as dramatic, given the gradual rise of the bridge above water and the less extensive urban landscape on the east side of the Cataraqui River.

It is equally acknowledged however, that the potential disadvantages of this alignment include:

1. A bridge at the project site location would have a noticeable presence on the landscape. As such, the opportunities afforded by the s-curve alignment would not completely eliminate the noise and visual impacts from the bridge on adjacent land uses on either side of the Cataraqui River.

2. The alignment, by landing north of the Point St. Mark community, would impact the westerly portion of the Gore Road Library, a designated cultural heritage property. As noted earlier, though the buildings, lawn, dry stone wall and off-leash dog park are located on the upper plateau to the north and east, portions of the woodland, former fields and recreational pathways are located on the lower plateau to the south and west. The s-curve alignment would affect the features on the lower plateau.

3. Finally, though the alignment would avoid the single archaeological site that was encountered adjacent to the northerly boundary of the Gore Road right-of-way near the Cataraqui River shoreline, the site would still be affected by site preparation and bridge construction activities in the immediate area.

.2 The Bridge Profile

As shown on Drawings 4.21 to 4.24, the bridge clearance above the water for each of the three alternative bridge designs is 3 m along most of its westerly portion (or at 78.8 m elevation) and then gradually rises to 14 m over the Rideau Canal's navigable channel (or at 90 m elevation) near the east shore and adjacent rowing lanes. It then descends to 12 m (or at 88 m elevation) at the east shore. This profile offers potential opportunities to:

1. Accommodate existing topographic conditions and features on the west and east side lands.

2. Exceed the Rideau Canal's minimum 6.7 m Federally regulated navigable requirement, thereby ensuring continued through-navigation and enjoyment of both the canal and the City's unique heritage and cultural character.

3. Exceed the CHBDC's required minimum 1 m vertical clearance above the design high water level, which is at 76.3 m elevation at the project site location.

4. Mitigate visual impact, which is discussed further below, based on the key viewshed limits at the project site location and surrounding area:

a) As shown earlier on Drawing 3.11, the bridge would not be visible from the water at or near Highway 401 and, as such, the visible cattail marsh, near continuous overhanging tree canopy and shrub understory would still dominate the natural landscape;

b) As shown on Drawing 4.30, as boaters proceed southward at roughly 1 km north of the Inner Harbour entrance near Belle Island and enter the open vista of the Cataraqui River, the bridge would be in full view along with the City's emerging urban landscape, but most of the rising silhouette of the bridge would be below the tree line along the north shore of Belle Island and Belle Park;

c) As shown on Drawing 4.31, as boaters proceed northward from the LaSalle Causeway and round the tip of Belle Island at roughly 1 km south of the project site location, the sense of the urban-to-natural landscape transition begins with all but the east end of the bridge being visible (the east end is blocked from view by the Rideau Marina and shoreline) and its rising silhouette either at or below the tree line of the natural landscape that emerges in the background further north;

d) Drawing 4.32, which provides a bridge profile view from the Elliott Avenue Parkette on the west side of the Cataraqui River, shows the gradual rise in bridge clearance over the water west-to-east that remains at or below the tree line on the east side of the river; and

e) Drawing 4.33, which provides a bridge profile view from the Point St. Mark residential neighbourhood on the east side of the Cataraqui River, shows the gradual descent in bridge clearance over the water east-to-west and its integration into the urban landscape on the west side of the river, with the Village On The River Apartments and John Counter Place noted prominently in the background. It should also be noted that the landscape improvements on the west side lands provide an opportunity for the bridge to be below the 'future' tree line in this area when viewed from both the water and land on the east side.

At the same time however and as referenced earlier, given that the construction and operation of a bridge would introduce a major piece of infrastructure at the project site location, the potential opportunities afforded by the bridge profile would not completely eliminate the visual impacts from the bridge on both on-water views and adjacent land uses on either side of the Cataraqui River.

.3 The Bridge Deck Configuration

The bridge deck components coincide with the rationale that led to the selection of a bridge at the project site location as the preferred solution during Stage 1 of this EA study, namely:

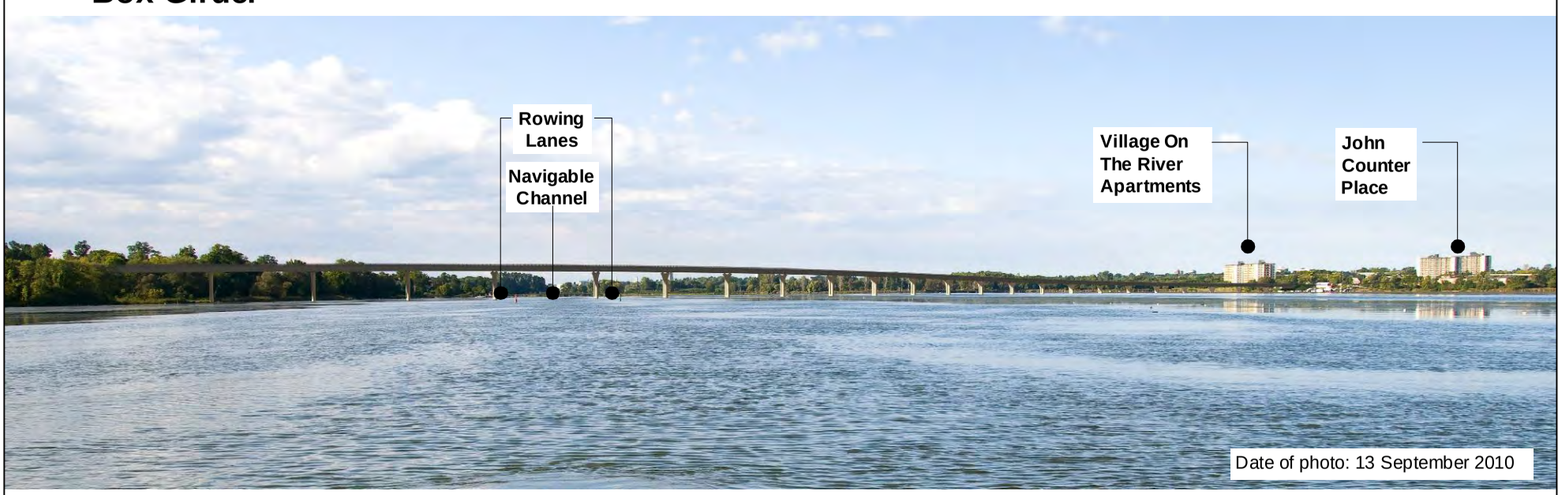
1. The opportunity for the bridge deck components to tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area.

Key Plan

Arch / V-Piers

Tube

Box Girder



PROJECT:

CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:

BRIDGE CONCEPT VIEW
LOOKING SOUTH
(AT BUOY S33)

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DESIGN:	DRAWING NO.: 4-30
DRAWN:	
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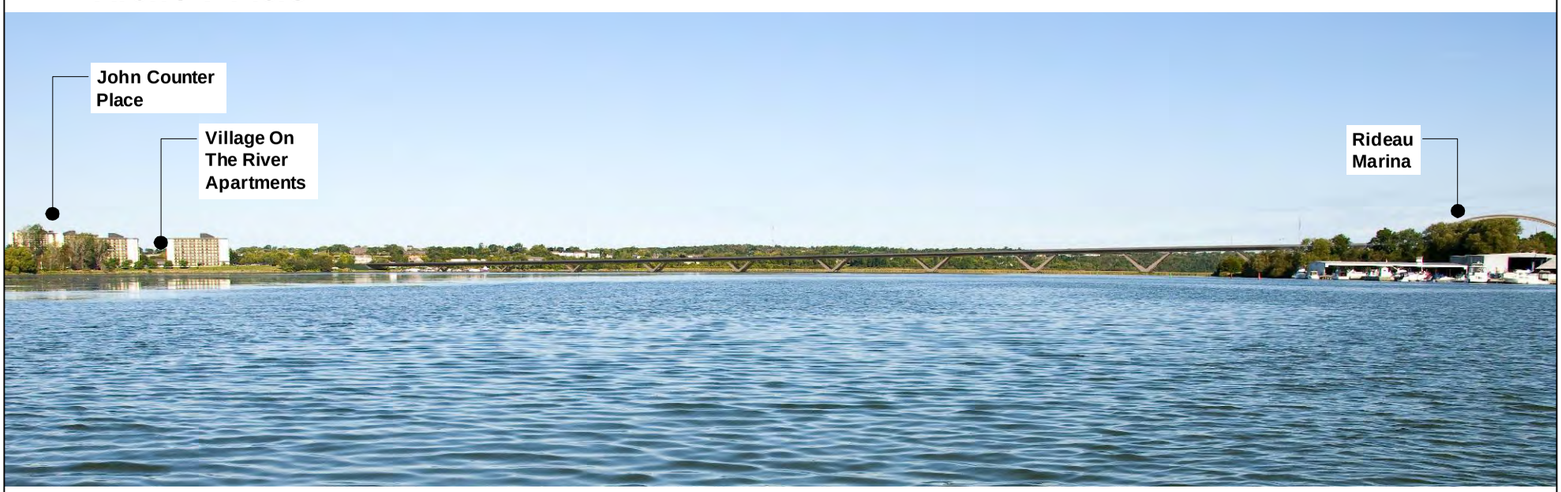
PLOTTED: 15-Mar-12	

File Location: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-30 - 4-33.dwg

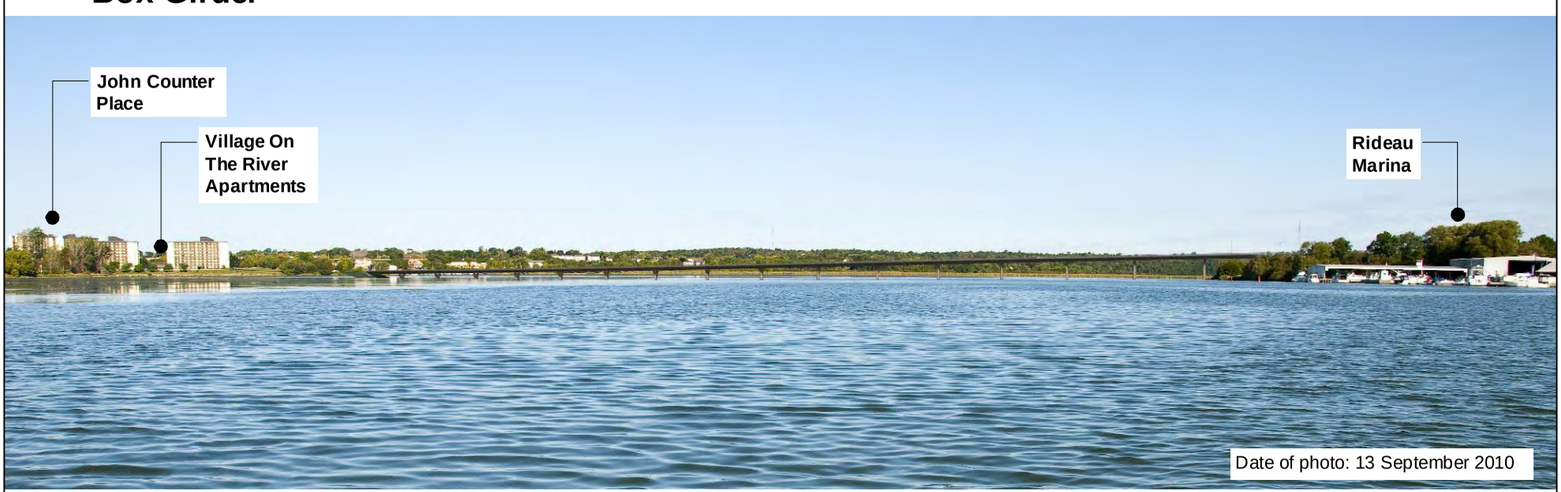
Key Plan

Arch / V-Piers



Tube

Box Girder



PROJECT:

CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:

BRIDGE CONCEPT VIEW
LOOKING NORTH
(AT BUOY S15)

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DESIGN:

DRAWN:

CHECKED:

PLOTTED: 15-Mar-12

DRAWING NO.: **4-31**

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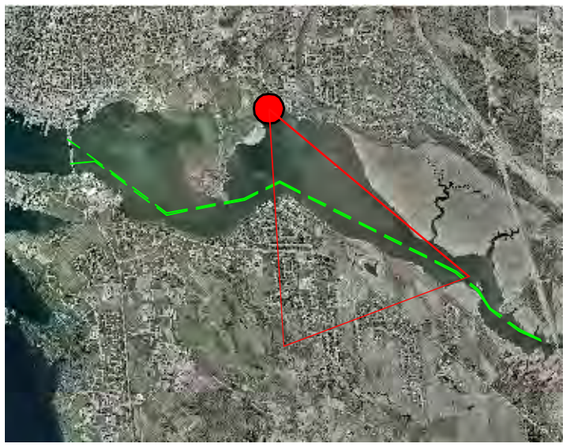

Key Plan

Arch / V-Piers

Tube

Box Girder

PROJECT:

CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:

BRIDGE CONCEPT VIEW
LOOKING EAST
(FROM THE ELLIOTT AVENUE PARKETTE)

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Key Plan

Arch / V-Piers

Tube

Box Girder

PROJECT:

CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:

BRIDGE CONCEPT VIEW
LOOKING WEST
(FROM POINT ST. MARK)

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DESIGN:

DRAWN:

CHECKED:

PLOTTED: 16-Apr-12

DRAWING NO.: 4-33

JLR NO: 23446-02

File Location: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-30 - 4-33.dwg

2. The role of the bridge deck components in helping to provide a more direct mid east-west connection to existing road infrastructure on either shore. This in turn would address travel demand patterns, accommodate CFB Kingston's future strategic plans as well as provide opportunities to enhance emergency response services, the City's express bus route strategy and active travel and commuter cycling networks.

3. The intent of the observation look-out/interpretive areas along the south side of the bridge deck, which is to maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

In addition, the purpose of the bridge deck design and staging approach is to reflect the following sensitivities:

4. How barriers and railings on the bridge could address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge.

5. How the use of soft, directional and intermittent lighting on the bridge could address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

6. As per the 2005 PPS, the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure. This Report recognizes the merits of facilitating an infrastructure improvement program that is both flexible and able to evolve in response to changing conditions. First, this Report has acknowledged the 2011 HDR/iTrans report and its recommended strategy to improve existing and future deficiencies along the LaSalle Causeway-Highway 2 corridor over the short-to-medium term. This Report and the 2011 HDR/iTrans report have also jointly acknowledged that this strategy may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor beyond 2019. As such, the capacity analysis done for this EA study has determined that a two-lane bridge could be needed by as early as 2019 and that a four-lane bridge crossing could be needed by roughly 2029, subject to interim monitoring of traffic volumes and other related conditions by the City.

Furthermore and despite these projected requirements, this Report has also proposed that an initial bridge configuration could be a three lane, centre lane reversible, cross section. It has been determined that this configuration could operate from opening day up to approximately 2029. This too would be subject to interim monitoring of traffic volumes and other related conditions by the City. When or if ultimately required, the bridge deck could then be widened equally on both sides to accommodate the four-lane vehicular roadway, commuter cycling lanes and multi-use trail.

At the same time however and as referenced earlier, Section 4.6.35 of the City's Official Plan reflects the recommendation in the 2004 KTMP, wherein it cites a 2-lane bridge crossing at the project site location as a strategic 'future major road extension', subject to the outcome of an EA study. As noted above, based on the capacity analysis done for this EA study, the proposed interim three-lane and ultimate four-lane bridge deck configuration requirements would not conform to the Official Plan. As such, a text amendment to the Official Plan would be required. It is noted that the Official Plan is subject to review every five years. However, City Council may direct that such a review occur at any time due to exceptional circumstances or opportunities for the City.

.4 The Bridge Concepts

Considerations regarding the bridge concepts are as follows:

1. It is anticipated that the bridge would have a minimum design life of at least 100 years, which exceeds the CHBDC's minimum 75 year design life requirement.

2. The 'Box Girder' concept has the second lowest preliminary opinion of probable cost in comparison to the other concepts. Still, it was viewed as 'somewhat preferred' by a vast majority of residents who attended the Public Information Centre on March 31, 2011. This view was also reflected during the TAC meetings, which combined, expresses a sentiment that the 'Box Girder' concept is too conventional and plain from an aesthetic perspective, particularly given the Rideau Canal context. It is also unable to span over both the canal's navigable channel and adjacent rowing lanes without negatively impacting span-length-to-girder-depth proportions. Even despite achieving this objective, as shown earlier, the profile views of the 'Box Girder' concept from the west and east sides of the Cataraqui River still convey an on-water 'wall' visual bridge effect resulting from the 23 piers. On the other hand, reducing the number of piers would require an increased girder depth, thereby potentially leading to a 'bulkier' visual bridge effect.

3. The avant garde nature of the 'Tube' concept exceeds in its response to the history of engineering innovation with the Rideau Canal within a 21st Century design context. By providing additional structural support, the steel truss work requires only 11 piers, which reduces associated in-water disturbances and provides a more open viewscape when viewed from the water. Moreover, the 'Tube' concept requires less structural steel and concrete compared to a more conventional bridge such as the 'Box Girder' concept, which results in it having the lowest preliminary opinion of probable cost in comparison to the other concepts. The benefit of its ability to span over the canal's navigable channel and adjacent rowing lanes is also acknowledged. Despite these potential advantages, which were recognized during the TAC meetings and by residents who attended the Public Information Centre on March 31, 2011, it was equally acknowledged that the 'Tube' concept imposes an excessive, industrial aesthetic on the landscape. Views of the water and surrounding landscape from the bridge would be negatively impacted by the enclosed steel truss work.

Moreover, concerns were also expressed about the potential 'shadow-flickering' affect on bridge users from the truss work, the on-going maintenance of the truss work and the ability of the truss work to maintain its structural integrity if impacted by vehicular accidents. Finally, the 'Tube' concept could not be widened in the future and as such, would be unable to accommodate the bridge deck staging options cited earlier. As such, the 'Tube' concept was viewed as 'least preferred' by a vast majority of residents who attended the Public Information Centre on March 31, 2011.

4. The 'Arch With V-Piers' concept was viewed as 'most preferred' by a vast majority of residents who attended the Public Information Centre on March 31, 2011. This view was also generally reflected during the TAC meeting discussions. The 'Arch With V-Piers' concept is able to provide two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. It could also be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers, similar to the 'Tube' concept, and still maintain appropriate span-length-to-girder-depth proportions. This could further benefit viewscape considerations and reduce associated in-water disturbances. In addition, it is able to span over the Rideau Canal's navigable channel and adjacent rowing lanes, while the arch over the canal's navigable channel highlights the bridge as a 21st Century 'gateway' to/from the Inner Harbour and canal. Still, its preliminary opinion of probable cost is roughly 20 percent higher than the 'Box Girder' and 'Tube' concepts.

.5 The West and East Side On-Land Effects

A. General Effects

The potential advantages of the proposed roadway and landscape improvement on the west and east side lands include:

1. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid east-west arterial corridor at an acceptable LOS D over the long-term. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short-cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated. Should future monitoring by the City of traffic flows demonstrate otherwise after the bridge is built, measures could then be put in place to help discourage short-cutting, such as those measures highlighted earlier.

2. The purpose of the active travel and commuter cycling provisions on the bridge is to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

3. The intent of the landscape concept is to:

   a) Ground the bridge structure dramatically and distinctively at each side of the crossing using gateway elements, materials and proportions that reference and enhance the cultural landscape without overt imitation of heritage architecture;

   b) Maximize opportunities for residents to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

   c) Enhance the natural landscape, particularly its edge condition where the land falls away under the bridge; and

   d) Demonstrate how context sensitive design could address public and traffic safety requirements, maximize viewing opportunities, accentuate public realms and mitigate impacts on the surrounding environment.

   In terms of the crossing experience, the landscape concept utilizes the principle of spatial compression to amplify the difference between the views passing along a roadway corridor and the open vistas over the Cataraqui River.

4. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River have been incorporated into the landscape design as a 'naturalized' feature to further accentuate the public realm.

Furthermore, based on the fieldwork done at the project site location:

5. The west side lands are dominated by urban land uses but no cultural heritage properties or ELC community types. As such, the landscape improvements represent an opportunity for a degree of restoration by creating a more naturalized landscape that mitigates the extensive environmental disturbance and alteration that has occurred in this area. This in turn could further serve to enhance both the 'ribbon of life' along the shoreline and visitor experience of the Rideau Canal.

6. The east side lands also demonstrate anthropogenic-based disturbances, including: i) historic agricultural land uses; ii) yard waste and detritus dumping; iii) the trails on the Gore Road library property, which have fragmented the forest block; iv) non-native and some invasive plant species; and v) surrounding urban land uses. Despite there being some aerial extent, the forest block is largely isolated, such that linkages to other forested lands are significantly affected. Moreover, none of the trees observed are listed in either the OESA or the Federal SARA. Though there are

some very large mature trees, the east side lands are generally lacking the key characteristics of an old-growth forest. Overall, the affected woodlands on the east side lands should not be considered provincially significant or contributory, as per the 2005 PPS and the City's Official Plan. Ultimately, the landscape improvements represent an opportunity for ecological compensation in this area by recreating a more naturalized landscape. This in turn could also further serve to enhance both the 'ribbon of life' along the shoreline and visitor experience of the Rideau Canal.

It is equally acknowledged however, that such design measures will be a critical piece of the broader package of mitigation measures required during the Project Implementation phase to either reduce or eliminate potential negative project impacts on the surrounding terrestrial environment, including:

1. Exhaust emissions and airborne dust from equipment traffic during bridge construction and from the subsequent use and maintenance of the bridge could impact air quality (particulate matter).

2. Though the alignment would avoid the single archaeological site that was encountered adjacent to the northerly boundary of the Gore Road right-of-way near the Cataraqui River shoreline, the site would still be affected by bridge construction activities in the immediate area.

3. As shown earlier on Drawing 4.25, it is anticipated that, due to a lack of available vacant land near the project site location on the west side, certain privately owned properties (either in whole or in part) would be required for reconfigured and expanded road, trail and landscaping works, stormwater management provisions and as a bridge construction lay-down and staging area. Moreover, though visual examination of the west side lands suggests that virtually all lands within the existing road rights-of-way have been disturbed to the extent that any archaeological testing in those areas is almost certain to be futile, the private lands on either side of John Counter Boulevard do not appear to have been extensively disturbed and may contain areas where archaeological potential still remains.

4. As noted earlier, the bridge, by landing north of the Point St. Mark community, would impact the woodland, former fields and recreational pathways on the lower plateau portion of the Gore Road Library. Moreover, as shown earlier on Drawing 4.26, it is anticipated that, due to a lack of available vacant land near the project site location on the east side, a portion of the lower plateau would be required for stormwater management provisions and as a bridge construction lay-down and staging area. Furthermore, the widening of Gore Road would also require the removal of the formal gardens that extend along the southerly portion of the library property as well as the relocation of a 12 m portion of the dry stone wall that extends perpendicular from the library into the Gore Road right-of-way on the upper plateau. These features are significant attributes of the library property that contribute to its heritage value and landmark status along Kingston Road 15, as outlined in By-Law No. 2007-166. In addition to the proposed landscape improvements which represent an opportunity for ecological compensation in this area by recreating a naturalized landscape, it should also be noted that efforts have also been made during the design of the east approach to the bridge to minimize the impacts on the dry stone wall. The following three options were considered:

a) Moving the road alignment further to the south: this is not considered feasible as it would directly impact existing homes in Point St. Mark that back onto Gore Road;

b) Reducing the Gore Road right-of-way by eliminating the centre median and mature trees that currently exist in the south boulevard as well as moving the road further south and the sidewalk and multi-use trail up against the road: this is not considered feasible due to:

   i. public and traffic safety concerns for those using the road, sidewalk and multi-use trail;

   ii. the traffic noise impacts on the existing homes in Point St. Mark that back onto Gore Road; and

   iii. the ecological and quality of life impacts from removing the mature trees that currently exist in the south boulevard; and

c) Elevating Gore Road by up to 4 m so it passes over the dry stone wall: this is not considered feasible as it would:

   i. require the vertical and horizontal alignment of Gore Road to be modified in order to preserve vertical sight distances for traffic and maintain the intersections at Gore Road-Point St. Mark Drive and Gore Road-Kingston Road 15 at 90 degrees; and

   ii. the traffic noise impacts on the existing homes in Point St. Mark that back onto Gore Road.

It was thus concluded that the dry stone wall would be impacted by the widening of Gore Road, but that mitigation measures will be needed to minimize the potential effects.

5. The bridge would impact existing faunal wildlife habitats and species on both sides of the Cataraqui River. Certain faunal species are also at some level of risk. Lands would be required to implement reconfigured and expanded road, trail and landscaping works, stormwater management provisions and to facilitate bridge construction. Such activities would involve: i) riparian vegetation removal; ii) stripping and stockpiling of topsoil; iii) shoreland excavation works; iv) heavy equipment use and maintenance; v) heavy material use and storage; vi) sanitary and construction waste management; and vii) accidents and malfunctions from equipment use. Without mitigation measures in place,

these activities would lead to a loss of habitat, species mortalities, restricted species movement, shoreline erosion and a subsequent decrease in surface water quality.

6. Both the property at 917-919 Montreal Street and the fill material along the western shoreline of the Cataraqui River between the CN and CP railway tracks are issues of potential environmental concern. Site preparation and bridge construction activities could disturb potentially contaminated soils in these areas.

7. The bedrock on-shore could potentially be frost susceptible, as it is at relatively shallow depths of about 1.7 m and 3.1 m at the east and west banks, respectively.

B. Noise Effects

The construction and operation of a bridge will generate noise impacts at the project site location. For this reason, a noise assessment was conducted of the four-lane bridge alignment at the project site location, as it is projected to be ultimately needed by the 2029 horizon year. The objectives of the noise assessment were: i) to predict future 'build' and future 'no-build' sound levels from road traffic sources; ii) to use these predictions to assess potential effects from bridge construction and bridge operations according to the applicable joint guidelines from the MTO and OMOE, as cited earlier; and iii) to specify mitigation measures at the project site location, which are discussed later in this Report.

As discussed earlier, the joint Provincial guidelines specify that an outdoor objective sound level is 55 dBA L_{eq}, or the existing ambient, whichever is higher. Mitigation is warranted when increases in sound levels over the future 'no-build' ambient sound levels are 5 dB or greater. Mitigation measures should achieve at least 5 dB of attenuation, averaged over the first row of noise-sensitive receivers, and can include barriers, sound reducing asphalts and/or changes in vertical profiles and horizontal alignments. The mitigation measures are restricted to within the road right-of-way and must be administratively, economically and technically feasible.

As shown on Drawing 4.34, 15 noise receptors represent the 'Noise Sensitive Areas' (NSAs) within the project site location area. There are roughly 700 NSAs in the following general areas:

1. Five existing residential areas.

2. The River Park subdivision on the north side of John Counter Boulevard that is currently under construction.

3. An existing day care centre on the south side of John Counter Boulevard just west of Montreal Street.

4. A vacant privately owned lot adjacent to the Gore Road Library property to the north that could potentially accommodate a future residential development.

5. The Gore Road Library, though it is not strictly considered a NSA by the joint Provincial guidelines.

File Location: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-34 Location of Noise Receptors and Existing Barriers.dwg

PROJECT:
CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:
LOCATION OF
NOISE RECEPTORS
AND EXISTING BARRIERS

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JLR NO: 23446-02

The noise assessment then compared future 'build' sound levels (projected traffic volumes for the 2029 horizon year with the four-lane bridge in place) versus future 'no-build' sound levels (projected traffic volumes for the 2029 horizon year with no bridge in place). Tables 4.19 and 4.20 show this comparison under pre-mitigation conditions during the daytime (16-hours) and night-time (8-hours), respectively.

Table 4.19
Projected 2029 Daytime Sound Levels (Unmitigated)

Receptor Location	Number of NSAs	Unmitigated Future 'No-Build' (dBA)	Unmitigated Future 'Build' (dBA)	Unmitigated Change (dB)
NR1 (Briceland Street Residential)	90	47	55	8
NR2 (Day Care)	1	60	67	8
NR3 (Montreal Street Residential)	5	63	66	3
NR4 (River Park Subdivision West)	72	53	62	10
NR5 (River Park Subdivision East)	72	51	64	13
NR6 (Village On The River Apartment)	250	48	58	10
NR7 (Kenwood Crescent Residential)	20	45	58	13
NR8 (Kenwood Crescent Residential)	15	43	53	10
NR9 (Kenwood Crescent Residential)	20	49	60	11
NR10 (Barker Drive Residential)	10	56	67	11
NR11 (Gore Road Library)	1	57	64	7
NR12 (Barker Drive Residential)	24	60	65	5
NR13 (McLean Court Residential)	35	59	61	2
NR14 (McLean Court Residential)	18	60	62	2
NR15 (Vacant Land-Potential Residential)	1	50	55	5

Table 4.20
Projected 2029 Night-time Sound Levels (Unmitigated)[33]

Receptor Location	Number of NSAs	Unmitigated Future 'No-Build' (dBA)	Unmitigated Future 'Build' (dBA)	Unmitigated Change (dB)
NR1 (Briceland Street Residential)	90	46	54	8
NR3 (Montreal Street Residential)	5	57	59	3
NR4 (River Park Subdivision West)	72	52	58	6
NR5 (River Park Subdivision East)	72	48	58	9
NR6 (Village On The River Apartment)	250	45	53	8
NR7 (Kenwood Crescent Residential)	20	40	53	13
NR8 (Kenwood Crescent Residential)	15	38	47	10
NR9 (Kenwood Crescent Residential)	20	45	54	10

[33] Note: i) night-time sound levels were not predicted at places of business [NR2 (Day Care) and NR11 (Gore Road Library)] since they are assumed to operate during the daytime only; and ii) NR15 (Vacant Land-Potential Residential) was only considered a daytime receptor since development details are unknown.

