



# Kingston Third Crossing (Waaban Crossing)

Canadian Consulting Awards 2023 - Transportation

Hatch

**HATCH**



## Project Summary

For many years, the City of Kingston recognized that a new, third crossing of the Cataraqui River was needed to connect communities on both sides of the river and to accommodate growth. In 2018, with funding secured, the city implemented the project using a unique Integrated Project Delivery (IPD) model and signed a four-party contract with Hatch, Systra and Kiewit. Together, and despite the pandemic, this integrated team completed the 1.2km long bridge on time and under budget.

*Photos courtesy of Aerosnapper, Kingston*







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## Innovation

The most significant innovation introduced on this project was the decision by the City of Kingston to utilise an IPD approach for the new crossing. This was a bold choice because, although IPD had been used for building construction, this was the first time that it had been used in North America for a bridge project. In the IPD model all the parties (the owner, designer and constructor) sign a joint contract which incentivises them to set aside their individual interests and to act as a team to make best-for-project decisions. The IPD agreement achieves this incentivisation in several ways:

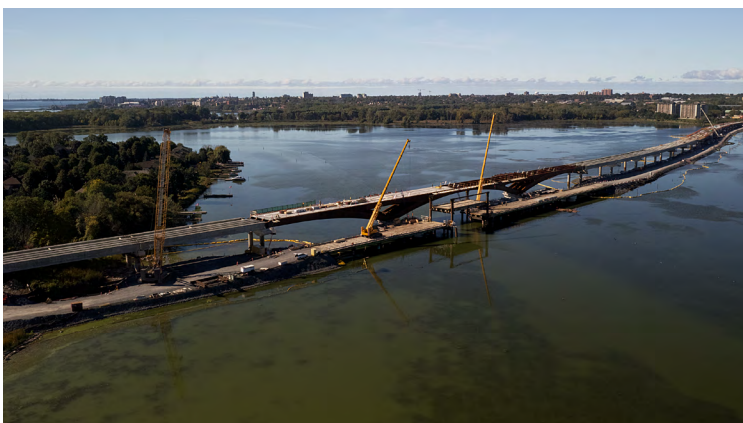
- it precludes the parties from submitting claims against each other.
- the consultant and contractor are paid all their costs (but not including profit) by the owner.
- profit is earned by meeting project goals, that can, for example, include meeting a target timeline, obtaining approvals and permits, meeting local purchasing targets, etc.
- profit is adjusted up or down depending on whether the project exceeds or underruns the target project cost.





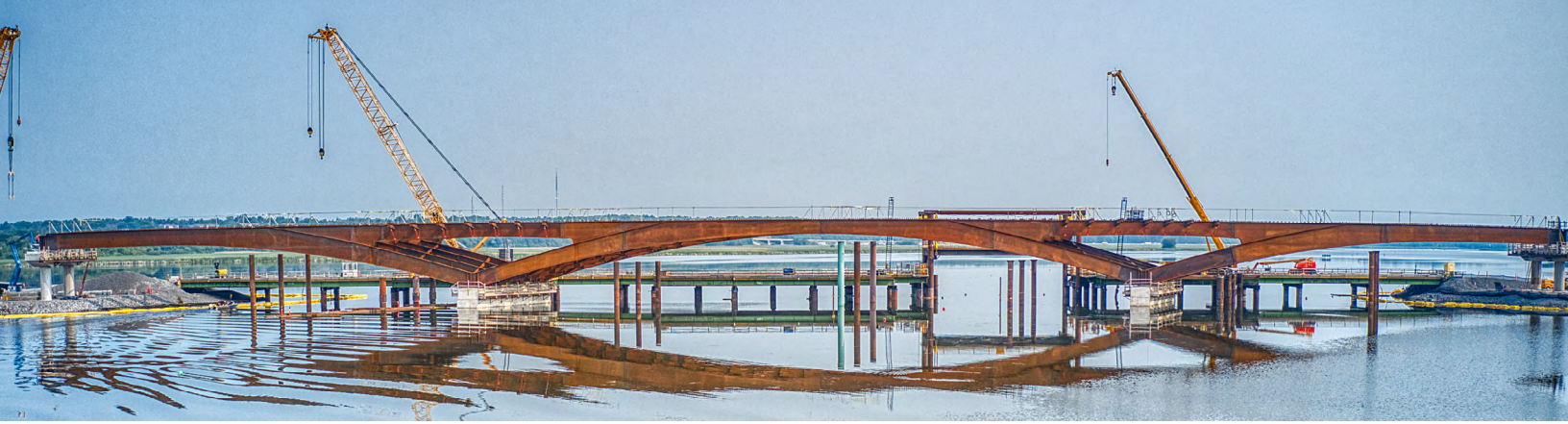
This innovative IPD approach let the team work together during the project validation period (from 2018 to 2019), to modify and refine the bridge design concept and the methods of construction from those approved in the earlier Environmental Assessment (EA), with the goal of bringing the target cost within the budget of \$180M. The major cost-saving innovations conceived during the validation period were:

- The approach span substructure design was simplified from V-piers (as proposed in the EA) to modified conventional vertical piers and pier caps that had a less heavy and more open appearance.
- Because of high steel prices, the steel approach spans were replaced by 48m long precast concrete NU girders - the largest concrete girders ever produced in Ontario. These were the longest girders that could be manufactured (albeit with minor modifications to the precast plant), that could be delivered by road, and that could be lifted into place on-site.
- Providing a temporary platform in the river from which to construct the new bridge was a significant cost. After considering various options, a hybrid approach using a combination of a causeway in the shallow areas, a trestle in the deeper parts, and a temporary lift-bridge over the navigation channel was selected.



