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0.0 PROJECT SUMMARY

0.1 Project Proponent
The project proponent is the City of Kingston (City). Contact information is as follows:

City of Kingston
216 Ontario Street
Kingston, Ontario K7L 2Z3
Mr. Mark Van Buren, P.Eng.
Director, Engineering Department
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Fax: (613) 542-7880
E-mail: mvanburen@cityofkingston.ca
Website: www.cityofkingston.ca

0.2 Project Title
The project is referred to as the ‘City of Kingston Third Crossing of the Cataraqui River Harmonized Environmental Assessment’.

0.3 Project Location
As shown on Drawing PS-1, the Environmental Assessment (EA) study area is within the City, extending along the shoreline and lands adjoining the Cataraqui River from the LaSalle Causeway-Highway 2 crossing in the south to the Highway 401 crossing in the north. The Highway 401 crossing is roughly 6 kilometres (km) north of the LaSalle Causeway-Highway 2 crossing. Additional main road networks in the EA study area include John Counter Boulevard and Montreal Street west of the Cataraqui River shoreline as well as Kingston Road 15 and Gore Road east of the Cataraqui River shoreline. The Cataraqui River forms part of the Rideau Canal, a designated United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway. The Federally regulated navigable waterway within the EA study area extends northward from the LaSalle Causeway.

As shown on Drawing PS-2, the project site location is a corridor extending from John Counter Boulevard on the west shore to Gore Road on the east shore. The Universal Transverse Mercator (UTM) coordinates, taken near the mid-point of this corridor, is generally UTM 18T 382402 metres (m) E. 4901531 metres N (+/−).

0.4 Problem Description
The purpose of the EA study is to evaluate the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River in the City. Two major east-west transportation crossings of the Cataraqui River currently exist within the City’s urban limits. One crossing is the LaSalle-Causeway-Highway 2 corridor, which crosses the Cataraqui River in the southern portion of the EA study area at the confluence of the Cataraqui River and Lake Ontario. The LaSalle Causeway is comprised of a two-lane cross section and a series of structures (fixed truss, rigid frame structure and Bascule Lift Bridge, the latter of which is raised to accommodate recreational boat traffic). It is under the jurisdiction of Public Works & Government Services Canada. With an existing traffic volume in the order of 1,000 to 1,100 vehicles per hour in each direction during the PM peak hour, the LaSalle Causeway is currently operating below the City’s target Level of Service (LOS) D policy1. This is based on an average estimated capacity of 900 vehicles per hour, per lane, which is further reflective of existing network conditions along the LaSalle Causeway-Highway 2 corridor2. Based on urban growth and related travel volume demand forecasts, the LaSalle Causeway is expected to reach an average of 1,260 vehicles per hour, per lane, during the PM peak hour by 2019. This is 40 percent greater than its existing average estimated capacity. If left unaddressed, these volumes would cause local traffic to divert north to use the Highway 401 crossing, thereby leading to further out of way travel, additional delays and potential local-regional traffic conflicts on Highway 401.

The second crossing is the Highway 401 corridor, which crosses the Cataraqui River approximately 6 km north of the LaSalle Causeway. Highway 401 is owned by the Province of Ontario through the Ministry of Transportation Ontario (MTO). It is a four-lane Freeway that extends through the City and is the primary inter-city freeway, with local interchanges at Joyceville Road, Kingston Road 15, Montreal Street, Division Street, Sir John A. Macdonald Boulevard, Sydenham Road, and Highway 38. The Highway 401 crossing capacity is estimated to be approximately 1,500 to 2,000 vehicles per hour, per lane (for a total two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). The MTO is currently widening Highway 401 from four to six lanes west of Sydenham Road to west of Montreal Street as part of a broader provincial strategy to ultimately twin Highway 401 from the City of Windsor to the Quebec border in response to traffic volume growth and traffic collision incidents. The forecasted 2019 PM peak hour demand for the Highway 401 crossing is estimated to be roughly 2,400 vehicles per hour for eastbound travel and 2,500 vehicles per hour for westbound travel. As the trigger for recommending roadway solutions for the Highway 401 crossing is 5,400 vehicles per hour, there would appear to be capacity to accommodate additional local (or short distance) City traffic crossing the Cataraqui River using Highway 401.

