8.0 POTENTIAL ENVIRONMENTAL EFFECTS, MITIGATION MEASURES, AND COMMITMENTS TO FUTURE WORK

This chapter describes the Recommended Plan in terms of the environmental effects and mitigation measures, as well as any necessary commitments to further work.

The key to ensuring effective environmental quality control and risk management during the project is the development and proactive implementation of an approach that:

- Identifies the environmental sensitivities;
- Presents the environmental protection measures in a way that can be translated into contractual requirements and for which compliance can be verified; and
- Includes a monitoring program that verifies that the environmental protection measures are being implemented and are effective.

It is important to ensure that the Detail Designers, and ultimately the Contract Administrator and Contractor are made aware of, and are prepared to deal with, all environmental issues that may arise during construction. The mitigation measures outlined in this report will be refined in greater detail as the Detail Design is developed and assessed in a subsequent phase of the project. Specific environmental controls based on these detailed mitigation measures will then be included in the contract documents to address specific environmental and operational concerns during the preparation of the contact documents in the Detail Design phase.

8.1 NATURAL ENVIRONMENT

As discussed in **Chapter 7**, two bridge twinning design options and two access options to the east side of the Credit River Valley are being carried forward to Detail Design:

Bridge Twinning Design Options

- Option 1: Steel Girder Bridge; and
- Option 2: Concrete Segmental Box Girder Bridge.

Access Options

- East Access Road
- Temporary Bridge

The potential impacts of all of the design and access options have been considered to the extent possible given the level of design information available at this stage. The assessment of temporary and permanent impacts will be confirmed at Detail Design, once details regarding design and construction access have been fully developed.

8.1.1 Terrestrial Ecosystems

8.1.1.1 Potential Impacts

The following section describes the direct and indirect impacts to vegetation, wildlife and wildlife habitat as a result of the proposed works.

Vegetation – Direct Impacts

Temporary

Several vegetation communities will be directly impacted by temporary construction works. Temporary construction impacts primarily affect vegetation communities associated with the Credit River Valley. All affected vegetation communities within the Credit River Valley are part of the Credit River Coastal Marsh ANSI and the Stavebank Oakwoods ESA. These temporary impacts are required to facilitate construction of the new bridge. Following completion of construction activities, these areas will be restored to match, as closely as possible, the pre-construction conditions (ex. through re-vegetation, re-stabilization, etc.).

Temporary construction impacts for the two bridge options are similar from a vegetation perspective, and therefore a combined assessment of impacts is presented below, with differences noted. The specific location and extent of the vegetation disturbances will also vary depending on the ultimate selection of the preferred construction access option (i.e., east access road or temporary bridge). This impact assessment will be refined during Detail Design once the preferred bridge and construction access options have been selected and more detailed design information is available.

Anticipated temporary impacts include:

- If Option 1 (Steel Girder Bridge) is selected, extension of the existing access road to the river edge will be required, resulting in temporary removal of a portion of the Unit 2b Dry-Fresh Oak Deciduous Forest vegetation community on the west side of the valley. If Option 2 (Concrete Segmental Box Girder Bridge) is selected, the existing access road will be widened to 8 m and will curve to the south, possibly only requiring encroachment into the south edge of Unit 2b. Unit 2b is a relatively small patch of deciduous forest vegetation isolated between two maintained utility corridors. The magnitude of impacts to this community is anticipated to be larger for the extension of the existing access road associated with Option 1 (Steel Girder Bridge).
- If Option 1 (Steel Girder Bridge) is selected, temporary removal of the south half of the Unit 2d Pondweed Submerged Shallow Aquatic vegetation community located along the west bank of the Credit River is required within the temporary crane pad footprint. A slightly smaller portion of this feature will be disturbed for construction of the west pier footing of both design options, regardless of construction access. This is the only submergent vegetation community present within the immediate vicinity of the Credit River Bridge. The community is dominated by the regionally

rare Flatstem Pondweed. This community is considered part of the Credit River Marshes PSW complex.

- Temporary removal of vegetation from the Unit 2e Cultural Meadow/Meadow Marsh mosaic located along the west bank of the Credit River to facilitate placement of the proposed crane pad (Option 1) and installation of the bridge pier footings (Options 1 and 2). The magnitude of impacts to this community will vary slightly depending on which design and construction options are selected. This community is part of the Credit River Marshes PSW complex.
- Temporary removal of vegetation from the south portion of Unit 2l (Reed Canary Grass Meadow Marsh) and Unit 2h (Cattail Mineral Shallow Marsh) to facilitate placement of the crane pad or laydown area (Option 1) on the east bank of the Credit River. The affected area will vary slightly depending on which options are selected during Detail Design. This community is part of the Credit River Marshes PSW complex.
- If the east valley access road is required, additional temporary removal from the south edge of Unit 2i (and possibly other vegetation communities) will be required.

Permanent

The shifting of the existing QEW to the north will result in the permanent removal of vegetation from cultural vegetation community types (Cultural Meadow, Cultural Thicket, Cultural Savannah, Cultural Woodland and hedgerows) along the tablelands east and west of the Credit River Valley to accommodate the expanded footprint of the highway. Within the Credit River Valley, permanent footprint impacts are restricted to removal of cultural woodland vegetation along the east and west valley slopes, and minor permanent removal from disturbed portions of the floodplain wetland associated with the cross-section of the bridge piers at the west bank of the Credit River. All vegetation communities that will be directly impacted by permanent removals are disturbed and culturally influenced, and are generally dominated by disturbance tolerant species.

Direct permanent footprint impacts to vegetation communities resulting from construction of the Recommended Plan will include:

- Removal of the entire Unit 1c Cultural Savannah to facilitate construction of a SWM pond at this location.
- Removal of a portion of the Unit 1e Cultural Woodland located at the SE quadrant of QEW Mississauga Road Interchange to facilitate construction of a new Mississauga Road on-ramp. The new ramp will bisect the existing community. Although this unit is not considered significant or sensitive from an ecological perspective, residents on Kedleston Way have indicated, during consultation, that the mature trees occurring in this location are highly valued from a visual/aesthetic perspective. This is discussed further in **Section 8.2.2**, Community Features.
- Removal of a portion of the Unit 1b Cultural Thicket to facilitate replacement of the existing Mississauga Road overpass structure and widening of the existing QEW

highway to the north. This community has been partially removed during the recent construction of the valley access road for the Holding Strategy.

- Removal of vegetation from the edge of the Unit 1c (Cultural Woodland) and Unit 1a (Cultural Meadow) to facilitate shifting the existing QEW to the north. These communities have been partially removed during the recent construction of the valley access road for the Holding Strategy.
- Removal of Cultural Woodland vegetation from Unit 2c along the east and west Credit River Valley slopes associated with the footprint of the new Credit River Bridge. The portion of this community located on the west valley slope was entirely removed during the construction of the valley access road. Unit 2c is located within the Stavebank Oakwoods ESA.
- Removal of a portion of the mosaic of Cultural Meadow/Meadow Marsh vegetation from Unit 2e. This unit is part of the Credit River Marshes PSW complex. Permanent removal from this community will be restricted to the combined cross-sectional area of the new Credit River Bridge piers (as the pier footings will be buried). The impacts to the other vegetation areas under the bridge should be temporary given the height of the new structure. The total area of PSW removal will be determined during the Detail Design phase once the bridge option is finalized, and will be minimized as much as possible. This portion of the PSW is moderately disturbed and is comprised of tolerant facultative wetland species (i.e. Reed Canary Grass and Common Reed) with old-field meadow species (i.e. Canada Goldenrod).
- Removal of a portion of the Unit 2i Cultural Thicket to facilitate construction of a SWM dry pond at this location. This community is located within the Stavebank Oakwoods ESA but is a cultural disturbed community associated with an existing maintained utility corridor right-of-way.
- Removal of Unit 3b Cultural Woodland vegetation and associated Stavebank Creek riparian zone vegetation to facilitate widening of the existing QEW to the north at this location.
- Removal of the entire Unit 4c hedgerow located south of Premium Way. Partial removal of the Unit 4c hedgerow along the north side of Premium Way at this location may also be required. Although Unit 4c is not considered significant or sensitive from an ecological perspective, residents in the Dickson Road / Dickson Park Crescent area have indicated, during consultation, that the vegetation occurring along the north and south sides of Premium Way is highly valued from a visual / aesthetic perspective. This is discussed further in **Section 8.2.2**, Community Features.

Vegetation – Indirect Impacts

The proposed improvements may also have indirect impacts on the adjacent vegetation communities. Potential indirect impacts to wetland and other adjacent vegetation features that may occur during and following the construction period include:

- Release of construction-generated sediment to vegetated areas.

- Vegetation clearing/damage beyond the working area.
- Spills of contaminants, fuels and other materials that may reach natural areas.
- Stress or potential dieback as a result of grading (cutting or filling) activity into the root zones of adjacent vegetation.
- Salt runoff and salt spray into vegetated areas may cause loss of vegetation vigour and in extreme cases, vegetation dieback, and spread of salt tolerant flora (halophytes).
- Changes in drainage patterns (groundwater and/or surface runoff flow) that can impact dependant vegetation/wetland areas located either upgradient or downgradient of the right-of-way.

However since this project is comprised of changes to an existing facility, most indirect impacts will be limited to edge areas that are generally tolerant and have already been disturbed by the existing highway construction, maintenance and road operations. Therefore, potential indirect impacts can typically be managed through implementation of standard and site-specific mitigation construction measures (see **Section 8.1.1.2**).

Indirect impacts resulting from the construction of the temporary access road have the potential to impact more natural vegetation communities further from the existing QEW, specifically any remaining portions of Unit 2b. These impacts will also be managed through standard and site-specific mitigation measures (see **Section 8.1.1.2**).

Wildlife and Wildlife Habitat – Direct Impacts

Temporary

Based on the Recommended Plan, most of the expected direct impacts to wildlife and wildlife habitat will be temporary in nature during the construction phase of the project. Temporary construction impacts for the two bridge options being carried forward are generally similar from a wildlife perspective, and therefore a combined assessment of impacts is presented below, with differences noted. The impact assessment will be refined during Detail Design once the preferred bridge option has been selected and more detailed design information is available. The determination as to whether a temporary bridge or east slope access road is used will result in minor differences to temporary wildlife and habitat impacts.

The temporary intrusion into small portions of the Credit River Marshes PSW Complex in the NW and NE quadrants of the bridge for the temporary crane pads or laydown areas, construction access, and the construction zones for the footings will temporarily impact wildlife habitat. This impact will be greater for Option 1 (Steel Girder Bridge) as only Option 1 involves the placement of temporary crane pads. The crane pads and laydown/staging areas will be comprised of granular fill that will be removed following completion of construction activities, enabling restoration of these areas. The exact extent of the temporary impacts will vary slightly depending on which design and construction access options are selected during Detail Design.

Temporary – Northwest Quadrant

The temporary construction areas (crane pads or staging areas, access road and footing construction zones) in the NW quadrant will temporarily remove a portion of Cultural Meadow/Meadow Marsh mosaic (Units 2e and 2d). These temporary construction requirements will also extend slightly into the Credit River channel. Minor removal of small portions of amphibian habitat along the river edge and in the shallow aquatic habitat of Unit 2d will occur (i.e., habitat for common species such as Northern Leopard Frog, American Toad), however there is abundant habitat present for these species throughout the project area and beyond, within the Credit River Marshes complex.

No turtle hibernation or nesting habitat potential is known in the NW quadrant; although basking Northern Map Turtles (Special Concern) and Midland Painted Turtles have been observed during field surveys on small rocks located in the channel adjacent to the shoreline in this location. Some of these areas may be temporarily disturbed during construction works. However, more suitable basking opportunities exist north and south of the Credit River Bridge that will not be impacted by construction (i.e., fallen trees, logs, sandy bars, etc.).

River Bluet was observed in both the NW and NE quadrants of the project area. This species is restricted to streams and rivers, and feeds on a variety of aquatic insects, using vegetation as breeding sites. Some minor temporary removal of suitable vegetation will occur as a result of the construction/access requirements, however the habitat impacts will be temporary as river edge habitat will re-establish following construction (see **Section 8.1.1.2**). Furthermore, this species is rapidly colonizing riparian areas in southern Ontario and it seems likely that River Bluet is fairly common and widespread within the general vicinity of the bridge including adjacent, suitable habitats.

Temporary – Northeast Quadrant

The temporary construction access requirements (crane pads or laydown areas, access road or temporary bridge) in the NE quadrant will temporarily remove a portion of wetland habitat. The crane pads, if Option 1 (Steel Girder Bridge) is selected, will extend into the Credit River channel, however there are no specific wildlife habitat functions associated with this zone of the river.

From a wildlife habitat perspective, this quadrant is considered the most sensitive community of the two north quadrants. The Cattail Shallow Marsh (Unit 2h), located in a depression along the edge of the floodplain, at the base of the valley slope, appears to provide potential hibernation habitat for Snapping Turtles (Special Concern). Three adults were observed in this marsh during early spring field surveys from 2011-2012, indicating possible hibernation emergence from this location. Efforts should be made to avoid this area if at all possible. However, given the presence of the large coastal cattail marshes along the Credit River shoreline,

particularly south of the bridge, suitable hibernation habitat for Snapping Turtle is assumed to be prevalent in the broader area. Removal of portions of this cattail marsh will also result in temporary removal of amphibian breeding habitat for anuran species such as American Toad and Northern Leopard Frog (amphibian egg sacs were observed during spring field visits but were not identified to species).

