached house with a porch capped with pediment, and an intact cornice. Smooth stone lintels and sills. Located in Old Ottawa East	 Plate 43: 142-144 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 25	Residence	149 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1892 Queen Anne Revival style, Truncated Hip roof, three storey, Brick, Ornate brick residence. Three-sided projecting bay topped with bracketed gable roof with cedar fish scale shingles. Segmentally arched windows. Two storey porch with ornate millwork. Oval window next to entrance. Brick stringcourses and voussoirs. Located in Old Ottawa East	 Plate 44: 149 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 26	Residence	159-161 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1930 Vernacular/Tudor Revival style, Side Gable roof, two storey, Brick, Symmetrical residence with projecting central gable cantilevered over front entrance with half-timbering and dentils. Entry consists of two rounded doors projecting outward from front porch. Stucco on second floor, and brick on ground floor. Located in Old Ottawa East	 Plate 45: 159-161 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 27	Residence	163-165 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1932 Vernacular/Edwardian Classicism style, Side Gable roof, two storey, Brick, Red brick symmetrical residence with central dormer. Darker red brick accents around windows and on corners. Half-ellipse portico over doorways, with stone keystones set in brick. Located in Old Ottawa East	 Plate 46: 163-165 Hawthorne Avenue (MTBA Associates Inc., 2023)
B.H.R. 28	Residence	167-169 Hawthorne Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1932 Vernacular/Edwardian Classicism, Side Gable roof, two storey, Brick, Red brick symmetrical residence with central dormer. Darker red brick accents around windows and on corners. Half-ellipse portico over doorways, with stone keystones set in brick. Located in Old Ottawa East	 Plate 47: 167-169 Hawthorne Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 29	School	20 Graham Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): School, 1928-1958 Art Deco/Edwardian Classicism style, Flat roof, three storey, Brick, Red brick school with symmetrical façade and large windows. Central entry with stepped parapet at roofline. Stone lintels and sills connect windows. Stonework on entrance pavilion. Decorative brickwork on sides of building. The property at 20 Graham Avenue (also known as St Nicholas School) is an institutional brick building, continuously used as a school, with neighbouring institutional buildings forming a campus on the eastern embankment of the Rideau Canal. Located in Old Ottawa East	 Plate 48: 20 Graham Avenue (MTBA Associates Inc., 2023)
B.H.R. 30	Church	31 Graham Avenue	Potential B.H.R. – Included in the Ontario Heritage Trust's Places of Worship Inventory	The Ottawa Chinese Bible Church is located at the northwest corner of the intersection of Main Street and Graham Avenue. The potential heritage attributes include the church building with table roof. The 1965 aerial photograph (Figure 12) depicts the extant church building. Located in Old Ottawa East	 Plate 49: 31 Graham Avenue (Google Streetview, 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 31	Residence	44 Lees Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1902 Front Gable/Edwardian Classicism style, Front Gable roof, two-and-a-half storey, Brick, Porch extends across façade. Brick voussoirs over segmentally arched windows, brick stringcourse above second floor windows. Located in Old Ottawa East	 Plate 50: 44 Lees Avenue (MTBA Associates Inc., 2023)
B.H.R. 32	Residence	52 Lees Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Converted Dwelling, c.1892 Vernacular/Edwardian Classicism Style, Front Gable roof, two-and-a-half storey, Brick, Porch with ornate millwork extends across façade. Brick voussoirs over segmentally arched windows, and brick stringcourse above second floor windows. Located in Old Ottawa East	 Plate 51: 52 Lees Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 33	Residence	59 Lees Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Converted Dwelling, c.1912 Vernacular/Italianate style, Flat roof, two storey, Brick, Red brick residence with projecting side bay. Brick voussoirs and rough-cut stone lintels. Porch over entrance. Cornice has been modernized. Windows and door appear to be original. Located in Old Ottawa East	 Plate 52: 59 Lees Avenue (MTBA Associates Inc., 2023)
B.H.R. 34	Residence	63 Lees Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): "Plain Air" house, Detached House, c.1893 Vernacular/Queen Anne Revival style, Front Gable, two-and-a-half storey, Wood – Clapboard siding, irregularly planned residence with projecting front gable and Palladian window in gable end. Small gabled roof over entryway. Painted shingles in gable ends. Past occupant: W.A.D. Lees Located in Old Ottawa East	 Plate 53: 63 Lees Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 35	Residence	67-71 Lees Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, 1912-1928 Italianate style, Flat roof, two storey, Brick, Grey brick row house with intact cornice. Gabled porch over entryways. Windows appear to be original. Brick voussoirs and stone sills. Transoms over doors. Located in Old Ottawa East	 Plate 54: 67-71 Lees Avenue (MTBA Associates Inc., 2023)
B.H.R. 36	Residence	73-77 Lees Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c.1912 Vernacular/Italianate style, Flat roof, two storey, Brick, Red brick row house with intact cornice. Flat roof porches over entryways. Stone sills and lintels. Located in Old Ottawa East	 Plate 55: 73-77 Lees Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 37	Residence	60 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1902 Queen Anne Revival style, Front Gable roof, two-and-a-half storey, Brick, Dichromatic brick Queen Anne revival house with original porch, and prominent second floor balcony. Palladian window in third storey gable. Oval window next to front door, with original transom window above. Located in Old Ottawa East	 Plate 56: 60 Evelyn Avenue (MTBA Associates Inc., 2023)
B.H.R. 38	Residence	62 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1872 Front Gable style, two storey, Wood – Shiplap, Green painted shiplap cladded front gable house with ornate detailing and full-length front porch with pediment. Decorative finial at gable peak with simple bargeboard trim. Located in Old Ottawa East	 Plate 57: 62 Evelyn Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 39	Residence	66 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1907 Simple two-storey vernacular house with flat roof, full length front porch, and enclosed second floor balcony with pediment, Brick. Smooth stone lintels and rough cut stone sills on each window with transom above front door. Simple multi-coloured wood cornice with brackets. Located in Old Ottawa East	 Plate 58: 66 Evelyn Avenue (MTBA Associates Inc., 2023)
B.H.R. 40	Residence	78 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1907 Queen Anne Revival Style, Front Gable roof, two-and-a-half storey, Brick, Dichromatic brick Queen Anne revival house with original porch, and prominent second floor balcony. Palladian window in third storey gable. Original transom window above front door. Prominent smooth stone lintels and sills. Located in Old Ottawa East	 Plate 59: 78 Evelyn Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 41	Residence	80-82 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1914 Vernacular/Edwardian Classicism Style, Flat roof, two storey, Brick, Semi-detached brick symmetrical house with prominent balcony with pediment, and front porch. Brick voussoirs and transoms above front doors Located in Old Ottawa East	 Plate 60: 80-82 Evelyn Avenue (MTBA Associates Inc., 2023)
B.H.R. 42	Residence	85 Evelyn Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1892 Queen Anne Revival Style, Front Gable roof, two-and-a-half storey, Brick, Prominent full-length, covered front porch with small balcony above entrance. Cedar shingles in front gable. Located in Old Ottawa East	 Plate 61: 85 Evelyn Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 43	Church	253 Echo Drive	Known B.H.R. – Included in the Municipal Register Also included in the Ontario Heritage Trust's Places of Worship Inventory	The following description is from previous reporting (MTBA Associates Inc., 2023): "Church of the Ascension," c. 1920, Place of Worship Vernacular/Arts and Crafts Style, irregular roofline, one-and-a-half storey, brick. This property is a rare example of a vernacular church inspired by the Arts and Crafts Movement. Located in Old Ottawa East	 Plate 62: 253 Echo Drive (MTBA Associates Inc., 2023)
B.H.R. 44	Residence	171 Echo Drive	Potential B.H.R. – Identified during background research and field review	The residence is located on the east side of Echo Drive to the south of Harvey Street. The potential heritage attributes include the two-storey brick residence with a square footprint and flat roof. The front façade (western elevation) features a central front door flanked by symmetrical windows, and three rectangular windows along the second floor. The potential heritage attributes of the property do not include the attached buildings to the north which appear to have been constructed between 1999 and 2002. The 1928 aerial photograph (Figure 11) shows a building in the vicinity of the extant structure.	 Plate 63: 171 Echo Drive (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 45	Residence	145 Echo Drive	Potential B.H.R. – Identified during background research and field review	The apartment building is located on the east side of Echo Drive to the south of Main Street. The potential heritage attributes include the two-and-a-half storey brick apartment building with a hipped roof and rectangular footprint and rear wings. The front façade (western elevation) features a projecting central bay with a front door, symmetrical windows, and a dog tooth pattern in the brickwork along the second floor. The 1928 aerial photograph (Figure 11) shows a building in the vicinity of the extant structure.	 Plate 64: 145 Echo Drive (A.S.I., 2024).
B.H.R. 46	Apartment Building	143 Echo Drive	Potential B.H.R. – Identified during background research and field review	The apartment building is located on the east side of Echo Drive to the south of Main Street. The potential heritage attributes include the three-storey brick apartment building with a rectangular footprint and flat roof. The front façade (western elevation) features a doorway at the northern end, rectangular windows with concrete lintels, and an infilled lunette above the third-floor northern window. The 1928 aerial photograph (Figure 11) shows a building in the vicinity of the extant structure.	 Plate 65: 143 Echo Drive (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 47	Residence	133 Echo Drive	Known B.H.R. – Included in the Municipal Register	The residence is located on the east side of Echo Drive to the south of Main Street. The potential heritage attributes include the two-and-half storey brick residence with a gable roof and rectangular footprint that was constructed circa 1910 (City of Ottawa, 2023c). The front façade (western elevation) features a door at the southern end with an arched transom window, arched windows, and a central window beneath the gable. The house also features a rear addition. The 1928 aerial photograph (Figure 11) shows a residence in the vicinity of the extant structure.	 Plate 66: 133 Echo Drive (A.S.I., 2024).
B.H.R. 48	Residence	166-170 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c.1912 Vernacular/Italianate style, Flat roof, two storey, Brick, Italianate row house with balanced façade, two porticos with pediments, and an intact cornice with decorative wood brackets across the width of the building. Subtle brick voussoirs are visible. Located in Old Ottawa East	 Plate 67: 166-170 Greenfield Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 49	Residence	172 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1887 Front Gable/Vernacular style, Hipped roof, two-and-a-half storey, Brick, Simple front gable brick house with keystones above windows integrated into stone mouldings. Brackets under stone lintels. Located in Old Ottawa East	 Plate 68: 172 Greenfield Avenue (MTBA Associates Inc., 2023)
B.H.R. 50	Residence	173 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1892 Vernacular style, Hipped roof, two-and-a-half storey, Brick, Prominent full-length balcony and porch. Original wood doors at entry and on second floor balcony with transoms above. Two-tone cedar shingles in gable dormer. Located in Old Ottawa East	 Plate 69: 173 Greenfield Avenue (MTBA Associates Inc., 2023)

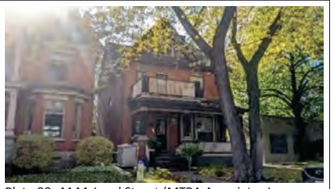
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 51	Residence	175 Greenfield Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1892 Queen Anne Revival style, Front Gable roof, two-and-a-half storey, Brick, Red brick Queen Anne revival house with intricately decorative bargeboard, brick voussoirs, a string course above the first and second floor and a semicircular window in gable. Original transom window above door. Located in Old Ottawa East	 Plate 70: 175 Greenfield Avenue (MTBA Associates Inc., 2023)
B.H.R. 52	Residence	44-46 Havelock Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1892 Vernacular/Italianate Style, Flat roof, two storey, Brick, Red brick semi-detached house with intact cornice. Windows appear to be original. Front porch with small gable roof. Located in Old Ottawa East	 Plate 71: 44-46 Havelock Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 53	Residence	76-78 Havelock Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1910 Vernacular/Italianate style, Flat roof, two storey, Brick, Red brick residence with intact cornice. Porch with pediment and dentils in entablature. Segmentally arched windows with brick voussoirs and stone sills. Old Ottawa East	 Plate 72: 76-78 Havelock Street (MTBA Associates Inc., 2023)
B.H.R. 54	Residence	93 Harvey Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1925 Four Square/Edwardian Style, Hipped roof, two-and-a-half storey, Brick, Red brick Four Square in excellent condition. Windows and door appear to be original. Stone lintels and sills. Porch extends across façade. Located in Old Ottawa East	 Plate 73: 93 Harvey Street (MTBA Associates Inc., 2023)

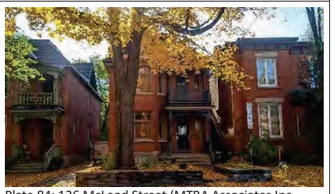
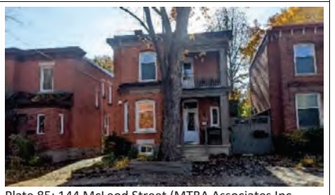
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 55	Residence	125 Harvey Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1887 Ontario Cottage/Gothic Revival style, Side Gable roof, two storey, Stone residence with symmetrical façade. Gable in centre of roofline with window. Entry has classical mouldings. Located in Old Ottawa East	 Plate 74: 125 Harvey Street (MTBA Associates Inc., 2023)
B.H.R. 56	Residence	56 Concord Street North	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1905 Vernacular Style, Gambrel roof, two storey, Wood – Shiplap siding, Grey painted shiplap cladded vernacular house with original wood door, simple portico and sympathetic windows. Cedar shingles in small gable above second floor windows. Located in Old Ottawa East	 Plate 75: 56 Concord Street North (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 57	Residence	58 Concord Street North	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1905 Front Gable/Vernacular style, Front Gable roof, two storey, Wood – Shiplap siding, Grey painted shiplap house with small wood portico and original wood door. Located in Old Ottawa East	 Plate 76: 58 Concord Street North (MTBA Associates Inc., 2023)
B.H.R. 58	Residence	90 Concord Street North	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Residential - Converted Dwelling, c.1907 Vernacular/Gothic Revival Style, Front Gable roof, two-and-a-half storey, Brick, Intact pediment over porch and bargeboard along the front gable roofline. Decorative brick pattern visible between second floor windows. Brick voussoirs with dentils above all window openings. Pointed gable-end window. Located in Old Ottawa East	 Plate 77: 90 Concord Street North (MTBA Associates Inc., 2023)

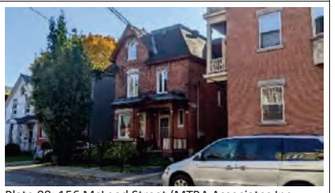
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 59	Residence	6 McLeod Street	Known B.H.R. – Designated under Part IV of the *Ontario Heritage Act* (By-law 287-89). Please see the By-law available via this link. or see Appendix B for a copy of the By-law.	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached Home, c. 1908 This property is a two-and-a-half storey residential home, built between 1907 and 1908, for Martin Rosenhall. It is constructed of brick and stucco, in the Edwardian Classical style, and is currently used as multiunit housing. It is one of the largest and oldest houses constructed immediately following the 1905 residential subdivision of Centretown	 Plate 78: 6 McLeod Street (MTBA Associates Inc., 2023)
B.H.R. 60	Residence	38-40 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Red brick residence with a centre hall plan. Centretown	 Plate 79: 38-40 McLeod Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 61	Residence	44 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1908 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Red brick residence. Centretown	 Plate 80: 44 McLeod Street (MTBA Associates Inc., 2023)
B.H.R. 62	Residence	128 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1912 Vernacular style, Front Gable roof, two-and-a-half storey, Brick, Gable-front cottage. Centretown	 Plate 81: 128 McLeod Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 63	Residence	132 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Hipped roof with asymmetrical gabled bay. Centretown	 Plate 82: 132 McLeod Street (MTBA Associates Inc., 2023)
B.H.R. 64	Residence	134 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1897 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Asymmetrical bay with gable roof; bargeboard; segmental arch windows; brick voussoirs; stone sills; stone foundation; two storey porch with pediment; door appears original. Centretown	 Plate 83: 134 McLeod Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 65	Residence	136 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1910 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Asymmetrical bay with gabled dormer; decorated wood soffits; transom; oval window; brick voussoirs; stone sills; stone foundation; two storey porch with pediment. Centretown	 Plate 84: 136 McLeod Street (MTBA Associates Inc., 2023)
B.H.R. 66	Residence	144 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Edwardian Classicism/Italianate style, Flat roof, two storey, Brick, Red brick residence. Centretown	 Plate 85: 144 McLeod Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 67	Residence	150 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Edwardian Classicism/Italianate style, Flat roof, two storey, Brick, Red brick residence. Centretown	 Plate 86: 150 McLeod Street (MTBA Associates Inc., 2023)
B.H.R. 68	Residence	154 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1911 Edwardian Classicism/Italianate style, Flat roof, two storey, Brick, Red brick residence. Centretown	 Plate 87: 154 McLeod Street (MTBA Associates Inc., 2023)

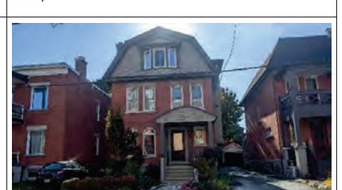
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 69	Residence	156 McLeod Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1892 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Asymmetrical bay with gable roof; decorative wood trim; brick corbelling; brick stringcourses; keystones; transom; one storey porch; stone foundation. Centretown	 Plate 88: 156 McLeod Street (MTBA Associates Inc., 2023)
B.H.R. 70	Residence	170 Cartier Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1900 Eclectic/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Red brick residence with a side hall plan; Style is Eclectic. Centretown	 Plate 89: 170 Cartier Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 71	Residence	172 Cartier Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Classical Revival/Vernacular style, Truncated Hip roof two-and-a-half storey, Brick, Red brick residence with a side hall plan. Centretown	 Plate 90: 172 Cartier Street (MTBA Associates Inc., 2023)
B.H.R. 72	Residence	178-184 Cartier Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c. 1900 Edwardian Classicism/Italianate Style, Flat roof, two storey, Brick, Red brick row house. Centretown	 Plate 91: 178-184 Cartier Street (MTBA Associates Inc., 2023)

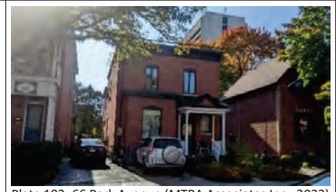
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 73	Residence	190 Cartier Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Queen Anne Revival/Vernacular Style, Hipped roof, two-and-a-half storey, Brick, Corner property, irregular massing, two storey wraparound porch with turret form at corner, brick voussoirs, stone sills Centretown	 Plate 92: 190 Cartier Street (MTBA Associates Inc., 2023)
B.H.R. 74	Residence	194-198 Cartier Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c. 1900 Second Empire/Vernacular Style, Mansard roof, three storey, Brick, Red brick residence with gabled bay, round arch windows, keystones, transom, exposed stone foundation. Centretown	 Plate 93: 194-198 Cartier Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 75	Residence	40 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1900 Dutch Revival/Vernacular style, Gambrel roof, two-and-a-half storey, Brick, Red brick residence. Centretown	 Plate 94: 40 Park Avenue (MTBA Associates Inc., 2023)
B.H.R. 76	Residence	44 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Queen Anne Revival/Vernacular style, Front Gable roof, two-and-a-half storey, Brick, Red brick residence. Centretown	 Plate 95: 44 Park Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 77	Residence	47 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1907 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Hipped roof with asymmetrical gabled bay. Centretown	 Plate 96: 47 Park Avenue (MTBA Associates Inc., 2023)
B.H.R. 78	Residence	48 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1900 Vernacular style, Front Gable roof, two-and-a-half storey, Brick, Gable-front cottage. Centretown	 Plate 97: 48 Park Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 79	Residence	50-52 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Duplex, c. 1907 Edwardian Classicism/Italianate style, Flat roof, two storey, Brick, Red brick residence. Centretown	 Plate 98: 50-52 Park Avenue (MTBA Associates Inc., 2023)
B.H.R. 80	Residence	54 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1907 Vernacular/Dutch revival style, Gambrel roof, two-and-a-half storey, Brick, oriel window in gambrel-end; cedar shingle; round arch windows; brick voussoirs; stone lintels; stone sills; stone foundation. Centretown	 Plate 99: 54 Park Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 81	Residence	58 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1905 Vernacular style, Irregular roof, two-and-a-half storey, Brick, decorated wood soffits; dormer with gable roof and distinct segmental arch window; stone lintels; stone sills; stone foundation; transom. Windows and doors appear original. Centretown	 Plate 100: 58 Park Avenue (MTBA Associates Inc., 2023)
B.H.R. 82	Residence	62 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Vernacular/Dutch revival style, Gambrel roof, two-and-a-half storey, Brick, wood trim and cornice; cedar shingle; stringcourse; brick voussoirs; lunettes; stone sills; stone lintels; stone foundation; one storey projecting bay; two storey porch. Centretown	 Plate 101: 62 Park Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 83	Residence	66 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Edwardian Classicism/Italianate style, Flat roof, two storey, Brick, Red brick residence. Centretown	 Plate 102: 66 Park Avenue (MTBA Associates Inc., 2023)
B.H.R. 84	Residence	65-67 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c. 1905 Italianate/Vernacular style, Flat roof, two storey, Brick, Red brick residence. Centretown	 Plate 103: 65-67 Park Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 85	Residence	70 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1892 Vernacular style, Front Gable roof, one-and-a-half storey, Brick, Gable-front cottage with contrasting brick quoins and voussoirs; wood finial; metal hood and door surround; entrance door appears original. Centretown	 Plate 104: 70 Park Avenue (MTBA Associates Inc., 2023)
B.H.R. 86	Residence	80 Park Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1902 Queen Anne Revival/Tudor Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Red brick residence. Centretown	 Plate 105: 80 Park Avenue (MTBA Associates Inc., 2023)