1 Note ‘Level Of Service’ (LOS) is a measure of the mobility of traffic and the resulting level of congestion determined by vehicle delay. A volume-to-capacity ratio associated with LOS is measured based on traffic counts (or the ‘volume’) and the ability of the road to carry traffic (or the ‘capacity’). Generally, LOS is measured between LOS A and LOS F where LOS A involves free flow traffic operations at average travel speeds and LOS F involves gridlock conditions. LOS B, C, D and E are incremental measures between LOS A and LOS F. The City generally applies LOS D for future design purposes at peak hour traffic volume levels, which is commonly used in similarly sized Canadian cities.
2 Based on the ‘Traffic Operations Study For The LaSalle Causeway Corridor’ (July 2011), the capacity of the LaSalle Causeway is impacted primarily by the signalized intersections at each end of the crossing, namely, the Highway 2-Kingston Road 15 intersection to the east and the Barrack Street-Ontario Street intersection to the west.
RECOMMENDED WELLINGTON ST. EXTENSION ALTERNATIVE AS PER 2006 ENVIRONMENTAL STUDY REPORT.

LIMIT OF RIDEAU CANAL RESERVE LANDS (APPROXIMATE LOCATION)

BELLE ISLAND CULTURAL HERITAGE SITE PROTECTION

SUTHERLAND DR.
HIGHWAY 401
CNR RIDEAU HEIGHTS
MONTREAL ST.
WELLER AVE.
JOHN COUNTER BOULEVARD
BELLE PARK FAIRWAYS (CLOSED LANDFILL)
FORMER DAVIS TANNERY
RUSSELL ST.
RIDEAU ST.
NORTH ST.
DOWNTOWN KINGSTON
LASALLE CAUSEWAY
ONTARIO ST.
INNER HARBOUR
GREAT CATARAQUI RIVER
HIGHWAY 401 KINGSTON ROAD 15
GRENADIER VILLAGE
POINT ST. MARK
BUOYED CHANNEL
GORE ROAD
GREENWOOD GARRISON GOLF AND CURLING CLUB
CFB KINGSTON
HIGHWAY 2
CRAFTSMAN BLVD.
BARRIEFIELD JAMES ST.
BELLE ISLAND
BELLEPARK DR.
ROYAL MILITARY COLLEGE
FORT HENRY

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

EA STUDY AREA

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DRAWN: JLR NO: 23446-02
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401. However, the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic, which is inconsistent with effective transportation engineering practice. In addition, based on the trip demand lines of vehicles that favour crossing the Cataraqui River via the LaSalle Causeway to the south, diverting local traffic 6 km north to use the Highway 401 crossing would also lead to further out of way travel and additional delays.

The context within which this EA study is to respond to this problem is equally important, as highlighted below:

1. The Cataraqui River, which has a water depth averaging 1.2 m except at the buoyed channel and the southern portion of the Inner Harbour. Water levels are primarily defined by the water levels in Lake Ontario. The Cataraqui River is a slow moving glide with flow velocities ranging from negligible up to 0.4 metres/second (m/s). Winter ice cover is variable. It is typically established from December to late April and melts in place due to the low water flow velocities.

2. Most of the winds are from due south and due west, caused mainly by the effects of Lake Ontario. But high winds can be experienced from any direction, in that 100 year wind speeds are roughly 20 m/s [or 72 kilometres/hour (km/hr)] from either the south or north.

3. The Cataraqui River forms part of the Rideau Canal, one of the most significant heritage properties in the EA study area. Originally built between 1826 and 1832, 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 (which is officially closed to watercraft from Thanksgiving to Victoria Day). Within the EA study area, the designated site of the canal (for all three designations) begins at Belle Island and follows the high-water marks on either shore, north to and beyond the limits of the EA study area. 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 Muney, Shoal and Cathcart Martello Towers) National Historic Sites in the southern portion of the EA study area. The canal is owned, managed and regulated by Parks Canada according to management plans and guidelines that conserve its heritage values.

