HP ENGINEERING

HP Job Number: 22003

May 24, 2022

CGH Transportation Inc.

Attn: Mr. Christopher Gordon, P.Eng.

**RE: CAIVAN PERTH – PETER STREET BRIDGE CROSSING**

## ***Introduction***

HP has been retained by CGH Consulting (CGH) in order to carry out a review of the existing Peter Street Bridge Crossing. The reviewed is being carried out as part of the proposed development around the Perth Golf Course currently being studied by Caivan Developments. The main purpose of the review is to assess the overall current condition of the bridge, explore the feasibility and cost of widening the bridge (to accommodate future anticipated traffic including pedestrian / cycling traffic) and determine future capital costs in order to maintain the crossing in service in the long-term future.

## ***Description of the Existing Crossing / Rehabilitation History***

The existing Peter Street Bridge crossing is located at the west end of Peter Street in the Town of Perth and crosses over the Tay River. The structure currently provides access to the Perth Golf Course and is located on the only access road in and out of the course property. The existing structure is a single span bridge with a total clear span length of approximately 18.3m and a total structure length (end to end of wingwalls) of approximately 28.6m. The structure carries two-lanes of vehicular traffic with a total clear roadway width of 7.5m (face to face of concrete parapet walls). The structure is constructed with reinforced concrete abutment walls / wingwalls supported on a series of timber piles supporting a superstructure consisting of pre-stressed concrete I-girders with a reinforced concrete deck. An 80mm thick asphalt wearing surface with a rubberized asphalt waterproofing is present on top of the concrete deck, protecting the concrete deck surface. Along the edges of the deck, a reinforced concrete parapet with a double box-beam railing (mounted along the top of the parapet) protects vehicular and pedestrian traffic.

The structure was originally constructed circa 1971 (designed by McCormick, Rankin & Associates). The original deck cross-section provided a clear roadway width of approximately 6.1m and was constructed using a 190mm deep transverse laminated timber deck. A single steel flex beam railing (mounted on timber posts supported from the timber deck) was utilized as the bridge guardrail. A major rehabilitation was undertaken on the structure circa 2007 (designed by Harmer Podolak Engineering Consultants / GENIVAR) and consisted of the replacement of the

timber deck with a new 225mm thick reinforced concrete deck protected with rubberized asphalt waterproofing and an asphalt wearing surface. The steel flex beam guardrail was also replaced with a reinforced concrete parapet with a double box-beam railing. As part the of the rehabilitation, the deck platform was widened to 8.2m (out to out), resulting in an increase in the clear roadway width to 7.5m. The widening was achieved by extending the deck cantilevers beyond the exterior girders (cantilevers were extended from approximately 0.84m to 1.41m).

## ***Information Available for Review***

For this assignment, the following information was made available for review:

- Original Bridge Drawings; Drawings 617-1 (Site Plan & Profile), 617-2 (General Arrangement), 617-3 (Foundations), 617-4 (Abutments & Wingwalls), 617-5 (Prestressed Concrete Girders), 617-7 (Reinforcing Steel Schedule). It is noted that Drawings 617-6 (Deck Details) and 617-8 (Standards) were missing from the set of drawings that were provided to us. Drawings were prepared by McCormick, Rankin & Associates and were dated October 1971.
- Prestressed Girder Drawings; Drawing C-1547-1 (Girder Layout & Sections). Drawing was prepared by Wilson Concrete Products Ltd. And was dated November 1971.
- Rehabilitation Drawings; Drawings 1 through 13 inclusive (including cover sheet). Drawings were prepared by Harmer Podolak Engineering / GENIVAR and were dated September 2007.
- Most recent OSIM inspections from year 2019 (prepared by DM Wills) and year 2021 (prepared by HP Engineering.

In addition to the above information, a supplemental site review inspection was also completed by HP Engineering for this assignment in order to gather updated condition information and other pertinent information needed for the current review.

## ***General Condition / Capacity of Existing Structure***

Based on our review of available information and our site review inspections, the existing bridge structure was found to be generally in good overall condition with no significant or appreciable deterioration that would require immediate / short-term attention or that would affect the overall load carrying capacity of the structure.

In its current condition and configuration, the Peter Street Bridge is adequate to support two simultaneous lanes of vehicular traffic with no load restrictions (i.e., full loading as per the Canadian Highway Bridge Design Code, 2019 can be accommodated). Provided vehicles travelling over the bridge are highway legal vehicles in Ontario, no restrictions would be required.

