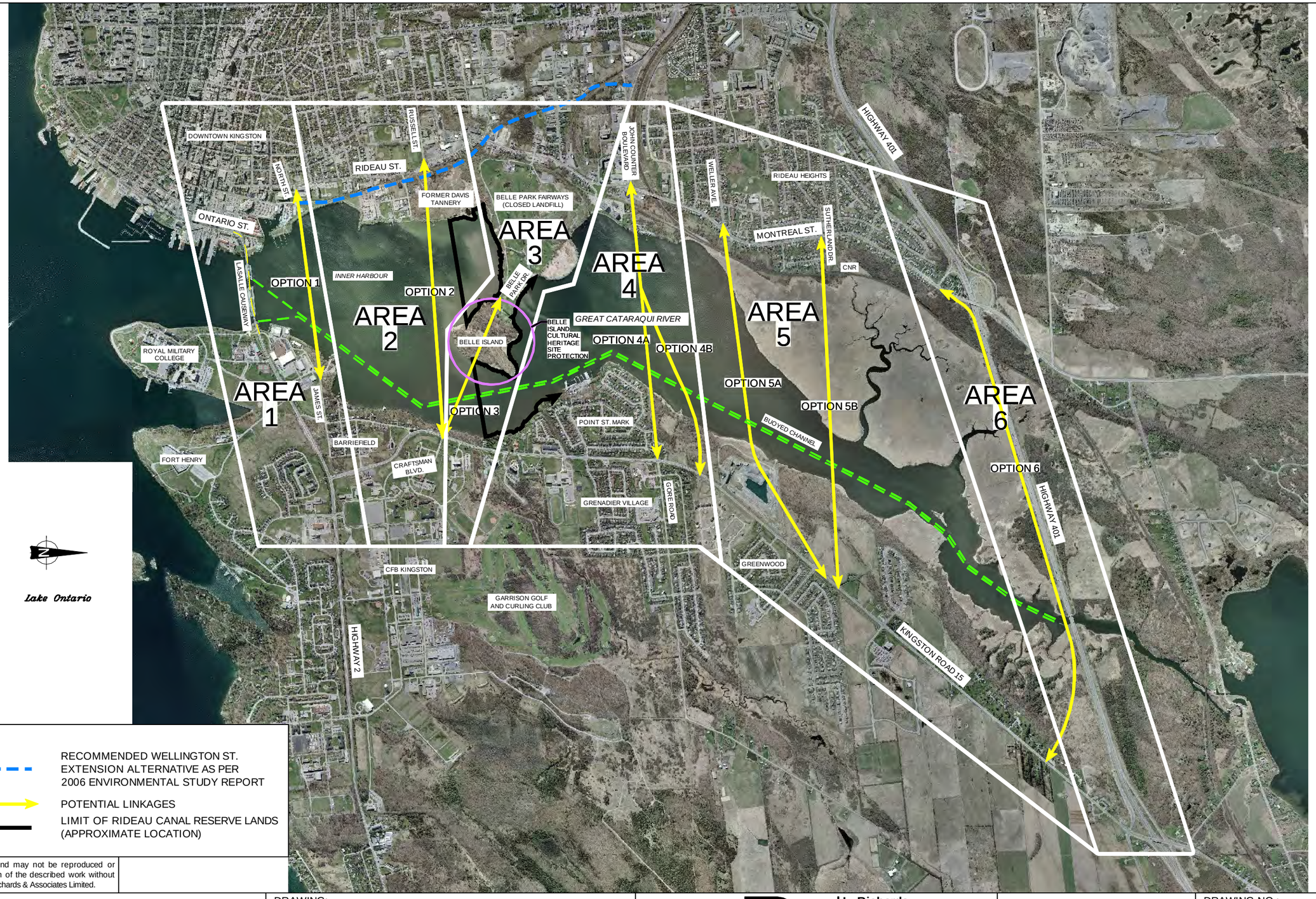


RECOMMENDED WELLINGTON ST. EXTENSION ALTERNATIVE AS PER 2006 ENVIRONMENTAL STUDY REPORT

POTENTIAL LINKAGES

LIMIT OF RIDEAU CANAL RESERVE LANDS (APPROXIMATE LOCATION)



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

DRAWING:
## EA CORRIDOR AREAS

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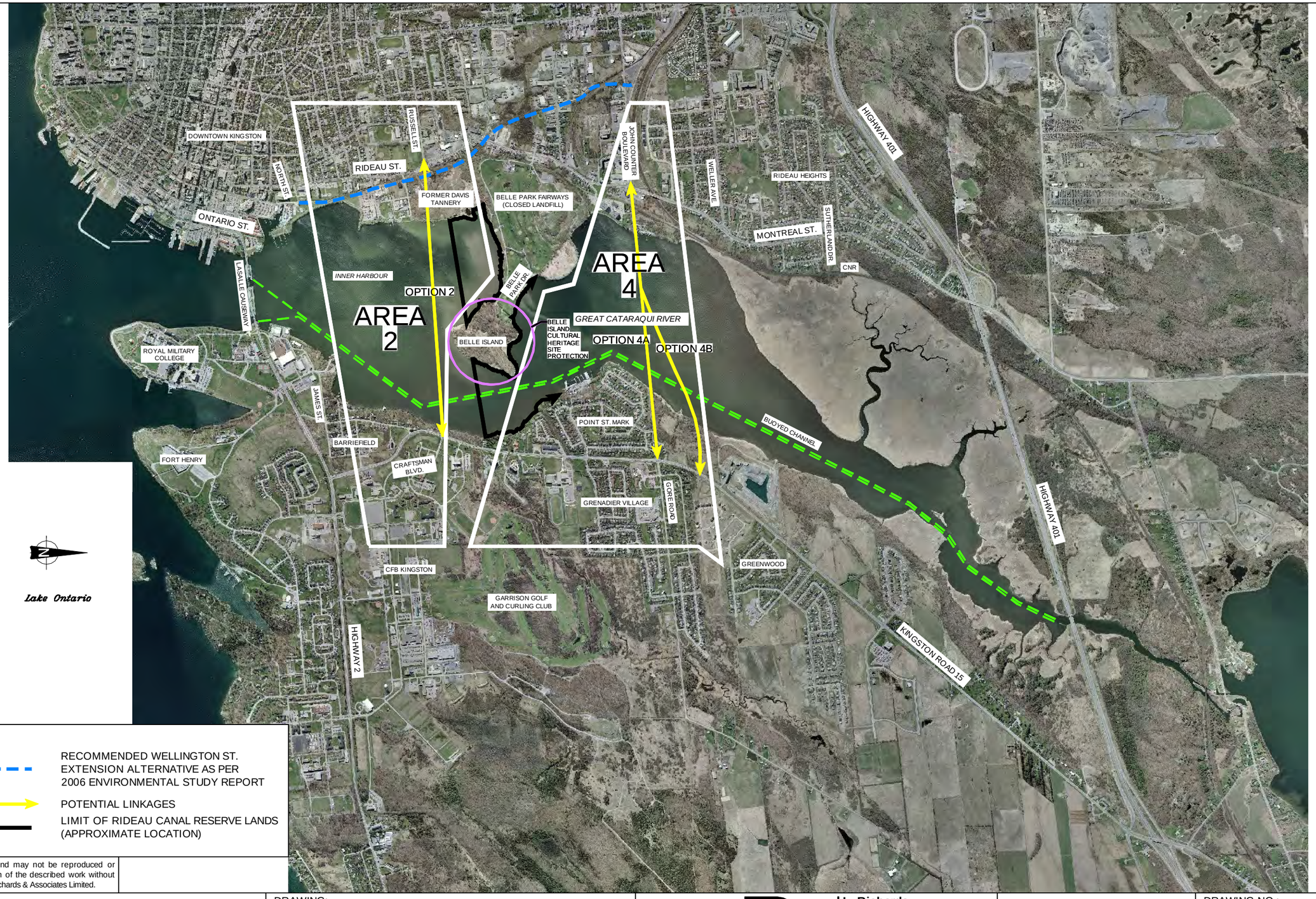
DESIGN:
DRAWN:
CHECKED:
PLOTTED: 26-Jan-12

DRAWING NO.: **3-19**

JLR NO: 23446-02

File Location: C:\Documents and Settings\djudson\Desktop\23443-02 - Third Crossing ESR\Figures\Figure 3-19 3-20 3-22 4-15 PS-2 PS-3.dwg




RECOMMENDED WELLINGTON ST. EXTENSION ALTERNATIVE AS PER 2006 ENVIRONMENTAL STUDY REPORT

POTENTIAL LINKAGES

LIMIT OF RIDEAU CANAL RESERVE LANDS (APPROXIMATE LOCATION)



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

DRAWING:
## SHORT LISTED EA OPTIONS AND CORRIDORS

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CHECKED:
PLOTTED: 26-Jan-12

DRAWING NO.: **3-20**

JLR NO: 23446-02

File Location: C:\Documents and Settings\djudson\Desktop\23443-02 - Third Crossing ESR\Figures\Figure 3-19 3-20 3-22 4-15 PS-2 PS-3.dwg

### .2 Area 2

Area 2 was short-listed for further assessment for the following main reasons:

1. Though it is not the most direct mid-City east-west link and there would be limited capacity at the Rideau Street-Russell Street connection on the west side of the Cataraqui River, it could be made more effective with the future Wellington Street Extension which, if implemented, could accommodate traffic flows both to/from the downtown and north to other portions of the City via John Counter Boulevard.

2. Area 2 is also part of the City's 'urban landscape' and the Russell Street-Craftsman Boulevard alignment option is north of most of the identified heritage sites, protected views and the fourteen registered shipwrecks that rest in the southern portion of the Inner Harbour.

3. The Russell Street-Craftsman Boulevard alignment option, if designed to stay low to the water from west-to-east and rise above the navigable channel near the west shoreline, its silhouette, in conjunction with its proximity to Belle Island to the north and the steep and wooded west shoreline, could be below the tree line. This context could serve to mitigate potential visual impacts.

Despite the above, the Russell Street-Craftsman Boulevard alignment option in Area 2 raises the following potential issues:

1. The Russell Street-Craftsman Boulevard alignment option is not the most direct mid-City east-west link and the current limited capacity at the Rideau Street-Russell Street connection on the west side of the Cataraqui River would require the future Wellington Street Extension to make it more effective from a transportation perspective. There is also limited space at the Craftsman Boulevard connection on the east shore to accommodate future crossing infrastructure works.

2. The Russell Street-Craftsman Boulevard alignment option would only create a short loop of the Inner Harbour with the LaSalle Causeway to serve active travel and commuter cycling needs. Again, the future Wellington Street Extension would be required to improve east-west connectivity both to/from the downtown and John Counter Boulevard, but this is not the most direct mid-City east-west link.

3. Though Area 2 is not part of the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard, the Russell Street-Craftsman Boulevard alignment option is still within the Provincially Significant Wetland and Provincially Significant Coastal Wetland and could further impact aquatic resources, species at risk and identified provincially significant woodlands, for which mitigation measures would be required.

4. Similar to Area 1, the Russell Street-Craftsman Boulevard alignment option could encounter contaminated sediments within the Inner Harbour and contaminated soil and groundwater conditions on the western shore as this area was also subject to intensive urban industrialization.

5. Significant archaeological resources are present in Area 2 representing the Euro-Canadian urbanization of the City. In addition, though Area 2 is north of most of the identified heritage sites, protected views and registered shipwrecks and is part of the City's 'urban landscape', the potential impacts resulting from its mere proximity to these identified resources cannot be underestimated. Moreover, its proximity to Belle Island could impact First Nations interests. Still further, the facts that virtually the whole EA study area exhibits high archaeological potential and that the northern section of Area 2, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage resources, only reinforces the importance of this issue.

6. Based on discussions with CFB Kingston personnel, the intersection at Kingston Road 15 and Craftsman Boulevard could be closed at any time by CFB Kingston when it needs to activate full security clearance and lockdown mode.

7. The shore-to-shore crossing distance of the Russell Street-Craftsman Boulevard alignment option is among the longest in comparison to the other alignment options, which would result in additional capital and maintenance costs.

### .3 Area 3

The Belle Island-Craftsman Boulevard alignment option in Area 3 was not short-listed due mainly to its severe impacts on First Nations interests. Belle Island contains a historic First Nations hunting settlement and cemetery. It is also the subject of a site protection strategy that would set it physically apart from the mainland and place it under the joint ownership of the City and the Mohawk Nation Council of Chiefs. An agreement to this effect was endorsed by City Council in 2006.

Other issues impacting the Belle Island-Craftsman Boulevard alignment option in Area 3 are as follows:

1. Though Area 3 is not part of the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard, the Belle Island-Craftsman Boulevard alignment option is still within the Provincially Significant Wetland and Provincially Significant Coastal Wetland and could further impact aquatic resources, species at risk and the provincially significant old oak grove on Belle Island, for which mitigation measures would be required.

2. Similar to Areas 1 and 2, the Belle Island-Craftsman Boulevard alignment option could also encounter contaminated sediments within the Inner Harbour and contaminated soil and groundwater conditions on the western shore associated in particular with the former Belle Park Landfill site.

3. Similar to Area 2, though Area 3 is north of most of the identified heritage sites and protected views, the fact that Area 3, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage resources, only reinforces the possible issues resulting from its mere proximity to these resources.

4. The Belle Island-Craftsman Boulevard alignment option is still not the most direct mid-City east-west link and the current limited capacity of Belle Park Drive and beyond on the west side of the Cataraqui River would require extensive improvements and the future Wellington Street Extension to make it more effective from a transportation perspective. Moreover, as the Craftsman Boulevard link on the east shore is similar to what is shown in Area 2, there is also limited space here to accommodate crossing infrastructure works.

5. Though more northerly of Areas 1 and 2, the Belle Island-Craftsman Boulevard alignment option in Area 3 would still create a loop of the Inner Harbour with the LaSalle Causeway that would primarily serve active travel and offer marginal improvements to east-west commuter cycling networks. The future Wellington Street Extension would be required to improve east-west connectivity both to/from the downtown and John Counter Boulevard but again, this is not the most direct mid-City east-west link.

### .4 Area 4

Area 4 was short-listed for further assessment for the following main reasons:

1. Area 4 represents the most central crossing location within the EA study area. Based on the 2004 KTMP, the John Counter Boulevard-Gore Road alignment option (Option 4A) is cited as the location for a future 2-lane bridge in the City's Official Plan, subject to the outcome of an EA study. As such, Option 4A could:

   a) 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;

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

   c) 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[18];

   d) 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;

   e) 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

   f) 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.

2. The John Counter Boulevard-Kingston Road 15 alignment option (Option 4B) could provide similar benefits on the west side of the Cataraqui River as Option 4A, but its more northerly connection to Kingston Road 15 on the east side of the Cataraqui River would result in staggered intersections with Kingston Road 15. This is not ideal from a transportation perspective.

[18] Note Elliott Avenue is an east-west collector road that intersects with John Counter Boulevard (and the future Wellington Street Extension) just west of Montreal Street (outside the EA study area).

3. The John Counter Boulevard-Kingston Road 15 alignment option (Option 4B) could address potential impacts of a crossing on the Point St. Mark residential neighbourhood and the Gore Road Library located on the south and north sides of Gore Road, respectively.

4. Area 4 is part of the transition point between the 'natural landscape' of the Cataraqui River to the north and the City's 'urban landscape' to the south, east and west. If both alignment options were designed to stay low to the water from west-to-east and rise above the navigable channel near the east shoreline, its silhouette, in conjunction with its proximity to Belle Island to the south and the steep and wooded west shoreline, could be below the tree line. Similarly, when viewed from the west, the rising silhouette of the bridge could either be at or below the tree line on the east side lands and, from the south, by the natural landscape that emerges in the background further north to Highway 401. This context could serve to mitigate potential visual impacts.

Despite the above, Option 4A and Option 4B raise the following potential issues:

1. Though Area 4 is not part of the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard, both alignment options are still within the Provincially Significant Wetland and Provincially Significant Coastal Wetland and could further impact aquatic resources, species at risk and identified provincially significant woodland, for which mitigation measures would be required.

2. Both alignment options could encounter contaminated soil and groundwater conditions on the western shore as this area was subject to intensive urban industrialization.

3. Area 4, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage potential. This, in conjunction with the presence of the Rideau Canal, the Gore Road Library and high archaeological potential of this area, only reinforces the possible issues resulting from the mere proximity of both alignment options to these resources.

4. The John Counter Boulevard-Gore Road alignment (Option 4A) could impact the Point St. Mark residential neighbourhood and the Gore Road Library located on the south and north sides of Gore Road, respectively, for which mitigation measures would be required. Though the John Counter Boulevard-Kingston Road 15 alignment (Option 4B) could address these potential impacts, its more northerly connection to Kingston Road 15 on the east side of the Cataraqui River would result in staggered intersections with Kingston Road 15 which again, is not ideal from a transportation perspective.

5. The shore-to-shore crossing distance of Option 4B is 25 percent longer than Option 4A, which would result in additional capital and maintenance costs.

### .5 Area 5

Area 5 was not short-listed for the following primary reasons:

1. Both the Weller Avenue-Kingston Road 15 (Option 5A) and Sutherland Drive-Kingston Road 15 (Option 5B) alignments extend through ANSI's, which are areas having identified life science or earth science values. Both alignment options also extend through the visible cattail portion of the Greater Cataraqui Marsh which, based on the OWES, has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion of the wetland. The identified provincially significant woodlands on either shore would be impacted as well, for which mitigation measures would be required.

2. Area 5, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage potential. This, in conjunction with the presence of the Rideau Canal and the Kingston Outer Station site north of Belle Island on the west side of the Cataraqui River as well as the high archaeological potential of this area, only reinforces the possible issues resulting from its mere proximity to these resources.

3. Area 5 is further north of established urban areas. As such, there are limited roadway links on the west and east sides of the Cataraqui River in Area 5 to disperse traffic, which would provide limited opportunities to improve vehicular traffic as well as active travel and commuter cycling networks through a more mid east-west urban transportation corridor.

4. Both Options 5A and 5B involve the longest shore-to-shore crossing distances in comparison to the other alignment options. The shore-to-shore crossing distance, in conjunction with the overhead road crossing that would be required at the CNR line on the west shore, would result in additional capital and maintenance costs.

### .6 Area 6

Expanding the Highway 401 crossing in Area 6 by a parallel, but separate, crossing for local traffic is not considered a practical option for the following main reasons:

1. Similar to Area 5, Area 6:

   a) Extends through ANSI's, the visible cattail portion of the Greater Cataraqui Marsh and identified provincially significant woodlands on either shore would also be impacted, for which mitigation measures would be required; and

   b) Has yet to be systematically reviewed for cultural heritage potential.

2. Area 6 is the furthest north of established urban areas in comparison to the other corridor areas. As such, there are limited roadway links on the west and east sides of the Cataraqui River in Area 6 to disperse traffic, which would provide limited opportunities to improve vehicular traffic as well as active travel and commuter cycling networks through a more mid east-west urban transportation corridor.

#### 3.2.5 Implement a New Tunnel Crossing

As noted earlier, the feasibility of implementing a tunnel crossing in Area 4 at the John Counter Boulevard-Gore Road alignment was considered in the 1992 TSH study and found to be non-viable. The tunnel crossing options considered as part of this EA study focused on the short-listed corridor Area 2 and Area 4. A tunnel crossing in Area 2 would also be non-viable as there is limited land available on the east shore near Craftsman Boulevard. A tunnel at this location would thus need to extend under and well east of Kingston Road 15 onto CFB Kingston property in order to maintain the acceptable geometric design criteria of a 6 percent slope or less to match the existing elevation at the intersection.

Two possible tunnel crossing options were then considered in Area 4, as shown on Drawing 3.21:

1. Tunnel Option A would require its east section to extend parallel to Kingston Road 15 between the river's edge and the Gore Road Library in order to achieve an acceptable vertical profile and eventually connect with Kingston Road 15 at a new "T" intersection roughly 350 m north of Gore Road. This alignment would require substantial clearing of the treed area along the river's edge and would reduce opportunities for future development north of the Gore Road Library.

2. Tunnel Option B would involve a spiral ramp around the Gore Road Library including a section through the Kingston Road 15-Gore Road intersection. Traffic along the Kingston Road 15-Gore Road intersection would need to be detoured for several months to permit construction. The posted speed along the spiral ramp section would be limited to 30 km/hr due to the relatively short radius required with this horizontal alignment.

For either option, the tunnel would be constructed using a cut and cover technique. A tunnel through rock is not feasible due to vertical profile constraints, as the rock elevation is roughly 20 m to 40 m below the riverbed surface. With the cut and cover technique, construction would be carried out in a series of roughly 100 m sections inside a 25 m wide cofferdam area that would be dredged and dewatered to a depth of approximately 12 m below the riverbed surface. This, in conjunction with the extensive excavations at the west and east shores that would also be required, would result in severe environmental impacts.

In addition, during the construction of the tunnel section at the Rideau Canal's navigable channel, boat traffic would need to be re-routed. Furthermore, special consideration would be required to address issues including, but not limited to, fire safety, emergency response, ventilation, drainage, lighting, and crime prevention. Depending on the extent of fire protection provided, the transportation of dangerous goods such as fuel tankers through the tunnel may need to be prohibited for public safety reasons. It should also be noted that the tunnel option could only accommodate vehicular use as neither cyclists nor pedestrians would be allowed through the tunnel, also for public safety reasons.

Finally, the preliminary opinion of probable cost for Tunnel Options A and B are in the $350 million to $450 million range, respectively, based on 2 lanes in each direction. Given the above-noted design and construction challenges and impacts as well as probable cost considerations, it would not be practical or cost effective to implement a tunnel option with one lane in each direction and then later expand it to two lanes in each direction.

Thus, implementing a new tunnel crossing would not address the EA Problem Statement for this EA study and is not considered a viable alternative solution.

### 3.3 Detailed Evaluation of Area 2 and Area 4

The more detailed assessment of a possible bridge crossing within the shortlisted Area 2 and Area 4 corridors involved two key components, namely: i) outlining preliminary opinion of probable cost considerations; and ii) assessing the potential positive and negative social, cultural, economic and environmental impacts of the proposed bridge alignment locations.

#### 3.3.1 Preliminary Opinion of Probable Cost Considerations

A number of different arrangements, types of structures and span lengths can be considered for a bridge crossing. The following provides a contextual discussion of the assumptions used in developing the preliminary opinion of probable cost for a bridge crossing at each of the proposed bridge alignment locations within the shortlisted Area 2 and Area 4 corridors.