Temporary removal of portions of the Reed Canary Grass Mineral Shallow Marsh (Unit 2l) will also result in removal of general amphibian habitat for common anuran species such as American Toad and Northern Leopard Frog, as well as snake species such as Dekay's Brownsnake and Eastern Gartersnake that were observed during field surveys.

One juvenile Northern Map Turtle was observed during field surveys in late summer, basking on a small tree branch located in the channel adjacent to the shoreline in an area that will be disturbed by construction works. However, more suitable basking opportunities for Northern Map Turtle, which will not be impacted by construction, exist north and south of the QEW bridge where the majority were observed by field staff (i.e., fallen trees, logs, sandy bars, etc.).

Temporary – QEW Bridge Rehabilitation Works

Temporary impacts to breeding birds that are known to use the QEW Credit River Bridge for nesting will occur during the construction phase of the proposed bridge works. Field surveys from 2010/2012 confirmed nesting evidence on the bridge structure for Northern Rough-winged Swallow, Cliff Swallow, House Sparrow, and European Starling. In addition, Eastern Phoebe may use this structure for nesting, based on behaviour noted by individuals observed in close vicinity to the bridge. None of these species are considered Species of Conservation Concern.

While suitable nesting habitat for Barn Swallows (Threatened) is present on the bridge structure, and individuals were observed on numerous occasions foraging with other swallows along the Credit River channel in close proximity to the bridge, no nests were observed on the bridge structure. Other study teams conducting environmental site inspections for the current bridge Holding Strategy have also confirmed absence of nesting Barn Swallow on the existing bridge (S. Merriam, MTO, pers. comm., June 1, 2012). Nonetheless, since this species is known to commonly nest under bridges, the possibility of Barn Swallow nesting on this structure in the future should not be ruled out. As discussed further in **Section 8.1.1.2**, the Migratory Bird Convention Act precludes impacts to migratory birds or their active nests. It should be noted that the ultimate twinning of the Credit River Bridge will result in a net benefit for nesting migratory birds, including potentially Barn Swallow, through creation of additional nesting habitat surface area.

Permanent

As noted above, based on the Recommended Plan, permanent impacts to wildlife and wildlife habitat will be localized in extent and intensity for the most part; most of the expected direct impacts to wildlife and wildlife habitat will be temporary in nature during the construction phase of the project.

Permanent construction impacts for the two bridge design options being carried forward are similar from a wildlife perspective, and therefore a combined assessment of impacts is presented below, with differences noted. There will be some differences depending on whether a temporary access road down the east slope or a temporary bridge across the river is used. The impact assessment will be refined during Detail Design once the preferred bridge design and construction access options have been selected and more detailed design information is available.

The piers for both bridge options will be placed near the vegetated river banks immediately north of the existing bridge, permanently removing very small portions of meadow/wetland/cultural woodland habitat within the Credit River Marshes PSW.

Transparent noise walls are proposed on the Credit River Bridge (see **Section 8.2.3**) for noise mitigation. Transparent noise barriers have been recommended to preserve the Credit River Valley view and to avoid distracting from the heritage features of the existing bridge. Specific elements to make the barriers visible to birds (e.g., avoiding large sheets of transparent material, having regular and closely spaced vertical 'strapping' between the transparent sheets, and wire mesh embedded in the glass) is recommended and many of these design elements are already incorporated into the manufacturer's noise barrier system. The crash resistant horizontal rails will also form a visual deterrent for birds.

Permanent – Northwest Quadrant

In the NW quadrant, installing the piers in the cultural meadow/meadow marsh habitat will remove very minor portions of potential habitat for common amphibian species such as American Toad and Northern Leopard Frog, however, impacts will be minimal.

As noted previously, River Bluet (S2) was observed in both the NW and NE quadrants of the project area. This species is restricted to streams and rivers, and feeds on a variety of aquatic insects, using vegetation as breeding sites. Small areas of this vegetation may be permanently removed for the portions of the piers closest to the river, however, as noted, this species is rapidly colonizing riparian areas in southern Ontario and it seems likely that River Bluet is fairly common and widespread within the general vicinity of the bridge, based on the habitat present through the crossing reach as well as up and downstream.

Eastern Red-backed Salamander was noted under man-made cover material found under the span of the existing Credit River Bridge in the NW quadrant. This species tends to prefer a wide range of forest conditions and is not considered at-risk. It is

not expected to be present within the area of impact, however as no cover materials were present in this location during field surveys.

Permanent – Northeast Quadrant

In the NE quadrant, the placement of the piers will result in removal of disturbed cultural habitat comprised of deciduous landscaped trees (i.e., willow, cedar) and manicured lawn adjacent to the shoreline within the limits of a residential property. Removal of these large trees may remove potential nesting habitat for some avian species, although no nests were observed during field surveys. Suitable habitat for Eastern Milksnake and Eastern Ribbonsnake within the anthropogenic and/or marsh edges is present in the NE quadrant and within the project area, generally. Direct impacts to either of these two SAR species is not expected to occur as a result of the proposed temporary and permanent works as no hibernation or gestation habitat is believed to be present within the construction footprint. Being shy creatures by nature, any basking individuals will quickly remove themselves from the area if they were disturbed. Given that the proposed works within the wetland habitat in the NE quadrant will be temporary, it is expected they would return to the area after the temporary works cease and the habitats are restored.

Permanent – Stormwater Management Ponds

A 'wet' SWM pond is proposed on the west side of the project area limits north of the QEW within the Mississauga Road Interchange (see **Section 8.1.3**). This pond will require removal of Cultural Savannah (Unit 1c) vegetation present in this location. This small, isolated area has been previously culturally disturbed and is surrounded on all sides by the interchange and QEW, which experiences high traffic flow on a daily basis. Wildlife habitat quality is typically lower in the vicinity of highway corridors, particularly with elevated traffic volumes. Moreover, this community is adjacent to urban residential and recreational lands which are already highly disturbed. The highway interchange ramp encircling this community presents a significant barrier to wildlife movement. Any species that may be using habitat at this location are expected to be very tolerant and common generalist species. Removal of this community is not expected to have long-term negative impacts on wildlife or wildlife habitat.

A 'dry' SWM pond is also proposed on the east side of the valley north of the QEW within the NE quadrant (see **Section 8.1.3**). This pond will be perched on the east valley tableland, and will permanently remove a portion of the existing maintained hydro corridor as well as portions of the cultural thicket (Unit 2i) and adjacent residential trees/shrub communities. Given this area is already heavily impacted by cultural disturbances, only minor impacts on wildlife habitat are expected. Eastern Gartersnake has been observed basking within the cultural woodland and hydro corridor, however habitat is present within the broader project area for this species and other common wildlife confirmed present in this area. Avifauna noted within this

location are all disturbance tolerant species (i.e., Northern Cardinal, American Robin, European Starling).

Wildlife and Wildlife Habitat – Indirect Impacts

Wildlife habitat quality is typically lower in the vicinity of highway corridors, particularly those with high traffic volumes. Although wildlife in the area is already adapted to the presence of the existing highway, the construction of the north twinning lanes and new bridge will incrementally extend indirect effects beyond the ROW.

Potential construction disturbances and noise will tend to displace wildlife temporarily during the construction period, and increased traffic and associated noise may also increase local disturbance of wildlife such as breeding birds and amphibians within the "road effect zone" (see Forman et al. 2003). However, for most of the alignment, these effects are already present along the existing highway.

Potential for other indirect impacts to habitat occurs in relation to potential changes such as alteration of local drainage patterns that may alter affect associated local amphibian breeding habitats, however for the most part these impacts are expected to be nominal since the wetland hydrology is dominated by the Credit River.

8.1.1.2 Mitigation Measures

The impacts to vegetation and wildlife habitat associated with the proposed highway works have been minimized to the extent possible through the process of choosing the Recommended Plan. This process of avoiding or reducing impacts continued through Preliminary Design, with the incorporation of feasible design measures. For example, constructing the footings below ground surface was incorporated in the design to minimize the above ground impacts and avoid the river bed permanent footprint impacts. Further refinements during Detail Design may be possible to further reduce local effects on vegetation, wildlife and habitat, where the specific characteristics of these features warrant.

Another key design-related component is restoration of the temporarily disturbed areas following construction to conditions that are as close to pre-construction conditions as feasible and reasonable. Specific restoration aspects are discussed below.

Various construction mitigation measures to avoid or minimize construction-related impacts are also outlined below. One important overall consideration is ensuring the recommended measures are implemented properly during construction. An Environmental Inspector will be retained to undertake general on-site environmental inspection throughout construction, with specific monitoring during key phases (e.g., in-water works, works in or near wetlands) to ensure environmental design, protection and restoration measures are implemented, maintained and repaired and any remedial measures instigated where warranted. The Contract Administrator is ultimately responsible for ensuring that appropriate measures are implemented and that immediate action is taken to correct any environmental concerns.

Prior to the commencement of construction works, a pre-construction briefing session with the Contractor, Construction Supervisors, Environmental Inspector and applicable

Government Agency representatives should occur to discuss all aspects of construction works as well as protection and mitigation measures, and to clarify contract proposals in the event of issues that may arise.

These measures will be further developed and finalized in conjunction with the development of the Detail Design. Agency review and input will be integrated into developing and finalizing these measures. Ultimately, all of the final mitigation measures will be included in the Contract documents for implementation during construction.

The following suite of mitigation measures is recommended for incorporation and refinement during the development of the Detail Design in order to minimize the potential direct and indirect effects of the project on terrestrial features. In some cases, these measures may be superseded by new or refined measures or techniques as time passes. Consequently, the most current measures and Best Management Practices (BMPs) available at the time of construction should be implemented.

Vegetation and Associated Wildlife Habitat

Site Specific Mitigation Measures

In addition to the standard mitigation measures identified, the following site specific mitigation measures are recommended to further minimize impacts of the proposed works to vegetation communities and associated wildlife habitat:

- Habitat Protection Measures

  Temporary vegetation protection fencing will be installed around those portions of Unit 1c, 1e (portion located at southeast quadrant of QEW and Mississauga Road), 2b, 2i, 2h and 4c that are to be retained (as well as any additional areas that may be identified during the Detail Design work). This fencing will be shown on the Contract drawings once the construction limits are finalized.

- Wetland Habitat Restoration Measures

  In general, given the tolerant nature of the majority of the affected types of wetland, with the general exception of Unit 2d, the Pondweed Submerged Shallow Aquatic community, wetland plants can be expected to re-colonize those areas that are disturbed during construction provided physical site conditions are re-instated (e.g., local topography, drainage, substrates). Furthermore, given the presence of the large coastal marshes along the Credit River shoreline, particularly south of the bridge, the small areas of wetland affected will not reduce overall habitat function within the general area.

  Nonetheless, to expedite the re-establishment of the affected features and encourage re-introduction of the pre-construction species assemblage, specific measures that incorporate salvage and re-instatement of existing materials are recommended below.

  Reasonable opportunities to enhance or expand the disturbed wetland areas should be examined during Detail Design, for example by enhancing/adding specific habitat

elements such as nesting, perching, basking and cover structures, and increasing species, micro-topography and micro-habitat diversity.

i) Unit 2d Pondweed Submerged Shallow Aquatic Community:

During Detail Design, a plan will be developed to restore this community. This plan may include salvage and re-instating the existing (or similar) bed materials above the material backfilled over the new footings. Depending on timing, it may be feasible to retain a viable seedbank and/or root mats in the salvaged bed materials. If salvage of existing plant material is not feasible, planting of appropriately sourced plugs of weed free, local and native submergent vegetation plugs may be considered. Re-inoculation of bed materials using material from the retained portion of the community may also be an option. In time, vegetation would also be expected to re-colonize the substrates on its own.

ii) Unit 2h Cattail Shallow Marsh and Units 2e/2l Reed Canary Grass Meadow Marsh Vegetation:

Portions of the Unit 2e, 2l and 2h floodplain vegetation communities impacted by temporary construction works will be restored as close to pre-construction conditions as feasible. These vegetation community types are common and are generally tolerant of moderate levels of disturbance, and these communities may spontaneously recolonize impacted areas relatively quickly following cessation of disturbance provided the substrate materials and local topography (especially the depressional topography at 2h) are re-instated. However, restoration can be expedited and enhanced through use of seedbank and root mat salvage and re-instatement and/or planting or seeding an appropriate native mix of wetland species.

The pre-construction topography will be surveyed in Unit 2h prior to construction to enable reinstatement following removal of the crane pads or laydown areas. Substrate conditions will also be documented in detail to enable replacement, or materials excavated and stored properly for reinstatement. These aspects are also important to specific habitat functions that appear to be associated with this wetland area, specifically potential hibernation habitat for Snapping Turtle and habitat for semi-terrestrial crayfish both of which are potential Significant Wildlife Habitat (MNR 2000). Analysis of structure alternatives and associated construction requirements should integrate consideration of the status of Wetland Units 2h and 2l as potential SWH and avoid or minimize impacts to the extent possible.

Site specific mitigation measures will be reviewed, confirmed and further detailed during the Detail Design phase once the preferred bridge design and construction access options have been finalized by appropriate technical specialists in consultation with agency staff, as relevant.