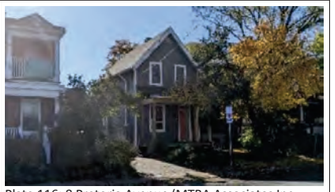
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 87	Residence	29 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1907 Vernacular Style, two-and-a-half storey, Truncated Hip, Brick, Gambrel dormer with shingle and Palladian window; keystones; stone sills; stone foundation; transom; two storey porch with pediment. Centretown	 Plate 106: 29 Argyle Avenue (MTBA Associates Inc., 2023)
B.H.R. 88	Residence	31 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1912 Queen Anne Revival Style, two-and-a-half storey, red brick residence with a side hall plan. Centretown	 Plate 107: 31 Argyle Avenue (MTBA Associates Inc., 2023)

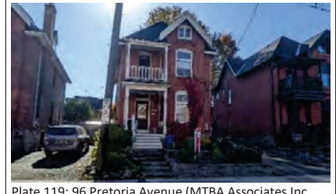
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 89	Residence	33 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1903 Queen Anne Revival and Vernacular Style, Truncated Hip roof, two-and-a-half storey, Brick, Hipped roof with asymmetrical gabled bay. Centretown	 Plate 108: 33 Argyle Avenue (MTBA Associates Inc., 2023)
B.H.R. 90	Residence	37 Argyle Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c. 1903 Vernacular Style, Mansard roof, two-and-a-half storey, Brick, Red brick double residence. Centretown	 Plate 109: 37 Argyle Avenue (MTBA Associates Inc., 2023)

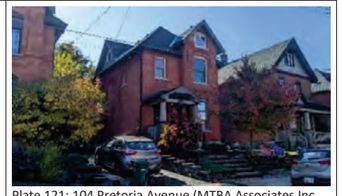
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 91	Residence	114 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1922 Four Square/Vernacular style, Hipped roof, two-and-a-half storey, Brick, Symmetrical building with central entrance, central dormer, wood door, rectangular lintels, and sills. Faces Rideau Canal. It is directly adjacent to the Rideau Canal and neighbours other properties on the Heritage Register. Centretown	 Plate 110: 114 Queen Elizabeth Driveway (MTBA Associates Inc., 2023)
B.H.R. 92	Residence	116 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1922 Four Square/Vernacular style, irregular roof, two-and-a-half storey, Brick, Symmetrical building with central entrance, central dormer, wood door, 3/4 porch with pediment, rectangular lintels, and sills. Faces Rideau Canal. It is directly adjacent to the Rideau Canal and between two other properties on the Heritage Register. Centretown	 Plate 111: 116 Queen Elizabeth Driveway (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 93	Residence	118 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1927 Four Square/Vernacular style, irregular roof, two-and-a-half storey, Brick, Symmetrical building with central entrance, hipped gable roof, central dormer, rectangular lintels and sills, yellow/brown brick. Faces Rideau Canal. It is directly adjacent to the Rideau Canal and neighbours other properties on the Heritage Register. The brick used in its construction is slightly lighter in colour than the adjacent red brick buildings. Centretown	 Plate 112: 118 Queen Elizabeth Driveway (MTBA Associates Inc., 2023)
B.H.R. 94	Apartment Building	150 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	The apartment building, known as the Tiffany Apartments, is located at the northwest corner of the intersection of Queen Elizabeth Driveway and Catherine Street. According to the heritage listing report for the property, the heritage attributes include the multi-storey brick apartment building that was constructed in 1954. The yellow brick building faces the canal and was the first post-war luxury apartment built in the city. It has decorative banding and displays elements of Modernism (City of Ottawa, 2020). The 1965 aerial photograph (Figure 12) shows the extant apartment building.	 Plate 113: The Tiffany Apartments, 150 Queen Elizabeth Driveway (A.S.I., 2024).

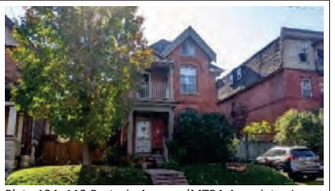
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 95	Residence	216-218 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1912 Vernacular/Edwardian Classicism style, Flat roof, two2 storey, Brick, Red brick symmetrical semi-detached house with a two storey porch. Cornice has end brackets and pediment with dentils at centre. Windows have stone sills and brick voussoirs with a jagged stringcourse along the voussoirs of the second storey windows. It directly fronts the Rideau Canal and the adjacent NCC's landscaped pathways. This property is visible from the Queensway Bridge at the Rideau Canal. Glebe	 Plate 114: 216-218 Queen Elizabeth Driveway (MTBA Associates Inc., 2023)
B.H.R. 96	Residence	234 Queen Elizabeth Driveway	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1933 Georgian Revival/Vernacular style, Side Gable roof, two storey, Brick, Red brick symmetrical residence with eyebrow dormer. Cornice, front entrance, and first floor windows have dentils. Windows have brick sills on first floor, and stone on second. A stringcourse connects the first floor sills. Entrance has sidelights. Glebe	 Plate 115: 234 Queen Elizabeth Driveway (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 97	Residence	8 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1910 Front Gable style, Front Gable roof, two storey, Wood – Shiplap siding, Grey painted shiplap cladded front gable house with full length front porch. Decorative wood bargeboard on gable and transom over door.It is adjacent to the Rideau Canal and is built in a similar style to other early 20th century detached homes on both the eastern and western embankments. Glebe	 Plate 116: 8 Pretoria Avenue (MTBA Associates Inc., 2023)
B.H.R. 98	Residence	92 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival/Vernacular style, Hipped roof, two-and-a-half storey, Brick, Red brick residence with two storey enclosed porch. Projecting side bay with gable end. Windows have stone sills and brick voussoirs with a stringcourse. Windows and door transom are decorated with patterned lunettes. Part of a cluster of homes of similar typology and construction along Pretoria Avenue (92, 96, 100, 104 Pretoria Avenue) Glebe - Dows Lake	 Plate 117: 92 Pretoria Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 99	Residence	95-97 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1900 Queen Anne Revival/Vernacular style, Flat roof, two storey, Brick, Red brick semi-detached residence with a decorative full-length porch and second floor pedimented balcony. Projecting bays on both sides with bargeboard trim. Second floor windows have stone sills, decorative lunettes, voussoirs, and stringcourse. Glebe	 Plate 118: 95-97 Pretoria Avenue (MTBA Associates Inc., 2023)
B.H.R. 100	Residence	96 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival/Vernacular, Hipped roof, two-and-a-half storey, Brick, Red brick residence with two storey porch. Projecting side bay with gable end containing bargeboard trim. Windows have stone sills and brick voussoirs with a stringcourse. Windows and doors are decorated with patterned lunettes Part of a cluster of homes of similar typology and construction along Pretoria Avenue (92, 96, 100, 104 Pretoria Avenue) Glebe	 Plate 119: 96 Pretoria Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 101	Residence	100 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival/Vernacular style, Hipped roof, two-and-a-half storey, Brick, Red brick residence with two storey porch. Projecting side bay with gable end containing bargeboard trim. Windows have stone sills and brick voussoirs with a stringcourse. Windows and doors are decorated with patterned lunettes. Part of a cluster of homes of similar typology and construction along Pretoria Avenue (92, 96, 100, 104 Pretoria Avenue) Glebe - Dows Lake	 Plate 120: 100 Pretoria Avenue (MTBA Associates Inc., 2023)
B.H.R. 102	Residence	104 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival/Vernacular style, Hipped roof, two-and-a-half storey, Brick, Red brick residence with single storey porch. Projecting side bay with gable end. Windows have decorative brick voussoirs and a stringcourse. Door appears original. Part of a cluster of homes of similar typology and construction along Pretoria Avenue (92, 96, 100, 104 Pretoria Avenue) Glebe	 Plate 121: 104 Pretoria Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 103	Residence	107 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1904 Vernacular/Edwardian Classicism style, Flat roof, two storey, Brick, Flat-roof red brick residence with bracketed cornice and two storey porch. Windows and doors have decorative lunettes, stone sills, elaborate voussoirs and stringcourse. Glebe - Dows Lake	 Plate 122: 107 Pretoria Avenue (MTBA Associates Inc., 2023)
B.H.R. 104	Residence	108 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Front Gable style, Front Gable roof, two-and-a-half storey, Brick, Red brick residence with elaborate cedar shingle design in gable end. Decorative bargeboard. Full length pedimented porch with stone pillar supports. Front door and its transom look original. Glebe	 Plate 123: 108 Pretoria Avenue (MTBA Associates Inc., 2023)

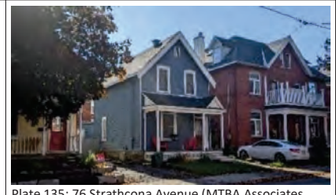
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 105	Residence	112 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1901 Queen Anne Revival/Vernacular style, Hipped roof, two-and-a-half storey, Brick, Red brick residence with two storey pedimented porch. Projecting side bay with gable end containing bargeboard trim. Windows have elaborate brick voussoirs and patterned lunettes. Front door appears original. Glebe	 Plate 124: 112 Pretoria Avenue (MTBA Associates Inc., 2023)
B.H.R. 106	Residence	154 Pretoria Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Converted Dwelling, c.1877 Queen Anne Revival style, Irregular roof, two-and-a-half storey, Brick, Red brick residence with wrap-around verandah including a conical roof with finial at the northeast corner. Front and side gables have decorative bargeboard and cedar shingles. Windows on front façade have stone sills and decorative lunettes. Glebe - Dows Lake	 Plate 125: 154 Pretoria Avenue (MTBA Associates Inc., 2023)

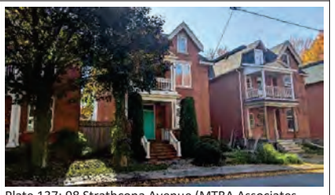
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 107	Residence	23 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1905 Gothic Revival/Vernacular style, Front Gable roof, two-and-a-half storey, Wood – Clapboard siding, Wood bargeboard; wood pendant; wood window surrounds; veranda with pediment; decorative millwork. It is adjacent to the Rideau Canal and is built in a similar style to other early 20th century detached homes on both the eastern and western embankments. Its basic vernacular arrangement has been overlaid with fine millwork trims of a neoclassical/post-modern style. Glebe	 Plate 126: 23 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 108	Residence	40-42 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1900 Edwardian Classicism style, Flat roof, two storeys, Stucco, Highly symmetrical; brick quoins; wood cornice with brackets; brick posts punctuate roofline. Glebe	 Plate 127: 40-42 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 109	Residence	46 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1932 Edwardian Classicism style, Flat roof, two storey, Brick, Flat-roofed building with segmental arched windows, brick voussoirs, two storey porch, and a cornice with brackets Glebe	 Plate 128: 46 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 110	Residence	53 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1880 Gothic Revival style, Front Gable roof, two-and-a-half storey, Wood – Clapboard siding, Veranda with pediment; decorative millwork; transom window; exposed stone foundation. Attributed to builder John Hodgkin. Glebe	 Plate 129: 53 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 111	Residence	54 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1932 Tudor Revival style, irregular roof, two-and-a-half storey, Stucco, house with half-timbering, stucco cladding, red brick at first storey, brick quoins, dichromatic brick entranceway surround Glebe	 Plate 130: 54 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 112	Residence	55-57 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1900 Edwardian Classicism style, Flat roof, two storey, Brick, Intact wood cornice with brackets; stone lintels; stone sills; exposed stone foundation; transom windows; two-storey porch with pediment. Attributed to builder John Hodgkin. Glebe	 Plate 131: 55-57 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 113	Residence	56-58 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1925 Tudor Revival style, irregular roof, two storey, Stucco, Corner property, stucco cladding with half timbering at eaves and brick entranceway surrounds. Prominent brackets are featured at roofline. Glebe	 Plate 132: 56-58 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 114	Residence	59 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism style, Front Gable roof, two-and-a-half storey, Brick, two storey porch with pediment, fishscale shake at gable, simple stone sills and lintels, corner property. Attributed to builder John Hodgkin. Glebe	 Plate 133: 59 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 115	Residence	70 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Vernacular/Queen Anne Revival style, Front Gable roof, one-and-a-half storey, Metal – Siding, Modest workers home; veranda with pediment; decorative millwork; transom window; stone foundation. Glebe	 Plate 134: 70 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 116	Residence	76 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Vernacular/Queen Anne Revival style, Front Gable roof, one-and-a-half storey, Wood – Shiplap siding, Modest workers home; veranda with pediment; wood window surrounds; wood bargeboard; transom window; stone foundation. Entry door appears original. Glebe	 Plate 135: 76 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 117	Residence	80-82 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, 1900 Gothic Revival style, Truncated Hip roof, two-and-a-half storey, Brick, duplex, segmental arch windows with decorative lunettes and brick voussoirs, two storey central porch, transom windows over front entrances Glebe	 Plate 136: 80-82 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 118	Residence	98 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, two storey porch, simple stone lintels, rough-faced stone sills, decorative barge board at gable, stone foundation. Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 137: 98 Strathcona Avenue (MTBA Associates Inc., 2023)

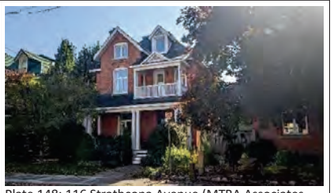
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 119	Residence	99 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, 1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, decorative barge board, window openings feature brick and stone hood mouldings, two storey porch Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 138: 99 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 120	Residence	100 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, String courses continue into hood mouldings over brick voussoirs at first and second storey, stone foundation, stone sills, decorative bargeboard, two storey porch Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 139: 100 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 121	Residence	101 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Round arch window openings with brick voussoirs and hood moulding at first storey, stone sills, two storey porch, brick string course marking second storey, corbelling at third storey window, decorative barge board Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 140: 101 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 122	Residence	103 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, String courses join hood moulding over brick voussoirs at first storey, stone foundation, stone sills, round-arched window openings, decorative corbelling at third storey, decorative bargeboard, two storey porch Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 141: 103 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 123	Residence	104 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, String courses continue into hood mouldings over brick voussoirs at first and second storey, stone foundation, stone sills, decorative bargeboard, two storey porch Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 142: 104 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 124	Residence	106-108 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, 1900 Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Stone foundation, two storey porch, stone sills and lintels, string course, Hines Builder Glebe	 Plate 143: 106-108 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 125	Residence	107 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Stone foundation, stone sills, brick voussoirs, two storey porch Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 144: 107 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 126	Residence	111 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Stone foundation, brick voussoirs, stone sills, decorative bargeboard, two storey porch, brick corbelling at third storey. Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 145: 111 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 127	Residence	112 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Stone foundation, two storey porch with decorative railing, columns and trim, bargeboard Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 146: 112 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 128	Residence	115 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c. 1900 Queen Anne Revival style, Front Gable roof, two-and-ahalf storey, Brick, Brick voussoirs, stone sills, two storey porch with pediment, transom, stained glass, exposed stone foundation. Glebe	 Plate 147: 115 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 129	Residence	116 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Side-hall plan with two-and-a-half storey gabled bay; segmental arch windows; lunettes; voussoirs; stone sills; transom window; veranda; second floor porch with pediment. Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 148: 116 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 130	Residence	117 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, String courses continue into hood mouldings over brick voussoirs at first and second storey, stone foundation, stone sills, two storey porch Part of a cluster of homes of similar typology and construction along Strathcona Avenue (98, 99, 100, 101, 103, 104, 107, 111, 112, 116, 117 Strathcona Avenue) Glebe	 Plate 149: 117 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 131	Residence	119 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Queen Anne Revival style, Truncated Hip roof, two-and-a-half storey, Brick, Two-storey porch, brick corbelling at third storey, stone lintels and sills join into stone banding, stone foundation Glebe	 Plate 150: 119 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 132	Residence	145 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Front Gable style, Front Gable roof, two-and-a-half storey, Wood – Clapboard siding, Front porch with milled columns and decorative trim, two over two windows, decorative bargeboard Glebe	 Plate 151: 145 Strathcona Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 133	Residence	151 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1910 Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Two storey porch, large 8 over 12 windows, decorative bargeboard and cedar shake at gable end Glebe	 Plate 152: 151 Strathcona Avenue (MTBA Associates Inc., 2023)
B.H.R. 134	Residence	155-157 Strathcona Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1910 Vernacular style, Gambrel roof, two-and-a-half storey, Brick, two storey porch with pediment, simple stone sills and lintels, cedar shake at gambrel end Glebe	 Plate 153: 155-157 Strathcona Avenue (MTBA Associates Inc., 2023)

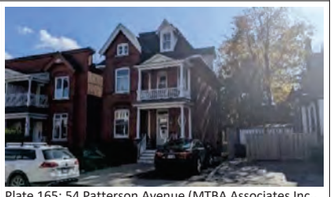
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 135	Residence	8 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1905 Edwardian Classicism style, Truncated Hip roof, two-and-a-half storey, Brick, Large red brick house with Palladian window in gambrel dormer. Two storey porch with enclosed second floor and pediment. Windows enhanced by continuous lintels and sills. Glebe	 Plate 154: 8 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 136	Residence	15 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, three storey gable bay with decorative bargeboard in gable-end. Large two storey porch with pediment. Brick voussoirs over windows with stone sills. Transom enhances entrance. Glebe	 Plate 155: 15 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 137	Residence	17-19 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1900 Edwardian Classicism style, Flat roof, two storey, Brick, Symmetrical red brick duplex with pedimented two storey porch. Intact wood cornice with brackets. Façade is enhanced by brick stringcourses. Transoms appear above each entrance. Glebe	 Plate 156: 17-19 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 138	Residence	23 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1890 Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Three storey gable bay with decorative bargeboard in gable-end. Large two storey porch with pediment. Brick voussoirs over windows with stone sills. Transom enhances entrance. Glebe	 Plate 157: 23 Patterson Avenue (MTBA Associates Inc., 2023)

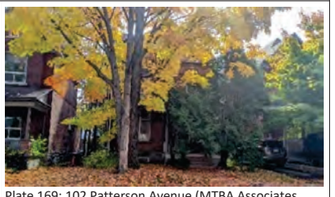
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 139	Residence	33 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1900 Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Red-brick duplex with twin bays and recessed entrance. Cedar shingles in gable ends. Two storey pedimented porch. Glebe	 Plate 158: 33 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 140	Residence	39 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1910 Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Three storey gable bay with segmental arch windows and decorative lunettes. Large two storey porch with pediment. Contrasting stone details decorate windows. Transom enhances entrance. Glebe	 Plate 159: 39 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 141	Residence	43 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism style, Flat roof, two storey, Brick, Red brick building with brick voussoirs and stringcourse. Two storey pedimented porch frames entrance. Glebe	 Plate 160: 43 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 142	Residence	44 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, three storey gable bay with semi-circular windows and decorative bargeboard in gable-end. Large two storey porch with pediment. Brick hood moulding over windows with stone sills. Transom enhances entrance. Glebe	 Plate 161: 44 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 143	Residence	46 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, three storey gable bay with semi-circular windows and decorative bargeboard in gable-end. Large two storey porch with pediment and enclosed second floor. Brick hood moulding over windows with stone sills. Transom enhances entrance. Glebe	 Plate 162: 46 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 144	Residence	47-49 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1892Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Symmetrical red-brick duplex with twin gable bays. Decorative bargeboard, cedar shingle and corbelling decorate each bay. Large verandah and second floor porch frame entrance. Glebe	 Plate 163: 47-49 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 145	Residence	50-52 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1900 Edwardian Classicism style, Flat roof, two storeys, Brick, Symmetrical red-brick duplex with twin gable bays. A pedimented two storey porch includes decorative millwork. All four doors topped with transom window. Intact wood cornice with brackets. Bargeboard in gable-ends. Glebe	 Plate 164: 50-52 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 146	Residence	54 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, three storey gable bay with segmentally arched windows and decorative bargeboard in gable-end. Large two storey porch with pediment. Brick voussoirs enhance windows with stone sills. Transom over entrance. Stringcourses divide floors. Glebe - Dows Lake	 Plate 165: 54 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 147	Residence	96 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular style, Hipped roof, two-and-a-half storey, Brick, three storey gable bay with segmentally arched windows and decorative bargeboard in gable-end. Large porch with pediment. Brick voussoirs enhance windows with stone sills. Transom over entrance. Glebe	 Plate 166: 96 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 148	Residence	98 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular style, Hipped roof, two-and-a-half storey, Brick, three storey gable bay with segmentally arched windows and decorative bargeboard in gable-end. Large porch with pediment. Brick voussoirs enhance windows with stone sills. Transom over entrance. Glebe	 Plate 167: 98 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 149	Residence	100 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1907 Edwardian Classicism/Vernacular style, Hipped roof, two-and-a-half storey, Brick, three storey gable bay with segmentally arched windows. Large one storey porch with decorated pediment and fascia. Brick voussoirs enhance windows with stone sills. Transom over entrance. Glebe	 Plate 168: 100 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 150	Residence	102 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Vernacular/Edwardian Classicism style, Hipped roof, two-and-a-half storey, Brick, Red brick home with cedar shingles in gable-end. Brick voussoirs enhance segmentally arched windows. One storey porch with pediment. Visible brick stringcourse on second floor. Glebe	 Plate 169: 102 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 151	Residence	104 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Edwardian Classicism/Vernacular, Hipped roof, two-and-a-half storey, Brick, three storey gable bay house with decorative brackets and cedar shingles in gable end. Large first floor verandah and second floor balcony. Keystones and brick details enhance windows. Transom over entrance. Glebe	 Plate 170: 104 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 152	Residence	106 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Vernacular/Edwardian Classicism style, Front Gable roof, two-and-a-half storey, Brick, Red brick residence with unique trim and cedar shingles in gable-end. Brick stringcourse and protruding one storey bay distinguish façade. Segmentally arched windows are enhanced by brick voussoirs and stone sills. Glebe	 Plate 171: 106 Patterson Avenue (MTBA Associates Inc., 2023)

