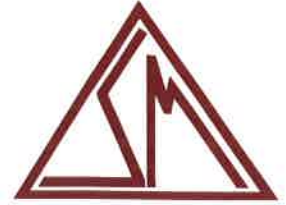

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PROJECT NO.: SM 190580-G

December 6, 2019

JAMES DICK CONSTRUCTION LIMITED
14442 Regional Road 50
Bolton, Ontario
L7E 3E2

Attention: Leigh Mugford
Resource Manager

**GEOTECHNICAL CONSIDERATIONS
PAVEMENT STRUCTURE EVALUATION
REID SIDEROAD – FROM GUELPH LINE TO TWISS ROAD
CAMPBELLVILLE [MILTON], ONTARIO**

Dear Mr. Mugford,

Further to our correspondence and your request, SOIL-MAT ENGINEERS & CONSULTANTS LTD. has undertaken a review of the pavement condition of the subject roadway, along with relevant geotechnical reports provided to our office. Our comments and recommendations are presented in the following paragraphs.

1. INTRODUCTION

We understand that it is proposed to re-open the quarry facility located west of Twiss Road at Reid Sideroad. Truck traffic associated with the quarry operation would travel along Reid Sideroad to the interchange with Highway 401 at Main Street [Guelph Line] approximately 1.5 km to the east. The purpose of this review and pavement evaluation, is to establish the existing condition of the pavement structure, and provide our comments with respect to the anticipated performance and future reconstruction, from a geotechnical point of view.

Our office was provided with the following reports by others:

- Soil Investigation for 2016 Asphalt Overlay Program, Various Road in Milton. Soil Engineers Ltd. Report 1509-S106, dated January 2016.
- Geotechnical Investigation, Culvert Replacement, Reid Sideroad, Milton. Wood Environment & Infrastructure, Report TPB188147S.2000.1, dated May 2019.
- Reid Road Reservoir Quarry Transportation Impact Study. Paradigm Transportation Solution Limited, Project 170051, dated January 2018.



2. EXISTING CONDITIONS

2016 INVESTIGATION [SOIL ENGINEERS]:

The Soil Engineers Ltd. 2016 report for the Town of Milton included detailed investigation of the existing pavement on several roadways, including Reid Sideroad between Guelph Line and Twiss Road. A total of 5 boreholes and 10 coreholes were advanced along the subject section to establish the existing pavement structure and subgrade soils.

The report noted the section as a local rural roadway and established the existing pavement structure to consist of approximately 180 to 230mm [outlier of 380mm] of asphalt over approximately 410 to 640mm [outlier of 280mm] of granular base, an average of roughly 200mm of asphalt and 500mm of granular base. The subgrade soils were described as brown silty sand, in a compact to dense condition.

The report noted the Town Standard for new pavement structure for a collector/industrial roadway as:

- 40mm HL3 Surface Asphalt
- 100mm HL8 Binder Asphalt
- 150 Granular A Base
- 375 Granular B Sub-Base

The required Granular Base Equivalency [GBE] for the Town Standard new pavement structure was established as 681mm for a collector/industrial roadway. This is based on a GBE ratio of 2.0:1.0:0.67 for asphaltic concrete, granular base and granular sub-base. The GBE of the existing pavement structure was assessed base on a ratio of 1.0:0.5 for asphaltic concrete and granular base, providing existing GBE values of 405 to 520 mm, average of 450mm.

The report provided a recommendation for reconstruction of the roadway consisting of an overlay of 40mm of HL3 surface course over 75mm of HL8 binder course. The report also noted a recommendation for pulverization of the existing asphalt into the granular base, as well as the use of HL1 asphalt for industrial roadways.

The 2016 report was described as the 2016 asphalt overlay program, however it is not clear what if any of the recommendations of the report were implemented to improve the roadway.

2019 INVESTIGATION [WOOD]:

The Reid Sideroad culvert replacement report by Wood in early 2019 encountered approximately 180 and 215mm of asphalt over dense to very dense sand fill extending to a depth of approximately 2.1 to 2.2 metres. The sand fill is in turn underlain by firm to stiff silty clay fill to about 3.7 metres, over a layer of organic/peat material approximately 0.3 to 0.7 metres thick, followed by native silt and sand. It is likely that the noted organic/peat layer is localized to the area of the culvert crossing, associated with the drainage course.

FALL 2019 CULVERT REPLACEMENT:

The culvert reconstruction was conducted recently in the fall of 2019. Observations at the time of this work found the existing pavement structure to be consistent with that reported in the 2019 Geotechnical Investigation, with approximately 150 to 200 millimetres of asphalt over sand and gravel fill.

It is understood that the new culvert has been designed to accommodate existing and future truck traffic.

FALL 2019 CONDITION REVIEW:

A senior representative of Soil-Mat Engineers attended the site on October 28, 2019 to conduct a review of the existing pavement condition over the subject section from Twiss Road to Guelph Line.

The subject section is an asphalt paved, two lane roadway, with gravel shoulders and side ditches. The existing asphalt was found to be in good condition over the full length of the subject section. There was regularly spaced transverse cracking and occasional longitudinal cracking noted across the roadway, occasional limited edge cracking at the gravel shoulders, limited evidence of raveling, and minor isolated locations exhibiting alligator cracking.

It was noted that the borehole and corehole locations from the 2016 investigation were observed during the site evaluation, confirming that no reconstruction or rehabilitation works have been conducted based on that report. As well, it was noted that most of the borehole locations have settled below the pavement surface as much as perhaps 50 to 150 millimetres.