By the end of the validation period, the IPD team had agreed on a design concept and on construction methods for the new bridge that brought the target cost within budget.





## Complexity

The main challenge faced by the IPD team was to work together to modify the bridge concept contained in the environmental approval documentation so that it could be completed within the budget of \$180M, meet the city's vision for the project and, at the same time, mitigate adverse environmental impacts on the Cataraqui River. The resulting concept for the bridge consisted of:

- A 1.2 km long bridge complete with onshore approach roads, providing a connection between John Counter Boulevard on the west side of the river and Gore Road on the east side.
- A bridge deck cross-section width of 15.6 m comprised of a two-lane roadway with a multi-use trail on the south side of the bridge separated from the roadway by traffic barrier. The trail widens out into two observation lookouts above the main span piers.
- 19 approach span piers each supported by two 1626 mm outer diameter steel cased concrete caissons and two piers, for the main navigation span, each supported by three 1626 mm outer diameter steel cased concrete caissons.
- Concrete approach spans each consisting of five 2.4 m high Nebraska University (NU) I type precast prestressed concrete girders with span lengths of 48 m on the west approach and span lengths of 43 m on the east approach.
- A main navigation span (meeting the required navigation clearances) consisting of four Atmospheric Corrosion Resistant (ACR) steel plate haunched girders. The 95 m navigation channel span and its 66 m back spans form an under-deck arch.



*Photos courtesy of Aerosnapper, Kingston*



## Social and/or Economic Benefits

The city's vision for the new bridge was to provide an iconic structure that would give their residents a sense of pride, attracts tourism, and respect the natural environment in which it is built. The more specific benefits of the project were to provide a connection between communities on the east and west sides of the Cataraqui River, improve emergency response times, accommodate future growth of the city, promote active and public transportation alternatives, and be respectful of the crossing's location within the river.

In addition to these longer-term benefits, the IPD approach allowed the city to encourage local participation in the construction work by setting goals that rewarded local input into the project. This led to various direct economic and social benefits to the Kingston area, including:



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*The more specific benefits of the project are building connections between communities on both sides of the strait, shortening emergency response times, and accommodating the city's future growth.*

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- Procuring more than \$22.7 million of locally sourced material and contracts.
- Utilizing more than 326,000 hours of labour from workers who live within 115 kilometres of Kingston, with more than 168,000 of those hours from workers who live within 40 kilometres.
- Securing 93 contracts with local businesses.
- Employing 38 staff members, who moved to Kingston to work on the project.
- Donation of more than \$15,000 in charitable donations to local causes, by the IPD team, including Kiewit, Hatch, Systra and Bauer, who have also contributed over 80 community service hours.





## Environmental Benefits

The Cataraqui River that divides Kingston is part of the Rideau Canal system and is a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, a National Historic Site of Canada (NHSC), a Canadian Heritage River, and a Federally regulated navigable waterway. As a result, environmental concerns regarding the construction and operation of the new crossing were significant and means of mitigating these impacts had to be developed in order to obtain approval from Parks Canada. To ensure that the mitigation measures were successful, the city will be monitoring the river for several years after construction

to ensure the project has not negatively impacted the environment.

But the new bridge brings meaningful environmental benefits as well. The new crossing with its bike lanes and walking paths will encourage active transportation, shorten journey time across the river by an estimated 40%, allow for expansion of existing transit routes, provide a potential emergency detour route for Highway 401 traffic, and improve access to city services. The city estimates that these benefits will reduce vehicular travel by 60 million kilometres per year and reduce greenhouse gas emissions by approximately 14,000 tonnes per year.





## Meeting Client's needs

The bridge is the largest infrastructure project ever undertaken by the City of Kingston and, despite a worldwide pandemic and labour strikes, it was designed and constructed within the original timeframe and for slightly less than the original \$180 million budget.

This was achieved largely because of the team-based approach that was encouraged by the Integrated Project Delivery model and that was wholeheartedly adopted by the City of Kingston, the designers (Hatch and Systra) and the contractor (Kiewit, and their trade partners Bauer and Walters). This collaborative approach resulted in significant innovation, including:

- The design, manufacture, transportation, and installation of the longest (48 meters) NU precast prestressed concrete girders ever produced in Ontario.
- A reduction of the in-water footprint of the bridge by over 50% by using a slimmer pier design.
- A lowered bridge profile which was praised by Parks Canada because it fitted within the surrounding UNESCO heritage site, rather than dominating it.



The result of the IPD team approach is a bridge that not only respects its location in a UNESCO World Heritage Site, but also promises to enhance the local community by encouraging active transportation and reducing travel times and greenhouse gasses.

The city opened the new bridge to the public following a ribbon cutting ceremony on 13<sup>th</sup> December 2022 and officially renamed the bridge as the Waaban Crossing. (Waaban is an Ojibwe term meaning dawn or morning light.) As Kingston Mayor Bryan Paterson said at the bridge opening, “This is a moment to savour. This is a moment that we have all earned by working together.”





## Photo Appendix



*Two Cranes Sitting On The Temporary Causeway*



*An Overview Of The Bridge Looking Westwards*





*An Overview Of The Eastern End Of The Bridge*



*Piles And Pile Caps Being Constructed*





*The Arch Of The Main Span Reflected In The River*



*The Bridge Looking Westwards*





*The First Of 95 Girders Arriving In Kingston*



*The New Approach Road (Gore Road) On The East Side*





*The Temporary Lift-Bridge Over The Cataraqui*



*The Waaban Crossing, Opened To Traffic*