4. There are 71 other heritage properties within the EA study area. The southern portion of the EA study area from the LaSalle Causeway up to Belle Island contains 64 of the 71 heritage properties. In addition, 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. As noted below, there are 9 of these views within the EA study area, 7 of which are in its southern portion:

   a) From the LaSalle Causeway up to Belle Island:
      (i) views between the Kingston Fortifications and between each fortification and Kingston Harbour;
      (ii) views from the Barriefield Village Conservation District towards the Cataraqui River, St. Lawrence River, Fort Henry and downtown Kingston;
      (iii) views of St. Mark’s Church in Barriefield Village;
      (iv) views from the Woolen Mill to City Hall and the Cataraqui River;
      (v) views from Barrack Street and Queen Street to the Inner Harbour;
      (vi) views of the City Hall cupola from the LaSalle Causeway and Royal Military College (RMC); and
      (vii) views across the Inner Harbour; and

   b) From Belle Island to the Highway 401 crossing:
      (i) views of the Rideau Canal from the municipally designated site of the Pittsburgh Branch of the Kingston Frontenac Public Library (Gore Road Library); and
      (ii) all development overlooking the Rideau Canal.

5. The EA study area contains the following main natural heritage features:

   a) The Greater Cataraqui Marsh, which is a Provincially Significant Wetland and Provincially Significant Coastal Wetland and is the most significant ecological system on the landscape [based on the Ontario Wetland Evaluation System (OWES), its visible cattail portion in the northern portion of the EA study area has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion];

   b) The visible cattail portion of the Greater Cataraqui Marsh and the buffering woodlands are a Significant Area of Natural and Scientific Interest;
c) Most of the identified significant and contributory woodlands within the EA study area are in narrow, fragmented strips, except for areas mainly along the visible cattail portion of the Greater Cataraqui Marsh as well as on Belle Park and Belle Island; and
d) The Cataraqui River and shoreland areas provide significant habitat to a wide range of terrestrial and aquatic wildlife species, including feeding areas for migratory waterfowl, 206 bird species (at least 21 of which are dependent on the marsh for nesting habitat), at least 26 sport and forage fish species that use the river system for spawning, nursing and rearing and 16 amphibian and reptile species (note there are 30 listed terrestrial and aquatic wildlife and plant ‘species at risk’ within the EA study area).

6. There are 37 registered archaeological sites within and adjacent to the EA study area and an undetermined number of areas that are in process of being investigated. Significant archaeological resources are present on both sides of the LaSalle Causeway. The area between the LaSalle Causeway and Belle Island also contains 14 registered shipwrecks and intact archaeological resources relating to City urbanization. In addition, sites of significant First Nations heritage are located on Belle Island and to the north of Belle Island on the west side of the Cataraqui River. An archaeological site is also proximate to the east shore of the Cataraqui River and the Gore Road right-of-way. Since a large percentage of the EA study area remains essentially unaltered, all indicators point to virtually the whole EA study area exhibiting high archaeological potential.

7. 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. Consequently, areas having the highest densities of potential environmental impact include portions of the downtown and surrounding area, the shoreland segments north of the downtown along Montreal Street and John Counter Boulevard, the southwest portion of the Inner Harbour as well as Belle Park and its vicinity.

8. The EA study area is generally characterized by shallow limestone bedrock. Where overburden is present, it consists mostly of post-glacial silts and clays. The elevation of the Cataraqui River is at roughly 74.5 m. The bedrock at either shoreline is at elevation 73 m which dips to elevations that vary from 36 m to 55 m within the Cataraqui River. This ‘bedrock valley’ is made up of clay soils and organic deposits.

9. Watercraft navigation is an important feature of the EA study area, typified by the Inner Harbour and Outer Harbour, the HMCS Cataraqui Facility immediately north of the LaSalle Causeway, the marinas and rowing clubs and the rowing lanes which run adjacent to the Rideau Canal’s navigable channel.

10. There are major infrastructure works within the Cataraqui River, including a buried sewage forcemain and watermain that extends from River Street on the west side of the Cataraqui River southward to James Street on the east side as well as three Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the John Counter Boulevard-Gore Road area. In addition, a future east-west watermain, which is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (in east Kingston) in order to improve the redundancy in the municipal water system on the east side of the Cataraqui River, is also envisioned being installed across the Cataraqui River.

11. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston’s Inner Harbour near Belle Island is a rare example of the waterway where the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401, have remained largely intact. The area defined by the northern entrance of the Inner Harbour near Belle Island provides a transition between the natural character of the Cataraqui River to the north and the more urbanized environment of the City to the south, east and west.

0.5 Preferred Solution

The implementation of additional transportation capacity across the Cataraqui River must satisfy both the Federal and Provincial EA frameworks in recognition of the following:

1. In regards to the Federal EA framework as per the ‘Canadian Environmental Assessment Act’ (CEA Act):
   a) The riverbed throughout the EA study area is owned by the Federal Government, resulting in various Federal approval requirements; and
   b) Prospective project implementation activities will involve a future request by the City for Federal financial assistance.

2. In regards to the Provincial EA framework as per the ‘Ontario Environmental Assessment Act’ (OEA Act), the Ontario Municipal Class EA planning process developed by the Municipal Engineers Association (October 2000, as amended in 2007) is an approved decision-making process for various projects undertaken by municipalities related to road, water, wastewater and transit facilities. The Ontario Municipal Class EA process comprises five general phases that allow for the development and evaluation of alternative solutions in facilitating a project through to construction. This EA study is following the Schedule ‘C’ framework of the Ontario Municipal Class EA.
As a result of harmonization of the Federal and Provincial EA frameworks as per the ‘Canada-Ontario Agreement on Environmental Assessment Cooperation’ (November 2004), the evaluation, consultation and decision-making process for this EA study is summarized through this Environmental Study Report (Report).

As per City requirements, this EA study has proceeded in two stages. Stage 1, which was completed in late May 2010, focused on Phases 1 and 2 of the Ontario Municipal Class EA framework, namely, the evaluation of the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River (or ‘Phase 1’) and the assessment of the following alternative solutions (or ‘Phase 2’):

1. **Retain the status quo or ‘do nothing’.** This means no facilities would be constructed to provide additional transportation capacity across the Cataraqui River and the problem would remain and/or an opportunity would not be addressed. This option is not considered a viable alternative solution since:
   a) The LaSalle Causeway is operating at capacity and is expected to increase congestion during peak traffic periods as population and employment growth continues; and
   b) Focusing solely on active transportation (cycling and walking) and public transit, though laudable, would not be able to address the entire capacity on the LaSalle Causeway over the immediate-to-long-term, based on the following current and projected conditions:
      i. The projected 2019 traffic congestion on the LaSalle Causeway takes into account the existing modal shares for active transportation (14 percent) and public transit (5 percent);
      ii. though Kingston Transit expects the introduction of 2 new express bus routes serving the east and west sides of the City to increase the modal share for public transit from 5 percent to 6 percent by 2019, even at a simulated 9 percent public transit modal share by 2029, the LaSalle Causeway is still projected to operate below the City’s target LOS D; and
      iii. significantly increasing the modal shares for active transportation and public transit over-and-above current projections would be very difficult to achieve within the next 15 to 20 years, given the size of the City in relation to the major infrastructure investment and aggressive policy approach that would be required.

Thus, if left unaddressed, projected traffic volumes and resulting congestion on the LaSalle Causeway would cause local traffic to divert north to use the Highway 401 crossing, thereby leading to further out of way travel, additional delays and potential local-regional traffic conflicts on Highway 401.

2. **Increase the capacity of the LaSalle Causeway.** This alternative solution involves three possible sub-options, namely:
   a) The widening of the Bascule Lift Portion of the LaSalle Causeway, which is considered non-viable due to the fill and additional loads from the expanded structure, which could overstress the clay and organic soils within the Cataraqui River, thereby causing differential settlement patterns between the existing structure and the expanded structure; and
   b) Based on the 2011 ‘Traffic Operations Study For The LaSalle Causeway Corridor’ prepared by HDR/iTrans:
      i. the widening of Highway 2 to accommodate an extra lane (either for a through lane or an extended eastbound lane) between Duty Drive and Kingston Road 15, which is considered non-viable due to capital cost, property acquisition requirements and the impact on the Barriefield Rock Cut; or
      ii. a series of short-to-medium term improvements to the LaSalle Causeway corridor, which generally involve: transportation demand management measures; traffic signal optimizations; adaptive traffic controls; storage lane extensions; constructing a new Canadian Forces Base (CFB) Kingston access road connection to Gore Road; public transit service enhancements; and replacing the traffic signal at the Highway 2-Kingston Road 15 intersection with a roundabout.