Standard Construction Mitigation Measures

Recommended standard mitigation measures to minimize effects to the local vegetation communities and their associated habitat functions include:

- Install temporary erosion and sediment control measures prior to construction, and maintain throughout construction in accordance with Ontario Provincial Standard Specification (OPSS) 805.
- Routinely inspect sediment and erosion control structures, including after storms, and repair as required.
- Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation seed mix and plantings (or other specific techniques as outlined) appropriate to the project area (as determined in Detail Design).
- Clearly delineate right-of-way vegetation clearing zones and vegetation retention zones both on the construction drawings and in the field to confirm with the contractor prior to clearing and grading. Equipment, materials and other construction activities will not be permitted in these zones.
- Conduct vegetation removal and protection measures in accordance with OPSS 201 (tree clearing) and OPSS 801 (tree protection). Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (i.e. temporary fencing).
- Trees to be removed will be felled into the highway right-of-way and away from vegetation located outside of the right-of-way and any nearby aquatic habitat resources to avoid disturbance to these features.
- Tree grubbing will be restricted to the required activity zone.
- Undertake hazard tree management assessment during Detail Design once final grading requirements are confirmed.
- Ensure appropriate clearing and disposal of all construction-related debris following construction in accordance with OPSS 180.
- Employ proper handling of potentially toxic construction materials and ensure proper spills prevention and management measures are in place throughout construction.
- Unnecessary traffic, dumping and storage of materials over tree roots will be avoided.
- In dust-sensitive areas, dust will be controlled through the use of water or calcium chloride.
- Vehicle maintenance and fuelling will be carried out at the maintenance areas in the works yards or at commercial garages whenever possible.

Wildlife

In addition to protecting vegetation and aquatic habitat, which in turn protects the associated wildlife habitat functions, it is necessary to ensure the protection of breeding birds, as well as wildlife generally that may nest or otherwise use areas where construction is proposed. Other wildlife of interest in the project area that warrant specific protection attention include herpetofauna.

Migratory Birds

As noted, nesting migratory birds are protected under the Migratory Birds Convention Act (MBCA 1994). No work is permitted to proceed that would result in the destruction of active nests (nests with eggs or young birds), or the wounding or killing of birds, of species protected under the Migratory Birds Convention Act, 1994 and/or Regulations under that Act.

In order to protect nesting migratory birds, in accordance with the Migratory Birds Convention Act (MBCA), the following guidance is suggested, and should be utilized in the Operational Constraint wording:

- Ensure that timing constraints are applied to avoid vegetation clearing (including grubbing) and/or structure works (construction, maintenance) during the breeding bird season [approximately April to August; to be confirmed during Detail Design based on current MTO Central Region standards (based on Canada Wildlife Service - Environment Canada guidance)]. It should be noted that occasionally bird species will precede or exceed the approximate breeding bird season window.
- The Contractor shall not destroy active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the Provincial Endangered Act (ESA 2007). When these nests are encountered the Contractor Administrator must be contacted.
- The structures will be monitored and inspected to ensure no migratory birds nest on them prior to structure works, or the structure being removed.
- Additional exclusionary measures may be implemented (e.g., netting or tarping of bridge) if construction cannot commence prior to May 1.
- If a nesting migratory bird (or SAR protected under ESA 2007) is identified within or adjacent to the construction site and the construction activities are such that continuing construction in that area would result in a contravention of the Migratory Birds Convention Act, or ESA (2007), all activities will stop and MNR and Environment Canada will be contacted to discuss mitigation options.
- Additional/modified measures may be required for any SAR (including Barn Swallow if future nesting surveys confirm nesting activity) and will be determined on a case-by-case basis through consultation with MNR.

Note: As of January 14, 2012, Barn Swallow has been listed as Threatened and protected under the provincial Endangered Species Act (ESA 2007). Barn Swallows nest on and within roadway structures (such as culverts, bridges) as well as suitable building sites

(typically older structures, barns, etc.). It will reuse nests from previous years. A Letter of Advice for Barn Swallow (dated April 23, 2012) has been prepared by MNR specifically for MTO projects to guide MTO as to how clearing or other activities will be dealt with by MNR under the ESA in relation to Barn Swallows. This document should be referred to if Barn Swallows are determined subsequently to be nesting on the bridge.

Other Wildlife

The following measures are recommended for the general protection of wildlife:

- Wetland Unit 2h should not be disturbed after mid-September through April to protect any turtles that may be hibernating in this feature. Alternatively, if installation of the crane pad/staging area is required during the winter, exclusion fencing could be erected around this feature prior to the end of August to prevent access of turtles to hibernate. Minimize the construction footprint to the extent possible considering that this area is identified as candidate Significant Wildlife Habitat.
- In the event that an animal encountered during construction does not move from the construction zone and construction activities are such that continuing construction in the area would result in harm to the animal, all activities will stop and the Contract Administrator will be notified. In particular, the contractor will notify the Contract Administrator immediately if any turtles or other reptiles are found in the construction area.
- 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. The Contract Administrator will then contact the MNR SAR Biologist for direction, as these animals are protected under the ESA (2007).
- Development of a Contractor awareness programme during Detail Design should be considered to ensure the Contractor is aware of wildlife and habitat sensitivities and associated requirements for protection and agency consultation. Such a programme may include a pre-construction start-up meeting, which agency staff may wish to attend.
- All required permits for wildlife handling, including fish rescue, will be obtained and posted on site prior to engaging in such activities and all associated conditions strictly adhered to.
- MNR and CVC will be consulted during the Detail Design phase to develop the details of such mitigation measures (i.e., timing windows in relation to habitat intrusion, exclusion fencing, handling and relocation protocols, construction protocols, Contractor awareness) as well as the habitat restoration plans.
- Temporary impacts to amphibian habitat will be managed with the implementation of the vegetation and watercourse mitigation measures and following completion of construction activities, will be restored to a condition resembling existing conditions.

- Given the presence of the large coastal cattail marshes along the Credit River shoreline, particularly south of the bridge, suitable hibernation habitat for Snapping Turtle is assumed to be prevalent in the broader area.

Employing the strategies outlined will minimize direct impacts to vegetation and wildlife habitat features, and protect adjacent vegetation and wildlife habitat features from potential indirect impacts, during and following construction.

8.1.2 Fish and Fish Habitat

8.1.2.1 Potential Impacts

The following section describes the direct and potential indirect impacts to fisheries and/or aquatic habitat as a result of the proposed works.

Credit River

Existing Bridge

It is anticipated that the Contractor will use a temporary bridge or temporary trestle to access the piers during construction. Erection of a temporary work platform will also be required near the base of the pier as well as a scaffolding system/platform for access and to contain debris. The pier rehabilitation works will not require in-water works however, installing the temporary bridge or temporary trestle from the east bank to access the pier may entail some disturbance of the river bed and possible mobilization of fine substrate materials. However, the substrates on the east side are generally coarse and subject to regular scouring, so any impacts should be localized and temporary. The rehabilitation works could potentially involve debris entry into the river however, this can be managed with implementation of appropriate containment systems.

The deck replacement will include the reconfiguration of the deck drains to eliminate road runoff draining directly to the Credit River (i.e., 12 of the 18 existing deck drains currently drain to the river). Deck drains over the valley will still be required since the slope of the existing bridge is not sufficient to direct flows to the new stormwater management (SWM) facility proposed for the northeast quadrant. The number of deck drains will be determined during Detail Design. An assessment of the need for drain discharge disbursement or valley protection/splash pads will be undertaken in Detail Design.

Field staff did not note any evidence of scour in the valley under the existing deck drains. The potential need for splash pads will be determined based on the final deck drain number and configuration in Detail Design.

New Bridge – Construction Access

It has been assumed that the access road constructed on the west side of the valley to implement the Rehabilitation Holding Strategy, will be used during the future construction of the new bridge. A new access road may also be required on the east side of the valley. Alternatively, given the east valley face is very steep and higher than the west face,

installation of a temporary bridge over the Credit River may also be a feasible construction access option in order to avoid the significant cuts/re-grading that would be required on the east valley slope (i.e., the temporary bridge would be accessed via the existing west access road).

CVC has indicated that they would be amendable to reviewing further details of a temporary construction access bridge crossing in Detail Design given the significant construction implications of an access road on the east valley face. If a temporary bridge option is pursued, it is expected that there will be some localized temporary impacts associated with its construction (i.e., footings on the river bed, localized disturbance of riparian vegetation). The design and duration of the use of the temporary bridge will require specific consideration of flow conditions and whether or not the bridge will stay in place over the winter. These and any other relevant design aspects will be considered in the impact assessment that will be undertaken during Detail Design, if this option is pursued.

New Bridge – Construction of Footings

Both bridge design options have been designed such that the above ground structural components fully span the bankfull channel. However, although the pier shafts are set back from the bankfull channel, the north end of the west pier footing encroaches into the bankfull channel, and the south end of the east footing will be very close to the bankfull channel. The portion of the west pier footing in-water/under the bed is similar for both options, but is nominally larger for Option 2 (Concrete Segmental Box Girder Bridge).

In order to construct the new piers/footings, a temporary containment/cofferdam system will be used to surround and isolate the construction zones from the river. Cofferdam type and any associated potential impacts will be determined during Detail Design. Since the east pier footing is located very close to the bankfull channel, the temporary construction containment/cofferdam may extend into the water's edge very slightly. The encroachment and associated temporary excavation and disturbance to install the west footing will be somewhat larger. Substrate will then be re-instated over the footing and the bank restored, so that there is no permanent change to the existing bankfull channel profile.

It is also possible, depending on the final pier design that rock protection may be required, a portion of which may encroach into the bankfull channel. The extent and nature of the rock protection and any associated potential impacts will be determined during the Detail Design. Any impacts should be localized and for the most part should be temporary, provided the rock protection can be inset to match the profile of the existing bank.

New Bridge – Construction Staging Areas

The two design options vary slightly in the physical design/footprint of the piers, and the west pier footing of Option 2 (Concrete Segmental Box Girder Bridge) has slightly more encroachment (subsurface) into the channel than Option 1 (Steel Girder Bridge). These differences and those associated with construction staging are not anticipated to have any significant implications on the river. The key difference between the two options is the need for crane pads within the valley and in the water. Option 1 (Steel Girder Bridge) will require

construction of a temporary rock crane pad on both sides of the river in order to erect the steel girders. These crane pads will encroach well into the bankfull channel, which may have erosion implications as a result of temporary changes to the flow path, particularly on the east side of the river. The crane pads and their implications are discussed further below.

Option 2 (Concrete Segmental Box Girder Bridge) is not likely to require temporary crane pads, but rather, laydown/staging areas on the east and west sides of the river. These staging areas are smaller than the crane pads and are located back from the active channel of the river.

The crane pads or construction staging/laydown areas are expected to be required for a period of approximately two years.

New Bridge – Potential Impacts to Fish and Fish Habitat

As discussed in **Section 4.1.5**, the aquatic habitat conditions in the immediate vicinity of the new bridge crossing are not particularly sensitive. No specialized functions were identified, and in general, the habitat conditions are well represented along these reaches of the river. Habitat conditions are dominated by flat morphology. Substrates in the vicinity of the new west pier are gravel dominant (65%) with rubble (20%), sand (10%) and silt (5%). The finer component of the substrates in the depositional edge zones and along the west side of the river will be susceptible to mobilization and downstream transport if poor construction or restoration techniques are used; potential implications of the crane pads are discussed further below.

While these reaches support a diverse warmwater community and are part of a migratory corridor for salmonids, no spawning areas have been identified by CVC or the project team. As previously noted, migratory salmonids (Coho Salmon, Chinook Salmon, Rainbow Trout and Brown Trout) move through the crossing area to spawn in more suitable areas upstream. No fish species of conservation concern are known to occur in the vicinity of the bridge structure.

Direct impacts of the bridge works will also include localized and primarily temporary, removal or disturbance of riparian vegetation during construction, and specifically for the crane pads and/or staging/laydown and access areas. Only small areas of vegetation will be permanently removed by the new piers. Although there may be some shading impacts under the new bridge, the bridge is very high and there is reasonable growth under the existing bridge. The majority of the disturbed riparian vegetation is comprised of common, hardy species that can be re-instated following construction or will re-colonize naturally from the adjacent retained areas.

Riparian vegetation along the west bank that will be disturbed/ removed is comprised of Reed Canary Grass, cattail, sedge *spp.*, and old field species (golden rod dominant, aster spp., Burdock, Queen Anne's Lace) further back. Riparian vegetation along the east bank is comprised of several overhanging Weeping Willow, locust, White Ash and Manitoba Maple and the lawn/grass associated with the residential lot, as well as predominantly Reed Canary

Grass meadow marsh that extends from the bridge upstream along the bank and nearshore zone.

In both bridge design options, the temporary crane pad and/or laydown area on the east side of the river will also encroach into the south portion of the backwater wetland area along the base of the valley slope and will be placed over the high water/seasonal swale that connects this feature to the river. The work areas can be expected to compress underlying substrates, especially in the seasonally saturated wetland area where materials are soft and fine.

The west pier footing construction, as well as an additional area for the crane pad required for Option 1 (Steel Girder Bridge) will also disturb a portion of the submergent macrophyte instream cover associated with the depositional backwater habitat area in the west nearshore zone. As noted, the fine depositional materials that support the submergent vegetation will also be susceptible to compression, as well as mobilization and transport, during the construction, use and removal of the crane pad. Re-instatement of the submergent cover may take longer if the fine depositional materials that support this growth are compressed significantly by the crane pad.