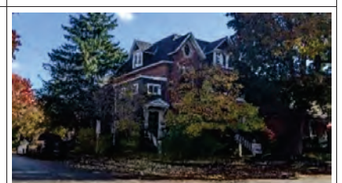
Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 153	Residence	110-112 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c. 1929 Vernacular/Four Square style, Hipped roof, two-and-a-half storey, Brick, Symmetrical red brick residence with central hipped dormer, one storey porch with large pediment, brick voussoirs and stone sills. Glebe	 Plate 172: 110-112 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 154	Residence	145 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Vernacular Style, Truncated Hip roof, two-and-a-half storey, Brick, Gabled dormer with wood trim, two-storey porch, brick voussoirs, stone foundation, transom. Glebe	 Plate 173: 145 Patterson Avenue (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 155	Residence	149-151 Patterson Avenue	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1900 Vernacular/Queen Anne Revival style, Truncated Hip roof, two-and-a-half storeys, brick, gabled bay with bargeboard, brick voussoirs, two-storey porch with pediment, transoms, exposed stone foundation. Glebe	 Plate 174: 149-151 Patterson Avenue (MTBA Associates Inc., 2023)
B.H.R. 156	Residence	485-489 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, c.1907 Edwardian Classicism style, Flat roof, two storey, Brick, Pair of two storey porches with pediments and fluted columns, cornice with brackets, rough faced stone sills and lintels Glebe	 Plate 175: 485-489 Metcalfe Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 157	Residence	491-493 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, 1907 Vernacular style, Flat roof, two storey, Brick, Pair of two storey porches enclosed at second storey, stone sills and lintels, cornice with brackets Glebe	 Plate 176: 491-493 Metcalfe Street (MTBA Associates Inc., 2023)
B.H.R. 158	Residence	494-498 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Row House, 1900 Vernacular style, Flat roof, two storey, Brick, Cornice with brackets, stone sills, and lintels one storey porches with pediments, stone foundation Glebe	 Plate 177: 494-498 Metcalfe Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 159	Residence	495 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1902 Queen Anne Revival style, Hipped roof, two-and-a-half storey, Brick, Corner property, projecting bay, second and third storey clad with cedar shake, ornamental brackets Glebe	 Plate 178: 495 Metcalfe Street (MTBA Associates Inc., 2023)
B.H.R. 160	Residence	504 Metcalfe Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, 1898 Queen Anne Revival style, Hipped roof, two-and-a-half storey, Brick, Corner property, projecting bay clad in wood at second and third storey, decorative brackets, stone foundation Glebe	 Plate 179: 504 Metcalfe Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 161	Residence	466-468 O'Connor Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1905 Edwardian Classicism/Vernacular style, Flat roof, two storey, Brick, Symmetrical red brick façade with bracketed cornice, two storey pedimented porch, and stringcourse. Windows have stone sills, brick voussoirs, and decorative lunettes. Stone foundation. Glebe	 Plate 180: 466-468 O'Connor Street (MTBA Associates Inc., 2023)
B.H.R. 162	Residence	470-472 O'Connor Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Semi-detached House, c.1905 Vernacular/Edwardian Classicism style, Flat roof, two storey, Brick, Symmetrical façade with projecting bays. Bracketed cornice and two storey pedimented porch. Decorative stringcourse and brick corbelling. Windows have stone sills, brick voussoirs, and decorative lunettes. Front doors and transom appear original. Glebe	 Plate 181: 470-472 O'Connor Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 163	Residence	478 O'Connor Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, c.1905 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-a-half storey, Brick, Red brick residence with projecting gabled bay with bargeboard. Two storey porch has pediment and Doric columns with stone supports. Segmental arch windows have stone sills, brick voussoirs, decorative lunettes. Stringcourse and decorative brick design. Glebe	 Plate 182: 478 O'Connor Street (MTBA Associates Inc., 2023)
B.H.R. 164	Residence	501 O'Connor Street	Known B.H.R. – Included in the Municipal Register	The following description is from previous reporting (MTBA Associates Inc., 2023): Detached House, Converted Dwelling, c.1907 Queen Anne Revival/Vernacular style, Truncated Hip roof, two-and-ahalf storey, Brick, Red brick residence with projecting bay and two-storey porch with Doric columns. Stone banding and brick corbelling. Stone foundation and sills. Front door appears original. Glebe	 Plate 183: 501 O'Connor Street (MTBA Associates Inc., 2023)

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 1	Canal Landscape	Rideau Canal C.H.L. The C.H.L. includes the Rideau Canal and a 30-metre buffer.	Known C.H.L. – U.N.E.S.C.O. World Heritage Site; National Historic Site; Canadian Heritage River System	The Rideau Canal was built between 1826 and 1832 and is 202 kilometres in length between Ottawa and Kingston. The Rideau Canal was first identified as a National Historic Site in 1925, a Canadian Heritage River System in 2000 (Canadian Heritage Rivers Board and Technical Planning Committee, n.d.), and was inscribed as a U.N.E.S.C.O. World Heritage Site in 2007 (ICOMOS, 2007). The designation of the canal of a U.N.E.S.C.O. World Heritage Site includes a 30-metre buffer on both sides of the canal. The known heritage attributes include the canal itself, the landscape adjacent to the canal, and the structures associated with the canal such as the locks, dams, and blockhouses. Other heritage attributes of the canal include its role in the defence of Upper Canada, that it is the best preserved example of a slack water canal in North America demonstrating a European technology on a large scale, and that it was one of the first canals to be designed specifically for steam-powered vessels (ICOMOS, 2007). Furthermore, a description of the designated place in the Commemorative Integrity Statement outlines the heritage attributes of the Rideau Canal. Even prior to its completion in 1832, the Rideau Canal has shaped human settlement in eastern Ontario as people arrived to work on the construction and then settled along its route. Its course has not been altered since its construction and can be seen in the 1863 mapping (Figure 8). Within the City of Ottawa, the canal was within a suburban context from the early-twentieth century, as is apparent on the 1928 aerial photography (Figure 11). A study of the Rideau Canal Cultural Heritage Landscape is currently in progress with anticipated completion in Spring 2024.	 Plate 184: View of the Rideau Canal (A.S.I., 2024).  Plate 185: View of the Rideau Canal and park space adjacent to the canal (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 2	Park	Ballantyne Park 31 Hawthorne Avenue	Potential C.H.L. – Identified in previous report (MTBA Associates Inc., 2023)	Ballantyne Park is located on the north side of Hawthorne Avenue to the west of Main Street between 27 Hawthorne Avenue and 60 Main Street. The potential heritage attributes include the park's association with a prominent figure in Ottawa East, James Ballantyne, who was an important businessman in the community and helped to build the Town Hall at 61 Main Street. His family home was located at 54 Main Street and following his passing, it was demolished, and the land donated to the community as a public park (Wallace, 2012a). Additional potential heritage attributes include the mature trees within the park, lighting standards, and James Ballantyne memorial monument. The 1928 aerial photograph (Figure 11) shows greenspace on the Ballantyne property that was to become Ballantyne Park.	 Plate 186: Ballantyne Park (A.S.I., 2024).  Plate 187: Ballantyne Park (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 3	Parkway	Queen Elizabeth Driveway The C.H.L. includes the Queen Elizabeth Driveway right-of-way.	Potential C.H.L. – Identified by the City of Ottawa Official Plan as Scenic Capital Entry Route; Identified by the N.C.C. as Scenic Parkway	The Queen Elizabeth Driveway, originally known as the Rideau Canal Drive, it was constructed during the early twentieth century as one of the first projects of the Ottawa Improvement Commission. In 1965 it was officially renamed as Queen Elizabeth Driveway. Its route followed the western side of the Rideau Canal to Dow's Lake. The parkway is 5.6 kilometres in length and extends from Preston Street to Confederation Park at the Laurier Avenue Bridge (French, 1995). The potential heritage attributes include the alignment of the parkway, the greenspaces surrounding it, concrete stairs with metal railings and concrete posts leading from the multi-use path to the Rideau Canal (interspersed along the parkway), lighting standards, vegetation, and the scenic views of the Rideau Canal. The 1906 topographic map (Figure 10) depicts Queen Elizabeth Driveway following its currently alignment adjacent to the Rideau Canal.	 Plate 188: Queen Elizabeth Driveway, looking north (A.S.I., 2024). Plate 189: Queen Elizabeth Driveway south of the Queensway, looking north (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 4	Parkway	Colonel By Drive The C.H.L. includes Colonel By Drive right-of-way.	Potential C.H.L. – Identified by the City of Ottawa Official Plan as Scenic Capital Entry Route; Identified by the N.C.C. as Scenic Parkway	Construction of Colonel By Drive began in 1920, following a pre-existing roadway on the eastern side of the Rideau Canal. Its construction took places in smaller sections and it was completed until 1967 and given the official name of Colonel By Drive when it was opened to the public. Colonel By Drive is 7.6 kilometres in length and extends from the intersection of Sussex Drive and Rideau Street to Hog's Back Road. It serves as both a commuter and ceremonial route for those travelling around Ottawa (French, 1995). The potential heritage attributes include the alignment of the parkway and its connections with Confederation Boulevard and the capital landscape along with the views to the East Block of the Parliament Buildings and the final kilometre of the canal to Entrance Bay (French, 1995). Within the study area, potential heritage attributes include the greenspace and vegetation associated with the parkway, and views to the Rideau Canal. The 1906 topographic map (Figure 10) depicts the Colonel By Drive's predecessor following its current alignment adjacent to the Rideau Canal. The 1928 aerial photograph (Figure 11) depicts Colonel By Drive following its initial construction.	 Plate 190: Colonel By Drive north of the Queensway, looking south (A.S.I., 2024). Plate 191: Colonel By Drive north of the Queensway, looking north (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
C.H.L. 5	Heritage Conservation District	Centretown Heritage Conservation District Generally bounded by Lisgar Street, Elgin Street, Argyle Street, and Kent Street	Known C.H.L. – Designated under Part V of the *Ontario Heritage Act* (By-law 269-97) Please see the By-law available via this link, or see Appendix B for a copy of the By-law.	The Centretown Heritage Conservation District is generally bounded by Lisgar Street, Elgin Street, Argyle Street, and Kent Street (Figure 14). The cultural heritage value of the district is in its role as an early residential neighbourhood with a mix of housing types. The area also features commercial streets, local institutions, and the Museum of Nature is an important landmark within the district. The known heritage attributes of the heritage conservation district include the variety of architectural forms within the district, though the predominant built form is residential in nature, the majority of the buildings in the district constructed between the 1870s and 1914, the proximity to Parliament Hill, its streetscape and public realms, and the various associations the district has with individuals, organizations, and themes of development in the City of Ottawa and Canada at large (Sally Coutts Heritage Consulting Inc., 2022). Within the study area the property at 240 McLeod Street has the following heritage recognitions: • Designated under Part IV of the *Ontario Heritage Act* (By-law 235-79), link • Classified Federal Heritage Building, link • National Historic Site of Canada, link • Meetings of Parliament National Historic Event, link • Alice Evelyn National Historic Person plaque, link • Diamond Jenness National Historic Person plaque, link • John Macoun National Historic Person plaque, link • Edward Sapir National Historic Person plaque, link	 Plate 192: The Museum of Nature and residences along McLeod Street (A.S.I., 2024).  Plate 193: Apartment buildings on Elgin Street (A.S.I., 2024).

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
					 Figure 20: Map of the Centretown Heritage Conservation District (Sally Coutts Heritage Consulting Inc., 2022)

Appendix B: Heritage By-laws and Commemorative Integrity Statement

ONTARIO HERITAGE TRUST
An agency of the Government of Ontario

FIDUCIE DU PATRIMOINE ONTARIEN
Un organisme du gouvernement de l'Ontario

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Ce document est tiré du registre aux fins de la *Loi sur le patrimoine de l'Ontario,* accessible à partir du site Web de la Fiducie du patrimoine ontarien sur **www.heritagetrust.on.ca.**

ONTARIO HERITAGE TRUST

MAY 02 2018

RECEIVED

April 25, 2018

BY ELECTRONIC AND REGULAR MAIL

Ontario Heritage Trust
10 Adelaide Street East
Toronto, Ontario M5C 1J3

Attention: Erin Semande, Provincial Heritage Registrar

Re: Request for copies of heritage designation by-laws for the City of Ottawa and former municipalities of Ottawa Region

Dear Erin Semande,

I am writing further to your emails to me dated April 13 and 20, 2018, in which you requested the by-laws listed below. Further to the electronic copies provided to you, this letter and enclosed by-laws are to effect service to the Ontario Heritage Trust pursuant to section 67 of the *Ontario Heritage Act*.

Please contact me if you require any additional documentation.

Yours very truly,

Eric Pelot
Coordinator, Standing Committee

Encl. (by regular mail only):

1. Former City of Ottawa by-law no. 190-91
2. Former City of Ottawa by-law no. 269-99
3. Former City of Ottawa by-law no. 240-91
4. Former City of Ottawa by-law no. 2005-14
5. City of Ottawa by-law no. 2009-2
6. City of Ottawa by-law no. 2001-196
7. City of Ottawa by-law no. 2005-163
8. Former City of Ottawa by-law no. 98-93
9. Former City of Ottawa by-law no. 274-92
10. Former City of Ottawa by-law no. 198-90
11. City of Ottawa by-law no. 2004-374
12. Former City of Ottawa by-law no. 296-91
13. Former Rideau Township by-law no. 33-89
14. City of Ottawa by-law no. 2004-372
15. Former Township of Goulbourn by-law no. 59-90
16. Former Township of Goulbourn by-law no. 43-87
17. Former Rideau Township by-law no. 82-86
18. Former Township of Goulbourn by-law no. 31-86
19. City of Ottawa by-law no. 2004-369
20. City of Ottawa by-law no. 2004-375
21. City of Ottawa by-law no. 2004-370
22. Former Village of Rockcliffe Park by-law no. 87-24
23. City of Ottawa by-law no. 2004-373
24. Former City of Ottawa by-law no. 287-89
25. City of Ottawa by-law no. 2006-419
26. Former City of Nepean by-law no. 87-89
27. City of Ottawa by-law no. 2008-221
28. City of Ottawa by-law no. 2012-55
29. City of Ottawa by-law no. 2005-460
30. Former City of Ottawa by-law no. 351-78
31. Former City of Ottawa by-law no. 227-96
32. Former Rideau Township by-law no. 91A-86
33. City of Ottawa by-law no. 2001-195
34. City of Ottawa by-law no. 2006-420
35. Former City of Ottawa by-law no. 221-90
36. City of Ottawa by-law no. 2011-91
37. Former Rideau Township by-law no. 50-98
38. Former Rideau Township by-law no. 44-86
39. Former City of Ottawa by-law no. 168-99
40. Former Rideau Township by-law no. 31-88
41. Former City of Nepean by-law no. 35-82
42. Former City of Ottawa by-law no. 202-90
43. Former City of Gloucester by-law no. 90-2000
44. Former City of Gloucester by-law no. 182-2000
45. Former Township of Goulbourn by-law no. 33-87
46. City of Ottawa by-law no. 2005-15
47. Former Rideau Township by-law no. 65-86
48. Former City of Ottawa by-law no. 228-96
49. Former City of Ottawa by-law no. 201-90

City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario K1P 1J1
Mailcode 01-71
Tel.: (613) 580-2424, ext. 22953
Fax: (613) 580-9609
eric.pelot@ottawa.ca

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110, avenue Laurier Ouest
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BY-LAW NUMBER 287-89

A by-law of The Corporation of the City of Ottawa to designate 6 McLeod Street to be of historic and architectural value or interest;

WHEREAS The Ontario Heritage Act, R.S.O. 1980, Chapter 337, authorizes the Council of a municipality to enact by-laws to designate real property, including all the buildings and structures thereon, to be of historic and architectural value or interest;

AND WHEREAS the Council of The Corporation of the City of Ottawa has caused to be served upon the owners of the lands and premises known as 6 McLeod Street more particularly described in Schedule "A" hereto, and upon the Ontario Heritage Foundation, notice of intention to so designate the aforesaid real property and has caused such notice of intention to be published in The Ottawa Citizen newspaper having a general circulation in the City of Ottawa, once a week for three consecutive weeks, namely on 23rd and 30th day of September and the 7th day of October, 1989.

AND WHEREAS the reasons for the designation are set out as Schedule "B" hereto;

AND WHEREAS no notice of objection to the said proposed designation was served upon the Clerk of the City of Ottawa;

THEREFORE the Council of The Corporation of the City of Ottawa enacts as follows:

1. There is designated as being of historic and architectural value or interest the real property more particularly described in Schedule "A" hereto, known as 6 McLeod Street.

.../2

2. The City Solicitor is hereby authorized to cause a copy of this by-law to be registered against the property described in Schedule "A" hereto in the proper Land Registry Office.

3. The City Clerk is hereby authorized to cause a copy of this by-law to be served upon the owners of the property described in Schedule "A", and upon the Ontario Heritage Foundation, and to cause notice of this by-law to be published in a newspaper having a general circulation in the City of Ottawa.

4. The schedules attached hereto and marked Schedule "A" and Schedule "B" form part of this by-law and all notations, references and other information contained therein shall be as much a part of this by-law as if all the matters and information set forth by the said schedules were all fully described herein.

GIVEN under the corporate seal of the City of Ottawa this 1st day of November, 1989.

J.R. CYR,
CITY CLERK.

J. DURRELL,
MAYOR.

SCHEDULE "A"

In the City of Ottawa, in the Regional Municipality of Ottawa-Carleton and Province of Ontario, namely, Lots 57 and 58 on the south side of McLeod Street, on Plan M-3 filed in the Office of Land Titles, Ottawa, excepting thereout and therefrom a strip of land fifteen (15) feet wide off the southeasterly side thereof measured at right angles to the said southerly side owned by the Ottawa Improvement Commission and forming part of Parcel 22, in the register for Section Ottawa.

SUBJECT to certain covenants running with the land as set forth in transfer 68 being Parcel 4581 in the register for Section Ottawa.

Schedule "B"

STATEMENT OF REASON

FOR DESIGNATION

6 McLeod Street

The house located at 6 McLeod Street is recommended for designation as a property of architectural and historical value. Built in 1907 and 1908 for Martin Rosenthal, of Rosenthal and Sons, Jewellers, the house was later occupied by Gerald Horace Brown, Assistant Deputy Minister of Labour.

The design of this Edwardian house is attributed to the Ottawa architectural firm of Weeks and Keefer. It is one of the largest and oldest houses constructed immediately following the 1905 residential subdivision of this part of Centretown.

The interior of the house is included in the designation by virtue of the interior plan, fine woodwork, plaster detailing, original light fixtures and other period features evident in the entrance hall, parlour, living room, stairway and dining room.

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Un organisme du gouvernement de l'Ontario

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DEPARTMENT OF THE CITY CLERK
SERVICE DU GREFFE
(613) 583-3396

OTTAWA
CITY HALL | HÔTEL DE VILLE
111 SUSSEX DRIVE | 111, PROMENADE SUSSEX
K1N 5A1

EVELYNE H. COOPER
CITY CLERK
GREFFIER DE LA VILLE

R.F. PEPPER
DEPUTY CITY CLERK
GREFFIER ADJOINT

FILE No:
No. DE DOSSIER

June 17, 1982

Professor S.F. Wise
Chairman
Ontario Heritage Foundation
Suite 602
77 Grenville Street
Queen's Park
Toronto, Ontario
M7A 1E8

Dear Sir:

The Council of the Corporation of the City of Ottawa on the 19th day of May 1982, enacted By-law Number 145-82 and thereby designated the property known municipally as 61 Main Street in the City of Ottawa pursuant to the Ontario Heritage Act, R.S.O. 1980, c. 337.

Enclosed herewith is a certified copy of By-law Number 145-82 and the Notice of Designating By-law served according to the Act.