Firstly, the types of bridges include:

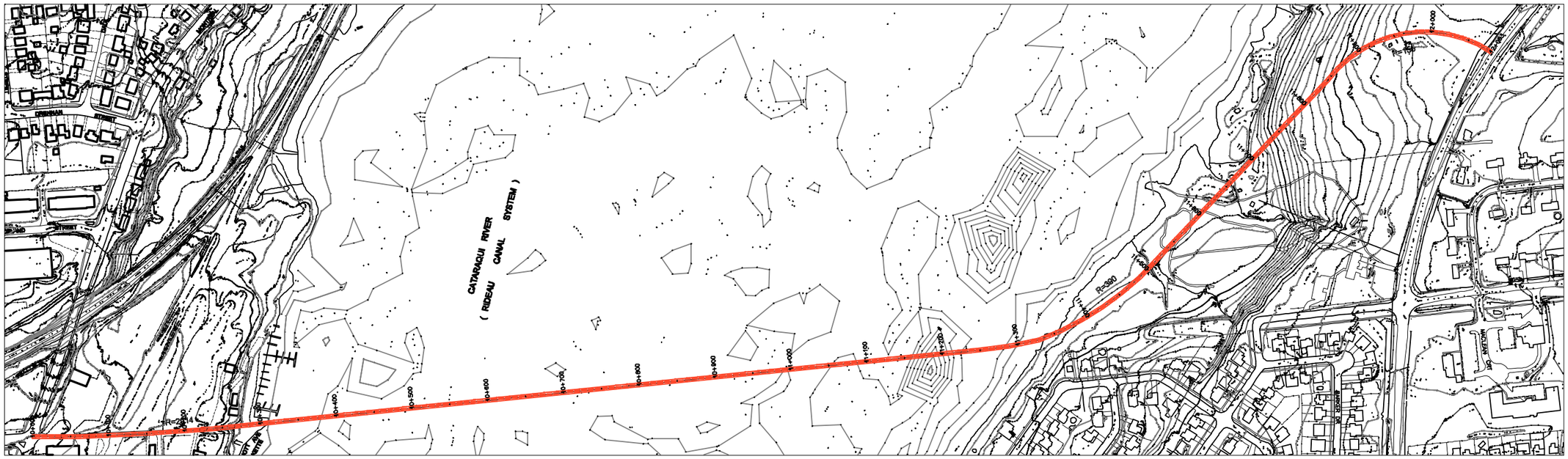
1. Steel and concrete girder bridges which are cost effective for spans up to 100 m.

2. Pre-stressed segmental concrete box girder bridges which are cost effective for spans up to 200 m.

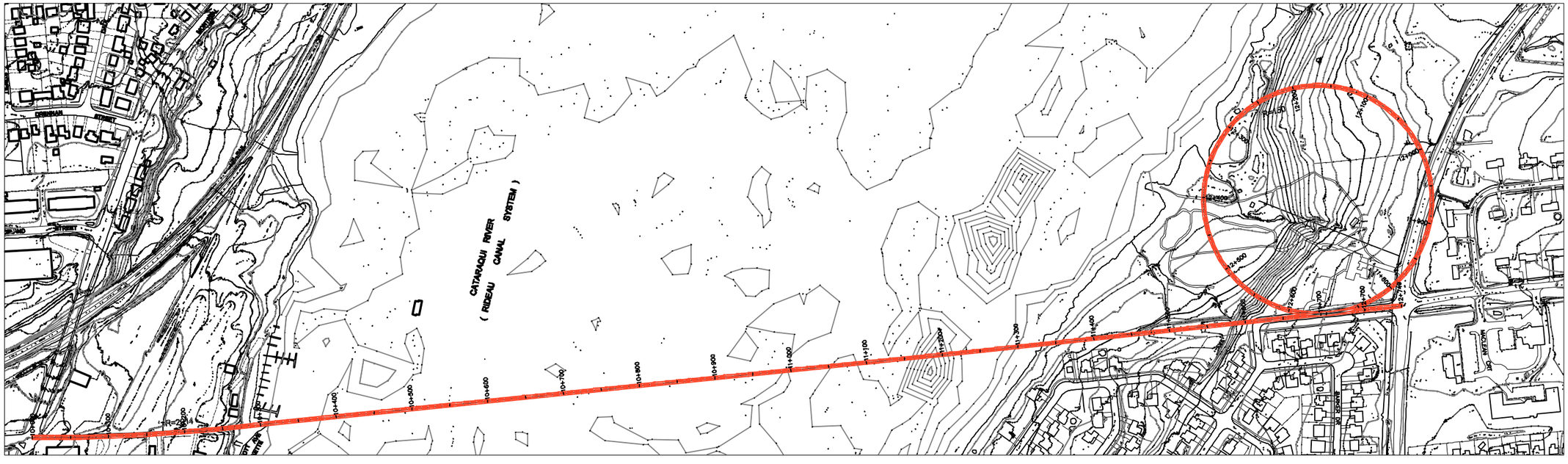
3. Cable stayed bridges which are cost effective for spans up to 1,000 m.

4. Suspension bridges which are cost effective for spans of over 1,000 m.

A bridge tends to be more prominent and more visible at longer spans because its elements tend to be larger, taller or higher above the water surface. Many factors require careful consideration in designing a bridge. These include the navigable clearance required and maintaining appropriate length-to-height proportions for visual and aesthetic reasons.




OPTION "A"




OPTION "B"



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

DRAWING:
CONCEPTUAL TUNNEL
ALIGNMENT OPTIONS

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Capital and maintenance costs are also an important consideration. The cost per lineal metre increases as the span length increases. Bridge spans in the 200 m range are typically 50 percent more costly than spans in the 50 m range. Similarly, long span bridges, such as those involving 500 m spans or longer, are typically 100 percent more costly than spans in the 50 m range. Thus, the preliminary opinion of probable cost was developed on the basis that a shore-to-shore crossing with multiple bridge spans in the 50 m to 100 m range would be cost-effective and able to maintain appropriate span length-to-height proportions as well as a relatively low profile above the water to mitigate potential visual impacts.

Secondly, temporary access into the Cataraqui River would be required for construction equipment to install the pile foundations, construct the piers and install the superstructure. Temporary in-water construction access options include:

1. The use of construction barges, which require 2 m to 3 m of water depth for draft purposes. Given that the Cataraqui River has a water depth averaging 1.2 m except at the buoyed channel and the southern portion of the Inner Harbour, the use of construction barges would require dredging of an access channel from shore to reach each of the pier locations. Once the bridge is built, the dredged channel could either be back-filled or left in place.

2. The installation of a temporary earth berm, which would involve infilling an area with earth material and capping it with gravel to provide a temporary roadway to facilitate construction. A series of culverts would also be installed in the berm to allow for river flow continuity and species movement. The berm would be removed after the permanent bridge is built.

3. The installation of a temporary work bridge, which would be built adjacent to the permanent bridge to facilitate construction. It too would be removed once the permanent bridge is built. However, it is more costly to install compared to the use of construction barges or a temporary earth berm.

The preliminary opinion of probable cost incorporated costs for a temporary work bridge as a worst case scenario.

The final issue regards the number of lanes that should be part of the bridge in order to meet current and projected needs (2 lanes versus 4 lanes). The 'Canadian Highway Bridge Design Code' (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 shortlisted Area 2 and Area 4 corridors typically have a design life of at least 100 years. As such, approval authorities may permit only one intrusion into the Cataraqui River to minimize environmental disruptions and impacts. Thus, the preliminary opinion of probable cost was developed for three potential scenarios, namely, a 2-lane bridge, a four-lane bridge and a 2-lane bridge that could be expanded to 4 lanes in the future.

Based on the above, the preliminary opinion of probable cost is shown in Table 3.5 below.

**Table 3.5**
**Preliminary Opinion of Probable Cost for a Bridge Crossing**

| Bridge Corridor Location | Shore to Shore Distance (m) | Preliminary Opinion of Probable Cost | | |
|---|---|---|---|---|
| | | 2 Lanes | 2 Lanes and a Substructure for 4 Lanes | 4 Lanes |
| Area 4 – Option 4A: John Counter Boulevard to Gore Road | 1,150 | $114 million | $139 million | $181 million |
| Area 4 – Option 4B: John Counter Boulevard to Kingston Road 15 | 1,450 | $141 million | $172 million | $224 million |
| Area 2 – Option 2: Russell Avenue to Craftsman Boulevard | 1,450 | $141 million | $172 million | $224 million |

Notes:
1. Includes $15 million and $18 million at Option 4A and Options 2 and 4B, respectively, for a temporary work bridge;
2. Based on multiple 50 m spans;
3. Includes a sidewalk and bicycle lane in both directions;
4. Includes 15 percent for Engineering and 25 percent for Contingency;
5. Expressed in 2010 dollars, with no allowance for cost escalation/inflation; and
6. Excludes property acquisition and applicable taxes.

### 3.3.2 EA Evaluation Matrix

The purpose of the EA evaluation matrix was to further assess the proposed bridge alignment locations within the shortlisted Area 2 and Area 4 corridors. It was developed in response to the Municipal Class EA framework and in direct consultations with the TAC. The matrix is summarized in Table 3.6 and shown in more detail in Table 3.7 below. It includes six main criteria groups with weighting that, combined, totals 100 points. The main criteria deal with:

1. Aquatic Natural Environment which was assigned 20 points.
2. Cultural Heritage Environment which was assigned 15 points.
3. Economic Environment which was assigned 20 points.
4. Social Environment which was assigned 10 points.
5. Terrestrial Natural Environment which was assigned 10 points.
6. Transportation Environment which was assigned 25 points.

Each of the main criteria groups has seven to nine sub-criteria, for a total of 48 sub-criteria, which have also been assigned relative weighting totaling 100 points. The scoring, which was reviewed and endorsed by the TAC, is based on a range of minus 3 to plus 3 to show potential negative and positive impacts, respectively, for pre-mitigation associated with the bridge crossing by itself and post-mitigation associated with preliminary bridge design considerations.

**Table 3.6**
**EA Evaluation Matrix Summary**

| EA Evaluation Criteria | EA Criteria Weight | Summary Scores | | | | | |
|---|---|---|---|---|---|---|---|
| | | Area 2 (Option2): Bridge | | Area 4 (Option 4A): Bridge | | Area 4 (Option 4B): Bridge | |
| | | Pre-Mitigation | Post-Mitigation | Pre-Mitigation | Post-Mitigation | Pre-Mitigation | Post-Mitigation |
| Aquatic Natural Environment | 20 | -3700 | 0 | -2200 | 0 | -3700 | 0 |
| Cultural Environment Heritage | 15 | -1200 | -300 | -1650 | 525 | -1500 | 675 |
| Economic Environment | 20 | -4300 | -4300 | -1600 | -1600 | -4500 | -4500 |
| Social Environment | 10 | -50 | 650 | 50 | 750 | 300 | 1000 |
| Terrestrial Natural Environment | 10 | -850 | 0 | -800 | 0 | -800 | 0 |
| Transportation | 25 | 2000 | 2000 | 6625 | 6625 | 3500 | 3500 |
| **SCORE TOTAL** | | **-8100** | **-1950** | **425** | **6300** | **-6700** | **675** |
| **RANK** | | **3** | **3** | **1** | **1** | **2** | **2** |

**Table 3.7**
**EA Evaluation Matrix**

| EA Evaluation Criteria | EA Criteria Weight | EA Corridor Areas and Options | | | | | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Area 2 (Option2): Bridge | | | | Area 4 (Option 4A): Bridge | | | | Area 4 (Option 4B): Bridge | | | | |
| | | Pre-Mitigation | | Post-Mitigation | | Pre-Mitigation | | Post-Mitigation | | Pre-Mitigation | | Post-Mitigation | | |
| | | Score | Total | Score | Total | Score | Total | Score | Total | Score | Total | Score | Total | |
| **Aquatic Natural Environment** | **20** | | | | | | | | | | | | | |
| .1 Effect on Emergent Aquatic Vegetation | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | The visible cattail portion of the Marsh is to the north |
| .2 Effect on Aquatic Breeding / Rearing Habitat / Mobility | 15 | -3 | -900 | 0 | 0 | -2 | -600 | 0 | 0 | -3 | -900 | 0 | 0 | Crossing length is 25% shorter for Option 4A; potential net gain opportunities, subject to detailed Stage 2 assessment and mitigation |
| .3 Effect on Provincially Significant Wetland Areas | 20 | -2 | -800 | 0 | 0 | -1 | -400 | 0 | 0 | -2 | -800 | 0 | 0 | |
| .4 Effect on Species at Risk | 20 | -3 | -1200 | 0 | 0 | -2 | -800 | 0 | 0 | -3 | -1200 | 0 | 0 | |
| .5 Effect on River Hydraulics | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No anticipated net negative effects, subject to detailed Stage 2 assessments and mitigation |
| .6 Effect on Submergent Aquatic Vegetation | 10 | -2 | -400 | 0 | 0 | -1 | -200 | 0 | 0 | -2 | -400 | 0 | 0 | Crossing length is 25% shorter for Option 4A; no anticipated net negative effects, subject to detailed Stage 2 assessment and mitigation |
| .7 Effect on Water Quality | 10 | -2 | -400 | 0 | 0 | -1 | -200 | 0 | 0 | -2 | -400 | 0 | 0 | |
| .8 Effect of Stormwater Drainage on Environment | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **SCORE SUB-TOTAL** | | **-3700** | | **0** | | **-2200** | | **0** | | **-3700** | | **0** | | |
| **Cultural Environment Heritage** | **15** | | | | | | | | | | | | | |
| .1 Effect on Rideau Canal UNESCO World Heritage Site | 15 | 1 | 225 | 1 | 225 | 0 | 0 | 2 | 450 | 0 | 0 | 2 | 450 | Elements that directly led to the UNESCO designation are north of Area 4; potential Rideau Canal enhancement with Areas 2/4 |
| .2 Effect on Rideau Canal National Historic Site | 15 | 1 | 225 | 1 | 225 | -1 | -225 | 2 | 450 | -1 | -225 | 2 | 450 | Potential Rideau Canal enhancement with Areas 2/4 |
| .3 Effect on Built Heritage Resources | 10 | 0 | 0 | 0 | 0 | -2 | -300 | -1 | -150 | -1 | -150 | 0 | 0 | Option 2 does not impact existing built heritage resources; Rideau Canal / Gore Road Library in Area 4 |
| .4 Effect on Cultural Heritage Landscapes / Viewscapes | 15 | -3 | -675 | -2 | -450 | -2 | -450 | -1 | -225 | -2 | -450 | -1 | -225 | The 'urban landscape'/viewscapes in Area 2 (Barriefield / Inner Harbour / downtown); the 'urban-to-natural landscape' transition at the northern entrance of the Inner Harbour; the Rideau Canal and Gore Road Library in Area 4 |
| .5 Effect on Terrestrial Archaeological Resources | 10 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | High archaeological potential but no anticipated net negative effects, subject to detailed Stage 2 assessment and mitigation |
| .6 Effect on Marine Archaeological Resources | 10 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | |
| .7 Effect on First Nations Archaeological Resources | 15 | -1 | -225 | 0 | 0 | -1 | -225 | 0 | 0 | -1 | -225 | 0 | 0 | |
| .8 Effect on First Nations Interests | 10 | -3 | -450 | -2 | -300 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | Area 2 is closer to Belle Island; archaeological potential with Areas 2/4 but no anticipated net negative effects with Area 4, subject to detailed Stage 2 assessment and mitigation |
| **SCORE SUB-TOTAL** | | **-1200** | | **-300** | | **-1650** | | **525** | | **-1500** | | **675** | | |

**Table 3.7**
**EA Evaluation Matrix**

| EA Evaluation Criteria | EA Criteria Weight | EA Corridor Areas and Options | | | | | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Area 2 (Option2): Bridge | | | | Area 4 (Option 4A): Bridge | | | | Area 4 (Option 4B): Bridge | | | | |
| | | Pre-Mitigation | | Post-Mitigation | | Pre-Mitigation | | Post-Mitigation | | Pre-Mitigation | | Post-Mitigation | | |
| | | Score | Total | Score | Total | Score | Total | Score | Total | Score | Total | Score | Total | |
| **Economic Environment** | **20** | | | | | | | | | | | | | |
| .1 Effect on Property Tax Assessment Base | 10 | 2 | 400 | 2 | 400 | 3 | 600 | 3 | 600 | 2 | 400 | 2 | 400 | Option 4A as optimum mid east-west corridor for all growth areas; Options 2/4B still address growth area sectors |
| .2 Effect on Adjacent Property Acquisition Requirements | 10 | -2 | -400 | -2 | -400 | -1 | -200 | -1 | -200 | -3 | -600 | -3 | -600 | Property acquisition required in Areas 2/4 (future development impacts on east side on Option 4B landing); ROW for link on east side for Option 4A; property acquisition may be required for construction staging in Areas 2/4 |
| .3 Effect of Property Acquisition Cost Considerations | 10 | -2 | -400 | -2 | -400 | -1 | -200 | -1 | -200 | -3 | -600 | -3 | -600 | |
| .4 Effect of Geotechnical /Geoenvironmental Conditions on Capital Costs | 10 | -3 | -600 | -3 | -600 | -2 | -400 | -2 | -400 | -2 | -400 | -2 | -400 | The 'bedrock valley' and contaminated soils in Areas 2/4; Inner Harbour sediment contamination in Area 2 |
| .5 Effect of Capital Cost Considerations | 20 | -3 | -1200 | -3 | -1200 | -1 | -400 | -1 | -400 | -3 | -1200 | -3 | -1200 | Crossing length is 25% shorter for Option 4A, therefore capital costs and maintenance costs will be 25% lower with Option 4A; crossing length for Options 2/4B are similar |
| .6 Effect of Maintenance Cost Considerations | 20 | -3 | -1200 | -3 | -1200 | -1 | -400 | -1 | -400 | -3 | -1200 | -3 | -1200 | |
| .7 Effect on Property Taxes / Development Charges | 15 | -3 | -900 | -3 | -900 | -2 | -600 | -2 | -600 | -3 | -900 | -3 | -900 | |
| .8 Effect of Utilities Considerations on Capital Costs | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Potential opportunity to incorporate existing 44 kV marine cable crossing and new east-west trunk watermain into bridge design in Area 4 |
| **SCORE SUB-TOTAL** | | **-4300** | | **-4300** | | **-1600** | | **-1600** | | **-4500** | | **-4500** | | |
| **Social Environment** | **10** | | | | | | | | | | | | | |
| .1 Effect of Noise / Vibration on the Local Community | 15 | -2 | -300 | -1 | -150 | -3 | -450 | -2 | -300 | -1 | -150 | 0 | 0 | Option 2 north of Barriefield; impacts to Point St. Mark / Gore Road Library with Option 4A but caveat on title for Point St. Mark landowners acknowledging potential crossing; rationale for Option 4B crossing north of Point St. Mark / Gore Road Library but future development impacts on east side on Option 4B landing |
| .2 Effect on Adjacent Property Values | 15 | -1 | -150 | -1 | -150 | -2 | -300 | -2 | -300 | -1 | -150 | -1 | -150 | |
| .3 Compatibility with Adjacent Land Uses / Water Recreation Uses | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| .4 Effect on Landscape Character | 15 | -2 | -300 | 1 | 150 | -2 | -300 | 1 | 150 | -2 | -300 | 1 | 150 | The Inner Harbour/Belle Island as a transition between a natural environment to the north and a more urbanized landscape to the south, east and west; potential for low profile bridge design |
| .5 Effect of Stormwater Management on the Local Community | 10 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | No anticipated net negative effects, subject to detailed Stage 2 assessment and mitigation |
| .6 Compatibility with City's Adopted Official Plan | 20 | 2 | 400 | 2 | 400 | 3 | 600 | 3 | 600 | 2 | 400 | 2 | 400 | Option 4A is in the City's adopted Official Plan, subject to an EA |
| .7 Effect on Public Access / Visitor Experience | 20 | 2 | 400 | 2 | 400 | 3 | 600 | 3 | 600 | 3 | 600 | 3 | 600 | The Inner Harbour/Belle Island as a transition between a natural environment to the north and a more urbanized landscape to the south, east and west |
| **SCORE SUB-TOTAL** | | **-50** | | **650** | | **50** | | **750** | | **300** | | **1000** | | |

**Table 3.7**
**EA Evaluation Matrix**

| EA Evaluation Criteria | EA Criteria Weight | EA Corridor Areas and Options | | | | | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Area 2 (Option2): Bridge | | | | Area 4 (Option 4A): Bridge | | | | Area 4 (Option 4B): Bridge | | | | |
| | | Pre-Mitigation | | Post-Mitigation | | Pre-Mitigation | | Post-Mitigation | | Pre-Mitigation | | Post-Mitigation | | |
| | | Score | Total | Score | Total | Score | Total | Score | Total | Score | Total | Score | Total | |
| **Terrestrial Natural Environment** | **10** | | | | | | | | | | | | | |
| .1 Effect on ANSI's | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | The ANSI is to the north |
| .2 Effect on Wildlife Breeding / Rearing Habitat / Mobility | 15 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | -1 | -150 | 0 | 0 | Existing shoreland ROW link on east side for Option 4A; potential net gain opportunities, subject to detailed Stage 2 assessment and mitigation |
| .3 Effect on Terrestrial Vegetation | 10 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | |
| .4 Effect on Woodland Areas | 10 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | |
| .5 Effect on Species at Risk | 20 | -1 | -200 | 0 | 0 | -1 | -200 | 0 | 0 | -1 | -200 | 0 | 0 | |
| .6 Effect on Natural Hazards | 5 | -2 | -100 | 0 | 0 | -1 | -50 | 0 | 0 | -1 | -50 | 0 | 0 | Potential erosion and slope stability (higher elevation at Area 2); no anticipated net negative effects, subject to detailed Stage 2 assessment and mitigation |
| .7 Effect on Riparian Zone | 10 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | -1 | -100 | 0 | 0 | No anticipated net negative effects, subject to detailed Stage 2 assessment and mitigation |
| .8 Effect on Groundwater / Surface Water Quantity, Quality, Flows | 5 | -1 | -50 | 0 | 0 | -1 | -50 | 0 | 0 | -1 | -50 | 0 | 0 | |
| .9 Effect of Stormwater Management on Environment | 5 | -1 | -50 | 0 | 0 | -1 | -50 | 0 | 0 | -1 | -50 | 0 | 0 | |
| **SCORE SUB-TOTAL** | | **-850** | | **0** | | **-800** | | **0** | | **-800** | | **0** | | |
| **Transportation** | **25** | | | | | | | | | | | | | |
| .1 Effect on Road Network Continuity / Improvements | 20 | -3 | -1500 | -3 | -1500 | 3 | 1500 | 3 | 1500 | 0 | 0 | 0 | 0 | Wellington Street Extension required for Option 2; staggered intersection for Option 4B |
| .2 Effect on Level of Service / Congestion / Travel Times | 25 | 2 | 1250 | 2 | 1250 | 3 | 1875 | 3 | 1875 | 2 | 1250 | 2 | 1250 | Inner Harbour 'loop' for Option 2 (Wellington Street Extension to accommodate flows to downtown and John Counter Boulevard); Option 4A mid east-west corridor; Option 4B mid east-west corridor but staggered intersection / northerly link at Kingston Road 15 |
| .3 Effect on Pedestrian / Cyclist Access and Mobility | 10 | 2 | 500 | 2 | 500 | 3 | 750 | 3 | 750 | 2 | 500 | 2 | 500 | |
| .4 Effect on Public Transit Access and Operations | 15 | 1 | 375 | 1 | 375 | 3 | 1125 | 3 | 1125 | 2 | 750 | 2 | 750 | Inner Harbour 'transit loop' for Option 2; Option 4A mid east-west corridor; Option 4B mid east-west corridor but staggered intersection / northerly link at Kingston Road 15 |
| .5 Effect on Emergency Vehicle Access and Mobility | 15 | 3 | 1125 | 3 | 1125 | 3 | 1125 | 3 | 1125 | 2 | 750 | 2 | 750 | Master Fire Plan recommends new substation based on mid east-west corridor in Option 4A; potential for east-west access with Option 2; staggered intersection / northerly link at Kingston Road 15 for Option 4B |
| .6 Effect on Universal Access and Mobility | 5 | 1 | 125 | 1 | 125 | 1 | 125 | 1 | 125 | 1 | 125 | 1 | 125 | Potential enhancement based on emergency access improvements and detailed Stage 2 design |
| .7 Effect on Public / User Safety | 5 | 1 | 125 | 1 | 125 | 1 | 125 | 1 | 125 | 1 | 125 | 1 | 125 | |
| .8 Effect on Navigable Waterways | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Waterway navigation is a legislated requirement |
| **SCORE SUB-TOTAL** | | **2000** | | **2000** | | **6625** | | **6625** | | **3500** | | **3500** | | |
| **SCORE GRAND TOTAL** | | **-8100** | | **-1950** | | **425** | | **6300** | | **-6700** | | **675** | | |
| **CORRIDOR AREA RANK** | | **3** | | | | **1** | | | | **2** | | | | |

### 3.3.3 Preferred Solution

Based on the above-noted potential benefits and impacts of the proposed bridge alignment locations within the shortlisted Area 2 and Area 4, the Russell Street-Craftsman Boulevard alignment (Option 2) in Area 2 scored lower than both the John Counter Boulevard-Gore Road (Option 4A) and John Counter Boulevard-Kingston Road 15 (Option 4B) alignments in Area 4. Primary considerations regarding the ranking of Option 2 in Area 2 included:

1. The role that mitigation measures could fulfill in addressing potential impacts of a crossing on the aquatic and terrestrial natural environments.

