

**Environmental Impacts and Mitigation Measures**

Factor		Project Phase	Impact	Mitigation
Biophysical environment	Aquatic habitat	Construction	<p>No Provincially Significant Wetlands, Areas of Natural and Scientific Interest, or Environmentally Sensitive Areas are located within the study area.</p> <p>A number of fish species have been identified in the study area. Turtle species such as Snapping Turtle (Special Concern) and Midland Painted Turtle may use the Canal for hibernation during the winter months or as a movement corridor to reach other waterbodies in the area. American eel, listed federally as Special Concern and provincially as Endangered, has been identified in the study area. Natural vegetation within the waterway consists of submergent aquatic vegetation such as invasive Asian Milfoil.</p> <p>The ornamental shallow-water Lily Pond may be suitable for basking turtles, however none have been observed during this study. Pond vegetation includes Narrow-leaved Cattail and the invasive exotic species Flowering Rush. The pond is surrounded by manicured lawn up to its edge, and therefore does not provide suitable turtle nesting habitat.</p> <p>Sedimentation and erosion may impact aquatic habitat and water quality within the Rideau Canal locally and downstream of the project site.</p>	<p>Sedimentation and erosion control measures will be employed during construction in accordance with Ontario Provincial Standard Specification (OPSS) 805. Sediment and erosion control structures will be routinely inspected and repaired as required.</p> <p>Construction of the structure is scheduled to occur in the fall/winter months when the Canal and associated ponds have been dewatered.</p> <p>Rock pads constructed in the Canal will be constructed of clean rock to minimize sediment entering the Canal. Rock pads will then be removed following the erection of the steel superstructure.</p> <p>Entry of petroleum products, debris, sediment, or other potential contaminants to the watercourse will be avoided. No storage, maintenance or refueling of equipment will be conducted near the watercourse. A Spills Prevention and Response Plan will be developed by the Contractor and kept on site at all times.</p> <p>The species of conservation concern impact assessment will be updated during Detail Design and mitigation measures will be refined as necessary.</p>
	Terrestrial habitat	Construction	<p>No confirmed specialized wildlife habitats, Species at Risk (SAR) or reptiles have been observed on-land within the study area. No provincially rare avian species have been observed in the study area, although Barn Swallow (Threatened) has been observed north of the study area. The proposed crossing may provide a net gain for Barn Swallow in potentially providing additional nesting habitat. Some disturbance to terrestrial wildlife may occur during construction.</p> <p>Manicured lawns, shrubs and medium-large landscaped trees line the Canal pathway. The Recommended Plan requires tree and shrub removals at the west landing to create a staging area and to allow vehicles to access the site during construction, as well as tree removals at the median between Echo and Colonel By to accommodate the east landing. This may disrupt the habitat of avian species and result in soil erosion.</p>	<p>The work area will be fenced off to minimize disturbances to terrestrial wildlife. If wildlife is encountered, trapping and relocation procedures will be utilized.</p> <p>In the event that an animal encountered during construction does not move from the site and construction activities would result in harm to the animal, all activities will stop and the Contract Administrator will be notified.</p> <p>In the event that a SAR or possible SAR is found in the construction area, all construction that could potentially harm the animal will cease immediately and the Contract Administrator will be notified.</p> <p>A Contractor awareness program will be developed to ensure that the Contractor is aware of wildlife and habitat sensitivities and associated requirements for protection and agency consultation.</p> <p>All required permits for wildlife handling will be obtained and posted on site prior to engaging in such activities.</p> <p>Nesting migratory birds will be protected in accordance with the <i>Migratory Birds Convention Act</i> (MBCA):</p> <ul style="list-style-type: none"> <li>• Vegetation clearing and structure works will be avoided during</li> </ul>