Yours truly,

Evelyne H. Cooper
City Clerk

/bc

REGISTERED

IN THE MATTER OF the Ontario Heritage Act, R.S.O. 1980, c. 337;

AND IN THE MATTER OF the lands and premises known municipally as 61 Main Street in the City of Ottawa, in the Province of Ontario.

NOTICE OF DESIGNATING BY-LAW

TAKE NOTICE that the Council of The Corporation of the City of Ottawa on the 19th day of May, 1982, enacted By-law Number 145-82 designating the lands and buildings known municipally as 61 Main Street as a property of historical and architectural value or interest under the Ontario Heritage Act, R.S.O. 1980, c. 337.

STATEMENT OF REASONS FOR THE DESIGNATION:

Ottawa East Town Hall, located at 61 Main Street, is recommended for individual designation as being of architectural and historical value. The building was erected in 1895 for the Village of Ottawa East, and has been a centre for community affairs since.

The two and one-half storey brick structure is a good example of an institutional building for a modest community during the late 19th century. Significant elements of the building include; the truncated hip roof, the projecting frontispiece with gabled roof, the second floor round arched windows, both have label lintels.

A copy of this by-law may be obtained at the office of the City Clerk.

DATED at Ottawa this 17th day of June 1982.

EVELYNE E. COOPER
City Clerk

BY-LAW NUMBER 145-82

A by-law of The Corporation of the City of Ottawa to designate 61 Main Street to be of historic and architectural value or interest;

WHEREAS the Ontario Heritage Act, R.S.O. 1980, c. 337, authorizes the Council of a municipality to enact by-laws to designate real property, including all the buildings and structures thereon, to be of historic and architectural value or interest;

AND WHEREAS the Council of The Corporation of the City of Ottawa has caused to be served upon the owners of the lands and premises known as 61 Main Street, more particularly described in Schedule "A" hereto, and upon the Ontario Heritage Foundation, notice of intention to so designate the aforesaid real property and has caused such notice of intention to be published in the Citizen newspaper having a general circulation in the City of Ottawa, once a week for three consecutive weeks, namely on March 27th, April 3rd and April 10th, 1982;

AND WHEREAS the reasons for the designation are set out as Schedule "B" hereto;

AND WHEREAS no notice of objection to the said proposed designation has been served upon the Clerk of the City of Ottawa;

THEREFORE the Council of The Corporation of the City of Ottawa enacts as follows:

1. There is designated as being of historic and architectural value or interest the real property, more particularly described in Schedule "A" hereto, known as 61 Main Street.

2. The City Solicitor is hereby authorized to cause a copy of this by-law to be registered against the property described in Schedule "A" hereto in the proper Land Registry Office.

3. The City Clerk is hereby authorized to cause a copy of this by-law to be served upon the owners of the property described in Schedule "A", and upon the Ontario Heritage Foundation, and to cause notice of this by-law to be published in a newspaper having a general circulation in the City of Ottawa.

4. The schedules attached hereto and marked Schedule "A" and Schedule "B" form part of this by-law and all notations, references and other information contained therein shall be as much a part of this by-law as if all the matters and information set forth by the said schedules were all fully described herein.

GIVEN under the corporate seal of the City of Ottawa this 19th day of May , 1982.

CITY CLERK

MAYOR

CERTIFIED A TRUE COPY
Deputy City Clerk

CERTIFIED A TRUE COPY
Deputy City Clerk

SCHEDULE A

Heritage Designation - 61 Main Street

ALL AND SINGULAR those certain parcels or tracts of lands and premises, situate, lying and being in the City of Ottawa, Regional Municipality of Ottawa-Carleton, and Province of Ontario, BEING COMPOSED OF all of Lot C and the southerly half of Lot B on the east side of Main Street according to a plan registered in the Land Registry Office for the Registry Division of Ottawa-Carleton Number 5 as number 150.

The hereinbefore described parcels of land are those lands described in instruments OE132 and OE137 registered in said Land Registry Office for the Registry Division of Ottawa-Carleton Number 5.

Dated at Ottawa this 30th day of April, 1982.

for R. Benny
Ontario Land Surveyor

SCHEDULE "B"

STATEMENT OF REASONS FOR DESIGNATION

Ottawa East Town Hall, located at 61 Main Street, is recommended for individual designation as being of architectural and historical value. The building was erected in 1895 for the Village of Ottawa East, and has been a centre for community affairs since.

The two and one-half storey brick structure is a good example of an institutional building built for a modest community during the late 19th century. Significant elements of the building include; the truncated hip roof, the projecting frontispiece with gabled roof, the second floor round arched windows, both have label lintels.

NS151647

LAND REGISTRY DIVISION OF OTTAWA-CARLETON (No.5)
'82 MAY 31 A11:15
IN THE LAND REGISTRY OFFICE AT OTTAWA, ONTARIO
LAND REGISTRAR

BY-LAW NUMBER . 145-82 .

A by-law of The Corporation of the City of Ottawa to designate 61 Main Street to be of historic and architectural value or interest;

1st READING . . . . . MAY 19 1982

2nd READING . . . . . MAY 19 1982

3rd READING . . . . . MAY 19 1982

Council Authority
OPB Report No. 3,
Item 6, January 6, 1982.

LEGAL DEPARTMENT
CITY HALL, OTTAWA

(JLO'B: HRT- 154)

APPENDIX A

COMMEMORATIVE INTEGRITY STATEMENT

RIDEAU CANAL and MERRICKVILLE BLOCKHOUSE NATIONAL HISTORIC CANALS OF CANADA (Approved September 2000)

1.0 INTRODUCTION

The Rideau Canal National Historic Site of Canada which includes the Merrickville Blockhouse National Historic Site of Canada is owned by the federal government and administered by the Parks Canada Agency for the benefit, education and enjoyment of all Canadians. While the Canal contains a remarkable collection of engineering structures and buildings that survive from its early history, the Rideau is not an historic enclave or museum piece. Rather, this historic waterway remains an integral link in a corridor of communities running 200 kilometers between the Ottawa River and Lake Ontario. It is also an operating canal, providing local and through navigation for tens of thousands of boaters annually. Furthermore, managing the Rideau Canal carries with it an important environmental stewardship role because the waterway and the corridor's ecosystem are inextricably joined. In fact, many of the natural ecosystem features of the Rideau corridor are a direct creation of Canal construction. Given the Canal's size and complexity and its important roles in both the human and natural environment, the task of safeguarding its irreplaceable heritage places and cultural resources and effectively telling its story to Canadians is a challenging responsibility.

The Merrickville Blockhouse is wholly contained within the designated place for the Rideau Canal. Its designation as a national historic site in its own right highlights its excellence as a type of structure, others of which are also found along the waterway and all of which constitute Level I resources under the Rideau Canal's designation.

For the purposes of this CIS, a statement of commemorative intent, designated place, values and messages of national significance are identified for the blockhouse. The other heritage values for this national historic site are fully subsumed into the other values and messages for the Rideau Canal.

1.1 National Historic Sites of Canada Objectives

The Government of Canada's objectives for National Historic Sites of Canada are:

- to foster knowledge and appreciation of Canada's past through a national program of historical commemoration;
- to ensure the commemorative integrity of national historic sites of Canada administered by Parks Canada, by protecting and presenting them for the benefit, education and enjoyment of this and future generations, in a manner that respects the significant and irreplaceable legacy represented by these places and their associated resources;
- to encourage and support the protection and presentation by others of places of national historical significance that are not administered by Parks Canada.

2.0 PURPOSE AND DEFINITION OF COMMEMORATIVE INTEGRITY

Commemorative integrity describes the health and wholeness of a national historic site. A national historic site possesses commemorative integrity:

- when the resources that relate to the reasons for designation of the national historic site or symbolize or represent its importance are not impaired or under threat,
- when the reasons for the site's national historic significance are effectively communicated to the public, and
- when the site's heritage values including those not related to national significance are respected by all whose decisions or actions affect the site.

2.1 Commemorative Integrity Statement

A Commemorative Integrity Statement is a site-specific elaboration of what is meant by commemorative integrity for a particular national historic site. The CIS is intended to provide the benchmark for planning, managing operations, reporting and taking remedial action. It is divided into three main elements:

- Resources that relate to the reasons for designation of the national historic site or symbolize or represent the site's importance are not impaired or under threat - This section of the CIS identifies the resources that relate directly to the site's national significance. It also describes the historic values of these resources, which can be symbolic as well as physical. These values must be safeguarded and communicated. The CIS provides guidance, through indicators and objectives, about the meaning of "not impaired or under threat" in the context of the site.
- Reasons for the site's national significance are effectively communicated to the public - This section of the CIS identifies messages of national significance, as well as any additional, essential information required to ensure their understanding. It provides guidance, through objectives, on integrity in presentation and effective communication with audiences.
- Site's heritage values (including those not related to national significance) are respected in all decisions and actions affecting the site - This section of the CIS covers heritage resources and values that are not related to national significance, as well as any other matters not covered under the other two elements of commemorative integrity. It provides guidance, through indicators and objectives, on what is meant by "respect" in the context of the site.

3.0 STATEMENT OF COMMEMORATIVE INTENT

Commemorative intent identifies the reason(s) why the site was commemorated as being of national historic significance. While the authority to designate a national historic site rests with the Minister, it is on the advice of the Historic Sites and Monuments Board of Canada [HSMBC or the "Board" that this authority is exercised. Commemorative intent, therefore, is based on the Ministerially-approved recommendations of the Board's deliberations.

During its deliberations in June 1924, the Historic Sites and Monuments Board first noted the national importance of the Rideau Canal The following year, the Board adopted the resolution *"that the construction of the Rideau Canal be declared an event of national importance."*

In 1926, the Canal was commemorated through a Board-approved plaque. It stated:

> *This tablet commemorates the hundredth anniversary of the beginning of the construction of the Rideau Canal in September, 1826, under the direction of Lieutenant Colonel John By: R.E., connecting the Ottawa River with Lake Ontario for ship navigation, thereby, laying the foundation of the City of Ottawa and advancing the development of Eastern Ontario.*

In May 1939, the Board recognized the national significance of the Merrickville Blockhouse by recommending *"That a secondary tablet bearing the following inscription be placed on this structure: - MERRICKVILLE BLOCKHOUSE A fine example of the best type of blockhouses erected for the defense of the Rideau Canal about 1832."*

The Plaque text reads as follows:

MERRICKVILLE BLOCKHOUSE

When construction of the Rideau Canal began, Merrickville was already an established village and was considered to be a logical target for an invader. Consequently Colonel John By urged strong measures for the protection of the lockstation. The result was this Blockhouse, built in 1832-33, the largest on the Rideau Canal and the second largest surviving in Canada. It still resembles its early description as "a good blockhouse, the basement and ground floor being of stone, and the upper storey of wood covered with tin, the whole surrounded by a ditch".

The next Board recommendation came in 1967, when it reconfirmed that *"the Rideau Canal is of national historical importance, and further resolves as follows:*

the entire lock system of the Rideau Canal including locks, blockhouses, dams, weirs and original lockmasters' houses be declared of national historical significance.... the Minister should assume such responsibilities for the policies of Canal maintenance and operation as may be necessary to maintain the existing structures and preserve the unique historical environment of the Canal System."

During deliberations on the Trent-Severn Waterway in November 1987, the Board commented in a comparative note that the Rideau Canal *"is unique among Canadian Canals in that so many of its original structures have survived as built and most of its lockstations retain their integrity...."*

The Rideau Canal was designated a national historic site in 1924. The reasons for national significance, based on the 1924, 1967 and 1987 Minutes of the Historic Sites and Monuments Board of Canada are:

- *the construction of the canal system;*
- *the survival of a high number of original canal structures including locks, blockhouses, dams, weirs and original lockmasters' houses plus the integrity of most lockstations, and;*
- *the unique historical environment of the canal system.*

The Merrickville Blockhouse was designated a national historic site in 1939 because:

- *it is a fine example of the best type of blockhouses erected for the defense of the Rideau Canal.*

4.0 HISTORIC AND GEOGRAPHIC CONTEXT

Preliminary surveys of the Rideau-Cataraqui waterways were first commissioned by the British military during the War of 1812 because of concern that the vital supply line along the St. Lawrence River between Montreal and Kingston was vulnerable to interdiction by the Americans. It was not until 1826, however, that the decision was made to construct this inland route. The Canal was built by civilian labor but it was a military project from beginning to end. The construction was wholly financed by the British Treasury and it was engineered and supervised by Lt.-Colonel John By, Royal Engineers [R.E.].

While the Canal's defensive buildings remained unfinished, the system opened to through navigation in May 1832 - less than six years since construction began. In its time the Rideau Canal was considered a remarkable engineering achievement. Unlike most North American canals of the period, the Rideau's engineering works were constructed primarily of stone masonry and it was the first canal system in the world designed to accommodate steamboats. Furthermore, the Canal route ran through a remote, wilderness region which had challenged the builders with a host of engineering and logistical problems.

The Merrickville Blockhouse was the largest of the defensible structures built along the Canal and the most impressive of the four blockhouses. It was the first of the blockhouses built and most closely followed By's own design. A single gun port was built into each wall of the masonry lower storey for mounting a cannon, and all four sides of the timber upper storey had openings for small-arms fire. Loopholes, called machicolations, were also cut in the underside of the overhang to enable the defenders to fire at any attackers reaching the walls. The upper storey of the blockhouse housed the lockmaster and his family. In the event of war, the blockhouse was intended to be a mustering point for local militia, a supply depot where provisions, munition and arms could be stored, and a strong defensive position for repelling anyone attempting to destroy the Canal structures. It served a military function only once, in the aftermath of the 1837 Rebellion, when it was taken over temporarily by the 34th Regiment. In 1908-9, the impending collapse of the roof necessitated the removal of the second storey but in 1960-65 it was restored to its former appearance. The Blockhouse currently houses a museum about the history of the blockhouse itself and the local area, managed by the Merrickville and District Historical Society.

For 16 years the Rideau Canal served as the primary transportation route from Lower Canada to Upper Canada. During this period several defensive structures including the Merrickville Blockhouse were completed. With the completion of the first St. Lawrence River canals in 1848, however, the Rideau's commercial importance declined. The St. Lawrence route was shorter, faster and less expensive than the Ottawa-Rideau-Cataraqui route and while the Rideau continued to serve an important regional function after 1848, its significance as a part of the national canal system was gone. The British Board of Ordnance continued its ownership and operation of the Canal until 1855, when the system was signed over to the colonial government of Canada. The Canal's military period was over.

While the military usefulness of the Canal was never tested in war, the Rideau played a significant role in the development of eastern Ontario. The waterway facilitated extensive logging, lumbering and milling operations in the region through the 19th century. Much of the wealth and development in this part of eastern Ontario was directly attributable to the logging and lumbering enterprises. Immigration, settlement and agricultural development in the Rideau-Cataraqui corridor was accelerated because of the benefits that the waterway offered pioneer settlers. The Canal fostered the emergence of industrial centers of surprising scale at places such as Merrickville and Smith Falls. The City of Ottawa, originally known as Bytown, traces its origins and urban patterns to the Canal builders and the commerce generated by Canal traffic.

By the turn of the century, excursion tours and recreational activities assumed increasing economic importance along the lakes and rivers of the system. By the early 1960s, all commercial traffic was gone and the Rideau Canal had become a recreational waterway. Today, the Rideau Canal is the cohesive link through a 200 kilometer corridor which is characterized by a variety of lockstations, canal structures, urban and agricultural landscapes, built heritage districts, wetlands, woodlands, scenic areas and shore-lands which collectively create the Canal's unique and varied historical environment.

While the corridor landscape has changed considerably since the British military signed over control of the system in 1855, many character-defining features remain from the early period. Most original engineering works remain in situ and operational and over half of the military buildings survive. The lockstations maintain much of their original configuration and many of retain their mid-nineteenth century character. Whether located in an urban center, a rural village, an agricultural setting, or cottage country, the lockstations provide a sense of integrated continuity along the entire route.

Whereas the Canal structures are the most obvious features of the system, the Rideau Canal is more than the sum of its engineering works and masonry buildings. The construction of the Canal and the opening of through navigation held far-reaching implications for the natural and human history of the corridor. The transportation corridor, created and defined by the Rideau Canal, represents a rich and varied landscape which is an integral value of the system.

The natural environment of the Rideau Canal corridor - woodlands, wetlands, islands and waters - represent significant components of the region's present-day ecosystem. One of the most visible remnants of Canal construction on the corridor landscape are the drowned lands. Although the thousands of hectares of drowned lands exist today as natural features, most are human made, the result of the slack water system the engineers employed to flood the shallows and create the navigation route. These drowned lands represent significant aspects of the corridor's natural environment as well as being directly linked to the Canal construction.

The extensive wetlands between Merrickville and Lower Rideau Lake resulted from Canal construction as did many of the wetlands south of Jones Falls down through the River Styx. Numerous lakes along the system were created or substantially enlarged by the Canal builders including lakes such as: Dows, Upper Rideau, Newboro, Opinicon, Whitefish, Cranberry and Colonel By.

In contrast to the natural and rural settings that characterize much of the Canal environment, the relationship between the Canal and the two large urban centers of Kingston and Ottawa presents a very different landscape. The expansion of the city of Ottawa and its attendant suburban growth south along the Rideau River to Kars has effected considerable change on this section of the Canal landscape. But if modern urban development is a dominant feature here, such change has not altered the evidence of the fundamental link between the Canal and the city of Ottawa. The city's initial layout and early development are directly tied to the construction and operation of the Canal in the first half of the nineteenth century. In the center of the city today, the Canal remains a key feature in a remarkable heritage setting that speaks not only to the evolutionary stages of Ottawa from its construction camp origins to modern capital city, but to the nation's history as well. Both physically and symbolically, the Canal remains central to the nation's capital.

In Kingston harbour, the southern terminus of the waterway, the landscape speaks most dramatically to the military origins of the Rideau Canal. Here, overlooking the Canal and harbor, sits Fort Henry, the largest fortification built in colonial Canada west of Quebec City. This citadel, along with the four surviving Martello Towers that dot the harbor, were a defense system built to protect the harbor and the access to the Canal. Today, the tangible interrelationship of the Canal and the Kingston Fortifications is a remarkable survivor on the heritage landscape.

Although substantially smaller than either Kingston or Ottawa, the town of Smiths Falls and the village of Newboro trace their origins to the Canal's construction and the opening of navigation. Other communities such as Kingston Mills, Chaffey's Lock, Merrickville, and Burritt's Rapids existed as small settlements and mill sites prior to the Canal. Since the later 1820s, however, the histories of these communities are closely interwoven with the waterway particularly through their associated lockstations.

Today, the Rideau Canal is an historic transportation corridor linking together diverse natural and cultural elements along its route and in doing so links the past to the present.

The Level One Resources: The Resources that Symbolize or Represent the National Significance of the Site.

5.0 THE DESIGNATED PLACE

Designated place refers to the place designated as a national historic site by the Minister of Canadian Heritage on the recommendation of the Historic Sites and Monuments Board of Canada. Information on what constitutes the designated place for a particular historic site is drawn from the minutes of the Board.

In the case of the Rideau Canal, the designated place consists of the lands and waters under the jurisdiction of Parks Canada including the bed of the Rideau Canal to the high water mark between the Ottawa River and the harbor in Kingston.

The designated place of the Merrickville Blockhouse is the footprint of the building.

All the resources within the designated place for the Rideau Canal which are directly related to the construction of the Canal and the military period of operation, including the Merrickville Blockhouse National Historic Site of Canada, are deemed to illustrate, reflect or give expression to the national significance of the site. These are level one cultural resources.

While the designated place describes the boundary of the Canal in terms of identifying the level one cultural resources, it is important to note that there are historic values of the Canal system and its environment that extend beyond the administered Canal lands and waters. Significant view sheds, visual linkages and associative values encompass a variety of urban, rural and natural areas adjacent to the Canal. The following identifies associated lands of particular importance to the values of the Rideau Canal; these include but are not restricted to:

- the view sheds from the Canal locks and channel to the central core of Ottawa between the Mackenzie King Bridge and the Ottawa River;
- the views sheds and visual linkages in the Kingston harbor landscape that portray the relationship between the fortifications, the harbor and the Canal;
- the views from the Canal and Canal lands to the heritage shore-lands and communities between Becketts Landing and Kilmarnock lockstation;
- the views from the Canal and Canal lands to the heritage shore-lands along the Newboro channel;
- the views from the Canal and Canal lands to the heritage community of Chaffey's Locks;
- the views from the Canal and Canal lands to the heritage shore-lands and communities at Davis Locks, Jones Falls, Upper and Lower Brewers and Kingston Mills lockstations.

5.1 The Rideau Canal as a designated place is valued for:

- the engineering achievement of the construction of the Canal;
- its continuous seasonal operation since 1832;
- the survival and integrity of the Canal system with the majority of its original built resources intact;
- the continuity and integrity of the lockstations and the sense of a complete "system" that these stations convey;
- the historic, ecological and visual associations with the certain shore-lands and communities along the waterway which contributes to the unique historical environment of the Canal;
- the extensive wetlands and lakes of the Canal which reveal the relationship between Canal construction and the natural environment and which are an integral part of the unique historical environment of the waterway.