Traffic modelling concluded that the City’s target of LOS D on the corridor could be maintained until at least 2020 with the implementation of the improvements highlighted in point 2.b.i above. As such, the recommended improvements are considered a viable interim solution and are further reflective of the 2005 Provincial Policy Statement (PPS) which states that the use of existing infrastructure should be optimized, wherever feasible, before consideration is given to developing new infrastructure. Still, the recommended improvements may not be able to solely reduce congestion and accommodate future traffic volume demand over the long-term. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

3. **Increase the capacity of Highway 401 from Montreal Street to Kingston Road 15.** Despite its current capacity and expansion program from four to six lanes, the Highway 401 crossing is not considered a viable alternative solution, given its primary role as an inter-city freeway, the trip demand lines of vehicles that favour crossing the Cataraqui River via the LaSalle Causeway to the south and the related out of way travel and additional delays that would result from diverting local traffic 6 km north to use the Highway 401 crossing.
4. **Implement a new crossing at a location between the LaSalle Causeway and Highway 401 by either a tunnel or bridge.** As shown on Drawing PS-3, in order to evaluate this alternative solution, the EA study area was subdivided into six corridor areas with nine possible crossing alignment options based on potential connections to existing roads. The corridor areas were evaluated based on technical feasibility, transportation effectiveness and potential social, cultural, environmental and financial impacts. Area 2 and Area 4 on Drawing PS-3 were then short-listed for further assessment. An evaluation matrix consisting of forty-eight criteria was developed and applied to Area 2 and Area 4. Based on this exercise:

a) A tunnel is not considered a viable alternative solution, given that:

i. 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 and the acceptable geometric design criteria of a 6 percent slope or less to match the existing elevation and intersections cannot be achieved;

ii. a tunnel could only be realistically built using a cut and cover technique which would require:

   (a) construction to be carried out in about 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 water surface (this would be repeated until the entire tunnel was constructed);

   (b) the east section to either:

      (i) parallel Kingston Road 15 between the river's edge and the Gore Road Library and connect with Kingston Road 15 at a new 'T' intersection only 350 m north of the Gore Road Intersection, which is not ideal from a transportation perspective; or

      (ii) spiral around the Gore Road Library and through the Kingston Road 15-Gore Road intersection, resulting in vehicular traffic detouring to permit construction;

   (c) as noted above, substantial dredging of the riverbed and dewatering as well as excavations at both the west and east shores, resulting in severe environmental impacts;

   (d) boat traffic detouring to permit tunnel construction across the Rideau Canal's navigable channel; and

   (e) a four-lane tunnel scenario (two lanes in each direction) at the outset, given the design and construction challenges and impacts, resulting in a prohibitive capital cost estimated in the range of $350 million to $450 million;

iii. the transportation of dangerous goods may not be allowed through the tunnel for public safety reasons; and

iv. neither cyclists nor pedestrians would be allowed through the tunnel, also for public safety reasons.

b) The preferred alternative solution, as shown on Drawing PS-4, is a bridge crossing at the John Counter Boulevard-Gore Road alignment, which:

i. by providing a mid-central arterial road corridor through the City, offers opportunities to improve urban transportation network connectivity in order to:

   (a) relieve existing and future traffic congestion;

   (b) enhance the delivery of municipal services such as public transit and utility infrastructure;

   (c) promote walking and cycling as viable alternative modes of transportation; and

   (d) accommodate planned future residential and employment growth on the east and west sides of the Cataraqui River; and

ii. by being within the Rideau Canal and proximate to its southern boundary at Belle Island, offers opportunities to enhance the City’s historic association with, and the values of, the canal through the use of state-of-the art and sustainable design practices.
At the May 25, 2010 City of Kingston Council meeting, Council approved the 'City of Kingston Third Crossing of the Cataraqui River Environmental Assessment Stage 1 Summary Report' (Stage 1 Summary Report) and authorized that this EA study proceed to completion, or Stage 2. Stage 2 is addressing Phase 3 and Phase 4 of the Ontario Municipal Class EA process, namely:

1. Assessing and identifying a preferred bridge crossing design at the John Counter Boulevard-Gore Road alignment (the project site location), including the identification of potential impacts, the development of mitigation measures 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').