Table 4.20
Projected 2029 Night-time Sound Levels (Unmitigated)[33]

Receptor Location	Number of NSAs	Unmitigated Future 'No-Build' (dBA)	Unmitigated Future 'Build' (dBA)	Unmitigated Change (dB)
NR10 (Barker Drive Residential)	10	52	59	7
NR12 (Barker Drive Residential)	24	54	59	4
NR13 (McLean Court Residential)	35	53	55	2
NR14 (McLean Court Residential)	18	54	56	2

The results show that changes in sound levels resulting from the four-lane bridge are projected to be:

1. 5 dB or less at NR3 (Montreal Street Residential) as well as at NR12 (Barker Drive Residential), NR13/NR14 (McLean Court Residential) and NR15 (Vacant Land-Potential Residential). Therefore, mitigation is predicted to be unnecessary at these receptors.

2. More than 5 dB at NR11 (Gore Road Library) but the library is considered noise-sensitive inside the building and not an OLA. Therefore, it is expected that the building construction should adequately attenuate 'future build' sound.

3. 5 dB or greater at the remaining NR locations for which mitigation will need to be investigated further.

Potential mitigation measures in this regard could include:

1. Changes to horizontal alignments: Horizontal changes in alignment can result in increases or decreases in sound levels at noise-sensitive receptors by moving the roadway closer or further away. However, the changes that result are limited since the distance to the roadway must be doubled for a 3 to 5 dB decrease in sound level. This is not feasible at the project site location as the alignment is constrained by the location and width of the existing rights-of-way, and by the proximate locations of the NSAs.

2. Changes to vertical alignments: Vertical changes in alignment can affect sound levels at NSAs by affecting the line-of-sight between the roadway sources and the receiver. Line-of-sight changes influence ground attenuation and barrier effects of the surrounding topography. For example, placing the roadway at the bottom of a shallow in-cut can create a natural barrier effect at the edge of the excavation. On the other hand, elevated roadways located on embankments or structures may also have reduced sound levels, as the structure can act as a barrier for ground level receptors, blocking the line-of-sight for roadway lanes on the 'far side' of the road from the receptor in question. However, these scenarios are not feasible at the project site location as the alignment is constrained by the location and width of the existing rights-of-way, and by the proximate locations of the NSAs.

3. Sound-reducing pavement: For vehicles travelling at highway speeds, the majority of the sound produced is due to interactions between the tires and pavement surface. Sound-reducing asphalts such as 'open-graded friction course' or 'stone mastic asphalt' may cost twice as much as conventional mixes, and by themselves produce sound reductions of only 2.5 dB. This is only half of the 5 dB minimum needed to be considered effective under the Joint Protocol. Thus, other mitigation measures must also be employed to meet the 5 dB attenuation requirement.

4. Sound barriers: Barriers reduce sound levels at protected receptors by blocking the path of sound waves from the source towards the receiver, and by absorbing or reflecting the incident sound energy away. Therefore, a barrier must at least break the line-of-sight between the source (the roadway) and the NSA. Barriers can be formed of earthen berms, engineered walls, or some combination of the two. Where earthen berms are used, side slopes of 3:1 should be used for drainage and erosion control and right-of-way maintenance. Where walls are used, they should be free of gaps and cracks, and have a minimum surface density (mass per unit of face area) of 20 kg/m2. Transparent barriers can also be used to minimize their aesthetic effect on current surroundings. Sound barriers can theoretically provide at least 5 dB of attenuation, which is needed to be considered effective under the Joint Protocol. The available sound barrier options may also be able to address the constraints created by the location and width of the existing rights-of-way and by the locations of the NSAs at the project site location. As such, sound barriers have been carried forward for further assessment as the preferred method of noise mitigation resulting from bridge use:

a) Regarding the use of sound barriers for the identified NSAs on the west side lands:

   i. there is an existing barrier at NR1 (Briceland Street Residential) and therefore, sound mitigation is not considered economically feasible without reconstructing the entire wall;

   ii. it is not considered administratively feasible to build sound barriers along the south side of John Counter Boulevard to mitigate sound levels at NR2 (Daycare) and NR3 (Montreal Street Residential) due to right-of-way and access restrictions as well as commercial frontages;

iii. it is not considered technically or economically feasible to build sound barriers at NR6 (Village On The River Apartment) due to the height of the buildings and their 92 m distance from the bridge corridor, both conditions of which would require major barriers (more than 6 m in height) extending across the bridge to achieve the acceptable mitigation; and

iv. as shown on Drawing 4.35:

(a) for NR4 (River Park Subdivision West) a 3 m high by 110 m long sound barrier wall, earthen berm or a combination on the north side of John Counter Boulevard up to Ascot Lane would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 55 dBA; and

(b) for NR5 (River Park Subdivision East) a 3 m high by 96 m long sound barrier wall, earthen berm or a combination on the north side of John Counter Boulevard up to Ascot Lane would achieve an average of 9 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 55 dBA; and

b) Regarding the use of sound barriers for the identified NSAs on the east side lands:

i. design constraints on the east shore related to geometry (terrain change and elevated bridge deck), the location and width of the existing Gore Road right-of-way and its proximate location to the NSAs preclude the use of an earthen berm as a feasible sound barrier;

ii. the existing Gore Road right-of-way and its proximate location to the NSAs also requires that a portion of the sound barrier extend onto the bridge deck, which further precludes the use of an earthen berm as a feasible sound barrier;

iii. sound barrier wall heights ranging from 0.5 m up to 3 m were assessed; and

iv. as also shown on Drawing 4.35:

(a) for NR7/NR9 (Kenwood Crescent Residential) a 3 m high by 400 m long sound barrier wall extending west from the south side of the Point St. Mark Drive-Gore Road intersection onto the bridge deck would achieve an average of 5 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level ranging from 53 dBA to 55 dBA; and

(b) for NR10 (Barker Drive Residential) a 2.4 m high by 168 m long sound barrier wall extending east from the south side of the Point St. Mark Drive-Gore Road intersection to Kingston Road 15 would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 60 dBA; and

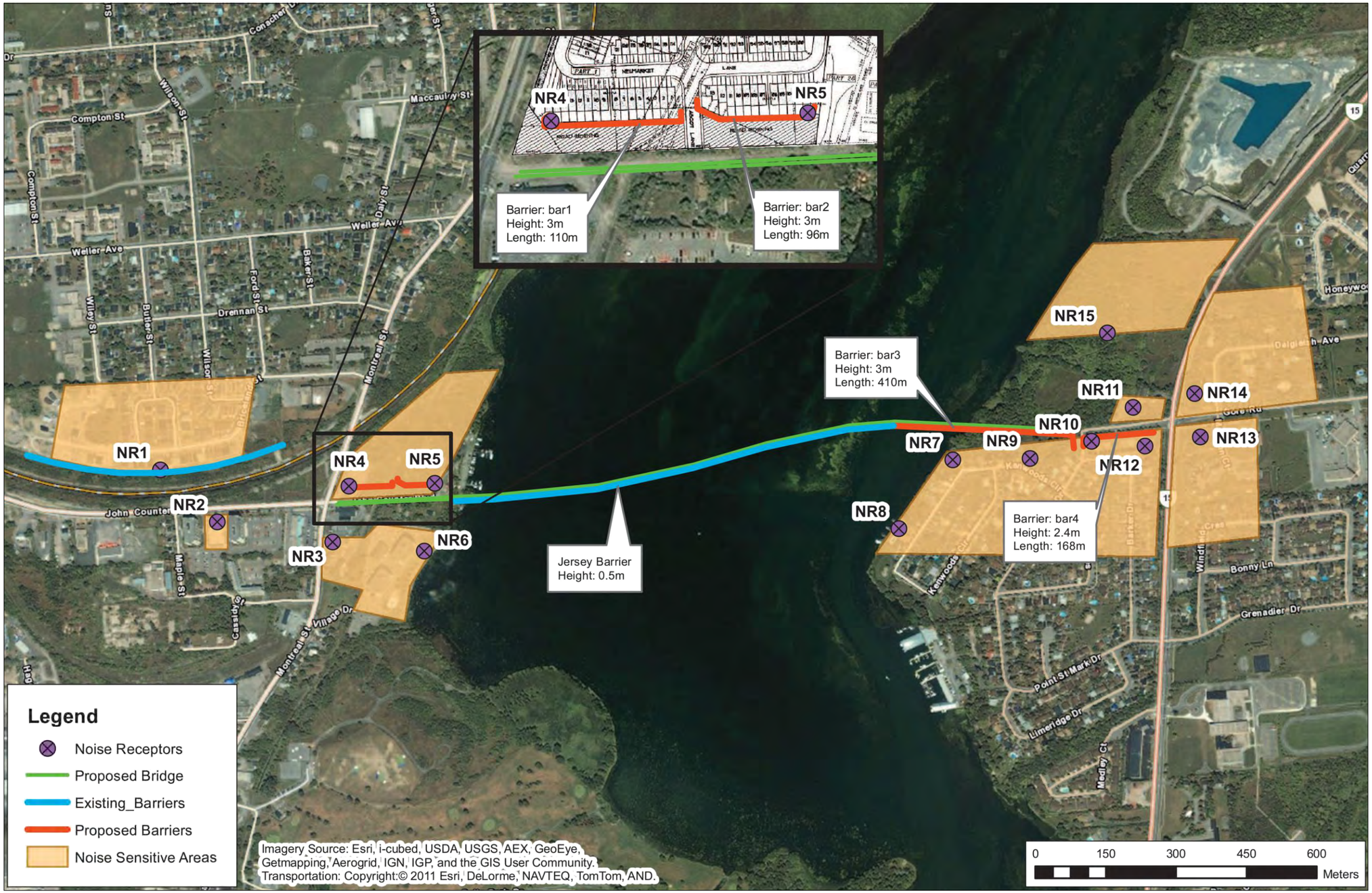
v. it is not considered technically or economically feasible to build sound barriers at NR8 (Kenwood Crescent Residential) because:

(a) a large sound barrier would be required to achieve the acceptable mitigation; and

(b) the mitigated sound level would be below the joint Provincial guideline of 55 dBA at NR8 due to the effects of the sound barriers at NR7/NR9 (Kenwood Crescent Residential) to the north.

The preliminary opinion of probable capital cost for the proposed sound barriers cited above is $1.1 million (in 2011 dollars and excluding applicable taxes). This could be included under the Contingency line item for the preliminary opinion of probable capital costs for the four-lane bridge scenario, as noted earlier in Table 4.18.

In addition, sound and vibration may also affect the behaviour of land and marine wildlife resulting from a bridge at the project site location. The literature on this issue indicates that human-made sound can alter wildlife patterns under some circumstances, such as with mating call interference and startle responses. These effects tend to happen when sound levels reach high values (typically 70 dBA or higher) or are elevated for prolonged periods of time. In most instances, wildlife adapt their behaviour to the new surroundings (e.g., alter mating calls, change nesting areas) or simply avoid the local area where effects are most notable. This latter behaviour helps to prevent unnecessary human interactions with wildlife that could endanger animals or result in fatalities. For transportation corridors, sound levels typically only reach the high levels of concern within 100 m of the corridor and hence tend to be localized. More detailed assessments of specific wildlife effects are very difficult since the body of available research is limited and does not adequately describe the dose-effect relationships for sound, principally since wildlife cannot communicate the effects of sound.



File Location: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-35 Location of Noise Barriers.dwg

PROJECT: CATARAQUI RIVER THIRD CROSSING EA - STAGE 2 ENVIRONMENTAL STUDY REPORT	DRAWING: LOCATION OF NOISE BARRIERS	J.L. Richards & Associates Limited 203-863 Princess Street Kingston, ON Canada K7L 5N4 Tel: 613 544 1424 Fax: 613 544 5679	DESIGN: DRAWN: CHECKED: PLOTTED: 11-Apr-12	DRAWING NO.: **4-35** JLR NO: 23446-02

It is also anticipated that the proposed bridge may serve as an emergency detour route for Highway 401 should an accident or event cause it to be closed in the vicinity of Kingston. In this instance, traffic volumes on the proposed bridge can be expected to increase, likely to the point of causing congestion and reduced vehicle speed since the bridge would be exceeding its capacity. Such congestion events generally produce reduced sound levels from road traffic since wheel sound is largely limited by the reduced speed of the vehicles. Normally, wheel sound created by the interaction of tires with the road surface creates a large portion of traffic sound levels, which tends to increase with increasing speed. As a result, emergency detours over the proposed bridge are expected to produce lower sound levels than under more free-flow conditions. This could also extend to emergency situations on the bridge itself, which are expected to result in decreased sound levels due to restricted traffic movements.

Finally, sound from bridge construction activities would also be generated at the project site location, which will be temporary and vary temporally and spatially as construction progresses. Sound levels from construction at a given NSA will also very over time as different activities take place and change location. Though construction sound would be largely unavoidable, guideline and Code of Practice requirements will be critical to minimize potential effects on NSAs. In this regard, the City of Kingston Noise By-Law (No. 2004-52), as amended, prohibits the following:

1. The operation of any item of construction equipment without an effective exhaust muffling device that is in good working order and in constant operation.

2. The operation of construction equipment or performing any action relating to construction between 1900 hours (7:00 PM) of one day to 0700 hours (7:00 AM) of the next day, all day Sundays and statutory holidays.

However, it is important to note that under Schedule ‘C’ to this By-law, the operation of municipal and utility service vehicles and related equipment is exempt, which could apply to bridge construction activities. Despite this, a protocol has been put in place for other past major municipal infrastructure projects to notify City Council in advance if the Contractor, in consultation with the City, has deemed it necessary to perform construction works outside of the allowable time periods listed above. This protocol has given City Council the opportunity to consider whether any conditions should be imposed on the proposed works.

Furthermore, as outlined in Table 4.21 below, the OMOE ‘Publication NPC-115: Construction Equipment’, stipulates the following limits on sound emissions from individual items of construction equipment:

Table 4.21
OMOE NPC-115: Construction Equipment Sound Emission Levels

Type of Unit	Maximum Sound Level (dBA)	Distance From NSA (m)	Power Rating (kW)
Excavation Equipment	83	15	Less than 75 kW
	85	15	More Than 75 kW
Pneumatic Equipment	85	7	N/A
Portable Compressors	76	7	N/A

The OMOE also sets blast vibration limits in its ‘Publication NPC 119: Blasting’, as shown below in Table 4.22.

Table 4.22
OMOE NPC-119: Maximum Blast Vibration Levels

Vibration Source	Cautionary (Unmonitored Blasts)	Peak (Monitored Blasts)
Concussion (air overpressure)	120 dB	128 dB
Ground-borne Vibration	1 cm/s	1.25 cm/s

.6 The In-Water Effects and Bridge Construction Options

The project has the potential to have a two-fold impact on the natural and cultural heritage of the marine environment. First, there would be the potential impacts associated with the three temporary in-water construction access options, namely, the temporary earth berm, the use of dredging for construction barges or the installation of a temporary work bridge. Once in-water access is provided, then the installation of the bridge piers and superstructure would create the second set of potential impacts. Prior to mitigation, the potential negative impacts from these two in-water activities as they relate to the project site location are discussed below:

1. ***The potential negative effects of the project on marine archaeological resources.*** As discussed earlier, no cultural heritage materials were located at the project site location during the

marine archaeological fieldwork. Moreover, the paleo-environment of the project site location suggests a marsh environment, similar to the existing marsh to the north, wherein small, isolated areas of raised elevation are evident as opposed to a discrete, submerged paleo-shoreline. As such, the project site location exhibits a low archaeological potential for encountering either prehistoric or historic cultural remains. This should not be interpreted to mean however, that marine archaeological resources are not present at the project site location and will not be potentially impacted by the project.

2. ***The potential negative effects of the project on river hydrology.*** The use of a temporary earth berm with culverts and the installation of piers associated with either the temporary work bridge or permanent bridge could change water levels and flows. This is due to the partial blockage of water flow from the in-water works which causes upstream water levels to increase to force the flow through the restricted openings and around the obstructions. Typically, hydraulic bridge design is based largely on the flow-generated conditions at the bridge location as these conditions generate the largest local velocities. Though wind speed and water flow velocities vary within the watercourse over time, as previously noted, the lower Cataraqui River reach is not a typical reach, in that it is wide and flow-generated velocities, especially at the project site location, are low, at roughly 0.4 m/s. As such, the physical characteristics of the lower Cataraqui River reach are similar to a lake-like setting.

Due to the reduced importance of the hydrologic conditions at the project site location, six environmental forcing scenarios reflecting a range of temporal changes in water flow and wind speeds were modeled[34] to assess potential project impacts on river hydrology. The scenario conditions are summarized in Table 4.23 below.

Table 4.23
Hydraulic Modeling Conditions at the Project Site Location

Scenario	Water Flow (m^3/s)	Wind Speed (m/s)	Wind Direction
High (100 Year) Condition	50	20	North
Moderate I Condition	50	4.5	North
Moderate II Condition	10	20	North
Moderate III Condition	10	4.5	North

[34] The ADCIRC model was used which solves time dependent, free surface circulation and transport problems in two dimensions (depth integrated). The program uses the finite element method in space allowing the use of highly flexible, unstructured grids.

Table 4.23
Hydraulic Modeling Conditions at the Project Site Location

Scenario	Water Flow (m^3/s)	Wind Speed (m/s)	Wind Direction
Moderate IV Condition	4.5	20	South
Low Condition	0	4.5	North

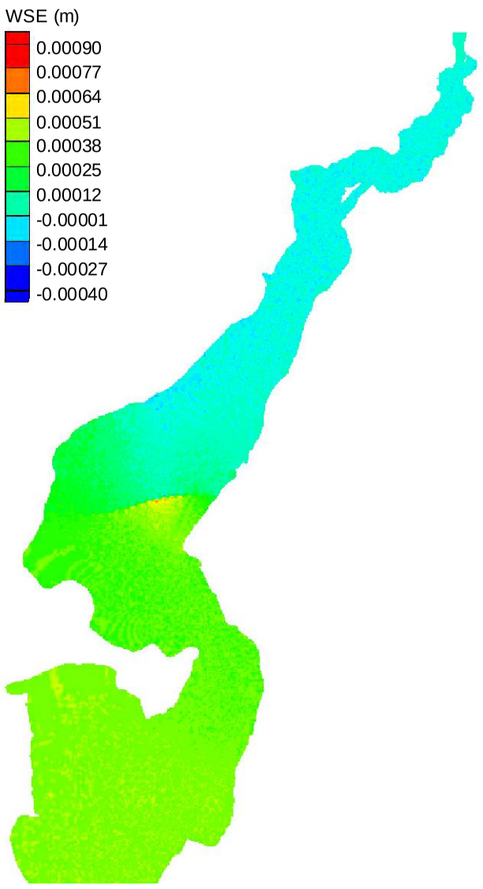
The modeling results generally show that the worst case scenario is the 'High (100 Year) Condition' model. Under this scenario and as shown on Drawings 4.36 and 4.37, the double v-piers as part of the 'Arch With V-Piers' design would generate the most impact on water levels and flow-generated velocities. But these impacts are considered very minor and localized, in that:

a) The highest increase in water levels is modeled to be only 4 mm in the vicinity of the double v-piers themselves, which is due to the resistance to flow generated by the piers and the increase in flow-generated velocity between the piers;

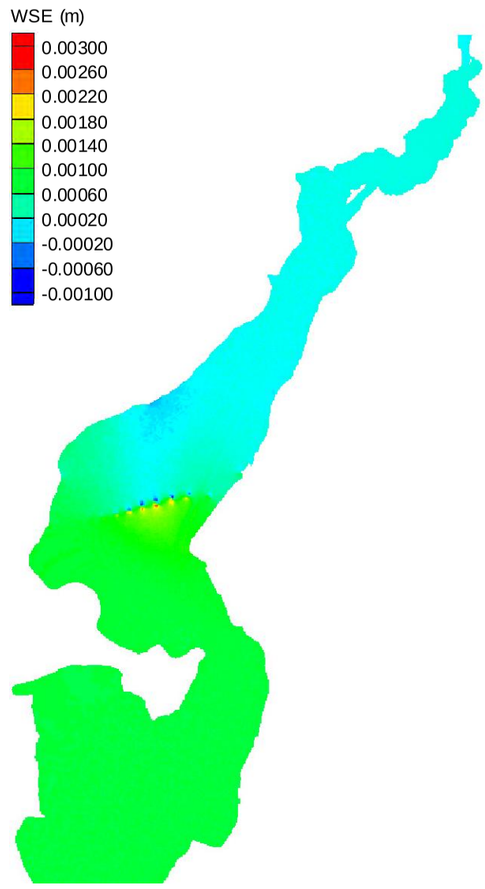
b) The highest increase in flow-generated velocity is modeled to be only 0.035 m/s, which is found between the spans of each double v-pier and, as noted above, is due to the resistance to flow generated by the piers themselves;

c) The impact of the double v-piers on flow-generated velocity is most evident in the area between the two piers of any given pair, where flows would be stalled; and

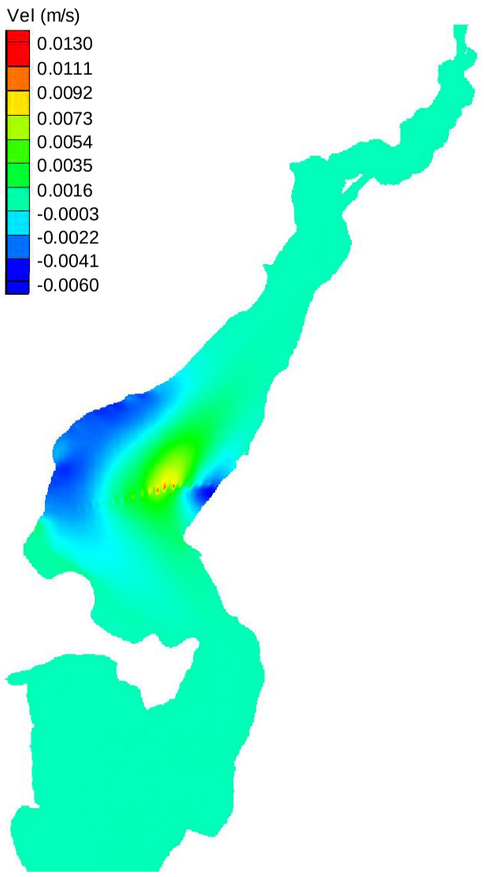
d) As the above-noted impacts would be under worst case conditions, and as such, would not be expected to persist for any significant period of time, under more normal conditions of lighter winds, lower flows or reduced setdown in Lake Ontario, the flow-generated velocities within the channel and their related effects would be reduced even further.



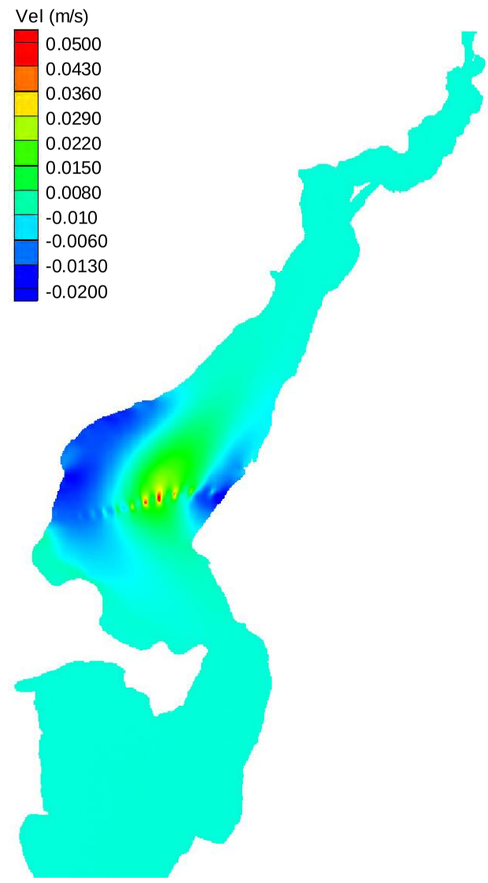
A: WATER LEVELS
TUBE/BOX GIRDER CONCEPTS



ARCH WITH V-PIERS CONCEPT



B: WATER VELOCITIES
TUBE/BOX GIRDER CONCEPTS



ARCH WITH V-PIERS CONCEPT

PROJECT:

CATARAQUI RIVER THIRD CROSSING EA - STAGE 2 ENVIRONMENTAL STUDY REPORT

DRAWING:

BRIDGE CONCEPT IMPACTS ON WATER LEVELS AND VELOCITIES

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DESIGN:	DRAWING NO.: 4-36
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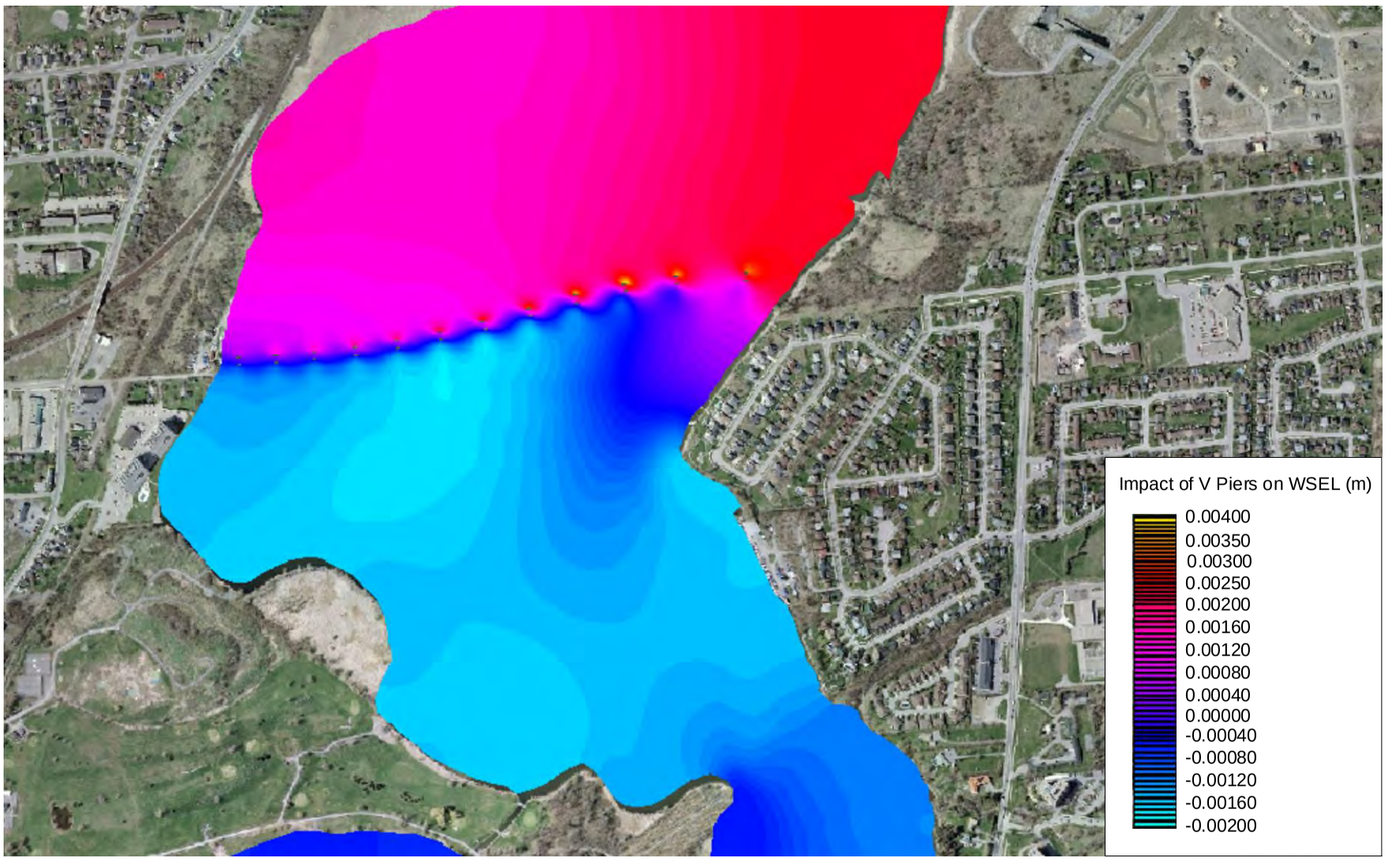
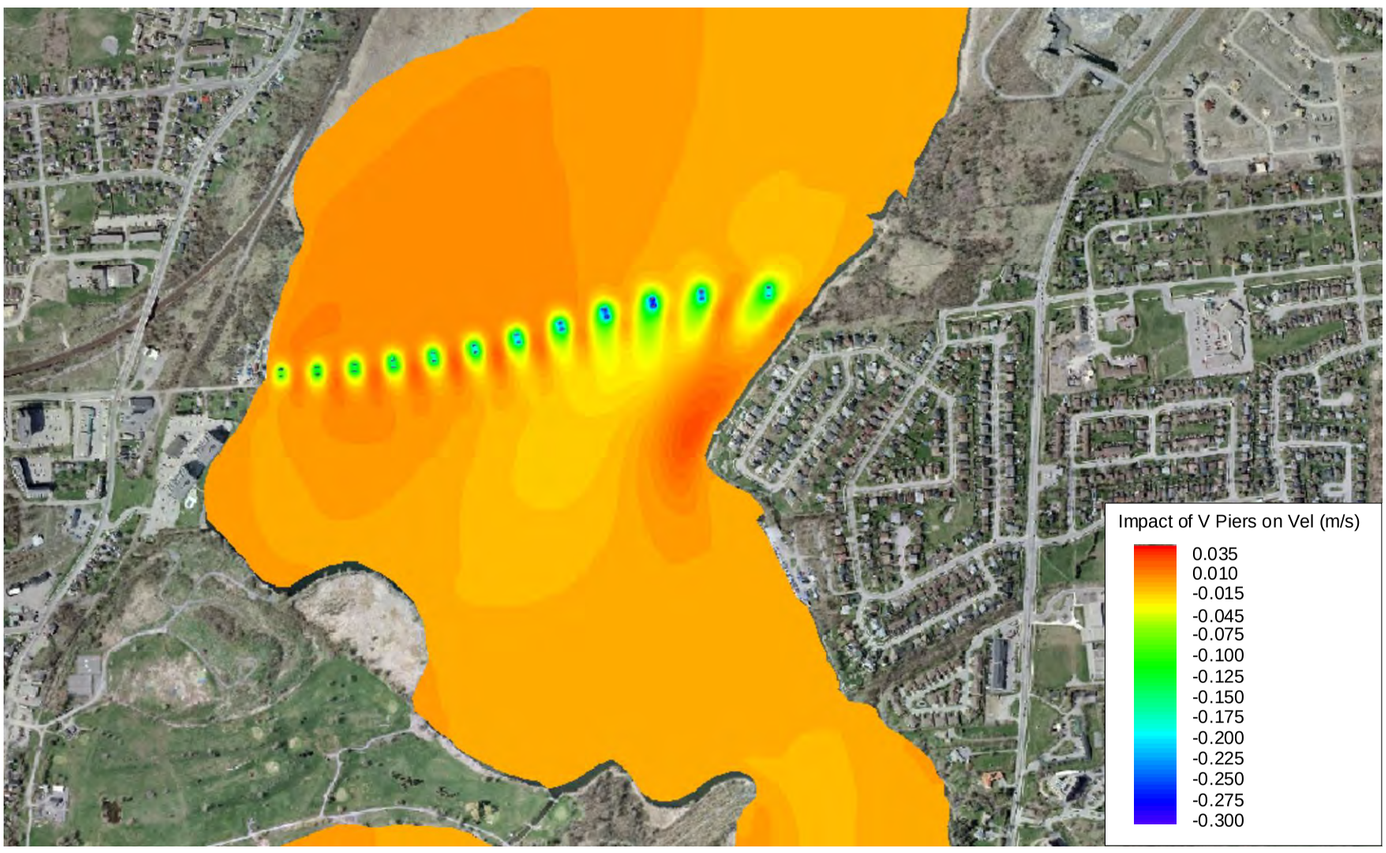


A: WATER LEVELS



B: WATER VELOCITIES

PROJECT:

CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:

DETAIL OF ARCH WITH
V-PIERS CONCEPT IMPACTS ON
WATER LEVELS AND VELOCITIES

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PLOTTED: 11-Apr-12	

File Location: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-37 Detail of Arch With V-Piers Concept Impacts.dwg

In addition, general and local scour estimates were prepared based on the hydraulic modeling and as per the CHBDC requirements with guidance from MTO's Drainage Management Manual. Given the width of the watercourse and limited flow-generated velocities at the project site location, the general scour estimates are in the order of 2 N/SM, which is considered negligible. In terms of local scour, preliminary estimates suggest a local scour depth allowance of 7.5 m. This potential undermining of the pier footings would be prevented if the piles were socketed directly into the bedrock.