The crane pads required for Option 1 (Steel Girder Bridge) will also entail additional temporary impacts during construction, as outlined below:

- The west crane pad will occupy more of the river bed area and above-noted backwater submergent habitat than the zone disturbed for the footing excavation and installation.
- The east crane pad may extend well out into the river, disturbing more of the river bank and associated meadow marsh riparian habitat than the laydown area for Option 2 (Concrete Segmental Box Girder Bridge). It will also require disturbance of a section of the river bank itself as well as the adjacent river bed. Given the location along the outside of the bend, which is subjected to higher velocities, the bed profile drops off quickly from the bank and substrates are generally coarse. Therefore, the bed zone should be less sensitive to compression impacts than on the west side. Re-stabilization of the bank will require careful design and implementation attention to avoid potential future instabilities.
- The required placement of the east crane pad on the bend will also result in deflection of the main flow path (thalweg) of the river, which presently follows the east bank through the river bend and moves through the existing east bridge span. Flow will be deflected toward the middle and west sides of the river and through the west span. The west portion of the channel through the inside of the meander bend is shallow and depositional. Therefore the new flow path will likely result in scouring, mobilization and downstream transport of the fine bed materials during higher flow conditions.

Given that there should be no permanent footprint impacts in the bankfull channel (subject to the design of any rock protection requirements during Detail Design), and the areas of temporary encroachment required to construct the pier footings are small, the post-construction scale of effects of the bridge works is low. With the proper design and

implementation of appropriate mitigation and restoration measures, it should also be feasible to manage the potential for indirect construction related impacts (e.g., potential for erosion and downstream sediment transport, potential for interference with fish migration and sensitive functions). However, the specific construction aspects, specifically pertaining to the use of crane pads and the temporary bridge option, require further review during Detail Design.

The design of Options 1 and 2 and their associated construction requirements, as well as the temporary bridge access option, will be explored further during the Detail Design stage and a preferred option will be chosen. This process will include consideration of the impacts of both Options and possible opportunities to mitigate these impacts. Once the preferred option is selected and the design further developed, the impacts will be further detailed, incorporating design mitigation measures as feasible to minimize impacts to fish and fish habitat.

Unnamed Tributary of Credit River

There are no works proposed at the Unnamed Tributary of Credit River.

Stavebank Creek

The existing concrete box culvert requires a 43 m extension on the north side of the QEW to accommodate the north shift of the highway. This extension includes the replacement of the existing Premium Way culvert, therefore the incremental length of channel enclosed by the culvert extension/replacement will be approximately 23 m.

As noted, there will also be a new 'dry' SWM pond constructed on the east side of Stavebank Creek and north of the new Premium Way alignment. The pond will treat the road runoff from the new bridge and will outlet to Stavebank Creek through an outlet pipe located just upstream of the culvert extension. This is considered an improvement over existing conditions as there are currently no stormwater management measures for the highway or existing bridge.

Direct impacts of the culvert extension (and replacement of the Premium Way culvert) include temporary disturbance and localized removal of riparian vegetation and alteration of the channel banks and bed along the section of the channel that will be enclosed in the culvert extension.

Potential impacts from the SWM dry pond are considered minimal although the outflow from the dry pond outlet will increase the volume of flow in Stavebank Creek. The outflow from the pond will be controlled to ensure no erosion impacts to the creek channel. The release rates will be controlled so that there will be no increase to the 2-year storm runoff, up to the 100-year storm runoff.

The habitat conditions of Stavebank Creek are not particularly sensitive; sections have been straightened/channelized in the past. No specialized habitat features occur and morphology in the affected reaches is dominated by flats with the exception of at pool at the Premium

Way culvert outlet and a few small riffles. Habitat conditions are well represented within the project limits and vicinity. Furthermore, there is no direct fish use in the vicinity of the crossing. The fine substrates in the substrate mix could be susceptible to downstream transport during periods of flow if poor construction or restoration techniques are used however this can be managed with the implementation of proper construction and mitigation measures.

Riparian vegetation that requires removal between the QEW and Premium Way is comprised of grasses and old field species (goldenrod and aster spp., dense Poison Ivy) along the west bank and within the right-of-way of Premium Way along with woody trees and shrubs (White Elm, White Ash, White Pine, Trembling Aspen, Sumac, Manitoba Maple, elderberry). There is also some Jewelweed, Bracken Fern and horsetail along the east bank closer to the QEW that will require removal, and a small amount of cattail and several Red Osier Dogwood that will require removal to extend the culvert upstream of the existing Premium Way.

As noted above, there is no direct fish use in the vicinity of the proposed extension which is likely due to barriers downstream and lack of refuge habitat along the channel. Therefore the new culvert extension does not require specific mitigation measures for fish passage (e.g., substrate with low flow channel). If, at some point in the future the entire culvert is replaced and there is a desire to re-instate opportunities for fish use at least seasonally, culvert design measures could be implemented in combination with downstream rehabilitation efforts to remove the barriers, if feasible.

Potential indirect impacts of the culvert extension include local disruption during culvert installation and potential for erosion and downstream sediment transport during periods of higher flow. These impacts can be managed using appropriate mitigation and restoration measures. Potential indirect habitat effects due to changes in local hydrology are considered nominal given the nature of the works.

Kenolli Creek

The existing QEW concrete box culvert that also extends under Premium Way may require an extension of approximately 3 m on the north side to accommodate the realignment of Premium Way. This will be confirmed during Detail Design.

Direct impacts of the culvert inlet extension include temporary disturbance and nominal localized removal of riparian vegetation and alteration of the channel banks and bed along the short affected section of the watercourse. The new culvert extension will be designed and constructed to avoid any impacts to fish habitat associated with the nominal additional enclosure, and specifically designed to maintain fish movement and habitat opportunities.

The habitat conditions of Kenolli Creek are not particularly sensitive; sections have been straightened/channelized in the past. No specialized habitat features occur and morphology in the affected reaches is flat. Habitat conditions are well represented within the project limits and vicinity. The fine component of the substrate mix could be susceptible to downstream transport during periods of flow if poor construction or restoration techniques

are used however this can be managed with the implementation of proper construction and mitigation measures.

Riparian vegetation that may require removal is comprised of small amounts of Reed Canary Grass, Jewelweed, Spotted Joe-pye Weed and horsetail along the banks of the creek and mowed lawn further back. The creek supports direct fish use in the vicinity of the crossing (Three-spined Stickleback captured by CVC in 2010) and CVC has classified the system as warmwater fish habitat.

Potential indirect impacts of the culvert extension include local disruption during culvert installation and potential for erosion and downstream sediment transport during periods of higher flow. These impacts can be managed using appropriate mitigation and restoration measures. Potential indirect habitat effects due to changes in local hydrology are considered nominal given the minor nature of the works.

8.1.2.2 Design Related Mitigation Measures

The following section outlines the design related and site-specific mitigation measures to avoid impacts on fish and/or fish habitat in the Credit River, Stavebank Creek and Kenolli Creek as a result of the proposed bridge and culvert works. All of these measures will be refined and further developed during Detail Design, once the preferred design and access options are determined and their associated design details developed and assessed in relation to the fish and fish habitat conditions.

Credit River

Existing Bridge

The temporary access trestle or bridge required to access the east pier of the existing bridge for rehabilitation works will be designed to minimize impacts to the river bed and bank. Any areas disturbed during its construction and use will be restored following its removal.

Other than the temporary access requirements, no in-water works are currently anticipated for the rehabilitation, however should this change during Detail Design, these works will be assessed and appropriate measures to protect fish and fish habitat developed at that time.

All other rehabilitation works will be fully contained using appropriately designed and maintained isolation systems to prevent debris from entering the river.

New Bridge

The new bridge has been designed such that the permanent above-ground structure (i.e., pier shafts) spans the bankfull channel. Construction of the west footing and possibly, very nominally, the east footing works will require temporary encroachment into the edge of the river. The footings are designed such that they will be constructed sub-surface. Substrate materials will be re-instated over the top of the west footing to match the existing bed surface so that there is no permanent footprint on the river bed. In addition to footing protection and bed stability aspects, the development of the design of the overlying substrate

material during Detail Design will consider the depositional nature of the existing bed materials that support the submergent wetland habitat and associated cover adjacent to the west pier.

As outlined in **Section 8.1.2.1**, the specific design and placement of the temporary cofferdams that will be used to isolate the construction zones for the pier footings will be developed during Detail Design. Based on Preliminary Design, it is not anticipated that the construction of the east footing will entail in-water works. If the bank zone adjacent to the south end of the footing is disturbed temporarily depending on the design and placement of the cofferdam, it will require careful restoration design and implementation to avoid future erosion.

If Option 1 (Steel Girder Bridge) is determined to be the preferred design solution during Detail Design, the required encroachment of the crane pads into the water will require rehabilitation of the east bank and adjacent bed zone, as well as the west. Re-stabilization of the east bank, which will be susceptible to scouring influences, will require specific design consideration during Detail Design. The fish and fish habitat risk assessment undertaken during Detail Design will consider the magnitude and duration of the temporary in-water encroachment in determining whether or not Fisheries Act Auhtorization is required.

The disturbed south portion of the depressional area along the base of the east valley slope that will be disturbed for both the laydown areas required for Option 2 (Concrete Segmental Box Girder Bridge) and the crane pad area will be re-instated following construction. The pre-construction profile of the depression as well as the shallow outlet swale will be reinstated.

Appropriate substrate materials for the wetland vegetation will also be re-instated. If rock protection is required for protection of the footings or as part of the bank re-stabilization works to provide integrity (e.g., along the toe of bank, under the bridge, etc.), it will be designed during Detail Design so as to re-instate the existing channel profile and transition smoothly with the up and downstream bed and bank zones.

New Bridge – Riparian Vegetation

Those areas disturbed during the rehabilitation and new construction works will be re-stabilized and re-vegetated following construction. The restoration/landscape plans will be developed during Detail Design; where appropriate, opportunities to enhance riparian vegetation conditions will be developed. Only native species, compatible with site conditions will be used (e.g., Red-osier Dogwood, willow species, Eastern White Cedar, Common Cattail).

While the disturbed wetland vegetation is generally hardy and should quickly re-colonize disturbed areas following re-instatement of site conditions, opportunities to use techniques such as seedbank and/or root mat salvage and re-instatement will be explored during Detail Design. For example, these techniques may be appropriate to expedite re-instatement of the wetland habitat along the east bank and within the depressional area along the base of the east valley slope. The desirability of inoculating the disturbed portion of the west river bed

using transferred substrates and the associated seedbank to expedite re-instatement of the submergent/pond weed cover in the depositional backwater area will also be explored during Detail Design.

Stavebank Creek and Kenolli Creek

There is no direct fish use in Stavebank Creek in the vicinity of the proposed extension. Therefore, the new culvert extension does not require specific mitigation measures for fish passage based on the existing conditions.

Although direct fish use occurs at Kenolli Creek, only a single forage species that is not dependent on seasonal movement between habitats for foraging and spawning was caught during only one of three fishing efforts.

Therefore, exceptional efforts to enhance fish movement do not appear warranted. The short extension will be designed to maintain fish movement, and reasonable opportunities will be investigated during Detail Design to enhance movement and habitat conditions (e.g., through embedding the culvert, placing stable substrate and creating a low flow channel through the substrate to transition smoothly with the existing channel).

Riparian plantings will also be incorporated in the right-of-way area at both crossing sites to replace vegetation disturbed during construction and to enhance existing conditions locally along the watercourses. Only native shrub and tree species, compatible with site conditions (e.g., Red-osier Dogwood, willow species, Eastern White Cedar) will be used. Details of the planting/restoration plan will be developed during Detail Design.

8.1.2.3 Construction Related Mitigation Measures

- All in-water (and near water) works at the Credit River, Stavebank Creek and Kenolli Creek will be conducted during the warmwater construction timing window between July 1 and March 31. That is, there will be no in-water works between April 1 and June 30 of any given year. The timing window for the Credit River will be further reviewed and confirmed with CVC in relation to migratory fish requirements at Detail Design once the final design and associated construction requirements are finalized.
- Erosion and sediment control measures will be implemented during all phases of construction, cleanup and restoration to prevent sediment laden runoff from entering any of the watercourses directly from the construction zone. The erosion and sediment control plan will focus on preventing erosion to avoid or minimize generation of sediment, in accordance with the *Greater Golden Horseshoe Area Conservation Authorities Erosion and Sediment Control Guideline for Urban Construction (2006)* and best management practices in place at the time of Detail Design. At a minimum, the plan will address the following elements:
    - All disturbed areas/construction zones that drain to the Credit River, Stavebank Creek and Kenolli Creek will be isolated using standard perimeter silt fencing. The silt fencing will be heavy duty/reinforced fencing. Silt fencing

will be regularly inspected and maintained as required. Inclusion of temporary erosion prevention measures to provide interim stability of exposed surfaces, particularly slopes that drain to the watercourses, will also be integrated in the design of the plan.