3. DISCUSSION

Based on our recent evaluation the existing pavement structure is in a good condition. The noted transverse and longitudinal cracking are consistent with typical age-related fatigue of the asphalt, however do not present as severe or indicative of significant deterioration. The noted edge cracking is typical of asphalt pavement with a 'soft' gravel shoulder and is not considered as an indicator of significant deterioration of the pavement. The noted locations with evidence of alligator cracking are generally isolated, and are not considered to represent a typical condition of the pavement structure over the subject section.

The pavement condition observed in 2019 is generally consistent with the photos included in the 2016 report. The boreholes for the 2016 investigation were noted to terminate at depths of approximately 1.2 metres, within the dense silty sand fill. The boreholes for the 2019 culvert replacement extended to greater depth, encountering dense to very dense sand fill to about 2.1 to 2.2 metres.

It is understood that at least a portion of the alignment of Reid Sideroad was originally established as a haul road for the quarry operation [circa 1960s]. The conditions presented in the 2019 culvert replacement investigation are consistent with such a scenario, with evidence of an organic layer in the area of the culvert crossing left in place, and the grade raised with silty clay fill and then a roughly 2 metre deposit of sand/silty sand fill. Based on the borehole information from 2016 and 2019 the sand/silty sand fill deposit is in a dense to very dense condition. It is not known when the roadway was established as asphalt paved municipal right of way, nor is it known when any previous pavement reconstruction or overlay work was done.

The subgrade condition afforded by the dense to very dense sand fill would be considered quite robust, and would contribute to a good long-term performance of an asphalt pavement structure, with lesser potential for subgrade related failure. This is consistent with the observed condition of the pavement, with typical transverse and longitudinal cracking, and limited isolated locations of alligator cracking. Evidently the pavement structure has performed well to date, and would be reasonably considered to have significant remaining lifespan subject to routine maintenance.

The subject roadway section was indicated as a local rural section in the 2016 report, however was assessed based on a collector/industrial standard pavement requirement. The roadway is noted to provide access from the interchange with Highway 401, and to a number of commercial businesses and the Campbellville Emergency Response Centre at the east end of the roadway. The roadway is also noted to provide access to existing industrial operations on Twiss Road. As such, the existing roadway would be reasonable considered as a rural industrial section.

The 2016 report establishes the existing pavement structure to consist of an average of roughly 200 millimetres of asphalt over 500 millimetres of granular base. The Granular Base Equivalency [GBE] of the existing pavement structure was calculated based on a ratio of 1.0:0.5 for asphalt and granular base, giving a value of 450 millimetres. However, this is considered to be a rather conservative assessment of GBE considering the observed condition of the existing asphalt, and the robust subgrade condition. The existing pavement would reasonably be evaluated on the basis of a ratio of 2.0:0.5 for asphalt and granular base, providing an existing GBE of 650 millimetres. Considering the robust subgrade condition, the existing pavement would be considered to be roughly consistent with the noted Town Standard for collector/industrial roads.

The Transportation Impact Study identifies the roadways as existing truck routes. The forecast for site generated trips at peak hour is 16 inbound and outbound trucks, or 32 total trips. Based on the existing and forecast traffic counts, this appears to represent a relatively small increase to the base traffic conditions. As such, it would not be expected that the traffic associated with the proposed re-opened quarry operation would have a significant impact on the condition of the roadway, or accelerate the need for rehabilitation works.

4. CONCLUSIONS AND RECOMMENDATIONS

Given the above information and discussion, we offer the following conclusion and recommendations:

- The existing roadway is presently supporting truck traffic associated with local commercial and industrial properties, although it is not a designated truck route.
- The forecast site generated trips do not appear to represent a significant increase on the existing and forecast base condition. As such, this would not be considered to significantly accelerate the rate of deterioration or need for normal end of lifespan rehabilitation.
- The existing pavement structure is considered to be roughly consistent with the relevant Town Standard for a collector/industrial roadway.
- The existing pavement is presently in a good condition, with evidence of typical age-related fatigue cracking and isolated location of subgrade damage. The present roadway section is evidently performing well supporting truck traffic under the present traffic conditions, and would be considered to have remaining serviceable lifespan based on the expected continued operation as a rural industrial access.
- It is recommended that specific reconstruction or rehabilitation of the roadway is not immediately warranted at present.

- A maintenance program of crack routing and sealing is recommended to extend the useful life of the present pavement. This program could also include cut and patch repairs of noted isolated location of evident subgrade deterioration [i.e. alligator cracking].
- Future rehabilitation of the pavement would be warranted, pending suitable maintenance, within approximately 4 to 8 years. This would be warranted based on the existing use and condition, irrespective of the proposed quarry operation. Subject to evaluation at the time, a recommended rehabilitation would involve a 'mill and pave' approach. The asphalt surface would be milled and resurfaced with 50 millimetres of new surface course asphalt. The use of an HL1 asphalt is recommended to achieve the best performance under truck traffic. The provision of a fiberglass mesh product would also be recommended to address potential reflection cracking, such as at transverse crack locations. Of course, as with any pavement structure, over a longer span of time the need for more robust rehabilitation will likely become warranted, such as full removal and replacement of the asphalt layers.

5. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The site conditions are based on the information provided in the referenced reports by others, and observations at the time of our specific site visit.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarification as to the contents of this document, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.

A handwritten signature in blue ink, appearing to read 'I. Shaw', is written over a light blue circular stamp.

Ian Shaw, P.Eng., QP_{ESA}
Senior Engineer



Distribution: James Dick Construction [1, plus pdf]