Finally, the potential for any of the bridge concepts to influence ice jamming on the Cataraqui River is also considered to be negligible. As stated earlier, the ice generally melts in place due to the limited flow-generated velocities. This is not expected to change with a bridge at the project site location.

3. ***The potential negative effects of the project on watercraft navigation:*** As noted earlier, the proposed bridge clearance above the water is 14 m over the Rideau Canal's navigable channel and adjacent rowing lanes. This exceeds the 6.7 m Federally regulated navigable requirement for the canal. The navigable channel is officially closed to watercraft from Thanksgiving to Victoria Day.

In addition, the proposed 100 m arch span over the canal's navigable channel (for a total 131 m distance pier-to-pier) was originally considered to be sufficient to span the existing rowing course which runs in parallel to the channel from the Point St. Mark residential neighbourhood north for 2,000 m. However, the initial 131 m distance pier-to-pier has subsequently been increased to a proposed 150 m distance pier-to-pier, as shown on Drawing 4.38. This increase reflects recent consultations with the Kingston Rowing Club, during which the project team was advised that the rowing course is seven lanes wide. Four rowing lanes are on the west side of the channel and three lanes are on the east side. Though only the rowing lanes abutting either side of the channel are marked, club staff indicated that an 11 m wide rowing lane width is presumed for each lane across the full course, which accommodates the rowing shells, prevents collisions and complies with Olympic requirements. As such, concerns were expressed that the initial 131 m distance pier-to-pier would encumber the rowing course and not provide adequate horizontal and vertical clearance between the rowers and abutting piers, given:

a) The channel is at roughly a 30 degree angle to the bridge;

b) The minimum 6.7 m Federally regulated navigable requirement for the canal;

c) The CRCA design 'high' water level requirement of 76.3 m; and

d) The 1H:1.2V rising slope of the v-piers above the water does not accommodate full vertical clearance from the waterline to the underside of the bridge deck.

Based on these recent consultations, the project team has determined that it would be feasible to increase the pier-to-pier distance to 150 m in order to provide unencumbered through-navigation for the existing rowing course. Proposed design features include:

a) A 9.4 m horizontal clearance from the abutting pier on the west side of the course;

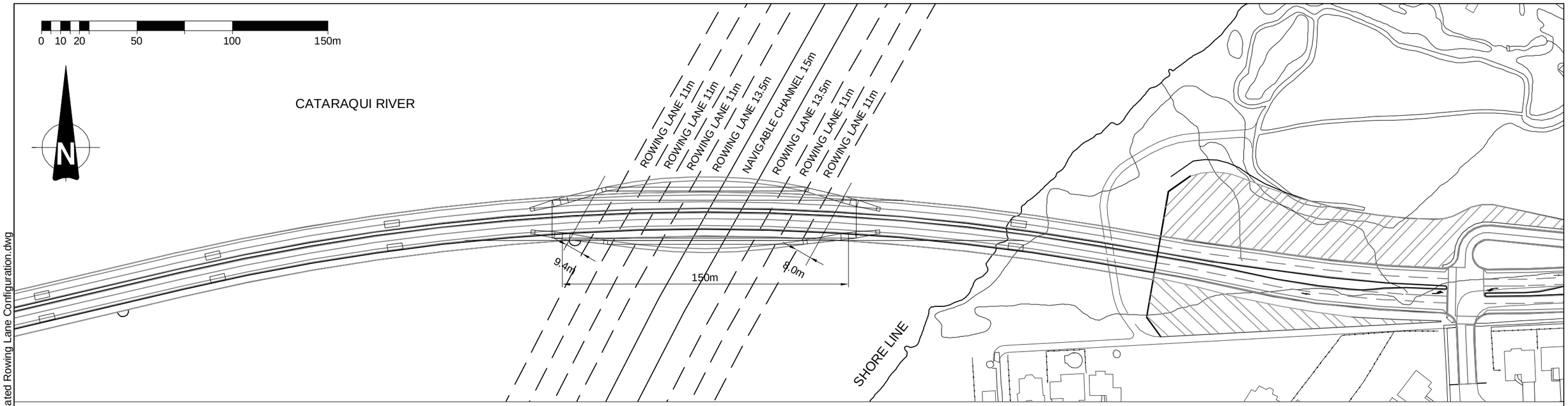
b) An 8 m horizontal clearance from the abutting pier on the east side of the course; and

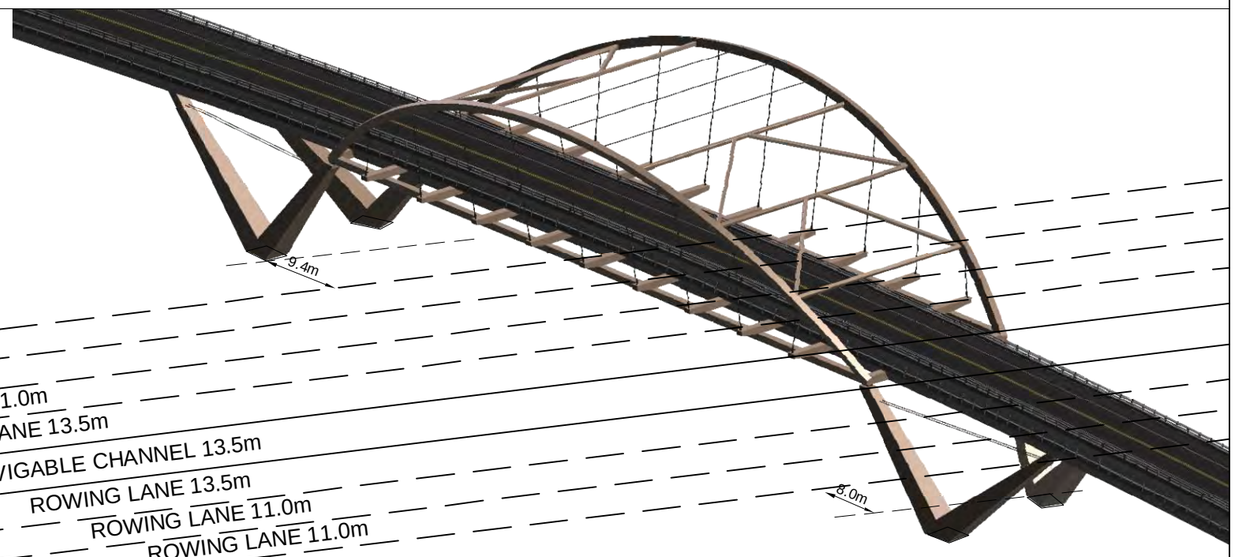
c) A 13.5 m wide rowing lane on either side of the navigable channel to provide an additional 2.5 m clearance from the channel itself.

The 150 m distance pier-to-pier would also provide flexibility to optimize the pier locations further during the project implementation phase in response to more specific rowing course and navigable channel configurations and characteristics north and south of the bridge corridor. It should also be noted that the preliminary opinion of probable cost for the four-lane bridge scenario cited earlier in Table 4.18 ($161 million to $196 million) would have to be reviewed further during the project implementation phase if the proposed 150 m distance pier-to-pier design is pursued to fully accommodate the rowing course.

4. ***The potential negative effects of geophysical conditions on the project.*** For seismic design purposes, Kingston is listed in Table A3.1.1 of the CHBDC and falls in an Acceleration-related seismic zone ('Za') of 2 and a Zonal acceleration ratio of 0.10. Assuming the bridge would be classified as a 'Lifeline' bridge, the seismic performance zone would be 3 based on the CHBDC. The Site Coefficient ('S') for the project site location, also based on the CHBDC, may be taken as 1.5, which is consistent with Soil Type III, due to the deep clay deposit within the Cataraqui River.

Under the design earthquake condition, the silty clay soil and glacial till soil at the project site location are not considered to be susceptible to liquefaction. This is because of their relatively high fines contents and plasticity. But the layer of organic soils below the river mudline is considered to be susceptible to liquefaction under the design earthquake condition. Provided the bridge structure is founded on bedrock, no adverse impact on the post-liquefaction capabilities of the bridge foundation is anticipated.





PROJECT:
CATARAQUI RIVER THIRD CROSSING
EA - STAGE 2
ENVIRONMENTAL STUDY REPORT

DRAWING:
UPDATED ROWING
LANE CONFIGURATION

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DESIGN:
DRAWN:
CHECKED:
PLOTTED: 11-Apr-12

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File Location: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-38 Updated Rowing Lane Configuration.dwg

In addition, as discussed earlier, there are two zones within the project site location where low resistivity is observed within the bedrock beneath the river, centred at distances of 320 m and 970 m along the ERI survey line. These areas are most likely associated with the Frontenac Axis. If these zones are faults, they are considered inactive and do not pose any additional seismic impacts. Still, as shown earlier, the foundation elements associated with the 'Arch With V-Piers', 'Tube' and 'Box Girder' designs avoid these potential fault zones.

5. ***The potential negative effects of the project on substrate disturbance.*** As noted earlier, higher metals concentrations were found at sediment 'grab sample' location SS3 in the middle part of the Cataraqui River and higher PAHs concentrations were found at sediment 'coring sample' CS7 in the middle-west part of the Cataraqui River in comparison to the other sampling locations. Exceedances of CCME and Provincial Sediment Quality Guidelines were also found in all grab samples and at most depths in the sediment cores. In-water preparation and bridge construction activities could disturb this substrate, causing sediment suspension and a subsequent decrease in surface water quality.

6. ***The potential negative effects of the project on fish and fish habitat.*** In-water preparation and bridge construction activities could potentially lead to: i) restriction of fish movement; ii) species mortalities or avoidance of the area; iii) the loss of aquatic vegetation and fish habitat; iv) the spread of invasive species from vessels brought in from areas outside the Great Lakes system; and v) accidents and malfunctions from equipment use. It is the cumulative effect of all of these potential impacts which can result in a 'Harmful Alteration Disruption or Destruction' (HADD) to fish and fish habitat.

Based on the proposed in-water preparation options and bridge construction activities, a risk assessment for fish and fish habitat has been prepared in accordance with the 'Practitioner's Guide to the Risk Management Framework for DFO Habitat Management Staff'. This involves a matrix using the following two scales: i) the 'scale of negative effect', which uses three attributes, namely, extent, duration and intensity; and ii) the 'scale of sensitivity of fish and fish habitat', which uses four attributes, namely, species sensitivity, species dependence on habitat, rarity and habitat resiliency. It is important to note that this assessment has been guided by the above-noted discussion on potential negative effects of the project and the following four additional considerations, which are based on the bridge concepts as well as the terrestrial and marine ecological fieldwork:

1. ***The footprint of the bridge itself.*** As discussed earlier, the bridge deck would ultimately have a total shore-to-shore area of roughly 26,500 SM, based on a four-lane, 22.9 m deck width scenario and a crossing distance of 1,150 m. In addition, the total in-water footprint resulting from the piers in the 'Arch With V-Piers', 'Tube' and 'Box Girder' concepts would be up to 669.5 SM, 192.5 SM and 402.5 SM, respectively. With these factors in mind, the potential direct impacts associated with the bridge itself (foundations and superstructure) could include: i) restriction of fish movement; ii) avoidance of the area while the piers and superstructure are being installed; and iii) the loss of 192.5 SM to 669.5 SM of fish habitat. The potential indirect impacts could include: i) shading from the bridge deck on the marine environment; ii) loss of riparian vegetation; and iii) erosion along the shoreline. These impacts are considered minor relative to the following:

   a) The larger potential impact spectrum associated with the in-water footprints of the three temporary in-water construction access options, which as cited earlier, could range from 2 ha (or 20,000 SM) for the temporary work bridge, to 4.3 ha (or 43,000 SM) for the dredging option, to 6.2 ha (or 62,000 SM) for the temporary earth berm;

   b) It is anticipated that the bridge clearance above the water, which as noted earlier, is 3 m along most of its westerly portion and then gradually rises to 14 m over the Rideau Canal's navigable channel near the east shore and then descends to 12 m at the east shore, should contribute only partial bridge deck shading on the marine environment; and

   c) Though riparian vegetation provides habitat, shading and a food source for fish (insects falling into the water), its efficacy in doing so at the project site location is impacted by the wide span of the Cataraqui River and the limited extent of riparian vegetation.

2. ***The characteristics of the Greater Cataraqui Marsh PSW at the project site location.*** As noted earlier, the majority of the project site location consists of one vegetation type (suW1), and the balance is open water areas (OW). The suW1 community is a vegetation community with only one vegetation form (submerged vegetation), dominated in 1990 by Milfoil. The OW areas are non-vegetated areas, which in this area is due to the maintenance of dredged channels for watercraft. As noted above, these areas are not part of the Greater Cataraqui Marsh PSW.

   In the OWES, vegetation communities are valued for their diversity and single form communities such as the suW1 community have a lower value because they will generally support a lower diversity of other wetland species. The project site location also avoids the more sensitive portions of the Greater Cataraqui Marsh PSW, most notably its visible cattail portion to the north.

3. ***The fish sampling results at the project site location area.*** As discussed earlier, yellow perch which were found spawning throughout the mid channel zone during the spring visit. The presence of YOY pumpkinseed, bluegill, largemouth bass and the occasional rock bass and brown bullhead suggests that these species are also spawning within the project site location area. Despite these observations, the fieldwork results demonstrated that the fish communities were composed primarily of common warm to cool water sport and forage fish. No species of conservation value or SAR were captured or observed.

4. ***The role of mitigation measures.*** The intent of the considerations noted above is to contextualize the potential direct and indirect negative impacts associated with the footprint of the bridge and the three temporary in-water construction access options discussed further below. The role of mitigation measures during the project implementation phase will be critical to either reduce or eliminate its potential negative impacts on the natural and cultural heritage of the marine environment.

With the above considerations in mind, the risk assessment results on fish and fish habitat are outlined below in Table 4.24 ('scale of negative effect') and Table 4.25 ('scale of sensitivity of fish and fish habitat') and focus on the three temporary in-water construction access options. This assessment indicates that all three temporary in-water construction access options would be categorized as acceptable low risk projects under the DFO risk management framework, provided best management practices and mitigation measures are properly implemented and maintained. By extension, the bridge would similarly be categorized as an acceptable low risk project under the DFO risk management framework, given the role of mitigation measures and its more limited footprint and impacts in comparison to the three temporary in-water construction access options.

.7 Utility Infrastructure Considerations

As highlighted earlier, Utilities Kingston has requested that an east-west watermain, which is required to service a proposed new water booster station in east Kingston, should be incorporated in the bridge design. It is estimated that a 525 mm watermain would be needed, subject to future detailed design and modeling confirmation. There are two options available to incorporate this infrastructure in the bridge design, namely:

1. Attach it to the bridge deck and provide for necessary: i) insulation equipment to maintain water flows during the winter months; ii) heat tracing equipment for monitoring and maintenance purposes; and iii) expansion joints on the watermain to accommodate bridge expansion and contraction. This would increase the diameter of the watermain and associated infrastructure to at least 800 mm.

2. Dredge the riverbed and install the watermain within the dredged channel. It is important to note that Utilities Kingston installed a watermain and forcemain across the Cataraqui River within a dredged channel south of Belle Island and the Rideau Canal (but within the Greater Cataraqui Marsh PSW) in 2003.

The selection of a preferred temporary in-water construction access option will have a direct bearing on how and where the watermain could be installed. If either the temporary earth berm option or temporary work bridge option is preferred, then the watermain and associated equipment would have to be incorporated into the bridge superstructure. If aesthetics were not an issue, it would typically be installed alongside the bridge deck. But this approach would be difficult to justify at the project site location, given the Rideau Canal context. Thus, the watermain would need to be installed underneath the bridge deck and either enclosed within a bridge girder or installed between bridge girders so as to block its view. In this regard, if the watermain was installed between the bridge girders, Utilities Kingston would need 'snooper' trucks[35] to inspect the integrity and condition of the watermain and the functionality of the expansion joints, so as to mitigate the risk of a potential infrastructure breach. If the watermain was enclosed within a bridge girder, then inspections would have to occur within a 'confined space entry' protocol. Two access points to the watermain between each pier would be needed from the bridge deck level shore-to-shore. This is due to the diaphragms at each pier which would restrict full access pier-to-pier. Up to forty-six access points could be required, given that the 'Box Girder' concept has the most piers (23 piers) in comparison to the other concepts. In addition, it is also important to note that with the 'Arch With V-Piers' concept, a girder is not needed under the arch portion, as the arch structure and skewed double v-pier at each end of the arch would provide the necessary structural support for the bridge deck. As such, additional masking or screening of the watermain under the arch portion would be required, which could impact the slenderness of its design.

If the dredging option is preferred, then the watermain could be installed within the dredged channel. Snooper trucks, expansion joints, heat tracing and insulation jacket equipment would not be needed under this scenario. This would simplify maintenance and reduce associated costs and eliminate the risk of a potential infrastructure breach. Masking or screening of the watermain under this scenario would also not be required, given that it would be located within the dredged channel. Utilities Kingston has requested the dredged channel as the preferred location for the watermain, based on its advantages and their past experience with installing and monitoring infrastructure in this manner.

[35] Note the snooper truck has a positional platform or basket that is able to extend under the bridge deck from the bridge deck level to facilitate inspections.

Table 4.24
Temporary In-Water Construction Access Options and the 'Scale of Negative Effect'

Construction Option	Attribute	Rating	Rationale
Temporary Earth Berm	Extent	Low	The direct footprint will be 6.2 ha which is considered to have a localized effect within one portion of a larger marine environment. No indirect impacts are anticipated provided best management practices and mitigation measures are properly implemented and maintained.
	Duration	High	The temporary earth berm would take up to two to three months to construct during the mid-summer/early fall and would be in place for two consecutive construction seasons. It would then take up to two to three months to remove, also during the mid-summer/early fall period, after the bridge is built. Fish use of the area would be prevented for up to four years.
	Intensity	Low	It is anticipated that the area would return to pre-construction conditions within one to two years after the bridge is built.
Dredging	Extent	Low	The direct footprint will be 4.3 ha which is considered to have a localized effect within one portion of a larger marine environment. As such, no indirect impacts are anticipated provided that best management practices and mitigation measures are properly implemented and maintained.
	Duration	High	Dredging would occur over a two month period during the mid-summer/early fall and would create a non-vegetated area that could last for eight years or more in light of the relatively shallow waters (ranging from 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal's navigable channel) and low water flow velocities (ranging from negligible up to 0.4 m/s). If the dredgeate is returned to the affected area after the bridge is built, then the vegetation should re-establish to pre-construction conditions within one to two years.
	Intensity	Low (dredgeate returned) Moderate (dredgeate not returned)	If the dredgeate is returned to the affected area after the bridge is built, it is anticipated that the area would return to pre-construction conditions within one to two years. If the dredgeate is not returned to the affected area after the bridge is built, then the area could become less productive as it is not expected to re-vegetate. On the other hand, given that the project site location area is dominated by littoral habitat and represents only a single habitat type, dredging has the potential to create lentic habitat and thereby increase the biodiversity in the wetland. It is acknowledged that this concept of self-enhancement through the creation of non-vegetated areas is uncommon. It is also acknowledged that Parks Canada restricts dredging, unless an EA study shows that it could be environmentally beneficial and that there will be no significant adverse environmental impacts or impacts to cultural resources. With this in mind, during the wetland evaluation process, points are awarded in four main categories: i) Biological Component; ii) Social Component; iii) Hydrological Component; and iv) Special Features. Biodiversity is scored within the Biological Component in several ways, including interspersion. An area with just one habitat type, such as at the project site location area, would have low interspersion and therefore receive a low biodiversity score. Interspersion can be increased by adding greater edge complexity. Dredging has the potential to increase interspersion by adding greater edge complexity at the project site location. This could then increase the wetland evaluation score, the quantitative value of the wetland and fish habitat diversity, particularly for larger species such as largemouth bass, northern pike, larger yellow perch and white sucker. This potential benefit is recognized in the case study research done as part of the marine ecological fieldwork for this EA study[36]. In addition to the potential benefits of increasing interspersion at the project site location through dredging, it is equally important to further contextualize Parks Canada's policy on dredging in relation to the project site location: a) The project site location exhibits a low archaeological potential for the recovery of both prehistoric and historic cultural remains; and b) The fish communities at the project site location were composed primarily of common warm to cool water sport and forage fish and no species of conservation value or SAR were captured or observed. The critical role of properly implementing and maintaining best management practices and mitigation measures with dredging is also recognized.
Temporary Work Bridge	Extent	Low	The direct footprint will be 0.6 ha from the temporary piles. The indirect impact due to shading would result in a loss of vegetation within an additional 1.4 ha area. This is considered to have a localized effect within one portion of a larger marine environment. As such, no other indirect impacts are anticipated provided best management practices and mitigation measures are properly implemented and maintained.
	Duration	High	The incremental installation of the temporary work bridge would occur during the mid-summer/early fall. The work bridge would be in place for two consecutive construction seasons. It would then take up to two to three months to remove, also during the mid-summer/early fall period, after the bridge is built.
	Intensity	Low	After the bridge is built, the temporary piles would either be removed or cut off below the top of the riverbed and left in place. It is anticipated that the area would return to pre-construction conditions within one to two years.

[36] The 'Working Around Wetlands? What You Should Know' publication on the Environment Canada website (www.ec.gc.ca/Publications) states that though dredging is generally not favoured because it provides only a temporary solution and can cause environmental damage, it also acknowledges that carefully dredged channels sometimes can provide important deeper water habitat for waterfowl and other wildlife. Also, three case studies done in areas having similar conditions to the project site location area have cited that dense aquatic macrophytes results in specific types of fish communities. The creation of low or no vegetation can create an area for larger fish species and thereby potentially increase local productivity and biomass diversity.

Table 4.25
Temporary In-Water Construction Access Options and the 'Scale of Sensitivity of Fish and Fish Habitat'

Attribute	Construction Option	Rating	Rationale
Species Sensitivity	Dredging	Low	The fish species at the project site location area are mostly moderately sensitive to turbidity. Provided that best management practices and mitigation measures are properly implemented and maintained, the potential impacts from turbidity would be low. The fish species at the project site location area are habituated to areas with dense vegetation, soft substrate and slow water velocities. These species are generally resilient and will avoid the impact area if active disturbances are taking place. Provided that best management practices and mitigation measures are properly implemented and maintained, the potential for species mortalities would be low. No highly sensitive species such as salmonides are present at the project site location area.
	Temporary Earth Berm	Low	
	Temporary Work Bridge	Low	
Species Dependence on Habitat	Dredging	High	This area, especially the mid channel, is used for spawning by several species (sunfish, bass, perch). There is a potential to impact spawning habitat over the long term for the temporary earth berm and dredging options. For the temporary work bridge option, it is uncertain what portion of the area would no longer function as spawning habitat as it would depend on the amount of shading and resilience of the vegetation.
	Temporary Earth Berm	High	
	Temporary Work Bridge	Low-High	
Rarity	Dredging	NIL	There is an abundance of one habitat type at the project site location area.
	Temporary Earth Berm	NIL	
	Temporary Work Bridge	NIL	
Habitat Resiliency			The Cataraqui River system is classed as warm-water and there will be no thermal or flow effects associated with project implementation. As discussed earlier, for the temporary earth berm and temporary work bridge options, it is anticipated that the area would return to pre-construction conditions within one to two years after the bridge is built. As noted earlier, if the dredgeate is returned to the affected area after the bridge is built, it is anticipated that the area would return to pre-construction conditions within one to two years. As discussed earlier, if the dredgeate is not returned to the affected area after the bridge is built, the aquatic conditions will change from a shallow habitat chocked with vegetation to a more pelagic habitat, particularly for larger species. This has the potential to increase the quantitative value of the wetland and fish habitat diversity at the project location area.
	Temporary Earth Berm	Low	
	Temporary Work Bridge	Low	
	Dredging	Low (dredgeate returned)	
		Moderate (dredgeate not returned)	

4.2.3 Mitigation Measures

The assessment of the bridge concepts and their potential impacts is useful in further exploring the interactions of the project during each stage of its design life (construction, operation and decommissioning) with valued ecosystem components (VECs) at the project site location area. This can assist in identifying best management practices and mitigation measures required to either reduce or eliminate the potential negative effects of specific project activities. The potential project-environmental interactions are introduced in Table 4.26 below.

