March 23, 2023
Our File: 523007

Municipality of Middlesex Centre
10227 Ilderton Road
Ilderton, ON N0M 2A0

Attention: Mr. Andrew Giesen
Transportation Manager

Re: Bridge B-301 Bearing Replacement Memo

Dear Mr. Giesen,

As you are aware, GM BluePlan Engineering Limited (GM BluePlan) was retained by the Municipality of Middlesex Centre (Municipality) to complete the design, approvals, tender document preparation, contract administration, and construction inspection for the minor rehabilitations of municipal bridge structures B-301, B-314, and B-505.

As part of our scope of work GM BluePlan completed a structure inspection of B-301 on March 2, 2023. Through this inspection the overall rehabilitation scope for B-301 was confirmed to generally be in accordance with the scope of work presented in the Municipality's Request for Quotation email, dated January 16, 2023 with the exception of the elastomeric bearings along the north abutment which were found to be in poor condition. These bearings were not previously identified as requiring replacement in the provided 2021 OSIM report. However, these bearings were found to exhibit signs of advanced deterioration including bulging, presumed uneven loading, and cracking. The bearings along the south abutment appear to be in fair condition by comparison, exhibiting less signs of deterioration.

This Memo has been prepared at the request of the Municipality to summarize GM BluePlan's recommendation that the rehabilitation scope for B-301 be updated to include bearing replacement at this time as opposed to maintaining the original rehabilitation scope and performing bearing replacement at a later date under a separate rehabilitation scope. The updated rehabilitation scope would include the temporary raising of the bridge superstructure via bridge jacking to allow for a swap-out of the bearings. While the south abutment bearings appear to be in fair condition and would likely not warrant bearing replacement on their own, it is recommended that all bearings be replaced at one time to ensure that the life cycle of all bearings remains similar. This Memo should be read in conjunction with GM BluePlan's Work Plan to gain a full understanding of B-301's original rehabilitation scope.

## CONSIDERATIONS FOR BEARING REPLACEMENT

All bridge elements have an expected service life and require either replacement or rehabilitation at the end of that service life in order to maintain proper function of the overall bridge. When considering which bridge elements to include in a bridge rehabilitation's scope, it is preferable to group related bridge elements with similar service lives together. This is to reduce the likelihood that a bridge element will need to be replaced prematurely on future rehabilitation projects. Expansion joints and bearings are bridge elements that are commonly grouped together in bridge rehabilitations due to the similar service lives of these element and that the function of these elements effect the other.

The current scope of rehabilitation work includes replacement of the expansion joints. While bearing replacement can be done without the need to replace expansion joints, there does exist some risk of bearing replacement affecting the seal and flush transition of expansion joints. If bearing replacement is not completed at this time it is unlikely that the bearings will last until the next rehabilitation cycle of B-301. Bearing replacements are costly. However, if carried out in isolation under a separate rehabilitation scope it is likely that the cost to replace the bearings would increase.

We know from visual inspection that several of the existing bearings are in poor condition and in need of replacement. The current project presents an opportunity to address the observed issues through bearing replacement and to align the expected service lives of the bearing and expansion joint elements.

## ADDITIONAL CONSTRUCTION COSTS

GM BluePlan has prepared a high-level construction cost estimate to complete the bearing replacement. The construction costs provided below are estimates only and do not include work generally beyond the structure and costs such as engineering, approval fees, and applicable taxes. These costs should be considered as preliminary only, as minimal pre-design work has been completed that may influence costs of items such as environmental considerations, regulatory requirements, etc.

The estimated additional construction costs for bearing replacement at B-301 are approximately **$140,000+HST**. This cost includes the supply and installation of jacking equipment, supply and installation of new bearings, and an increase to overall expected construction duration and ancillary project costs such as mobilization, bonding and insurance and temporary traffic control.

## ADDITIONAL ENGINEERING FEES

The inclusion of bearing replacement within the B-301 rehabilitation scope will require that additional engineering efforts be undertaken beyond what was originally described in our submitted Work Plan, dated February 9, 2023. These additional efforts will include engineering calculations to determine existing dead loads, in service live loads, bridge jacking loads, additional drafting, and additional specification preparation. It is anticipated that the inclusion of bearing replacement within the B-301 rehabilitation scope will extend the construction duration by 1 week. Therefore, additional efforts will also include extension of Contract Administration and Site Inspection services to accommodate a longer construction duration.

The estimated additional engineering fees for bearing replacement at B-301 are approximately **$9,300+HST**. This cost is inclusive of efforts likely to be required in the carrying out of this additional work, such as additional engineering calculations, drafting, shop drawing review, construction inspection, etc.

## RECOMMENDATION

Based on the above information, GM BluePlan recommends that bearing replacement be included in the overall rehabilitation scope of bridge B-301. Upon your confirmation, we will proceed with the detailed design and tender document preparation of the bridge rehabilitation. We trust that this Memo provides the information that you require at this time. If you have any further questions, or if we may be of further assistance, please do not hesitate to contact us.

All of which is respectfully submitted,

GM BLUEPLAN ENGINEERING LIMITED
Per:

Brendan Kaus, P. Eng.