  - At the Credit River crossing, the pier construction zones will be isolated using a 'containment' system that will fully isolate the pier and footing works from the river. The type of containment/cofferdam system will be determined during Detail Design.
  - The culvert works at Stavebank Creek and Kenolli Creek will be conducted 'in the dry' using an appropriate temporary flow bypass system to maintain clean flow around the construction zone.
  - Only clean materials free of fine particulate matter (e.g., 'pea gravel' bags, sheet pile, clear stone or rock material) will be placed in the water for temporary or permanent construction measures (e.g., crane pads if required, temporary flow management dams and cofferdams, bed and bank restoration rock material/substrate).
  - If any temporary dewatering of the near or in-water construction zones is required in order to construct the Credit River pier/footings or the Stavebank and Kenolli Creek culvert extensions, dewatering discharge will not be released directly to the watercourses. Appropriate settling, filtration and energy dissipation measures will be used to detail, filter and release discharge so as to ensure no erosion or sediment release occurs in the watercourses (e.g., temporary settling facility, filter bag, etc., located on level ground at least 30 m from the watercourses).
  - All salvaged or stockpiled materials will be located a safe distance from the watercourses edges and stabilized to prevent migration of any sediment or other material to the watercourse.
  - All work areas or other disturbed surfaces draining to the watercourses and/or in the floodplain will be stabilized and re-vegetated with appropriate native, non-invasive species as soon as feasible following construction.
  - The interim erosion and sediment control measures will be left in place, monitored and maintained in proper working order until all disturbed areas draining to the watercourses are fully stabilized, including establishment of vegetative cover.

- The Contractor will be required to develop a containment plan that addresses all aspects of both the rehabilitation and new bridge construction works to prevent construction debris and any deleterious material from entering the river.
- The isolated in-water work zones for the Credit River structure and the Kenolli Creek culvert extension (if required) will be searched and specifically sampled as appropriate to capture and transfer any stranded fish to a downstream location unharmed.
- The culvert extensions and any local channel tie-ins at the Kenolli and Stavebank Creek crossings will be specifically installed and then inspected to ensure they transition smoothly and no barriers are created, and to avoid creation of future

erosion or potential creation of temporary or permanent culvert 'perching' or local 'barriers'.

- No equipment shall ford or otherwise enter the watercourses, except as outlined above, to construct the specified works or unless authorized by CVC and/or MNR. If the Contractor requires access across the watercourses, they will apply to CVC (and other agencies as appropriate) for the temporary crossing.
- All activity will be controlled so as to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances, in addition to sediment as outlined above, to the watercourses. Storage, maintenance or re-fuelling or maintenance of equipment will be conducted at least 30 m away from the watercourses. The Contractor will have an appropriate spills management/response plan in place throughout construction, including spill control and absorbent materials, instructions regarding their use and notification procedures.
- Every effort will be made to retain as much of the natural vegetation as reasonably possible to help ensure bank stability and control erosion, and to expedite the re-colonization of native plant species.
- All vegetation removed to construct the road works will be replaced with a mix of appropriate native species. Additional riparian plantings may be incorporated to enhance existing conditions along the right-of-way, and crossing location areas. Only native shrub and tree species, compatible with the site conditions (e.g., Red-osier Dogwood, willow species, Eastern White Cedar) will be used.
- An experienced environmental inspector will be on-site and will be responsible for ensuring that the erosion and sediment control measures are functioning effectively and being maintained, and all of the other mitigation measures are being implemented as intended. During Detail Design, the appropriateness of retaining a Fisheries Contracts Specialist and/or Fluvial Geomorphologist/channel Specialist to provide specialized services during construction (e.g., fish rescue, detailed pre-disturbance survey, field fitting advice, restoration advice) will be specifically reviewed in relation to the final design and construction requirements.
- As a courtesy, CVC and MNR will be notified of the initiation of construction in advance.
- Seedbanking.

8.1.3 Drainage and Stormwater Management

Existing stormwater management (SWM) measures currently do not address quantity and water quality control, with the exception of the grassed swales along sections of the QEW, west of the Credit River, which provide some degree of quality treatment of storm runoff from the highway and ramps.

A drainage and stormwater management strategy was developed to minimize potential impacts the Credit River, Stavebank Creek and Kenolli Creek as a result of the proposed

improvements. The SWM strategy will provide water quality treatment and peak flow control for the runoff from the improved highway.

The highway drainage improvement and SWM strategy is described in **Section 7.2.6**.

8.1.4 Contaminated Properties

A Contaminant Overview Study (COS) was undertaken to determine the presence and significance of any actual or potential contamination within the study area that may impact future highway design and construction activities. The recommendations of the COS are available under separate cover in the Contamination Property Technical Memorandum (September 2010) and are summarized below. An overview of the COS findings is outlined in **Section 4.2.4**.

High Potential for Contamination

No areas with high potential for contamination will be impacted by the Recommended Plan.

Moderate Potential for Contamination

The following are areas within the study area where moderate potential for contamination may be present:

- QEW right-of-way including interchange – potential for shallow soil contamination from vehicle exhaust (e.g., lead and other metals), general wear and tear (e.g., heavy metals, oils and lubricants), and winter road maintenance activities (e.g. salt staining); and
- Hydro corridor – potential for shallow soil contamination from historical spraying of vegetation with pesticides within the corridor. In addition, corrosion of the galvanized steel towers which support the electrical transmission lines can cause zinc contamination of the soil.

The specific locations noted do not represent a significant environmental concern. However, it may be prudent to test the soil during Detail Design in those areas impacted by construction where materials are excavated or removed from the site.

8.2 SOCIO-ECONOMIC ENVIRONMENT

8.2.1 Properties and Access

As noted in **Section 7.2.1**, the Recommended Plan will result in the displacement of 2 private properties in the study area to accommodate the new bridge footprint. In addition, as part of the project, properties will be required from Infrastructure Ontario (IO)/Hydro One and the City of Mississauga.

All efforts have been made to minimize the properties required and maximize opportunities for the use of the remaining lands. The Ministry will negotiate the transfer of all necessary properties once the EA has been approved. Standard mitigation/compensation measures for property impacts will be addressed on an individual property/land owner basis. Mitigation and compensation measures for the displaced properties will include the acquisition of property at fair market value in accordance with Ministry policy and directives.

Access disruptions and nuisance impacts (e.g. noise, air quality) will be minimized during construction. A landscaping buffer will be provided, if warranted.

8.2.2 Community Features

There will be no direct impacts to community features, such as church's, trails or cycling facilities, as a result of the Recommended Plan.

The Recommended Plan will result in removal of vegetation patches of cultural origin (i.e., hedgerows, landscape plantings etc.), discussed in **Sections 4.1.3 and 8.1.1**. These areas are identified as:

- Vegetation Unit 1e, a Cultural Woodland located at the SE quadrant of QEW Mississauga Road Interchange will be partially removed to facilitate construction of a new Mississauga Road on-ramp. The new ramp will bisect the vegetation community. Although this unit is not considered significant or sensitive from an ecological perspective, residents on Kedleston Way have indicated, during consultation, that the mature trees occurring in this location are highly valued from a visual/aesthetic perspective. As such, the following mitigation measures are recommended and have been reflected on the Recommended Plan in **Exhibit 8-1**:
    - Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (i.e. temporary fencing).
    - Clearly delineate right-of-way vegetation clearing zones and vegetation retention zones both on the construction drawings and in the field to confirm with the contractor prior to clearing and grading. Equipment, materials and other construction activities will be restricted to the required activity zone.
    - Trees to be removed will be felled into the highway right-of-way and away from vegetation to be retained to avoid disturbance to these features.
    - Large stock tree plantings are to be employed in restoring the disturbed areas adjacent to the on-ramp.
- Vegetation Unit 4c, a Hedgerow located along the north and south sides of Premium Way, east of Dickinson Road will be removed to accommodate the realignment of Premium Way and the associated extensive underground utilities relocation. Although Unit 4c is not considered significant or sensitive from an ecological perspective, residents in the Dickson Road / Dickson Park Crescent area have indicated, during consultation, that the vegetation occurring along the north and south sides of Premium Way is highly valued from a visual / aesthetic perspective. In order to mitigate this impact, the Project Team examined where possible replacement landscape plantings could be located. Opportunities to plant replacement trees within the Premium Way corridor will be significantly constrained by the existing hydro corridor, the realignment of Premium Way including sidewalk, and the reduced boulevard width along the south side of Premium Way. Opportunities to plant other vegetation such as shrubs and vines have been identified and are reflected on the

Recommended Plan in **Exhibit 8-1**, at a conceptual level. Given the complexity of the utilities relocations, the final utilities plan and thus specific opportunities for landscape plantings cannot be developed until Detail Design, when engineering and utilities surveys are available.

RECOMMENDED PLANT SPECIES:

COMMON NAME	SCIENTIFIC NAME
DECIDUOUS TREES	
silver maple	Acer saccharinum
white oak	Quercus alba
red oak	Quercus rubra
basswood	Tilia Americana
chokeberry	Prunus viginiana
CONIFEROUS TREES	
eastern red cedar	Juniperus virginiana
tamarack	Larix laricina
white spruce	Picea glauca
white pine	Pinus strobus
DECIDUOUS SHRUBS	
smooth juneberry	Amelanchier laevis
black chokeberry	Aronia melanocarpa
red osier dogwood	Cornus sericea
American larch	Larix laricina
staghorn sumac	Rhus typhina
bebb's willow	Salix bebbiana
nannyberry	Viburnum lentago
CONIFEROUS SHRUBS	
common juniper	Juniperus communis
MIXED WHIPS	
silver maple	Acer saccharinum
basswood	Tilia Americana
trembling aspen	Populus tremuloides
EMERGENT PLUGS	
bulrush	Sciprus sp.
cattail	Typha latiforlia sp.
SEED MIX	
CREEK BANK SEED MIX distributed by OSC	
6% black eyed susan	Rudbeckia hirta
6% bottlebrush grass	Elymus hystrix
25% Canada wild rye	Elymus canadensis
25% fowl bluegrass	Poa palustris
25% fox sedge	Carex vulpinoidea
3% New England aster	Aster novae-angliae
10% Virginia wild rye	Elymus virginicus

NOTE: ONLY NATIVE AND NON-INVASIVE PLANTS WILL BE USED.

LEGEND

- EXISTING ROADWAY
- EXISTING MTO RIGHT-OF-WAY
- PROPOSED MTO RIGHT-OF-WAY
- PROPERTY LINE
- PROPOSED ROADWAY
- EXISTING NOISE WALL
- PROPOSED NOISE WALL
- PROPOSED CONIFEROUS TREE
- PROPOSED DECIDUOUS TREE
- PROPOSED SHRUBS
- PROPOSED WHIPS
- EXISTING BUTTERNUT TO BE PRESERVED
- POTENTIAL AREA FOR REINSTATEMENT OF AQUATIC PLUGS
- AREA FOR SALVAGE OF AQUATIC PLUGS
- PONDED HABITAT AREA
- OPPORTUNITY FOR AQUATIC HABITAT ENHANCEMENT
- SIDEWALKS / MULTI-USE PATH
- HIGH MAST LIGHTING

Ontario

MRC McCORMICK RANKIN A member of MMM GROUP

TITLE

RECOMMENDED PLAN

Scale N.T.S.

Date June, 2013

EXHIBIT

8-1

8.2.3 Noise

A noise impact assessment study was carried out in accordance with the MTO Noise Guide (October 2006). The following summarize the results of the assessment. The detailed report can be reviewed in **Appendix D**.

The assessment compared predicted future noise levels with the proposed undertaking in place (10 years after construction) and the predicted future noise levels associated with the "do nothing" alternative at the same date. The significance of a noise impact was determined by comparing these two sound levels, qualified by using the objective of 55 dBA for outdoor noise levels, in addition to the change in noise level above the ambient sound level. Per the MTO Noise Guide, where increases in noise levels are predicted, the mitigation efforts to be applied are as follows:

EXHIBIT 8-2: REVIEW OF NOISE MITIGATION CRITERIA

Change in Noise Level Above Ambient / Projected Noise Levels with Proposed Improvements	Mitigation Required
< 5 dBA change & < 65 dBA	• None
≥ 5 dBA change OR ≥ 65 dBA	• Investigate noise control measures on right of-way (ROW) • Introduce noise control measures within ROW and mitigate to ambient if technically, economically and administratively feasible • Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation, over first row receivers

STAMINA 2.0 was used to assess the noise levels given the topography of the study area, and the need to investigate noise mitigation scenarios. STAMINA 2.0 was developed based on the Federal Highway Administration (FHWA) Highway Noise Prediction Model and is approved for use in Ontario by MOE and MTO. The program is used to predict noise levels generated from road sources at the outdoor living areas (typically backyards) of Noise Sensitive Areas (NSAs). It considers numerous variables including traffic volumes, percentage of trucks, and distance from roadway, road grade, posted speed, topography, barriers and vegetation.

Noise levels are predicted in decibels in the A-weighted dBA scale, which best approximates the human perception of sound over a specified time period. An increase of 2 – 3 decibels in noise levels is considered to be just perceivable to the average person. It should be noted that a 3 dBA increase in noise equates to a doubling of traffic volumes.

Noise levels were calculated at selected receiver locations for the following scenarios:

- Future noise levels without proposed improvements of QEW (Year 2031) with existing noise walls; and
- Future noise levels with proposed improvements of QEW (Year 2031), including relocation / replacement of existing noise walls on both sides of the QEW east and west of the Credit River bridge, no walls on Credit River Bridge.