5.2 The Merrickville Blockhouse as a designated place is valued for:

- its association with the military period of the Rideau Canal
- its association with the Merrickville Lockstation
- its landmark status in the village of Merrickville
- as a fine example of the best type of blockhouses erected for the defense of the Rideau Canal
- its defensive features, including:
  - an unobstructed view up and down the waterway at the Merrickville lockstation and down the Prescott and Brockville Roads;
  - thick, vented stone walls, fire resistant design;
  - apertures for musket and artillery fire;
  - self-sufficient design which included storage for provisions and armaments, as well as barracks
  - original fabric in the lower storey.

5.3 The designated place will be unimpaired or not under threat when:

- through navigation of the Canal system is maintained to help assure the preservation of the unique historical environment and safeguard the level one cultural resources;
- the cultural resources related to the military period are safeguarded according to Parks Canada's Cultural Resource Management [CRM] Policy (see detailed description of cultural resources below);
- the existing manual mode of operation of locks, dams and weirs on the system is maintained;
- the visual relationship between the Canal and the heritage landscape in the central core of Ottawa remains evident and intact;
- the views and visual linkages which enhance the military character of the Kingston harbor landscape and portray the relationship between the fortifications, the harbor and the Canal remains evident and intact;
- the heritage character of corridor shore-lands are safeguarded from inappropriate development or uses;
- the visual relationship between the Merrickville Blockhouse and the heritage landscape adjacent to the site remains intact;
- the heritage character of those identified corridor communities are safeguarded;
- the landmarks, view scapes and natural ecosystem features of the Canal's islands, shore-lands and wetlands that are related to the construction of the Canal and which are part of the Canal's unique historical environment are safeguarded;
- the level one historic values of the designated place are effectively communicated to the public.

6.0. IN SITU RESOURCES

Note: Because of the number of cultural resources on the system there is no attempt here to list them individually. An inventory of the in situ resources and their CRM level is available.

The in situ resources that are directly associated with the commemorative intent of the Rideau Canal - resources that symbolize or represent the national significance of the site - are identified as level one cultural resources. These resources are located on Canal lands and include engineering works, buildings, lockstation landscapes along with underwater and terrestrial archaeological sites.

6.1 Engineering Works

Through the evaluation exercise 40 of the Rideau's 47 locks were identified as level one cultural resources. (NOTE: the locks do not include the lock gates which are facsimiles of the original.)

Of the approximately 45 dams, weirs and embankments along the original route, 18 were evaluated as level one. Over the years the original form and function of several of the dams and embankments have been lost to sight because of overfill and infill - the most notable one being the crib dam at Hogs Back. Technically these are now archaeological resources but have been included here because they remain part of the operational system.

The evaluation team recognized that many of the locks and dams had undergone repair and reconstruction, including the introduction of varying amounts of new material, as part of their operational life over the past 160 years. There was no attempt to impose a specific quota of original fabric in the evaluation. If the work retains core elements of its original built material - in situ not reused as a facade - it is considered an original structure. Those locks and dams rebuilt with all new material or retaining only a vestige of original fabric or reusing original material only as part of a facade are not considered original to the system. This latter case applies to the locks at Lower Brewers (45), Davis (38) and locks one through five at Ottawa, plus the hydraulic lock at Smiths Falls (29a).

6.1.1 The level one engineering works are valued for their:

- direct relationship to the original construction achievement;
- contribution to the unique historical environment of the Canal system;
- integral role in the continuing operation of the navigation system (Locks 29, 30 & 31 at Smiths Falls Combined excepted);
- surviving physical attributes of form, material and function;
- manual mode of operation (Newboro, Black Rapids and Smiths Falls Combined Locks excepted);
- contribution to knowledge relating to early 19th century engineering and construction techniques.

Noteworthy in this discussion of the historic values of the Rideau's engineering structures are the remarkable stone arch dams at Long Island and Jones Falls. These are the two largest such structures on the system and the only two of the original five still completely visible. The Jones Falls dam is the first true masonry arch dam constructed in North America, and on completion was one of the largest arch dams in the world.

6.1.2 The level one engineering works will be unimpaired or not under threat when:

- they are maintained in an operational state (Locks 29, 30, and 31 at Smiths Falls Combined excepted);
- a regular monitoring and maintenance regime is in place as an integral part of the operational and conservation program;
- the existing manual mode of operation is maintained;
- their original material, massing and form are safeguarded and maintained by technical and professional experts in accordance with the CRM Policy;
- a record is maintained of any changes, repairs and/or interventions;
- the current material and design of the gate and valve opening mechanism is maintained (Newboro, Black Rapids and Smiths Falls Combined Locks excepted);
- the current material and design of lock gates is maintained, (Newboro, Black Rapids and Smiths Falls Combined Locks excepted);
- their historic values are effectively communicated to the public.

6.2 Buildings

In total, 18 Canal buildings including the Merrickville Blockhouse National Historic Site of Canada are level one cultural resources because they are considered to represent or symbolize the national significance of the site and were mentioned in the Board's recommendation. These include the 12 defensible lockmasters' houses and the four blockhouses one of which is the Merrickville Blockhouse. In addition, the blacksmith's shop at Jones Falls and the Commissariat building at Ottawa Locks are level one because they relate directly to the commemorative intent of the site.

Several of the buildings have undergone considerable modification over the years including recent reconstruction and restoration work. Seven of the lockmasters' houses had second stories added. While acknowledging these evolutionary changes, the evaluation team considered that all the buildings retain enough of their core elements to be considered level one cultural resources.

6.2.1 The level one buildings are valued for their:

- direct association with the construction, operation and maintenance of the Canal during the military period;
- direct association with the defense of colonial Canada;
- physical evidence of the original purpose of the Canal;
- functional design qualities;
- surviving physical attributes of form and material;
- contribution to the unique historical environment of the Canal system;
- contribution to the historic character of their associated lockstations.

6.2.2 The level one Canal buildings will be unimpaired or not under threat when:

- their historic characters are safeguarded according to the CRM Policy and the FHBRO Code of Practice, where applicable;
- their heritage settings are safeguarded according to the CRM Policy;
- a record is maintained of any additions, repairs or other interventions;
- a regular monitoring and maintenance regime is in place as an integral part of a conservation program;
- their material, form, and functional design qualities are safeguarded;
- their visibility within the site and/or from approaches are maintained or enhanced through appropriate vegetation management;
- their historic values are effectively communicated to the public.

6.3 Lockstation Landscapes

The lockstation landscapes are fundamental resources of the Canal system and integral to the Rideau's unique historical environment. The landscapes were evaluated in terms of the retention of historic circulation patterns, the spatial inter-relationships of buildings, engineering works, open spaces and other landscape features, plus the overall impact of new features on or near the stations. All 22 lockstations were evaluated as being Level I in accordance with the 1967 recommendation of the HSMBC.

6.3.1 The level one lockstation landscapes are valued for their:

- associative and physical connection with the construction and early operation of the Canal;
- contribution to the unique historical environment of the Canal system;
- visual and historic associations with heritage communities along the Canal system such as Chaffey's Lock, Newboro, Merrickville, Burritt's Rapids, and Ottawa;

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Management Plan

- role as landmarks and providing a sense of continuity along the Canal system;
- surviving historic layout and configuration including their open spaces and circulation patterns;
- surviving historic views both within and beyond the station boundaries;
- contextual and heritage settings for the stations' buildings and engineering works.

6.3.2 The level one lockstation landscapes will be unimpaired or not under threat when:

- their current historic layout and landscape patterns, including open spaces and circulation patterns, are safeguarded;
- their historic views and visual linkages with surrounding landscapes are safeguarded through encouragement of and co-operation with municipalities or other levels of government, private landowners and partners;
- their historic views within the lockstation grounds are safeguarded or enhanced through appropriate vegetation management;
- the proposed introduction of new landscape elements (signage, parking lots, concession booths, vegetation, buildings, utility poles, etc.) are reviewed according to the principles of the CRM Policy in order to safeguard the historic layout, landscape patterns and views of the stations;
- the appropriateness of proposed new uses or activities on lockstation landscapes are assessed according to the CRM Policy;
- their historic values are effectively communicated to the public.

6.4 Archaeological Sites

There is no comprehensive inventory of Level I terrestrial or underwater archaeological sites along the Rideau Canal. The evaluation approach is to treat all archaeological sites dating from the construction and military periods as level one cultural resources.

Examples of known archaeological sites of national significance include:

- the ruins of the engineers' building, the remains of the lime kilns, the remains of the Sapper's Bridge and the blacksmiths' shop - all at Ottawa Locks;
- the original dam at Merrickville (underwater site);
- the construction camp at Newboro;
- the remains of the submerged bridge at the Jones Falls dam (underwater site);
- the guardhouse remains at Jones Falls;
- the guardhouse remains at Morton Dam.

Note: There are archaeological sites directly related to the Canal's construction and early operational period located off Canal lands and outside of the designated place. Most of the known sites are the remains of quarries that were sources of stone used in Canal construction. Due to their location, these sites are not included in this cultural resource inventory but they are identified here because they have historic value associated with the Canal. Of particular importance are the quarry remains located: near the village of Elgin, off the First Concession Road; Clowes Quarry on the south shore of the Rideau River by Clowes Lockstation; and the quarry at Hogs Back located in Vincent Massey Park in the City of Ottawa.

6.4.1 The level one archaeological sites are valued for their:

- association with the construction of the Canal;
- association with the military purpose of the Canal;
- surviving physical elements.

6.4.2 The level one archaeological sites will be unimpaired and not under threat when:

- inventory and evaluation records of Canal sites are developed and maintained;

- known archaeological sites on Canal lands are monitored and safeguarded by adhering to the CRM Policy and the Guidelines for the Management of Archaeological Resources in the Canadian Parks Service;
- underwater resources are safeguarded through the encouragement of and co-operation with municipalities or other levels of government, private landowners and partners;
- all operational projects involving below ground disturbance (including the introduction of new vegetation) on Canal lands are reviewed to ascertain potential impact on resources;
- all operational projects involving underwater disturbance are reviewed to ascertain potential impact on resources;
- their historic values are effectively communicated to the public where deemed appropriate relative to the security of the resources.

7.0 MOVEABLE RESOURCES

The level one moveable resources include a wide range of excavated archaeological artifacts and archival material that are directly linked to the commemorative intent of the site.

7.1 Archival Material

A collection of surviving deeds, site plans, surveys, maps, reports and correspondence dating from the military period are housed at the National Archives of Canada in Ottawa and copies are available for research purposes. A collection of original design drawings and engineering plans are on file at the engineering office at Canal headquarters in Smiths Falls. Also, there are early Canal records housed in the Realty section of Parks Canada's National Office.

While not under the ownership of the Canal, it is important to note the collection of Royal Engineers' Working Drawings from the Rideau Canal, many the work of Lt.-Col. By, housed at the Scottish Record Office, Edinburgh. Similarly, the Public Record Office in London holds a collection of early maps of the Rideau Canal. Also, there is a remarkable group of watercolors and pencil sketches dealing with a variety of Rideau Canal subjects dating from the 1820s through the 1840s housed in several repositories including the Ontario Archives, the McCord Museum, the Royal Ontario Museum and the National Archives of Canada.

7.1.1 The level one archival material of the Rideau Canal is valued for:

- the information it provides on the pre-Canal route;
- its association with the survey, design and construction of the Canal;
- its association with travel on the Canal system during the early period;
- the information it provides regarding the impact of Canal construction on the natural environment;
- the information it provides on construction methods;
- the information it provides on working and social life on the Canal;
- the information it provides on lockstation sites and adjacent communities;
- its aesthetic qualities.

7.1.2 The level one archival material will be unimpaired and not under threat when:

- a comprehensive inventory record of all such material is developed and maintained;
- the level one documents held by Parks Canada are organized and available for research and presentation purposes;
- the level one documents held by Parks Canada are removed from working circulation, protected, conserved and provided with appropriate storage facilities;

- their historic values are effectively communicated to the public.

7.2 Archaeological Artifacts

Archaeological excavation at several sites on the Canal has resulted in an extensive collection of level one artifacts related to Canal construction, operation and maintenance as well as social and working life on the Canal during the military period. This material is under the management of the Archaeological Services Section at Parks Canada's Cornwall Office.

7.2.1 The level one artifacts are valued for:

- their association with Canal construction;
- their association with working life on the Canal;
- the detailed information they provide on working and social life;
- the detailed information they provide about construction techniques and tools;
- their presentation potential;
- their integrity as a collection.

7.2.2 The level one artifacts will be unimpaired and not under threat when:

- inventory and evaluation records of the holdings are completed and maintained;
- resource collections are maintained;
- the integrity of collections are maintained (this does not preclude the exhibit of portions in different locations)
- their historic values are effectively communicated to the public.

PART II

Level One Messages: Reasons for the Site's National Significance Are Effectively Communicated to the Public

8.0 MESSAGES OF NATIONAL SIGNIFICANCE

Level one messages or messages of national significance are based on the reasons why the site was commemorated a national historic site. Effective communication focuses on what knowledge and understanding as many people as possible should have regarding the national significance of the site. This involves communicating the national significance of the Canal, plus the provision of contextual information which provides the essential context for people's historical knowledge and understanding of the place.

The information outlined below is intended only as a communications framework. These are key messages upon which a heritage presentation program should be developed.

8.1 Messages of National Significance

The messages of national significance for Rideau Canal NHS are:

- the construction of the Canal system;
- the survival of a high number of original Canal structures including locks, blockhouses, dams, weirs and original lockmasters' houses plus the integrity of most lockstations;
- the unique historical environment of the Canal system.

The message of national significance for Merrickville Blockhouse NHS is:

- it is a fine example of the best type of blockhouses erected for the defense of the Rideau Canal.

8.2 Context Messages

As many people as possible should understand the following contextual messages:

- the importance of water transportation in colonial Canada in the first-half of the nineteenth century;

- the transportation and supply problems encountered defending Upper Canada during the War of 1812;
- the military purpose behind the construction of the Rideau Canal;
- the role of Lt.-Colonel John By in engineering and supervising the construction of the Canal;
- the difficulties encountered constructing the Canal such as the environment, logistics, engineering challenges and working conditions;
- the impact of Canal construction on the natural environment including impacts on drainage patterns, the destruction of large areas of forest, the flooding of thousands of hectares of land which created new wetlands, islands and lakes;
- many of the corridor's highly important ecosystem features were created by the Canal builders;
- the impact of Canal construction and the opening of through navigation on the development of eastern Ontario - lumbering, settlement, agriculture, and manufacturing development;
- the impact of Canal construction and the opening of through navigation on the founding of the city of Ottawa;
- the reasons for the survival of most of the Canal's engineering structures and the system's remarkable record of continuous operation since 1832;
- the differing parts or sections of the Canal corridor - urban, rural, natural, agricultural, recreational - and how each contributes to the unique historical environment of the system;
- the different historical phases evident in different sections of the Canal corridor;
- the historic and present importance of water management for Canal operations and ecosystem management
- the high level of skill and workmanship exhibited in the construction of the Merrickville Blockhouse.

8.3 Effective Communication of the reasons for national significance

The effective communication of the reasons for national historic significance of the Rideau Canal as expressed in the messages of national significance and the context messages, will be achieved when:

- the overall presentation experience conveys these reasons;
- the public, both visitors and non-visitors, exposed to a heritage presentation experience understand the reasons for the site's national historic significance; and
- the effectiveness of communication is measured and monitored.

PART III

The Site's Heritage Values Are Respected

In addition to those resources and messages deemed to be level one, the Canal possesses other associative and physical historic values that contribute to the site's heritage character and heritage experience. Included in this section of the commemorative integrity statement is the Tay Canal, which is not considered part of the original Rideau Canal system, but is deemed to be part of the level two heritage values of the present Canal.

Additional heritage values of the Rideau Canal include:

- its post-military operation, maintenance and administration;
- its evolving use - commercial to recreational;
- its evolving role with corridor communities and the heritage value of the Rideau corridor;

- the construction and operation of the first and second Tay Canals;
- its role in a larger international canal network;
- the continuing relationship between the Canal - its resources and operations - and the corridor's natural environment.

9.0 LEVEL TWO IN SITU RESOURCES

9.1 Level Two Engineering Works

In total 20 engineering works were evaluated as level two cultural resources. These include the two locks on the Tay Canal plus other dams, weirs, embankments, bridges, channels and turning basins along the system built between 1887 and the early 1950s. No structure built in 1967 or later was evaluated. (Specific details regarding these structures is available in the cultural resource inventory of the Rideau Canal.)

9.1.1 These level two engineering works are valued for their:

- association with the commercial and recreational use of the Canal;
- association with corridor communities and expansion of the Canal system;
- role in the continuing operation of the Canal;
- evidence of changing construction technologies;
- manual mode of operation;
- surviving physical attributes of form and material.

9.1.2 The values of the level two engineering works will be respected when:

- they are monitored and maintained in an operational condition;
- the current manual mode of operation is maintained;
- the current material type, massing and form are safeguarded whenever possible;
- the current material type and design of the gate and valve opening mechanism is maintained;
- the current material type and design of lock gates is maintained;
- the appropriateness of any repairs or other interventions to the works are reviewed in accordance to the principles of the Parks Canada's CRM Policy.

9.2 Level Two Buildings

In total 19 Canal buildings were evaluated as level two cultural resources, nine of which were Federal Heritage Buildings. No building constructed in 1967 or later was evaluated.

9.2.1 The level two Canal buildings are valued for their:

- association with the post-military operation and maintenance of the Canal;
- association with working and social life on the Canal;
- association with industrial activities in corridor communities;
- designation as Federal Heritage Buildings;
- functional design qualities;
- surviving physical attributes of form and material;
- contribution to the historic character of their associated lockstations.

NOTE: the collection of outbuildings at Poonamalie is valued as a farmstead landscape assemblage, not for any individual value.

9.2.2 The values of the buildings will be respected when:

- their current material, form, and functional design qualities are safeguarded;
- their heritage settings are preserved;

- repairs and other interventions adhere to the procedures of the CRM Policy.

9.3 Archaeological Sites

No comprehensive inventory of archaeological sites exists. Those archaeological sites that pre-date or post-date the Canal's military period up to 1967 are considered potential level two cultural resources until they are evaluated otherwise.

9.3.1 The Canal's level two archaeological sites are valued for their:

- association with the evolving use of the Canal;
- association with the post-military operations, maintenance and working life on the Canal;
- surviving physical elements.

9.3.2 The level two archaeological sites will be respected when:

- an inventory and evaluation record of all archaeological sites is developed and maintained;
- known archaeological sites on Canal lands are monitored and safeguarded by adhering to the Guidelines for the Management of Archaeological Resources in the Canadian Parks Service;
- all operational projects involving below ground or water disturbance on Canal lands are reviewed to ascertain the potential impact on resources.

9.4 Merrickville Industrial Ruins (Level two)

9.4.1 The industrial ruins are valued for their:

- association with the evolution and variety of industrial activity on this site;
- association with industrial activity in the Rideau Corridor area;
- remaining physical form and material;
- contextual setting - relation to the locks, the rapids and other industrial buildings adjacent to the site.

9.4.2 The values of the Merrickville ruins will be respected when:

- their physical form and material are safeguarded;
- repairs and other interventions adhere to the procedures of the CRM Policy;
- the current contextual setting is maintained.

10.0 LEVEL TWO MOVEABLE RESOURCES

The level two moveable resources consist of archival material, historic objects and archaeological artifacts.

10.1 Level Two Historic Objects

While there is a great number of objects - particularly tools and hardware - with potential association with the Canal, it is difficult to determine their historic value because of a lack of information regarding their provenance and the scattered nature of the holdings. The approach is to treat any object with a direct association with the operation or maintenance of the Rideau Canal in the 1855 to 1967 period as a potential level two resource until evaluated otherwise.

10.1.2 The values of the level two historic objects will be respected when:

- an inventory and evaluation is conducted on the resources and their provenance and value determined;
- those resources determined to be level two are maintained as collections.

10.2 Level Two Archival Material

The archival material for the post-military Canal period consist of maps, surveys, correspondence and photographic plates and negatives. This material is held in various locations on and off site.

10.2.1 The level two archival material is valued for:

- its association with the operation and maintenance of the Canal;

- its association with commercial and recreational use of the Canal system;
- the information it provides to the changes on the system;
- the information it provides on working and social life on the Canal;
- the information it provides on lockstation sites and adjacent communities;
- the information it provides on commercial and recreational activities in the Rideau corridor area;
- its aesthetic qualities.

10.2.2 The archival material will be respected when:

- an inventory record of these level two resources on and off site is developed and maintained.

10.3 Level Two Archaeological Artifacts

Archaeological excavation on Canal lands has resulted in an extensive collection of artifacts related to Canal's post-military operation and maintenance as well as social and working life. This material is under the management of the Archaeological Services, Cornwall Office.

10.3.1 The artifacts are valued for:

- their association with the evolving use of the Canal;
- their association with working life on the Canal;
- the information they provide on working and social life;
- their integrity as a collection.

10.3.2 The artifacts will be unimpaired and not under threat when:

- inventory and evaluation records are developed and maintained;
- resource collections are prepared;
- they are conserved when significance warrants;
- they are maintained as a collection (this does not preclude the exhibit of portions in different locations).