Note that Project Implementation, which would involve detailed design and project construction activities (or 'Phase 5') of the Ontario Municipal Class EA process, is beyond the scope of this EA study.

The outcome of Stage 2 of this EA study is a preferred design solution at the project site location, the main components and structures of which are highlighted below:

1. The shore-to-shore distance is roughly 1,150 m 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.

2. 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 project site location typically have a design life of at least 100 years. It is anticipated that the bridge at the project site location, in terms of its proposed structural elements and materials, intended function and maintenance requirements in relation to the geographical setting, would have a design life exceeding 100 or even 120 years.

3. As shown on Drawing PS-5, the bridge alignment is a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood located on the south side of Gore Road on the east shore. This alignment offers opportunities for:
   a) Reduced potential noise and visual impacts on Point St. Mark;
   b) ‘Softer landscaping’ along the Gore Road right-of-way on the east shore; and
   c) A more organic reflection of the bridge within the context of its transitional location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

4. As shown on Drawings PS-4, PS-6 and PS-7, the preferred design solution was selected out of the following three alternative bridge concepts:
   a) A ‘Tube’ concept, which:
      i. uses rounded/smooth steel truss work that forms a tube around the bridge for additional structural support;
      ii. uses 11 piers at 100 m spans with a 120 m span over the Rideau Canal’s navigable channel and adjacent rowing lanes;
      iii. would be the first bridge of its kind in the world for vehicular use;
      iv. is considered avant garde due to its shape, aesthetics, robustness (less deflection and vibration) and lighter weight (it uses a third less structural steel and concrete compared to a conventional bridge with the same spans); and
      v. was not selected as the preferred design solution due to technical issues raised with the EA study’s Technical Advisory Committee and related lack of public support (maintenance costs, too enclosed, driver view and user safety impacts from potential ‘shadow-flicker’, restricted views of the water, inability to widen the bridge in the future);
   b) A ‘Box Girder’ concept, which:
      i. uses 23 piers at 50 m spans;
      ii. has a 65 m span over the Rideau Canal’s navigable channel, which would exclude the adjacent rowing lanes; and
      iii. was not selected as the preferred design solution due to its perceived conventional, plain design by both the public and the EA study’s Technical Advisory Committee, particularly given the Rideau Canal context, and its inability to span over both the Rideau Canal’s navigable channel and adjacent rowing lanes without negatively impacting span-length-to-girder-depth proportions; and
   c) An ‘Arch With V-Piers’ concept, which is the preferred design solution, in that it:
      i. provides two structural supports for the bridge girders but only one in-river foundation for each pier, which reduces associated in-water disturbances and capital costs;
A: 3-LANE BRIDGE DECK STAGING OPTION

B: 4-LANE BRIDGE DECK

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

DRAWING:
BRIDGE ALIGNMENT AND
DECK CONFIGURATIONS
(3-LANE AND 4-LANE OPTIONS)
A: RENDERING (LOOKING SOUTH)

B: PROFILE AND PIER LOCATIONS (LOOKING NORTH)
ii. uses up to 13 piers at 83 m spans (for a total in-water pier footprint of 0.07 hectares (ha)), which further minimizes visual impacts by maintaining appropriate span-length-to-girder-depth proportions\(^4\);

iii. initially incorporated a 100 m arch span over the Rideau Canal’s navigable channel and adjacent rowing lanes (for a total 131 m distance pier-to-pier) which, based on recent consultations with the Kingston Rowing Club and noted below, has subsequently been increased to show a proposed 150 m distance pier-to-pier over the navigable channel and existing seven lane rowing course (four lanes on the west side of the channel and three lanes on the east side of the channel);

iv. provides an arch over the Rideau Canal’s navigable channel to showcase the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and Rideau Canal; and

v. was preferred by the public and its advantages were generally recognized by the EA study’s Technical Advisory Committee.