The review of potential noise impacts of the proposed improvements of QEW took into consideration the following:

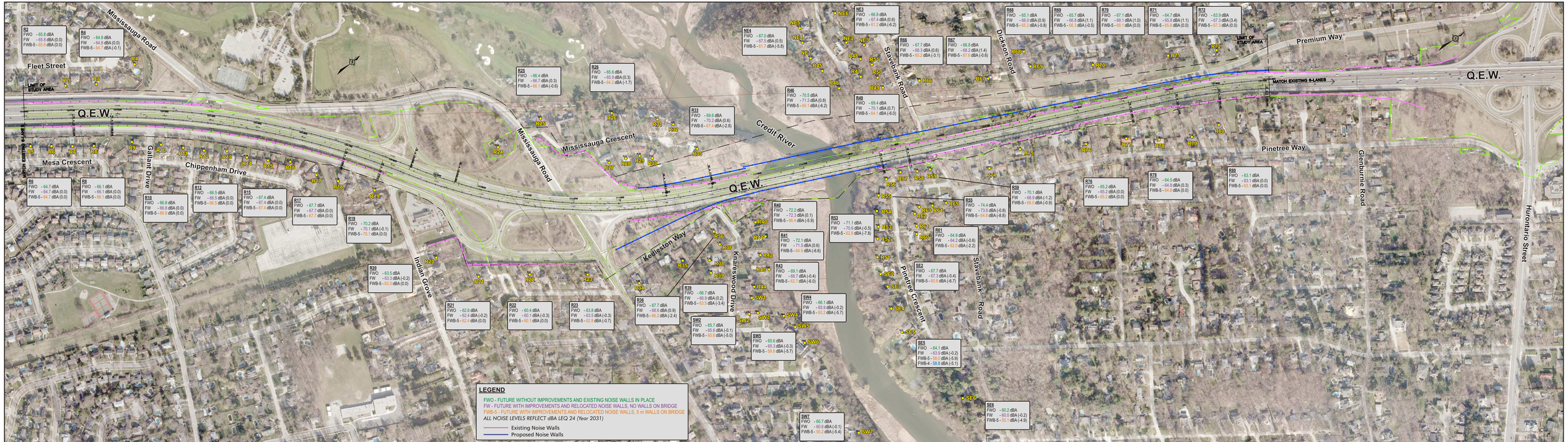
- QEW is considered to be the dominant noise source within the study area given the higher traffic volumes on the QEW in comparison to other local roads.
- Traffic noise generated from the Mississauga Road and Hurontario Street interchanges along the QEW has been accounted for in the noise assessment given the close proximity of the adjacent NSAs to these crossing roads and the interchange ramps.
- Other local roads are not included in the assessment given the relatively low traffic volumes on these roads and that the QEW is the dominant noise source in the study area.

Exhibit 8-3 outlines the noise receiver locations and summarizes the results of the assessment. The detailed summary of calculated noise levels is available in **Appendix D**.

Review of Noise Mitigation

As shown in **Exhibit 8-3**, the predicted increases in future noise levels are < 5 dBA for all receiver locations as a result of the proposed works to the QEW and the Credit River Bridge. However, the majority of receiver locations are predicted to experience an absolute noise level of ≥ 65 dBA with or without the proposed works given their close proximity to the QEW and the heavy traffic volumes on the highway.

Where an absolute noise level ≥ 65 dBA is predicted, the MTO Noise Guide requires that noise control measures be investigated on the highway right-of-way. If noise mitigation is



Ontario

MRC McCORMICK RANKIN

GWP 08-20008
QUEEN ELIZABETH WAY
from Mississauga Road to Hurontario Street
Preliminary Design and Class Environmental Assessment

SUMMARY OF FUTURE NOISE LEVELS

Exhibit
8-3

provided, noise control measures should be designed to achieve a minimum attenuation of 5 dBA (for new noise walls) or 3 dBA (for those previously constructed) over the "first row" receivers or to mitigate to ambient if technically, economically or administratively feasible.

Noise mitigation measures were reviewed at the all receiver locations predicted to experience an absolute noise level ≥ 65 dBA with the proposed improvements to the QEW. The following summarizes the assumptions made during the review of noise mitigation:

- 5 m high noise wall is the maximum height considered for MTO highways.
- The MTO Noise Guide requires that noise mitigation measures be reviewed within the right-of-way.
- For calculation purposes, the lengths of the walls were determined by applying a 5:1 ratio to the distance between the noise barrier and the receiver location (i.e. therefore the barrier length is 5 times the distance between the barrier and the receiver). For example, a distance between the noise barrier and the receiver being 100 m generally requires a 500 m noise wall length.

The assessment of the scenario with the future improvements to the QEW includes relocating the existing noise walls that are impacted by the proposed works. The location of the new and relocated noise walls are shown in **Exhibit 8-3**. The height of the new noise walls will be 5 m high, which is the maximum height considered for MTO highways.

The relocated noise walls provide the maximum noise protection east and west of the Credit River Bridge. All of the receiver locations are predicted to experience less than a 5 dBA increase with the relocated noise walls, with majority of the receiver locations predicted to experience less than a 1 dBA change. As mentioned earlier, a 2 to 3 dBA change is considered to be just perceptible to the average human ear.

Review of Noise Mitigation on the QEW Credit River Bridge

The review of noise mitigation also focused on providing noise walls on the Credit River Bridge to attenuate traffic noise at the NSAs along the Credit River Valley. Future noise levels without noise walls on the Credit River Bridge are predicted to be above 65 dBA at all receivers along both sides the Credit River Valley north and south of the bridge. Thus, the review of noise mitigation at these receiver locations is warranted based on MTO noise criteria.

An assessment of providing noise walls 4 m or 5 m high was undertaken to determine their technical and economic feasibility. The detailed review of 4 m high walls versus 5 m high walls is provided in **Appendix D**. Noise walls of 5 m on the Credit River Bridge are predicted to achieve a 5 dBA noise level reduction at all receivers along both sides of the Credit River valley, except for the receiver locations along the valley northwest of the bridge. The receiver locations along the valley northwest of the bridge are also exposed to the QEW traffic noise west of Mississauga Road, which likely contributes to the absolute noise levels at these receiver locations.

In addition, considering that absolute noise levels remain greater than 65 dBA at the receiver locations in close vicinity to the QEW and that all of the existing noise walls that are impacted by the proposed improvements are being replaced with noise walls being 5 m high, this noise assessment recommends that walls being 5 m also be provided on the Credit River Bridge.

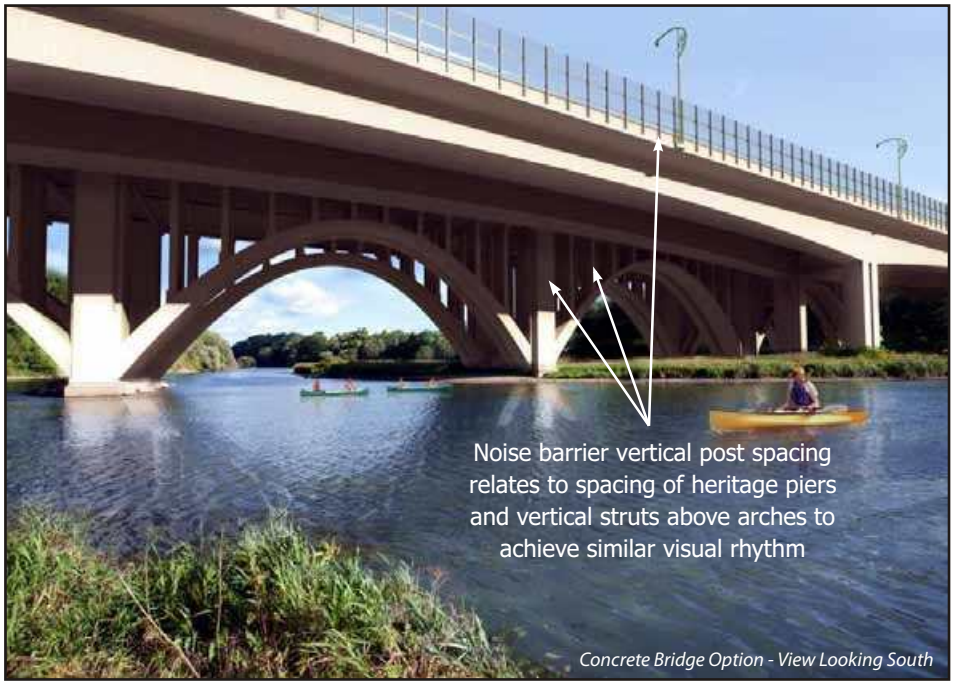
A separate structural analysis and feasibility study was also complete to assess the structural feasibility of supporting noise walls on the existing bridge and on the new North Twin in the future. The separate structural analysis and feasibility study is available in **Appendix D**. The structural analysis determined that the existing parapet cannot support a noise barrier, without modifications. Major work to strengthen the parapet would be required in order to support a noise barrier. As such, the structural review recommended that noise walls are only economically feasible on the Credit River Twin Bridges (i.e., south side of existing bridge and north side of new bridge) in the future.

Transparent barriers are proposed on the Credit River Bridge. Transparent noise barriers have been recommended to preserve the Credit River Valley view and to avoid distracting from the heritage features of the existing bridge.

The Project Team's bridge architect examined a portion of the aesthetic elements of the transparent noise barriers proposed for the bridge and how the transparent noise barriers will tie into the bridge design. Specific elements to make the barriers visible to birds (e.g., avoiding large sheets of transparent material, having regular and closely spaced vertical 'strapping' between the transparent sheets, and wire mesh embedded in the glass) is also recommended and many of these design elements are already incorporated into the manufacturer's noise barrier system. The crash resistant horizontal rails will also form a visual deterrent for birds. The proposed noise wall design is shown in **Exhibit 8-4**. Design concepts and a recommendation for the type of noise barrier to be used on the bridge will be further refined at Detail Design.

Other types of noise mitigation that were reviewed include:

- Adjustments to the horizontal alignment of the QEW to increase the distance between the highway and adjacent NSAs.
- Adjustments to the vertical alignment by lowering the vertical profile to reduce noise levels by affecting the line of sight between the highway and the NSAs.
- Use of landscaping and/or berms.
- Use of pavement mixes that reduce noise levels produced by the interaction of the tires with pavement surfaces.



Panels are resistant to weathering from UV exposure and are self-cleaning

Embedded wire mesh also provides a bird-deterrent feature. The addition of horizontal crash bars and vertical posts, in combination with the embedded wire mesh, ensure maximum visibility for birds.

Embedded wire mesh (or, filaments) provide fragment retention, preventing fragments from falling to the river below in the event of a collision.

The noise wall will be a crash-tested transparent noise barrier system, designed to stabilize vehicles and reduce the severity of collisions.

Ontario

MRC McCORMICK RANKIN
A member of MMM GROUP

GWP 08-20008
QUEEN ELIZABETH WAY
from Mississauga Road to Hurontario Street
Preliminary Design and Class Environmental Assessment

PROPOSED NOISE WALLS

Exhibit
8-4

Shifting the horizontal alignment to the north of the existing alignment would increase the distance between the highway and adjacent NSAs on the south side of the highway or shifting the horizontal alignment to the south would increase the distance between the highway and adjacent NSAs on the north side of the highway. However, shifting the horizontal alignment to either side of the highway may require displacement of residences due to their close proximity to the highway. These options are not considered to be economically feasible as the proposed improvements primarily follow the existing highway alignment and profile. Any adjustments to the horizontal and vertical alignments to the highway would significantly increase the costs to the highway improvements and result in further property impacts.

Landscaping and/or berms may be used to enhance aesthetics/visual screening and to a lesser degree to reduce noise; however, it will not be the primary mitigation measure for noise, since noise walls are already present along the entire corridor. Nonetheless, landscaping is being implementing as part of the Recommended Plan to minimize vegetation removal during construction and planting large stock trees and native conifer trees to provide an immediate visual screening/aesthetics year round.

In addition, the current presence of seven (7) double expansion joints creates a 'thump-thump' noise when driven over due to the differential elevation between the pavement and the expansion joints. Once the expansion joints are replaced and the pavement is flush, the future noise levels are anticipated to be reduced. Also, in the future rehabilitation work, these expansion joints will be converted to single joint and the bridge deck will be replaced, which will significantly reduce the current bridge noise. The new North Twin Bridge will only have two (2) single-expansion joints.

Construction Noise

During construction, the Contractor will be required to abide by the Contract Operational Constraints and municipal noise control by-laws. The Contractor will be required to keep idling of construction equipment to a minimum and to maintain equipment in good working order to reduce noise from construction activities.

Construction will occur outside of normal working hours and on weekends for certain activities along the QEW. Such work will be carried out in compliance with local noise by-laws and any Noise By-Law exemptions that may be granted.

If complaints regarding construction noise arise from construction, they will be investigated according to the provisions of the MTO Environmental Guide for Noise. The Protocol requires that any initial complaint from the public requires verification by MTO that the general noise control measures agreed to be in effect. If not, MTO will warn the Contractor of any problems and will take steps to enforce the contract provisions.

8.2.4 Air Quality

An air quality assessment was undertaken to assess the proposed improvements to the study area based on Ontario Ministry of the Environment (MOE) air quality criteria. The

assessment considered the contribution of the proposed highway improvements to the local air quality in the future.