For special construction equipment (e.g., oversized or overweight vehicles that may not be highway legal in Ontario), these vehicles would have to be evaluated on a case-by-case basis depending on their overall weight and axle configurations; however, it is noted that typically for this type of loading, relatively straight forward restrictions can usually be implemented (e.g., vehicles to travel at low speeds, only a single vehicle is permitted over the bridge at any given time, etc.) so as to accommodate the vehicle and not result in overloading of the bridge.

***Review of Cross-Sectional Modifications / Future Rehabilitation Requirements***

The existing structure currently supports a total of 2-lanes of vehicular traffic. Traffic (in each direction) is provided a total width 3.75m which includes the lane width plus the side clearance. Pedestrians and cyclists utilizing the bridge currently travel in the side clearance as no separate raised walkway is present. This accommodation (for pedestrians and cyclists) is typically acceptable for bridges located on low volume roads (and bridges located in rural areas).

Based on discussions with CGH to date, it is understood that the addition of outboard raised pedestrian sidewalks will likely be required for this crossing based on future anticipated use. Increases to the overall clear roadway width (beyond the current 7.5m) may also be required, although it should be noted that the current clear width would be considered acceptable as a two-lane structure on a low volume road (e.g., where traffic volumes are less that 400 vehicles per day). If outboard raised sidewalks were to be added, a minimum sidewalk clear width of 1.5m would be recommended.

Based on the overall current configuration and existing structural capacity of the structure (in particular noting the existing approximately 1.41m cantilever deck sections along each side), widening of the existing cross-section (e.g., with 1.5m wide outboard raised sidewalks and possibly increasing the overall travelled width of the roadway beyond the current 7.5m) would not be possible without adding additional girders and substructure / foundation elements to support the deck extensions. The approximate construction cost to widen the bridge by approximately 1.5m on each side is estimated to be in the order of $750,000.

Based on the age (currently 51 years old), current condition (generally in good overall condition based on the results of our recent site investigations) and rehabilitation history of the structure (major rehabilitation including full deck replacement completed 15 years ago), the following presents the anticipated future rehabilitation requirements and order of magnitude costs:

- Major Bridge Rehabilitation in or around Year 2032; estimated cost of $1,000,000. A major bridge rehabilitation would likely include removal and replacement of the asphalt wearing surface and waterproofing membrane, concrete deck repairs / scarify and overlay, expansion joint replacement, pre-stressed girder repairs, substructure concrete repairs, replacement of approach wearing surface and replacement of approach guiderail.

- Full Bridge Replacement in or around Year 2057; estimated cost of $1,800,000. This would generally include the full removal of the existing bridge structure (superstructure and substructure) and the construction of a new (similarly configured) bridge crossing including new pile foundations, new reinforced concrete abutment walls / wingwalls, new superstructure (pre-stressed concrete girders, reinforced concrete deck, barrier walls), new waterproofing and asphalt, replacement of approach asphalt and roadside safety features (guiderail, end treatments, signage, etc.).
- Minor Bridge Rehabilitation (of the replacement bridge) in or around Year 2082; estimated cost of $600,000. A minor bridge rehabilitation would likely include removal and replacement of the asphalt wearing surface and waterproofing membrane, localized concrete deck repairs, expansion joint repair / replacement or replacement of expansion joint seals and replacement of approach wearing surface.
- Major Bridge Rehabilitation (of the replacement bridge) in or around Year 2107; estimated cost of $1,000,000. This rehabilitation would be as generally described above.
- Full Bridge Replacement in or around Year 2132; estimated cost of $1,800,000. This work would be as generally described above.

The above costs are presented in 2022 dollars and are strictly construction costs (assuming a competitive tender process). The costs do not include costs for engineering design / supervision during construction, environmental assessment, project management and other internal costs; these costs could be estimated to be in the range of 10% to 20% of the total construction costs. The costs are also presented based on the structure in its current configuration (e.g., overall width). If the overall roadway width is increased and / or outboard raised sidewalks are added, the above costs would likely increase relatively proportionality to the overall plan area of the structure.

The above cost estimates are based on what would be expected for typical bridges in Ontario maintained using typical asset management strategies. The overall requirements, timing and costs of the various anticipated future rehabilitation requirements can be greatly affected by a number of factors including the overall extent of completion of periodic maintenance activities on the bridge (e.g., annual power washing, periodic sealing of asphalt, cracks, periodic replacement of joints seals, completion of small concrete repairs, etc.), the overall use of the roadway / type of traffic passing over the bridge, the type of winter maintenance operations (sanding versus salting), etc.

We trust the above letter report satisfies your requirements. Should you have any questions or require further information, please do not hesitate to contact the undersigned.

Regards,

**HP Engineering Inc.**

Tashi Dwivedi, P.Eng.
Principal