11.0 THE NATURAL ENVIRONMENT OF THE RIDEAU CANAL CORRIDOR

Many of the natural features of the Canal - the wetlands and the identified lakes - are known to have a direct connection to the construction of the Canal and are deemed to be Level I resources, (see sections 5.1 and 5.2). In addition, there are extensive ecosystem features - lands, waters, plants and animals - under the jurisdiction of the Rideau Canal that are valued because they comprise an important component of the Canal's history and landscape and as such are considered a vital heritage resource that must be respected and safeguarded.

11.1 The natural ecosystem elements within the Canal corridor are valued because:

- of their contribution to the health and wholeness of the ecosystem within the corridor;
- they are vital parts of the landscape character and history of the corridor;
- of their contribution to the enjoyment and quality of life along the corridor.

11.2 The natural ecosystem features of the Canal will be respected when:

- a natural ecosystem inventory on Canal lands and waters is developed and maintained;
- natural resources of special significance are safeguarded and monitored;
- the habitat of flora and fauna species designated as rare, threatened or endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or by the Province of Ontario is protected;

- features, which, by virtue of their strategic location and physical or biological characteristics, are of special value to government or non-government agencies involved in environmental monitoring and programs to maintain biodiversity and genetic resources in Canada, will be protected;
- features of special significance are managed in accordance with the principles and relevant policies regarding the protection and management of natural ecosystems.

12.0 HERITAGE MESSAGES ARE COMMUNICATED TO THE PUBLIC

In addition to the level one messages (Section 8.0), the Rideau Canal possesses other heritage values that should be communicated in order for people to understand the range and complexity of the Canal's heritage. These level two heritage messages include:

- the Rideau Canal and the Merrickville Blockhouse are National Historic Sites and are part of the family of national historic sites;
- the operational and maintenance history of the Canal through the post-military period, (after 1855);
- the construction and operation of the first and second Tay Canals;
- the evolving use of the Canal from commercial to recreational waterway;
- the historic and evolving relationship between corridor communities and the Canal;
- heritage values and the question of modernization;
- the Rideau Canal is part of an international inland canal network;
- the Rideau Canal is one of the historic canals administered by Parks Canada;
- the Rideau Canal is historically related to other national historic sites such as Fort Henry and the Kingston Fortifications;
- the cultural and natural heritage presented by these National Historic Sites is our legacy as Canadians and a very significant element of Canadian history.

12.1 Communications Objectives for Heritage Messages

The effective communication of the heritage messages of the Rideau Canal will be achieved when:

- aspects of the presentation experience addresses these subjects;
- the public, both visitors and non-visitors, exposed to a heritage presentation experience have an opportunity to learn about the site's broader heritage messages; and
- the effectiveness of communication is measured and monitored.

ONTARIO HERITAGE TRUST
An agency of the Government of Ontario

FIDUCIE DU PATRIMOINE ONTARIEN
Un organisme du gouvernement de l'Ontario

This document was retrieved from the Ontario Heritage Act Register, which is accessible through the website of the Ontario Heritage Trust at **www.heritagetrust.on.ca.**

Ce document est tiré du registre aux fins de la *Loi sur le patrimoine de l'Ontario,* accessible à partir du site Web de la Fiducie du patrimoine ontarien sur **www.heritagetrust.on.ca.**

BY-LAW NUMBER 269-97

A by-law of The Corporation of the City of Ottawa designating an area within the limits of the City of Ottawa as a heritage conservation district.

WHEREAS the Council of The Corporation of the City of Ottawa has examined the area shown on Schedule "A" and Schedule "B" annexed hereto pursuant to the provisions of Section 40 of the Ontario Heritage Act, R.S.O. 1990, c. O.18;

AND WHEREAS the Council of The Corporation of the City of Ottawa has an approved Official Plan in effect that contains provisions relating to the establishment of heritage conservation districts;

AND WHEREAS the Council of The Corporation of the City of Ottawa is empowered, pursuant to Section 41 of the said Ontario Heritage Act, to designate any defined area of the municipality as a heritage conservation district;

THEREFORE the Council of The Corporation of the City of Ottawa enacts as follows:

1. The area within the territorial limits of the City of Ottawa shown on Schedule "A" and Schedule "B" annexed hereto, is hereby designated as a heritage conservation district, to be known as Centretown Heritage Conservation District.

2. The Schedules attached hereto and marked Schedule "A" and Schedule "B" shall form part of this by-law and all notations, references and other information contained therein shall be as much a part of this by-law as if all the matters and information set forth by the said Schedule were all fully described herein.

3. The City Clerk is hereby authorized to apply to the Ontario Municipal Board for approval of this by-law.

4. The City Solicitor is hereby authorized to cause a copy of this by-law to be registered against each property described in Schedule "A" and Schedule "B" hereto in the proper Land Registry Office upon the issuance by the Ontario Municipal Board of its formal Order approving this by-law.

GIVEN under the corporate seal of the City of Ottawa, this 1st day of October, 1997

CITY CLERK

MAYOR

CERTIFED A TRUE COPY
Cathy Wilkie
Cathy Wilkie Deputy City Clerk
Date: OCT 03 1997

SCHEDULE A
(LAND TITLES)

FIRSTLY:

Lots 4 to 9 both inclusive on the West side of Kent street, Registered Plan 30;
Lot 4 to 9 both inclusive on the East side of Kent Street, Registered Plan 30;
Lots 4 to 12 both inclusive on the West side of Bank Street, Registered Plan 30;
Lot 4 to 8 both inclusive on the East side of Bank Street, Registered Plan 30;
Lots 4 to 8 both inclusive on the West side of O'Connor Street, Registered Plan 30;
Lots 11 to 21 both inclusive on the South side of McLeod Street, Registered Plan 30;
Lots 17 to 21 both inclusive on the North side of Flora Street, Registered Plan 30;
Lots 17 to 21 both inclusive on the South side of Flora Street, Registered Plan 30;
Lots 17 to 21 both inclusive on the North side of Arlington Street, Registered Plan 30;
Lots 11 to 16 both inclusive on the North side of Argyle Avenue, Registered Plan 30;
SAVE AND EXCEPT:
Part of Lot 8 on the West side of Kent Street, Registered Plan 30, being P.I.N. 04122-0227 (R)
Being P.I.N.'s
04123-0002 (LT), 04123-003 (LT),
04123-0031 (LT) to 04123-0052 (LT) both inclusive,
04122-0057 (LT) to 04122-0084 (LT) both inclusive,
04122-0098 (LT) to 04122-0101 (LT) both inclusive,
04122-0197 (LT) to 04122-0200 (LT) both inclusive,
04122-0202 (LT) to 04122-0226 (LT) both inclusive,
04122-0228 (LT)
04122-0336 (LT) to 04122-0343 (LT) both inclusive.

SECONDLY:

Lot 9 and part of Lots 10 and 11 on the East side of Bank Street, Registered Plan 30 as in Inst. CR487655.
Being P.I.N. 04123-0004 (LT)

Part of Lots 10 and 11 on the East side of Bank Street, Registered Plan 30 as in Inst. N 660385.
Being P.I.N. 04123-0005 (LT)

Part of Lot 11 on the East side of Bank Street, Registered Plan 30, as in Inst. N. 570173.
Being P.I.N. 04123-0006 (LT)

Lot 12 on the East side of Bank Street, Registered Plan 30.
Being P.I.N. 04123-0007 (LT)

Lot F and part of Lots E, I, J, K Registered Plan 68608, as in Inst. CR200528 SAVE AND EXCEPT as in Inst. N 660036.
Being P.I.N. 04123-0011 (LT)

Part of Lots C, D and E, Registered Plan 68608, as in Inst. N 660036.
Being P.I.N. 04123-0012 (LT)

Part of Lots B, C, D and E, Registered Plan 68608, designated as Part 1 on Plan 5R-4571.
Being P.I.N. 04123-0013 (LT)

Part of Lot B, Registered Plan 68608, designated as Part 2 on Plan 5R-4571.
Being P.I.N. 04123-0014 (LT)

Lot A and part of Lots B and E, Registered Plan 68608, as in Inst. N 469577.
Being P.I.N. 04123-0015 (LT)

Lots 13 to 17 both inclusive on the South side of Argyle Avenue.
Being P.I.N.'s 04123-0022 (LT) to 04123-0027 (LT) both inclusive.

THIRDLY:

Lots 3 to 8 both inclusive on the South side of Argyle Street, Registered Plan 30;
Lots 9 and 10 on the West side of Metcalfe Street, Registered Plan 30;
Lot 9 on the East side of Metcalfe Street, Registered Plan 30.
Being P.I.N.'s
04123-0055 (LT) to 04123-0059 (LT) both inclusive;
04123-0063 (LT), 04123-0064 (LT);
and part of P.I.N. 04123-0054 (LT).

North half of Lot 10 on the East side of Metcalfe Street, Registered Plan 30.
Being P.I.N. 04123-0060 (LT)

Part of Lot 10 on the East side of Metcalfe Street, Registered Plan 30, as in Inst. N659766, SAVE AND EXCEPT Part 2 on Plan 4R-9150.
Being P.I.N. 04123-0061 (LT)

FOURTHLY:

Lot 23 and part of Lot 24, on the East side of Elgin Street, Registered Plan 49052, as in Inst. N 488796.
Being P.I.N. 04124-0001 (LT)

Lot 25 and part of Lot 24 on the East side of Elgin Street, Registered Plan 49052.
Being part of P.I.N. 04124-0002 (LT)

Lot 1 on the East side of Elgin Street, Registered Plan 30.
Being P.I.N. 04124-0003 (LT)

Part of Lots 2 and 3 on the East side of Elgin Street, Registered Plan 30, designated as Part 1 on Plan 5R-3460.
Being P.I.N. 04124-0004 (LT)

Lots 4, 5 and 6 on the East side of Elgin Street, Registered Plan 30.
Being P.I.N.'s 04124-0005 (LT) to 04124-0008 (LT) both inclusive.

Part of Lot 7 on the East side of Elgin Street, Registered Plan 30, as in Inst. N 522318.
Being P.I.N. 04124-0009 (LT)

Part of Lot 7 on the East side of Elgin Street, Registered Plan 30, as in Inst. N 481377.
Being P.I.N. 04124-0010 (LT)

Part of Lot 8 on the East side of Elgin Street, Registered Plan 30, designated as Part 1 on Plan 4R-4526.
Being P.I.N. 04124-0093 (LT)

Part of Lot 8 on the East side of Elgin Street, Registered Plan 30, designated as Part 2 on Plan 4R-4526.
Being P.I.N. 04124-0094 (LT)

Part of Lot 8 on the East side of Elgin Street, Registered Plan 30, designated as Part 3 on Plan 4R-4526.
Being P.I.N. 04124-0095 (LT)

Part of Lots 8 and 9 on the East side of Elgin Street, Registered Plan 30, designated as Part 4 on Plan 4R-4526.
Being P.I.N. 04124-0096 (LT)

Part of Lots 8 and 9 on the East side of Elgin Street and Part of Lot A on the North side of Argyle Avenue, Registered Plan 30, designated as Parts 5 and 6 on Plan 4R-4526.
Being P.I.N. 04124-0097 (LT)

Part of Lot 9 on the East side of Elgin Street, Registered Plan 30, designated as Parts 16, 17 and 18 on Plan 5R-9080.
Being P.I.N. 04124-0157 (LT)

Part of Lot 9 on the East side of Elgin Street, Registered Plan 30, designated as Parts 13, 14 and 15 on Plan 5R-9080.
Being P.I.N. 04124-0158 (LT)

Part of Lot 9 on the East side of Elgin Street, Registered Plan 30, designated as Parts 10, 11 and 12 on Plan 5R-9080.
Being P.I.N. 04124-0159 (LT)

Part of Lot 9 on the East side of Elgin Street, Registered Plan 30, designated as Parts 7, 8 and 9 on Plan 5R-9080.
Being P.I.N. 04124-0160 (LT)

Part of Lot 9 on the East side of Elgin Street, Registered Plan 30, designated as Parts 4, 5 and 6 on Plan 5R-9080.
Being P.I.N. 04124-0161 (LT)

Part of Lot 9 on the East side of Elgin Street and Part of Lot A on the North side of Argyle Avenue, Registered Plan 30, designated as Parts 1, 2 and 3 on Plan 5R-9080.
Being P.I.N. 04124-0162 (LT)

FIFTHLY:

Part of Lot 3 on the West side of Kent Street, Registered Plan 30, designated as Parts 1 and 5 on Plan 5R-8277.
Being P.I.N. 04120-0347 (LT)

Part of Lot 3 on the West side of Kent Street, Registered Plan 30, designated as Parts 2 and 6 on Plan 5R-8277.
Being P.I.N. 04120-0348 (LT)

Part of Lot 3 on the West side of Kent Street, Registered Plan 30 as in Inst. N 346007.
Being P.I.N. 04120-0349 (LT)

Part of Lot 3 on the West side of Kent Street, Registered Plan 30 as in Inst. N 288882.
Being P.I.N. 04120-0350 (LT)

Part of Lot 2 on the West side of Kent Street, Registered Plan 30, designated as Parts 3 and 4 on Plan 5R-8277.
Being P.I.N. 04120-0351 (LT)

Lot 1 and part of Lot 2 on the West side of Kent Street, Registered Plan 30 as in Inst. N 710673, SAVE AND EXCEPT Parts 1, 2 and 4 on Plan 4R-11575.
Being P.I.N. 04120-0352 (LT)

SIXTHLY:

Lots 16 to 21 both inclusive, on the South side of Gladstone Avenue, Registered Plan 30;
Lots 16 to 21 both inclusive, on the North side of McLeod Street, Registered Plan 30;
Lots 1, 2 and 3 on the East side of Kent Street, Registered Plan 30;
Lots 1, 2 and 3 on the West side of Bank Street, Registered Plan 30;
Being P.I.N.'s
04119-0236 (LT) to 04119-0259 (LT) both inclusive;
04119-0261 (LT)

SEVENTHLY:

Lot 12 and Part of Lot 11 on the North side of Gladstone Avenue, Registered Plan 21612, as in Inst. N422307.
Being P.I.N. 04120-0266 (LT)

Part of Lot 11 on the North side of Gladstone Avenue, Registered Plan 21612, as in Inst. NS264190.
Being P.I.N. 04120-0267 (LT)

Lot 11 and part of Lot 12 on the South side of Florence Street, Registered Plan 21612, as in Inst. N566531.
Being P.I.N. 04120-0268 (LT)

EIGHTHLY:

Part of Lots 12 and 13 on the North side of Florence Street, Registered Plan 30671, as in Inst. CR611211.
Being P.I.N. 04120-0243 (LT)

Part of Lots 11 and 12 on the North side of Florence Street, Registered Plan 30671, as in Inst. N725149.
Being P.I.N. 04120-0244 (LT)

Part of Lots 11 and 12 on the North side of Florence Street, Registered Plan 30671, as in Inst. NS181784.
Being P.I.N. 04120-0245 (LT)

Lots 11, 12, 13, 14 and 15 on the South side of James Street, Registered Plan 30671, SAVE AND EXCEPT Parts 2, 3, 4, 6 and 7 on Plan 4R-1678 and Part 1 on Plan 5R-14264.
Being P.I.N. 04120-246 (LT)

NINTHLY:

Lots 31 and 31A on the North side of James Street, Registered Plan 27904;
Lots 31 and 31A on the South side of Gilmour Street, Registered Plan 27904;
Being P.I.N.'s 04120-0160 (LT) to 04120-0164 (LT) both inclusive.

Part of Lot 31 on the North side of Gilmour Street, Registered Plan 27904, as in Inst. N690759.
Being P.I.N. 04120-0125 (LT)

Part of Lot 31A on the North side of Gilmour Street, Registered Plan 27904, as in Inst. N398296.
Being P.I.N. 04120-0126 (LT)

Part of Lots 31A and 31 on the North side of Gilmour Street, Registered Plan 27904, as in Inst. N670489.
Being P.I.N. 04120-0127 (LT)

Lot 31A and part of Lot 31 on the South side of MacLaren Street, Registered Plan 27904 as in Inst. N656345.
Being P.I.N. 04120-0128 (LT)

TENTHLY:

Lots 37 to 40 both inclusive, on the South side of Gilmour Street, Registered Plan 30671;
Lots 36 to 40 both inclusive, on the North side of James Street, Registered Plan 30671;
Lots 1 to 10 both inclusive, on the South side of James Street, Registered Plan 21612;
Lots 1 to 10 both inclusive, on the North side of Florence Street, Registered Plan 21612;
Lots 1 to 10 both inclusive, on the South side of Florence Street, Registered Plan 21612;
Lots 1 to 10 both inclusive on the North side of Gladstone Avenue, Registered Plan 21612;

Lots 14 to 25 both inclusive, on the West side of Bank Street, Registered Plan 15558.
Being P.I.N.'s
04119-0083 (LT) to 04119-0093 (LT) both inclusive;
04119-0139 (LT) to 04119-0182 (LT) both inclusive;
04119-0198 (LT) to 04119-0200(LT) both inclusive;

Lots 32, 33, 34 and part of Lot 35 on the South side of Gilmour Street; Lots 32, 33, 34 and 35 on the North side of James Street, Registered Plan 30671, as in Inst. NS207100.
Being P.I.N. 04119-0081 (LT).

All Units and Common Elements comprising the property included in Carleton Condominium Plan No. 315.
Being P.I.N.'s 15315-0001 (LT) to 15315-0010 (LT) both inclusive.

ELEVENTHLY:

Part of Lot 1 and all of Lots 2 and 3 on the West side of O'Connor Street, Lot 11 and part of Lot 12 on the South side of Gladstone Avenue, Lot 11 and part of Lot 12 on the North side of McLeod Street, Registered Plan 30, designated as Part 1, 2, 3 and 4 on Plan 5R-3283.
Being P.I.N. 04119-0226 (LT)

Part of Lots 12 and 13 on the South side of Gladstone Avenue, Registered Plan 30 as in Inst. CR258673.
Being P.I.N. 04119-0227 (LT)

Part of Lots 13 and 14 on the South side of Gladstone Avenue, Registered Plan 30, designated as Part 2 on Registered Plan 5R-8481.
Being P.I.N. 04119-0228 (LT)

Part of Lot 14 on the South side of Gladstone Avenue, Registered Plan 30, designated as Part 1 on Registered Plan 5R-8481.
Being P.I.N. 04119-0229 (LT)

Part of Lot 1 and all of Lots 2 and 3 on the East side of Bank Street, Lot 15 on the South side of Gladstone Avenue and part of Lot 15 on the North side of McLeod Street, Registered Plan 30 as in Inst.'s NS116211, CR210079, CR337634, CR500676.
Being P.I.N. 04119-0230 (LT)

Part of Lots 12 and 13 on the North side of McLeod Street, Registered Plan 30 as in Inst. NS30945.
Being P.I.N. 04119-0231 (LT)

Part of Lot 13 on the North side of McLeod Street, Registered Plan 30 as in Inst. N456853.
Being P.I.N. 04119-0232 (LT)

Part of Lot 14 on the North side of McLeod Street, Registered Plan 30, designated as Part 2 and 4 on Plan 4R-9076.
Being P.I.N. 04119-0233 (LT)

Part of Lot 14 on the North side of McLeod Street, Registered Plan 30, designated as Part 1 and 3 on Plan 4R-9076.
Being P.I.N. 04119-0234 (LT)

Part of Lot 15 on the North side of McLeod Street , Registered Plan 30 as in Inst. N397605.
Being P.I.N. 04119-0235 (LT)

TWELFTHLY:

Lots 6, 7, 8, 9 and 10 on the North side of McLeod Street, Registered Plan 30;
Lots 6, 7, 8, 9 and 10 on the South side of Gladstone Avenue, Registered Plan 30;
Lots 1, 2 and 3 on the East side of O'Connor Street, Registered Plan 30;
Lots 1, 2 and 3 on the West side of Metcalfe Street, Registered Plan 30.
Being P.I.N.'s
04118-0163 (LT) to 04118-0174 (LT) both inclusive
04118-0176 (LT) to 04118-0182 (LT) both inclusive
04118-0259 (LT) and 04118-0260 (LT)

THIRTEENTHLY:

Part of Lot 1 on the East side of Metcalfe Street, Registered Plan 30 as in Inst. NS38070.
Being P.I.N. 04118-0183 (LT)

Part of Lot 1 on the East side of Metcalfe Street, Registered Plan 30, as in Inst. N510256.
Being P.I.N. 04118-0184 (LT)

Lots 1, 2, 3, 4 and 5 on the North side of McLeod Street, Registered Plan 30;
Lots 1, 2, 3, 4 and 5 on the South side of Gladstone Avenue, Registered Plan 30;
Lots 2 and 3 on the East side of Metcalfe Street, Registered Plan 30.
Lots 1, 2 and 3 on the West side of Elgin Street.
Being P.I.N.'s 04118-0185 (LT) to 04118-0193 (LT) both inclusive.