5. The CHBDC requires the bridge deck to have a minimum 1 m vertical clearance above the design high water level, which is at 76.3 m elevation at the project site location. With this in mind and as also shown on Drawings PS-4, PS-6 and PS-7, the bridge clearance above the water exceeds this CHBDC requirement as follows:

a) It is 3 m along most of its westerly portion (or at 78.8 m elevation) to both accommodate existing topographic conditions on the west shore and mitigate visual impacts, in that its silhouette would be below existing tree lines when viewed from the water and on land;

b) It then gradually rises to 14 m over the Rideau Canal’s navigable channel (or at 90 m elevation) near the east shore and adjacent rowing lanes, which also exceeds the minimum 6.7 m Federally regulated navigable requirement for the canal, thereby ensuring continued through-navigation and enjoyment of both the canal and the City’s unique heritage and cultural character; and

c) It then descends to 12 m (or at 88 m elevation) at the east shore to tie into existing elevations and topographic features.

6. As also shown on Drawing PS-5, a 22.9 m wide bridge deck is ultimately proposed that is comprised of the following:

a) A four-lane vehicular roadway (two 3.5 m wide lanes for westbound travel and two 3.5 m wide lanes for eastbound travel) with a 1.8 m wide median, based on traffic demand forecasts and various planned road network improvement scenarios in proximity to the project site location;

b) A 3.6 m wide multi-use trail provided on the south side of the bridge for active transportation;

c) A 1.5 m wide commuter cycling lane provided on both sides of the bridge; and

d) A 0.5 m wide area for a barrier separating the multi-use trail and commuter cycling lane on the south side of the bridge.

A series of observation look-out/interpretive areas (or ‘Belvederes’) are also provided along the south side of the bridge to maximize opportunities for bridge users to both enjoy views of and learn about the Rideau Canal, Belle Island and the Greater Cataraqui Marsh.

7. As also shown on Drawing PS-5 and reflective of the 2005 PPS which states that infrastructure should meet current and projected needs and be provided in a coordinated, efficient and cost-effective manner, an 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. This scenario 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. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

8. In regards to utility infrastructure:

a) As per the City’s 2007 Master Plan for Water Supply for the City of Kingston Urban Area, Utilities Kingston has requested that an east-west watermain be incorporated in the bridge design, as it is required to:

i. improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of the project site location); and

\(^4\) Note it could be feasible to reduce the number of bridge piers from 13 to 11 piers. It is recommended that this matter be reviewed and confirmed during the detailed design stage prior to the construction phase of the project.
iii. improve the redundancy in the municipal water system on the east side of the Cataraqui River; and

b) That the three existing Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the project location area be attached and concealed as part of the bridge deck, as requested by Hydro One Networks Inc.

9. The following three alternatives were considered for in-water bridge construction:

a) A temporary earth berm, which:
   i. would involve infilling an area with earth material and capping it with gravel to provide a temporary roadway from both riverbanks up to the Rideau Canal’s navigable channel;
   ii. would require culverts to accommodate water flows in the Cataraqui River;
   iii. would be removed after the bridge is built; and
   iv. was not selected as the preferred in-water bridge construction solution as it:
      (a) would result in two in-water disturbances during its installation and removal, for which a set of mitigation measures for each activity would be needed; and
      (b) would require the east-west watermain to be masked or screened underneath the permanent bridge deck, which in turn would:
         (i) impact efforts in achieving a context sensitive bridge design; and
         (ii) require the watermain to have expansion joints, heat tracing and insulation jacket equipment, all of which would require regular maintenance and servicing within a confined space entry scenario;

b) A temporary work bridge, which:
   i. would be built adjacent to the permanent bridge using a series of temporary piles;
   ii. would be removed after the bridge is built, with the temporary piles either being removed entirely or cut below the top of the riverbed and left in place; and
   iii. was not selected as the preferred in-water bridge construction solution as it:
      (a) would add an additional 8 percent to 12 percent in capital costs to the project;

   (b) would result in two in-water disturbances during its installation and removal, for which a set of mitigation measures for each activity would be needed; and