Table 4.26
Potential Project – Environmental Interactions

PROJECT PHASE AND ACTIVITIES	Air Quality (Particulate Matter)	Air Quality (Noise)	Soil and Groundwater	Surface Water Systems	Vegetation	Wildlife Habitat	Aquatic Habitat	Cultural Heritage Resources	Archaeological Resources	Local Community	Roads and Road Traffic; Boat Traffic	Business and Job Opportunities
CONSTRUCTION PHASE (UP TO 3 YEARS)												
Site Preparation	●	●	●	●	●	●	●	●	●	●	●	o
Temporary Facilities and Lay-Down Areas	●	●	●	●	●	●	●	●	●	●	●	o
Superstructure Construction and Installation	●	●	●	●	●	●	●	-	●	●	●	o
Bridge Deck Construction and Installation	●	●	●	●	●	●	●	-	●	●	●	o
Utility Installations	●	●	●	●	●	●	●	-	●	●	●	o
Road and Landscape Works	●	●	●	●	●	●	●	●	●	●	●	o
Waste Management Systems	-	-	●	●	-	-	-	-	-	●	●	o
Malfunctions and Accidents	●	●	●	●	●	●	●	●	●	●	●	-
OPERATION PHASE (OVER 100 YEARS)												
Bridge and Road / Water Use	●	●	●	●	●	●	●	o	-	●/o	o	o
Bridge and Road Maintenance	●	●	●	●	o	●/o	●/o	o	-	●/o	●/o	o
Utility Operations	-	-	-	-	-	-	-	-	-	o	-	o
Malfunctions and Accidents	●	●	●	●	●	●	●	●	●	●	●	-
DECOMMISSIONING PHASE (PREMATURE AT THIS TIME)												
Removals	●	●	●	●	●	●	●	●	●	●	●	o
Site Rehabilitation	●	●	●	●	●	●	●	●	●	o	●	o
Malfunctions and Accidents	●	●	●	●	●	●	●	●	●	●	●	-

(●) Potential Negative Impact (-) Limited or No Impact (o) Potential Positive Impact

Based on these potential project-environmental interactions, the mitigation measures outlined below are introduced that could reduce or eliminate potential negative impacts from specific activities associated with the design life of the bridge. There are two important tools that will be administered by the City during future project phases to mitigate potential adverse environmental effects. The first tool deals with the preparation and implementation of a Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including:

1. As part of the project construction phase:

   a) Ensuring all construction equipment:

      i. is maintained in good working condition through regular maintenance and inspections;

      ii. includes industry-standard emissions treatment and noise-suppression systems that meet applicable Provincial guidelines current at that time; and

      iii. operate and re-fuel only in designated areas;

   b) Employing dust suppression techniques such as watering on construction access roads and sweeping at construction site entrances;

c) Installing:

   i. ditches along temporary roadways to direct surface drainage to temporary treatment ponds or permanent facilities; and

   ii. permanent stormwater drainage and management facilities to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements;

d) Using local aggregates for site preparation and construction activities, subject to availability;

e) Conducting analyses of sediments in advance of and following excavation activities both on-shore and in-water in order to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage and agency notification) and excavated material disposal to an approved landfill facility are mobilized in accordance with regulatory requirements;

f) In advance of shoreland excavation works, installing sediment fencing along the riverbanks to prevent sediment movement and erosion outside of the work area;

g) Ensuring shoreland excavation works meet applicable Provincial blasting vibration guidelines current at that time;

h) Installing silt fencing for spoil stockpiling or fill materials and ensuring such areas are at least 30 m off-shore;

i) Ensuring spill kits are located on-site and storing construction materials and debris as well as fuel, lubricants and other hazardous materials in designated areas away from high-traffic areas and the Cataraqui River;

j) Purging the ballasts of all in-water vessels, should they originate from outside the Great Lakes system, in order to minimize the risk of introducing invasive species into the Cataraqui River;

k) Suspending in-water construction activities during periods of heavy rain and high wind events;

l) Minimizing the removal of shoreline and riparian vegetation as this could represent an opportunity for the continuance of existing ecosystem features and functions;

m) In advance of in-water removal of aquatic vegetation or substrate, installing silt curtains and/or turbidity barriers around in-water work areas and ensuring such measures remain in place until the sediments within the affected area have settled;

n) Regularly monitoring:

   i. shoreline erosion and sediment control measures and ensuring such measures are not removed until the terrestrial vegetation is re-established as part of the landscape improvement works; and

   ii. river water quality north and south of the project site location for turbidity, suspended soils, nutrients and contaminants.

o) Conducting advance inspections in areas slated for site preparation and construction activities in order to assess the presence of sensitive vegetation and tree species as well as wildlife species and the feasibility of relocating affected species to other hospitable environments and/or establishing buffers to protect affected species and to restrict access;

p) Scheduling site preparation and construction activities:

   i. to avoid sensitive areas as well as breeding/spawning seasons and over-wintering periods for wildlife (from March 15 to July 15 for fish; Spring and Fall for migratory waterfowl; from May to late September and the Fall-Winter months for the Eastern Milke Snake; between early August and late September for turtle species), unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; and

   ii. in consultation with:

      (a) the Kingston Rowing Club and Queens Rowing Club to avoid impacts to the local rowing community as much as possible; and

      (b) Parks Canada, Department of Fisheries & Oceans and Transport Canada to ensure the Rideau Canal's navigable channel remains open and the arch span bridge section installation in particular occurs during when the channel is officially closed to watercraft (from Thanksgiving to Victoria Day);

q) In advance of site preparation activities and in consultation with the appropriate Provincial and Federal agencies, preparing a Natural Environment Enhancement Plan that includes measures related to wetland restoration, creating aquatic habitat enhancements (such as

islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating and re-foresting the east and west side lands in direct response to the detail bridge design and construction program;

r) In regards to the Gore Road Library property:

i. documenting the condition of historic structures in advance of site preparation works and during construction activities to ensure that any adverse effects are promptly addressed;

ii. ensuring that the historic structures are protected from direct impact by vehicles during site preparation and construction activities;

iii. assessing the condition of trees and plantings along the southern boundary of the property and avoiding or relocating those specimens having historical significance to other suitable locations on the property, as feasible and appropriate;

iv. despite efforts to avoid the impact on the dry stone wall:

(a) relocating as little of the wall as possible in order to facilitate the widening of Gore Road and to meet safety and traffic requirements in road construction;

(b) documenting the section of the wall to be relocated, both for historical purposes and to facilitate site reconstruction;

(c) ensuring the relocated section of the wall is reconstructed by a qualified heritage stonemason and that it is rebuilt as a continuation of the existing wall, but at right angles and heading eastward on a parallel to Gore Road (the latter as per the request of representatives of the Kingston Heritage Advisory Committee); and

(d) assessing the condition of the remaining wall by a qualified heritage stonemason; and

v. preparing and implementing an Interpretation Plan that both documents and presents the known history of the property in situ;

s) In advance of site preparation works, removing and documenting archeological site BbGc-127 through archaeological excavation in order to mitigate the risk of the site being damaged during the project construction phase;

t) Conducting periodic monitoring of excavated materials to minimize potential impacts on previously undocumented archaeological resources;

u) Ensuring proper in situ conservation or excavation and removal measures as well as notification protocols are in place regarding the discovery of previously undocumented cultural heritage and archaeological resources;

v) In the event that human remains are encountered, immediately notifying the Kingston Police, OMTC, the Cemeteries Registrar of the Ontario Ministry of Government and Consumer Services and the City's Heritage Planner;

w) Sorting construction debris for recycle or disposal for hauling off-site by licensed operators to approved facilities;

x) Using licensed personnel to:

i. handle hazardous materials; and

ii. provide regular pump-out and haulage services of temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment;

y) Ensuring proper on-site construction signage and controls are installed for designated areas and traffic lanes to ensure safe and efficient circulation on-land and in-water;

z) Establishing a remote off-site facility for construction labour force parking complete with scheduled shuttle service to and from the project site location as well as encouraging the construction labour force to carpool to and from the project site location;

aa) Unless otherwise necessary, undertaking site preparation and construction activities during daylight hours in accordance with the City's Noise By-Law and to avoid potential effects of noise and artificial night lighting on the natural environment;

bb) Implementing the preferred design, which as noted above, incorporates additional elements as potential mitigation measures; and

cc) Employing detailed protocols for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.

2. As part of the project operation phase:

   a) Ensuring all maintenance equipment is in good working condition through regular maintenance and inspections;

   b) Continuing to regularly monitor:

      i. shoreline erosion and sediment control measures and ensuring such measures are not removed until the terrestrial vegetation is re-established as part of the landscape improvement works; and

      ii. Cataraqui River water quality north and south of the project site location for turbidity, suspended soils, nutrients and contaminants;

   c) Maintaining and monitoring those works that are included in the Natural Environment Enhancement Plan;

   d) Implementing dust suppression measures as part of maintenance activities;

   e) Using only non-chlorinated de-icing agents on the bridge deck;

   f) Ensuring the stormwater drainage and management facilities are in good working condition through regular maintenance and inspections;

   g) Suspending in-water maintenance activities during periods of heavy rain and high wind events;

   h) Conducting advance inspections in areas slated for maintenance activities in order to assess the presence of sensitive vegetation and tree species as well as wildlife species and the feasibility of relocating affected species to other hospitable environments and/or establishing buffers to protect affected species and to restrict access;

   i) Ensuring that the historic structures are protected from direct impact by maintenance equipment;

   j) Scheduling maintenance activities to avoid sensitive areas as well as breeding/spawning seasons and over-wintering periods for wildlife (from March 15 to July 15 for fish; Spring and Fall for migratory waterfowl; from May to late September and the Fall-Winter months for the Eastern Milke Snake; between early August and late September for turtle species), unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts;

   k) Monitoring future traffic conditions by the City in order to:

      i. confirm the future viability of the initial three-lane bridge scenario, should it be pursued;

      ii. optimize the coordination of traffic signals to maximize efficient traffic flows; and

      iii. address the potential issue of short-cutting through residential neighbourhoods on the west and east side lands through such means as:

         (a) monitoring signal timings to optimize traffic flow on the main public roads;

         (b) building out curb radii to restrict vehicular turns into residential areas;

         (c) installing speed humps on residential roads to slow down traffic;

         (d) creating restrictions within the residential road system such as one-way streets, restricted turns and dead end roads; and/or

         (e) installing traffic signage restricting vehicular turns into residential areas either at all times or during certain times of the day; and

   l) Preparing and employing an Operations and Maintenance (O & M) Manual that contains detailed protocols for employees/contractors regarding stormwater management system and maintenance equipment inspections and maintenance procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.

3. Similar mitigation measures used during the project construction phase would be employed as part of the project decommissioning phase. If and when decommissioning and rehabilitation are required at the project site location, it is anticipated that such works would take up to two years to complete. Such works would also be assessed as part of a Decommissioning Plan (DP), which would further be subject to EA regulations current at that time.

The second tool deals with the preparation and implementation of a Community Action Plan (CAP) that will be in place from the start of the construction phase and extend into the operation phase of the project. The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

4.2.4 Selection of a Preferred Design

The components of the 'preferred design' consist of the bridge design, roadway and landscape design improvements on the west and east side lands as well as the temporary in-water bridge construction access option. These elements are based on the fieldwork done at the project site location and the assessment of the concepts, including their potential impacts and the role of mitigation measures to reduce or eliminate potential impacts.

Firstly, the 'Arch With V-Piers' concept is the preferred bridge design for the following reasons:

1. It provides two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. To further benefit viewscape considerations and reduce associated in-water disturbances, it could be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers and still maintain appropriate span-length-to-girder-depth proportions.

2. The hydraulic modeling results show that the double v-piers would generate only minor impacts on water levels and flow-generated velocities.

3. It is able to span over the Rideau Canal's navigable channel and adjacent rowing lanes, while the arch over the canal's navigable channel highlights the bridge as a 21st Century 'gateway' to/from the Inner Harbour and canal.

4. The bridge alignment, as a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood, offers opportunities for:

   a) Reduced potential noise and visual impacts on the Point St. Mark community;

   b) 'Softer landscaping' along the Gore Road right-of-way on the east shore;

   c) A more organic reflection of the bridge within the context of its 'transitional' location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and

   d) A more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

5. The bridge clearance above the water accommodates existing topographic conditions on both shorelines and exceeds the Rideau Canal's Federally regulated navigable requirement. It also mitigates visual impacts, in that its silhouette would be below the tree line when viewed:

   a) On the water from the north by the north shore of Belle Island and Belle Park;

   b) On the water from the south by the visible cattail portion of the Greater Cataraqui Marsh that begins to emerge in the background; and

   c) To the east from both water and land on the west side by the existing topography of the east side lands.

   It should also be noted that the restorative landscape improvements on the west side lands provide an opportunity for the bridge to be below the 'future' tree line in this area when viewed from both the water and land on the east side.

6. The bridge deck components contribute to providing a more direct mid east-west connection to existing road infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension. This could further serve to direct traffic south to the downtown area.

7. The observation look-out/interpretive areas along the south side of the bridge deck maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

8. The use of context sensitive:

   a) Barriers and railings on the bridge and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and

   b) Directional and intermittent lighting on the bridge and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

9. The need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is recognized in the initial bridge configuration design which consists of a three lane, centre lane reversible, cross section that can be widened in response to future traffic conditions.

Secondly, the roadway and landscape improvements on the west and east side lands shown on Drawings 4.25 and 4.26 are preferred for the following reasons:

1. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid east-west arterial corridor at an acceptable LOS D over the long-term. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated.

2. The active travel and commuter cycling provisions on the bridge serve to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

3. The observation look-out/interpretive areas serve to maximize opportunities for residents to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

4. The landscape improvements represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands by creating/re-creating naturalized landscapes.

5. In the public realm areas, the use of context sensitive:

   a) Barriers and railings serve to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and

   b) Directional and intermittent lighting serve to address public and traffic safety requirements, accentuate public realms and mitigate light impacts on the surrounding environment.

6. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River further accentuate the public realm as a ‘naturalized’ feature.

Thirdly, though unmitigated changes in sound levels resulting from the project would exceed the applicable criteria at some representative receptors of concern, the proposed mitigation measures, in the form of earthen walls and/or sound barriers shown on Drawing 4.35, are preferred for the following reasons:

1. For NR4 (River Park Subdivision West) a 3 m high by 110 m long sound barrier wall, earthen berm or a combination on the north side of John Counter Boulevard up to Ascot Lane would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 55 dBA.

2. For NR5 (River Park Subdivision East) a 3 m high by 96 m long sound barrier wall, earthen berm or a combination on the north side of John Counter Boulevard up to Ascot Lane would achieve an average of 9 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 55 dBA.

3. For NR7/NR9 (Kenwood Crescent Residential) a 3 m high by 400 m long sound barrier wall extending west from the south side of the Point St. Mark Drive-Gore Road intersection onto the bridge deck would achieve an average of 5 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level ranging from 53 dBA to 55 dBA.

4. For NR10 (Barker Drive Residential) a 2.4 m high by 168 m long sound barrier wall extending east from the south side of the Point St. Mark Drive-Gore Road intersection to Kingston Road 15 would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 60 dBA.

5. The sound attenuation measures noted above are considered administratively, economically and technically feasible to implement.

Fourthly, dredging, which would include not backfilling the dredged channel after the bridge is built, is the preferred temporary in-water bridge construction access option for the following reasons:

1. The excavated channel could represent a mitigation measure in response to potential project effects, in that it would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more.

2. It would reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option.

3. It could accommodate Utilities Kingston’s east-west watermain within the dredged channel, which:

   a) Has been requested by Utilities Kingston as the preferred location for this infrastructure;

   b) Would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and

   c) Offers a more sustainable design solution, in that the need for expansion joints, heat tracing and insulation jacket equipment as well as related maintenance and servicing would not be required.

4. In light of the above-noted hydraulic modeling results for the double v-piers, it is similarly expected that the dredged channel, and the associated removal of aquatic vegetation that is required to accommodate it, would not have any significant influence on water levels or flow-generated velocities.

Finally, the preparation and implementation of the Natural Environment Enhancement Plan during the project implementation phase will include detailed measures related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating/re-foresting the east and west side lands in direct response to the detail bridge design and construction program.

5.0 THE PROJECT DESCRIPTION

This section of the Report discusses the potential environmental effects from the project on the VECs. Summary tables are presented indicating the valued ecosystem components (VECs), potential environmental effects, mitigation measures that would reduce or eliminate the potential effects, the significance of the residual effects and the net residual effects after mitigation measures are applied. The potential effects of the environment on the project and the potential cumulative effects of the project in conjunction with existing and future projects in the area are also outlined.

The significance of the residual effects on each VEC is evaluated using the following factors as per the CEA Act:

1. ***Magnitude.*** This pertains to the typical effects of the impact on each VEC, which are rated as 'low', 'medium' or 'high'.

2. ***Geographic Extent.*** This relates to the area where the effect occurs, which is rated as 'immediate', 'local' or 'regional'.

3. ***Duration.*** This regards the duration of the effect on each VEC, which is rated as 'short term' or 'long term'.

4. ***Frequency of Occurrence.*** This pertains to the frequency that the effect occurs, which is rated as 'intermittent' or 'continuous'.

5. ***Reversibility/Irreversibility.*** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be 'reversed' and return to its pre-existing situation or is 'irreversible'.

6. ***Ecological Context.*** This provides an estimate of the ecological value of the area in which the effect occurs, using a 'low' or 'high' rating.

The scope of the assessment covers works and activities associated with the construction, operations and decommissioning phases of the project. It should be noted that only those VECs determined to be affected by project activities during each phase are discussed. In addition, the preliminary and detailed design stage of the Project Implementation phase of the EA planning process will review and confirm specific implementation options and techniques. Additional scrutiny will also occur as part of the pre-construction approval process to further ensure that potential negative project effects can and will be mitigated in a satisfactory manner.

5.1 Project Activities

5.1.1 Construction Phase

The best management practices and mitigation measures noted earlier will be in place as part of the construction phase of the project. They are more specifically applied to the project construction activities later in this Report.

.1 Site Preparation

The main site preparation activities will include:

1. Brush and tree removal as well as site grading and excavation works, which will be completed mainly by using heavy machinery. However, along the shorelines, brush and tree removal will be completed by using small machinery.

3. Stripping of topsoil and stockpiling spoil or fill materials.

4. Construction of temporary granular roadways, roadside ditches (that would direct storm water runoff to either temporary treatment ponds or permanent facilities) and material storage/re-fueling areas.

5. Commencing dredging activities, which would involve the following detailed tasks, including further best management practices and mitigation measures in addition to those noted earlier regarding in-water works:

a) Turbidity Barriers: The full length of the dredge corridor will be divided into segments referred to as dredge zones. A dredge zone of 150 m to 200 m in length is manageable and is a function of practical fish salvage, dredging production swaths and third party river activities. Each dredge zone will be dredged individually and in a sequential program.

Double turbidity barriers would be suspended in the water column around individual dredge zones. A turbidity barrier is a geotextile fabric similar to silt fencing that is suspended from an upper sleeve float and weighed down with chain links in a bottom sleeve. As a zone is dredged, a new zone would be isolated until the full corridor is dredged. A snap shot of the zones during mid-production should result in fishing of zone 3 (lead), dredging of zone 2

(production) and stabilization of zone 1 (removal turbidity barriers post dredge activity/turbidity settlement). This protocol would carry through subsequent zones until the turbidity barriers in the final zone have been removed after the stabilization period.

The combination of dredge zones would not block the flow of water, prevent fish migration or restrict boat traffic. The double turbidity barrier system is made up of an inner curtain and a second outer curtain. The inner curtain is the primary barrier to prevent suspended sediments from dispersing to the open water environment. The outer curtain facilitates two purposes: i) to prevent fish and other marine species from migrating into the dredge zone; and ii) to provide secondary containment in the event the inner curtain is breached. The outer curtain should be separated from the inner curtain by a minimum buffer of 4 m. This allows for the monitoring of water quality within the buffer annulus and if there is a breach of the inner curtain, then the suspended cloud plume of escaped sediment is easier to trace.

There is the possibility that the bottom sleeve of the curtain would not seal with the river bottom due to aquatic vegetation growth. If this could occur, the vegetation in the dredge zone should be mowed with a boat mounted oscillating cutter bar prior to the deployment of the barriers.

b) Wildlife Capture and Release: Best management practices would be put in place to prevent wildlife from being stranded within the lead dredge zone. The techniques vary but for shallow water containing dense aquatic vegetation, fish capture with minnow traps, electroshocking, hoop net traps and/or bag seine nets are effective. Hoop traps and basking traps are similarly effective for capturing turtles. The duration of wildlife capture and release outside of each lead dredge zone will vary, subject to the number and type of species that are caught.

c) Dredging: The river bottom is soft sediment comprised of organic matter and fine grain inert soil, such as silt. Dredging of this material can be done with a self-propelled hydraulic auger-head dredge. This is a barge like vessel complete with hopper suction inlet at the bow, discharge outlet/pipeline connection at the stern, split twin paddle wheels at the stern, diesel power plant, hydraulic drives, high solids suction pump and a control/instrumentation operator's cab.

Vegetation in the water column and roots in the upper layers of sediment are anticipated to be encountered which will require the need for a weed cutter head attachment. The cutter head auger and suction inlet is housed within a wide mouth inlet that can dredge a 2 m to 3 m swath depending on the size of the dredge model. The depth of cut is dependent on the resistance the grade bar encounters due to roots and compact sediment. The self-propelled mechanism is a stern drive paddle wheel that thrusts against water and in some cases, such as in shallow water with a firm bottom (sand), crawls along the bottom. Thrust can be increased with dead-man weights, cables and winches for long deep cutting production passes.

The dredge will require one to two support work boats to assist in towing and repositioning for each pass. Multiple passes will be required. In addition to work boats, a refuelling barge with double wall enviro fuel tank will also be needed on a daily basis to refuel the dredge unit(s). Spill response kits will be required on all water based work units. The hydraulic fluid for the drives on the dredge units is ecologically friendly (vegetable based oils). At this stage, water access for the dredge and associated equipment could be from existing marine facilities on either the east or west shore.

If the schedule limits the dredging window of opportunity and if there is sufficient working space, a second dredge could be deployed. With two dredges, the first unit can make passes with the weed cutter head attachment, but tends to have a low daily sediment production rate. The second unit would be a high daily sediment production unit as it will not be encumbered with cutting, augering and hydraulic suction of weeds and roots. The production unit will auger sediment, draw by hydraulic suction and pump slurry on a steady production program.

Survey control of the dredge would be done by electronic devices such as global position system (GPS), auger head dipstick depth gauge and portable laptop data collector. GPS tracking is full time in real time kinematics (RTK) and displayed live on the laptop with AutoCAD mapping in the background. The benefit of RTK data logging is the operator can maintain horizontal control of the dredge passes and adjust bearing and offset as required to maintain course. Depth measurement is by manual survey down to the cutter bar. Accurate verification of the dredge pass depths can be done by a support survey boat equipped with RTK GPS, depth sounding sonar and portable laptop. Permanent water elevation gauges would be installed at each shoreline and at intermediate points along the crossing for the purpose of recalibrating the datum elevation for the sonar transponder. Data could then be down loaded into modelling software for comparison of the RTK digital terrain model (DTM) and the design DTM. This data can also be up loaded to the dredge operator laptop for the purposes of planning the dredge depth swaths for the next shift.

d) Transport and Disposal: Prior to transporting the dredged material to an approved landfill facility off-site, the in-situ sediment will be mixed with water to form slurry that can range from 5 to 15 percent solids content. This will largely be a function of the specific gravity of the sediment, interference from vegetative stringy matter, hydraulic suction pump capacity and slurry pipeline conveyance to a land based receiving location. Dependent on the in-situ

solids content of the sediment which can vary significantly from organic sediment (low percent solids) to sand sediment (high percent solids) the volume of additional water to dilute the sediment into transportable slurry for pipeline flow will vary. The main portion of the pipeline will likely be butt fused HDPE pipe and located generally beyond the limits of an active dredge zone. It is anticipated the pipeline will be suspended in the water with floats. At the navigable channel, the pipeline will need to be weighed down near the channel bottom. The same HDPE pipe construction would carry beyond the shoreline as a ground surface laid pipeline to the land base disposal site. Within the active dredge zone the pipe will be a flexible hose, suspended from floats and connected to the discharge of the dredge unit outlet.

The width of the water crossing is approaching a limiting distance for slurry pipeline conveyance of heavy solids slurry. It is possible the furthest dredge zones will see a decrease in daily sediment production due to the need to reduce solids content in order to maintain flow velocities in the pipeline. A floating in-line booster pump is feasible; however, the preference is for a land based booster pump(s). In the event there is a need for in-line booster pumps to augment the capacity of the dredge suction pump it is best to interlock the pump operations. This can be done manually with full time pump operators and hand held radio control or unmanned and remotely controlled with electronic control devices from the dredge operator's cab.

.2 Temporary Facilities and Lay-Down Areas

Temporary office and parking facilities as well as equipment and material lay-down areas will be required for the duration of the construction period. As shown earlier on Drawings 4.25 and 4.26, it is anticipated that, due to a lack of available vacant land near the project site location, certain privately owned properties (either in whole or in part) on the west side and a portion of the lower plateau of the Gore Road Library on the east side will be required. Due to limited working space at the project site location, it is also anticipated that most of the on-site storage and temporary facilities would be located on the east side of the river, west of the Gore Road Library. Access to this area would be directly from Kingston Road 15, north of the library building. Moreover, parking for construction workers will most likely be limited on-site. It is thus anticipated that a remote off-site facility would be required for parking along with shuttle service provided to and from the project site location. In order to limit the disturbed area, the steel box girder and precast bridge components could be fabricated in an approved off-site facility. Following construction, the temporary facilities will be removed and the disturbed areas will then be part of the landscape improvement works shown earlier on Drawings 4.25 and 4.26.

.3 Superstructure Construction and Installation

As noted earlier, the bedrock surface appears to be variable across the project site location. It is exposed or near surface on both sides of the Cataraqui River (at an elevation of 73 m at the east bank and 76 m at the west bank) and then dips to elevations ranging from elevation 30 m to elevation 55 m within the river. As such, the bridge superstructure will require deep foundations, which will be installed by the Contractor. Potential installation options include driven piles or drilled foundations such as large diameter concrete caissons, which are highlighted below:

1. Driven steel H-piles or pipe piles are usually 18 m long and would require two or more welded splices on-site. The piles would then be installed using a barge mounted pile driving hammer. The size of the barge and hammer equipment would determine the size and number of required piles. Pile caps/footings would also be needed at or below the top of the riverbed/waterline, as the base for the double v-pier columns. Sheet pile cofferdams would be used if the footings are installed below the waterline in order to construct the footings in the dry. The sheet piles could be driven by barge mounted cranes. If the footings are installed above the waterline, the formwork footing could be mounted on the piles protruding above the waterline. Driven steel H-piles or pipe piles have the advantages of faster installation, no tailings and better adaptability to varying bedrock depths. However, the use of pile driving hammers and sheet pile cofferdams generate major noise and potentially harmful impacts on the marine environment. This latter point also applies to formwork footings that protrude above the waterline, in that they have the potential to attract debris (wind-or-water-sourced).

2. Drilled shafts for large diameter caissons will require barge mounted cranes and steel casings. Drilling slurry will likely be required and preventive measures will need to be in place to avoid spillage of the slurry into the Cataraqui River. The steel casing will remain below the top of the riverbed. The double v-pier columns would then be extended directly from the top of the large diameter caissons, without the need for footings below the waterline. The formwork for the double v-pier columns would preferably be made of steel so that it is watertight and durable for repeated use. Alternatively, they could be made of segmental precast concrete sections and post-tensioned together.

The use of rock socketed piles was selected as the basis for the conceptual design as they are the least intrusive and have the smallest environmental impact of the various types of pile foundation available. Pile casings would be located in position and driven or vibrated through the silts and overburden to contact with the underlying rock. The casings would then be driven into the rock to obtain a seal. The depth of penetration into the rock would be dependent on the hardness of the rock, but is usually in the order of 500 mm. Silt and over burden would then be removed from inside the pile and pumped to a settling pond onshore. There is some vibration and sound waves generated in this part of the operation but it is limited.

The use of air-bubble curtains could further mitigate vibration and sound effects, if needed. Once dewatered, the sediment would be tested for contaminants. Disposal would be dependent on the presence and level of contaminants. It could either be transported to an approved landfill facility off-site or, if it is clean fill, taken to another construction site. The piles would be drilled into the rock to the specified design depth. Drilling could be performed using a variety of equipment (either coring or drilling). The environmental effects of either option are similar and limited since all work would be performed inside of the casing. The drilled rock would then be removed to a spoil barge and taken to an approved landfill facility off-site.

Concrete could either be delivered by barge (with the truck on the barge) or pumped using a line pump from shore. Barge/truck delivery is considered more likely as volumes in each pile are small relative to the amount required to charge the pump and fill the line, which could be up to 500 m in length. Water access for construction barges and associated equipment would be mainly from the east shore at this stage, given the likelihood that most of the on-site storage and temporary facilities would be located on the east side of the river. Water access from the west shore would also be available, as needed and logistically practical. Since the concrete would be delivered directly to the pile location, no environmental impacts are anticipated. Once the piles are complete at each pier location, temporary supports for pier cap construction would be attached to the piles.

The v-piers may require temporary support during construction. Steel piles would be driven to achieve the required bearing capacity and completely removed after construction. If the Contractor sequenced the work from east-to-west (or longer to shorter) then the steel piles could be reused. Alternatively, there could be a series of horizontal ties to provide temporary support for the inclined legs of the piers.

In addition, shallow foundations bearing on the limestone bedrock may be used for the support of the bridge abutments. As noted earlier, the bedrock surface at the east and west banks are at relative shallow depths of about 1.7 m and 3.1 m, respectively. Due to the possible presence of frost susceptible materials in joints and seams within the bedrock, the bedrock is considered to be potentially frost susceptible. Therefore, foundations founded directly on the bedrock will require at least 1.6 m of earth cover for frost protection purposes.

.4 Bridge Deck Construction and Installation

Various options exist for the construction of the concrete deck slabs by the Contractor, including: i) cast-in-place concrete; ii) partial depth precast panels with cast-in-place topping; or iii) full depth precast concrete panels. The use of full depth precast deck panels would minimize on-site construction time. The panels are biaxially pre-stressed (both in the longitudinal and transverse directions) to minimize cracking, which increases their durability (the elliptical paraboloid shell soffit allows for the optimization of the panel weight). These panels could be fabricated in either the on-site lay-down areas or an approved off-site facility and transported by barges. Local aggregates would be used for concrete construction to the greatest extent possible, subject to availability.

The steel girders and precast components could be delivered by either barges or road. The steel girder segments would be between 20 m and 50 m in length depending on the capacity of the fabrication plant, mode of transportation and the erection method to be used. The girders could be erected by cranes mounted on barges. For each span, the pier girders would be erected first, followed by the infill segment. Other methods of girder erection, such as the use of temporary piers, span-by-span erection using traveling cranes and launching methods could also be used. However, girder erection using barges provides faster installation and minimizes risks to the marine environment.

The arch span could be fabricated in an approved off-site facility and then transported by barges and lifted into place by cable suspenders from the piers. Alternatively, the arch segments could be fabricated in smaller segments and bolted together in the on-site lay-down areas. In this latter case, the box girders and tie girders at the deck level would have to be designed to temporarily support the weight of the arch segments or shoring would have to be extended from the Cataraqui River.

The precast deck panels could be erected sequentially, panel by adjacent panel, by moving the crane over the previously completed part. Fast-setting grout would be used to connect the panels to steel girders. The size of the panels would be maximized if they are cast on-site. If they are cast in an approved off-site facility and transported by barges, the panels would be approximately 3.6 m wide by 24 m long. Therefore, 330 panels would be required. If these panels were transported by truck, each panel would have to be transported separately, which would generate significantly higher truck traffic to the site and require a larger lay-down area.

.5 Utility Installations

As stated earlier, there are three existing Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the project location area. Hydro One has acknowledged that it would need four 100 mm ducts concealed in the bridge girder superstructure to accommodate the future replacement of this infrastructure. Utilities Kingston, which provides asset management, billing and operational services to utilities in the water and wastewater, natural gas and electricity industries in the City, has made a similar request on behalf of Kingston Hydro. In addition, and as noted earlier, Utilities Kingston has requested that an east-west watermain be installed within the dredged channel, as it is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of the project site location); and improve the redundancy in the municipal water system on the east side of the Cataraqui River.

All existing and new utility connections and relocations, including related approvals, will be coordinated with the appropriate authorities during the preliminary and detailed design phase. The actual work will be undertaken directly by the authority or by approved Contractors.

.6 Road and Sound Attenuation Works

As shown earlier on Drawing 4.25, the existing horizontal alignment of John Counter Boulevard will then be widened to municipal standards by the Contractor in order to accommodate:

1. For westbound travel:
   a) Two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at the Village On The River apartment access on the south side of John Counter Boulevard and shared through/right-turn access into the River Park subdivision on the north side of John Counter Boulevard; and
   b) A 3.25 m wide by 60 m long left-turn bay and right-turn bay at Montreal Street.
2. For eastbound travel, two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at the River Park subdivision access and shared through/right-turn access into the Village On The River apartments.
3. Provisions for a median barrier separating the eastbound and westbound vehicular lanes.
4. The 3.6 m wide multi-use trail and 1.5 m wide commuter cycling lane on the south side of the bridge continuing along the south side of John Counter Boulevard to Montreal Street and connecting with the existing Elliott Avenue Parkette recreational trail on-land by a 3.6 m wide multi-use trail.
5. The 1.5 m wide commuter cycling lane on the north side of the bridge continuing along the north side of John Counter Boulevard to Montreal Street and also connecting with the existing Elliott Avenue Parkette on-land by a 3.6 m wide multi-use trail under the bridge.
6. A 1.5 m wide sidewalk on the north side of John Counter Boulevard extending from the multi-use trail access to Montreal Street.