2. Its potential to impact viewscapes in and south of Area 2 and its proximity to Belle Island which could affect both cultural heritage considerations and First Nations interests.

3. Its more indirect mid-City east-west link and the current limited capacity at the Rideau Street-Russell Street connection on the west side of the Cataraqui River which would require the future Wellington Street Extension to make it more effective for vehicular traffic as well as active travel and commuter cycling.

4. Its shore-to-shore crossing distance which is 25 percent longer than at Option 4A and its requirement for the future Wellington Street Extension to address traffic flows which would further affect economic considerations and external road network improvement requirements.

Option 4A, as shown on Drawing 3.22, scored higher than Option 4B in Area 4. Main considerations in this regard included:

1. Similar to the scoring of Option 2 in Area 2, the role that mitigation measures could fulfill in addressing potential impacts of both alignment options in Area 4 on the aquatic and terrestrial natural environments.

2. The potential for Option 4A and Option 4B in Area 4 to:

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

   b) Incorporate into the bridge design the east-west watermain that is required to service a proposed new water booster station in east Kingston (located northeast of the project site location); and

   c) Potentially incorporate into the bridge design the three Hydro One marine electrical cables (3-phase 44 kV line) that currently cross the Cataraqui River in the John Counter Boulevard-Gore Road area.

3. Option 4A offers a more direct mid east-west connection to existing road infrastructure on either shore. This is more effective in addressing travel demand patterns, accommodating CFB Kingston's future strategic plans as well as providing opportunities to enhance emergency response services, the City's express bus route strategy and active travel and commuter cycling networks. The more northerly connection to Kingston Road 15 on the east side of the Cataraqui River with Option 4B results in staggered intersections with Kingston Road 15, which is not ideal from a transportation perspective.

4. The potential impacts of Option 4A being proximate to the Point St. Mark residential neighbourhood and the Gore Road Library could negatively impact cultural heritage and social environment considerations, for which mitigation measures would be required. It should also be noted however, that there is a caveat on each title for Point St. Mark landowners acknowledging the potential for a bridge crossing at the Option 4A location. The location of Option 4B north of Point St. Mark and the Gore Road Library could more positively address such considerations.

5. Option 4B is 25 percent longer shore-to-shore than Option 4A, which would have a more negative impact on capital cost and other related economic considerations.


RECOMMENDED WELLINGTON ST. EXTENSION ALTERNATIVE AS PER 2006 ENVIRONMENTAL STUDY REPORT

LIMIT OF RIDEAU CANAL RESERVE LANDS (APPROXIMATE LOCATION)

POTENTIAL LINKAGE



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

DRAWING:
## PROJECT SITE LOCATION

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DESIGN:
DRAWN:
CHECKED:
PLOTTED: 26-Jan-12

DRAWING NO.: **3-22**
JLR NO: 23446-02

File Location: C:\Documents and Settings\djudson\Desktop\23443-02 - Third Crossing ESR\Figures\Figure 3-19 3-20 3-22 4-15 PS-2 PS-3.dwg

In addition, Option 4A and the Retain the Status Quo (or 'Do Nothing') option were compared on the basis of environmental considerations [fuel consumption and greenhouse gas (GHG) emissions] for the 2009 and 2029 planning horizons. Firstly, idling fuel consumption is based on the assumption that travel time delay is equivalent to vehicle idling time. Transport Canada estimates that the average idling fuel consumption for passenger cars and heavy vehicles is 2.5 litres/hour (L/hr) and 4 L/hr, respectively. As such, Table 3.8 below suggests that a bridge crossing at the Option 4A location could reduce idling fuel consumption in the order of 85 percent to 70 percent during the PM peak hour in 2009 and 2029 compared to the Retain the Status Quo option.

**Table 3.8**
**Idling Fuel Consumption**

| Alternative Solution | 2009 Annual PM Peak Hour Fuel Consumption (L) | 2029 Annual PM Peak Hour Fuel Consumption (L) |
|---|---|---|
| Retain the Status Quo | 21,000 | 68,000 |
| Option 4A | 3,000 | 20,000 |

Secondly, emissions statistics are defined by both Natural Resources Canada and Transport Canada in terms of kilograms of carbon monoxide ($CO_2$) produced per litre of fuel consumed, which is estimated to be 2.4 kilograms/litre (kg/L). With this in mind, $CO_2$ emissions produced during idling are the product of $CO_2$ emission statistics (2.4 kg/L) and the total fuel consumed during idling. Table 3.9 below shows that 2029 PM peak hour greenhouse emissions could be 70 percent less with Option 4A compared to the Retain the Status Quo option.

**Table 3.9**
**Annual $CO_2$ Produced During Idling**

| Alternative Solution | 2009 Annual PM Peak Hour $CO_2$ Production (kg) | 2009 Annual PM Peak Hour $CO_2$ Production (kg) |
|---|---|---|
| Retain the Status Quo | 50,000 | 163,000 |
| Option 4A | 7,000 | 48,000 |

Based on this assessment, the recommended preferred solution is a bridge crossing at the John Counter Boulevard-Gore Road alignment (Option 4A), as shown on Drawing 3.22. This was outlined in the 'City of Kingston Third Crossing of the Cataraqui River Environmental Assessment Stage 1 Summary Report' (Stage 1 Summary Report), which was prepared to conclude Stage 1 of this EA study. The Stage 1 Summary Report was presented to City Council in April, 2010. As part of this process, it was also recommended that the City continue its ongoing assessment of ways to reduce congestion on the LaSalle Causeway-Highway 2 corridor and enhance public transit services as an interim measure.

At the May 25, 2010 City Council meeting, Council approved the Stage 1 Summary Report and authorized that this EA study proceed to completion, or Stage 2. City Council also subsequently commissioned the undertaking and completion of the 2011 HDR/iTrans report, which as noted earlier, recommended improvements to address existing and future deficiencies along the LaSalle Causeway-Highway 2 corridor over the short-to-medium term.

The purpose of Stage 2 of this EA study is to address Phase 3 and Phase 4 of the Ontario Municipal Class EA process, namely:

1. Assessing and identifying a preferred bridge crossing design solution at the John Counter Boulevard-Gore Road alignment (the project site location, as shown on Drawing 3.22), including the identification of potential impacts, the development of mitigation measures, monitoring requirements as well as capital and maintenance costs (or 'Phase 3').

2. Finalizing approval of this Report that documents the decision-making process during Stage 1 and Stage 2 of this EA study (or 'Phase 4').

## 4.0 THE ALTERNATIVE DESIGNS AND THE PREFERRED DESIGN

### 4.1 Corridor Conditions

#### 4.1.1 Traffic

This section of the Report discusses the capacity analysis for the bridge crossing at the project site location. This analysis is divided into the following three sub-sections:

1. The timing of the need for a four-lane bridge.

2. Intersection configuration needs at the project site location.

3. The potential for short cutting at the project site location.

##### .1 The Timing of the Need for a Four-Lane Bridge

###### A. Methodology

In 2011, AECOM reviewed the City's 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 framework for this analysis was taken from the 2000 Highway Capacity Manual (HCM). The HCM

calculates travel speed and delay [based on seconds/vehicle (s/veh)] on a facility during a defined peak hour period and uses LOS to rate operational performance. As stated earlier, the City's minimum acceptable LOS target is LOS D. This would correspond to a travel speed ranging from 26 kilometres/hour (km/hr) to 33 km/hr during the PM peak hour on the bridge.

The bridge at the project site location is located between two signalized intersections, namely, John Counter Boulevard-Montreal Street on the west side of the Cataraqui River and Gore Road-Kingston Road 15 on the east side. There are also three non-signalized intersections: i) John Counter Boulevard-Ascot Lane on the west side of the Cataraqui River; and ii) Gore Road-Gore Road Library access and Gore Road-Point St. Mark Drive on the east side. AECOM's analysis forecasted travel demand across the bridge during the PM peak hour at 2019 (which is the earliest possible time frame by which the bridge could conceivably be built) and 2029. Once the bridge is built, the analysis further assumed that:

1. Left-turn storage would be provided at the two signalized intersections.

2. The posted speed limit on the bridge would be 60 km/hr, which is consistent with the existing posted speed limit on John Counter Boulevard.

3. Based on the TransCAD travel demand model in the 2009 KTMP Update, PM peak hour traffic demand crossing the Cataraqui River screenline is expected to grow at an annual rate of 0.4 percent for eastbound travel and 0.9 percent for westbound travel from 2019 to 2029.

### B. Observations

As shown in Table 4.1 below, the forecasted 2019 PM peak hour traffic demand and nine planned road network improvement scenarios indicate the need for a four-lane bridge would be triggered by 2029 to 2034. Table 4.1 also estimates the change in the total veh-km by area, as shown earlier on Drawing 3.14, relative to the Retain the Status Quo option. Specific highlights are as follows:

1. The total Cataraqui River screenline would operate at LOS B by 2019 for all nine scenarios if the unused capacity of Kingston Mills Road and Highway 401 is included. However, as stated earlier, relying on Highway 401 to accommodate local traffic does not recognize: i) the primary function of Highway 401 which is to serve regional (or long distance) traffic and not local traffic needs; and ii) the strong demand for trips crossing the Cataraqui River south of Highway 401.

2. Under Scenario 'A' (All City Development Charge Projects and a 2-Lane Bridge), a portion of trips are projected to divert from the LaSalle Causeway to the bridge at the project site location as well as Highway 401.

3. For Scenario 'B' (AECOM Suggested Development Charge Projects and a 2-Lane Bridge), a portion of the traffic is forecast to be routed to Highway 401 in order to take advantage of the Division Street widening. Higher eastbound traffic volumes are also projected on the LaSalle Causeway due to the widening of Kingston Road 15 from Highway 2 up to Gore Road. As a result, lower traffic demand is projected on the bridge at the project site location.

4. Under Scenario 'C' (2-Lane Bridge and John Counter Boulevard Widening), a projected increase in traffic on the LaSalle Causeway is noted due to the lack of additional capacity improvements in the network, which includes the bridge at the project site location. Compared to Scenario 'B', a higher eastbound volume on the bridge at the project site location is noted due to additional congestion projected on Division Street, resulting in fewer trips diverting further north to use Highway 401.

5. The above-noted rationale for the projected increase in traffic on the LaSalle Causeway in Scenario 'C' can also be applied to Scenario 'D' (2-Lane Bridge and the Wellington Street Extension). In addition, due to capacity limitations on John Counter Boulevard, a portion of westbound traffic from the bridge at the project site location would be diverted north to Highway 401. But compared to Scenario 'B', eastbound volume on the bridge at the project site location is higher due to additional congestion on Division Street, resulting in fewer eastbound trips via Highway 401.

6. For Scenario 'E' (2-Lane Bridge and new CFB Kingston Access to Gore Road), the traffic volumes on the LaSalle Causeway are similar to Scenarios 'C' and 'D' due to the lack of additional capacity improvements in the network. The new CFB Kingston access to Gore Road also increases westbound trips (mostly from those leaving the Base) onto the bridge at the project site location.

7. Under Scenario 'F' (Combination of Scenarios 'C' and 'D'), additional traffic on the bridge at the project site location is noted due to the combined effect of the John Counter Boulevard widening and the Wellington Street Extension, which would attract trips into the downtown area.

8. For Scenario 'G' (Combination of Scenarios 'C' and 'E'), the traffic volumes on the LaSalle Causeway are similar to Scenarios 'C', 'D' and 'E' due to the lack of additional capacity improvements in the network. The new CFB Kingston access to Gore Road also increases westbound trips (mostly from those leaving the Base) onto the bridge at the project site location.

9. The above-noted rationale for the projected increase in traffic on the LaSalle Causeway in Scenarios 'C', 'D', 'E' and 'G' can also be applied to Scenario 'H' (Combination of Scenarios 'D' and 'E'), though a higher portion of eastbound traffic is noted being diverted from the LaSalle Causeway onto the bridge at the project site location due to effect of the Wellington Street Extension. The new CFB Kingston access to Gore Road also increases westbound trips (mostly from those leaving the Base) onto the bridge as well.

**Table 4.1**
**Network Improvement Scenarios, Forecasted 2019 PM Peak Hour Traffic Demand and Neighbourhood Impacts**

| Scenario | 2019 Total Volume on a 2-Lane Bridge | | | 2-Lane Bridge is at Capacity By: | 2019 Total Volume on LaSalle Causeway | | | Cataraqui Screenline LOS (South of Hwy. 401) | Veh-Km of Travel in Neighbourhoods (Percent Change) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Westbound | Eastbound | LOS | | Westbound | Eastbound | LOS | | | Area 1 (Downtown) | Area 2 (Mid-Town) | Area 3 (North) | Area 4 (Point St. Mark) | Area 5 (Barriefield) | Total |
| | | | | | | | | | **Do Nothing:** | 16,337 | 3,007 | 1,412 | 90 | 231 | 21,077 |
| A: All City Development Charge Projects and a 2-Lane Bridge | 840 | 800 | E | 2027 | 1,100 | 1,100 | F | F | | 15,474 (-5%) | 3,695 (+23%) | 1,426 (+1%) | 258 (+187%) | 59 (-74%) | 20,912 (-1%) |
| B: AECOM Suggested Development Charge Projects[19] and a 2-Lane Bridge | 820 | 500 | E | 2029 | 1,090 | 1,190 | F | F | | 15,691 (-4%) | 3,764 (+25%) | 1,353 (-4%) | 256 (+184%) | 64 (-72%) | 21,128 (+0.2%) |
| C: 2-Lane Bridge + John Counter Boulevard Widening | 810 | 730 | D | 2031 | 1,150 | 1,180 | F | F | | 15,858 (-3%) | 2,937 (-2%) | 1,538 (+9%) | 229 (+154%) | 150 (-35%) | 20,712 (-2%) |
| D: 2-Lane Bridge + Wellington Street Extension | 790 | 790 | D | 2034 | 1,130 | 1,110 | F | F | | 16,120 (-1%) | 4,042 (+34%) | 1,490 (+6%) | 263 (+192%) | 90 (-61%) | 22,005 (+4%) |
| E: 2-Lane Bridge + new CFB Kingston Access to Gore Road | 900 | 730 | E | 2019 | 1,140 | 1,240 | F | F | | 15,885 (-3%) | 3,152 (+5%) | 1,552 (+10%) | 175 (+94%) | 121 (-48%) | 20,885 (-1%) |
| F: Combination of Scenarios C + D | 830 | 790 | E | 2028 | 1,100 | 1,130 | F | F | | 15,333 (-6%) | 3,770 (+25%) | 1,430 (+1%) | 218 (+142%) | 57 (-75%) | 20,808 (-1%) |
| G: Combination of Scenarios C + E | 890 | 670 | E | 2021 | 1,140 | 1,270 | F | F | | 15,527 (-5%) | 2,908 (-3%) | 1,491 (+6%) | 189 (+210%) | 172 (-26%) | 20,287 (-4%) |
| H: Combination of Scenarios D + E | 890 | 770 | E | 2021 | 1,130 | 1,170 | F | F | | 16,267 (-0.4%) | 3,982 (+32%) | 1,465 (+4%) | 214 (+237%) | 110 (-52%) | 22,038 (+5%) |
| I: 4-Lane Bridge + John Counter Boulevard Widening + new CFB Kingston Access to Gore Road | 1,180 | 820 | C | N/A | 1,090 | 1,220 | F | D | | 15,346 (-6%) | 2,834 (-6%) | 1,417 (+0.3%) | 217 (+241%) | 102 (-56%) | 19,916 (-6%) |

[19] Note suggested road improvements within the project site location area are: i) the John Counter Boulevard widening; ii) the Wellington Street Extension; iii) the Division Street widening; and iv) the Kingston Road 15 widening from Highway 2 to Gore Road.

10. 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, though eastbound traffic volumes on the LaSalle Causeway would still be over capacity. Scenario 'I' would also be able to reduce traffic on local roads in all five neighbourhood areas by a combined total of 6 percent which is the highest reduction in comparison to the other scenarios.

11. All the scenarios forecast potential reductions in short cutting through the Barriefield residential neighbourhood and potential increases in short cutting through the Point St. Mark residential neighbourhood.

12. The forecasted increase in traffic volumes in the mid-town area (south of John Counter Boulevard) under Scenarios 'A', 'B', 'D', 'F' and 'H' is due to the projected use of the Wellington Street Extension. It should also be noted that the scenarios involving the Wellington Street Extension would direct more eastbound traffic away from the LaSalle Causeway and onto this facility.

13. The scenarios do not take into account the improvements to the LaSalle Causeway-Highway 2 corridor recommended in the 2011 HDR/iTrans report. As stated earlier, though 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, they are considered viable short-to-medium term solutions.

Based on these scenarios, the 2030 to 2034 trigger for a four-lane bridge 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. 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 forestall 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. Based on Scenario 'I' in Table 4.1, 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.

Tables 4.2 and 4.3 below show the results of the capacity analysis for Scenario 'I' under the 2019 and 2029 horizons for the initial three-lane bridge and ultimate four-lane bridge, respectively.

**Table 4.2**
**PM Peak Hour LOS of a Three-Lane Bridge at the Project Site Location**

| | Westbound Travel (2 Lanes) | | | Eastbound Travel (1 Lane) | | |
|---|---|---|---|---|---|---|
| **Year** | **Average Speed (km/hr)** | **Delay (s/veh)** | **LOS (v/c)** | **Average Speed (km/hr)** | **Delay (s/veh)** | **LOS (v/c)** |
| 2019 | 35.4 | 26.1 | C (0.7) | 29.0 | 40.4 | D (0.96) |
| 2029 | 34.5 | 27.7 | C (0.76) | 28.3 | 42.2 | D (0.99) |

Table 4.2 shows that 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.

**Table 4.3**
**PM Peak Hour LOS of a Four-Lane Bridge at the Project Site Location**

| | Westbound Travel (2 Lanes) | | | Eastbound Travel (2 Lanes) | | |
|---|---|---|---|---|---|---|
| **Year** | **Average Speed (km/hr)** | **Delay (s/veh)** | **LOS (v/c)** | **Average Speed (km/hr)** | **Delay (s/veh)** | **LOS (v/c)** |
| 2019 | 35.4 | 26.1 | C (0.7) | 38.1 | 21.5 | C (0.48) |
| 2029 | 34.5 | 27.7 | C (0.76) | 37.9 | 21.8 | C (0.5) |

Table 4.3 shows that based on Scenario 'I', the four-lane bridge is expected to exceed the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years.

It should be noted that a median barrier separating the eastbound and westbound vehicular lanes would not be needed immediately on the four-lane bridge. Traffic volumes and speed in relation to the probability and severity of potential accidents are critical factors in determining when the need for a median barrier should be considered. As the bridge would be a new facility, there is currently no accident history upon

which to gauge this requirement. Assuming that the posted speed limit on the bridge would be 60 km/hr, the operating speed can be expected to be 70 km/hr. Based on this assumption and effective transportation engineering practice, the trigger point at which a median barrier may be needed is when the Average Annual Daily Traffic (AADT) on the bridge reaches 25,000 vehicles per day. This is anticipated to occur by 2051 if the PM peak hour traffic demand crossing the Cataraqui River screenline continues to grow at an annual rate of 0.4 percent for eastbound travel and 0.9 percent for westbound travel beyond 2029. Despite this projection, the future monitoring by the City of traffic conditions on the bridge, including the frequency and severity of accidents, would be equally critical in determining whether or not a median barrier is ultimately needed.