   (c) would require the east-west watermain to be masked or screened underneath the permanent bridge deck, similar to the temporary earth berm option; and

   c) Dredging, which as shown on Drawing PS-8:
      i. would involve excavating a channel 1.4 m to 1.8 m below the existing river mud line from and for construction barges;
      ii. the excavated channel would be left in place after the bridge is built; and
      iii. is the preferred in-water bridge construction solution as:
         (a) dredging would require only one in-water disturbance and one related set of mitigation measures as part of its installation;
         (b) the excavated channel could represent a mitigation measure in response to potential project effects, in that it would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more;
         (c) dredging would reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option; and
         (d) as noted above, dredging could accommodate the east-west watermain within the excavated channel, which in turn would:
            i. provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and
            ii. preclude the need to install and maintain expansion joints, heat tracing and insulation jacket equipment.
DREDGING OPTION - SECTION BETWEEN PIERS

DREDGING OPTION - SECTION AT PIER

Dredging of channel below the existing river mudline.
10. As shown on Drawing PS-9, roadway and landscape improvements for the west side lands include:

a) For westbound travel:
   i. two 3.5 m wide vehicular lanes are shown on John Counter Boulevard along with a 3.25 m wide by 20 m long left-turn bay at the Village On The River apartment access on the south side of John Counter Boulevard and shared through/right-turn access into the River Park subdivision on the north side of John Counter Boulevard; and
   ii. a 3.25 m wide by 60 m long left-turn bay and a right-turn bay are shown at Montreal Street;

b) For eastbound travel, two 3.5 m wide vehicular lanes are shown on John Counter Boulevard along with a 3.25 m wide by 20 m long left-turn bay at the River Park subdivision access and shared through/right-turn access into the Village On The River apartment;

c) Provisions for a median barrier separating the westbound and eastbound vehicular lanes;

d) Two shoreland observation look-out/interpretive areas are shown on the north and south sides of the bridge to maximize opportunities for those on-land to both enjoy views of and learn about the Rideau Canal, Belle Island and the Greater Cataraqui Marsh;

e) The 3.6 m wide multi-use trail and 1.5 m wide commuter cycling lane on the south side of the bridge are shown continuing along the south side of John Counter Boulevard to Montreal Street and connecting with the existing Elliott Avenue Parkette recreational trail on-land by a 3.6 m wide multi-use trail;

f) The 1.5 m wide commuter cycling lane on the north side of the bridge is shown continuing along the north side of John Counter Boulevard to Montreal Street and also connecting with the existing Elliott Avenue Parkette on-land by a 3.6 m wide multi-use trail under the bridge; and

g) A sidewalk is shown on the north side of John Counter Boulevard extending from the multi-use trail access to Montreal Street.

11. As shown on Drawing PS-10, roadway and landscape improvements for the east side lands include:

a) For westbound travel, two 3.5 m wide vehicular lanes are shown on Gore Road along with a 3.25 m wide by 20 m long left-turn bay at Point St. Mark Drive and a right turn option at the Gore Road Library;

b) For eastbound travel, two 3.5 m wide vehicular lanes are shown on Gore Road along with:
   i. a 3.25 m wide by 60 m long left-turn bay, through lane/left-turn lane and right-turn lane option east of Point St. Mark Drive at Kingston Road 15;
   ii. a 3.25 m wide by 20 m long left-turn bay at the Gore Road Library; and
   iii. a right-turn option at Point St. Mark Drive;

c) Provisions for a median barrier separating the westbound and eastbound vehicular lanes;

d) The 3.6 m wide multi-use trail on the south side of the bridge is shown:
   i. continuing along the south side of Gore Road west of Point St. Mark Drive and connecting to the existing trail into Point St. Mark; and
   ii. extending under the bridge to connect with the trail network on the Gore Road Library property;

e) A 1.5 m commuter cycling lane is proposed on both sides of Gore Road;

f) The existing 1.5 m wide sidewalk would remain on the south side of Gore Road east of Point St. Mark Drive to Kingston Road 15;

g) In regards to the Gore Road Library property:
   i. a proposed on-land observation look-out/interpretive area is shown to maximize opportunities for those on-land to both enjoy views of and learn about the Gore Road Library, Rideau Canal, Belle Island and the Greater Cataraqui Marsh; and
   ii. as the proposed roadway improvements would impact a portion of the traditional dry stone wall, it is proposed that the affected portion of this wall be realigned (as shown conceptually on Drawing PS-10) and incorporated into the landscape improvements to mitigate associated cultural heritage impacts; and

h) The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River, which are incorporated into the landscape design as a ‘naturalized’ feature.