The assessment used dispersion modelling techniques to predict local air quality conditions at sensitive receptor locations in the study area (or, model area). A total of 50 sensitive receptors were considered, primarily representing single-family residences. There are no other sensitive receptors in the model area (or within 200 m of the highway), such as schools, hospitals, seniors residences, religious centers or daycares.

The assessment was undertaken for two scenarios, the assumed construction year (2021) and 10 years after construction (2031), in order to evaluate pre-construction and post-construction air quality conditions against the applicable acceptability criteria. Project impacts were assessed using computer simulations (emissions modelling and dispersion modelling) to predict maximum concentrations due to highway traffic at representative sensitive receptors. Background air quality is assessed using historical data from the MOE and Environment Canada monitoring stations near the study area.

For most contaminants, the predicted maximum concentrations at sensitive receptors are within the recommended regulatory benchmark when combined with the respective background concentrations. This is true for both the assumed construction year (2021) and 10 years after construction (2031) scenarios, with concentrations being marginally lower in the 2031 scenario. In both scenarios and for most pollutants, the predicted concentration levels remain relatively stable in the future despite increased in traffic volumes at the Credit River Bridge. The exceptions are benzene and PM_{10}.

For benzene, the predicted maximum 24-hr concentration is within its acceptable level, but the predicted annual average concentration is not. In the latter case, the main cause of the exceedance is the background level of benzene, which exceeds the acceptable level before adding in the QEW's contribution. This is also true of many other parts of Southern Ontario. The background concentration contributes more than 80% of predicted annual benzene concentration at locations in the study area.

The analysis shows that the proposed Credit River Bridge project contributes little or no change to benzene levels in the study area. At most impact locations, the predicted average concentration was slightly lower in the 2031 scenario compared to the 2021 scenario. This is due to the fact that the project does not entail any increase in traffic volume on the QEW between its opening day and 10 years later. The slightly lower levels in 2031 are related to the ongoing effect of federal engine emission and fuel regulations.

For PM_{10}, the predicted 24-hour levels in both the 2021 and 2031 scenario are generally within the acceptable level, but exceed it occasionally (about 10 days per year). As with benzene, the main cause of these occasional exceedances is the background levels, which exceed the threshold about 8 days/year on their own. The project improvements have very little effect on the status of PM_{10}. The predicted maximum 24-hour levels in the 2021 and 2031 scenarios are within a few percent of each other at all of the impact locations that were studied.

The existing and proposed tall vegetation can be effective at reducing pollutant concentrations downwind of roadways, and noise barriers can also reduce pollutant levels in areas immediately behind the barrier (within 80 m).

To reduce the potential for air quality impacts during construction, it is recommended that an emissions management plan based on established best practices be developed during Detail Design. Standard construction practices will be employed to minimize dust emissions.

8.3 CULTURAL ENVIRONMENT

8.3.1 Archaeological Resources

Large portions of the corridor were found to have been disturbed, likely by the construction of the QEW, Mississauga Road, and surrounding residences.

To assess the potential archaeological impacts of the proposed improvement, a Stage 2 assessment was conducted on all properties in the study area in the fall of 2010, the summer of 2011, and the spring of 2012. The Stage 2 field assessment involved a test pit survey of the subject corridor conducted at five-metre intervals. All lands were surveyed except for those that could be visually determined to be disturbed. Evidence of intensive and extensive disturbance was found over the majority of the subject corridor; however one flake was recovered from a test pit located in an apparently undisturbed area south of Premium Way.

Subsequently, a Stage 3 assessment was conducted on one property. One meter squares were placed at a five-metre interval and dug to subsoil in an attempt to discern the limits of the site. In total, 96 artifacts were recovered. Despite the extensive disturbance to the site, a Stage 4 excavation is recommended in the future.

During the Stage 2 assessment of two additional properties, positive test pits yielded over 100 artifacts. Permission has not yet been granted to complete the Stage 3 and 4 test excavation of this area; therefore, Stage 3/4 assessment is required for these properties before construction can occur.

The following summarize the mitigation measures and commitments to future work identified as a result of the archaeological assessment:

- The areas assessed for the Stage 2 archaeological assessment that fall outside of Properties 1, 2 and 3 have been found to be free of archaeological concern, therefore it has been recommended to the Ministry of Tourism, Culture and Sport that construction can proceed as planned.
- Due to the cultural materials recovered from Property 1 during the Stage 3 excavation, it has been recommended to the Ministry of Tourism, Culture and Sport that Stage 4 excavation be completed within the subject area before construction can proceed as planned.
- Due to the materials recovered during the Stage 2 assessment from Properties 1 and 3, it has been recommended to the Ministry of Tourism, Culture and Sport that a Stage 3 excavation be conducted before construction can proceed as planned.

- Development should not proceed before receiving confirmation that the Ministry of Tourism, Culture and Sport has entered the *Stage 1-3 Archaeological Assessment of the QEW Highway Corridor From Hurontario Street to Mississauga Road, Part of Concession 1 South, Lots 3 to 7 South, and Concession 2 South, Lots 5, 6, and 9 North, City of Mississauga, Regional Municipality of Peel Original License Report (July 2012)* into the provincial register of reports.
- Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act.
- Any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Government Services.

In addition, MTO is committed to sharing the results of future archaeological investigations and continuing discussions with First Nations as appropriate throughout the design and construction process to discuss appropriate mitigation when details are known.

8.3.2 Built Heritage and Cultural Heritage Landscapes

An assessment was undertaken to determine the potential adverse impacts of the Recommended Plan to built heritage features and cultural landscapes. An overview of the cultural heritage resources within the study area is provided in **Section 4.3.2**.

Generally, road improvements and bridge improvements / replacement have the potential to adversely affect cultural heritage landscapes and built heritage resources by displacement and/or disruption during, as well as after construction. Built heritage resources and/or cultural heritage landscapes may experience displacement, i.e., removal, if they are located within the rights-of-way of the undertaking or isolated by the introduction of new infrastructure. There may be potential for disruption, or indirect impacts, to cultural heritage resources located within or adjacent to the study corridor by the introduction of physical, visual, audible or atmospheric elements that are not in keeping with their character and, or setting.

A proposed undertaking should avoid impacts to cultural heritage where possible or minimize impacts by incorporating design elements that are sympathetic with the value of the resources. When the nature of the undertaking is such that adverse impacts are unavoidable it may be necessary to implement management or mitigation strategies that alleviate the impacts to cultural heritage resource.

Within the study area, the potential displacement and disruption impacts of the Recommended Plan are associated with the twinning to the north of the existing Credit River Bridge and the associated geometric improvements to the highway mainline and Mississauga Road Interchange.

There is one (1) direct impact to cultural heritage resources, i.e., displacement or removal:

- One (1) residence (Site 3) located at 2002 Stavebank Road

  Recommended mitigation: A photographic documentation report for this resource will be considered in consultation with the City of Mississauga, as part of the Detail Design.

There are 4 indirect impacts i.e., disruption effects, as a result of the introduction of physical, visual, audible or atmospheric elements. The proposed undertaking will disrupt the following four (4) cultural heritage resources:

- Premium Way (Site 2) - It is a two lane paved road with no shoulders and a curb on the north side. Premium Way, formerly Middle Road, will be realigned slightly to the north, disrupting the existing streetscape.

  Recommended mitigation: A simple photographic recording of the streetscape prior to construction is recommended. The photographic record with a photo key plan should be prepared and provided to the City of Mississauga Public Library Special Collections.

- Credit River Valley Corridor River (Site 5)

  Recommended mitigation: The design of the proposed new structure has been prepared to be sympathetic to the original structure and limit change to the landscape context when viewed from the valley floor. The new piers have been designed to evoke the rhythm of the heritage bridge and the horizontal deck remains constant in the context of the cultural heritage landscape. No further mitigation is required.

- QEW Credit River Bridge (Site 4)

  Recommended mitigation: The bridge design is considered to be respectful of the style and form of the original and widened bridge. The QEW heritage light pole standards will align with the piers as originally conceived. The new piers alignment will visually blend in with the existing pier alignment and spacing so as to reduce visual disruption. This structure has been evaluated under the *MTO Ontario Heritage Bridge Guideline.* A copy of the November 2008 report titled *Heritage Assessments of the QEW Etobicoke Creek and Credit River Bridges* should be provided to the to the City of Mississauga Public Library Special Collections for municipal historical records. It is recommended that a photographic documentation report be prepared prior to construction and be made available to the City of Mississauga Public Library Special Collections. Principal elevations and structural details should form part of the documentation record along with a photo key plan.

- QEW Mississauga Road Overpass (Site 7)

  Recommended mitigation: Although the MTO *Identification and Assessment Guide for Bridges Built in Ontario Between 1945-1965 (2005)* publication does not consider this bridge to be of heritage value, it is recommended that a simple photographic

recording of the streetscape and bridge context be completed prior to construction. Since the 2005 publication of the inventory, more bridges of this type have been replaced with fewer examples remaining along the QEW corridor and this is a well-known visual landmark for local residents and drivers. The photographic record with a photo key plan should be provided to the City of Mississauga Public Library Special Collections.

- Hydro-Electric Transmission Line – TMB Site (AlGv-72) (Site 9)

  Recommended mitigation: This site has been mitigated through a Stage Three Test Excavation. No further mitigation is required.

MTO and MTCS are currently developing proper guidance to assist in the preparation of Conservation Plans that can be employed for MTO projects. This may result in additional documentation requirements for future design phases.

8.4 ENGINEERING

8.4.1 Utilities

The existing utility installations and potential conflicts are summarized in **Section 7.2.10**.

Further consultation with the utility agencies will be pursued during Detail Design to confirm the location/type of utility installations and their potential impact resulting works.

8.4.2 Construction Staging

A preliminary staging plan will be prepared to minimize impacts to the road users and ensure a safe work zone during the construction phase.

During construction of the proposed works, all six existing QEW traffic lanes will be maintained at all times during peak hours. Short-term partial lane closures may be required during non-peak periods. Short term closures are also anticipated for the realignment of the entrance and exit ramps at the Mississauga Road Interchange. As with all MTO projects involving lane, ramp and roadway closures, Advanced Notification Signing will be specified to inform motorists of the closures. Motorists may experience delays and disruption during construction.

A detailed construction staging plan to minimize temporary disruptions during construction will be developed during the Detail Design phase.

8.5 SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK

Exhibit 8-5 summarizes the identified concerns and the proposed mitigation measures and commitments to future work based on the identified environmental sensitivities and the proposed Recommended Plan.

Legend

MTO: Ministry of Transportation	MTCS: Ministry of Tourism, Culture and Sport
MNR: Ministry of Natural Resources	MUN: City of Mississauga, Region of Peel
MOE: Ministry of the Environment	CVC: Credit Valley Conservation Authority
UTIL: Utilities	RES/BUS: Local Residents and/or business owners

EXHIBIT 8-5: SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK

ENVIRONMENTAL ISSUE / CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK
GENERAL		
General environmental impacts.	MTO All Stakeholders	• Implement environmental inspection during construction to ensure that protection measures are implemented, maintained and repaired and remedial measures are initiated where warranted. • Carry out ongoing consultation with stakeholders, agencies, landowners and general public during subsequent design phases and construction, including Public Information Centre(s) (PIC(s). • Obtain any necessary approvals or permits during Detail Design.
NATURAL ENVIRONMENT		
Terrestrial Ecosystems (Section 8.1.1)		
• Direct and indirect impacts to vegetation communities during construction. • Temporary direct and indirect impacts to wildlife habitat during construction. • Temporary impacts to breeding birds during construction. • Protection of wildlife during construction. • Maintaining wildlife movement opportunities.	MTO MOE MNR CVC	• Section 8.1.1.2 outlines site specific mitigation measures. • Install temporary erosion and sediment control measures prior to construction, and maintain throughout construction in accordance with Ontario Provincial Standard Specification (OPSS) 805. Routinely inspect sediment and erosion control structures, including after storms, and repair as required. • Clearly delineate right-of-way vegetation clearing zones and vegetation retention zones both on the construction drawings and in the field to confirm with the contractor prior to clearing and grading. Equipment, materials and other construction activities will not be permitted in these zones. • Conduct vegetation removal and protection measures in accordance with OPSS 201 (tree clearing) and OPSS 801 (tree protection). Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (i.e. temporary fencing). • Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation seed mix and plantings (or other specific techniques as outlined) appropriate to the project area (as determined in Detail Design). • Ensure appropriate clearing and disposal of all construction-related debris following construction in accordance with OPSS 180. • In dust-sensitive areas, dust will be controlled through the use of water or calcium chloride. • Undertake work in accordance with Migratory Birds Convention Act, 1994 and/or Regulations under that Act. • Additional/modified measures may be required for any SAR (including Barn Swallow if future nesting surveys confirm nesting activity) and will be determined on a case-by-case basis through consultation with MNR. • Wetland Unit 2h should not be disturbed after mid-September through April to protect any turtles that may be hibernating in this feature. Alternatively, if installation of the crane pad/staging area is required during the winter, exclusion fencing could be erected around this feature prior to the end of August to prevent access of turtles to hibernate. • Minimize the extent of the construction footprint in Wetland Unit 2h given that this area is identified as candidate Significant Wildlife Habitat. • In the event that an animal encountered during construction does not move from the construction zone and construction activities are such that continuing construction in the area would result in harm to the animal, all activities will stop and the Contract Administrator will be notified. In particular, the contractor will notify the Contract Administrator immediately if any turtles or other reptiles are found in the construction area.