### .2 Intersection Configuration Needs at the Project Site Location

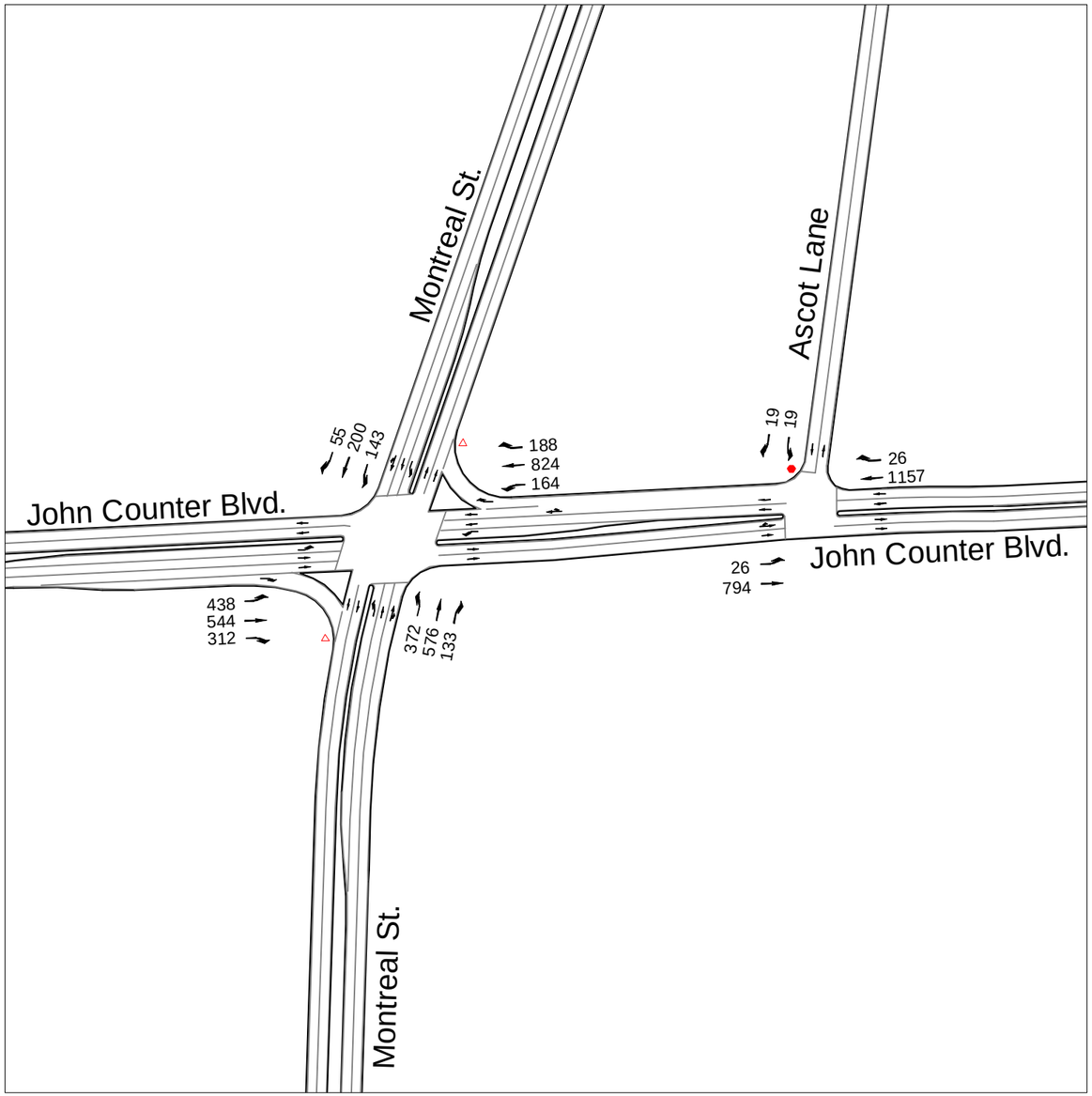
#### A. Methodology

Under Scenario 'I' conditions, projected 2019 PM peak hour traffic volumes at the intersections within the project site location were established based on link volume forecasts from the TransCAD travel demand model used in the 2009 KTMP Update. The 2019 intersection volume forecasts are shown on Drawing 4.1. PM peak hour traffic volumes at these intersections were then forecasted from 2019 to 2029 using the model's annual projected growth rates of 0.4 percent for eastbound travel and 0.9 percent for westbound travel. The projected 2029 intersection volumes are shown on Drawing 4.2. The traffic simulation program, Synchro 7, was then used to address traffic conditions at the project site location after the bridge would be built. The following assumptions were used in this analysis:

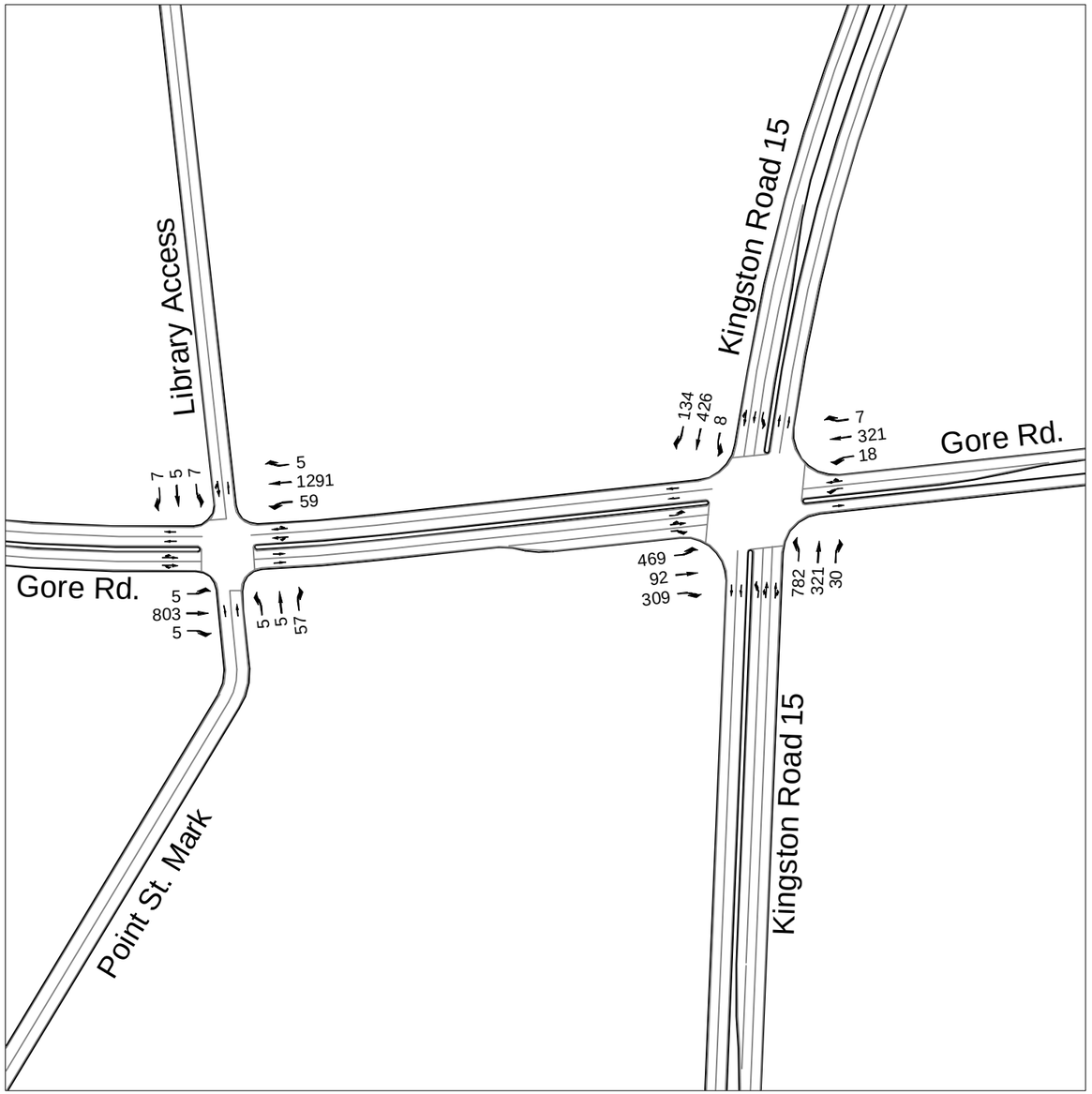
1. Due to right-of-way requirements, the Gore Road Library access is consolidated with the Gore Road-Point St. Mark Drive intersection to the west to form a four-leg intersection.
2. The 85$^{th}$ percentile speed on all roadways within the project site location was assumed to be equal to the speed limit.
3. Commercial truck volumes were assumed at 2 percent.
4. The ideal saturation flow was assumed at 1,800 vehicles per hour.
5. A minimum turning movement volume was assumed at five vehicles per hour.
6. Cycling movements were assumed at ten per hour per leg of intersection.
7. Pedestrian crossings were assumed at ten per hour per leg of intersection.

#### A. Observations

Table 4.4 shows the estimated storage lengths at each of the four intersections within the project site location that would be required to achieve the City's minimum acceptable LOS target of LOS D under projected 2019 and 2029 traffic conditions. Similarly, lane requirements at the project site location are summarized in Table 4.5 below.




JOHN COUNTER BOULEVARD -
MONTREAL STREET
CORRIDOR




GORE ROAD -
KINGSTON ROAD 15
CORRIDOR



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

DRAWING:
PROJECTED 2019 PM PEAK
HOUR TRAFFIC VOLUMES

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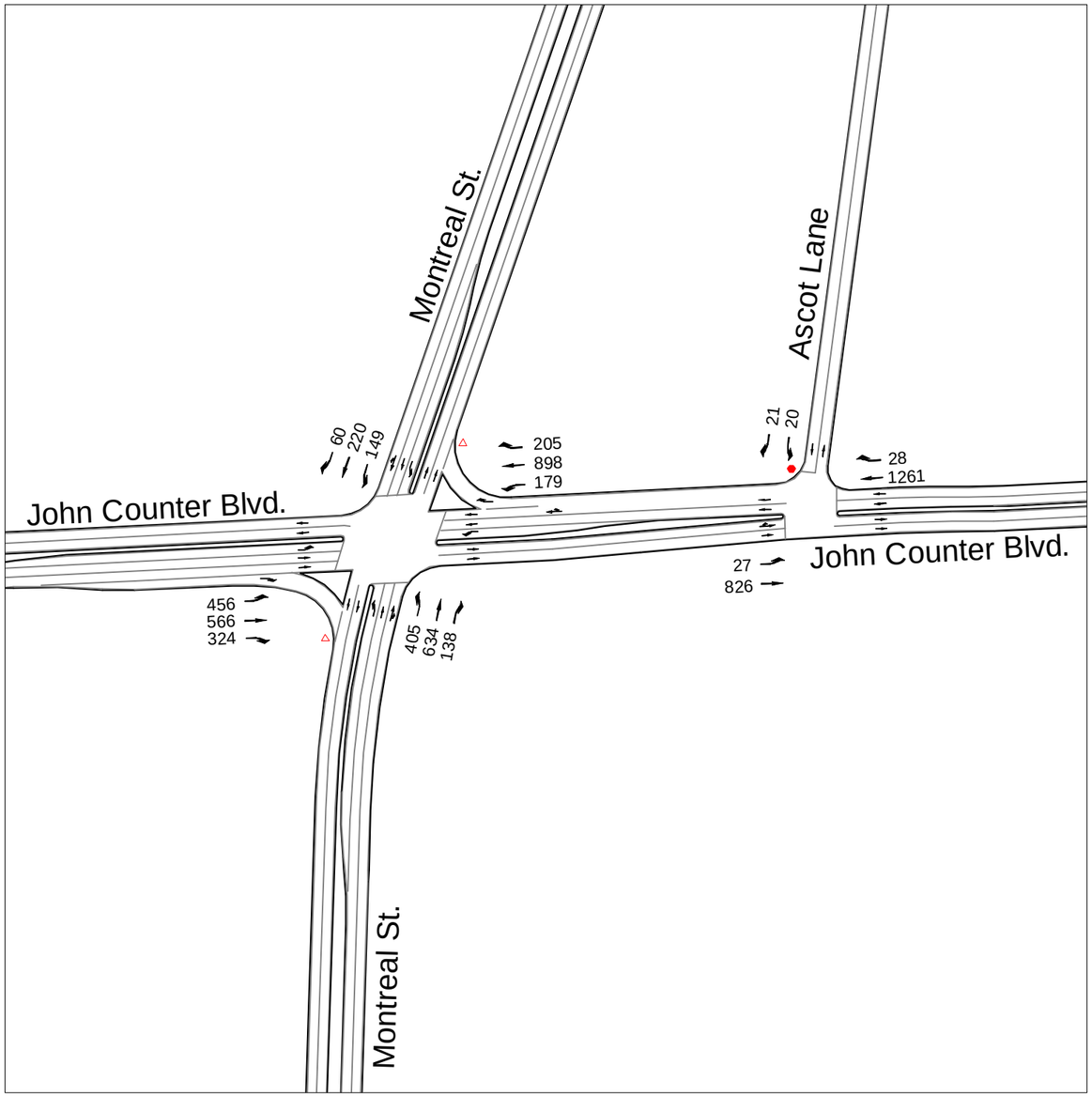
DESIGN:
DRAWN:
CHECKED:
PLOTTED: 25-Jan-12

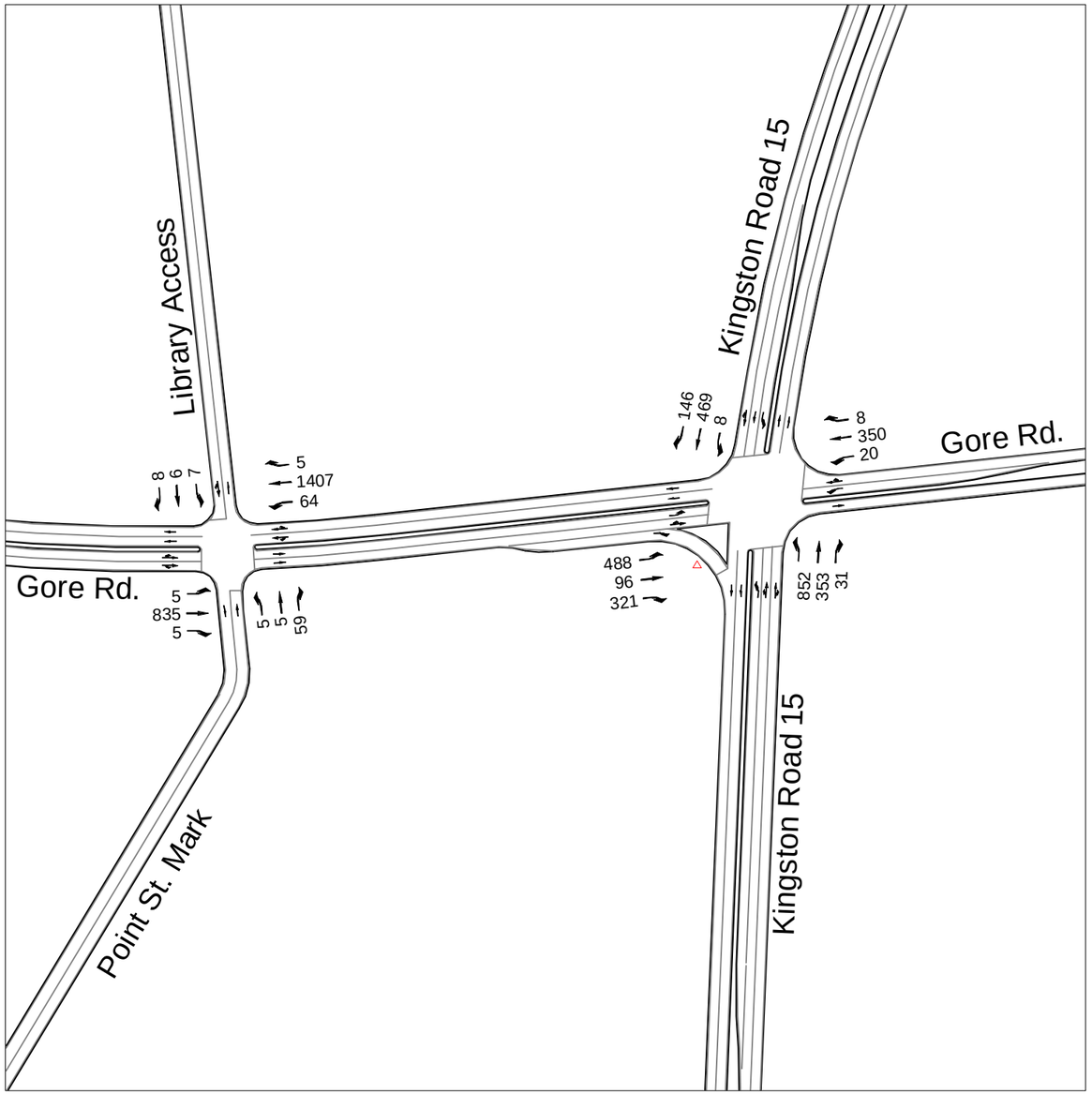
DRAWING NO.: 4-1

JLR NO: 23446-02

File Location: C:\Documents and Settings\djudson\Desktop\23443-02 - Third Crossing ESR\Figures\Figure 4-1 & 4-2.dwg




JOHN COUNTER BOULEVARD -
MONTREAL STREET
CORRIDOR




GORE ROAD -
KINGSTON ROAD 15
CORRIDOR



| | | | | |
|---|---|---|---|---|
| PROJECT: CATARAQUI RIVER THIRD CROSSING EA - STAGE 2 ENVIRONMENTAL STUDY REPORT | DRAWING: PROJECTED 2029 PM PEAK HOUR TRAFFIC VOLUMES | J.L.Richards ENGINEERS·ARCHITECTS·PLANNERS<br>J.L. Richards & Associates Limited<br>203-863 Princess Street<br>Kingston, ON Canada<br>K7L 5N4<br>Tel: 613 544 1424<br>Fax: 613 544 5679 | DESIGN:<br>DRAWN:<br>CHECKED:<br>PLOTTED: 6-Feb-12 | DRAWING NO.: 4-2<br>JLR NO: 23446-02 |

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**Table 4.4**
**2019 and 2029 PM Peak Hour Lane Storage Requirements**

**2019 Left-Turn Storage / Right-Turn Storage**
**(2029 Left-Turn Storage / Right-Turn Storage)**

| Intersection | West Approach | East Approach | South Approach | North Approach |
|---|---|---|---|---|
| John Counter Boulevard / Montreal Street<br>(Signal Control) | 70 m shared thru-left / 30 m<br>(105 m shared thru-left / 30 m) | 30 m / channelized right<br>(35 m / channelized right) | 100 m / thru-right<br>(120 m / thru-right) | 35 m / thru-right<br>(55 m / thru-right) |
| John Counter Boulevard / Ascot Lane<br>(Stop Sign Control) | thru-left / N/A<br>(thru-left / N/A) | N/A / thru-right<br>(N/A / thru-right) | N/A / N/A<br>(N/A / N/A) | shared left / shared right<br>(shared left / shared right) |
| Gore Road / Point St. Mark Drive / Gore Road Library<br>(Signal Control) | thru-left / thru-right<br>thru-left / thru-right | thru-left / thru-right<br>thru-left / thru-right | shared left / thru-right<br>(shared left / thru-right) | shared left / thru-right<br>(shared left / thru-right) |
| Gore Road / Kingston Road 15<br>(Signal Control) | N/A / 30 m<br>(N/A / 30 m) | 50 m / thru-right<br>(50 m / thru-right) | 90 m dual left / thru-right<br>(120 m dual left / thru-right) | 50 m / thru-right<br>(50 m / thru-right) |

**Table 4.5**
**Lane Requirements**

| Intersection | West Approach | East Approach | South Approach | North Approach |
|---|---|---|---|---|
| John Counter Boulevard / Montreal Street<br>(Signal Control) | One left-turn<br>One shared thru-left<br>One thru<br>One right-turn | One left-turn<br>Two thru<br>One right-turn | One left-turn<br>Two thru<br>One right-turn | One left-turn<br>One thru<br>One shared thru / right-turn |
| John Counter Boulevard / Ascot Lane<br>(Stop Sign Control) | One left-turn<br>Two thru | One left-turn<br>Two thru | Shared left / thru / right | Shared left / thru / right |
| Gore Road / Point St. Mark Drive / Gore Road Library<br>(Signal Control) | One left-turn<br>Two thru | One left-turn<br>Two thru | Shared left / thru / right | Shared left / thru / right |
| Gore Road / Kingston Road 15<br>(Signal Control) | One left-turn<br>One shared thru-left<br>One right-turn | One left-turn<br>One shared thru-right | One left-turn<br>One shared thru-left<br>One shared thru-right | One left-turn<br>One shared thru<br>One shared thru-right |

#### .3 The Potential for Short Cutting at the Project Site Location

This section considers the potential for short cutting to occur within the project site location after the bridge is built. Short cutting is defined as an unintended intrusion resulting from traffic choosing to drive on a shorter public road route (or the 'short cut route') rather than remain on the main public road route (or the 'direct route').

There are two potential opportunities for short cutting within the project site location. The first is through the Point St. Mark residential neighbourhood. Traffic taking the direct route, namely, Gore Road-to-Kingston Road 15 southbound, would encounter one signalized intersection at Gore Road and Kingston Road 15. Traffic taking the short cut route, namely, Gore Road-to-Point St. Mark Drive-to-Barker Drive-to-Point St. Mark Drive-to-Kingston Road 15 southbound, would encounter one signalized intersection at Kingston Road 15 and Point St. Mark Drive.

Under "Scenario 'I', delays of 35 seconds to 55 seconds are expected in 2019 at the west approach of the Gore Road-Kingston Road 15 intersection. The eastbound left-turning traffic at this intersection would have to wait for an appropriate gap in the northbound traffic on Kingston Road 15, thereby creating queues and causing delay to eastbound right-turning and through traffic. Similarly, it is anticipated that northbound left-turning traffic could experience delays of 35 seconds to 55 seconds at this intersection. Northbound left-turning traffic would have to wait for an appropriate gap in the southbound traffic on Kingston Road 15. Drivers may have a perceived notion of gaining a time savings by using the short cut route through the Point St. Mark neighbourhood to avoid delays at the signalized intersection at Gore Road and Kingston Road 15.

Any additional traffic to the Gore Road-Point St. Mark intersection generated through short cutting is expected to result in a poor LOS at that intersection, in particular at its south leg (shared left/through/right). The short cut route through the Point St. Mark neighbourhood is also virtually equal in distance to the direct route of Gore Road-to-Kingston Road 15. It can therefore be expected that these conditions would discourage those drivers who would be inclined to use the Point St. Mark neighbourhood as a potential short cut route.

The second potential opportunity for short cutting is through the Village On The River apartment parking lot. Traffic taking the direct route, namely, John Counter Boulevard-to-Montreal Street southbound, would encounter one signalized intersection at John Counter Boulevard and Montreal Street. Traffic taking the short cut route, namely, John Counter Boulevard-to-the Village On The River apartment parking lot-to-Montreal Street southbound, would encounter one stop sign controlled intersection at Montreal Street. However, the speed of traffic traveling through the Village On The River apartment parking lot would be very slow as the route through the parking lot is circuitous and the travel lanes are narrow compared to travel on the direct route. As such, there is not expected to be a travel time savings by traveling through the Village On The River parking lot compared with traveling on the direct route.

The potential for short cutting should be monitored by the City after the bridge us built. 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.