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				<p>the breeding bird season (May 1 to August 8);</p> <ul style="list-style-type: none"> <li>• Active nests of protected migratory birds will not be destroyed; and</li> <li>• If a nesting migratory bird is identified within or adjacent to the construction site and construction activities would result in a contravention of the MBCA or ESA (2007), all activities will stop and MNR and Environment Canada will be contacted to discuss mitigation options.</li> </ul> <p>Existing trees will be protected wherever possible in accordance with OPSS 201, OPSS 801, and the City of Ottawa's Tree By-law; in particular, mature tree removals will be avoided. The mature oak tree at the south end of the median between Colonel By Drive and Echo Drive will be preserved. Vegetation that does not require removal will be protected as necessary through the installation of temporary vegetation protection measures (i.e. temporary fencing).</p> <p>Exposed surfaces will be re-stabilized and re-vegetated as soon as possible, using native vegetation seed mix and plantings appropriate to the project area (as determined in Detail Design). New trees and shrubs will be planted for screening on either side of the east landing ramp. Trees removed for the purpose of accommodating construction equipment will be re-planted and re-sodded following the construction period.</p> <p>Sedimentation and erosion control measures will be employed during construction in accordance with Ontario Provincial Standard Specification 805. Sediment and erosion control structures will be routinely inspected and repaired as required.</p> <p>The species of conservation concern impact assessment will be updated during Detail Design and mitigation measures will be refined as necessary.</p>
Surface and groundwater	Construction & Operation	<p>A combined sewer crosses the Canal between Fifth Avenue and Clegg Street, and the nearest storm sewer is located along Echo Drive, conveying stormwater north. Outlets in the Canal's eastside walls serve catchbasins on Colonel By Drive. No stormwater management measures are in place currently.</p> <p>A drainage and stormwater impact assessment revealed that the increase in imperviousness and runoff with the construction of the crossing would be minimal. The change in runoff quality and quantity, and overall change in water quality, would be minimal or negligible. With no existing storm sewers in the area, no physical impacts on municipal infrastructure are expected.</p>	<p>Sedimentation and erosion control measures will be employed during construction in accordance with Ontario Provincial Standard Specification 805. Sediment and erosion control structures will be routinely inspected and repaired as required.</p>	
Vibration	Construction	<p>Construction activities may cause ground vibrations and resulting impacts to nearby structures.</p>	<p>If threats to nearby structures are significant, energy of construction machinery will be limited.</p>	

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Cultural Environment	Soils	Construction	Contaminated materials may be excavated. This may result in delays in the timing of construction due to contamination management.  Soils may become contaminated during construction as a result of spills.	An assessment will determine whether contaminated materials are present on the construction site.  Refuelling and maintenance of construction vehicles will occur at least 30m away from water courses and off site when possible. Construction vehicles will be monitored for leaks. The contractor will have a hazardous material/fuel spill plan in place and will follow the OPSS 180 provincial standards for the management of excess materials.
	Rideau Canal setting	Construction	The Canal setting will be altered during construction. The stone walls of the Canal are of significant heritage value and may be threatened by construction activities.	The construction period will be minimized to reduce interference with the Canal setting. Stabilization measures will be used to protect the Canal walls during construction. The integrity of the Canal walls will be monitored during all pile-driving operations.
	Canal views	Construction & Operation	Local views of the Canal, such as the key vantage point from the Canal Ritz Restaurant patio, will be interrupted by the bridge.	The Recommended Plan is light and transparent in design, minimizing its interference with Canal views to the greatest extent possible. The number of piers in the Canal will be limited to two. New views of the Canal will also be provided from the deck of the bridge.
	Navigational clearance	Construction	Construction activities may interfere with the navigational clearance envelope.	A 25-metre wide and 6.7-metre high navigational clearance envelope will be provided, at minimum, underneath the bridge. This meets the requirements of the Navigable Waters Protection Act.
	Lily Pond	Construction & Operation	A Lily Pond is located adjacent to the Canal, just north of Fifth Avenue. The pond was created in 1903 to beautify the Canal edge. The bridge's west landing will span over the south end of the Lily Pond with the placement of a pier in the Pond. Although the existing landscape will be altered, new views of the Lily Pond from the bridge deck will be created.	Emphasis will be placed on seamlessly integrating the west landing into the existing landscape. The stone walls of the Lily Pond will be preserved, and the current size and shape of the pond will be maintained. Sedimentation control measures will be employed during construction.
	Pedestrian and cycling environment	Construction	Pedestrian and cycling pathways along the east and west sides of the Canal may be interrupted during construction.	Temporary detours will be provided during construction, with appropriate informational signage.
	Parking	Operation	A Parking Analysis was conducted and found that parking utilization on streets in close proximity to the east landing in Old Ottawa East is projected to increase from 23% to 42%, with an average projected parking utilization increase of up to 8% across Old Ottawa East.	Parking utilization is expected to remain well below the effective capacity and therefore mitigation measures are not required.