FOURTEENTHLY

Part of Lots 6 and 7 on the South side of Frank Street, Registered Plan 3766 as in Inst. N289958.
Being P.I.N. 04119-0183 (LT)

Part of Lots 6 and 7 on the South side of Frank Street, Registered Plan 3766 as in Inst. NS36926.
Being P.I.N. 04119-0184 (LT)

Part of Lot 6 on the South side of Frank Street, Registered Plan 3766 designated as Parts 3 and 4 on Plan 5R-3606.
Being P.I.N. 04119-0185 (LT)

Part of Lot 5 on the South side of Frank Street, Registered Plan 3766 designated as Parts 1 and 2 on Plan 5R-3606.
Being P.I.N. 04119-0186 (LT)

Part of Lot 5 on the South side of Frank Street, Registered Plan 3766 as in Inst. NS212232.
Being P.I.N. 04119-0187 (LT)

Part of Lots 3 and 4 on the South side of Frank Street, Registered Plan 3766 as in Inst. N722725.
Being P.I.N. 04119-0188 (LT)

Part of Lots 2 and 3 on the South Side of Frank Street, Registered Plan 3766 as in Inst. N476118.
Being P.I.N. 04119-0189 (LT)

Part of Lots 1 and 2 on the South side of Frank Street, Registered Plan 3766, designated as Part 2 on Plan 4R-11175.
Being P.I.N. 04119-0190 (LT)

Part of Lot 1 on the South side of Frank Street, Registered Plan 3766 and Part of Lot E, Concession C (RF), designated as Part 1 on Plan 4R-11175.
Being P.I.N. 04119-0191 (LT)

Part of Lot E, Concession C (RF) as in Inst. N672405 and Part of Block 51 on Registered Plan 15558 as in Inst. N672405.
Being P.I.N. 04119-0192 (LT)

Part of Lot E, Concession C (RF) as in Inst. CR517029 and Part of Block 51 on Registered Plan 15558 as in Inst. CR517029.
Being P.I.N. 04119-0193 (LT)

Part of Lot E, Concession C (RF) and Part of Block 51 on Registered Plan 15558 as in Inst. CR437618 SAVE AND EXCEPT Inst. CR627716.
Being P.I.N. 04119-0194 (LT)

Part of Lot E, Concession C (RF) and Part of Block 51 on Registered Plan 15558 as in Inst. CR627716 SAVE AND EXCEPT Inst. CR397551.
Being P.I.N. 04119-0195 (LT)

Part of Lot E, Concession C (RF); part of Lot 1 on Registered Plan 3766 as in Inst. CR422987; part of Block 51 on Registered Plan 15558 as in Inst. CR397551; SAVE AND EXCEPT Inst.'s CR419069 and CR422987.
Being P.I.N. 04119-0221 (LT)

Part of Lots 1, 2 and 3 on Registered Plan 3766 as in Inst. NS36927.
Being P.I.N. 04119-0222 (LT)

FIFTEENTHLY:

Part of Lot 8 on the South side of Frank Street, Registered Plan 3766 as in Inst. CR447638 and

Inst. CR442600.
Being P.I.N. 04118-0156 (LT)

Part of Lots 9 and 10 on the South side of Frank Street, Registered Plan 3766 as in Inst. NS189077.
Being P.I.N. 04118-0157 (LT)

Part of Lot 10 on the South side of Frank Street, Registered Plan 3766 as in Inst. N331143.
Being P.I.N. 04118-0158 (LT)

Part of Lots 11 and 12 on the South side of Frank Street , Registered Plan 15558, designated as Part 1 on Plan 5R-11743.
Being P.I.N. 04118-0159 (LT)

Part of Lots 12 and 13 on the South side of Frank Street, Registered Plan 15558, designated as Part 2 on Plan 5R-11743.
Being P.I.N. 04118-0160 (LT)

Part of Lots 13 and 14 on the South side of Frank Street, Registered Plan 15558 as in Inst. N484793.
Being P.I.N. 04118-0161 (LT)

Part of Lots 15, 16 and 17 on the South side of Frank Street, Registered Plan 15558 as in Inst. NS231194.
Being P.I.N. 04118-0162 (LT)

SIXTEENTHLY:

Part of Lot 2 on the East side of Metcalfe Street, Registered Plan 204329 as in Inst. CR340756 SAVE AND EXCEPT Inst. CR518196.
Being P.I.N. 04118-0194 (LT)

Part of Lots 15, 16 and 17 on the North side of Gladstone Avenue, Registered Plan 26981 as in Inst. CR518644.
Being P.I.N. 04118-0196 (LT)

Part of Lots 8 and 9 on the West side of Elgin Street, Registered Plan 26981 and part of Lot 14 on the North side of Gladstone Avenue, Registered Plan 26981 as in Inst. N524378.
Being P.I.N. 04118-0197 (LT)

Part of Lots 7 and 8 on the West side of Elgin Street, Registered Plan 26981 as in Inst. N577663.
Being P.I.N. 04118-0198 (LT)

Part of Lots C and 7 on the West side of Elgin Street, Registered Plan 26981 as in Inst. N537113.
Being P.I.N. 04118-0199 (LT)

Part of Lot 14 on the South side of Frank Street, Registered Plan 26981 and part of Lots C and

7 on the West side of Elgin Street, Registered Plan 26981 as in Inst. N140918.
Being P.I.N. 04118-0200 (LT)

Lots 15, 16 and 17 on the South side of Frank Street, Registered Plan 26981;
Lots 3 and 4 on the South side of Frank Street, Registered Plan 204329;
Lot 1 on the East side of Metcalfe Street, Registered Plan 204329.
Being P.I.N. 04118-0201 (LT) to 04118-0207 (LT) both inclusive.

SEVENTEENTHLY:

Lots 1 to 5 on the South side of Waverley Street, Registered Plan 3766;
Lots 1 to 5 on the North side of Frank Street, Registered Plan 3766;
Lots 19, 20 and 21 on the East side of Bank Street, Registered Plan 15558;
Lot A on the South side of Waverley Street, Registered Plan 15558;
Lot A on the North side of Frank Street, Registered Plan 15558.
Being P.I.N.'s
04119-0125 (LT) to 04119-0130 (LT) both inclusive
04119-0136 (LT) to 04119-0138 (LT) both inclusive

Part of Lot 6 on the North side of Frank Street. Registered Plan 3766 and part of Lot 7 on the North side of Frank Street, Registered Plan 12 as in Inst. NS77989.
Being P.I.N. 04119-0132 (LT)

Part of Lot 6 on the North side of Frank Street, Registered Plan 3766 and part of Lot 7 on the North side of Frank Street, Registered Plan 12 as in Inst. NS252467.
Being P.I.N. 04119-0133 (LT)

Part of Lot 6 on the North side of Frank Street, Registered Plan 3766 and part of Lot 7 on the North side of Frank Street, Registered Plan 12 as in Inst. CR351579.
Being P.I.N. 04119-0134 (LT)

Part of Lot 6 on the North side of Frank Street, Registered Plan 3766 as in Inst. N621644.
Being P.I.N. 04119-0135 (LT)

All Units and Common Elements comprising the property included in Carleton Condominium Plan No. 516.
Being P.I.N.'s 15516-0001 (LT) to 15516-0019 (LT)

EIGHTEENTHLY:

Lots 11 to 14 on the South side of Waverley Street, Registered Plan 15558;
Lots 11 to 14 on the North side of Frank Street, Registered Plan 15558;
Lots 14, 15 and 16 on the West side of Metcalfe Street, Registered Plan 15558;
Lots 9 and 10 on the South side of Waverley Street, Registered Plan 12;
Lots 9 and 10 on the North side of Frank Street, Registered Plan 12.
Being P.I.N.'s 04118-0142 (LT) to 04118-0154 (LT) both inclusive.

Part of Lot 8 on the South side of Waverley Street, Registered Plan 12, as in Inst. NS114313.

Being P.I.N. 04118-0141 (LT)

Part of Lot 8 on the North side of Bank Street, Registered Plan 12, designated as Parts 1, 2 and 3 on Plan 4R-10380.
Being P.I.N. 04188-0155 (LT)

NINETEENTHLY:

Lots 4 to 8 both inclusive on the South side of Lewis Street, Registered Plan 12;
Lots 4 to 8 both inclusive on the North side of Waverley Street, Registered Plan 12;
Being P.I.N.'s
04119-0103 (LT to 04119-0110 (LT) both inclusive
04119-0114 (LT) to 04119-0119 (LT) both inclusive.

Lot 1 on the East side of Bank Street, Registered Plan 12; Part of Lot 2 on the East side of Bank Street, Registered Plan 12; Part of a 2 feet Reserve lying East of Lot 16 and 17 on the East side of Bank Street, Registered Plan 15558 as in Inst. CR491485; Part of Lots 2 and 3 on the East side of Bank Street, Registered Plan 12 as in Inst. CR584304.
Being P.I.N. 04119-0111 (LT)

Part of Lots 2 and 3 on the East side of Bank Street, comprising of the East half of Lot 3 and the southeast Quarter of Lot 2, Registered Plan 12.
Being P.I.N. 04119-0112 (LT)

Part of Lots 16 and 17 on the East side of Bank Street, Registered Plan 15558 designated as Parts 6, 7 and 8 on Plan 5R-11389, SAVE AND EXCEPT Part 1 on Plan 5R-12508.
Being P.I.N. 04119-0120 (LT)

Part of Lot 17 on the East side of Bank Street, Registered Plan 15558, designated as Parts 1 and 2 on Plan 5R-11389.
Being P.I.N. 04119-0121 (LT)

Part of Lot 18 on the East side of Bank Street, Registered Plan 15558, designated as Parts 1 and 2 on Plan 5R-7232.
Being P.I.N. 04119-0122 (LT)

Part of Lot 18 on the East side of Bank street, Registered Plan 15558, designated as Parts 3, 4 and 5 on Plan 5R-7232.
Being P.I.N. 04119-0123 (LT)

Part of Lot 18 on the East side of Bank Street, Registered Plan 15558, designated as Part 1 on Plan 5R-11298.
Being P.I.N. 04119-0124 (LT)

TWENTYTHLY:

Lot 10 on the South side of Lewis Street, Registered Plan 3766;
Lot 10 on the North side of Waverley Street, Registered Plan 3766;

Lots 11, 12,13 and 14 on the South side of Lewis Street, Registered Plan 15558;
Lots 11, 12, 13 and 14 on the North side of Waverley Street, Registered Plan 15558;
Lots 11, 12 and 13 on the West side of Metcalfe Street, Registered Plan 15558;
SAVE AND EXCEPT:
Part of Lot 14 on the South side of Lewis Street; Lot 13 and Part of Lot 12 on the West side of Metcalfe Street; Part of Lot 14 on the North side of Waverley Street, Registered Plan 15558, as in Inst. N665941; being P.I.N. 04118-0136 (LT)
Being P.I.N.'s
04118-0126 (LT)
04118-0128 (LT) to 04118-0135 (LT) both inclusive
04118-0137 (LT) to 04118-0140 (LT) both inclusive

All Units and Common Elements comprising the property included in Carleton Condominium Plan No. 251.
Being P.I.N.'s 15251-0001 (LT) to 15251-0027 (LT) both inclusive

TWENTYFIRSTLY:

Part of Lots 5 and 6 on the East side of Metcalfe Street, Registered Plan 15558 and part of Gilmour Street, Lewis Street and Metcalfe Street, Registered Plan 15558, all as closed by Inst. CR176204, as in Inst. N694368.
Being P.I.N. 04118-0066 (LT)

Part of Lots 5 and 6 on the East side of Metcalfe Street, Registered Plan 15558 and part of Lots 1 and 2 on the West side of Beaconsfield Place, Registered Plan 15558, as closed by Inst. CR193089, as in Inst. CR691978.
Being P.I.N. 04118-0067 (LT)

Part of Lots 1 and 2 on the West side of Beaconsfield Place, Registered Plan 15558; Beaconsfield Place, Registered Plan 15558 as closed by Bylaw CR193089; Lots 1 and 2 on the East side of Beaconsfield Place, Registered Plan 15558; Lots 9 and 10 on the West side of Elgin Street, Registered Plan 15558; Part of Lewis Street, Registered Plan 15558 as closed by Bylaw CR623477; Part of Lot 15 on the South side of Lewis Street, Registered Plan 15558; Lots 16 and 17 on the South side of Lewis Street, Registered Plan 15558; Lot 17 on the South side of Lewis Street, Registered Plan 26981; Lots 16 and 17 on the North side of Waverley Street, Registered Plan 15558; Lot 17 on the North side of Waverley Street, Registered Plan 26981; Part of Waverley Street, Registered Plan 26981 as closed by Bylaw CR632789, as in Inst. CR648089, all being designated as Parts 1, 2, 5, 7 and 9, on Plan 4R-441 SAVE AND EXCEPT Part 1 on Plan 4R-731.
Being P.I.N. 04118-0068 (LT)

Part of Lots 15, 16 and 17 on the North side of Frank Street, Registered Plan 15558; part of Lot 14 and Lots 15, 16 and 17 on the North side of Frank Street, Registered Plan 26981; Part of Lot 14 and Lots 15, 16 and 17 on the South side of Waverley Street, Registered Plan 26981, closed by Bylaw CR632789; Lots 15, 16 and 17 on the South side of Waverley Street, Registered Plan 15558 closed by Bylaw CR634798; Part of Waverley Street, formerly Charles Street, Registered Plan 15558 closed by Bylaw CR634798; Part of Lot 14 and Lots 15 and 16 on the South side of Lewis Street formerly Henry Street, closed by Bylaw CR623477, Registered Plan 26981; Part of Waverley Street formerly McDougal Street closed by Bylaw CR632789, Registered Plan 26981; Part of Lot 14 and Lots 15 and 16 on the North side of Waverley Street

closed by Bylaw CR632789, Registered Plan 26981; Part of Lewis Street formerly Henry Street closed by Bylaw CR623477, Registered Plan 26981 all being designated as Parts 6, 8 and 10 on Plan 4R-441.
Being P.I.N. 04118-0208 (LT)

Part of Lots 11 and 12 on the East side of Metcalfe Street, Registered Plan 15558 as in Inst. N715677.
Being P.I.N. 04118-0209 (LT)

Lot A on the West side of Elgin Street, Registered Plan 26981, SAVE AND EXCEPT Inst. N737610.
Being P.I.N. 04118-0210 (LT)

Lot 1 on the West side of Elgin Street, Registered Plan 26981 and part of Lot A on the West side of Elgin Street, Registered Plan 26981 as in Inst. N737610.
Being P.I.N. 04118-0211 (LT)

Lot 2 on the West side of Elgin Street, Registered Plan 26981.
Being P.I.N. 04118-0212 (LT)

Lot 3 on the West side of Elgin Street, Registered Plan 26981.
Being P.I.N. 04118-0213 (LT)

Lot 18 on the West side of Elgin Street, Registered Plan 26981.
Being P.I.N. 04118-0214 (LT)

Part of Lot B and 4 on the West side of Elgin Street, Registered Plan 26981 as in Inst. NS118063.
Being P.I.N. 04118-0217 (LT)

Part of Lot 4 on the West side of Elgin Street, Registered Plan 26981 as in Inst. CR571218.
Being P.I.N. 04118-0218 (LT)

Lot 5 on the West side of Elgin Street, Registered Plan 26981.
Being P.I.N. 04118-0219 (LT)

Lot 6 on the West side of Elgin Street, Registered Plan 26981.
Being P.I.N. 04118-0220 (LT)

Lot 7 on the East side of Metcalfe Street, Registered Plan 15558; Part of Lot 15 on the South side of Lewis Street, Registered Plan 15558, designated as Parts 1, 2 and 3 on Plan 4R-2193.
Being P.I.N. 04118-0221 (LT)

Lot 9 on the East side of Metcalfe Street, Registered Plan 15558; Lot 15 on the North side of Waverley Street closed by Bylaw CR634798, Registered Plan 15558; Part of Waverley Street formerly Charles Street closed by Bylaw CR634798, Registered Plan 15558 designated as Parts 1 and 2 on Plan 5R-5258.
Being P.I.N. 04118-0223 (LT)

Part of Lots 10 and 11 on the East side of Metcalfe Street, Registered Plan 15558, designated as Part 1 on Plan 4R-4560.

Being P.I.N. 04118-0256 (LT)

TWENTYSECONDLY:

Lots 15 to 22 both inclusive, on the East side of Elgin street, Registered Plan 49052.
Being P.I.N.
04118-0110 (LT)
and part of P.I.N.'s 04118-0089 (LT), 04118-0090 (LT) and 04118-0111 (LT)

TWENTYTHIRDLY:

Lots 14 and 15 on the East side of Bank Street, Registered Plan 15558;
Lots 1 and 2 on the West side of Derby Street, Registered Plan 15558;
Lots D, E, F, G, H, I, J and K on the South side of Gilmour Street, Registered Plan 29598;
Being P.I.N.'s 04119-0094 (LT) to 04119-0102 (LT) both inclusive.

TWENTYFOURTHLY:

Lots 7 and 8 on the East side of O'Connor Street; Lots 1 and 2 on the West side of Wallace Place; Wallace Place as closed by Inst. CR449725; Part of Lots 1 and 2 on the East side of Wallace Place, as in Inst. CR423316; Registered Plan 15558.
Being P.I.N. 04118-0064 (LT)

Part of Lots 1 and 2 on the East side of Wallace Place, as closed by Inst. CR449725;
Lots 9 and 10 on the West side of Metcalfe Street; Registered Plan 15558.
Being P.I.N. 04118-0065 (LT)

TWENTYFIFTHLY:

Lots 32 to 38 both inclusive, on the South side of MacLaren Street, Registered Plan 27292;
Lots 32 to 38 both inclusive, on the North side of Gilmour Street, Registered Plan 27292.
Being P.I.N.'s 04119-0067 (LT) to 04119-0079 (LT) both inclusive.

Lot 38A on the South side of MacLaren Street, Registered Plan 27292;
Part of the Lane, Registered Plan 15558, designated as Parts 2, 4 and 7 on Plan 5R-11400, as closed by order, Inst. CR512311.
Being P.I.N. 04119-0066 (LT)

Lot 10 and part of Lot 11 on the West side of Bank Street, Registered Plan 15558, designated as Parts 1 and 2 on Plan 5R-12561.
Being P.I.N. 04119-0065 (LT)

All Units and Commons Elements comprising the property included in Ottawa-Carleton Condominium Plan No. 556.