EXHIBIT 8-5: SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK		
ENVIRONMENTAL ISSUE / CONCERN	**CONCERNED AGENCIES**	**PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK**
		• 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. The Contract Administrator will then contact the MNR SAR Biologist for direction, as these animals are protected under the ESA (2007). • Development of a Contractor awareness programme during Detail Design should be considered to ensure the Contractor is aware of wildlife and habitat sensitivities and associated requirements for protection and agency consultation. • All required permits for wildlife handling, including fish rescue, will be obtained and posted on site prior to engaging in such activities and all associated conditions strictly adhered to. • MNR and CVC will be consulted during the Detail Design phase to develop the details of such mitigation measures (i.e., timing windows in relation to habitat intrusion, exclusion fencing, handling and relocation protocols, construction protocols, Contractor awareness) as well as the habitat restoration plans. • Temporary impacts to amphibian habitat will be managed with the implementation of the vegetation and watercourse mitigation measures and following completion of construction activities, will be restored to a condition resembling existing conditions.
Fish and Fish Habitat (Section 8.1.2)		
• Potential direct and indirect impacts to fisheries and/or aquatic habitat as a result of the proposed works.	MTO MOE MNR CVC MUN	• Section 8.1.2.2 outlines specific mitigation proposed at each watercourse. • All inwater (and near water) works at the Credit River, Stavebank Creek and Kenolli Creek will be conducted during the warmwater construction timing window between July 1 and March 31. That is, there will be no instream works between April 1 and June 30 of any given year. The timing window for the Credit River will be further reviewed and confirmed with CVC in relation to migratory fish requirements at Detail Design once the final design and associated construction requirements are finalized. • The Contractor will be required to develop a containment plan that addresses all aspects of both the rehabilitation and new bridge construction works to prevent construction debris and any deleterious material from entering the river. The isolated in-water work zones for the Credit River structure and the Kenolli Creek culvert extension (if required) will be searched and specifically sampled as appropriate to capture and transfer any stranded fish to a downstream location unharmed. • The culvert extensions and any local channel tie-ins at the Kenolli and Stavebank Creek crossings will be specifically installed and then inspected to ensure they transition smoothly and no barriers are created, and to avoid creation of future erosion or potential creation of temporary or permanent culvert 'perching' or local 'barriers'. • No equipment shall ford or otherwise enter the watercourses except as outlined above to construct the specified works or unless authorized by CVC and/or MNR. If the Contractor requires access across either watercourse, they will apply to CVC (and other agencies as appropriate) for the temporary crossing. • All activity will be controlled so as to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances, in addition to sediment as outlined above, to the watercourses. Storage, maintenance or re-fuelling or maintenance of equipment will be conducted at least 30 m away from the watercourses. The Contractor will have an appropriate spills management/response plan in place throughout construction, including spill control and absorbent materials, instructions regarding their use and notification procedures. • An experienced environmental inspector will be on-site and will be responsible for ensuring that the erosion and sediment control measures are functioning effectively and being maintained, and all of the other mitigation measures are being implemented as intended. During Detail Design, the appropriateness of retaining a Fisheries Contracts Specialist and/or fluvial geomorphologist/channel specialist to provide specialized services during construction (e.g., fish rescue, detailed pre-disturbance survey, field fitting advice, restoration advice) will be specifically reviewed in relation to the final design and construction requirements. • As a courtesy, CVC and MNR will be notified of the initiation of construction in advance.
• Erosion and sediment control measures will be implemented during all phases of construction, cleanup and restoration to prevent sediment laden runoff from entering any of the	MOE MNR	• All disturbed areas/construction zones that drain to the Credit River, Stavebank Creek and Kenolli Creek will be isolated using standard perimeter silt fencing. The silt fencing will be heavy duty/reinforced fencing. Silt fencing will be regularly inspected and maintained as required. Inclusion of temporary erosion prevention measures to provide interim stability of exposed surfaces, particularly slopes that drain to the watercourses, will also be integrated in the

EXHIBIT 8-5: SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK		
ENVIRONMENTAL ISSUE / CONCERN	**CONCERNED AGENCIES**	**PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK**
watercourses directly from the construction zone.	MTO CVC MUN	design of the plan. The interim erosion and sediment control measures will be left in place, monitored and maintained in proper working order until all disturbed areas draining to the watercourses are fully stabilized, including establishment of vegetative cover. • Implement standard construction measures identified for protection of fish and fish habitat. • Only clean materials free of fine particulate matter (e.g., 'pea gravel' bags, sheet pile, clear stone or rock material) will be placed in the water for temporary or permanent construction measures (e.g., crane pads if required, temporary flow management dams and cofferdams, bed and bank restoration rock material/substrate). • If any temporary dewatering of the near or in-water construction zones is required in order to construct the Credit River pier/footings or the Stavebank and Kenolli Creek culvert extensions, dewatering discharge will not be released directly to the watercourses. Appropriate settling, filtration and energy dissipation measures will be used to detail, filter and release discharge so as to ensure no erosion or sediment release occurs in the watercourses (e.g., temporary settling facility, filter bag, etc., located on level ground at least 30 m from the watercourses). • All salvaged or stockpiled materials will be located a safe distance from the watercourses edges and stabilized to prevent migration of any sediment or other material to the watercourse. • All work areas or other disturbed surfaces draining to the watercourses and/or in the floodplain will be stabilized and re-vegetated with appropriate native, non-invasive species as soon as feasible following construction.
Drainage and Stormwater Management (Section 8.1.3)		
• Under the existing conditions, stormwater management (SWM) measures currently do not exist that address quantity and water quality control.	MTO CVC	• Drainage improvements include the creation of a stormwater management wet pond, grassed swales and grassed-lined highway embankments, a stormwater management dry pond, and installation of splash pads below the bridge deck drains. • Erosion and sediment control measures will be implemented to protect local watercourses and drainage channels.
Contaminated Properties (Section 8.1.4)		
• Areas have been identified within the study area where the moderate potential for contamination may be present: o QEW ROW and interchanges o Hydro corridor	MTO MOE	• The specific locations noted do not represent a significant environmental concern. However, it would be prudent to test the soil during detailed design in those areas impacted by construction for potential contaminants in support of excess materials management.
SOCIO-ECONOMIC ENVIRONMENT		
Properties and Access (Section 8.2.1)		
• Displacement of 2 private properties to accommodate the new bridge footprint. • Impacts on property. • Impacts on access.	MTO RES	• The Ministry will negotiate the transfer of all necessary properties once the EA has been approved. • Standard mitigation/compensation measures for property impacts will be addressed on an individual property/land owner basis. Mitigation and compensation measures for the displaced properties will include the acquisition of property at fair market value in accordance with Ministry policy and directives. • Minimize access disruptions during construction.

EXHIBIT 8-5: SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK		
ENVIRONMENTAL ISSUE / CONCERN	**CONCERNED AGENCIES**	**PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK**
		• Minimize nuisance impacts (e.g. noise, air quality) during construction. • Provide landscaping buffer, if warranted.
• Properties will be required from Infrastructure Ontario/Hydro One and the City of Mississauga	MTO IO	• The Ministry will negotiate the transfer of all necessary property through Infrastructure Ontario during the Detail Design phase.
Community Features (Section 8.2.2)		
• No direct impacts to community features were identified within the study area.		• None anticipated.
• Removal of mature vegetation from within the Mississauga Road Interchange, adjacent to Kedleston Way.	Area Residents	• Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (i.e. temporary fencing). • Clearly delineate right-of-way vegetation clearing zones and vegetation retention zones both on the construction drawings and in the field to confirm with the contractor prior to clearing and grading. Equipment, materials and other construction activities will not be permitted in these zones. • Tree grubbing will be restricted to the required activity zone. • Trees to be removed will be felled into the highway right-of-way and away from vegetation to be retained to avoid disturbance to these features. • Large stock tree plantings are to be employed in restoring the disturbed areas adjacent to the on-ramp.
• Removal of trees along the north and south side of Premium Way, east of Dickson Road.	Area residents	• Review landscaping opportunities during Detail Design once the final utilities relocations plan is prepared and the realignment of Premium Way is confirmed. Opportunities identified at a conceptual level include planting vegetation such as shrubs and vines.
Noise (Section 8.2.3)		
• The predicted increases in future noise levels are < 5 dBA for all receiver locations however, the majority of receiver locations are predicted to experience an absolute noise level of ≥ 65 dBA given their close proximity to the QEW and the heavy traffic volumes on the highway. • Construction noise issues.	MTO MOE Area residents	• Relocate the existing noise walls that are impacted by the proposed works. The height of the new noise walls will be 5 m high, the maximum height considered for MTO highways. • 5 m high transparent noise walls will be placed on the north side of the new bridge and the south side of the existing Credit River Bridge. Transparent noise walls have been recommended to preserve the Credit River Valley view and to avoid distracting from the heritage features of the existing bridge. • Replace the double expansion joints on the existing bridge. Expansion joints will be converted to single joint when the bridge deck will be replaced. The new Credit River will have a reduced number of single-expansion joints. • During construction of the improvements, the contractor will be required to abide by the Contract Operational Constraints and municipal noise control by-laws. • The Contractor will be required to keep idling of construction equipment to a minimum and to maintain equipment in good working order to reduce noise from construction activities. • Construction will occur outside of normal working hours and on weekends for certain activities along the QEW. Such work will be carried out in compliance with local noise by-laws and any Noise By-Law exemptions that may be granted. • If complaints regarding construction noise arise from construction, they will be investigated according to the provisions of the MTO Environmental Guide for Noise.
Air Quality (Section 8.2.4)		
• An air quality study was undertaken which determined that	MOE	• Standard construction practices will be employed to minimize dust emissions.

EXHIBIT 8-5: SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK		
ENVIRONMENTAL ISSUE / CONCERN	**CONCERNED AGENCIES**	**PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK**
significant effects are not anticipated during operations. • Some minor impacts (construction equipment emissions and dust) are anticipated during construction.	MTO Area Residents	• The existing and proposed tall vegetation can be effective at reducing pollutant concentrations downwind of roadways, and noise barriers can also reduce pollutant levels in areas immediately behind the barrier (within 80 m). • To reduce the potential for air quality impacts during construction, it is recommended that an emissions management plan based on established best practices be implemented.
CULTURAL ENVIRONMENT		
Archaeological Resources (Section 8.3.1)		
• Stage 2 and 3 Archaeological Assessments were undertaken for all properties where permission to enter was provided.	MTO MTCS	• The areas assessed for the Stage 2 archaeological assessment that fall outside of Properties 1, 2 and 3 have been found to be free of archaeological concern, therefore it has been recommended to the Ministry of Tourism, Culture and Sport that construction can proceed as planned. • Due to the cultural materials recovered from Property 1, located east of Stavebank Road and south of Premium Way during the Stage 3 excavation, it has been recommended to the Ministry of Tourism, Culture and Sport that Stage 4 excavation be completed within the subject area before construction can proceed as planned. • Due to the cultural materials recovered during the Stage 2 assessment from Properties 2 and 3, it has been recommended to the Ministry of Tourism, Culture and Sport that a Stage 3 excavation be conducted before construction can proceed as planned. • Development should not proceed before receiving confirmation that the Ministry of Tourism, Culture and Sport has entered all reports into the provincial register of reports. • Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act. • Any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Government Services. • MTO is committed to sharing the results of future archaeological investigations and continuing discussions with First Nations as appropriate throughout the design and construction process to discuss appropriate mitigation when details are known.
Built Heritage and Cultural Heritage Landscapes (Section 8.3.2)		
• The Credit River Bridge has been evaluated under the Ontario Heritage Bridge Guideline (January 2008) and has been determined to be a candidate for inclusion on the Ontario Heritage Bridge List. • The proposed undertaking will displace one (1) residence, and will disrupt four (4) cultural heritage resources.	MTO MTCS	• Architectural elements of the new bridge have been developed to be sympathetic to the heritage values of the existing Credit River Bridge. • Complete the site specific mitigation measures outlined in Section 8.3.2. • MTO and MTCS are currently developing proper guidance to assist in the preparation of Conservation Plans that can be employed for MTO projects. This may result in additional documentation requirements for future design phases.
ENGINEERING		
Utilities (Section 8.4.1)		
• There are potential conflicts with existing utility installations.	UTIL	• Further consultation with the utility agencies will be pursued prior and during Detail Design. • Special provisions will be included in the contract to ensure that care and precautions are taken to safeguard existing utilities from damage.
Construction Staging (Section 8.4.2)		

EXHIBIT 8-5: SUMMARY OF IDENTIFIED CONCERNS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK		
ENVIRONMENTAL ISSUE / CONCERN	**CONCERNED AGENCIES**	**PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK**
• Motorists may experience delays and disruption during construction.	MTO RES/BUS	• A preliminary staging plan will be prepared to minimize impacts to the road users and ensure a safe work zone during the construction phase. • All six existing traffic lanes will be maintained during construction, except at non-peak periods when short-term partial lane closures may be required. • Access between the QEW and Mississauga Road will be maintained during reconstruction of the interchange ramps. • Advance signing will be provided to inform motorists of construction and any lane, ramp and roadway closures.