### 4.1.2 Ecological Conditions – Land

This section of the Report discusses the terrestrial ecological fieldwork undertaken at the project site location and surrounding area. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following three sub-sections:

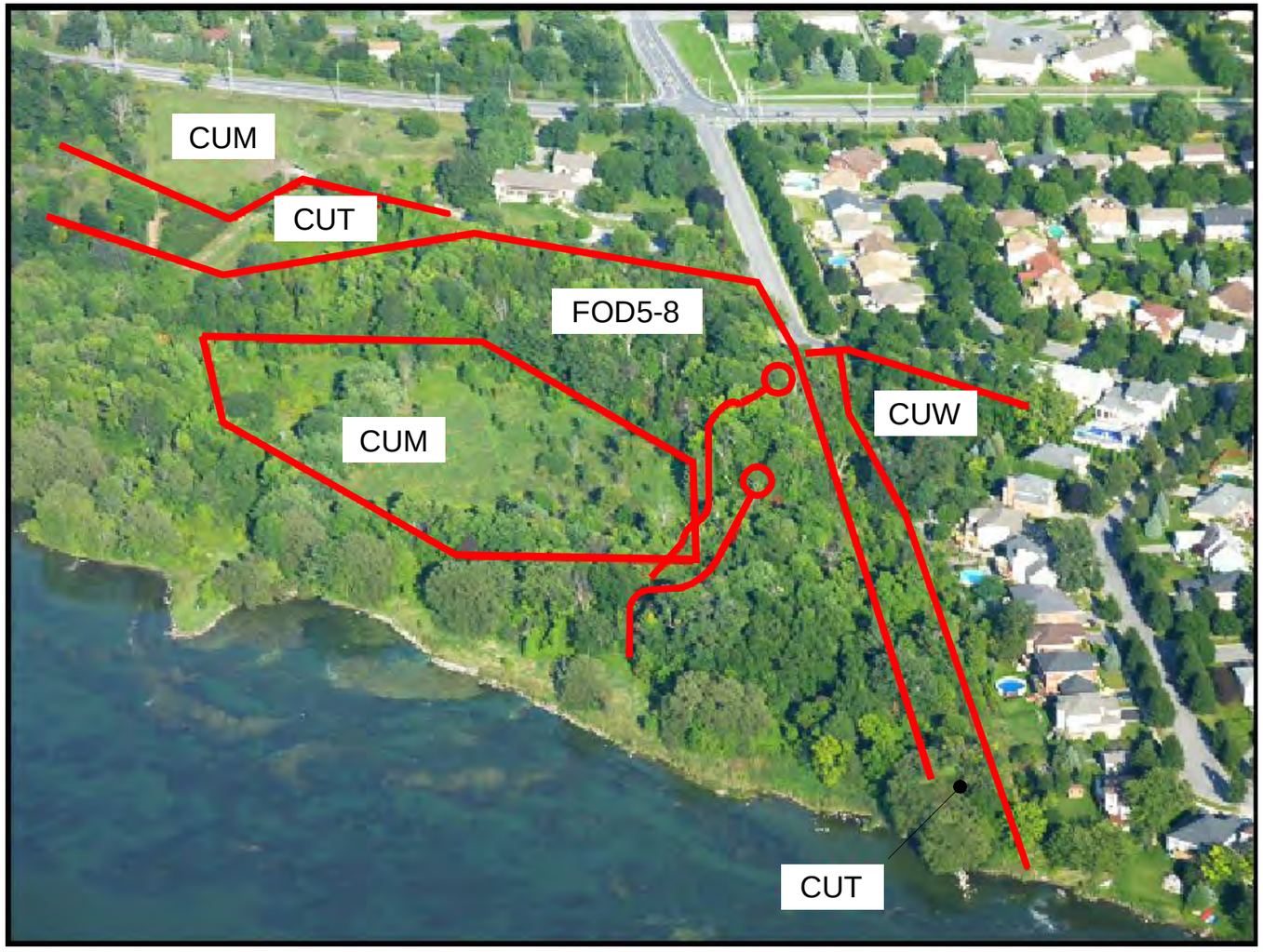
1. Ecological Land Classifications for the east and west side lands.
2. Faunal species inventory findings.
3. Greater Cataraqui Marsh Wetland vegetation.

#### .1 Ecological Land Classifications

Ecological Land Classification (or ELC) is an integrated approach to surveying and classifying land and resources. Its goal is to reduce complex natural variation to a reasonable number of meaningful ecosystem units. Development of the ELC mapping for the project site location involved a number of site visits (June 14, 2008; May 26 and June 11, 2009; and July 25, July 28, August 27 and September 3, 2010) to the two terrestrial shoreland areas. Aerial reconnaissance of the project site location was also conducted on August 24, 2010 in order to have the most up-to-date base imagery.

As shown on Drawing 4.3, there are no ELC community types on the west side lands. The land is dominated by cultural influences, including a public boat launch, the Music Marina, single dwellings, light industries, the River Park subdivision and the Village On The River apartments. Manitoba Maple is the main tree species present, growing along the road rights-of-way and on the residential properties. Ornamental garden plants are also present on some of the residential lots. European Buckthorn is the main shrub in the area. The bulk of the ground cover plants are weedy species typically found along road

A: WEST SIDE LANDS
(NO ELC COMMUNITY TYPES)




B: EAST SIDE LANDS

LEGEND
FOD5-8 - DECIDUOUS FOREST
CUT - CULTURAL THICKET
CUW - CULTURAL WOODLAND
CUM - CULTURAL MEADOW



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

DRAWING:
ELC COMMUNITY TYPES

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PLOTTED: 31-Jan-12

DRAWING NO.: 4-3
JLR NO: 23446-02

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edges such as Ragweed, Burdock, Sow Thistle and Mullein. No trees that are listed in either the OESA or the Federal SARA are present.

As also highlighted on Drawing 4.3, there are four ELC community types found on the east side lands:

1. (A) A 'Cultural Thicket' (CUT) community type is found within the Gore Road right-of-way. It is characterized as having a shrub cover greater than 25 percent and a tree cover of less than 25 percent.

   There are a few large diameter Sugar Maple, Red Oak, White Oak and Bur Oak trees that are likely over 100 years old, and a number of shrub-sized White Ash and Manitoba Maple, but the overall dominant species that characterizes this area is European Buckthorn. Other shrub species include Tartarian Honeysuckle, Staghorn Sumac, and Riverbank Grape. The ground cover is mostly weedy non-native species such as Knapweed, Burdock, Trefoil, Fragrant Bedstraw (native), Thistles, Dames Rocket, Crown Vetch, and Garlic Mustard. Many of the dominant plant species present are considered Category I invasive species[20].

   Site disturbances include an underlay of large rock fill that appears to have been recently laid down, making much of the Gore Road right-of-way roughly 6 to 8 m higher in elevation than the woodlot to the north. As well, yard waste and detritus have been dumped into this area.

   The shoreline component (about the first 20 m) of the Gore Road right-of-way is dominated by tree cover, but this area is too small to be considered a separate ELC community. The main tree species along the shoreline is Crack Willow, but Manitoba Maple and European Buckthorn are also noted down to the shoreline. Off-shore, there is little wetland vegetation, possibly due to the deposited rock fill and the existing limestone pavement. A fringe of Narrow-leaved Cattails extends to the north and south.

   (B) A CUT patch is also located west of the Gore Road Library, and extends into the off-leash dog park. Weedy species are common. Riverbank Grape is abundant along with Buckthorn and Staghorn Sumac, though there is no clear dominant species. Manitoba Maple is the most common tree.

2. 'Dry-Fresh Sugar Maple – White Ash Deciduous Forest' (FOD5-8) is found north of the Gore Road right-of-way and extends northward in fragmented segments to the Pittsburgh quarry operation. This forest type is typical of lands that have a history of disturbance.

   The dominant canopy tree species is Sugar Maple, with lesser amounts of White Ash. Manitoba Maple, Ironwood, Black Cherry, Shagbark Hickory, Basswood, Red Oak and White Oak are also present. It appears, based on historic photographs from 1945, 1953, 1962 and 1978, that much of the FOD5-8 forest area was used for agricultural purposes. This would coincide with the mostly young age of the woodlot, with many of the trees in the 30-year range. There are a few older trees in the 80-100 year range that, in the historic aerial photographs, are isolated within the agricultural areas.

   This woodlot has a high degree of edge due to its uneven shape, and has high fragmentation due to the numerous trails within it. Common trees in the edge include Manitoba Maple and White Ash, but European Buckthorn dominates, with Garlic Mustard as a common understory plant. Overall, the Buckthorn-dominated edge areas are almost greater in size than the area dominated by Sugar Maple.

   The woodlot also contains two drainage routes (shown as circles on Drawing 4.3) that collect groundwater from the Point St. Mark residential neighborhood and direct it to the Cataraqui River. During the numerous site visits in 2009 and 2010, the drainage routes were seen to be dry only once, but they do not provide fish habitat. The more easterly drainage route discharges at the base of the rock fill, near the current Gore Road-Point St. Mark Drive intersection. The other drainage route discharges within the FOD5-8 area, roughly 50 m west and 20 m north of the first discharge point at the base of the rock fill.

   The shoreline component of the FOD5-8 area has an approximate 15 m wide verge of wetland vegetation that is too small to be considered a separate ELC community type.

3. The 'Cultural Woodland' (CUW) area is found in the southwest quadrant of the Gore Road-Point St. Mark Drive intersection. This area is also too small [less than 0.5 hectares (ha)] to be considered a separate ELC type, but it is noted here. Like the nearby FOD5-8 woodland, Sugar Maple and White Ash are common, but numerous other tree species are also present, many of which were likely planted. The ground cover and shrub layers are mostly weedy non-native species.

4. The two 'Cultural Meadow' (CUM) patches, like most cultural meadows within urban settings, are dominated by weedy species and both have a history of disturbance. The more easterly CUM area adjacent to Kingston Road 15 is part of the off-leash dog park.

[20] Category I species are those species that can dominate a site to the exclusion of all other species and remain on-site indefinitely.

### .2 Faunal Species Inventory Findings

The fieldwork on faunal species was conducted during 2010 concurrent with the ELC fieldwork.

#### A. Methodology

##### 1. Turtle Trapping

Turtle trapping was undertaken at the project site location and surrounding areas. Hoop traps and basking traps were used. The hoop traps were baited with sardines and set such that a portion of the enclosure was above water, thereby allowing any trapped turtles to surface for air. The basking traps are more passive in that they provide a basking surface for the turtles. Turtles that slipped off this surface went into the interior of the trap, from where they were able to surface for air, but not escape.

Traps were placed in a site and their locations marked, as shown on Drawing 4.4. Site visits were then carried out from July to September, 2010 (July 7, 8, 15, 16, 26, 27; August 6, 7, 13, 14, 18, 19, 25; and September 2, 3, 19, 20). Parks Canada resource management personnel were advised of site visit dates in order to coordinate fieldwork activities. Weather forecasts were also checked to determine days that would have the highest probability for trapping the turtles. The traps were inspected late in the day, then left overnight and re-visited and removed the following day. In this way, no turtle remained in a trap for over 24 hours. Information sought on the trapped turtles included date of inspection, species, weight, sex, length, location and photographic documentation.

##### 2. Birds

Birds were surveyed both prior to and during Stage 2 of this EA study in 2008, 2009 and 2010. Most of the identifications were made by sight and/or call, but recorded calls were also used to lure certain target species, particularly Species at Risk and/or species with historical but no recent records of sightings.

##### 3. Other Fauna

Other animal species were not surveyed specifically, but any observations made were recorded during the site visits. Anecdotal reports from area residents were also noted.

#### B. Observations

##### 1. Turtles

Very few turtles were observed or caught during the 2010 fieldwork. The fieldwork results are summarized in Table 4.6 below.

**Table 4.6**
**Summary of 2010 Fieldwork Observations: Turtles**

| Date | Trap Type | Species | Weight (g) | Sex | Length (cm) | Location |
|---|---|---|---|---|---|---|
| 07-26-10 | Observed | Snapping | n/a | n/a | n/a | n/a |
| 08-13-10 | Basking | Painted | 300 | Male | 13 | N44° 15.712’ W076° 28.654’ |
| 08-13-10 | Basking | Painted | 200 | Female | 11 | N44° 15.712’ W076° 28.654’ |
| 08-25-10 | Observed | Painted | n/a | n/a | n/a | n/a |

It is recognized that other turtles are present in this area, based on previous fieldwork. For example, Parks Canada resource management personnel conducted turtle trapping in this area during 2008 and 2010. In 2008, Parks Canada reported Painted Turtles (60), Stinkpot Turtles (1), Snapping Turtles (1), Map Turtles (2), and a Red-eared Slider (1), the latter of which is a non-native species and was likely a pet release or escape. In 2010, Parks Canada reported Painted Turtles (22), Snapping Turtles (4) and Map Turtles (3), as well as basking Map Turtles observed across from the visible cattail marsh portion of the Greater Cataraqui Marsh wetland to the north of the project site location.

In general, the area of the Greater Cataraqui Marsh is known to support turtles. The most abundant turtle in the system is clearly the Painted Turtle, based on all the sampling done in 2010 and previous years. All turtle species with the exception of the Painted Turtle are at some level of risk: all are S3 or vulnerable, except for the Painted Turtle (S5) and the Red-eared Slider (SNA). Moreover, the Stinkpot Turtle and Blanding’s Turtle are considered to be Threatened, whereas the Map Turtle and Snapping Turtle are species of Special Concern.

##### 2. Birds

Bird species observed during the 2008-2010 fieldwork are summarized in Table 4.7 below[21].

[21] Data presentation and rarity information modified from the Natural Heritage Information Center (NHIC) website: < http://nhic.mnr.gov.on.ca/ >. The S-rank designates rarity in Ontario as follows: *S3* (Vulnerable – Vulnerable in the nation or state/province due to a restricted range, relatively few populations [often 80 or fewer]), recent and widespread declines, or other factors making it vulnerable to extirpation); *S4* (Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors); *S5* (Secure – Common, widespread and abundant in the nation or state/province); and *SNA* (Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities). *B* refers to breeding status; *SC* is a species of Special Concern; and *NAR* is a species that has been evaluated, but is considered Not at Risk.

LEGEND:

○ Turtle Trapping Sites

Project Site Location



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

DRAWING:
TURTLE TRAPPING SITES

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PLOTTED: 25-Jan-12

DRAWING NO.: 4-4

JLR NO: 23446-02

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**Table 4.7**
**Summary of 2008-2010 Fieldwork Observations: Birds**

| Species Name | Common Name | S-Rank | Federal Status | Provincial Status |
|---|---|---|---|---|
| *Agelaius phoeniceus* | Red-winged Blackbird | S5B | | |
| *Aix sponsa* | Wood Duck | S5B | | |
| *Anas americana* | American Wigeon | S4B | | |
| *Anas platyrhynchos* | Mallard | S5B | | |
| *Anas rubripes* | American Black Duck | S4B | | |
| *Anas strepera* | Gadwall | S4B | | |
| *Ardea herodias* | Great Blue Heron | S5B | | |
| *Aythya affinis* | Lesser Scaup | S4B | | |
| *Aythya collaris* | Ring-necked Duck | S5B | | |
| *Aythya marila* | Greater Scaup | S4B | | |
| *Bombycilla cedrorum* | Cedar Waxwing | S5B | | |
| *Branta canadensis* | Canada Goose | S5B | | |
| *Bucephala albeola* | Bufflehead | S4B | | |
| *Bucephala clangula* | Common Goldeneye | S5B | | |
| *Butorides virescens* | Green Heron | S4B | | |
| *Cardinalis cardinalis* | Northern Cardinal | S5 | | |
| *Carduelis tristis* | American Goldfinch | S5B | | |
| *Charadrius vociferus* | Killdeer | S5B | | |
| *Chlidonias niger* | Black Tern | S3B | NAR | SC |
| *Cistothorus palustris* | Marsh Wren | S5B | | |
| *Colaptes auratus* | Northern Flicker | S4B | | |
| *Corvus brachyrhynchos* | American Crow | S5B | | |
| *Cygnus columbianus* | Tundra Swan | S4B | | |
| *Dendroica petechia* | Yellow Warbler | S5B | | |

**Table 4.7**
**Summary of 2008-2010 Fieldwork Observations: Birds**

| Species Name | Common Name | S-Rank | Federal Status | Provincial Status |
|---|---|---|---|---|
| *Dryocopus pileatus* | Pileated Woodpecker | S5 | | |
| *Dumetella carolinensis* | Gray Catbird | S5B | | |
| *Fulica americana* | American Coot | S4B | NAR | NAR |
| *Gallinula chloropus* | Common Moorhen | S4B | | |
| *Geothlypis trichas* | Common Yellowthroat | S5B | | |
| *Hirundo rustica* | Barn Swallow | S5B | | |
| *Hydroprogne caspia* | Caspian Tern | S3B | NAR | NAR |
| *Icterus galbula* | Baltimore Oriole | S4B | | |
| *Larus argentatus* | Herring Gull | S5B | | |
| *Larus delawarensis* | Ring-billed Gull | S5B | | |
| *Lophodytes cucullatus* | Hooded Merganser | S5B | | |
| *Melospiza georgiana* | Swamp Sparrow | S5B | | |
| *Melospiza melodia* | Song Sparrow | S5B | | |
| *Mergus merganser* | Common Merganser | S5B | | |
| *Molothrus ater* | Brown-headed Cowbird | S5B | | |
| *Myiarchus crinitus* | Great Crested Flycatcher | S4B | | |
| *Pandion haliaetus* | Osprey | S4B | | |
| *Passer domesticus* | House Sparrow | SNA | | |
| *Phalacrocorax auritus* | Double-crested Cormorant | S4B | NAR | NAR |
| *Picoides pubescens* | Downy Woodpecker | S5 | | |
| *Picoides villosus* | Hairy Woodpecker | S5 | | |
| *Podilymbus podiceps* | Pied-billed Grebe | S4B | | |
| *Poecile atricapillus* | Black-capped Chickadee | S5 | | |
| *Progne subis* | Purple Martin | S4B | | |

**Table 4.7**
**Summary of 2008-2010 Fieldwork Observations: Birds**

| Species Name | Common Name | S-Rank | Federal Status | Provincial Status |
|---|---|---|---|---|
| *Quiscalus quiscula* | Common Grackle | S5B | | |
| *Spizella passerina* | Chipping Sparrow | S5B | | |
| *Stelgidopteryx serripennis* | Northern Rough-winged Swallow | S5B | | |
| *Sterna hirundo* | Common Tern | S4B | NAR | NAR |
| *Sturnus vulgaris* | European Starling | SNA | | |
| *Tachycineta bicolor* | Tree Swallow | S5B | | |
| *Thryothorus ludovicianus* | Carolina Wren | S4 | | |
| *Troglodytes aedon* | House Wren | S5B | | |
| *Turdus migratorius* | American Robin | S5B | | |
| *Vireo gilvus* | Warbling Vireo | S5B | | |
| *Zenaida macroura* | Mourning Dove | S5B | | |

There has been a considerable amount of previous work done on birds in the Greater Cataraqui Marsh, with 206 bird species having been observed to date. Its visible cattail marsh portion north of the project site location is the area of greatest value to birds, providing nesting habitat for bitterns, waterfowl, moorhens, rails and Black Terns, as well as roosting habitat for large numbers of migratory swallows. The open waters are important to migratory waterfowl in both spring and fall. The western shoreline of the Cataraqui River, particularly within 100 m of shore, is also important to both resident/breeding and migratory waterfowl. The shallow waters of the Cataraqui River provide rich feeding sections for waterfowl. Thousands of birds, representing over a dozen species, congregate in the area in both spring and fall.

Based on Natural Heritage Information Center (NHIC) records, there were only three at risk bird species listed within the project site location, namely:

1. The Northern Bobwhite, which is from an 1856 record. It should be noted that this species never established in the Kingston area and that none have been reported since 1859.

2. The King Rail, which is from a 1956 record. This species should be considered a very rare irregular spring and summer resident.

3. The Least Bittern, which though considered an uncommon regular summer resident, should be assumed to be present in the area, if only periodically. This is a species that is closely associated with emergent vegetation such as the visible cattail marsh to the north of the project site location.

3. Other Fauna

Other fauna species present are those normally found in a near urban site and are mostly considered habitat generalists. There is some species movement, including Red Fox that may hunt in the adjacent residential areas.

In addition, there are unconfirmed reports that Eastern Milk Snake also use the rock fill area at the end of Gore Road as a hibernaculum. While Eastern Milk Snakes were not observed during the fieldwork, a hibernaculum is conceivable due to the many crevices provided by the rock fill near the current Gore Road-Point St. Mark Drive intersection in the east side lands area (on a related note, Milk Snakes have been observed on nearby properties). The adjacent FOD5-8 area to the north is not ideal Milk Snake habitat, but the CUM area further north as well as the land around the Gore Road Library and the adjacent rear yard lawns in the Point St. Mark residential neighborhood could provide suitable habitat. The Eastern Milk Snake is relatively common in the Kingston area, but it is rare in Ontario (species of Special Concern) and across Canada (COSEWIC species of Special Concern). It is in Part 4 (species of Special Concern) of Schedule 1 of the Federal SARA. Species of Special Concern are wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. Though SARA prohibitions do not apply to species of Special Concern, the Milk Snake is protected under the Ontario 'Fish and Wildlife Conservation Act', where it is forbidden to hunt, trap, kill, trade, or hold in captivity these snakes without a permit.

### .3 Greater Cataraqui Marsh Wetland Vegetation

#### A. Methodology

The Greater Cataraqui Marsh is designated as both a Provincially Significant Wetland (PSW) and Provincially Significant Coastal Wetland, extending from the Woolen Mill / Barriefield area in the southern portion of the EA study area to just north of Highway 401. The Greater Cataraqui Marsh is the most significant ecological system on the landscape [based on the OWES, its visible cattail portion north of John Counter Boulevard has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion]. The Rideau Canal's navigable channel and the dredged access route for the Music Marina at the end of John Counter Boulevard within the project site location are excluded from the Greater Cataraqui Marsh PSW.

The ecological value of the vegetation that is part of the Greater Cataraqui Marsh at the project site location and surrounding area was assessed during Stage 2 of this EA study. The assessment was based

on three sources, namely: i) historic mapping done for the wetland area in 1990; ii) the 2011 marine ecological fieldwork also done during Stage 2 of this EA study and discussed later in this Report; and iii) aerial imagery dating back roughly 50 years.

**B. Observations**

Drawing 4.5 illustrates four vegetation communities within the project site location and surrounding area. As described below, they have been documented in a manner generally consistent with both wetland evaluation protocols and the OWES:

1. 'suW1' and 'OW': The majority of the project site location passes over only one vegetation type (suW1) and the balance over 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.

2. 'suW2': The suW2 community is found north and south of the project site location along the west shoreline. It consists of two vegetation forms (submerged vegetation and floating-leaved plants), dominated in 1990 by Milfoil and Waterlilies. This is consistent with current conditions. It is noted that the suW2 areas appear to be slightly more extensive in 2011 than in 1990, and aerial extent has increased both north and south of the project site location.

3. 'reM3': The reM3 community is made up of two vegetation forms (robust emergents and narrow-leaved emergents), dominated in 1990 by cattails and grasses. This is also consistent with current conditions. It is noted that the reM3 areas may be slightly more extensive in 2011 than in 1990, but the patches mapped on the east side of the Cataraqui River may not meet the minimum size criteria for mapping purposes of the OWES.

4. 'reM6': The reM6 community consists of two vegetation forms (robust emergents and ground cover), dominated in 1990 by cattails and Purple Loosestrife. It is south of the project site location, proximate to Belle Island.

In comparing the 1990 and 2011 wetland mapping and aerial imagery, it is evident that there has been little change to the Greater Cataraqui Marsh or its dominant vegetation in the intervening years. Despite some cattail infilling in the ponded areas within the main cattail swales, there has been no encroachment of the visible cattails into the project site location. There has also been limited Phragmites invasion in the Greater Cataraqui Marsh which, in eastern Ontario, is mainly apparent in marginal wet areas such as roadside ditches or roadside wetland areas.

### 4.1.3 Ecological Conditions – Marine

This section of the Report discusses the marine ecological fieldwork undertaken at the project site location and surrounding area. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. General setting.

2. Habitat description.

**.1 General Setting**

The Cataraqui River is roughly 1,150 m wide at the project site location and has water depths ranging from about 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal's navigable channel. Water flow speed at the project site location is estimated to be 0.4 m/s. The riverbed substrate consists of soft, unconsolidated muck. The shoreline substrate includes bedrock, boulders, cobbles, gravels and fines. Some areas are hardened with large boulders and/or rip rap. The shorelines also have a variety of riparian vegetation types such as wetland, forested areas that are limited mainly to the east shoreline, manicured parkland with scattered trees and manicured grass to the water's edge. The shorelines are exposed to wave action from boats either passing through the canal's navigable channel or using the dredged access route that extends from the channel to the Music Marina located north of John Counter Boulevard. The Cataraqui River, as part of the Greater Cataraqui Marsh PSW, is listed as having a regional significance in terms of fish spawning and rearing potential. Fish habitat is considered to be warm-water, though salmonids are known to migrate north through the area towards Kingston Mills.