Being P.I.N.'s 15556-0001 (LT) to 15556-0058 (LT)

TWENTYSIXTHLY:

Lots 39, 40, 41, 42 and 43 on the South side of MacLaren Street, Registered Plan 15558;
Lots 39, 40, 41, 42 and 43 on the North side of Gilmour Street, Registered Plan 15558;
Lots 10, 11, 12 and 13 on the East side of Bank Street, Registered Plan 15558;
Lots 10, 11, 12 and 13 on the West side of O'Connor Street, Registered Plan 15558.
Being P.I.N.'s 04119-0048 (LT) to 04119-0064 (LT)

TWENTYSEVENTHLY:

Lots 44, 45, 46, 47 an 48 on the South side of Maclaren Street, Registered Plan 15558;
Lot 44 on the North side of Gilmour Street, Registered Plan 15558;
Lots 3, 4, 5 and 6 on the East side of O'Connor Street, Registered Plan 15558;
Lots 5, 6 and 7 on the West side of Metcalfe Street, Registered Plan 15558.
Being P.I.N.'s 04118-0047 (LT) to 04118-0051 (LT) both inclusive

Lot 8 on the West side of Metcalfe Street and part of Lot 48 on the North side of Gilmour Street designated as Part 2 on Plan 5R-7408, Registered Plan 15558.
Being P.I.N. 04118-0052 (LT)

Lot 45 and part of Lot 46 on the North side of Gilmour Street, Registered Plan 15558, as in Inst. N506902.
Being P.I.N. 04118-0053 (LT)

All Units and Common Elements comprising the property included in Carleton Condominium Plan No. 273.
Being P.I.N's 15273-0001 (LT) to 15237-0017 (LT) both inclusive

TWENTYEIGHTHLY:

Lots 49 to 53 both inclusive on the South side of MacLaren Street, Registered Plan 15558;
Lots 49 to 53 both inclusive on the North side of Gilmour Street, Registered Plan 15558;
Lots 1, 2, 3 and 4 on the East side of Metcalfe Street, Registered Plan 15558;
Lots 5, 6, 7 and 8 on the West Side of Elgin Street, Registered Plan 15558.
Being P.I.N.'s 04118-0054 (LT) to 04118-0063 (LT) both inclusive

TWENTYNINTHLY:

Lots 9, 10, 11 and 12 on the East side of Elgin Street, Registered Plan 15558.
Being part of P.I.N. 04118-0258 (LT)

THIRTIETHLY:

Part of Lots 29 and 30 on the North side of MacLaren Street, Registered Plan 27267 as in Inst. N468063.
Being P.I.N. 04120-0068 (LT)

Part of Lots 29 and 30 on the North side of MacLaren Street, Registered Plan 27267; Lot 30 on the South side of Somerset Street, Registered Plan 27267 as in Inst. CR368878.
Being P.I.N. 04120-0376 (LT)

THIRTYFIRSTLY:

Lots 31, 32, 33, 34, 37 and 38 on the South side of Somerset Street, Registered Plan 15558;
Lots 31, 32, 37 and 38 on the North side of Gilmour Street, Registered Plan 15558;
Lot 6 on the West side of Bank Street, Registered Plan 15558, SAVE AND EXCEPT the easterly 22.5 metres in perpendicular width of the northerly 10 metres in perpendicular width of said Lot;
Lots 7, 8 and 9 on the West side of Bank Street, Registered Plan 15558.
Being P.I.N.'s
04119-0041 (LT), 04119-0042 (LT), 04119-0044 (LT), 04119-0045 (LT), 04119-0046(LT), 04119-0224 (LT) and 04119-0225 (LT)
and part of 04119-0039 (LT)

Part of Lots 35 and 36 on the South side of Somerset Street, Registered Plan 15558; Part of Lots 33, 34, 35 and 36 on the North side of MacLaren Street, Registered Plan 15558, as in Inst. CR585296.
Being P.I.N. 04119-0043 (LT)

Part of Lot 33 on the North side of MacLaren street, Registered Plan 15558 as in Inst. NS147251.
Being P.I.N. 04119-0047 (LT)

THIRTYSECONDLY:

Lots 39 to 43 both inclusive on the South side of Somerset Street, Registered Plan 15558;
Lots 39 to 43 both inclusive on the North side of MacLaren Street, Registered Plan 15558;
Lots 6, 7, 8 and 9 on the East side of Bank Street, Registered Plan 15558;
Lots 6, 7, 8 and 9 on the West side of O'Connor Street, Registered Plan 15558;
SAVE AND EXCEPT: Part of Lots 42 and 43 on the South side of Somerset Street, Registered Plan 15558, as in Inst. NS99018, being P.I.N. 04119-0033 (LT) and Part of Lot 43 on the South side of Somerset Street, Registered Plan 15558, as in Inst. CR714865, being P.I.N. 04119-0034 (LT).
Being P.I.N.'s
04119-0023 (LT) to 04119-0032 (LT) both inclusive
04119-0035 (LT) to 04119-0038 (LT) both inclusive

THIRTYTHIRDLY:

Lots 44 to 50 both inclusive on the South side of Somerset Street, Registered Plan 15558;
Lots 44, 45, 46, 47 and 48 on the North side of MacLaren Street, Registered Plan 15558;
Lots 1 and 2 on the East side of O'Connor Street, Registered Plan 15558;
SAVE AND EXCEPT: Lot 46 and Part of Lot 47 on the North side of MacLaren Street, Registered Plan 15558, as in Inst. CR634280, being P.I.N. 04118-0030 (LT) and Part of Lots 1 and 2 on the East side of O'Connor Street, Registered Plan 15558, as in Inst. NS124726, being P.I.N. 04118-0034 (LT).
Being P.I.N.'s
04118-0020 (LT) to 04118-0025 (LT) both inclusive
04118-0029 (LT)
04118-0031 (LT) to 04118-0033 (LT) both inclusive

THIRTYFOURTHLY:

Lots 51 TO 57 both inclusive on the South side of Somerset Street, Registered Plan 15558;
Lots 51 TO 57 both inclusive on the North side of Maclaren Street, Registered Plan 15558;
Lots 1, 2, 3 and 4 on the West side of Elgin Street, Registered Plan 15558.
Being P.I.N.'s 04118-0035 (LT) to 04118-0046 (LT) both inclusive

THIRTYFIFTHLY:

Lots 5 and 6 on the East side of Elgin Street, Registered Plan 15558; Lot 58 on the South side of Somerset Street, Registered Plan 15558.
Being P.I.N. 04118-0069 (LT)

Part of Lots 7 and 8 on the East side of Elgin Street, Registered Plan 15558 as in Inst. NS67197.
Being P.I.N. 04118-0077 (LT)

THIRTYSIXTHLY:

Lot 26A on the North side of Somerset Street, Registered Plan 15061.
Being P.I.N. 04120-0037 (LT)

Part of Lot 26A on the South side of Cooper Street, Registered Plan 15061 as in Inst. NS211895.
Being P.I.N. 04120-0038 (LT)

Part of Lot 26A on the South side of Cooper Street, Registered Plan 15061 as in Inst. N332051.
Being P.I.N. 04120-0039 (LT)

Part of Lot 26A on the South side of Cooper Street, Registered Plan 15061 as in Inst.

CR521447.
Being P.I.N. 04120-0040 (LT)

Part of Lot 26A on the South side of Cooper Street, Registered Plan 15061 as in Inst. N620809.
Being P.I.N. 04120-0041 (LT)

THIRTYSEVENTHLY:

Part of Lot 27 on the South side of Cooper Street, Registered Plan 12281 as in Inst. CR511520.
Being P.I.N. 04119-0001 (LT)

Lot 28 and part of Lot 27 on the South side of Cooper Street, Registered Plan 12281 as in Inst. N700963.
Being P.I.N. 04119-0002 (LT)

Lot 27 on the North side of Somerset Street, Registered Plan 12281.
Being P.I.N. 04119-0003 (LT)

Part of Lot 28 on the North side of Somerset Street, Registered Plan 12281 as in Inst. N610020.
Being P.I.N. 04119-0004 (LT)

Part of Lots 28 and 29 on the North side of Somerset Street, Registered Plan 12281 as in Inst. CR284499.
Being P.I.N. 04119-0005 (LT)

Part of Lot 29 on the North side of Somerset Street, Registered Plan 12281 as in Inst. N425628.
Being P.I.N. 04119-006 (LT)

Part of Lot 5 on the West side of Bank Street, Registered Plan 12281; Part of Lot 33 on the North side of Somerset Street, Registered Plan 12281; Part of Lot 34 on the northwest angle of Bank Street and Somerset Street, Registered Plan 12281 all as in Inst. CR606829.
Being P.I.N. 04119-0007 (LT)

Part of Lot 34 on the North side of Somerset Street, Registered Plan 12281 as in Inst. N549484.
Being P.I.N. 04119-0008 (LT)

All Units and Common Elements comprising the property included in Carleton Condominium Plan No. 100.
Being P.I.N.'s 15100-001 (LT) and 15100-0002 (LT)

THIRTYEIGHTHLY:

Lots 35 to 41 both inclusive on the South side of Cooper Street, Registered Plan 12281;

Lots 38, 39, 40 and 41 on the North side of Somerset Street, registered Plan 12281;
Lot 5 on the West side of O'Connor Street, Registered Plan 12281.
Being P.I.N.'s 04119-0010 (LT) to 04119-0021 (LT) both inclusive

Part of Lot 5 on the East side of Bank Street, Registered Plan 12281; Part of Lots 35, 36 and 37 on the North side of Somerset Street, Registered Plan 12281, as in Inst. N369757.
Being P.I.N. 04119-0009 (LT)

Part of Lot 37 on the North side of Somerset Street, Registered Plan 12281, as in Inst. N734748.
Being P.I.N. 04119-0022 (LT)

THIRTYNINTHLY:

Lots 42 to 49 both inclusive on the South side of Cooper Street, Registered Plan 12281;
Lots 42 to 49 both inclusive on the North side of Somerset Street, Registered Plan 12281;
SAVE AND EXCEPT: Part of Lot 46 on the South side of Cooper Street Registered Plan 12281, as in Inst. N742358, being P.I.N. 04118-0008 (LT) and Lots 47 and 48 and part of Lot 46 on the South side of Cooper Street, Registered Plan 12281, as in Inst N598731, being P.I.N. 04118-0009 (LT).
Being P.I.N.'s
04118-0001 (LT) to 04118-0007 (LT) both inclusive
04118-0010 (LT) and 04118-0011 (LT)

FORTIETHLY:

Lots 50, 51, 52, 53, 54, 56 and 57 on the South side of Cooper Street, Registered Plan 12281;
Lots 50 an 51 on the North side of Somerset Street, Registered Plan 12281;
Being P.I.N.'s
04118-0012 (LT), 04118-0013 (LT), 04118-0014 (LT), 04118-0016 (LT), 04118-0017 (LT)

Lot 57 and part of Lot 56 on the North side of Somerset Street, Part of Lot 57 on the South side of Cooper Street, Registered Plan 12281, as in Inst.'s CR440017, CR249947 and CR347684.
Being P.I.N. 04118-0018 (LT)

Lot 52 and part of Lot 53 on the North side of Somerset Street, Registered Plan 12281, as in Inst. CR238064.
Being P.I.N. 04118-0019 (LT)

Part of Lots 53, 54, 55 and 56 on the North side of Somerset Street, Registered Plan 12281, designated as Parts 1 and 2 on Plan 4R-5012.
Being P.I.N. 04118-0028 (LT)

FORTYFIRSTLY:

Lot 58 on the South side of Cooper Street, Registered Plan 14350;
Lot 58 on the North side of Somerset Street, Registered Plan 14350;
Lots 3 and 4 on the East Side of Elgin Street, Registered Plan 14350.
Being P.I.N.'s 04116-0032 (LT), 04116-0039 (LT) and 04116-0054 (LT)

FORTYSECONDLY:

Lot 26A on the North side of Cooper Street, Registered Plan 15061.
Being part P.I.N. 04114-0239 (LT)

Part of Lot 26 and part of Lot 26A on the South side of Lisgar Street , Registered Plan 15061 designated as Parts 1 and 3 on Plan 5R-13096.
Being P.I.N. 04114-0240 (LT)

Part of Lot 26A on the South side of Lisgar Street, Registered Plan 15061 as in Inst. N285068.
Being P.I.N. 04114-0242 (LT)

Part of Lot 26A on the South side of Lisgar Street, Registered Plan 15061 as in Inst. N320359.
Being P.I.N. 04114-0243 (LT)

FORTYTHIRDLY:

Part of Lot 30 on the North side of Cooper Street, Registered Plan 12281 as in Inst. NS78985.
Being P.I.N. 04114-0039 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 49, 50 and 62 on Plan 4R-12112.
Being P.I.N. 04114-0100 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 27 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 45, 46, 47 and 48 on Plan 4R-12112.
Being P.I.N. 04114-0101 (LT)

Part of Lots 27 and 28 on the South side of Lisgar Street, Registered Plan 12281; Part of Lots 27 and 28 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 43 and 44 on Plan 4R-12112.
Being P.I.N. 04114-0102 (LT)

Part of Lot 28 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 28 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 41 and 42 on Plan 4R-12112.
Being P.I.N. 04114-0103 (LT)

Part of Lots 28 and 29 on the South side of Lisgar Street, Registered Plan 12281; Part of Lots 28 and 29 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 39 and 40 on Plan 4R-12112.
Being P.I.N. 04114-0104 (LT)

Part of Lots 28 and 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 37, 38 and 61 on Plan 4R-12112.
Being P.I.N. 04114-0105 (LT)

Part of Lots 28 and 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 35 and 36 on Plan 4R-12112.
Being P.I.N. 04114-0106 (LT)

Part of Lot 28 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 33 and 34 on Plan 4R-12112.
Being P.I.N. 04114-0107 (LT)

Part of Lot 28 on the South side of Lisgar Street, Registered Plan 12281 designated as Part 32 on Plan 4R-12112.
Being P.I.N. 04114-0108 (LT)

Part of Lot 28 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 31 on Plan 4R-12112.
Being P.I.N. 04114-0109 (LT)

Part of Lots 28 and 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 29 and 30 on Plan 4R-12112.
Being P.I.N. 04114-0110 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 27 and 28 on Plan 4R-12112.
Being P.I.N. 04114-0111 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 26 on Plan 4R-12112.
Being P.I.N. 04114-0112 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 25 on Plan 4R-12112.
Being P.I.N. 04114-0113 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 23 and 24 on Plan 4R-12112.
Being P.I.N. 04114-0114 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 21 and 22 on Plan 4R-12112.
Being P.I.N. 04114-0115 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 19, 20 and 60 on Plan 4R-12112.

Being P.I.N. 04114-0116 (LT)

Lot 57 on the South side of Cooper Street, Registered Plan 12281, SAVE AND EXCEPT as in Inst. CR440017.
Being P.I.N. 04118-0017 (LT)

Part of Lot 29 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 29 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 15 and 16 on Plan 4R-12212.
Being P.I.N. 04114-0118 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 30 on the North side of Cooper Street, Registered Plan 12281 designated as Parts 13 and 14 on Plan 4R-12212.
Being P.I.N. 04114-0119 (LT)

Part of Lots 27 and 28 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 28 on the North side of Cooper Street, Registered Plan 12281, designated as Part 63 on Plan 4R-12112.
Being P.I.N. 04114-0168 (LT)

Part of Lots 29 and 30 on the South side of Lisgar Street, Registered Plan 12281; Part of Lots 29 and 30 on the North side of Cooper Street, Registered Plan 12281, designated as Part 64 on Plan 4R-12112.
Being P.I.N. 04114-0169 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 58 on Plan 4R-12112.
Being P.I.N. 04114-0170 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 57 on Plan 4R-12112.
Being P.I.N. 04114-0171 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 55 and 56 on Plan 4R-12112.
Being P.I.N. 04114-0172 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 53 and 54 on Plan 4R-12112.
Being P.I.N. 04114-0173 (LT)

Part of Lot 27 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 51 and 52 on Plan 4R-12112.
Being P.I.N. 04114-0174 (LT)

Part of Lots 27, 28, 29 and 30 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 1 and 4 on Plan 4R-11327.
Being P.I.N. 04114-0258 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 30 on the North side of Cooper Street, Registered Plan 12281, designated as Parts 11 and 12 on

Plan 4R-12112.
Being P.I.N. 04114-0246 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 9, 10 and 59 on Plan 4R-12112.
Being P.I.N. 04114-0247 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 7 and 8 on Plan 4R-12112.
Being P.I.N. 04114-0248 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 5 and 6 on Plan 4R-12112.
Being P.I.N. 04114-0249 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 4 on Plan 4R-12112.
Being P.I.N. 04114-0250 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281, designated as Part 3 on Plan 4R-12112.
Being P.I.N. 04114-0251 (LT)

Part of Lot 30 on the South side of Lisgar Street, Registered Plan 12281, designated as Parts 1 and 2 on Plan 4R-12112.
Being P.I.N. 04114-0252 (LT)

Part of Lot 31 on the South side of Lisgar Street, Registered Plan 12281; Part of Lot 31 on the North side of Cooper Street, Registered Plan 12281 as in Inst. N739810.
Being P.I.N. 04114-0253 (LT)

Part of Lot 31 on the South side of Lisgar Street, Registered Plan 12281 as in Inst. CR481813; Lots 32, 33 and 34 on the South side of Lisgar Street, Registered Plan 12281.
Being P.I.N. 04114-0254 (LT)

Lot 34 on the North side of Cooper Street, registered Plan 12281;
Lot 4 on the West side of bank Street, registered Plan 12281.
Being P.I.N.'s 04114-0255 (LT), 04114-0256 (LT) and 04114-0257 (LT)

FORTYFOURTHLY:

Part of Lots 35 and 36 on the South side of Lisgar Street, Registered Plan 12281 as in Inst. N631068.
Being P.I.N. 04115-0200 (LT)

Lot 4 on the East side of Bank Street, Registered Plan 12281; Part of Lot 36 on the North side of Cooper Street, Registered Plan 12281; Part of Lot 35 on the South side of Lisgar Street, Registered Plan 12281 as in Inst. NS76728.
Being P.I.N. 04115-0201 (LT)

Part of Lot 38 on the North side of Cooper Street, Registered Plan 12281 as in Inst. N544490.
Being part P.I.N. 04115-0202 (LT)

Lot 4 on the West side of O'Connor Street, Registered Plan 12281; Lots 39, 40 and 41 on the North side of Cooper Street, Registered Plan 12281.
Being part P.I.N. 04115-0204 (LT)

Part of Lot 38 on the North side of Cooper Street, Registered Plan 12281 as in Inst. CR585166.
Being P.I.N. 04115-0205 (LT)

Part of Lot 37 on the North side of Cooper Street, Registered Plan 12281 as in Inst. N721002.
Being P.I.N. 04115-0206 (LT)

Part of Lot 37 on the North side of Cooper Street, Registered Plan 12281 as in Inst. N338111.
Being P.I.N. 04115-0207 (LT)

Part of Lot 36 on the North side of Cooper Street, Registered Plan 12281 as in Inst. N432366.
Being P.I.N. 04115-0208 (LT)

Lot 35 and Part of Lot 36 on the North side of Cooper Street, Registered Plan 12281 as in Inst. CR619927.
Being P.I.N. 04115-0209 (LT)

FORTYFIFTHLY:

Lots 45, 46, 47, 48 and 49 on the South side of Lisgar Street, Registered Plan 12281;
Lots 42 to 49 both inclusive on the North side of Cooper Street, Registered Plan 12281.
Being P.I.N.'s 04115-0212 (LT) to 04115-0227 (LT) both inclusive

FORTYSIXTHLY:

Lots 50 to 57 both inclusive on the South side of Lisgar Street, Registered Plan 12281;
Lots 50 to 57 both inclusive on the North side of Cooper Street, Registered Plan 12281.
SAVE AND EXCEPT: Part of Lots 54 and 55 on the South side of Lisgar Street, Registered Plan 12281, as in Inst. N699663, being Ping P.I.N. 04115-0232 (LT).
Being P.I.N.'s
04115-0176 (LT) to 04115-0181 (LT) both inclusive
04115-0228 (LT) to 04115-0231 (LT) both inclusive
04115-0233 (LT), 04115-0234 (LT), 04115-0235 (LT)

FORTYSEVENTHLY:

Lot 58 on the North side of Cooper Street, Registered Plan 14350; Part of Lot 59 on the North side of Cooper Street, Registered Plan 14350 as in Inst. N752246; Lot 2 on the East side of Elgin Street, Registered Plan 14350; Part of Lot 1 on the East side of Elgin Street, Registered Plan 14350; Part of Lot 59 on the South side of Lisgar Street, Registered Plan 14350 as in Inst. N752246.
Being P.I.N. 04116-0056 (LT)

Part of Lot 1 on the East side of Elgin Street, Registered Plan 14350 as in Inst. CR204248; Lot 58 on the South side of Lisgar Street, Registered Plan 14350 SAVE AND EXCEPT: Inst. CR550541; Part of Lot 59 on the South side of Lisgar Street, Registered Plan 14350 as in Inst. CR204248.
Being P.I.N. 04116-0062 (LT)

FORTYEIGHTHLY:

Part of Lot 26 on the South side of Nepean Street, Registered Plan 2996 as in Inst. CR620262.
Being P.I.N. 04114-0189 (LT)

Part of Lot 26 on the South side of Nepean Street, Registered Plan 2996 as in Inst. N731076.
Being P.I.N. 04114-0190 (LT)

Part of Lot 26 on the North side of Lisgar Street, Registered Plan 2996 as in Inst. N575764.
Being P.I.N. 04114-0203 (LT)

Part of Lot 26 on the North side of Lisgar Street, Registered Plan 2996 as in Inst. CR654333.
Being P.I.N. 04114-0204 (LT)

FORTYNINETHLY:

Lots 27 to 34 both inclusive on the South side of Nepean Street, Registered Plan 2996;
Lots 27 to 34 both inclusive on the North side of Lisgar Street, Registered Plan 2996;
Lot 3 on the West side of Bank Street, Registered Plan 2996.
Being P.I.N.'s 04114-0191 (LT) to 04114-0202 (LT) both inclusive

FIFTIETHLY:

Lot 35 on the South side of Nepean Street, Registered Plan 2996.
Being P.I.N. 04115-0236 (LT)

Part of Lot 3 on the East side of Bank Street, Registered Plan 2996 as in Inst. N700632.
Being P.I.N. 04115-0237 (LT)

Part of Lot 35 on the North side of Lisgar Street, Registered Plan 2996; Part of Lot 3 on the East side of Bank street, Registered Plan 2996 as in Inst. CR382508.
Being P.I.N. 04115-0238 (LT)

FIFTYFIRSTLY:

Lots 27 to 34 both inclusive on the South side of Gloucester Street, Registered Plan 2996;
Lots 27 and 29 to 34 both inclusive on the North side of Lisgar Street, Registered Plan 2996;
Lot 2 on the West side of Bank Street, Registered Plan 2996.
Being P.I.N.'s
04114-0079 (LT) to 04114-0091(LT) both inclusive
04114-0096 (LT) and 04114-0097 (LT)

FIFTYSECONDLY:

Lot 35 on the South side of Gloucester Street, Registered Plan 2996;
Lot 35 on the North side of Nepean Street, Registered Plan 2996;
Lot 2 on the East side of Bank Street, Registered Plan 2996.
Being P.I.N.'s 04115-0140 (LT), 04115-0159 (LT) and 04115-0160 (LT)

SCHEDULE B
(REGISTRY)

FIRSTLY:

Part of Lot 8 on the West side of Kent Street, Registered Plan 30.
Being P.I.N. 04122-0227 (R)

SECONDLY:

Part of Lot 2 on the East side of Metcalfe Street, Registered Plan 204329;
Part of Lots 5 and 6 on the North side of Gladstone Avenue, Registered Plan 204329.
Being P.I.N. 04118-0195 (R)

BY-LAW NUMBER 269-97

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