As shown earlier on Drawing 4.26, the existing horizontal alignment of Gore Road will also be widened to municipal standards by the contractor in order to accommodate:

1. For westbound travel, two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at Point St. Mark Drive and a right turn option at the Gore Road Library.
2. For eastbound travel, two 3.5 m wide vehicular lanes along with:
   a) A 3.25 m wide by 60 m long left-turn bay, through lane/left-turn lane and right-turn lane option east of Point St. Mark Drive at Kingston Road 15;
   b) A 3.25 m wide by 20 m long left-turn bay at the Gore Road Library; and
   c) A right-turn option at Point St. Mark Drive.
3. Provisions for a median barrier separating the eastbound and westbound vehicular lanes.
4. The 3.6 m wide multi-use trail on the south side of the bridge:
   a) Continuing along the south side of Gore Road west of Point St. Mark Drive and connecting to the existing trail into the Point St. Mark residential neighbourhood; and
   b) Extending under the bridge to connect with the trail network on the Gore Road Library property.
5. A 1.5 m commuter cycling lane on both sides of Gore Road.
6. The existing 1.5 m wide sidewalk on the south side of Gore Road east of Point St. Mark Drive to Kingston Road 15.

Local aggregates would be used for the roadway works to the greatest extent possible, subject to availability.

As also shown earlier on Drawing 4.35, the four sound attenuation barriers would also be installed at the following locations to reduce the predicted sound levels from the project at noise-sensitive areas:

1. Adjacent to the River Park subdivision along the north side of John Counter Boulevard:
   a) A 3 m high by 110 m long wall and/or berm extending west from the John Counter Boulevard-Ascot Lane intersection; and
   b) A 3 m high by 96 m long wall and/or berm extending east from the John Counter Boulevard-Ascot Lane intersection.
2. Adjacent to the Point St. Mark subdivision along the south side of Gore Road:
   a) A 3 m high by 410 m long wall extending west from the Gore Road-Point St. Mark intersection onto the south side of the bridge deck and ending proximate to the Rideau Canal's navigable channel; and

b) A 2.4 m high by 96 m long wall extending east from the Gore Road-Point St. Mark intersection and ending proximate to the Gore Road-Kingston Road 15 intersection.

.7 Waste Management Systems

The following waste management systems will be required during the construction period:

1. Temporary on-site holding tanks will manage the effluent from construction washrooms and related facilities and will be located at least 30 m from the shorelines. A licensed operator will be engaged to provide regular pump-out and haulage services to an approved water pollution control plant for disposal and treatment.

2. Construction debris will be sorted for recycling. Non-recyclable waste will be stored separately for disposal within areas that are at least 30 m from the shorelines and protected by silt fencing. All construction waste will be hauled off-site by licensed operators to approved facilities.

3. Groundwater or runoff will be discharged into a stilling basin or sediment trap prior to being released into the City's existing storm drainage works.

4. Double lined fuel storage tanks with vacuum monitors will be used for centralized vehicle fuelling purposes. Equipment refueling and maintenance will occur in designated areas equipped with appropriate spill containment measures. Emergency response procedures, equipment and materials will be in place to respond to any fuel or hydraulic leaks that may occur.

.8 Natural Environment Enhancement

Following construction, the temporary facilities will be removed. The provisions in the Natural Environment Enhancement Plan, related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and the landscape improvement works (as shown on Drawings 4.25 and 4.26), will then be installed.

5.1.2 Operations Phase

Maintenance is required to ensure public safety, serviceability and durability of the infrastructure. Maintenance activities will occur at programmed intervals which will be outlined in an O & M Manual, and as-required in response to the inspection process. These activities are highlighted in Table 5.1 below.

Table 5.1
Project Maintenance Activities

Programmed Maintenance Activities	Responsive Maintenance Activities
Sweeping and washing the bridge deck, multi-use trails, seats, caps and salt spray zones	Resealing expansion joints
Cleaning the bridge drainage systems	Repainting structural steel members
Cleaning and lubricating the expansion bearing assemblies	Replacing wearing surfaces
Sealing the exposed concrete elements	Extending or enlarging the bridge deck drains
Patching the bridge deck	Replacing damage from vehicles hitting the structure

The best management practices and mitigation measures noted earlier will be in place as part of the operations phase of the project. They are more specifically applied to the project operations activities later in this Report. In addition, it should also be noted that as needed maintenance requirements would be reduced with appropriate selection of bridge materials and details. For example, some of the materials and details that could be considered are:

1. Full depth precast pre-stressed concrete panels for the bridge deck.

2. Stainless steel or FRP reinforcement in barriers.

3. Bridge deck waterproofing.

4. Asphalt concrete deck wearing surface.

5. Long durability painting of the structural steel components.

6. Polymer wrap around the base of the piers in the water fluctuation/splash zone.

7. Fixed Automated Spray Technology (FAST) for the automatic de-icing system.

8. Solar panels for the bridge lighting/deck heating.

9. Structural Health Monitoring systems.

10. Vandal resistant coating.

11. LED light fixtures.

12. Minimize the number of expansion joints.

13. Minimize the number of bearings and, where required, use bearings requiring low maintenance.

14. Minimize the number of steel girder splices.

A Life Cycle Cost Analysis should be undertaken during the detailed design stage for selecting the appropriate materials and methods. This analysis should take into consideration the environmental and societal factors such as sustainability and climate change effects, user costs and serviceability.

5.1.3 Decommissioning Phase

As noted earlier, the CHBDC requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics to those within the project site location typically have a design life of at least 100 years. It is anticipated that the materials and methods of bridge construction could extend the design life of the bridge at the project site location well in excess of 100 years.

However, this Report acknowledges that the bridge may need to be decommissioned for a number of reasons, including functional obsolescence or irreparable damage due to highly improbable human-made disasters or natural causes such as earthquakes or wind producing forces in excess of design forces. If or when the bridge becomes functionally obsolete, a change of use on the bridge may also be considered, such as commercial or residential structures that are supported by the bridge. This was done, for example, on the London Bridge in the 17th Century. But if the structure is to be removed, the basic procedure would closely follow activities associated with the construction phase. It is briefly outlined below:

1. Install temporary work platforms and dust enclosures, as necessary.

2. Remove the barriers, bridge railing and deck slab, starting from the middle and progressing towards the abutments. The use of barges will expedite the removal, transportation and disposal of the materials at approved facilities. The use of full depth precast components for the deck slab is beneficial in this regard. The deck slab segments could be salvaged. The concrete could be crushed for reuse as construction aggregate and the steel could also be recycled.

3. Remove the girder segments by disconnecting them at the splice points. The girders could either be salvaged or recycled.

4. Cut off the piers below the top of the riverbed and leave the foundation caissons in place. The use of precast pier segments would expedite removal.

5. Undertake rehabilitation works at the project site location, as necessary.

Given the projected design life of the project, more specific details regarding decommissioning and rehabilitation works are premature at this time. Still, it is anticipated that it would take up to two years to complete and that similar best management practices and mitigation measures used during the project construction phase would be part of a Decommissioning Plan (DP). A Decommissioning CAP (D-CAP), similar to the CAP that will be in place from the start of the construction phase and extend into the operation phase, would also be part of the project decommissioning phase. The D-CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge decommissioning and site rehabilitation activities.

Such measures are more specifically applied to the project decommissioning activities later in this Report. It should also be noted that, if and when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.

5.2 Project Effects

There are two important tools that will be administered by the City during future project phases to mitigate potential adverse environmental effects. The first tool deals with the preparation and implementation of a Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including the recommended mitigation measures contained in this Report. The second tool deals with the preparation and implementation of a Community Action Plan (CAP) that will be in place from the start of the construction phase and extend into the operation phase of the project. The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

The evaluation of project effects on valued ecosystem components (VECs) impacted during the construction, operations and decommissioning phases of the project are shown in Tables 5.2, 5.3 and 5.4, respectively.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
1. Air Quality (Particulate Matter)	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Malfunctions and Accidents	1.1 Diesel exhaust emissions from heavy equipment.	1.1.1 Diesel exhaust emissions, which are largely unavoidable due to the type of equipment needed during the construction phase.	1.1.2 (a) In accordance with the C-NHPP, all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time. (b) Construction is temporary and expected to last 24 to 36 months. (c) The CAP will detail the response plan to be implemented if public complaints are received.	M	I	S	I	R	L	The residual environmental effect will be Low to reflect existing land uses in relation to weekday construction activities, the short-term duration of construction and the proposed mitigation measures.
		1.2 Airborne dust from heavy equipment operations.	1.2.1 There is potential for airborne dust to be generated by equipment operations, construction traffic or the wind.	1.2.2 (a) In accordance with the C-NHPP, dust suppression techniques will be used by the Contractor such as watering on construction access roads and sweeping at construction site entrances. (b) Construction is temporary and expected to last 24 to 36 months. (c) Site re-vegetation will be undertaken as soon as is practical following the construction phase to minimize airborne dust. (d) The CAP will detail the response plan to be implemented if public complaints are received.	M	I	S	I	R	L	The residual environmental effect will be Low to reflect existing land uses in relation to weekday construction activities, the short-term duration of construction and the proposed mitigation measures.
		1.3 Unplanned events.	1.3.1 Accidental discharges of airborne matter can result in a degradation of the air quality at nearby points of reception.	1.3.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition; ii. river water quality will be monitored north and south of the site for turbidity, suspended soils, nutrients and contaminants; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.	M	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
2. Air Quality (Noise)	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Malfunctions and Accidents	2.1 Noise emissions from heavy equipment.	2.1.1 Noise emissions, which are largely unavoidable due to the type of equipment needed during the construction phase.	2.1.2 (a) In accordance with the C-NHPP: i. all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; and ii. works will be undertaken in accordance with the City's Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) and Provincial guidelines current at that time. (b) Construction is temporary and expected to last 24 to 36 months. (c) The CAP will detail the response plan to be implemented if public complaints are received.	M	I	S	I	R	L	The residual environmental effect will be Low to reflect existing land uses in relation to weekday construction activities, the short-term duration of construction and the proposed mitigation measures.
		2.2 Unplanned events.	2.2.1 Accidental high noise events can result in disturbance to residents and wildlife. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.	2.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. works will be undertaken in accordance with the City's Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) to avoid potential effects of noise on the natural environment; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for	M	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.							
3. Soil and Groundwater	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Waste Management Systems Malfunctions and Accidents	3.1 Soil erosion and sediment deposition.	3.1.1 There is potential for soil erosion and sediment deposition.	3.1.2 (a) In accordance with the C-NHPP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.	H	I	S	I	R	L	The residual environmental effect will be Minimal given the proposed mitigation measures.
		3.2 Unplanned events.	3.2.1 There is the potential to uncover contaminated soils. Also, accidental spills of hazardous materials can result in groundwater contamination. Note groundwater should not be encountered during the construction phase.	3.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
4. Surface Water	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation	4.1 Soil erosion and sediment loading.	4.1.1 There is potential for soil erosion and sediment deposition.	4.1.2 (a) In accordance with the C-NHPP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; iv. the on-land erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works; and v. silt curtains and/or turbidity barriers will be installed in advance of in-water removal of aquatic vegetation or substrate and kept in place, monitored and maintained until the sediments within the	H	I	S	I	R	L	The residual environmental effect will be Minimal given the proposed mitigation measures.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
	Utility Installations Road and Landscape Works Waste Management Systems Malfunctions and Accidents	4.2 Unplanned events.	4.2.1 Accidental spills of hazardous materials can result in surface water contamination.	affected area have settled. 4.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
5. Vegetation	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations	5.1 Change in vegetation diversity.	5.1.1 Vegetation removal will be required during the construction phase. Note: a) there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory; and b) the marine environment is currently dominated by one type of submerged vegetation (Milfoil).	5.1.2 (a) In accordance with the C-NHPP: i. surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and ii. the removal of shoreline vegetation will be minimized. (b) The landscape improvement works represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands. (c) The implementation of the Natural Environment Enhancement Plan will include detailed design measures related to wetland restoration, aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking) as well as stabilizing and rehabilitating the shoreline shallows.	H	L	S	I	R	L	The short-term residual environmental effect will be Low and the mid-to-long-term residual environmental effect will be Positive to reflect: (a) the short-term duration of construction; (b) the characteristics of the existing vegetation; and (c) the proposed mitigation measures.
	Road and Landscape Works Malfunctions and Accidents	5.2 Unplanned events.	5.2.1 Accidental spills of hazardous materials can result in degradation to vegetated areas.	5.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; viii river water quality will be monitored north and south of the site for turbidity, suspended soils, nutrients and contaminants; ix. in-water works will be suspended during periods of heavy rain and high wind events; and x. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.							
6. Wildlife Habitat	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Malfunctions and Accidents	6.1 Sensory disturbance.	6.1.1 There is potential for increased levels of sensory disturbance to local wildlife due to the types of activities and equipment used during the construction phase. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.	6.1.2 (a) In accordance with the C-NHPP: i. advance inspections will be done in areas slated for site preparation and construction activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; ii. site preparation and construction activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts; iii. all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; and iv. works will be undertaken in accordance with the City's Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) to avoid potential effects of noise and artificial night lighting on the natural environment.	L	I	S	I	R	L	The residual environmental effects will be Minimal given the proposed mitigation measures.
		6.2 Loss and fragmentation.	6.2.1 There is potential for habitat loss and fragmentation of habitat due to the types of activities and equipment used during the construction phase. Note there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory.	6.2.2 (a) In accordance with the C-NHPP: i. surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and ii. the removal of shoreline vegetation will be minimized and done using small machinery. (b) The landscape improvement works represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands.	L/M	I	S	I	R	L	The short-term residual environmental effect will be Low and the mid-to-long-term residual environmental effect will be Positive to reflect: (a) the short-term duration of construction; (b) the characteristics of the existing vegetation; and

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
											(c) the proposed mitigation measures.
		6.3 Mortality risk.	6.3.1 There is potential for wildlife to experience an increased risk of mortality due to the types of activities and equipment used during the construction phase.	6.3.2 (a) In accordance with the C-NHPP: i. advance inspections will be done in areas slated for site preparation and construction activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; and ii. site preparation and construction activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts.	L/M	I	S	I	R	L	The residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to the short-term duration of construction and the proposed mitigation measures.
		6.4 Unplanned events.	6.4.1 Accidental spills of hazardous materials can result in degradation to wildlife habitat.	6.4.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
7. Aquatic Habitat	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck	7.1 Mortality risk.	7.1.1 There is potential for aquatic wildlife to experience an increased risk of mortality due to loss of wetland structure or function resulting from the types of activities and equipment used during the construction phase.	7.1.2 (a) In accordance with the C-NHPP: i. advance inspections will be done in areas slated for site preparation and construction activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and to restrict wildlife access; ii. site preparation and construction activities will be scheduled to avoid sensitive areas as well as spawning seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and	L/M	I	S	I	R	L	The short-term residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to: (a) the short-term duration of construction; (b) the characteristics of the existing aquatic vegetation; and

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
	Construction and Installation Utility Installations Road and Landscape Works Malfunctions and Accidents	7.2 Unplanned events.	7.2.1 Accidental spills of hazardous materials can result in degradation to aquatic habitat.	7.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; viii. river water quality will be monitored north and south of the site for turbidity, suspended soils, nutrients and contaminants; ix. in-water works will be suspended during periods of heavy rain and high wind events; and x. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
8. Cultural Heritage Resources	Site Preparation Temporary Facilities and Lay-Down Areas Road and Landscape Works	8.1 Loss and fragmentation.	8.1.1 The potential for the loss and fragmentation of the Rideau Canal.	8.1.2 (a) The bridge provides two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look and the slender look of the girder, minimize visual impacts by providing a more open viewscape of the cultural heritage landscape from the water and on-shore. (b) The bridge is able to span over the Rideau Canal's navigable	H	L	S	I	R	L	The short-term residual environmental effect will be Low to reflect construction in relation to its short-term duration and the proposed mitigation measures. Also, the mid-to-long-term

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
	Malfunctions and Accidents			channel and adjacent rowing lanes, while the arch over the canal's navigable channel highlights the bridge as a 21st Century 'gateway' to/from the canal. (c) The bridge alignment is an organic reflection of the transitional context between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west. (d) The bridge clearance above the water exceeds the canal's Federally regulated navigable requirement and also mitigates visual impacts, in that its silhouette would be below the tree line when viewed from the water and on-shore. (e) The observation areas provide opportunities for residents to enjoy views of and/or learn about the canal, Belle Island, Belle Park and the marsh.							residual environmental effect will be Positive given the proposed mitigation measures.
		8.2 Loss and fragmentation.	8.2.1 The potential for the loss and fragmentation of the Gore Road Library.	8.2.2 (a) The condition of historic structures will be documented in advance of site preparation works and during construction activities to ensure that any adverse effects are promptly addressed. (b) Historic structures will be protected from direct impact by vehicles during site preparation and construction activities. (c) The condition of trees and plantings along the southern boundary of the property will be assessed and those specimens having historical significance will either be avoided or relocated to other suitable locations on the property, as feasible and appropriate. (d) Despite efforts to avoid the impact on the dry stone wall: i. only a 12 m portion will be affected by the widening of Gore Road, which is needed to meet safety and traffic requirements in road construction; ii. the affected portion will be reconstructed by a qualified heritage stonemason and will be rebuilt as a continuation of the existing wall, but at right angles and heading eastward on a parallel to Gore Road (the latter as per the request of representatives of the Kingston Heritage Advisory Committee), as shown on Drawing 4.26; and iii. the condition of the remaining dry stone wall will be assessed by a qualified heritage stonemason. (e) An Interpretation Plan will be prepared that both documents and presents the known history of the property in situ. (f) The landscape improvement works represent an opportunity for a degree of ecological compensation, while the interconnected trail network enhances existing non-automotive networks. (g) The observation areas provide opportunities for residents to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.	H	L	S	I	R	L	The short-term residual environmental effect will be Low to reflect construction in relation to its short-term duration and the proposed mitigation measures. Also, the mid-to-long-term residual environmental effect will be Positive given the proposed mitigation measures.
		8.3 Loss and fragmentation.	8.3.1 The potential for the loss and fragmentation of previously undocumented cultural heritage resources. Note the Stage 1 and Stage 2 cultural heritage survey work did not identify any other cultural heritage properties on the City's heritage list or any properties with potential cultural heritage value at the project site location.	8.3.2 (a) In accordance with the C-NHPP, notification and mitigation protocols will be in place regarding the discovery of previously undocumented cultural heritage resources.	L	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the cultural heritage characteristics of the project site location; and (b) the proposed mitigation measures.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
9. Archaeological Resources	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Malfunctions and Accidents	9.1 Loss and fragmentation.	9.1.1 The potential for the loss and fragmentation of archaeological site BbGc-127.	9.1.2 (a) In accordance with the C-NHPP, in advance of site preparation works, archaeological site BbGc-127 will be removed and documented though archaeological excavation in order to mitigate the risk of the site being damaged.	H	I	L	I	R	L	The short-term residual environmental effect will be Low/Medium to reflect the archaeological excavation protocol and the mid-to-long-term residual environmental effect will be Minimal as archaeological excavation will mitigate the risk of the site being damaged.
		9.2 Loss and fragmentation.	9.2.1 The potential for the loss and fragmentation of previously undocumented archaeological resources. Note: (a) Apart from Archaeological Site BbGc-127, no other archaeological materials were located on the east side lands during the terrestrial archaeological fieldwork. (b) No archaeological materials were located at the project site location during the marine archaeological fieldwork. (c) Visual examination of the west side lands suggests the John Counter Boulevard right-of-way has been extensively disturbed but the private lands may contain areas where archaeological potential still remains.	9.2.2 (a) In accordance with the C-NHPP: i. excavated materials will be periodically monitored to minimize potential impacts to previously undocumented archaeological resources; ii. in situ preservation or excavation and removal measures as well as notification protocols will be in place regarding the discovery of previously undocumented archaeological resources; and iii. protocols will be in place in the event that human remains are encountered (work stoppage, notification and mitigation).	L	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the archaeological characteristics of the project site location; and (b) the proposed mitigation measures.
10. Local Community	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Waste Management Systems Malfunctions and Accidents	10.1 Compatibility.	10.1.1 (a) Diesel exhaust emissions, airborne dust and noise emissions, which are largely unavoidable due to the type of equipment needed during the construction phase. (b) Vegetation removal will be required during the construction phase. (c) Access to the site will be via major roads such as Montreal Street and Kingston Road 15. Access to the main construction lay-down and staging area on the east side (west of the Gore Road Library) will be directly from Kingston Road 15, north of the library building. (d) Private property acquisition will be required on the west side lands for reconfigured and expanded road, trail and landscaping works, stormwater management and bridge construction lay-down and staging areas. (e) The proposed interim three-lane and ultimate four-lane bridge deck would not conform to the Official Plan.	10.1.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment and noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; ii. dust suppression techniques will be used by the Contractor such as watering on construction access roads and sweeping at construction site entrances; iii. the removal of shoreline vegetation will be minimized; iv. the landscape improvement works will be undertaken as soon as is practical following the construction phase to minimize airborne dust and create/re-create naturalized landscapes on the west and east side lands, respectively; v. works will be undertaken in accordance with the City's Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) and Provincial guidelines current at that time; vi. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures; vii. all heavy equipment will be required to operate and re-fuel in designated areas; viii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; ix. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River;	M	I/L	S	I	R	L	The residual environmental effect will be Low to reflect existing land uses in relation to weekday construction activities, the short-term duration of construction and the proposed mitigation measures.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				x. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; xi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and xii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) Construction is temporary and expected to last 24 to 36 months. In the long-term, the landscape and trail improvements and the public realm areas will enhance the natural and built environments in the area. (c) Private property acquisition by the City would proceed as per the Expropriation Act. (d) The need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is recognized in the staged bridge configuration design approach which can respond to monitoring of future traffic conditions. Also, the Official Plan is subject to review at least every five years. (e) The CAP will detail the response plan to be implemented if public complaints are received.							
		10.2 Unplanned events.	10.2.1 Traffic accidents as well as accidental spills, discharge of airborne matter or noise and contaminated soil discoveries can negatively impact the quality of life in the local community.	10.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response; iv. works will be undertaken in accordance with the City's Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) to avoid potential effects of noise on the natural environment; v. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; vi. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; vii. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; viii ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; ix. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; x. river water quality will be monitored north and south of the site for	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				turbidity, suspended soils, nutrients and contaminants; and xi. in-water works will be suspended during periods of heavy rain and high wind events. (b) The CAP will detail the response plan to be implemented if public complaints are received.							
11. Roads and Road Traffic, Boat Traffic	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Waste Management Systems Malfunctions and Accidents	11.1 Level of service.	11.1.1 (a) Road and boat traffic patterns will change as additional traffic will use the roads and water in the area due to the types of activities and equipment needed to carry out the construction phase. (b) Land access to the site will be via major roads such as Montreal Street and Kingston Road 15. Access to the main construction lay-down and staging area on the east side (west of the Gore Road Library) will be directly from Kingston Road 15, north of the library building. Parking for construction workers will most likely be limited on-site. (c) Initial water access to the site for dredging activities could be from existing marine facilities on either the east or west shore. As construction progresses, water access for construction barges and associated equipment would be mainly from the east shore, given the likelihood that the main construction lay-down and staging area would be located on the east side of the river. Water access from the west shore would also be available, as needed and logistically practical.	11.1.2 (a) In accordance with the C-NHPP: i. anticipated road and boat traffic volumes to and from the site will be documented; ii. site preparation and construction activities will be undertaken in accordance with the City's Noise By-Law (unless otherwise necessary and subject to Council notification and conditions); iii. site preparation and construction activities will also be scheduled and coordinated in consultation with: (a) the Kingston Rowing Club and Queens Rowing Club to avoid impacts to the local rowing community as much as possible; and (b) Parks Canada, Department of Fisheries & Oceans and Transport Canada to ensure the Rideau Canal's navigable channel remains open during the construction phase and the arch span bridge section installation in particular occurs during when the channel is officially closed to watercraft; iv. the transport of oversized construction components to the site will require local, Provincial and Federal approvals and may also involve formal transport escort; v. the construction labour force will be encouraged to carpool to and from the site; vi. a remote off-site facility will also be established for construction labour force parking along with shuttle service providing scheduled transport to and from the site; and vii. proper on-site construction signage and controls will be installed for designated areas and traffic lanes to ensure safe and efficient circulation on-land and in-water. (b) Construction is temporary and expected to last 24 to 36 months.	L/M	I	S	I	R	L	The residual environmental effect will be Low to reflect changes to existing road and boat traffic patterns due to weekday construction activities, the short-term duration of construction and the proposed mitigation measures. Also, the mid-to-long-term residual environmental effect will be Positive given the proposed mitigation measures.
		11.2 Unplanned events.	11.2.1 Accidents could negatively impact boat traffic and LOS on roads.	11.2.2 (a) Protocols will be outlined in the C-NHPP regarding: i. minimizing both the duration and severity of any accidents or malfunctions; ii. emergency response procedures; iii. only licensed carriers and operators will be involved during the construction phase; and iv. in-water works will be suspended during periods of heavy rain and high wind events.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
12. Business / Job Opportunities	Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Waste Management Systems	12.1 Employment opportunities and local economic growth.	12.1.1 There is potential for employment and local economic growth throughout the construction phase.	12.1.2 (a) The potential economic opportunities are as follows: i. local aggregates will be used for construction, subject to availability; ii. the employment opportunities during the construction phase are estimated at 300 new jobs over 24 to 36 months; iii. local support businesses will benefit from the construction works and the presence of the construction labour force; and iv. the project represents up to a $200 million investment, which will directly benefit the local community.	H	R	S	C	R	L	The residual economic effect will be Positive.

Note the significance of the residual effects on each VEC is evaluated in Table 5.2 using the following factors as per the CEA Act:

1. ***Magnitude.*** This pertains to the typical effects of the impact on each VEC, which are rated as ‘low’ (L), ‘medium’ (M) or ‘high’ (H).

2. ***Geographic Extent.*** This relates to the area where the effect occurs, which is rated as ‘immediate’ (I), ‘local’ (L) or ‘regional’ (R).

3. ***Duration.*** This regards the duration of the effect on each VEC, which is rated as ‘short term’ (S) or ‘long term’ (L).

4. ***Frequency of Occurrence.*** This pertains to the frequency that the effect occurs, which is rated as ‘intermittent’ (I) or ‘continuous’ (C).

5. ***Reversibility/Irreversibility.*** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be ‘reversed’ (R) and return to its pre-existing situation or is ‘irreversible’ (I).

6. ***Ecological Context.*** This provides an estimate of the ecological value of the area in which the effect occurs, using a ‘low’ (L) or ‘high’ (H) rating.