**.2 Habitat Description**

**A. Methodology**

As shown on Drawing 4.6, in order to assess the potential impacts from a bridge crossing on aquatic habitat, the project site location and the adjacent 500 m upstream and downstream areas were divided into west side, mid channel and east side zones. Information on fish and fish habitat was collected by the following methods:

1. Five shoreline transects were created (two on the west side and three on the east side). The shoreline transects were established perpendicular to the shoreline and extended in-water up to a 1 m water depth. Information on the substrate, aquatic vegetation and available cover was recorded at every 1 m interval. This data was then used to create profiles of the shoreline habitat.


LEGEND

| | |
|---|---|
| SuW1 | SUBMERGED VEGETATION |
| OW | OPEN WATER |
| SuW2 | SUBMERGED VEGETATION; FLOATING - LEAVED PLANTS |
| reM3 | ROBUST EMERGENTS; NARROW-LEAVED EMERGENTS |
| reM6 | ROBUST EMERGENTS; GROUND COVER |
| | FIELDWORK AREA |
| | PROJECT SITE LOCATION |



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

DRAWING:
GREATER CATARAQUI MARSH VEGETATION COMMUNITIES

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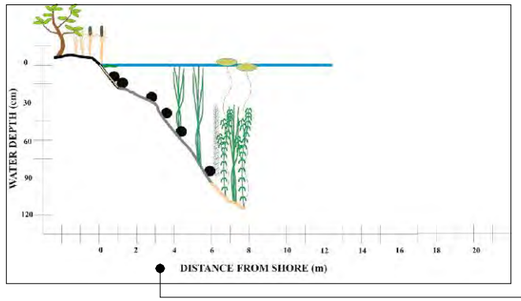
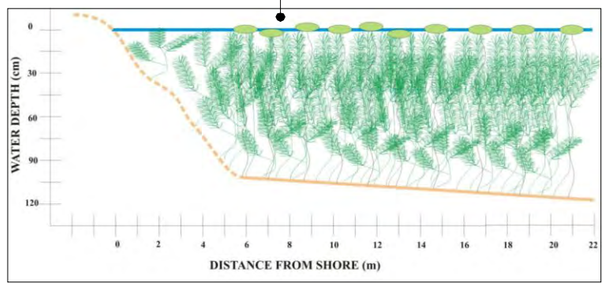
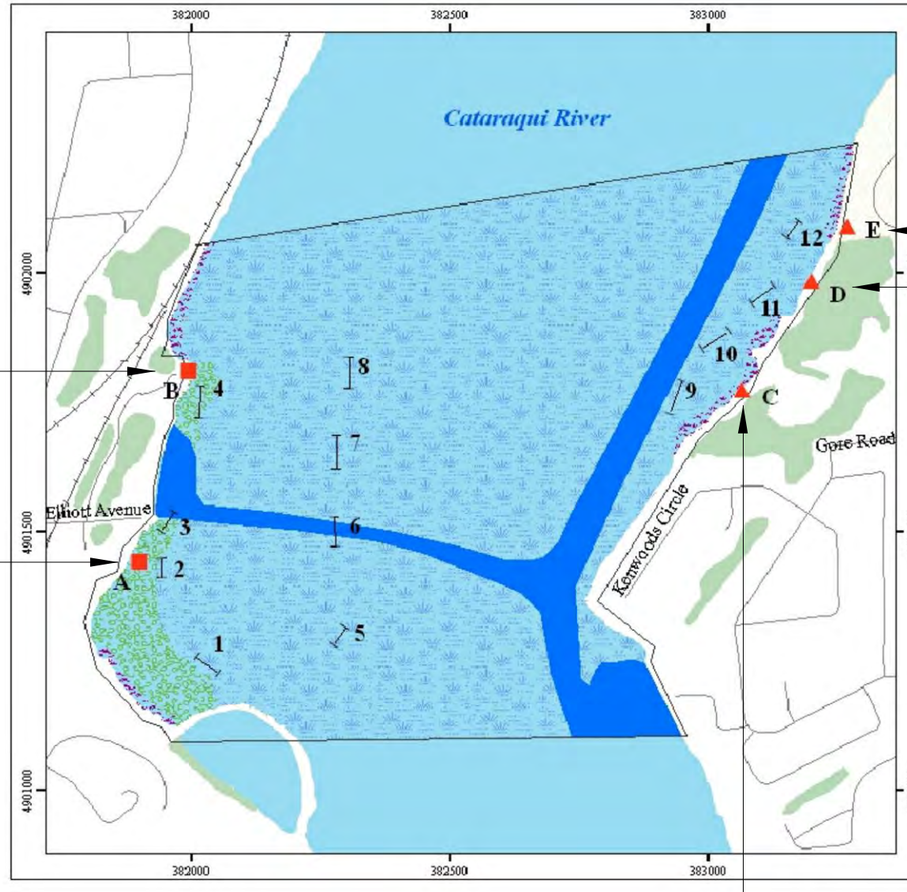
DRAWING NO.: 4-5
JLR NO: 23446-02

File Location: C:\Documents and Settings\djudson\Desktop\23443-02 - Third Crossing ESR\Figures\Figure 4-5 Greater Cataraqui Marsh.dwg




**Legend**

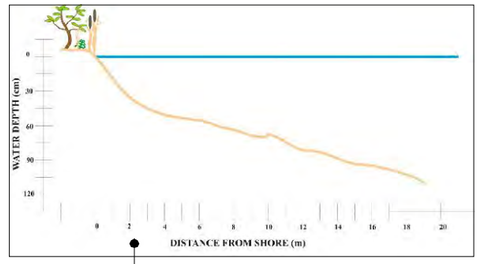
- Area of Focus
- Floating and Submergent Vegetation
  - Small White Water-lily
  - Chara sp.
  - Coontail
  - Canada Waterweed
  - Tapegrass
  - Water-milfoil sp.
- Robust Emergent Vegetation
  - Broad-leaved Cattail
  - Reed Canary Grass

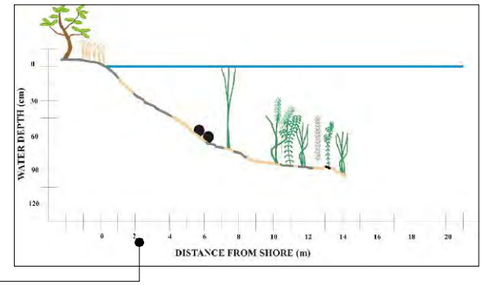
  (Very narrow band of vegetation)
- Submergent Vegetation
  - Tapegrass
  - Pale Water-milfoil
  - Eurasian Water-milfoil
  - Curly Pondweed
  - Flat-stem Pondweed
  - Richardson's Pondweed
  - Canada Waterweed
- Unvegetated (or nearly so)
- Boat Electrofishing / Offshore Habitat Transects
- Shoreline Habitat Transects
- Seine Netting Sites

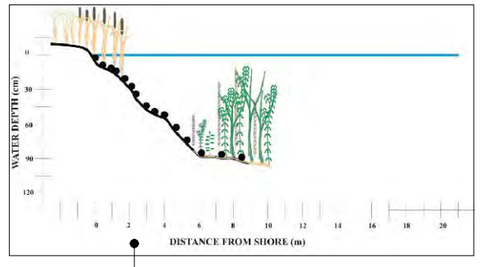
0 87.5 175 350 Meters

1:8,474

- Produced by Bowfin Environmental Consulting Inc.
- Data Sources:
  - Ontario Basic Mapping
- UTM NAD 83 Zone 18
- Last Modified: March 15, 2011






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

DRAWING:
AQUATIC VEGETATION AND
FISH SAMPLING SITES

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JLR NO: 23446-02

File Location: C:\Documents and Settings\djudson\Desktop\23443-02 - Third Crossing ESR\Figures\Figure 4-6 Aquatic Vegetation and Fish Sampling Sites.dwg

2. Twelve offshore transects were established (four transects within each of the three zones) with each transect varying from 40-60 m. Information was collected on aquatic and riparian vegetation, shore substrate, topography (onshore and offshore) as well as water depths, substrate, structure and quality (dissolved oxygen, temperature, turbidity). In addition, as requested by Parks Canada, samples of pondweed (*Potamogeton sp.*) were taken from each transect for analysis due to the potential for Ogden's Pondweed (*Potamogeton ogdenii*) to occur in the area.

3. Fish community sampling was done using a boat electroshocker and bag seine net. The boat electrofishing was completed along the twelve offshore transects and the seine netting along three of the five shoreline transects[22]. The boat sampling was done during the night on April 12, July 19 and October 17, 2010. The seine netting was completed during the day at four sites on July 20 and October 18, 2010[23]. All fish were identified, measured [fork length (FL) or total length (TL) depending on the species] and released unharmed prior to continuing to the next site.

**B. Observations**

The marine ecological fieldwork results are summarized in Table 4.8 and the profiles of the shoreline habitat are shown on Drawing 4.6. The results indicate that the habitat within the project site location area was fairly homogenous consisting of a slow moving glide with fine sediments and dense submergent vegetation. The aquatic vegetation along the shoreline within the bay created by Belle Island consisted mainly of extremely dense floating and submergents with a thin band of emergent cattails. Offshore, but still within the bay at the mid channel sites, the vegetation was chocked with dense submergent vegetation. The Rideau Canal's navigable channel contained the deepest habitat, but lacked aquatic vegetation. The presence and role of the canal's channel helps to reduce the density of aquatic vegetation both within the channel itself and along the east side of the Cataraqui River. The aquatic vegetation within and proximate to the dredged access route that extends from the canal's channel to the Music Marina located north of John Counter Boulevard was similarly less dense as well.

The only spawning activity observed during the spring, summer and fall field sampling consisted of Yellow Perch which were found spawning throughout the mid channel sites during the spring visit. However, the presence of young-of-the-year (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. Overall, the fish species found during the spring, summer and fall field sampling were mainly common warm to cool water sport and forage fish that prefer slow moving water bodies and spawn within aquatic vegetation or algae. The sportfish captured were Northern Pike, White Sucker, Yellow Bullhead, Brown Bullhead, Rock Bass, Pumpkinseed, Bluegill, Largemouth Bass, Black Crappie and Yellow Perch.

In addition, there were no Species at Risk (SAR) or species of conservation value caught or observed during the fieldwork. Still, based on additional background research and discussions with officials at the Ontario Ministry of Natural Resources, Parks Canada and Fisheries and Oceans Canada, five SAR species and five species of conservation value were noted as potentially occurring in the project site location area. These species are discussed in Table 4.9 below. As indicated, based on existing conditions and records, only the American Eel and Pugnose Shiner are considered as 'potentially occurring' in the project site location area.

### 4.1.4 Cultural Heritage

This section of the Report discusses the cultural heritage resources at the project site location. It is divided into the following four sub-sections:

1. Fieldwork methodology.
2. The Rideau Canal.
3. The Gore Road Library.
4. The west side lands.
5. Viewscape Considerations.

**.1 Fieldwork Methodology**

The more detailed accounting of cultural heritage resource conditions at the project site location involved the following activities:

1. The review of the cultural heritage survey work done as part of Stage 1 of this EA study.
2. Library and archival research at the Library and Archives of Canada, the National Air Photo Library, Queen's University Archives, the Frontenac Land Registry Office, the Gore Road Library and City of Kingston municipal offices.
3. Site visits undertaken on June 14 and June 23, 2011.
4. Consultations with staff at the City and Parks Canada as well as local historians and historic materials experts.

[22] Note the location and number of seine netting sites was restricted due to the dense aquatic vegetation, especially on the west bank, and the rocky shoreline on the east bank.
[23] Note that: i) the presence of docks and fishing nets prevented sampling within the east side zone south of the project site location; and ii) sampling was restricted during the summer and fall due to dense aquatic vegetation.

**Table 4.8**
**Summary of Shoreline Habitat Profiles and Fish Sampling Results**

| | West Side Zone | | | | | | Mid Channel Zone | | | | East Side Zone | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shoreline Transect | | Offshore Transect | | | | Offshore Transect | | | | Shoreline Transect | | | Offshore Transect | | | |
| | A | B | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | C | D | E | 9 | 10 | 11 | 12 |
| **Shoreline Habitat Profile** | White water-lily and stonewort at the shoreline.<br><br>100% in-stream cover (milfoil).<br><br>Substrate was soft and mucky. | Reed canary grass, cattails, flowering rush buckthorn, nannyberry, staghorn sumac at the shoreline.<br><br>20% in-stream cover near-shore, increasing to 60% offshore (milfoil, Canada waterweed, tapegrass).<br><br>Substrate was firm | | | | | | | | | Reed canary grass and broad-leaved cattail at the shoreline.<br><br>30% in-stream cover near-shore, increasing to 70% offshore (milfoil, Canada waterweed, tapegrass, flat-stem pondweed).<br><br>Substrate was firm with a mix of boulders and fines. | Reed canary grass, hog-peanut, black medick, common buckthorn, dogwood, red oak, crack willow and white ash at the shoreline.<br><br>20% in-stream cover near-shore, increasing to 50% offshore (stonewort, tapegrass, Canada waterweed, flat-stem pondweed, milfoil).<br><br>Substrate was firm with a mix of boulders and fines. | Reed canary grass, cattails, fern, nannyberry, white ash, field bindweed, meadowsweet at the shoreline.<br><br>Sparse in-stream cover observed in the Fall only (Canada waterweed, tapegrass).<br><br>Substrate was firm. | | | | |
| **Spring Fish Sampling:** | | | | | | | | | | | | | | | | | |
| No. of Fish | | | 174 | 163 | 155 | 107 | 173 | 179 | 198 | 95 | N/A | N/A | N/A | 165 | 106 | 72 | 85 |
| **Summer Fish Sampling:** | | | | | | | | | | | | | | | | | |
| No. of Fish | | | 59 | 81 | 125 | 106 | 81 | 108 | 68 | 90 | 102 | 99 | 242 | 54 | 26 | 29 | 20 |
| **Fall Fish Sampling:** | | | | | | | | | | | | | | | | | |
| No. of Fish | | | 97 | 69 | 194 | 55 | 147 | 183 | 26 | 61 | 155 | 232 | 160 | 167 | 161 | 436 | 299 |

Note:

1. The percentage of sportfish captured with the boat electrofisher and seine net were 83 percent and 86 percent, respectively.
2. The boat electrofishing catch across all the offshore transects was represented mainly by Yellow Perch (35 percent), Pumpkinseed (34 percent), Brook Silversides (10 percent) and Bluegill (8 percent).
3. The seine net catch at the shoreline transects was represented mainly by Yellow Perch (67 percent), Round Goby (9 percent), Pumpkinseed (7 percent) and Largemouth Bass (6 percent).

**Table 4.9**
**Summary of Potential Fish and Submergent Plant Species at Risk and Species of Conservation Value Occurring at the Project Site Location Area**

| Species Type | Species Name | Common Name | S-Rank | Federal Status | Provincial Status | Preferred Habitat | Likelihood at Project Site Location Area |
|---|---|---|---|---|---|---|---|
| **Species at Risk** | | | | | | | |
| Fish | *Acipenser fulvescens* | Lake Sturgeon | S2 | | THR | Bottoms of lakes and large rivers; spawn in fast flowing waters. | Considered 'unlikely to occur' due to unsuitable habitat. |
| | *Lepisosteus oculatus* | Spotted Gar | S1 | THR | THR | Warm, shallow, slow-moving waters (streams, sloughs, lakes and swamps) with dense aquatic vegetation. | Suitable habitat but considered 'unlikely to occur' due to no records of the species in the area. |
| | *Notropis anogenus* | Pugnose Shiner | S2 | END | END | Quiet areas of large lakes, stagnant channels and large rivers (mainly on sand bottoms with organic detritus). | Considered as 'potentially occurring' due to suitable habitat. |
| | *Anguilla rostrata* | American Eel | S1? | | END | Near cover over muddy, silty bottoms of lakes, rivers and creeks. | Considered as 'potentially occurring' due to identified migrations through the area. |
| Aquatic Plants | *Potamogeton ogdenii* | Odgen's Pondweed | SH | END | END | Shallow slow moving systems (typically highly alkaline). | Considered 'unlikely to occur' due to no records of the species in the area over the past 20 years; and the 2010 fieldwork samples were confirmed as 'Flat-Stem Pondweed'. |
| **Species of Conservation Value** | | | | | | | |
| Fish | *Esox americanus vermiculatus* | Grass Pickerel | S3 | SC | SC | Lakes, backwaters and sluggish pools of streams with mud bottom, aquatic vegetation and clear water. | Considered 'unlikely to occur' due to no records of the species in the area. |
| | *Moxostoma valenciennesi* | Greater Redhorse | S3 | | | Little is known; spawns in fast flowing waters; after spawn can be found in shallow slow moving areas. | Considered 'unlikely to occur' due to no records of the species in the area. |
| | *Macrhybopsis storeriana* | Silver Chub | S2 | SC | SC | Pools of slow moving streams having clean sand and gravel bottoms. | Suitable habitat but considered 'unlikely to occur' due to no records of the species in the area. |
| | *Notropis bifrenatus* | Bridle Shiner | S2 | SC | SC | Ponds, lakes and sluggish mud-bottomed pools of creeks and small-to-medium rivers with abundant submergent vegetation. | Suitable habitat but considered 'unlikely to occur' due to no records of the species in the area. |
| Aquatic Plants | *Najas marina* | Prickly Naiad | S1 | | | Salt springs, brackish or highly alkaline waters. | Considered 'unlikely to occur' due to no records of the species in the area. |
| | *Najas guadalupensis* | Southern Naiad | S3 | | | Alkaline, brackish and saline ponds, lakes, streams and coastal ponds. | |

As noted during the Stage 1 survey work, the cultural heritage context in the northern portion of the EA study area from Belle Island to Highway 401 should not be overlooked, given the presence of the Rideau Canal and Gore Road Library on the cultural heritage landscape. These two designated cultural heritage properties are situated within the project site location and are discussed further below.

### .2 The Rideau Canal

As noted earlier, the Rideau Canal was built by the Royal Engineers between 1826 and 1832 to provide a secure alternate supply route in the event of a military blockade by the Americans. The canal is a UNESCO World Heritage Site (designated in 2007), National Historic Site (designated in 1925), Canadian Heritage River (designated in 2000) and Federally regulated navigable waterway. Parks Canada is responsible on behalf of the Federal government for managing and protecting the canal as a National Historic Site and Canadian Heritage River. Parks Canada is also responsible on behalf of the UNESCO World Heritage Committee for protecting the canal as a UNESCO World Heritage Site. The designations for the National Historic Site and Canadian Heritage River are restricted geographically to the territory owned by the Federal government, namely, the canal bed, the lands around the lock stations as well as Fort Henry and the Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) in the southern portion of the EA study area. Parks Canada is an approval authority for any proposed developments within these areas. The UNESCO World Heritage Site designation includes these areas, plus a 30 m buffer zone along the shoreline and an as-yet-undefined area of 'visual impact'.

In the spirit of both guiding the EA study and design process and confirming its own role as an approval authority, Parks Canada articulated the heritage values and strategic principles of the section of the canal within the EA study area (or 'the lower Cataraqui section'). Prepared in 2010, the 'Heritage Values and Guiding Principles for the Cataraqui River Sector of the Rideau Canal' cites the lower Cataraqui section as a rare example of the waterway where the landscape 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, Parks Canada's report focuses the key heritage values of the lower Cataraqui section of the canal on its historic, ecological and visual inter-relationships with the waterway and shorelands; the through-navigation of the canal system itself; and its extensive wetlands and other natural heritage elements. These key heritage values are then reflected in the following strategic principles that serve to guide and inform proposed 'development projects' in the lower Cataraqui section of the canal:

1. Recognize Parks Canada's jurisdiction of the canal.
2. Protect and respect the heritage values of the canal as a UNESCO World Heritage Site and National Historic Site.
3. Maintain through-navigation of the canal system.
4. Increase the public's understanding of and appreciation for the canal and provide a memorable visitor experience.
5. Ensure consistency with the 'Standards & Guidelines for the Conservation of Historic Places in Canada' and Parks Canada's 'Cultural Resource Management Policy'.

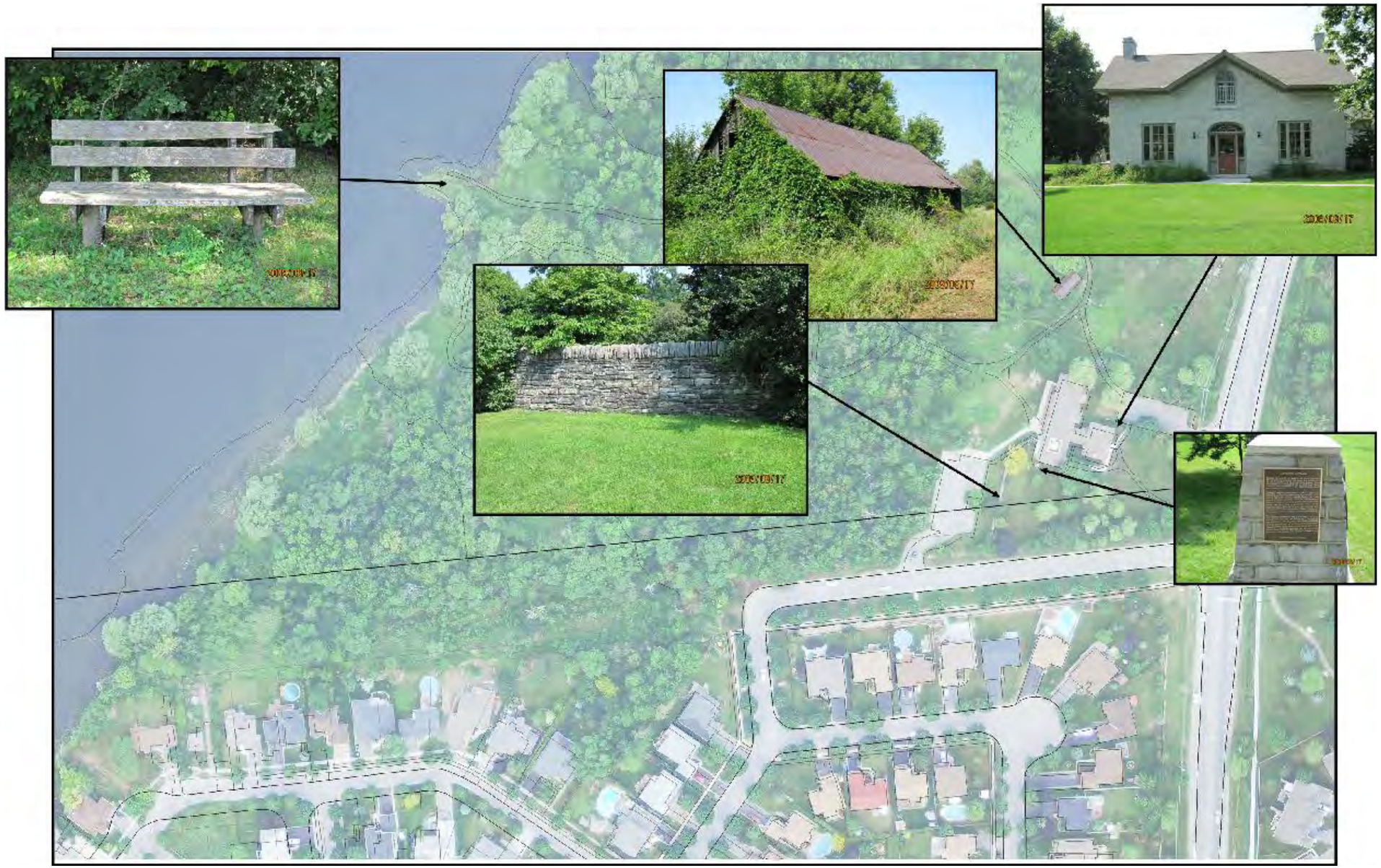
Five areas of concern specific to the intent of this EA study are also provided and focus on the need to:

1. Protect natural and cultural heritage resources.
2. Undertake First Nations consultations in accordance with the Federal Duty to Consult protocol.
3. Protect marine archaeological resources.
4. Maintain view sheds and visual linkages.
5. Enhance public understanding and visitor experience of the canal.

