



**THURBER** ENGINEERING LTD.

## MEMORANDUM

To: Christopher Schueler, P.Eng.  
AECOM

Date: December 21, 2015

From: Alastair Gorman, P.Eng.  
(Reviewed by P.K. Chatterji, P.Eng.)

File: 19-4406-20

### PRELIMINARY FOUNDATION ASSESSMENT PIGEON RIVER BRIDGE (SITE 21-023) G.W.P. 4008-13-01

## 1 INTRODUCTION

This memorandum presents a brief summary of a geotechnical assessment of the Pigeon River Bridge which carries Highway 7A over Pigeon River in the Municipality of Kawartha Lakes. It also presents preliminary geotechnical recommendations for use in assessment of the existing foundations at the site. It is noted that the proposed rehabilitation alternatives are not yet defined.

The recommendations provided in this memorandum are for planning, structure evaluation and preliminary design purposes only. Additional investigation and analysis may be required in any subsequent detail design phase of the project.

The following reference numbers apply to this site:

- Current W.P. 4008-13-01
- Site No. 21-023
- GEOCRES No. Not Applicable
- Historic W.P. 56-81-01

## 2 SITE DESCRIPTION

The site is located on Highway 7A at approximately 1 km west of the intersection of Highways 7A and 35 in the Geographic Township of Manvers, Municipality of Kawartha Lakes. Based on the description in Section 6.3.3 of the RFP, the existing bridge, constructed in 1950, is a single span reinforced cast-in-place concrete rigid frame slab bridge with a clear span of 9.1 m. The overall deck width is 11.8 m with an asphalt riding surface of 10.4 m carrying one lane of traffic in each direction of Highway 7A. The structure was last rehabilitated in 1988 which generally involved barrier wall replacement, deck patching, concrete overlay, waterproofing and paving.

The mapping in the Physiography of Southern Ontario by Chapman and Putnam shows that the site lies within the physiographic region known as the Peterborough Drumlin Field. As indicated



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by the name, this area is characterized by a large number of drumlins within a rolling till plain. The rolling nature of the terrain in the general vicinity of the site is consistent with this mapping.

### 3 SUBSURFACE CONDITIONS

No foundation information was found in the GEOCREST library for this bridge site. There is existing geotechnical information for the upper 1.5 m depth as part of a pavement investigation for the 1988 rehabilitation. This information indicates that the pavement structure overlies sands and silts. The sands and silts have been described as “stony” at some locations which could be interpreted as indicating a glacial till deposit.

### 4 SITE OBSERVATIONS

Foundation engineering staff from Thurber visited the site to observe conditions above the waterline related to the general geotechnical performance.

There were no obvious signs of settlement or distress at the foundation elements. Concrete spalling and cracking were observed on the abutment walls.

The approach slopes appeared to be stable with no obvious signs of instability. All slope faces appeared well vegetated, except for some erosion at the southeast approach slope near the creek water level. There was no visible settlement at the approach slabs although a slight bump was noticed at the west approach.

Photographs of the structure and the approaches are attached in Appendix A.

### 5 EXISTING FOUNDATIONS

A historic “General Drawing” dated May 1950 indicates that the original design involved a concrete rigid frame structure supported by strip footings of 3 ft. 6 ins. (1.07 m) in width. The wingwall at each of the four corners was designed to be 15 ft. 6 ins. (≈4.7 m) in length at the top reducing to 6 ft. (≈1.8 m) in length at the base. The rigid frame has an overall height of 14 ft. 8.5 ins. (≈4.5m) and an overall length (parallel to the highway) of 34 ft. (≈10.4 m).

According to this General Drawing, the strip footings supporting the bridge were designed to be founded at Elevation 82.0 ft (≈25.0 m), or approximately 4 ft. (≈1.2 m) below the riverbed at the time of the design.

There is no information from this drawing or other source available to us at this time that would indicate the design footing bearing pressure and founding stratum.

### 6 ASSESSMENT OF EXISTING FOUNDATIONS

There is no site-specific foundation information on which to base an assessment of the bridge foundations. Shallow pavement boreholes advanced in 1988 reveal the presence of sand and silt deposits immediately below the pavement structure. However, there is no information on the density of these soils. Soft or loose organic and alluvial deposits may have existed over the site prior to bridge construction.



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Structural inspection was carried out by others in 2012 as part of the Ontario Bridge Management System (OBMS). Results documented on inspection forms indicate some leached cracks, honeycombing and severe scaling on both abutments above waterline. Other forms of concrete deterioration were also noted on the wingwalls. These records are generally consistent with Thurber's observations during our recent site visit.

There is no documented record of the foundations having experienced any movement and the approach embankments appear to be performing well. Accordingly, it can be surmised that the existing bridge foundations were appropriately designed and can safely carry the imposed loads to date.

The RFP document suggested that the minimum required rehabilitation works consist of repairs to the concrete bridge deck and barrier walls, waterproofing and paving, replacement of the approach slabs, refacing of the wingwalls, and substructure repairs for soffits and abutment walls. Accordingly, there should not be appreciable increase in the loading on the foundations. Provided there is no increase in the applied loads, it can be assumed that the bridge foundations will continue to perform satisfactorily.

However, if replacement of the bridge is anticipated or there is an increase in loading, e.g. greater than 10%, it will be necessary to carry out site investigation and field testing to support the preparation of foundation design recommendations.

### **7 EXCAVATION AND ROADWAY PROTECTION**

If the selected rehabilitation strategy requires excavations adjacent to the bridge, it is recommended that site investigation and field testing be carried out through the approach embankments in order to characterize the soils and to select parameters for geotechnical design, including roadway protection. The number and depth of boreholes can be determined after the rehabilitation strategy has been selected.

### **8 CLOSURE**

Factual subsurface information for foundation purposes is not available for this site. Visual observations during our recent site visit, structure inspection records from 2012 and pavement investigation information from 1988 have been used in preparation of this memorandum.



This memorandum was prepared by Dr. Sydney Pang, P.Eng. and by Mr. Alastair Gorman, P.Eng. and was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.

Dec 21/15

Alastair Gorman, P.Eng.  
Associate, Senior Foundation Engineer

Dec 21/15

P.K. Chatterji, P.Eng.  
Review Principal, Designated MTO Contact

Attachment

Appendix A  
Site Photographs



Photo 1 North Elevation of Pigeon River bridge Looking East



Photo 2 Looking West Over Pigeon River Bridge