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
1. Air Quality (Particulate Matter)	Bridge and Road / Water Use Bridge and Road Maintenance	1.1 Exhaust emissions from vehicles.	1.1.1 Emissions are largely unavoidable as vehicle traffic is part of intended use of the bridge and roadways.	1.1.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) The bridge could reduce idling fuel consumption and greenhouse emissions.	L/M	I	L	C	I	H	The residual environmental effect will be Low to reflect existing land uses and the proposed mitigation measures.
	Malfunctions and Accidents	1.2 Airborne dust from maintenance equipment and vehicle traffic.	1.2.1 There is potential for airborne dust to be generated by maintenance equipment operations, vehicle traffic or the wind.	1.2.2 (a) In accordance with the C-NHPP and O & M Manual: i. dust suppression techniques such as watering will be used by the City and/or contractors during programmed and responsive maintenance activities; and ii. all maintenance equipment will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time. (b) The CAP will detail the response plan to be implemented if public complaints are received.	L/M	I	L	C	I	H	The residual environmental effect will be Low to reflect existing land uses and the proposed mitigation measures.
		1.3 Unplanned events.	1.3.1 Accidental discharges of airborne matter can result in a degradation of the air quality at nearby points of reception.	1.3.2 (a) In accordance with the C-NHPP and O & M Manual: i. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; i. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response.	L/M	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
2. Air Quality (Noise)	Bridge and Road / Water Use Bridge and Road Maintenance	2.1 Noise emissions from vehicles.	2.1.1 Emissions are largely unavoidable as vehicle traffic is part of intended use of the bridge and roadways.	2.1.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) The sound attenuation barriers will further reduce the predicted sound levels from the bridge at noise-sensitive areas. (c) The CAP will also detail the response plan to be implemented if public complaints are received.	L/M	I	L	C	I	H	The residual environmental effect will be Low to reflect existing land uses and the proposed mitigation measures.
	Malfunctions and Accidents	2.2 Noise emissions from maintenance equipment.	2.2.1 There is potential for noise from maintenance equipment operations.	2.2.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) The sound attenuation barriers will further reduce the predicted sound levels from the bridge at noise-sensitive areas. (c) In accordance with the C-NHPP and O & M Manual, all maintenance equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time. (d) The CAP will also detail the response plan to be implemented if public complaints are received.	L/M	I	L	I	I	H	The residual environmental effect will be Low to reflect existing land uses and the proposed mitigation measures.
		2.3 Unplanned events.	2.3.1 Accidental high noise events can result in disturbance to residents and wildlife. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.	2.3.2 (a) In accordance with the C-NHPP and O & M Manual: i. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response.	L/M	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
3. Soil and Groundwater	Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents	3.1 Soil erosion and sediment deposition.	3.1.1 There is potential for soil erosion and sediment deposition from activities that alter or affect the stormwater management facilities.	3.1.2 In accordance with the C-NHPP, the erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.	M	I	L	I	R	H	The residual environmental effect will be Minimal given the proposed mitigation measures.
		3.2 Unplanned events.	3.2.1 Accidental spills on grounds adjacent to roadway approaches may result in contaminants reaching the groundwater table.	3.2.2 (a) In accordance with the C-NHPP and O & M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.	L	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
4. Surface Water	Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents	4.1 Soil erosion and sediment loading.	4.1.1 There is potential for soil erosion and sediment deposition.	4.1.2 (a) In accordance with the C-NHPP: i. stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements; and ii. the shoreline erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.	M	I	L	I	R	H	The residual environmental effect will be Minimal given the proposed mitigation measures.
		4.2 Surface water contamination from bridge de-icing activities.	4.2.1 There is potential for chemical de-icing of the bridge deck to impact surface water.	4.2.2 (a) In accordance with the C-NHPP: i. melted snow and ice will be designed to drain from all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements; and ii. the shoreline erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works. (b) In accordance with the C-NHPP and O & M Manual, de-icing systems will use only non-chlorinated de-icing agent(s).	M	I	L	I	R	H	The residual environmental effect will be Minimal given the proposed mitigation measures.
		4.3 Unplanned events.	4.3.1 Accidental spills of hazardous materials can result in surface water contamination.	4.2.2 (a) In accordance with the C-NHPP and O & M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
5. Vegetation	Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents	5.1 Soil erosion and sediment deposition.	5.1.1 There is potential for vegetation degradation from activities that alter or affect the stormwater management facilities.	5.1.2 (a) In accordance with the C-NHPP and O & M Manual: i. the erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works; and ii. those works that are included in the Natural Environment Enhancement Plan will be inspected and maintained. (b) The maintenance of the landscape improvement works represents	M	I	L	I	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
		5.2 Unplanned events.	5.2.1 Accidental spills of hazardous materials can result in degradation to vegetated areas.	an opportunity to further enhance the west and east side lands. 5.2.2 (a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) In accordance with the C-NHPP and O & M Manual: i. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; ii. the stormwater drainage and management facilities will be inspected and maintained; and iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
6. Wildlife Habitat	Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents	6.1 Sensory disturbance and mortality risk.	6.1.1 There is potential for increased levels of sensory disturbance due to the use and maintenance of the bridge and roadways as well as mortality risk due to the maintenance of the east and west side lands. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.	6.1.2 (a) In accordance with the C-NHPP and O & M Manual: i. advance inspections will be done in areas slated for on-land maintenance in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; ii. on-land maintenance will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; and iii. all maintenance equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time. (b) The maintenance of the landscape improvement works represents an opportunity to further enhance the west and east side lands.	M	I	L	I	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.
		6.2 Unplanned events.	6.2.1 Accidental spills of hazardous materials can result in degradation to wildlife habitat.	6.2.2 (a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) In accordance with the C-NHPP and O & M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
7. Aquatic Habitat	Bridge and Road / Water Use Bridge and Road Maintenance	7.1 Mortality risk.	7.1.1 There is potential for aquatic wildlife to experience an increased risk of mortality due to the in-water maintenance of the bridge.	7.1.2 (a) In accordance with the C-NHPP and O & M Manual: i. advance inspections will be done in areas slated for in-water bridge maintenance in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and to restrict wildlife access;	M	I	L	I	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
	Malfunctions and Accidents	7.2 Unplanned events.	7.2.1 Accidental spills of hazardous materials can result in degradation to wildlife habitat.	7.2.2 (a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) In accordance with the C-NHPP and O & M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; ii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; iii. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
8. Cultural Heritage Resources	Bridge and Road / Water Use Bridge and Road Maintenance	8.1 Loss and fragmentation.	8.1.1 The potential for the loss and fragmentation of the Rideau Canal.	8.1.2 (a) In accordance with the C-NHPP and O & M Manual, the maintenance of the public realm components on the bridge deck as well as the public realm components and landscape improvement works on-land represent an opportunity to enhance the City's historic association with the Rideau Canal.	H	I	L	I	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.
	Malfunctions and Accidents	8.2 Loss and fragmentation.	8.2.1 The potential for the loss and fragmentation of the Gore Road Library.	8.2.2 (a) In accordance with the C-NHPP and O & M Manual, opportunities to enhance the City's historic association with the Gore Road Library through: i. the maintenance of the public realm components and landscape improvement works on the property; and ii. the preparation and implementation of the Interpretation Plan that both documents and presents the known history of the property in situ.	H	I	L	I	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.
		8.3 Unplanned events.	8.3.1 Accidents can result in degradation of cultural heritage resources.	8.3.2 (a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) In accordance with the C-NHPP and O & M Manual: i. historic structures will be protected from direct impact by	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				maintenance equipment; ii. the stormwater drainage and management facilities will be inspected and maintained; iii. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; iv. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and v. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.							and accidents.
9. Local Community	Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents	9.1 Exhaust, dust and noise emissions from vehicles.	9.1.1 Emissions are largely unavoidable as vehicle and equipment maintenance traffic are intended as part of bridge and roadway use.	9.1.2 (a) The bridge and associated roadways facilitate opportunities to: i. provide a critical mid east-west arterial corridor in the City, which could further reduce automotive idling fuel consumption and greenhouse emissions and enhance non-automotive networks; ii. tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area; iii. further enhance emergency services in the City and the City's express bus transit strategy; iv. accommodate CFB Kingston's future growth plans; v. improve water supply and service redundancies to the east side of the Cataraqui River; vi. accommodate boat traffic along the Rideau Canal's navigable channel; and vii. accommodate the long-term rowing needs of both the Kingston Rowing Club and Queens Rowing Club. (b) All vehicles are licensed by the MTO, which administers emissions control regulations. (c) The sound attenuation barriers will further reduce the predicted sound levels from the bridge at noise-sensitive areas. (d) In accordance with the C-NHPP and O & M Manual: i. dust suppression techniques such as watering will be used by the City and/or contractors during programmed and responsive maintenance activities; ii. all maintenance equipment will be in good working condition, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time; iii. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; iv. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and v. detailed protocols shall be established for employee/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (e) The CAP will detail the response plan to be implemented if public complaints are received.	H	R	L	C	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.
		9.2 Traffic Short-Cutting.	9.2.1 Traffic patterns will change as additional traffic will use the bridge and associated roadways. The potential exists for traffic to short-cut through local areas. Note short-cutting is not anticipated.	9.2.2 The potential for short-cutting will be monitored by the City and addressed, if necessary.	H	I	L	I	R	H	The residual environmental effect will be Low to reflect existing land uses and the mitigation measures.

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
		9.3 Unplanned events.	9.3.1 Traffic accidents as well as accidental spills, discharge of airborne matter or noise can negatively impact the quality of life in the local community.	9.3.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) In accordance with the C-NHPP and O & M Manual: i. dust suppression techniques such as watering will be used by the City and/or contractors during programmed and responsive maintenance activities; ii. all maintenance equipment will be in good working condition, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time; iii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; iv. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and v. detailed protocols shall be established for employee/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) Emergency response procedures will be outlined in the C-NHPP and O & M Manual. (c) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
10. Roads and Road Traffic, Boat Traffic	Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents	10.1 Level of service.	10.1.1 Traffic patterns will change as additional traffic will use the bridge and associated roadways in the area.	10.1.2 (a) The bridge and associated roadways facilitate opportunities to: i. provide a critical mid east-west arterial corridor in the City, which could further enhance non-automotive networks and the City's express bus transit strategy; ii. tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area; iii. accommodate boat traffic along the Rideau Canal's navigable channel; and iv. accommodate the long-term rowing needs of both the Kingston Rowing Club and Queens Rowing Club. (b) Traffic signals will be monitored and coordinated to maximize efficient traffic flows.	H	R	L	C	R	H	The residual environmental effect will be Positive given the proposed mitigation measures.
		10.2 Traffic Short-Cutting.	10.2.1 Traffic patterns will change as additional traffic will use the bridge and associated roadways. The potential exists for traffic to short-cut through local areas. Note short-cutting is not anticipated.	10.2.2 The potential for short-cutting will be monitored by the City and addressed, if necessary.	H	I	L	I	R	H	The residual environmental effect will be Low to reflect existing land uses and the proposed mitigation measures.
		10.3 Unplanned events.	10.3.1 Traffic accidents could negatively impact the level of service on municipal roads.	10.3.2 (a) Emergency response procedures and procedures for minimizing both the duration and severity of any accidents or malfunctions will be outlined in the C-NHPP and O & M Manual. (b) The CAP will detail the response plan to be implemented if public complaints are received.	H	I	L	I	R	H	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
11. Business / Job Opportunities	Bridge and Road / Water Use Bridge and Road Maintenance	11.1 Employment opportunities and local economic growth.	11.1.1 There is potential for employment and local economic growth.	11.1.2 (a) The bridge and associated roadways provide opportunities to facilitate economic development through enhanced east-west transportation mobility across the City and north-south transportation mobility into the downtown by tying into the northern terminus of the future Wellington Street Extension. (b) Bridge and roadway maintenance activities will be ongoing and will require the expansion of the City's public works efforts.	H	R	L	C	R	H	The residual economic effect will be Positive.

Note the significance of the residual effects on each VEC is evaluated in Table 5.3 using the following factors as per the CEA Act:

1. ***Magnitude.*** This pertains to the typical effects of the impact on each VEC, which are rated as 'low' (L), 'medium' (M) or 'high' (H).

2. ***Geographic Extent.*** This relates to the area where the effect occurs, which is rated as 'immediate' (I), 'local' (L) or 'regional' (R).

3. ***Duration.*** This regards the duration of the effect on each VEC, which is rated as 'short term' (S) or 'long term' (L).

4. ***Frequency of Occurrence.*** This pertains to the frequency that the effect occurs, which is rated as 'intermittent' (I) or 'continuous' (C).

5. ***Reversibility/Irreversibility.*** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be 'reversed' (R) and return to its pre-existing situation or is 'irreversible' (I).

6. ***Ecological Context.*** This provides an estimate of the ecological value of the area in which the effect occurs, using a 'low' (L) or 'high' (H) rating.

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
1. Air Quality (Particulate Matter)	Removals Site Rehabilitation Malfunctions and Accidents	1.1 Diesel exhaust emissions from heavy equipment.	1.1.1 Diesel exhaust emissions, which are largely unavoidable due to the type of equipment needed during the decommissioning phase.	1.1.2 (a) In accordance with the DP, all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time. (b) Decommissioning is temporary and expected to last up to 24 months. (c) The D-CAP will detail the response plan to be implemented if public complaints are received.	M	I	S	I	R	L	The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		1.2 Airborne dust from heavy equipment operations.	1.2.1 There is potential for airborne dust to be generated by equipment operations, traffic or the wind.	1.2.2 (a) In accordance with the DP, dust suppression techniques will be used by the Contractor such as watering on access roads and sweeping at site entrances. (b) Decommissioning is temporary and expected to last up to 24 months. (c) Site rehabilitation will be undertaken as soon as is practical following the decommissioning phase to minimize airborne dust. (d) The D-CAP will detail the response plan to be implemented if public complaints are received.	M	I	S	I	R	L	The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		1.3 Unplanned events.	1.3.1 Accidental discharges of airborne matter can result in a degradation of the air quality at nearby points of reception.	1.3.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition; ii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions.	M	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
2. Air Quality (Noise)	Removals Site Rehabilitation Malfunctions and Accidents	2.1 Noise emissions from heavy equipment.	2.1.1 Noise emissions, which are largely unavoidable due to the type of equipment needed during the decommissioning phase.	2.1.2 (a) In accordance with the DP: i. all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; and ii. works will be undertaken in accordance with regulations and guidelines current at that time. (b) Decommissioning is temporary and expected to last up to 24 months. (c) The D-CAP will detail the response plan to be implemented if public complaints are received.	M	I	S	I	R	L	The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
		2.2 Unplanned events.	2.2.1 Accidental high noise events can result in disturbance to residents and wildlife. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.	2.2.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. works will be undertaken in accordance with regulations and guidelines current at that time; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employee/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions.	M	I	S	I	R	L	regulations current at that time. The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
3. Soil and Groundwater	Removals Site Rehabilitation Malfunctions and Accidents	3.1 Soil erosion and sediment deposition.	3.1.1 There is potential for soil erosion and sediment deposition.	3.1.2 (a) In accordance with the DP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the site rehabilitation works.	H	I	S	I	R	L	The residual environmental effect will be Minimal given the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		3.2 Unplanned events.	3.2.1 There is the potential to uncover contaminated soils. Also, accidental spills of hazardous materials can result in groundwater contamination. Note groundwater should not be encountered during the decommissioning phase.	3.2.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
4. Surface Water	Removals Site Rehabilitation Malfunctions and Accidents	4.1 Soil erosion and sediment loading.	4.1.1 There is potential for soil erosion and sediment deposition.	4.1.2 (a) In accordance with the DP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the on-land erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the site rehabilitation works; and v. silt curtains and/or turbidity barriers will be installed in advance of in-water removals and kept in place, monitored and maintained until the sediments within the affected area have settled.	H	I	S	I	R	L	The residual environmental effect will be Minimal given the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		4.2 Unplanned events.	4.2.1 Accidental spills of hazardous materials can result in surface water contamination.	4.2.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
5. Vegetation	Removals Site Rehabilitation Malfunctions and Accidents	5.1 Change in vegetation diversity.	5.1.1 Vegetation removal will be required during the decommissioning phase. Note there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory.	5.1.2 (a) In accordance with the DP: i. surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and ii. the removal of shoreline vegetation will be minimized. (b) Site rehabilitation works will be undertaken as soon as is practical.	H	L	S	I	R	L	The residual environmental effect will be Low to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
		5.2 Unplanned events.	5.2.1 Accidental spills of hazardous materials can result in degradation to vegetated areas.	5.2.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; viii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and ix. in-water works will be suspended during periods of heavy rain and high wind events. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
6. Wildlife Habitat	Removals Site Rehabilitation Malfunctions and Accidents	6.1 Sensory disturbance.	6.1.1 There is potential for increased levels of sensory disturbance to local wildlife due to the types of activities and equipment used during the decommissioning phase. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.	6.1.2 (a) In accordance with the DP: i. advance inspections will be done in areas slated for decommissioning activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; ii. decommissioning activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; iii. all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; and iv. works will be undertaken in accordance with regulations and guidelines current at that time.	L	I	S	I	R	L	The residual environmental effects will be Minimal given the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		6.2 Loss and fragmentation.	6.2.1 There is potential for habitat loss and fragmentation of habitat due to the types of activities and equipment used during the decommissioning phase. Note there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory.	6.2.2 (a) In accordance with the DP: i. surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and ii. the removal of shoreline vegetation will be minimized and done using small machinery.	L	I	S	I	R	L	The residual environmental effect will be Low to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				(b) Site rehabilitation works will be undertaken as soon as is practical.							rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		6.3 Mortality risk.	6.3.1 There is potential for wildlife to experience an increased risk of mortality due to the types of activities and equipment used during the decommissioning phase.	6.3.2 (a) In accordance with the DP: i. advance inspections will be done in areas slated for decommissioning activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; and ii. decommissioning activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts.	L/M	I	S	I	R	L	The residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		6.4 Unplanned events.	6.4.1 Accidental spills of hazardous materials can result in degradation to wildlife habitat.	6.4.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.	L	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
7. Aquatic Habitat	Removals Site Rehabilitation Malfunctions and Accidents	7.1 Mortality risk.	7.1.1 There is potential for aquatic wildlife to experience an increased risk of mortality due to loss of wetland structure or function resulting from the types of activities and equipment used during the decommissioning phase.	7.1.2 (a) In accordance with the DP: i. advance inspections will be done in areas slated for decommissioning activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and to restrict wildlife access; ii. decommissioning activities will be scheduled to avoid sensitive areas as well as spawning seasons and over-wintering periods for	L/M	I	S	I	R	L	The residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to the short-term duration of decommissioning, the proposed mitigation

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts; iii. silt curtains and/or turbidity barriers will be installed in advance of in-water removals and kept in place, monitored and maintained until the sediments within the affected area have settled; and (b) Site rehabilitation works will be undertaken as soon as is practical.							measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		7.2 Unplanned events.	7.2.1 Accidental spills of hazardous materials can result in degradation to aquatic habitat.	7.2.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; viii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and ix. in-water works will be suspended during periods of heavy rain and high wind events. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.	L	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
8. Cultural Heritage Resources	Removals Site Rehabilitation Malfunctions and Accidents	8.1 Loss and fragmentation.	8.1.1 The potential for the loss and fragmentation of cultural heritage resources.	8.1.2 (a) In accordance with the DP, notification and mitigation protocols will be in place regarding impacted cultural heritage resources current at that time.	L	L	S	I	R	L	The residual environmental effect will be Low to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
9. Archaeological Resources	Removals Site Rehabilitation Malfunctions and Accidents	9.1 Loss and fragmentation.	9.1.1 The potential for the loss and fragmentation of archaeological resources.	9.1.2 (a) In accordance with the DP, notification and mitigation protocols will be in place regarding impacted cultural heritage resources current at that time.	L	L	S	I	R	L	The residual environmental effect will be Low to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
											decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
10. Local Community	Removals Site Rehabilitation Malfunctions and Accidents	10.1 Compatibility.	10.1.1 (a) Diesel exhaust emissions, airborne dust and noise emissions, which are largely unavoidable due to the type of equipment needed during the decommissioning phase. (b) Vegetation removal will be required during the decommissioning phase. (c) Access to the site will be via major road and water channel routes current at that time. (d) Private property acquisition may be required, depending on the impacts of decommissioning activities on land ownership patterns current at that time.	10.1.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment and noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; ii. dust suppression techniques will be used by the Contractor such as watering on access roads and sweeping at site entrances; iii. the removal of shoreline vegetation will be minimized; iv. works will be undertaken in accordance with regulations and guidelines current at that time; v. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions; vi. all heavy equipment will be required to operate and re-fuel in designated areas; vii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; viii. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; ix. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; x. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and xi. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) Private property acquisition by the City would proceed as per regulations and guidelines current at that time. (c) Decommissioning is temporary and expected to last up to 24 months. (d) Site rehabilitation works will be undertaken as soon as is practical. (e) The D-CAP will detail the response plan to be implemented if public complaints are received.	M	I/L	S	I	R	L	The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.
		10.2 Unplanned events.	10.2.1 Accidental spills, discharge of airborne matter or noise and contaminated soil discoveries can negatively impact the quality of life in the local community.	10.2.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. all heavy equipment will be required to operate and re-fuel in designated areas;	H	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
				iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions; iv. works will be undertaken in accordance with regulations and guidelines current at that time; v. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; vi. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; vii. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; viii ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; ix. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; x. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and xi. in-water works will be suspended during periods of heavy rain and high wind events. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.							and accidents.
11. Roads and Road Traffic, Boat Traffic	Removals Site Rehabilitation Malfunctions and Accidents	11.1 Level of service.	11.1.1 (a) Road and boat traffic patterns will change as additional traffic will use the roads and water in the area due to the types of activities and equipment needed to carry out the decommissioning phase. (b) Access to the site will be via major road and water channel routes current at that time.	11.1.2 (a) In accordance with the DP: i. anticipated road and boat traffic volumes to and from the site will be documented; ii. works will be undertaken in accordance with regulations and guidelines current at that time; iii. decommissioning activities will also be scheduled and coordinated in consultation with local rowing clubs and applicable Federal agencies current at that time to ensure the Federally regulated water channel(s) remain(s) open during the decommissioning phase; iv. the transport of oversized construction components to the site will require local, Provincial and Federal approvals current at that time and may also involve formal transport escort; v. the construction labour force will be encouraged to carpool to and from the site; vi. the need for an off-site facility for construction labour force parking along with shuttle service providing scheduled transport to and from the site will be determined; and vii. proper on-site construction signage will be installed for designated areas and traffic lanes to ensure safe and efficient circulation. (b) Decommissioning is temporary and expected to last up to 24 months.	L/M	I	S	I	R	L	The residual environmental effect will be Low presuming existing road and boat traffic patterns remain largely unchanged and to reflect weekday construction activities, the short-term duration of construction, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.

Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

VEC	Project Activity – VEC Interaction	Potential Environmental Effect Before Mitigation	Discussion of Potential Effects	Mitigation Measures	Residual Effects Evaluation Criteria						Significance of Residual Environmental Effects
					Magnitude	Geographic Extent	Duration	Frequency of Occurrence	Reversibility / Irreversibility	Ecological Context	
		11.2 Unplanned events.	11.2.1 (a) Accidents could negatively impact boat traffic and LOS on roads.	11.2.2 (a) In accordance with the DP: i. only licensed carriers and operators will be involved during the decommissioning phase; and ii. in-water works will be suspended during periods of heavy rain and high wind events.	L	I	S	I	R	L	The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
12. Business / Job Opportunities	Removals Site Rehabilitation	12.1 Employment opportunities and local economic growth.	12.1.1 There is potential for employment and local economic growth throughout the Project construction phase.	12.1.2 (a) The potential economic opportunities are as follows: i. the employment opportunities during the construction phase are estimated at 100 new jobs over 24 months; and ii. local support businesses will benefit from the construction works and the presence of the construction labour force.	H	R	S	C	R	L	The residual economic effect will be Positive.

Note the significance of the residual effects on each VEC is evaluated in Table 5.4 using the following factors as per the CEA Act:

1. ***Magnitude.*** This pertains to the typical effects of the impact on each VEC, which are rated as 'low' (L), 'medium' (M) or 'high' (H).
2. ***Geographic Extent.*** This relates to the area where the effect occurs, which is rated as 'immediate' (I), 'local' (L) or 'regional' (R).
3. ***Duration.*** This regards the duration of the effect on each VEC, which is rated as 'short term' (S) or 'long term' (L).
4. ***Frequency of Occurrence.*** This pertains to the frequency that the effect occurs, which is rated as 'intermittent' (I) or 'continuous' (C).
5. ***Reversibility/Irreversibility.*** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be 'reversed' (R) and return to its pre-existing situation or is 'irreversible' (I).
6. ***Ecological Context.*** This provides an estimate of the ecological value of the area in which the effect occurs, using a 'low' (L) or 'high' (H) rating.

5.3 Effects of the Environment on the Project

This section of the Report outlines the effects of climatic fluctuations and extreme events on the project that could occur in the area.

5.3.1 Climatic Fluctuations

Climatic fluctuations cannot be accurately predicted. As such, it is considered highly unlikely that any fluctuations that affect long-term weather trends would significantly affect the project, particularly since the design features of the project will need to meet the CHBDC.

5.3.2 Extreme Events

Potential extreme weather events that could affect the project include wind, earthquake, lightning and fire. Firstly, an extreme wind event is defined as winds in the range of 100 km/hr to 140 km/hr. Extreme wind events are rare but have been known to occur in the area. As noted earlier, the 1987 to 2007 wind data from the Kingston Airport suggests that most of the winds are from the southwesterly quadrants. The largest contributions are from due south and due west, caused mainly by the effects of Lake Ontario. Probable hourly wind speeds aggregated annually suggest that high winds can be experienced from any direction. But 100 year wind speeds are roughly 20 m/s (or 72 km/hr), which falls well below the criteria for an extreme wind event.

Secondly, as also noted earlier, for seismic design purposes, Kingston is listed in Table A3.1.1 of the CHBDC and falls in an Acceleration-related seismic zone ('Za') of 2 and a Zonal acceleration ratio of 0.10. Assuming the bridge would be classified as a 'Lifeline' bridge, the seismic performance zone would be 3 based on the CHBDC. The Site Coefficient ('S') for the project site location, also based on the CHBDC, may be taken as 1.5, which is consistent with Soil Type III, due to the deep clay deposit within the Cataraqui River. Under the design earthquake condition, the silty clay soil and glacial till soil at the project site location are not considered to be susceptible to liquefaction. This is because of their relatively high fines contents and plasticity. But the layer of organic soils below the river mudline is considered to be susceptible to liquefaction under the design earthquake condition. Provided the bridge structure is founded on bedrock, no adverse impact on the post-liquefaction capabilities of the bridge foundation is anticipated. There are also two zones within the project site location where low resistivity is observed within the bedrock beneath the river, centred at distances of 320 m and 970 m along the ERI survey line. These areas are most likely associated with the Frontenac Axis. If these zones are faults, they are considered inactive and do not pose any additional seismic impacts. Still, the foundation elements associated with the project avoid these potential fault zones.

Thirdly, during the spring and summer seasons, thunderstorms and electrical storms can occur in the area. In the event of a lightning strike that hits the bridge, the built-in grounding system should prevent any severe damage and reduce the risk of fire.

Given the design features of the project, which will need to meet the CHBDC, a significant environmental effect due to extreme events is unlikely to occur.

5.4 Cumulative Effects

In addition to the impacts of the project on the VECs, this Report must also consider the cumulative environmental effects of the project in conjunction with existing and future activities or projects. Cumulative effects are defined as effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out. Cumulative effects are limited to those effects that are likely and for which measureable or detectable residual effects are predicted. A measureable change is defined as a change that is real, observable and detectable compared with existing (baseline) conditions. A predicted change that is negligible or indistinguishable from background conditions is not considered to be measureable.

As discussed earlier, the EA Problem Statement cited in this Report is indicative of the cumulative effects of existing and future activities or projects on local traffic and the resulting need for this project:

1. The effects of the LOS for the LaSalle Causeway-Highway 2 corridor, which is falling below the City's accepted policy level of LOS D as a result of existing traffic congestion on the LaSalle Causeway during peak hour traffic demand (and during a Highway 401 detour event), despite focused strategies to optimize the transportation system and increase walking, cycling, and public transit use. The LOS is expected to continue to decrease in the future due to population and employment growth and increased traffic congestion.

2. The current role of the Highway 401 crossing as an inter-city roadway facility and the related safety and system efficiency issues that can result from conflicts between local and regional traffic use as well as the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City's urban limits.

3. Projected 19 percent population growth and 22 percent employment growth in the City by 2029 and the need to determine whether the City's transportation networks will be able to accommodate long-term planned growth and development programs on the east and west sides of the Cataraqui River in an efficient and effective manner.

Furthermore, the 2030 to 2034 trigger for a four-lane bridge cited in this Report would impact the viability of moving forward with a two-lane bridge or a two-lane bridge with a substructure to accommodate its widening to four lanes in the future. But the cumulative effects of future monitoring of traffic conditions by

the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even delay the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself. Moreover, the cumulative effect of future travel demand patterns could also confirm the viability of the initial three-lane bridge scenario (with the centre lane operating as a reversible lane and a substructure that could accommodate widening to four lanes) in the future. This design approach reflects the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure. As such, this Report recognizes the merits of facilitating an infrastructure improvement program that is both flexible and able to evolve in response to changing conditions.

In addition, the bridge deck components coincide with the rationale that led to the selection of a bridge at the project site location as the preferred solution during Stage 1 of this EA study, namely:

1. The opportunity for the bridge deck components to tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area.

2. The role of the bridge deck components in helping to provide a more direct mid east-west connection to existing road infrastructure on either shore. This in turn would address travel demand patterns, accommodate CFB Kingston's future strategic plans as well as provide opportunities to enhance emergency response services, the City's express bus route strategy and active travel and commuter cycling networks.

Overall, the cumulative environmental effects of the project need and design approach in conjunction with existing and future activities are Positive to the local community.

5.5 Project Delivery Models

This section of the Report discusses three potential project delivery models, namely, Design-Bid-Build, Design-Build, Public-Private-Partnership and Alliance. Highlights of their advantages, disadvantages and risk sharing arrangements are also outlined.

5.5.1 The Project Delivery Models

.1 Design-Bid-Build Model

The Design-Bid-Build model is the most common and well understood project delivery model by public sector owners (Owner). It involves the Owner directing the engineering design of a project through to completion. Once the tender package is ready, the Owner can tender the project out in an open public forum. The contractor bids on the project and the award is typically made to the contractor who submits the lowest price. The Owner has separate contracts with the designer and the contractor. There are no direct contractual links between the designer and contractor. The contractor is responsible to build the project to the construction specifications that have been provided in the construction contract.

.2 Design-Build Model

The Design-Build model has also been widely used throughout the world on a variety of infrastructure projects, including major road and bridge projects. It usually involves a team comprised of one or more engineering companies and a lead contractor that is capable of designing and building the infrastructure for a guaranteed price. This approach creates a single point of responsibility for project delivery. The financing of a Design-Build project is normally provided by the Owner, which could involve a payment schedule that is tied to specific project deliverables.

The basic Design-Build process involves two main steps. The first step is pre-qualification, which is typically an open public forum wherein submissions are made by the lead contractor teams in response to project-related criteria from the Owner. The top three to four submissions are usually selected and those teams are invited to participate in the second step. This step involves the development of an early bid. The early bid is based on a preliminary design produced by the engineer in each lead contractor team to meet the project criteria specified by the Owner. The preferred team is then selected by the Owner, normally on the basis of price. More subjective evaluation criteria can also be used, provided their context and roles in the selection process are clearly defined beforehand by the Owner.

.3 Public-Private-Partnership Model

The Public-Private-Partnership (P3) model is a cooperative venture between the public and private sectors. It is built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards. This essentially involves an analysis of what it would cost the public sector to design, build, finance and maintain the infrastructure for the life of the Concession, compared to engaging the P3 model, which is a form of procurement for providing capital assets and associated long term operations that includes a component of private finance.

The P3 model can be appropriate for major and complex capital projects that are usually in excess of $100 million and have significant ongoing maintenance requirements. A P3 can ensure that the contractor is bound to provide project management, design and risk management expertise to the Owner and to enter into long term operational contracts for the project after it is built. As such, a P3 carries the responsibility for the quality of the contractor's work over the implementation and operation phases of the project. Typically, at the end of the P3 contract, the infrastructure is turned over to the Owner under clearly defined conditions.

The initial P3 selection process is similar to the Design-Build process. The first step involves submissions by the lead contractor teams to the Owner during the pre-qualification stage. The top three to four

submissions are normally selected by the Owner and those teams are invited to develop designs of suitable detail that can be assessed by the Owner as well as used by the teams to establish their bids. Once the preferred team is selected, the Owner executes the contract agreements for the design, build, finance, operation, maintenance and transfer of the infrastructure at the end of the contract term[38]. This is the main difference between the Design-Build and P3 models, in that the P3 model includes a process for financing and payment over a long period (usually 25 years or more).