### .3 The Gore Road Library

The Gore Road Library at 80 Gore Road is on a 17 ha parcel of land which is owned by the City. It forms a rough parallelogram bounded by the Cataraqui River to the west, Gore Road to the south, Kingston Road 15 to the east and an adjacent privately owned lot to the north. As shown on Drawing 4.7, in addition to the library building [which includes a 465 square metre (SM) addition at the rear], the property also contains a dry stone wall, off-leash dog park, fields and forested areas with walking paths and two parking areas that serve these functions. The Cataraqui River escarpment runs diagonally through the middle of the property, with the buildings, lawn, wall and the off-leash dog park located on the upper plateau, and the woodland, former fields and recreational pathways located on the escarpment and lower plateau.

The property was originally surveyed in the late 18$^{th}$ century. It was settled in 1839 by John Canniff Ruttan, a farmer from Adolphustown who became a prominent resident, councilor and one-time reeve of the former Pittsburgh Township. The Ruttan family first settled in a log house elsewhere on the property, and later hired local stonemasons, Donald and Alexander Hay, to build the current one-and-a-half-storey stone house in 1863-6 ('Hawthorn Cottage'). The Ordnance Survey prepared by the Royal Engineers in 1868 shows the house and a solid line curving west and south of the house in the current location of the dry stone wall, suggesting that the wall was also in place by 1868. The area in the lee of the wall is marked as





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

DRAWING:
GORE ROAD LIBRARY FEATURES

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PLOTTED: 25-Jan-12

DRAWING NO.: 4-7

JLR NO: 23446-02

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'orchards'. This is consistent with the traditional practice of erecting a stone wall along the west sides of orchards to both protect fruit trees from prevailing winds and create a warmer microclimate[24].

The property stayed in the Ruttan family and continued to be farmed until the mid-20th century, whereupon it was subsequently subdivided and sold to the Bingham and MacLean families. In 1990 and 1992, the former Township of Pittsburgh purchased both properties from the MacLean family and used the property for municipal purposes. Following amalgamation in 1998, Hawthorn Cottage was renovated, with the addition of the library wing at the rear and restoration of the interior and exterior.

The Gore Road Library property was designated as a cultural heritage property by the City in 2007 under By-Law No. 2007-166 for its physical/design value, its historical/associative value and its contextual value. More specifically:

1. The physical/design value of the property resides in the 19th century stone house as a finely crafted example of the vernacular Classical Revival style; in the dry stone wall, which is one of only a few surviving examples of 19th Century dry stone walls in the area; the remains of the formal gardens around the house; and in the remnants of farming activities, including barns, barn foundations and orchards.

2. The historical/associative value of the property lies in its historic associations with the Ruttan and the Hay families.

3. The contextual value of the property pertains to its landmark status along Kingston Road 15, role as a City park and library and views of the Rideau Canal.

By-Law No. 2007-166 lists heritage attributes of the property which must be conserved in order to retain its heritage value. These include: i) the interior and exterior of the stone house; ii) the dry stone wall; iii) the evidence of historic garden and farming activities; iv) the intangible associations with the Ruttan and the Hay families; v) the pathways and views of the canal; vi) the role of the property as a library and centre for community activities; and vii) its status as a landmark along Kingston Road 15[25].

### .4 The West Side Lands

In regards to the west side lands that extend along John Counter Boulevard up to Montreal Street, the Stage 1 cultural heritage survey work did not identify any cultural heritage properties on the City's heritage list or any properties with potential cultural heritage value. Similarly, no further heritage properties were discovered as part of the more detailed research of this portion of the project site location.

### .5 Viewscape Considerations

In addition, as noted earlier, in certain cases, heritage protection also extends beyond the boundaries of the heritage property to include the consideration of visual impacts from proposed developments on the heritage property (both to and from the heritage property) or between related heritage properties. Within the EA study area these views are identified by Parks Canada in its World Heritage Site and/or National Historic Site management documents, the Barriefield Conservation District Plan, municipal designations, and the City's Official Plan. There are 9 of these views within the EA study area, 7 of which are in its southern portion up to Belle Island.

1. From the LaSalle Causeway up to Belle Island:

   a) Views between the Kingston Fortifications and between each fortification and Kingston Harbour;

   b) Views from the Barriefield Village Conservation District towards the Cataraqui River, St. Lawrence River, Fort Henry and downtown Kingston;

   c) Views of St. Mark's Church in Barriefield Village;

   d) Views from the Woolen Mill to City Hall and the Cataraqui River;

   e) Views from Barrack Street and Queen Street to the Inner Harbour;

   f) Views of the City Hall cupola from the LaSalle Causeway and Royal Military College (RMC); and

   g) Views across the Inner Harbour.

2. From Belle Island to the Highway 401 crossing:

   a) Views of the Rideau Canal from the municipally designated site of the Pittsburgh Branch of the Kingston Frontenac Public Library (Gore Road Library); and

   b) All development overlooking the Rideau Canal.

As discussed earlier and shown on Drawings 3.11 to 3.16, there are two landscape character types within the EA study area. 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

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[24] Although stone walls were also used to enclose gardens, this was not always the case. The wall may also have protected plants or trees from farm animals or wild animals, including deer that likely roamed the Cataraqui River escarpment.
[25] Although not mentioned in the designation, the property also includes a stone marker with brass plaques explaining the significance of Hawthorn Cottage, John Canniff Ruttan and the former Pittsburgh Township.

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 canal's navigable channel have remained largely intact. As such, this natural setting has contributed to the unique historical, ecological and visual environment of this section of the waterway. As boaters proceed from the Highway 401 crossing southward (roughly 4 km north of the Inner Harbour entrance), the visible cattail portion of the Greater Cataraqui Marsh dominates the landscape at first, with its shallow water and emergent aquatic plants, near continuous overhanging tree canopy and shrub understory. The City's urban landscape then becomes increasingly more visible in the background as boaters pass through the visible cattails. At roughly 1 km north of the Inner Harbour entrance near Belle Island, the natural landscape evolves into an increasingly urban, more manicured landscape. The project site location is part of this transition point. It is here that a vista opens, where the City's urban landscape to the west (the Elliott Avenue Parkette, Village On The River apartments and the River Park subdivision, for example) and east (the Rideau Marina and Point St. Mark residential neighbourhood, for instance) becomes visible against the backdrop of Belle Island immediately to the south. Views further south of Belle Island are blocked by the tree line along the northern portion of Belle Park and Belle Island as well as by the extension of the eastern shoreline whereon the Gore Road Library, Point St. Mark residential neighbourhood and Rideau Marina are located. South of Belle Island, the full view of the City's Inner Harbour and downtown area is experienced.

In addition, the inscribed property of the UNESCO World Heritage Site includes the Rideau Canal National Historic Site as well as the Fort Henry and the Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) National Historic Sites in the southern portion of the EA study area. As shown on Drawing 3.17, views of the Inner Harbour are obscured in the background at Fort Henry, not only by distance but also by the CFB Kingston and RMC facilities in the foreground. Furthermore, the tree line along the southern portion of Belle Park and Belle Island, in conjunction with the proximate extension of the eastern shoreline, blocks the protected views related to Fort Henry and the other six cultural heritage properties south of Belle Island to the project site location as well as the remaining EA study area that extends further north to Highway 401. This context establishes a more limited impacted viewshed as a bridge design consideration.

### 4.1.5 Archaeological Conditions – Land

This section of the Report discusses the terrestrial archaeological fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. The east side lands.

2. The west side lands.

#### .1 The East Side Lands

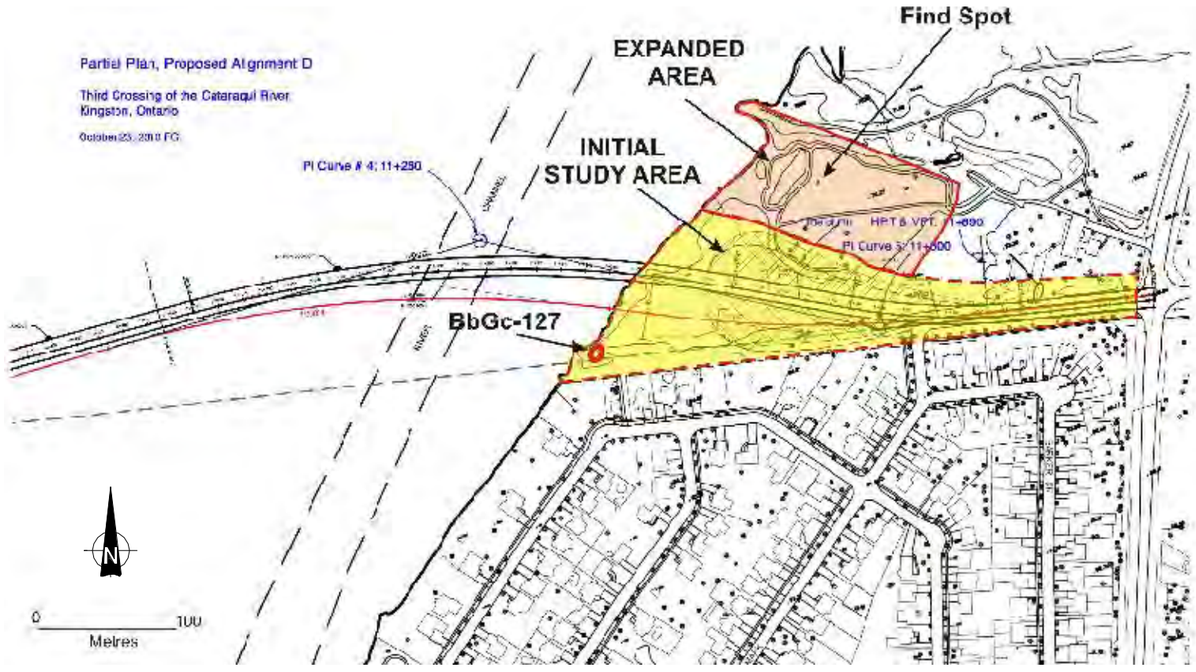
##### A. Methodology

As a result of the terrestrial archaeological survey work done during Stage 1 of this EA study, Stage 2 archaeological testing of the east side lands was subsequently recommended. This was engaged in the Fall of 2010. As shown on Drawing 4.8, the fieldwork area was bounded by the Gore Road Library property to the north (excluding the off-leash dog park which was subject to a separate archaeological assessment in 2009 prior to its development), the Gore Road right-of-way to the south, Kingston Road 15 to the east and the Cataraqui River to the west[26]. Since no part of the fieldwork area included cultivatable land, the fieldwork was done by 'test pit survey'. This involved the excavation and sifting by hand of small, shovel-sized test pits on a 5 m grid pattern. If no evidence of cultural materials was noted, the hole was backfilled. In cases where cultural materials were found, the 'positive' test pit was expanded into a 1 SM unit and eight additional test pits were then also excavated around the positive test pit, spaced at 2.5 m from the original find. Each test pit was excavated until either sterile subsoil or bedrock was encountered[27]. Any cultural material findings were bagged and labeled as per Ontario Ministry of Tourism and Culture (OMTC) guidelines.

##### B. Observations

The fieldwork area is typical of what much of the lower Cataraqui River valley must have looked like before modern development. As also shown on Drawing 4.8, from the river, the land rises in a series of steps, controlled by the horizontally bedded limestone bedrock which underlies the area. Exposed limestone bedrock is present at the shoreline. Proceeding easterly, a foreshore backs on to a steep, 2 m high forested bank. The land to the rear of the bank is generally level. The southern half is heavily forested and the northern half consists of open meadow. The eastern margin of these areas is defined by an abrupt rise in elevation, consisting of a bedrock and talus scarp face. Above the scarp, the terrain is essentially level limestone plain. The Gore Road Library lies on the level plain, between the scarp edge and Kingston Road 15.

[26] As shown on Drawing 4.6, as the fieldwork proceeded, the study area was expanded to an area of high archaeological potential to the north, as this area could also be affected during the Project Implementation phase.
[27] Note test pit surveying along the Cataraqui River shoreline was limited as it consists mainly of horizontal limestone bedrock with virtually no soil zones or vegetation.




A: FIELDWORK AREA AND SITE BbGc-127 LOCATION


B: FIELDWORK CONDITIONS



| | | | | |
|---|---|---|---|---|
| PROJECT: CATARAQUI RIVER THIRD CROSSING EA - STAGE 2 ENVIRONMENTAL STUDY REPORT | DRAWING: EAST SIDE TERRESTRIAL ARCHAEOLOGICAL FIELDWORK AREA, CONDITIONS & RESULTS | J.L.Richards ENGINEERS·ARCHITECTS·PLANNERS<br>J.L. Richards & Associates Limited<br>203-863 Princess Street<br>Kingston, ON Canada<br>K7L 5N4<br>Tel: 613 544 1424<br>Fax: 613 544 5679 | DESIGN:<br>DRAWN:<br>CHECKED:<br>PLOTTED: 25-Jan-12 | DRAWING NO.: 4-8<br>JLR NO: 23446-02 |

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The terrestrial archaeological fieldwork revealed the following two areas from which cultural materials were recovered:

1. Late 19th century artifacts were recovered along the existing Gore Road-right-of-way, within the garden area portion of the Gore Road Library property. The artifacts appear to be in contemporary association with the occupation of Hawthorn Cottage. Since 80 percent of its occupation would not have occurred prior to 1870, additional investigation was not pursued. Such spreads of cultural material surround all 19th century dwellings and are not regarded as warranting additional study.

2. As highlighted on Drawing 4.8, a single archaeological site was encountered adjacent to the northerly boundary of the Gore Road right-of-way near the Cataraqui River shoreline, which has been registered in the National Archaeological Site Database as BbGc-127. Subsequent Stage 3 investigations identified a small dwelling area or camp, dating to the last decades of the 18th century. Given the location of the site, its temporary nature and the type and age of the recovered cultural materials, it may have been a survey camp, occupied during the layout of the Lots and Concessions of Pittsburgh Township that occurred between 1786 and 1789.

#### .2 The West Side Lands

No terrestrial archaeological testing has been conducted to date of the west side lands extending along John Counter Boulevard up to Montreal Street. Visual examination of the area 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. On the other hand, 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. This is germane, given that certain private lands may be required as part of the Project Implementation phase for reconfigured and expanded road, trail and intersection works, construction facilitation and lay-down areas as well as landscaping, grading, and stormwater management provisions. However, archaeologists have no right of access to conduct archaeological testing on private lands. As such, archaeological assessment and testing of the west side lands has been suspended until the City has confirmed property acquisition requirements associated with the Project Implementation phase, which is beyond the current scope of this EA study.

### 4.1.6 Archaeological Conditions – Marine

This section of the Report discusses the marine archaeological fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. The fieldwork methodology.

2. The fieldwork findings.

#### .1 Fieldwork Methodology

As a result of the marine archaeological survey work done during Stage 1 of this EA study, Stage 2 archaeological testing of the marine environment was subsequently recommended. This was engaged in the early Spring of 2011 in order to avoid the growth of dense aquatic vegetation that precluded the fieldwork from occurring in the late Spring-to-Fall period of 2010. As reflected on Drawing 4.9, the fieldwork study area was set at 100 m wide, extending shore-to-shore at 50 m equi-distant north and south of the centreline of the preferred s-curve bridge alignment which is discussed later in this Report.

The marine archaeological fieldwork involved the following activities:

1. A survey of the riverbed, which was done on April 14 and April 15, 2011 using:

   a) Side Scan Sonar, which was used to prepare a riverbed profile;

   b) A Sub Bottom Profiler, which uses low sound frequencies to penetrate the sediment layers for locating buried objects or for determining stratigraphy;

   c) A Proton Magnetometer, which detects sub-surface ferrous objects by using the Earth's field nuclear magnetic resonance (EFNMR) to measure variations in the Earth's magnetic field; and

   d) A diver holding a forward-looking Sonar Navigation system, which was used to verify potential targets and surveyed areas that were inaccessible by watercraft.

2. Test pitting along both the east and west shorelines, which was done on April 15, 2011 using a shovel and a drop screen at 5 m intervals. 23 test pits [averaging a depth of 26 centimetres (cm) prior to hitting bedrock] were dug along the east shoreline and 11 test pits (averaging a depth of 39 cm) were dug along the west shoreline. Water depths at the test pit locations ranged from 0.3 m to 0.5 m. The test pit locations also varied by distance to shore due to existing geophysical conditions. The offshore distance averaged 10 m and 3 m along the east and west shorelines, respectively.

3. Vibrocoring of the riverbed, which was done on April 21 and April 22, 2011. This involved extracting riverbed sediment cores at ten locations across the fieldwork area and then assessing the cores to determine the potential for marine archaeological resources. Twenty samples from these cores were also taken for loss-on-ignition, particle size, microfossils and microdebitage analyses. The water level datum (IGLD 1985) at the time of the virbrocoring was 74.90 m on April 21 and 74.91 m on April 22, 2011. All the cores were adjusted to the mean water level datum (IGLD 1985) of 74.2 m for Lake Ontario at Kingston.

COORDINATES ARE SHOWN IN UTM NAD 83 (NORTHINGS AND EASTINGS) IN METERS AND NAD 83 LATITUDE AND LONGITUDE IN DECIMAL DEGREES

CATARAQUI RIVER ( RIDEAU CANAL SYSTEM )

DRENNAN STREET

CN RAIL

STREET

ELLIOTT AVE PARKETTE

WATERFRONT RAILWAY

LUGE DRIVE

Great Cataraqui River (Rideau Canal System)

E 381926.41
N 4901586.21
LAT 76.4791333
LON 44.2579411

E 381996.29
N 4901589.74
LAT 76.4782589
LON 44.2579778

CORE 9
E 382018.00
N 4901569.00

E 381893.96
N 4901484.45
LAT 76.4795164
LON 44.2570206

E 382001.33
N 4901489.87
LAT 76.4781733
LON 44.2570864

CORE 10
E 382038.00
N 4901497.00

CORE 8
E 382095.00
N 4901505.00

SUBMERGED WOOD
E 382095
N 4901505

CORE 7
E 382216.00
N 4901551.00

E 382439.30
N 4901663.91
LAT 76.4727278
LON 44.2587236

E 382551.99
N 4901696.48
LAT 76.1713239
LON 44.2590347

CORE 4
E 382593.00
N 4901668.00

CORE 3
E 382825.00
N 4901717.00

E 382467.06
N 4901567.85
LAT 76.4723586
LON 44.2578633

E 382579.76
N 4901600.41
LAT 76.4709544
LON 44.2581747

CORE 6
E 382386.00
N 4901575.00

CORE 5
E 382470.00
N 4901580.00

CORE 2
E 382905.00
N 4901696.00

LAT 76.4651286
LON 44.2594886

E 383047.42
N 4901736.78

LAT 76.4653525
LON 44.2594858

E 383029.56
N 4901738.05

CORE 1
E 382929.00
N 4901689.00

UPPER FACE OF ABUTMENT

LOWER FACE OF ABUTMENT

FIRST PIER

ARCHAEOLOGICALLY SENSITIVE AREA

E 382954.33
N 4901644.29
LAT 76.4662736
LON 44.2586300

E 382954.33
N 4901637.49
LAT 76.4652550
LON 44.2585817

BARKER POINT

POINT ST MARK

LORA DEAN CR

BERNADETTE CRT

RIDEAU MARINA



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

DRAWING:
MARINE ARCHAEOLOGICAL
FIELDWORK AREA AND
VIBROCORING LOCATIONS

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PLOTTED: 26-Jan-12

DRAWING NO.: 4-9

JLR NO: 23446-02

### .2 Observations

The findings from the marine archaeological fieldwork were as follows:

1. The Side Scan Sonar revealed a relatively featureless riverbed aside from the scour lines that are present near both the Music Marina on the west side of the Cataraqui River and the centre of the fieldwork area. These lines are most likely caused by boat traffic, based on: i) the absence of shadow indicating height; ii) the shallow water depths throughout the fieldwork area; and iii) their locations relative to the Music Marina. Mounds were also identified near the Rideau Canal's navigable channel, which were verified by the Sonar Navigator to be 'spoil' from previous dredging activities of the channel.

2. The Sub Bottom Profiler revealed an area of the riverbed that is made of softer material, as indicated by lighter returns. This area was common across all track lines. There was no evidence of buried paleo channels in the fieldwork area.

3. The Proton Magnetometer revealed distinct peaks and valleys in the local magnetic field, including six targeted anomalies, namely: i) a 'barge' target relating to a barge that was dragged onto the west shoreline near John Counter Boulevard; ii) two small, localized readings proximate to the west shoreline; and iii) three readings, also proximate to the west shoreline, that are most likely associated with the Frontenac Axis which passes through the area[28].

4. The Sonar Navigator surveyed portions of the Music Marina area where the Side Scan Sonar was blocked by pilings and, as noted above, the area along both sides of the Rideau Canal's navigable channel. No targeted anomalies were located.

5. The test pits along the west shore consisted of a muddy loose sediment top layer (11 cm to 31 cm deep), followed by a dense organic layer (11 cm to 18 cm deep) and then a sand layer. Remnants of garbage were also evident in some of the west shore test pits. No other cultural materials were located. The test pits along the east shore consisted of an organic top layer followed by a heavy clay layer. No cultural materials were located in any of the east shore test pits.

6. As shown on Drawing 4.9, out of the ten vibrocores, a piece of submerged wood was present in 'CR8', proximate to the west shoreline, at elevation 72.92 m. As it was unknown whether the wood was an in situ stump or other piece of wood, additional assessment was undertaken. First, carbon 14 dating was conducted for the wood, which calibrated its date at 2480 to 2300 B.C. (or 4430 to 4250 B.P.). Next, as shown on Drawing 4.10, contour elevations were taken from the bathymetry of the area. The 73.4 m contours shown on Drawing 4.10 represent slightly higher elevations within the river basin. The location of 'CR8' is on one of these elevated areas, which are also evident in the current marsh environment to the north of the fieldwork area. The loss-on-ignition, particle size, microfossil and microdebitage analyses, combined with additional background research of the area, further confirmed that water levels in this area fluctuated throughout the Holocene and remained relatively stable as a large wetland after the Admiralty Lowstand (11.4 ka B.P.) and the establishment of the river channel in the past 4,000 years. This river channel would have alternately dried and been re-established as water levels fluctuated between 4 to 2 ka B.P. Modern river sedimentation has been reasonably steady since 2 ka B.P., with minor changes occurring due to channel migration and human activities.