**Potential environmental impacts and proposed mitigation measures**

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Archaeological resources	Planning/pre-construction & Construction	<p>A Stage 1 Archaeological Assessment was conducted by Golder Associates Ltd.</p> <p>Moderate potential exists for both pre-contact and historic archaeological resources within the Study Area, particularly along the Canal.</p>	<p>Any construction areas identified as having archaeological potential in the present study will be preceded by a Stage 2 archaeological assessment undertaken by a licensed archaeologist.</p> <p>The alignment of the crossing will avoid built heritage properties. Should built heritage property be directly or indirectly impacted, a detailed property evaluation will determine appropriate mitigative measures such as landscaping, buffering and/or heritage recording.</p> <p>The design will minimize impact on the cultural landscapes of the Rideau Canal and adjacent park lands.</p> <p>Should deeply buried deposits be found during construction activities, the Ministry of Tourism and Culture, (416) 314-7148, will be notified immediately.</p> <p>Should human remains be encountered during construction activities, both the Ministry of Tourism and Culture and the Registrar or Deputy Registrar of the Cemeteries Regulations Unit of the Ministry of Small Businesses and Consumer Relations, (416) 326-8393, will be notified immediately.</p>
Noise	Construction	Noise created by construction equipment may be disruptive to local residents and users of the Canal's multi-use pathways.	The Contractor will adhere to noise by-laws; construction will only occur during by-law hours. Construction equipment will operate in a manner that prevents unnecessary noise through the use of muffler systems and lubrication of moving parts when needed.
Air quality	Construction	Construction equipment exhaust fumes may temporarily impact local air quality.	The Contractor will ensure that construction equipment is in good repair and adhere to dust control and emissions by-laws. Where possible, water will be used for dust suppression. Idling will be avoided.
Safety & Security	Construction & Operation	<p>Potential risks to construction workers and users of the Canal multi-use pathways during the construction period.</p> <p>During operation, safety risks to users of the bridge may be associated with poor lighting and obstructions to sight lines.</p>	<p>Fencing and signage will be used to direct passersby away from the construction site.</p> <p>Crime Prevention Through Environmental Design (CEPTD) principles will be used in the design of the bridge to reduce risks to bridge users. The design will use clear sight lines as well as sufficient lighting to maximize visibility.</p>
Lighting	Operation	Bridge night lighting may result in light pollution and disturbance to adjacent properties.	A subtle LED lighting scheme will be implemented, minimizing light pollution and interference with the cultural heritage landscape while providing a safe environment for pedestrians and cyclists.

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Technical	Utilities	Construction & Operation	<p>Bridge construction will conflict with an existing watermain located between Fourth Avenue and Clegg Street. The bridge's two piers in the Canal will sit directly on top of this watermain, requiring a relocation of the watermain. In 2001, the City of Ottawa identified this watermain as needing replacement. The location of the watermain replacement within this area of the Canal is flexible.</p> <p>Construction activities may cause damage to existing underground pipes or cables, resulting in disrupted service or injury to construction workers.</p>	<p>It is recommended that watermain replacement and relocation is coupled with bridge construction in order to reduce the costs of these individual activities. A replacement pipe of minimum 400mm inside diameter is required to be drilled under the Canal. This will connect to an existing stub adjacent to Queen Elizabeth Drive and Fourth Avenue on the west side of the Canal. The existing stub on the east side between Colonel By Drive and Echo Drive will need to be relocated 10 to 20 metres to the north to accommodate the bridge.</p> <p>The Contractor will refer to detailed construction and engineering drawings, including accurate information on the location of all existing infrastructure.</p>
	Geotechnical	Construction	<p>A Geotechnical Assessment was conducted by Golder Associates Ltd. Construction activities may threaten the stability of the Canal walls.</p> <p>Potential exists for seismic liquefaction to occur at several locations within the Study Area due to the presence of loose sands. This could have implications for the stability of the structure. Additional geotechnical investigations will verify these findings.</p> <p>If the water table is close to the ground surface, excavation side slope constraints may apply.</p> <p>Groundwater inflow into excavations may need to be controlled through pumping.</p> <p>As the bridge is intended for pedestrian and cyclist traffic only, excessively large loads are not anticipated during operation.</p>	<p>The stresses and stability of the Canal walls will be checked during Detail Design to ensure no negative consequences resulting from the proximity of piers to the wall, foundation type and loading conditions.</p> <p>Liquefiable areas will be improved through densification where necessary.</p> <p>Excavation side slopes will be kept at a minimum of 1 horizontal to 3 vertical where the water table is close to the ground surface. In areas with space constraints requiring steeper slopes, the sides of the excavation will be fully braced and designed by an engineer.</p> <p>Construction of the piers will be carried out from within cofferdams, which will be constructed using steel sheet piles, to control groundwater. Sheet pile depth will be determined based on the water level and the subsurface conditions at each pier.</p> <p>If more than 50,000 L/day of groundwater are required to be extracted, a Permit to Take Water will be obtained from the MOE prior to groundwater extraction.</p> <p>Driven steel H-piles will be used for the foundations of the piers and east abutment to ensure stability. Shallow spread footings will be used for the west abutment if further geotechnical investigation confirming subsoil conditions determines that this foundation option is appropriate.</p>