.4 Alliance Model

The Alliance model is fundamentally different from the three others described above in that it is based on a collaborative approach between the Owner, Designer and Contractor to design and build the project for an amount equal to, or less than the project budget. Risks and opportunities are managed jointly by all three parties to outcomes that give the best overall result for the project, rather than to one of the parties at the expense of the others. The Alliance model captures many elements of the guaranteed maximum price and construction management contractual arrangements.

There are variations on the project framework. These can range from the Owner hiring the designer and then tendering the project at a stage where the major cost elements can be identified. The three parties then work collaboratively to complete the design and construction. At the other end of the spectrum, there is a modified design-build approach where designers and contractors come together to prepare and price conceptual designs which are evaluated under previously identified criteria. Again, the parties work to complete the design and construction in a collaborative manner.

The key element is that there is no recourse to any Court by any of the three parties to settle disputes. Any dispute is settled internally by the parties, or at worst with the assistance of a facilitator. Under this process, there are no construction claims as any issues which arise are settled using a collaborative process.

The Alliance model is used extensively in New Zealand and Australia. It has also been used on transportation projects in British Columbia, including an early contract on the Sea-to-Sky project.

5.5.2 Advantages, Disadvantages and Risk Sharing Arrangements

Table 5.5 highlights the advantages, disadvantages and risk sharing arrangements with the Design-Bid-Build, Design-Build, Public-Private-Partnership and Alliance models. Though these highlights treat each model in isolation, it is recognized that variations and combinations of the models have been successfully implemented. For example, the Owner can have the design completed to a stage where variations in quantities are small and then use the P3 model for subsequent completion of the design, construction, financing and maintenance components. The success and effectiveness of the models depend on a number of factors such as the specific nature of the project, the experience of the parties involved, financial market conditions, budget constraints, schedule, risk tolerance and public acceptance.

Confirming the preferred project delivery model is outside this EA framework and is best addressed during the early stages of the Project Implementation phase to reflect the City's cost recovery model and business strategy to secure funding and manage control of the project design, construction and risk. It should be noted that a significant portion of the City's direct costs (the net cost after funding) would be recovered through Development Charges collected from new developments. It is therefore recommended that the City develop a Business Plan in order to fund and finance the project during the early stages of the Project Implementation phase and to identify the preferred project delivery model.

6.0 PROJECT MONITORING

This section of the Report discusses the monitoring tools that will be applied by the City or its agent in relation to the project both leading up and subsequent to the initiation of the Project Implementation Phase of the Class EA process.

6.1 Traffic Monitoring

Upon completion of this EA study, the City will monitor future traffic conditions, at a minimum, as part of the subsequent five-year review protocol for the KTMP Update. In regards to the project, this monitoring will focus on traffic conditions within the Cataraqui River screenline and the effectiveness of the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor, should they be implemented. The purpose of this review would be to confirm the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself as well as the preferred bridge configuration scenario: i) a two-lane bridge; ii) a two-lane bridge with a substructure to accommodate its widening to four lanes; or iii) a three-lane bridge with the centre lane operating as a reversible lane and a substructure that could accommodate widening to four lanes. If the preferred bridge scenario would require widening to four lanes in the future, this too, would prompt subsequent traffic monitoring by the City to confirm the timeline for this expansion[39].

[38] Honorariums are sometimes paid to the unsuccessful teams to partially cover the usually high cost of developing P3 proposals.

[39] As discussed earlier, the proposed interim three-lane and ultimate four-lane bridge deck configuration requirements would not conform to the Official Plan. As such, the need for a text amendment to the Official Plan could be confirmed as part of the City's future traffic monitoring protocol. Note as well that the Official Plan is subject to review every five years, but City Council may direct that such a review to occur at any time due to exceptional circumstances or opportunities for the City.

Table 5.5
Project Delivery Models: Advantages, Disadvantages and Risk Sharing Arrangements

Project Delivery Model	Advantages	Disadvantages	Risk Sharing
Design-Bid-Build	1. The Owner retains all of the control over the project. 2. It is the most inclusive project delivery model as several Contractors can line up to bid the project. 3. Changes can be easily implemented (although at cost) during the construction process. 4. It is the most common and well understood model. 5. For a nominal fraction (approximately 5 percent) of the total project cost, the design phase of the project could be undertaken early and prior to securing or committing the necessary funds for construction. This would allow the Owner to be better positioned to secure financial assistance from the upper levels of government, as the project would be 'shovel-ready'.	1. The Owner retains all of the risk over variances that can occur due to unknown circumstances. 2. The project completion schedule is the longest of all the project delivery models. 3. The Owner faces some uncertainties over final project costs, which are usually not known until project completion.	1. The majority of the risks are carried by the Owner.
Design-Build	1. The Owner has early knowledge of a guaranteed cost for a defined scope of work. 2. Some of the risks are transferred from the Owner to the Design-Builder. The general principle is that all risks are transferred unless they are specifically retained. 3. It encourages innovation and cost savings provided that the design and performance criteria are well established, the design information is adequate and a cost-sharing mechanism for latent defects is clearly specified. But the more these elements are specified, the less opportunity there is for innovation. 4. It saves time by compressing the overlap of design and construction at the early stages of the project.	1. It reduces the Owner's level of control. Because of the fast track nature of the process, changes usually become much more expensive as more rework is involved. The Owner needs to have a clear understanding of the final product and minimum standards. 2. It is more difficult to incorporate stakeholder input. 3. The process is more complex (requires a rigorous set of design and performance specifications) and less understood. 4. It reduces the number of contractors who are qualified to bid on the project.	1. Substantial risk is transferred from the Owner to the Design-Builder, but can be apportioned to where it is most appropriate and can be shared. The general principle is that all risks are transferred unless they are specifically retained.
Public-Private-Partnership	1. The Owner has early knowledge of all costs for a defined scope of work for the term of the Concession. 2. Most of the risks are transferred from the Owner to the Concessionaire. Some care needs to be taken in assigning risk, as there is a tendency to transfer essentially all risk to the Concessionaire but this can result in much higher costs to the Owner. 3. It encourages innovation and subsequent cost savings. 4. It saves time by compressing the overlap of design and construction at the early stages of the project. 5. Substantial project financing is provided by the Concessionaire. But this is a debt, which is no different than other kinds of debt financing by the Owner. 6. A perceived advantage is the holistic life cycle cost of the structure is minimized as all parties involved have an economic interest to keep costs as low as possible. This is not necessarily so in practice, as most Concessions in Canada have been sold early in the life of the infrastructure.	1. It reduces the Owner's level of control. Because of the fast track nature of the process, changes usually become much more expensive as more rework is involved. Difficult discussions between the Owner and Concessionaire will also ensue to arrive at equitable changes to the Concession Agreement. The Owner needs to have a clear understanding of the final product and minimum standards. 2. The process is more complex (requires a rigorous set of design and performance specifications), less understood and requires rigorous accountability. 3. It reduces the number of contractors who are qualified to bid on the project. 4. In practice, the Concessionaire is not a single corporation, but a team constituted for a specific project and comprised of a financier, one or more construction contractors, one or more engineering firms and another contractor for operations and maintenance. As such, the expected advantages of synergies may not be realized.	1. Substantial risk is transferred from the Owner to the Concessionaire, but can be apportioned to where it is most appropriate and can be shared. 2. It requires an internal Owner champion to be successful. 3. The specific form of capital asset is ultimately chosen through a design competition.
Alliance	1. The Owner retains all of the control over the project. 2. Changes can be implemented if necessary through an agreed cost recovery formula. If these increase the project cost, the team works together to identify off-setting savings. 3. There are no construction claims as any issues which arise are settled using a collaborative process.	1. The process is less understood by the design and construction industries.	1. Risks are minimized and shared according to the alliance agreement.

After the bridge is built, the identified roadway improvement works and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated. Still, the potential for short cutting will be monitored by the City. There are a number of solutions that can be implemented to address this issue, should it arise. These include:

1. Monitoring signal timings to optimize traffic flow on the main public roads.
2. Building out curb radii to restrict vehicular turns.
3. Installing speed humps to slow down traffic.
4. Creating restrictions within the local road system such as one-way streets, restricted turns and dead end roads.
5. Installing traffic signage restricting vehicular turns either at all times or during certain times of the day.

6.2 The Cultural-Natural Heritage Protection Plan

As part of the Project Implementation Phase of the Class EA process for the bridge, the City will prepare and implement the Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including the recommended monitoring measures contained in this Report.

6.3 The Community Action Plan

As part of the Project Implementation Phase of the Class EA process for the bridge, the City will prepare and implement the Community Action Plan (CAP). The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

7.0 PUBLIC AND FIRST NATIONS CONSULTATION

The project team has been committed to employing a partnership model to facilitate effective, open, and meaningful consultation activities for this EA study, both internally and with international, national, provincial, and local stakeholders, including First Nations communities. Critical components of this model are outlined below.

7.1 Mission Statement, Vision, and Guiding Principles

The project team prepared a 'Mission Statement, Vision and Guiding Principles' for use and reference throughout this EA study. It is summarized below in Table 7.1.

Table 7.1
Mission Statement, Vision and Guiding Principles

A. Mission Statement	1. To complete an EA that evaluates the need and feasibility for a new crossing of the Rideau Canal and Cataraqui River in the City within a framework that: a) builds trust, support, and consensus among international, national, provincial, First Nations, local interests and homeowner associations; b) protects and enhances the cultural and natural heritage integrity of the Rideau Canal as a designated UNESCO World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway; c) evaluates the functionality and compatibility of alternative solutions on the basis of social, cultural, economic, and environmental sustainability; and d) respects Kingston's unique heritage and cultural character, including the customs and traditions integral to the distinctive cultures of First Nations communities and other cultures that make up our community.
B. Vision	1. Through innovative planning, design, and consultation, the EA process for evaluating the need and feasibility for a new crossing of the Cataraqui River will display community leadership that reinforces the City's proud historic association with the Rideau Canal and its goal of becoming Canada's most sustainable City.

Table 7.1
Mission Statement, Vision and Guiding Principles

C.	Guiding Principles	
C1.	Scenic, Cultural and Natural Heritage Integrity	1. We respect the role of the Rideau Canal and Cataraqui River as: a) a cultural heritage and natural symbol of Canada's identity; b) a valuable tourism and recreational resource; and c) a valuable testimony of First Nations and early European settlements and cultures. 2. We recognize the traditional role of the Rideau Canal and Cataraqui River as a fully functional navigable historic waterway in both promoting public education and nurturing the appreciation of its scenic, cultural heritage, and natural heritage value. 3. We value the ongoing efforts of private landowners, stakeholder groups, government agencies, and public and private sector partnerships in protecting and enhancing the scenic, cultural heritage, and natural heritage character of the Rideau Canal and Cataraqui River. 4. We recognize that the sustainable design and development of the shoreline and lands adjoining the Rideau Canal and the Cataraqui River is achieved through respect of its scenic, cultural heritage, and natural heritage landscape.
C2.	Healthy Community	1. We recognize that efficient transportation linkages guide the future development of the City of Kingston and contribute to the quality of community life.

Table 7.1
Mission Statement, Vision and Guiding Principles

C2.	Healthy Community	2. We appreciate that the development of effective alternative solutions needs to incorporate, promote and respect: a) private and public transportation use; b) sustainable transportation options such as cycling and walking; c) the principles of universal accessibility; and d) remaining cultural heritage artifacts from First Nations and early European settlements. 3. We recognize that the evaluation of effective alternative solutions needs to be based on: a) a full set of social, cultural, economic, and environmental factors; b) mitigation measures that are state-of-the-art and sustainable; and c) the preservation of cultural and heritage resources.
C3.	Public and Agency Engagement	1. We acknowledge that international, national, provincial, and local interests and concerns shall be considered and addressed in an equitable manner. 2. We recognize that goals are realized when local knowledge and experience promotes understanding of project issues and solutions in an atmosphere of mutual respect and trust. 3. We are committed to a process in which support and consensus is established and nurtured through open and innovative public and agency consultation activities. 4. We welcome differences of opinion and competing interests as opportunities to ensure all project issues will be considered and addressed.

Table 7.1
Mission Statement, Vision and Guiding Principles

C4. Effective Implementation	1. We recognize that evaluating and developing alternatives at the same time will allow stakeholder and project team partners to better understand the issues from the outset and develop proactive solutions. 2. We appreciate that through effective graphic design of alternatives, the concepts will be better understood by stakeholders and help to generate feedback. 3. We recognize that our sense of accomplishment is achieved by providing clear and comprehensive documents that show how project decisions have been made.
C5. Project Teamwork	1. We are committed to providing professional services with a strong community-based presence that reflects professional pride, personal commitment, and mutual respect. 2. We acknowledge that project milestones are met by establishing realistic task objectives, strategic personnel assignments, proactive risk management, and effective schedule control.

7.2 Environmental Scan

Since consultation is a key element of the EA process, a comprehensive Consultation Plan was developed to facilitate agency, public stakeholder, and First Nations input throughout the project. As a precursor to the development of the Consultation Plan, approximately 25 interviews were undertaken with key stakeholders including, but not limited to: local residents; businesses; community groups; City staff and elected officials; and environmental groups and agencies. Commonly referred to as an 'Environmental Scan', this process identified potential community concerns and expectations about the project in general and the planned consultation activities in particular. In addition to identifying concerns, the environmental scan provided an opportunity to identify appropriate community representatives for the Public Liaison Committee, an important component of the Consultation Plan.

7.3 Consultation Plan

Based on the Environmental Scan, the Consultation Plan was finalized. It reflects the extensive interest and scrutiny to which this project will be subjected. Consultation to date has been facilitated through:

1. A 'Notice of Study Commencement', which was published in 'The Kingston Whig Standard' newspaper and posted on the City's website at www.cityofkingston.ca on March 3, 2009.
2. Maintaining a comprehensive agency, stakeholder group, and contact list.
3. Preparing regular project status updates such as newsletters and information handouts distributed by mail and/or E-mail.
4. Maintaining an up-to-date project website at www.cityofkingston.ca/thirdcrossing.
5. Vetting decision-making and project activities through a Technical Advisory Committee.
6. Engaging the community and facilitating consultation activities through a Public Liaison Committee.
7. Engaging consultation activities with First Nations communities through a First Nations Consultations Sub-Committee.
8. Specific consultations:

    a) During Stage 1 of this EA study with:

        i. Parks Canada on November 23, 2009 and February 8, 2010 to discuss the potential impacts of an additional crossing of the Cataraqui River on the Rideau Canal south of the Kingston Mills Lock Station; and

        ii. CFB Kingston on November 23, 2009 to provide an overview of the project and discuss CFB Kingston's long-term strategic plans; and

    b) During Stage 2 of this EA study with:

        i. Parks Canada on September 16, 2010 which involved a boat tour of the EA study area and discussions on First Nations history in the area as well as preliminary bridge design and viewscape considerations; and

        ii. the Kingston Rowing Club on August 16, 2010 as well as March 28, April 5 and April 9, 2012 to discuss rowing needs in the Cataraqui River.

9. Facilitating five Public Information Centres to date at the following key project milestones:

   a) During Stage 1 of this EA study:

      i. on April 23, 2009 to introduce the project;

      ii. on November 28, 2009 to discuss project issues in small working groups; and

      iii. on March 3, 2010 to present the preferred solution; and

   b) During Stage 2 of this EA study:

      i. on March 31, 2011 to present and receive feedback on the three preliminary bridge concepts; and

      ii. on March 1, 2012 to provide details on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations.

7.4 Project Committees

As shown in Table 7.2, project tasks, including decision making and consultation activities, were facilitated through four committees:

1. A Senior Management Committee to oversee the overall project direction.

2. A TAC to provide technical guidance and act as a sounding board for technical decision making on EA study alternatives, including the Stage 1 corridor area evaluation matrix and the Stage 2 preliminary bridge concepts.

3. A First Nations Consultations Sub-Committee to facilitate consultation with the following First Nations communities having an interest within the EA study area:

   a) Ardoch Algonquin First Nation;

   b) Mississaugas of Alderville First Nation;

   c) Mohawk Nation Council of Chiefs;

   d) Tyendinaga Mohawk Territory;

   e) Shabot Obaadjiwan First Nation;

   f) Huron-Wendat Nation;

   g) Algonquins of Ontario;

   h) Algonquins of Pikwàkanagàn; and

   i) Mohawk Council of Akwesansne.

4. A Public Liaison Committee to provide guidance and input for public consultation activities.

7.5 Public Consultation Sessions

As previously noted, the official Notice of Commencement to initiate the EA study was issued on March 3, 2009. There have since been five public consultation sessions. Three sessions were held during Stage 1 of this EA study and two sessions were held during Stage 2.

7.5.1 Stage 1 – Public Information Centre No. 1 (April 23, 2009)

The first Public Information Centre was held at the LaSalle Secondary School on April 23, 2009 to introduce the EA study. The Public Information Centre was organized to allow attendees to review display panels and an information handout and discuss project issues with City staff and project team members. EA study topics on the display panels included:

1. Welcome and Introduction.
2. Study Area.
3. Background Information.
4. Importance of the Rideau Canal.
5. Ontario Municipal Class EA Process, Flow Chart, and Study Timeline.
6. Alternatives and Outline of Preliminary Assessment Criteria.
7. Project Team Members.
8. Draft EA Study Mission Statement, Vision and Guiding Principles.
9. Public Consultation Activities Proposed.
10. Where Do We Go From Here?

74 people attended this session and a total of 33 comment sheets were received. In addition, there were 152 responses to an on-line survey.

Table 7.2
Role and Responsibilities of Various Committees

Committee	Committee Structure	Committee Roles and Responsibilities	Meetings to Date	
			EA Stage 1	EA Stage 2
Senior Management Committee	• Senior City Staff • Senior Project Team Members	• Project Oversight and Administration • Manage Project Budget and Schedule • Issue/Risk Management and Mitigation	• Various	• Various
Technical Advisory Committee	• Various City Departments • Senior Project Team Members • Canadian Environmental Assessment Agency • CFB Kingston • CRCA • Department of Fisheries and Oceans • Parks Canada • Ministry of Transportation Ontario	• Technical Guidance on EA Study Alternatives • Vetting Technical Decision-Making • Assistance in Identifying Approval Requirements	• March 9, 2009 • September 16, 2009 • November 4, 2009 • January 27, 2010 • February 10, 2010 • February 23, 2010	• October 18, 2010 • January 20, 2011 • May 26, 2011 • July 28, 2011
First Nations Consultations Sub-Committee	• Senior City Staff • Senior Project Team Members • Special Advisors	• Led by the City • Represents City and Project Team • Maintain a Link With First Nations	• Various	• Various
Public Liaison Committee	• Senior City Staff • Senior Project Team Members • Community representatives from both sides of the Cataraqui River	• Provide Input on Public Consultation Activities • Review Consultation Reports • Attend Public Information Centres	• June 4, 2009 • August 24, 2009 • October 14, 2009 • January 27, 2010 • February 25, 2010	• October 18, 2010 • January 19, 2011 • March 2, 2011 • May 25, 2011 • February 16, 2012

7.5.2 Stage 1 – Cataraqui Crossing Café (November 28, 2009)

The Cataraqui Crossing Café took place at LaSalle Secondary School on November 28, 2009. This half-day event was organized to reach out to the community using an innovative, yet simple methodology for hosting conversations about EA study issues. Using the World Café methodology, the Cataraqui Crossing Café encouraged small group discussions on EA study issues in an informal setting. Each group had a trained facilitator who used issue-specific questions to engage group dialogue on the following EA study topics:

1. Existing and Future Transportation Needs.
2. Cultural Heritage Issues.
3. Geotechnical and Geo-environmental Issues.
4. Terrestrial and Marine Ecological Issues.
5. Terrestrial and Marine Archaeological Issues.
6. An Open Forum for Other EA Study Issues.

Discussions lasted 20 minutes per topic. Participants were then asked to move to another table to discuss one of the other topic areas. The facilitators took notes and briefed each new group about the previous discussions. In so doing, these conversations linked and built on each other as people moved between groups, generating new ideas and insights about EA study issues.

Of the 102 pre-registered participants, 51 attended the Cataraqui Crossing Café. However, 22 non-registered participants arrived at the event and participated in the session, for a total of 73 participants.

7.5.3 Stage 1 – Public Information Centre No. 2 (March 3, 2010)

A second Public Information Centre was held on March 3, 2010 to present an overview of EA study activities and findings to date, a summary of the evaluation process for the consideration of the EA alternative solutions and the preferred EA solution, including the preliminary opinion of probable cost. The format consisted of a formal presentation followed by a Question and Answer period. A copy of the presentation material was available to all attendees as an Information Handout. Signed attendance at this event was 73.

7.5.4 Stage 2 – Public Information Centre No. 3 (March 31, 2011)

A third Public Information Centre was held on March 31, 2011, to review the three alternative bridge concepts and information about the EA study as well as learn more about the EA process. The format consisted of both an information session and formal presentation format. Display panels were located around the hall in two stations. The display panels provided information on the following topics:

1. The EA Study Purpose and Process.
2. A Catalogue of Bridge Types.
3. The Preliminary Bridge Alignment and Configuration.
4. The Preliminary Bridge Concepts From Various Vantage Points.
5. The In-Water Bridge Construction Options.
6. The Preliminary Road and Landscape Concepts.

As residents arrived, they were asked to sign in and were then given a comment sheet and information package that contained the display panels. Signed attendance at this event was 178.

7.5.5 Stage 2 – Public Information Centre No. 4 (March 1, 2012)

A fourth Public Information Centre was held on March 1, 2012, to review information on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations. The format consisted of both an information session and formal presentation and question-and-answer format. Display panels were located around the hall. The display panels provided information on the following topics:

1. The EA Study Area, Purpose and Process.
2. The EA Problem Focusing on Existing and Projected Traffic Conditions.
3. The EA Study Area Conditions.
4. The EA Alternative Solutions and the Preferred Solution.
5. The Bridge Concepts from Various Vantage Points.
6. The In-Water Bridge Construction Options.

7. The Preferred Road and Landscape Concept.

8. The Preferred Bridge Concept and In-Water Bridge Construction Option.

9. The Potential Project Effects and Proposed Mitigation Measures.

10. Next Steps.

As residents arrived, they were asked to sign in and were then given a comment sheet and information package that contained the display panels. Signed attendance at this event was 89.

7.6 First Nations Consultations

The Canadian constitutional framework takes into account that the First Nations of Canada were here first as sovereign peoples who were never conquered. Further, the 'Crown', which is made up of the Federal and Provincial levels of government, has an obligation, based on its own inherent honour, to consult on matters affecting Aboriginal interests raised by First Nations. In 2010, the Supreme Court of Canada in the *Rio Tinto* ruling confirmed that the purpose of consultation with First Nations was not only based on the honour of the Crown but also, because of that honour, related to the onerous demands of the trial process. Accordingly, it has been established that consultations must be undertaken with the awareness not only of the constitutional fiduciary duty of the Crown to protect Aboriginal interests but also that the process stand as a surrogate for a full court process. As such, the 'Duty to Consult' is a means to ensure First Nations' interests and rights are identified and respected. It also helps the Crown to make better more durable decisions and strengthen its relationships with the First Nations of Canada.

Procedural aspects of First Nations consultation processes are often delegated to the project proponent. The project proponent is typically best-suited to speak to technical and environmental aspects of the project and where appropriate, is best-placed to address concerns raised by First Nations communities. As the project proponent for this EA study, the City has been delegated the procedural aspects of First Nations consultation from the RA's.

First Nations history in the region of Kingston is complex, in that the establishment of a European presence occurs far earlier here as compared to most other cities in Ontario. As such, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City's interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City undertook consultations with the following First Nations communities as part of this EA study:

1. Ardoch Algonquin First Nation.
2. Mississaugas of Alderville First Nation.
3. Mohawk Nation Council of Chiefs.
4. Tyendinaga Mohawk Territory.
5. Shabot Obaadjiwan First Nation.
6. Huron-Wendat Nation.
7. Algonquins of Ontario.
8. Algonquins of Pikwàkanagàn.
9. Mohawk Council of Akwesansne.

The following key meetings and communications have been held to date:

The following key meetings and communications have been held to date:

1. During Stage 1 of this EA study:
   a) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on September 10, 2009;
   b) a general mailing sent on February 1, 2010 to the First Nations noted above providing an EA study update;
   c) a meeting with Chief James Marsden and Councilor David Mowat, Mississaugas of Alderville First Nation, on February 10, 2010; and
   d) a meeting with Co-Chief Mareille Lapointe, Ardoch Algonquin First Nation, on March 16, 2010.
2. During Stage 2 of this EA study:
   a) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on June 15, 2010;
   b) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on September 9, 2010;
   c) a general mailing sent on November 5, 2010 to the First Nations noted above providing a copy of the Stage 1 Summary Report to City Council and an EA study update;

d) a letter, dated December 2, 2010 from Ms. Elizabeth F. Nanticoke (Acting Director, Department of Environment, Mohawk Council of Akwesasne) to Mr. Alan McLeod (Senior Legal Counsel, City), requesting that the Mohawks of Bay of Quinte – Tyendinaga be considered the point of contact for the EA study (as part of co-ordinated approach to consultations);

e) a meeting with Co-Chief Mareille Lapointe, Ardoch Algonquin First Nation, on December 9, 2010;

f) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on January 31, 2011 during which a number of opportunities for extending consultations were identified regarding:

   i. archeological monitoring;

   ii. the review of archeological studies; and

   iii. the review and comments on design, native plantings and the ecological effects of the project;

g) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on February 23, 2011;

h) a general mailing sent on March 21, 2011 to the First Nations noted above providing a copy of the January 20, 2011 TAC meeting agenda, Public Information Centre No. 3 public notice, archaeological assessment report on the east side lands and an EA study update;

i) a mailing sent on April 15, 2011 to the Office of the Algonquins of Ontario providing a copy of the Stage 1 Summary Report to City Council, January 20, 2011 TAC meeting agenda, Public Information Centre No. 3 public notice, archaeological assessment report on the east side lands and an EA study update;

j) a general mailing sent on August 17, 2011 to the First Nations noted above providing information on the July 28, 2011 TAC meeting and the First Nations consultation process to date as well as an EA study update;

k) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on September 6, 2011 to discuss a preliminary report on the EA study submitted on behalf of the Mohawk Nation Council of Chiefs to the City (the project team prepared responses to the recommendations in the preliminary report and submitted them to the Mohawk Nation Council of Chiefs on September 29, 2011);

l) a general mailing sent on December 15, 2011 and February 16, 2012 to the First Nations noted above providing a copy of the preliminary report on the EA study submitted on behalf of the Mohawk Nation Council of Chiefs to the City, information on the First Nations consultation process to date as well as an EA study update;

m) a letter, dated February 23, 2012 from Mr. Alan McLeod (Senior Legal Counsel, City) to Ms. Melanie Paradis (Director of Lands, Resources and Consultation, Métis Nation of Ontario) confirming the verbal notification from the Métis Nation of Ontario to the City that the EA study area is not within its consultation area; and

n) a meeting with Chief James Marsden and Councilor David Mowat, Mississaugas of Alderville First Nation, and Parks Canada on March 22, 2012.

7.7 Main Concerns

As outlined above in the EA study's 'Mission Statement, Vision and Guiding Principles', the project team welcomed differences of opinion and competing interests as opportunities to ensure all project issues were considered and addressed. This acknowledgement was in recognition of the rich history, complexity and magnitude of this project, including its associated potential positive and negative social, cultural, economic and environmental impacts. The main concerns that were raised during this EA study can be summarized into the following main themes:

1. ***Is a new bridge needed if Highway 401 is expanded?*** With an existing traffic volume during the PM peak hour of 1,260 vehicles per hour per lane for eastbound travel and 1,252 vehicles per hour per lane for westbound travel, the Highway 401 crossing has ample capacity to accommodate additional traffic (based on its current two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). Its current widening from four to six lanes west of Sydenham Road to west of Montreal Street means that the Highway 401 crossing will also be able to handle even more traffic in the future.

   However, two issues need to be considered. The first is that the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic. This is inconsistent with effective transportation engineering practice. The second issue relates to the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City's urban limits. The Highway 401 crossing is 6 km north of the LaSalle Causeway. Diverting traffic to the Highway 401 crossing would lead to further out of way travel and additional travel delays. As noted earlier, traffic infiltration through the adjacent road network could then also be expected to occur as drivers seek less congested routes to reach their destinations.

Thus, increasing the capacity of Highway 401 would not address the EA Problem Statement for this EA study and is not considered a viable alternative solution.

2. ***Is a new bridge needed if public transit services are enhanced?*** The City's Transit Department has been reviewing the City's existing transit system. A number of transit service enhancements were recently approved by City Council including the introduction of two new express bus routes serving the east and west sides of the City. Express Route 1, covering the west side of the City, will form a loop from the downtown and connect the west end of the City along the King Street-Bayridge Drive-Princess Street corridors. Express Route 2, covering the east side of the City, will also form a loop both to and from the downtown across the LaSalle Causeway-Highway 2 corridor and extending north on Kingston Road 15.

   Based on preliminary assessments, the Express Routes are expected to increase transit ridership in the City and result in a 1 percent increase in the overall City-wide transit mode share, or from 5 percent today to 6 percent by 2019. This 1 percent modal share increase for transit is expected to generate 1,049 new transit trips during the PM peak hour, which represents a reduction of 384 vehicle trips City-wide. But this increase would have a marginal impact on the capacity deficiency on the LaSalle Causeway-Highway 2 corridor. Based on the 2009 KTMP Update, a simulated 9 percent transit mode share by 2029, the projected decrease in traffic volume on the LaSalle Causeway would only amount to 0.6 percent (a decrease from 2,699 vehicles per hour in 2019 to 2,682 vehicles per hour in 2029). As such, despite these projected and simulated increases in the transit mode share, the projected traffic volumes on the LaSalle Causeway would still result in the corridor operating below the City's target LOS D. It should also be noted that significantly increasing the modal shares for public transit over-and-above current projections or simulations would be very difficult to achieve within the next 15 to 20 years, given the size of the City in relation to the major infrastructure investment and aggressive policy approach that would be required.

