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ENGINEERING DEPARTMENT

OPEN SESSION REPORT

TO: Members of Sarnia City Council

FROM: Mike Berkvens, Acting Director of Engineering

DATE: October 2, 2017

SUBJECT: 2017 Donohue Bridge Project Update

Recommendation:
For Council's Information

Background:
The Donohue Bridge was built in 1969. It is the largest and most heavily travelled bridge owned by the City of Sarnia. The bridge is over 260 metres long and 6 lanes wide with a current replacement cost of $32M excluding design and removal of existing bridge. This cost makes up approximately 50% of the total replacement cost of all bridges owned by the City of Sarnia.

The Donohue Bridge has seen many years of structural rehabilitation over its life including the following works:

1982-1983 Surface Repairs to the original deck which included removing and replacing the wearing surface of the bridge deck with a latex modified concrete overlay.

2009-2010 Deck Repairs to the west side of the bridge, specifically the southbound lanes. These repairs included removal and replacement of deteriorated concrete and overlay material of the deck. The new installation of concrete parapet walls and the replacement of storm drainage pipes on the west side of the bridge.

2013 Substructure Repairs. This project included repairs to components under the bridge including concrete columns and concrete pier caps that support the bridge. Some repairs were also completed to select areas of the east bridge deck and to the storm drainage pipes on the east side of the bridge.

2017 The current Donohue Bridge Project contract was awarded at the May 1, 2017 regular council meeting. The project is currently underway and includes the following rehabilitation activities:

1. The removal and repair of deteriorated concrete on select bridge components, including select soffits, diaphragms, and slope paving.
2. The removal and repair/replacement of deteriorated concrete and steel reinforcement on girders over the main CN rail line to/from the United States.
3. Removal and repair of a section of the concrete median wall between the North and Southbound lanes for investigative purposes.
4. Jacking and supporting the ends of the bridge to allow for the replacement of the bridge's bearing pads and to allow for new bearings and girder end repair.

Comments:

2017 work on the Donohue Bridge described above as items # 1 and #3 are now complete.

Work on Item #2 is progressing and is expected to be partially complete by the end of October. This work includes the removal of deteriorated concrete from the underside of the girder. This repair will prevent continued deterioration underneath the girder. The girder needs further repair in 2018 described in detail below. At the end of this project the Donohue Bridge will be left with two traffic lanes in each direction. Temporary concrete barriers will be installed to remove the live load (traffic load) from girder 10 until permanent repairs can be completed with deck repairs in 2018/2019. The City's Consulting Engineer Amec Foster Wheeler (AMEC-FW) has done analysis and confirms that this configuration is safe for the reopening of the Donohue Bridge in fall of 2017.

<u>Girder 10</u>

Due to missing details on the as-built drawings, investigation work at the center median was conducted as described in Item # 3 above. Following the investigation it was determined by AMEC-FW that there is no reinforcement connection between Girder 10 and the bridge's concrete deck. It was also confirmed that a construction joint (seam) in the deck has allowed water to enter and deteriorate sections of Girder 10. Subsequent engineering analyses completed by AMEC-FW have revealed that to achieve the structural capacity it is essential that Girder 10 should be rehabilitated by providing a physical connection to the deck. This will be completed as part of the in 2018/2019 phases of the Donohue Bridge Project.

Jacking

The jacking of the Donohue Bridge described in Item #4 above has not been completed on the north side of the bridge due to concerns identified with how the Donohue Bridge was originally constructed. During construction while removing deteriorated concrete on diaphragms across the width of the bridge, it was discovered that the reinforcing steel connections between the diaphragms and girders, as well as the reinforcing steel within the diaphragms themselves, were not constructed as shown on the as-built drawings. The jacking operations as per the original design rely on the strength of the diaphragm and girder reinforcing steel connections to support the bridge loads.

The bridge is safe as it is constructed, however the original plan to jack the bridge is not possible. AMEC-FW is engineering an alternative method to be considered in 2018/2019 to allow for successful jacking of the bridge which will allow for end girder repairs and bearing seat replacement to the north side of the bridge in 2018/2019.

Jacking of the south side of the Donohue Bridge is continuing this year, with a change from the original scope, and is expected to take place late September or early October. The change is generally to jack on the girders as opposed to the diaphragms.

Future Phases

The 2018/2019 phase of the Donohue Bridge rehabilitation work will include the above items in addition to the major rehabilitation of the northbound Deck. AMEC-FW is currently working on a construction cost estimate for the remaining work for 2018/2019.

Currently the traffic on the bridge is restricted to one lane northbound and one lane southbound due to ongoing bridge substructure rehabilitation work. It is common to remove traffic loading from sections of a bridge during construction. It is important to remember that the work that is ongoing is under the bridge and is generally invisible to the public eye.