Thus, rather than a discrete submerged shoreline, the paleo environment of the fieldwork area suggests a marsh environment, with small, isolated areas of raised elevation that may have once been dry enough to support the growth of small trees. But it is unlikely that these areas of raised elevation could have supported any prehistoric campsites or even prehistoric activities. Furthermore, no additional evidence of a submerged shoreline was present in any of the other cores or the geophysical data.

## 4.1.7 Geo-Environmental Conditions

This section of the Report discusses the geo-environmental fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by Parks Canada, OMOE and the City. Its findings are divided into the following two sub-sections:

1. The Phase I Environmental Site Assessment findings.

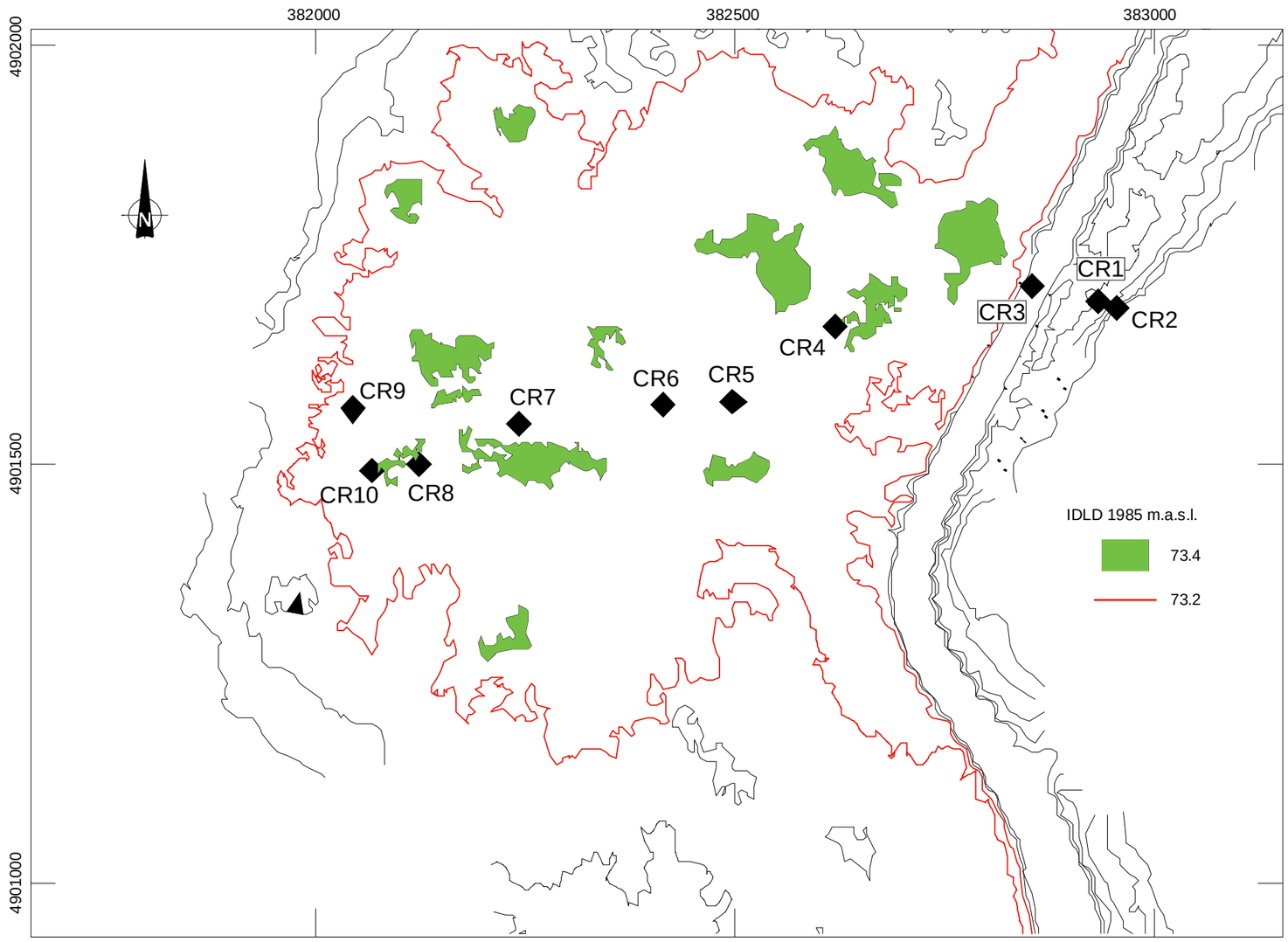
2. The riverbed sediment sampling findings.

### .1 The Phase I Environmental Site Assessment Findings

#### A. Methodology

As noted earlier, there are numerous sites of potential environmental concern throughout the EA study area. Though historically, the lands on the west side of the Cataraqui River from the LaSalle Causeway to just north of John Counter Boulevard were more heavily industrialized than in other portions of the EA study area, the Phase 1 Environmental Site Assessment (ESA) focused on both shoreland areas of the Cataraqui River within the project site location. As shown on Drawing 4.11, the fieldwork area was a 100 m corridor extending north and south of the centerlines of both John Counter Boulevard up to Montreal Street (on the west side) and Gore Road up to Kingston Road 15 (on the east side).

[28] The Frontenac Axis is an area of pre-Cambrian rock which joins the Canadian Shield with the Adirondack mountain range in New York State.



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

DRAWING:
CONTOUR ELEVATIONS
AND VIBROCORING
LOCATIONS

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CHECKED:
PLOTTED: 25-Jan-12

DRAWING NO.: **4-10**

JLR NO: 23446-02


**NOTE**

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. LETTER NO. 09-1121-0016 (2500)

**REFERENCE**

DIGITAL BASE MAP DATA SUPPLIED BY DMTI SPATIAL INC. CANMAP, 2007
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18

PROJECT:

# CATARAQUI RIVER THIRD CROSSING EA - STAGE 2 ENVIRONMENTAL STUDY REPORT

DRAWING:

# PHASE I ENVIRONMENTAL SITE ASSESSMENT AREA



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The Phase I ESA consisted of the following tasks:

1. A review of historic information, including City and Ontario Ministry of the Environment (OMOE) files, the Ecolog Eris Database, fire insurance plans and air photo records.

2. Information requests to the City, OMOE and the Technical Standards and Safety Authority.

3. A site visit undertaken on July 27, 2010[29].

### B. Observations

Air photo records from the City and National Air Photo Library were reviewed to develop a general development history of the fieldwork area. The outcome of this review is summarized in Table 4.10 below and did not raise any issues of potential environmental concern.

**Table 4.10**
**Air Photo Observations of Development Chronology at the Project Site Location**

| Year | Air Photo | General Observations | |
|---|---|---|---|
| | | West Side | East Side |
| 1936 | A5406-32<br>1:15000 | • Both sides of John Counter Boulevard were occupied by farmlands.<br>• The southwest corner of John Counter Boulevard and the Cataraqui River was occupied by a farm house. | • The segment of Gore Road east of Kingston Road 15 was not developed.<br>• Wooded areas and a few farm houses were noted west of Kingston Road 15. |
| 1948 | A11687-202<br>A11687-199<br>1:9000 | • As per 1936.<br>• A railway track ran north-south and intersected John Counter Boulevard between Montreal Street and the Cataraqui River. | • As per 1936. |
| 1955 | A14613-26<br>A14613-5<br>1:7000 | • More farmhouses were noted south of John Counter Boulevard.<br>• The railway track as described above appeared to be still in use. | • As per 1948. |
| 1965 | VRR2638-408<br>1:20000 | • As per 1955.<br>• The Music Marina was noted. | • As per 1955. |
| 1973 | A23663-201<br>1:25000 | • As per 1965. | • As per 1965. |
| 1987 | A27241-163<br>A28143-20<br>1:5000 | • Residential and commercial buildings were noted on both sides of John Counter Boulevard. | • No air photo coverage. |
| 1994 | A28143-20<br>1:5000 | • No air photo coverage. | • Gore Road was extended west of Kingston Road 15.<br>• Residences were noted on the south side of Gore Road.<br>• The Gore Road Library was noted on the north side of Gore Road.<br>• Wooded are northwest of Gore Road. |
| 1998 | City<br>1:2216 (west side)<br>1:4433 (east side) | • Are per 1987, except that the railway track as described above was removed. | • As per 1994. |
| 2004 | City<br>1:2216 | • As per 1998. | • As per 1998, except that a parking lot was noted immediately south of the Gore Road Library. |
| 2008 | City<br>1:5284 (west side)<br>1:4433 (east side) | • As per 2004, except that the undeveloped treed land north of John Counter Boulevard was cleared for the River Park subdivision. | • As per 2004. |

Additional findings during the Phase I ESA were as follows:

1. Though the 1963 fire insurance plans did not cover the east side of the Cataraqui River, no underground storage tanks were found on the plans covering the west side of the river.

2. An approval under Section 9 of the OEPA was issued for 917 Montreal Street on November 15, 2002. Also, an approval under Section 53 of the 'Ontario Water Resources Act' (OWRA) was issued for 645 John Counter Boulevard on September 11, 2008.

[29] Note the site visit did not include accessing the interior of buildings for the purposes of conducting a designated substances review, as defined in the 'Ontario Occupational Health and Safety Act' and the 'Workplace Hazardous Material Information System'.

3. 931 Montreal Street was subject to a Phase II ESA indicating on-site petroleum and metals contamination, which has since been remediated and a Record of Site Condition (RSC) has been filed with the OMOE. An additional four RSC's have been filed for a property between 931 Montreal Street and 0 Elliott Avenue, indicating that metals and polycyclic aromatic hydrocarbons (PAHs) in the soil and groundwater samples as well as BTEX in the soil samples were lower than applicable standards in the OEPA.

4. Based on other OMOE databases, there are no: i) registered PCB storage sites; ii) active or closed waste disposal sites; iii) registered former coal gasification plants or industrial sites producing and/or using coal tar or related tars; and iv) registered waste generators.

5. During the site visit, one aboveground storage tank (AST) was noted at 917-919 Montreal Street. This property is currently being used as 'Fitzgeralds Collision and Towing' and was once used as 'Kingston Used Cars'. At the time of the site visit, the AST contained automatic transmission fluid and appeared to be in damaged condition. It was also not kept free of debris and appeared to be partially buried.

6. As per the geo-environmental survey work done during Stage 1 of this EA study, fill material is located along the western shoreline of the Cataraqui River between the CN and CP railway tracks (from approximately Place D'Armes in the south to Drennan Street in the north). The land at the northeast corner of John Counter Boulevard and Montreal Street is located between the former CN and CP railway tracks and as such, may still contain the fill material in the subsurface.

### .2 The Riverbed Sediment Sampling Findings

#### A. Methodology

The riverbed sediment sampling fieldwork was done on September 1 and September 2, 2010. As shown on Drawing 4.12, there were ten sampling locations, of which five locations (locations SS1 to SS5) were sampled using 'grab techniques' (using a petite ponar sampler) and five locations (locations CS6 to CS10) were sampled using 'coring techniques' (using a tech-ops sampler). As requested by Parks Canada, one sediment core (at location CS10) was collected within the Rideau Canal's navigable channel. At each coring location, four or five samples were taken for analysis of metals, polychlorinated biphenyls (PCBs) and PAHs.

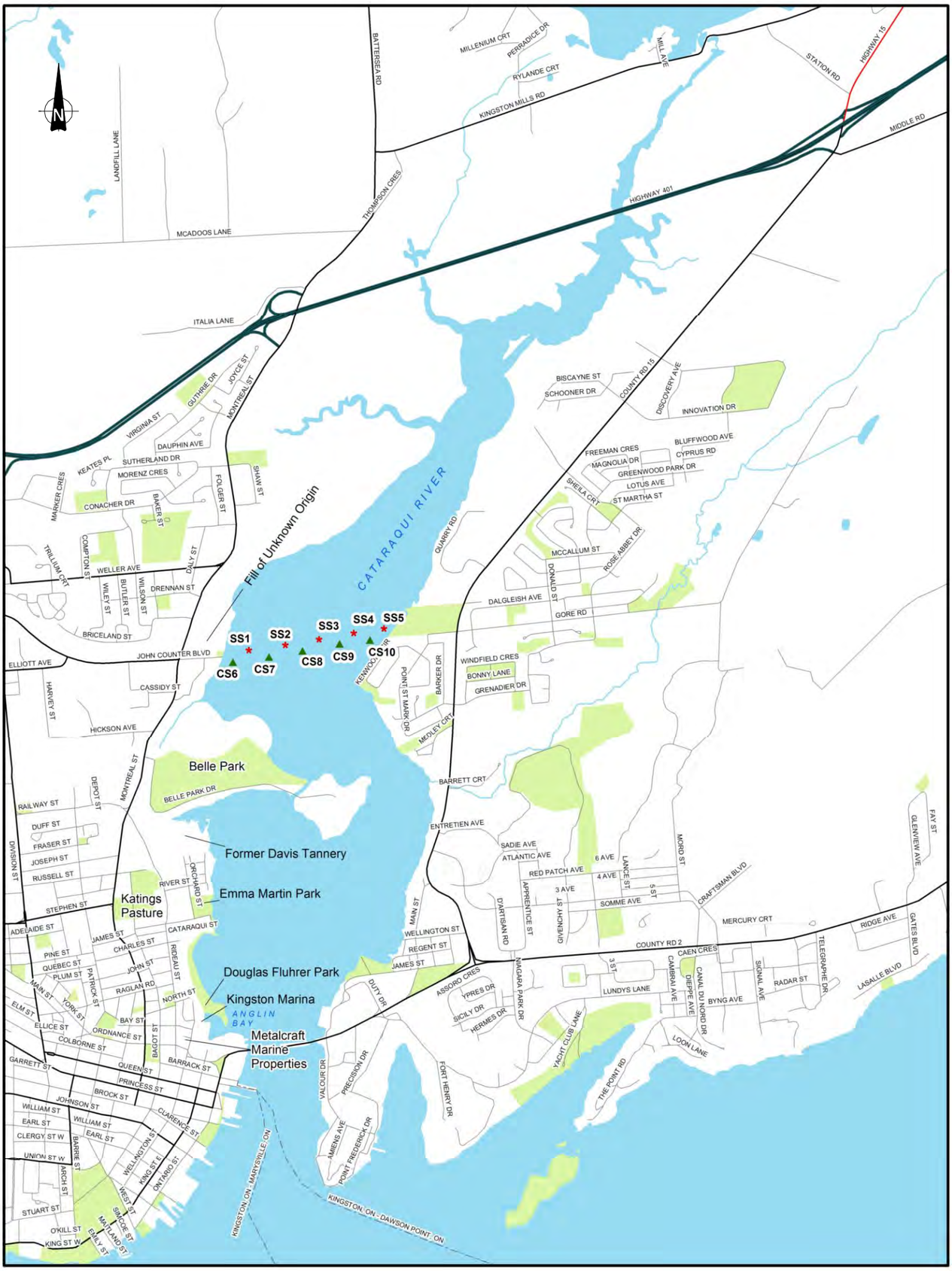
#### B. Observations

The summary provided in Table 4.11 below shows sediment exceedance levels at various sampling locations.

**Table 4.11**
**Sediment Exceedances at the Project Site Location**[30]

| Sampling Identifier | CCME Canadian Soil Quality Guidelines | | Provincial Sediment Quality Guidelines | | O.Reg. 511/09 Sediment Standards |
|---|---|---|---|---|---|
| | ISQG | PEL | LEL | SEL | |
| SS1 SA1 | Cd, Pb, PAHs | - | Cd, Cu, Pb | - | Cd, Pb, PAHs |
| SS2 SA1 | Cd, Pb, PAHs | - | Cd, Cr, Cu, Fe, Pb, Ni | - | - |
| SS3 SA1 | As, Cd, Cr, Cu, Pb, Zn, PAHs | Pb, Zn | As, Cd, Cr, Cu, Fe, Pb, Zn | Pb, Zn | As, Cd, Cr, Cu, Fe, Pb, Zn, PAHs |
| SS4 SA1 | PAHs | - | Cu | - | - |
| SS5 SA1 | PAHs | PAHs | Cu, PAHs | - | PAHs |
| CS6 SA1 | Cd, Cu, Pb, Zn, PAHs | - | Cd, Cu, Pb, Ni, Zn | - | - |
| CS6 SA2 | PAHs | - | - | - | - |
| CS6 SA3 | - | - | - | - | - |
| CS6 SA4 | - | - | - | - | - |
| CS7 SA2 | Cd, Cu, PAHs | PAHs | Cd, Cr, Cu, Fe, Pb, Ni, PAHs | - | PAHs |
| CS7 SA3 | PAHs | PAHs | Cu, PAHs | - | PAHs |
| CS7 SA4 | PAHs | - | Cu, Mn | - | - |
| CS7 SA5 | - | - | Cu | - | - |
| CS8 SA1 | Cd, Pb | - | Cd, Cr, Cu, Fe, Pb, Ni | - | - |
| CS8 SA2 | Cd, Cu, PAHs | - | Cd, Cu, Pb | - | - |
| CS8 SA3 | - | - | Cu, Fe, Ni | - | - |
| CS8 SA4 | - | - | Cu | - | - |
| CS9 SA1 | PAHs | - | Cr, Cu, Fe, Pb, Ni | - | - |
| CS9 SA2 | Cd, PAHs | - | Cd, Cr, Cu, Fe, Pb, Ni | - | - |
| CS9 SA3 | PAHs | - | Cu, Fe, Ni | - | - |
| CS9 SA4 | Cu, PAHs | - | Cr, Cu, Fe, Ni | - | - |
| CS10 SA1 | Cd, PAHs | - | Cd, Cr, Cu, Fe, Ni | - | - |
| CS10 SA2 | Cd, PAHs | - | Cd, Cu, Fe, Ni | - | - |
| CS10 SA3 | Cd, PAHs | - | Cd, Cu, Fe, Ni | - | - |
| CS10 SA4 | PAHs | - | Cr, Cu, Fe, Ni | - | - |

[30] The results were compared to the following guidelines and standards:
a) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (updated 2001): Canadian Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Levels (PELs), Canadian Council of Ministers of Environment (CCME);
b) Provincial Sediment Quality Guidelines, as provided in Appendix A of Evaluating Construction Activities Impacting on Water Resources, Part III A, Part III B and Part III C (February 1994): Lowest Effect Level (LEL) and Severe Effect Level (SEL); and
c) Sediment Standards for use under Part XV.1 of the OEPA (O.Reg. 153/04 and amended by O.Reg. 511/09) published July 27, 2009.




**LEGEND**

- Expressway
- Major Road
- Local Road
- Ferry Route
- Main Rail Line
- Sidetrack Rail Line
- Abandoned Rail Line

**Sediment Sampling Location**

- Surface sample from grab
- Core Sample

Park / Golf Course / Recreation Area

1,000 0 1,000

SCALE 1:25,000 METRES

**NOTE**

This figure is to be read in conjunction with the accompanying Golder Associates Ltd. letter No. 09-1121-0016 phase 2500 in June 2011.

**REFERENCE**

Digital base map data supplied by DMTI Spatial Inc. CANMAP, 2007
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 18

PROJECT:

# CATARAQUI RIVER THIRD CROSSING EA - STAGE 2 ENVIRONMENTAL STUDY REPORT

DRAWING:

# IN WATER SEDIMENT SAMPLING LOCATIONS



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Generally, the 'grab sample' at Location SS3 (located in the middle of the Cataraqui River) had higher metals concentrations than the other sampling locations. The 'core sample' at Location CS7 (located in the middle-west portion of the Cataraqui River) had higher PAHs concentrations than the other sampling locations. This is an issue of potential environmental concern. A more detailed explanation of the exceedances is provided below.

1. For metals:

   a) At the 'grab sample' SS1 to SS3 locations:

      i. cadmium (Cd) and lead (Pb) concentrations were above CCME ISQG guidelines;

      ii. Location SS3 also contained exceedances of CCME ISQG guidelines for arsenic (As), chromium (Cr), copper (Cu) and zinc (Zn); and

      iii. parameters that exceeded LELs under the Provincial Sediment Quality Guidelines and O.Reg. 511/09 Sediment Standards were As, Cd, Cr, Cu, Pb, Zn, iron (Fe) and nickel (Ni); and

   b) At the 'coring sample' CS6 to CS10 locations:

      i) Cd, Cu, Pb and Zn concentrations were above CCME ISQG guidelines; and

      ii) parameters that exceeded LELs under the Provincial Sediment Quality Guidelines and O.Reg. 511/09 Sediment Standards were Cr, Fe, Ni and magnanese (Mn).

   The CCME ISQG exceedances noted above were within one order of magnitude above the guidelines with the exception of Pb and Zn at 'grab sample' location SS3, which also exceeded CCME PELs and SELs under the Provincial Sediment Quality Guidelines. Also note that at all the 'coring sample' locations, higher metals concentrations were found in the shallow samples (up to 0.2 m below the top of the sediment surface), compared to those obtained in the deeper samples (from 0.2 m to 0.4 m below the top of the sediment surface).

2. The results of the PCB analysis showed that there were no exceedances of CCME guidelines, Provincial Sediment Quality Guidelines or O.Reg. 511/09 Sediment Standards.

3. For PAHs:

   a) At the 'grab sample' SS1 to SS5 locations:

      i. one or more PAH parameters exceeding CCME ISQGs were found; and

      ii. Location SS5 had the highest PAH concentrations and CCME PELs were also exceeded for benzo(a)nthracene and pyrene; and

   b) At the 'coring sample' CS6 to CS10 locations:

      i. one or more PAH parameters exceeding CCME ISQGs and LELs under the Provincial Sediment Quality Guidelines were found;

      ii. Location CS7 exceeded CCME PELs:

         (a) for cenaphthylene, anthracene, benzo(a)anthracene and benzo(a)pyrene at interval 0.1 m to 0.15 m and at interval 0.15 m to 0.2 m; and

         (b) for chrysene, dibenzo(a,h)anthracene, fluorene, phenanthrene and pyrene at interval 0.1 m to 0.15 m; and

      iii. Locations CS9 and CS10 exceeded CCME ISQGs at all depth intervals for benzo(a)pyrene and pyrene.

   At all 'coring sample' locations, higher PAHs concentrations were found in the shallow samples (up to 0.2 m below the top of the sediment surface), compared to those obtained in the deeper samples (0.2 m to 0.4 m below the top of the sediment surface).

#### 4.1.8 Geotechnical Conditions

This section of the Report discusses the geotechnical fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. The fieldwork methodology.

2. The fieldwork findings.

##### .1 Fieldwork Methodology

The geotechnical fieldwork included a geotechnical subsurface investigation and a geophysical survey. The geotechnical subsurface investigation was done between August 5 and August 16, 2010. It supplemented existing subsurface data, particularly fieldwork that was undertaken as part of the 1992 TSH study (referenced earlier in this Report), by advancing three additional boreholes through the overburden soils and into the underlying bedrock. As shown on Drawing 4.13, Borehole 10-2 was put down in the middle of the Cataraqui River and Boreholes 10-1 and 10-3 were put down at the west and east banks, respectively.