   Thus, focusing solely on optimizing transit, though laudable, would not be sufficient to address the entire capacity deficiency on the LaSalle Causeway-Highway 2 corridor over the immediate-to-long-term.

3. ***Is a new bridge needed if improvements are made to the LaSalle Causeway-Highway 2 corridor?*** Studies predating this EA study concluded that potential improvements along the LaSalle Causeway-Highway 2 corridor (channelization, signal timing and phasing, lane additions) and optimizing public transit use could enhance operations along the corridor but would not be able to solely address corridor deficiencies over the long-term. The studies also cautioned that expanding the capacity of the LaSalle Causeway could result in increased traffic congestion in the downtown core unless major changes to the surrounding intersections and street networks were effected.

   However, the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is duly noted. The 2011 HDR/iTrans report undertaken subsequent to Stage 1 of this EA study also reaffirmed that existing conditions on the LaSalle-Causeway-Highway 2 corridor would continue to negatively affect its LOS. The report outlines a preferred strategy to address existing and future deficiencies along the corridor. These improvements were then modelled relative to current and projected eastbound travel times on the LaSalle Causeway-Highway 2 corridor during the PM peak hour. The modelling concluded that the City's target of LOS D on the corridor could be maintained until at least 2020 with the implementation of the improvements. But it is also acknowledged that the improvements may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor over the long-term.

   Thus, making improvements to the LaSalle Causeway-Highway 2 corridor may address the EA Problem Statement for this EA study over the short-to-medium-term but may not be able to do so over the long-term. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

4. ***If a new bridge is needed, where should it be located?*** The EA study area was subdivided into six corridor areas and crossing options were developed based on potential connections to existing infrastructure. The six corridor areas were then short-listed for further assessment. A bridge at the John Counter Boulevard-Gore Road alignment option is the recommended preferred solution as it represents an opportunity, subject to best management practices and mitigation measures, to:

   a) Serve as a 21st Century 'gateway' to/from the Inner Harbour and canal;

   b) Provide a direct mid east-west connection to existing road infrastructure on either shore and thereby provide an effective and efficient link in addressing the travel demand patterns to/from the downtown and/or to/from John Counter Boulevard and beyond to other parts of the City;

   c) Tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area;

   d) Enhance emergency response services, in that the City's 2010 'Master Fire Plan' recommends that a new fire substation be built at Elliott Avenue and Division Street in 2013-2014 in strategic response to the transportation network improvements that could result from installing both a bridge at this location along with the future Wellington Street Extension;

   e) As per the 2007 'Master Plan for Water Supply for the City of Kingston Urban Area', facilitate the installation of an east-west watermain across the Cataraqui River that:

i. is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of Area 4) in order to improve the redundancy in the municipal water system on the east side of the Cataraqui River; and

ii. has been requested by Utilities Kingston as the preferred location for this infrastructure;

f) Further enhance the City's express bus route strategy as well as active travel and commuter cycling networks by providing a direct mid east-west urban transportation corridor; and

g) Based on discussions with CFB Kingston personnel:

i. tie into the CFB Kingston's intentions to explore implementation of a new access directly from Gore Road to provide an alternative route for its workforce;

ii. improve access from CFB Kingston to the VIA Rail Station which is used regularly by military personnel travelling to other centres;

iii. serve as an alternate route to the Kingston Airport which could add benefits to CFB Kingston's operations in the long term; and

iv. not be subject to potential lockdown situations as it is not directly adjacent to CFB Kingston.

5. ***If a new bridge is needed, how many vehicular lanes are required to accommodate future traffic conditions?*** In 2011, AECOM reviewed the KTMP Travel Demand Forecast Model specifically to test nine capital works upgrading scenarios and forecast the resulting travel demand on the bridge at the project site location. The forecasted 2019 PM peak hour traffic demand applied to the nine scenarios indicate the need for a four-lane bridge would be triggered by 2029 to 2034. Scenario 'I' (4-Lane Bridge, John Counter Boulevard Widening and new CFB Kingston Access to Gore Road) is the only scenario that would achieve LOS D across the network. Scenario 'I' would also be able to reduce traffic infiltration through the adjacent road network by a combined total of 6 percent which is the highest reduction in comparison to the other scenarios.

6. ***If a new bridge is needed, can it be designed, built and/or used so that it is appropriate to and compatible with adjacent land uses?*** A bridge at the project site location would have a noticeable presence on the landscape. As such, design measures will be a critical piece of the broader package of mitigation measures required during the project implementation phase to either reduce or eliminate potential negative project impacts. These include:

a) The preferred 'Arch With V-Piers' bridge design which, by providing two structural supports for the bridge girders but only one in-river foundation for each pier, could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore;

b) The constant gradual s-curve of the bridge alignment that lands north of the Point St. Mark residential neighbourhood, which offers opportunities for:

i. reduced potential noise and visual impacts on the Point St. Mark community; and

ii. 'softer landscaping' along the Gore Road right-of-way on the east shore;

c) The implementation of sound attenuation barriers to reduce the predicted sound levels from the project at noise-sensitive areas;

d) The bridge deck components, which contribute to providing a more direct mid east-west connection to existing infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension;

e) The observation look-out/interpretive nodes and public realm areas, which serve to maximize opportunities to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

f) The use of context sensitive directional and intermittent lighting and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts on the surrounding environment;

g) The identified roadway improvement works and their resulting effects on traffic flows, which should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated; and

h) The preparation and implementation of the Community Action Plan which will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

7. ***If a new bridge is needed, can it be designed, built and/or used so that it can be expanded to accommodate future traffic conditions?*** The 2030 to 2034 trigger for a four-lane bridge would impact the viability of moving forward with a two-lane bridge with a substructure to accommodate its

widening to four lanes in the future. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge twinning (with the two-lane bridge scenario) or widening (with the two-lane bridge-four-lane-substructure scenario) could be triggered shortly after the two-lane bridge would be built. However, neither scenario should be ruled out completely at this time. The future monitoring of traffic conditions by the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even delay the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself.

In addition, based on AECOM's review of the City's Travel Demand Forecast Model, another alternative staged approach to the development of an ultimate four-lane bridge could be viable. This option would involve constructing an initial three-lane bridge and a substructure that could accommodate widening to four lanes in the future. Under this scenario, the centre lane would operate as a reversible lane serving the peak direction of travel. The centre lane and dedicated westbound lane would accommodate westbound travel during the PM peak hour. Assuming the peak direction would be reversed during the AM peak hour, the centre lane and dedicated eastbound lane would then accommodate eastbound travel during the AM peak hour. The initial three-lane bridge is expected to operate at the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years. However, while the two lanes available for westbound travel are projected to have reserve capacity, the one dedicated eastbound lane during the PM peak hour is expected to approach capacity in 2019 and would be at capacity by 2029. At this point, the bridge deck would need to be widened from three lanes to four lanes. The widening would be applied in equal proportions to the north and south sides of the bridge deck and could be done directly from the bridge deck itself, as the required substructure would already be in place. This approach would also be viable for the two-lane-bridge-four-lane-substructure scenario mentioned above.

8. ***If a new bridge is needed, can it be designed, built and/or used so that it can, at a minimum, conserve the heritage values of the Rideau Canal?*** A part of the 'Vision' outlined in the 'Bridge Design Objectives' focuses on the use of innovative bridge planning and design to reinforce the City's proud historic association with the Rideau Canal. As noted above, a bridge at the project site location would have a noticeable presence on the landscape. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston's Inner Harbour near Belle Island is a rare example of the waterway where the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley's sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401 have remained largely intact. As such, design and mitigation measures will be critical during the project implementation phase to either reduce or eliminate potential negative project impacts on the natural and cultural heritage elements of the terrestrial and marine environments. These include:

a) The preferred 'Arch With V-Piers' bridge design which:

   i. by providing two structural supports for the bridge girders but only one in-river foundation for each pier, could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore; and

   ii. is able to span over the Rideau Canal's navigable channel and adjacent rowing lanes, while the arch over the canal's navigable channel highlights the bridge as a 21st Century 'gateway' to/from the Inner Harbour and canal;

b) The constant gradual s-curve of the bridge alignment that lands north of the Point St. Mark residential neighbourhood, which offers opportunities for:

   i. a more organic reflection of the bridge within the context of its 'transitional' location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and

   ii. a more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west;

c) The bridge clearance above the water, which exceeds the Rideau Canal's Federally regulated navigable requirement and could also mitigate visual impacts, in that its silhouette would be below the tree line along the north shore of Belle Island and Belle Park when viewed from the water;

d) The observation look-out/interpretive nodes and public realm areas, which serve to maximize opportunities to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

e) The use of context sensitive:

   i. barriers and railings on the bridge and public realm areas and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities of the Rideau Canal, Belle Island, Belle Park and the marsh; and

ii. directional and intermittent lighting and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts on the surrounding environment;

f) The use of dredging (and not backfilling the excavated channel after the bridge is built), which could:

i. represent a mitigation measure in response to potential project effects, in that the excavated channel would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more; and

ii. provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain if it was installed underneath the permanent bridge deck;

g) The preparation and implementation of a Natural Environment Enhancement Plan that includes detailed design measures related to wetland or aquatic restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating and re-foresting the east and west side lands; and

h) The use of best management practices and mitigation measures during the project implementation phase, as cited earlier.

9. ***If a new bridge is needed, can it be designed, built and/or used so that it is appropriate to and compatible with watercraft navigation?*** The proposed bridge clearance above the water is 14 m over the Rideau Canal's navigable channel and adjacent rowing lanes. This exceeds the 6.7 m Federally regulated navigable requirement for the canal.

In addition, the proposed 100 m arch span over the canal's navigable channel (for a total 131 m distance pier-to-pier) was originally considered to be sufficient to span the existing rowing course which runs in parallel to the channel from the Point St. Mark residential neighbourhood north for 2,000 m. However, the initial 131 m distance pier-to-pier has subsequently been increased to a proposed 150 m distance pier-to-pier. This increase reflects recent consultations with the Kingston Rowing Club, during which the project team was advised that the rowing course is seven lanes wide. Four rowing lanes are on the west side of the channel and three lanes are on the east side, though only the rowing lanes abutting either side of the channel are marked. Club staff indicated that an 11 m wide rowing lane width is presumed for each lane across the full course, which accommodates the rowing shells, prevents collisions and complies with Olympic requirements. As such, concerns were expressed that the initial 131 m distance pier-to-pier would encumber the rowing course and not provide adequate horizontal and vertical clearance between the rowers and abutting piers, given:

a) The channel is at roughly a 30 degree angle to the bridge;

b) The minimum 6.7 m Federally regulated navigable requirement for the canal;

c) The CRCA design 'high' water level requirement of 76.3 m; and

d) The 1H:1.2V rising slope of the v-piers above the water does not accommodate full vertical clearance from the waterline to the underside of the bridge deck.

Based on these recent consultations, the project team has determined that it would be feasible to increase the pier-to-pier distance to 150 m in order to provide unencumbered through-navigation for the existing rowing course. Proposed design features include:

a) A 9.4 m horizontal clearance from the abutting pier on the west side of the course;

b) An 8 m horizontal clearance from the abutting pier on the east side of the course; and

c) A 13.5 m wide rowing lane on either side of the navigable channel to provide an additional 2.5 m clearance from the channel itself.

The 150 m distance pier-to-pier would also provide flexibility to optimize the pier locations further during the project implementation phase in response to more specific rowing course and navigable channel configurations and characteristics north and south of the bridge corridor. It should be noted that the preliminary opinion of probable cost for the four-lane bridge scenario cited in this Report would have to be reviewed further during the project implementation phase if the proposed 150 m distance pier-to-pier design is pursued to fully accommodate the rowing course.

10. ***If a new bridge is needed, can it be designed, built and/or used so that it demonstrates respect for the customs and traditions integral to the distinctive cultures of First Nations communities?*** As noted above, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City's interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City endeavoured to undertake consultations either though meetings or regular mailings with local First Nations communities as part of this EA study. Feedback from local First Nations communities has been limited due to the following:

a) First Nations and Aboriginal community leadership have stated that they lack resources to respond to all requests for consultation made of them, especially in light of their own resource demands for the administration of their own communities; and

b) Each First Nation has its own history and traditions which are understood and practiced to different degrees. This difference is related to the size and resources available to each community, their distance in time and geography from their connection to the Lower Cataraqui River Valley, as well as their own understanding of their heritage in the region, which has been dislocated because of the intervention of Canadian settlement and governance.

However, a preliminary report was submitted on behalf of the Mohawk Nation Council of Chiefs to the City that outlined recommendations on the project. Subsequent direct consultations with a representative of the Mohawk Nation Council of Chiefs occurred on September 6, 2011. The project team then prepared responses to the recommendations in the preliminary report and submitted them to the Mohawk Nation Council of Chiefs on September 29, 2011. The recommendations and project team responses are summarized below:

a) ***The bridge should be designed to have a life cycle of at least 120 years.*** The CHBDC requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics of the Third Crossing typically have a design life of at least 100 years, which exceeds the minimum CHBDC requirement. It is also anticipated that the design of the Third Crossing (in terms of its structural elements and materials, intended function and maintenance requirements in relation to the geographical setting) will yield a design life exceeding 100 or even 120 years.

b) ***Bridge design should be guided by principles of context sensitive design: the bridge should be considered a guest, a visitor to the river and the land, and not an owner or overlord.*** The guiding bridge design objectives, which speak to 'cultural and natural heritage integrity' and 'healthy community', reflect the principles of context sensitive design.

c) ***Natural materials should be used as much as possible in bridge and supporting areas design and construction.*** The use of natural materials will confirmed during the future detailed design stage prior to the construction phase of the project. In terms of durability, economy and strength, current materials such as concrete and steel are the most suitable for this bridge. However, alternative new materials as they are developed in the future as well as natural materials such as stone will be incorporated as much as possible.

d) ***Local materials should be used as much as possible. One useful criterion is to avoid any materials from more than 800 km away.*** The use of local materials will be confirmed during the future detailed design stage prior to the construction phase of the project. Note local aggregates will be used for concrete and road construction, subject to availability.

e) ***The bridge should be designed to have an eventual capacity of four lanes of traffic, but it should initially consist of two traffic lanes and the other lanes, on a separate track, would be used by cyclists and pedestrians.*** 2019 is the earliest possible time frame by which the bridge could conceivably be built. As discussed earlier, forecasted 2019 PM peak hour traffic demand and various planned road network improvement scenarios indicate the need for a four-lane bridge would be triggered by 2030-2034.

The 2030-2034 trigger for a four-lane bridge impacts the viability of moving forward with a 2-lane bridge and a substructure that could accommodate widening to 4 lanes in the future. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge widening could be triggered shortly after the 2-lane bridge would be built. Despite this, the EA Report recommends a re-assessment of conditions impacting the need for the four-lane bridge during the detailed design stage prior to the construction phase of the project.

f) ***The bridge should respond to actual and planned needs, and not to pressure from those who would develop the lands east of the river, in ways inconsistent with Kingston's urban planning.*** The City's Official Plan provides for planned current and future growth and development areas on the east side of the Cataraqui River, where adequate urban services exist or can be more efficiently extended in an orderly and phased manner. This is recognized in the Official Plan as being equally integral to, and consistent with, the City's vision for sustainability as downtown revitalization, intensification and maintaining a sense of human scale. The need for the Third Crossing is similarly recognized in both the Official Plan (subject to this EA) and the 2004 KTMP (including its update in 2009) as a means to accommodate planned current and future growth on both the east and west sides of the Cataraqui River through improved road network connectivity. The design of the bridge is consistent with these Plans.

As noted above, this need is also reinforced through AECOM's recent traffic demand forecasting work. With an existing traffic volume in the order of 1,000 to 1,100 vehicles per hour in each direction during the PM peak hour, the LaSalle Causeway is currently operating below the City's LOS D policy. Without the Third Crossing in place, traffic volumes across the LaSalle Causeway are expected to increase further by 2019.

In addition, the City is currently considering a series of improvements to the LaSalle Causeway-Highway 2 corridor to help mitigate existing and expected traffic delays along this corridor. These improvements generally involve transportation demand management

measures; traffic signal optimizations; adaptive traffic controls; storage lane extensions; constructing the new CFB Kingston access road connection to Gore Road; public transit service enhancements; and replacing the traffic signal at the Highway 2-Kingston Road 15 intersection with a roundabout.

g) ***While the bridge should be designed to carry four lanes of traffic, conversion from two to four lanes, when proposed by the City, must be fully justified, and not only in terms of pressure for eastward development.*** Note the project team responses above.

h) ***We suggest supplementing our knowledge about the impact of a permanent trench and water main on the river environment.*** As noted, dredging offers opportunities to:

i. enhance aquatic biodiversity, in that the dredged channel would introduce a new component to a marine environment that is currently dominated by submerged vegetation;

ii. reduce capital costs in the range of 8-12 percent in comparison to other potential in-water bridge construction options; and

iii. accommodate the east-west watermain within the dredged channel, which:

(a) has been requested by Utilities Kingston as the preferred location for this infrastructure;

(b) would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain; and

(c) offers a more sustainable design solution, in that the need for expansion joints, heat tracing (which requires on-going energy use) and insulation jacket equipment as well as related maintenance and servicing (if the watermain was to be attached underneath the bridge deck) would not be required.

i) ***Accelerated bridge construction techniques will reduce environmental impact, cost and waste, and speed up construction.*** Note that: (a) repetitive geometric design provides similar opportunities through the benefit of structural pre-fabrication; and (b) off-site bridge structural assembly will be dictated by limited land availability proximate to the bridge corridor, thus facilitating accelerated bridge construction.

j) ***Bridge deconstruction must be planned and confirmed at the same time as construction is approved. This includes plans to dismantle and recycle the bridge and its materials, and to restore the land and the river afterwards. The cost of deconstruction must be included in the life cycle assessment of the bridge.*** As the bridge will have a design life of at least 100 years, if and when decommissioning and rehabilitation are required, such works will be subject to an EA as per regulations current at that time. [The EA Report acknowledges that the bridge may need to be decommissioned for a number of reasons, including functional obsolescence or irreparable damage due to highly improbable human-made disasters or natural causes such as earthquakes or wind producing forces in excess of design forces. If or when the bridge becomes functionally obsolete, a change of use on the bridge may also be considered, such as commercial or residential structures that are supported by the bridge. This was done, for example, on the London Bridge in the 17th Century. If the structure is to be removed, the basic procedure would closely follow activities associated with the construction phase.]

k) ***Bridge design should include monitoring systems for the state of health of the bridge, to supplement visual monitoring.*** The use of such evolving design technologies and the methods, extent and implementation staging of the monitoring system will be determined during the future detailed design stage prior to the construction phase of the project.

l) ***Consideration should be given to the bridge incorporating its own renewable energy sources.*** The use of such evolving design technologies and the type and extent of use of these sources will be determined during the future detailed design stage prior to the construction phase of the project, based on the bridge geometry, materials, environmental effects and cost effectiveness.

m) ***A Life Cycle Assessment must be part of the analysis of each alternative bridge design.*** The EA framework used to both evaluate the alternative bridge designs and select a preferred design will speak to the Life Cycle Assessment criteria, namely: (a) the extent to which the alternative designs address the solution to the problem; (b) the advantages and disadvantage of the alternative designs; (c) the effects of the alternative designs on the physical, natural, social, cultural, economic and technical environments; (d) recommended mitigation measures; and (e) decommissioning and rehabilitation measures, should such works be required in the future.

n) ***Bridge design and construction should take waste management into account. Winter waste from the bridge should not be allowed to run into the river. Rapid response from dedicated crews will reduce this waste: the rest should be gathered and recycled. Rainwater, as well, must be collected and recycled, and runoff into the river must be prevented.*** Stormwater and snow collection and management measures will be brought forward into the future detailed design stage prior to the construction phase of the

project. Such measures will focus on on-shore treatment (for sediment removal) and release in accordance with regulatory requirements.

o) ***Ultra High Performance Pavement would result in lighter, more durable road beds, and would permit more flexibility in design. It could incorporate solar heating elements within the pavement to melt winter ice.*** The use of such evolving design technologies will be part of the material selection and pavement design process to be determined during the future detailed design stage prior to the construction phase of the project.

p) ***High performance materials in all aspects of the bridge's design and construction would lead to cost savings, environmental benefits and would allow more attractive bridge designs.*** The use of such materials will be part of the material selection process to be determined during the future detailed design stage prior to the construction phase of the project.

q) ***The bridge, as well as the traffic on it, will reverberate along the river and its valley, including in the riverbed. Sound control and damping will reduce noise and vibration.*** Attenuation measures to help mitigate the effects of noise from the bridge on adjacent land uses are a critical component of the package of mitigation measures, which will be confirmed during the future detailed design stage prior to the construction phase of the project.

r) ***To enable the bridge to be built with lightweight construction materials, heavy commercial vehicles should be routed into Kingston over the Highway 401 crossing, and not over the bridge.*** The bridge is recognized as an essential piece of a mid-central arterial road corridor through the City that is needed to accommodate planned current and future employment and residential growth on both the east and west sides of the Cataraqui River. Restricting heavy commercial vehicles and, by extension, other 'heavy' vehicles (such as emergency vehicles and works vehicles) from using the bridge and instead routing them into the City over the Highway 401 crossing would: (a) compromise the intended function of the bridge within this broader strategic urban context; and (b) lead to further out of way travel, resulting in additional travel delays, fuel consumption and greenhouse gas emissions.

s) ***To extend the bridge's life, as well as for environmental benefits, any public transportation route using the bridge should employ lightweight vehicles.*** Given that the design life of the bridge is required to be at least 75 years, any future infrastructure investments that the City makes to enhance the sustainability of public transit service will have the added benefit of extending the life cycle of the bridge even further.

t) ***To reduce the bridge's electrical consumption, the bridge should incorporate LED and other low-burden lighting. The bridge lighting should have as little impact on the night sky and possible.*** The use of such evolving design technologies will be considered during the future detailed design stage prior to the construction phase of the project, based on safety, environmental effects and life cycle costs.

u) ***Pedestrian and cycling lanes, especially in their approaches to the bridge, should be designed to provide variety and be as natural as possible – avoiding the rigidity of straightness and flatness.*** The landscape concepts speak to the principles of organic flow and natural design. Also, the constant gradual s-curve of the bridge alignment along with the bridge clearance over the water (3 m along most of its westerly portion, then gradually rising to 14 m over the Rideau Canal and then descending to 12 m at the east shore) further avoids rigid, straight and flat design.

v) ***A cable stay design with a single pylon would be economical, would reduce the bridge's footprint in the river, and would respect the values of the Haudenosaunee by incorporating the symbols of the turtle and the Tree of Peace.*** The arch is the best option as it keeps the bridge profile low and allows for the spanning of both the Rideau Canal's navigable channel and rowing lanes with no piers separating these two important elements. However, a cable-stay and tower section close to the east shore will look disproportionately skewed to the east end of the river, and that its presence could negatively impact the flight patterns of birds and waterfowl both to and from the emergent cattail marsh north of the bridge corridor. The tower section could also create negative wind load effects on the bridge, for which the extent of related structural mitigation measures would need to be assessed.

The values of the Haudenosaunee, particularly the symbols of the turtle and the Tree of Peace, are acknowledged. The symbolism of the tree emerging from the turtle's back sends a message about creation, the natural world and peace. The City and project team are also sensitive about not wanting to either be 'too literal' in this regard or suggest that this Report represents the arbiter of 'context sensitive design'. The need for this EA study to strive to achieve a balance between competing stakeholder interests is also paramount. But in the spirit of wishing to convey respect for Haudenosaunee values, this Report notes the following:

i. the arch, combined with its supporting v-piers that rise out of the water, could be viewed as the turtle's back that 'rose to the water's surface so Sky Woman could sit and rest before she created the soil of this continent';

ii. the v-piers, by rising out of the water, could be viewed as:

(a) 'the mud that Sky Woman persuaded the animals to bring up from the bottom for her to spread around and create the soil of this continent'; and

(b) the branches of a tree; and

(c) turtle basking area(s) could also be designed at the base of select v-piers to look like a turtle's back rising out of the water.

It is recognized by the City that its own commitment to consult with local First Nations communities, as demonstrated in the trust that has grown out of previous consultations on other initiatives, will continue as part of the implementation phase for this project.

11. ***How can the capital costs from a new bridge be recovered by the City of Kingston?*** There are four project delivery models, namely Design-Bid-Build, Design-Build, Public-Private Partnership and Alliance. Confirming the preferred delivery model is outside this EA framework and is best addressed during the early stages of the Project Implementation phase to reflect the City's cost recovery model and business strategy to secure funding and manage control of the project design, construction and risk. It should be noted that a significant portion of the City's direct costs (the net cost after funding) would be recovered through Development Charges collected from new developments. It is recommended that the City develop a Business Plan in order to fund and finance the project during the early stages of the Project Implementation phase and to identify the preferred project delivery model.

8.0 CONCLUSION

This Report has assessed alternative solutions to determine the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River. Based on this assessment, the recommended preferred solution is the 'Arch With V-Piers' bridge crossing at the John Counter Boulevard-Gore Road alignment. This Report has also assessed the impact of this project and has concluded that it will be Low to Minimal for the following reasons:

1. The 'Arch With V-Piers' concept provides two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. To further benefit viewscape considerations and reduce associated in-water disturbances, it could be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers and still maintain appropriate span-length-to-girder-depth proportions.

2. It is able to span over the Rideau Canal's navigable channel and adjacent rowing lanes, while the arch over the canal's navigable channel highlights the bridge as a 21st Century 'gateway' to/from the Inner Harbour and canal.

3. The bridge alignment, as a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood, offers opportunities for:

   a) Reduced potential noise and visual impacts on the Point St. Mark community;

   b) 'Softer landscaping' along the Gore Road right-of-way on the east shore;

   c) A more organic reflection of the bridge within the context of its 'transitional' location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and

   d) A more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

4. The bridge clearance above the water accommodates existing topographic conditions on both shorelines and exceeds the Rideau Canal's Federally regulated navigable requirement. It also mitigates visual impacts, in that its silhouette would be below the tree line when viewed:

   a) On the water from the north by the north shore of Belle Island and Belle Park;

   b) On the water from the south by the visible cattail portion of the Greater Cataraqui Marsh that begins to emerge in the background; and

   c) to the east from both water and land on the west side by the existing topography of the east side lands.

   It should also be noted that the restorative landscape improvements on the west side lands provide an opportunity for the bridge to be below the 'future' tree line in this area when viewed from both the water and land on the east side.

5. The bridge deck components contribute to providing a more direct mid east-west connection to existing road infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension. This could further serve to direct traffic south to the downtown area and accommodate CFB Kingston's future growth plans.

6. The observation look-out/interpretive areas along the south side of the bridge deck maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

7. The use of context sensitive:

   a) Barriers and railings on the bridge and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and

   b) Directional and intermittent lighting on the bridge and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

8. The need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is recognized in an initial bridge configuration design could consist of a three lane, centre lane reversible, cross section that can be widened in response to future traffic monitoring and related conditions.

9. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid east-west arterial corridor at an acceptable LOS D over the long-term. In addition, it offers opportunities to further enhance emergency services in the City and the City's express bus transit strategy. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated.

10. The active travel and commuter cycling provisions on the bridge serve to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

11. The landscape improvements represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands by creating/re-creating naturalized landscapes.

12. In the public realm areas, the use of context sensitive:

   a) Barriers and railings serve to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and

   b) Directional and intermittent lighting serve to address public and traffic safety requirements, accentuate public realms and mitigate light impacts on the surrounding environment.

13. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River further accentuate the public realm as a 'naturalized' feature.

14. The use of dredging (and not backfilling the excavated channel after the bridge is built) as the preferred temporary in-water bridge construction access option provides the opportunity to:

   a) Introduce a mitigation measure in response to potential project effects, in that the excavated channel would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more;

   b) Reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option; and

   c) Accommodate Utilities Kingston's east-west watermain within the dredged channel, which:

      i. has been requested by Utilities Kingston as the preferred location for this infrastructure;

      ii. would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and

      iii. offers a more sustainable design solution, in that the need for expansion joints, heat tracing and insulation jacket equipment as well as related maintenance and servicing would not be required.

15. The implementation of sound attenuation barriers further reduces the predicted sound levels from the project at noise-sensitive areas.

16. In light of the relatively shallow waters (ranging from 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal's navigable channel) and low water flow velocities (ranging from negligible up to 0.4 m/s), the hydraulic modeling results show that the double v-piers would generate only minor impacts on water levels [the most significant increase is up to 4 millimetres (mm) in the vicinity of the piers] and flow-generated velocities [less than 3 centimetres/second (cm/s), also in the vicinity of the piers]. As such, it is similarly expected that the dredged channel, and the associated removal of aquatic vegetation that is required to accommodate it, would not have any significant influence on water levels or flow-generated velocities.

17. The best management practices and mitigation measures are means to reduce or eliminate potential adverse environmental effects from the project. In particular, the preparation and implementation of the Natural Environment Enhancement Plan during the project implementation phase will include further detailed measures related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows as well as re-vegetating/re-foresting the east and west side lands.

This Report can be used to satisfy both the Provincial and Federal EA frameworks. Upon City Council's review and approval of this Report under the Class EA planning process, a formal 'Notice of Completion' will be issued by the City. The public and review agencies will have thirty days to request a 'Part II Order' from the Ontario Minister of Environment. This is an appeal provision whereby a person or party with outstanding concerns may request the Ontario Minister of Environment to make an order requiring the City to comply with Part II of the OEA Act before proceeding any further with the Schedule C Class EA phase of the project. If no request for a Part II Order is received, the Schedule C Class EA phase of the project will be complete. The City will then seek Federal approval of the EA pursuant to the CEA Act. Following Federal EA approval, the City will be in a position to then initiate project implementation (detail design, final approvals and construction) within the next ten years without having to revisit the findings and recommendations identified through the Schedule C Class EA. This will enable the City to facilitate long-term planning and budget programming including the on-going collection of Development Charges and the pursuit of financial assistance from upper levels of government.

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