The traffic will be restored to two lanes northbound and two lanes southbound after completion of the rehabilitation work by the middle of November 2017.

Future lane restrictions and reconfigurations will need to be considered for future phases of the project.

AMEC-FW confirms that the Donohue Bridge is safe to continue operating with the previously described live load restriction on Girder 10, however it is essential to the life of the Donohue Bridge that repairs continue in 2018 and 2019.

Consultation:
The Engineering Department has consulted AMEC-FW during preparation of this report.

Financial Implications:
Currently, the 2017 phase of the Donohue Bridge Project has not exceeded the Council approved project budget. AMEC-FW is currently working on the scope and estimate for the remaining work for 2018 / 2019.

Engineering had previously budgeted $4,550,000 towards the 2018 Phase of the Donohue Bridge Rehabilitation.

Reviewed by:

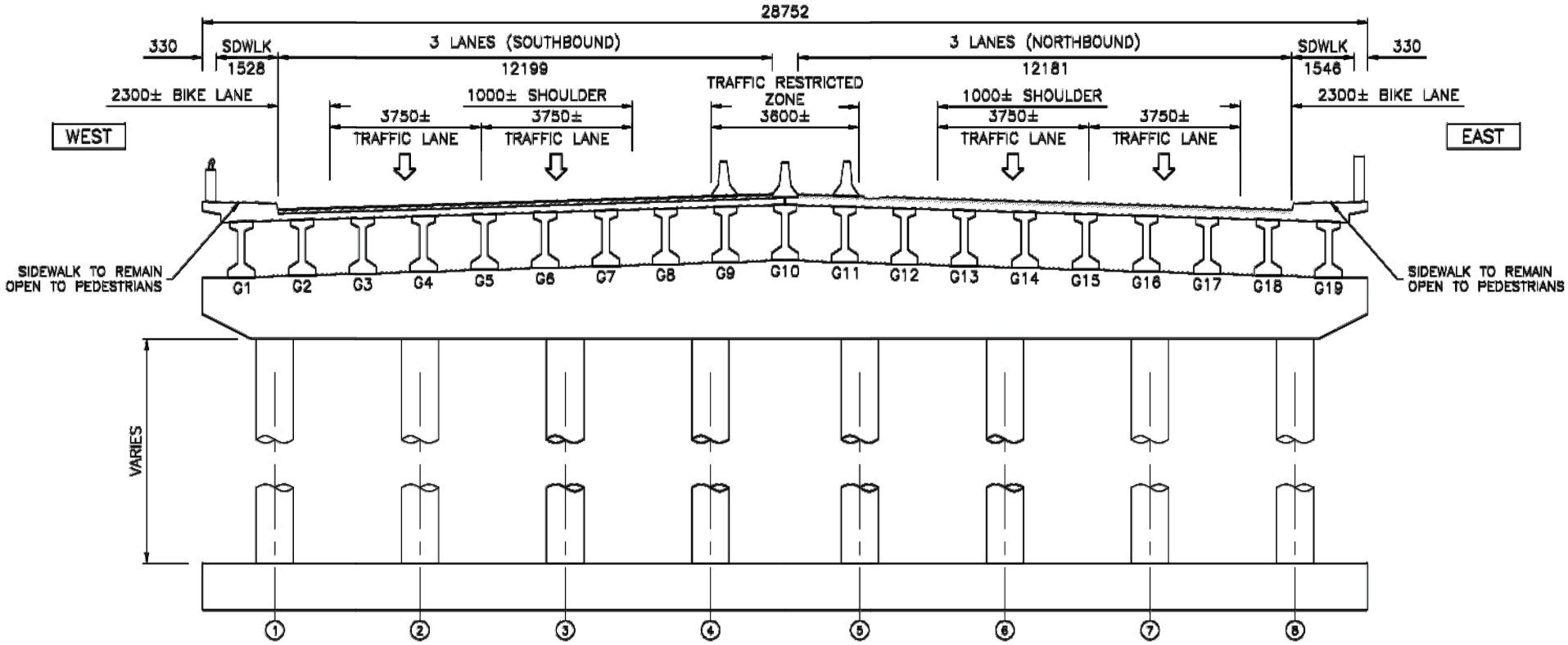
Mike Berkvens
Acting Director of Engineering

Approved by:

Margaret Misek-Evans
Chief Administrative Officer

This report was prepared by Robert Williams, Construction Manager.

Attachments: Donohue Bridge Deck Section and Basic Components of a Bridge



DONOHUE BRIDGE DECK SECTION

n.t.s.

Basic Components of a Bridge