



## STAFFORD BANDLOW ENGINEERING, INC.

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September 28, 2016

Wesley Weir, P.E.  
TranSystems Corporation  
55 Public Square #1900  
Cleveland, OH 44113

Re: Willow Avenue Lift Bridge Trunnion Bearing Replacement – Product Availability

Dear Wes,

This letter summarizes the work effort to identify the available repair options following the identification of a progressive failure at the NW OB Trunnion Bearing at the Willow Ave Lift Bridge in Cleveland, Ohio in December 2016.

Deterioration of the NW OB Trunnion Bearing indicative of a progressive failure was identified as part of a routine inspection in December 2015. Findings are documented in a memo dated December 11, 2015. Emergency repairs were implemented at that time to extend the life of the subject bearing. Additional in-depth inspection was performed in April 2016 and confirmed that replacement of the trunnion bearings was required on a priority basis. Findings are documented in a letter report dated April 20, 2016.

Upon the initial investigation findings identifying deterioration in December 2015, research was initiated to identify manufacturer's capable of providing a replacement. The trunnion bearings are cylindrical roller bearings supported by custom spherical inserts in pillow block housings. One bearing in each pair is also equipped with a roller thrust bearing at its outboard face. This bearing arrangement enjoyed a brief period of popularity circa 1950 and 1960 but fell out of favor following the development and advancement of spherical roller bearings and are presently no longer actively produced. We investigated the three major bearing suppliers (Timken, SKF and Messinger) capable of producing bearings in the size and capacity required for movable bridges, and who have a demonstrated track record of producing acceptable product. Of these three manufacturers, none actively produce bearings of the required type due to the effective obsolescence of this design. Despite the obsolescence of the design, any change to an alternate design would have increased the scope of work and time of procurement due to increased manufacturing and engineering time, and was considered undesirable.

Timken acquired Torrington, the original manufacturer of the trunnion bearings, and retained the original drawings for the subject bearings and recently produced a replacement bearing for this structure in 2002. This afforded Timken a distinct advantage and Timken provided a worst case lead time of 26 weeks for the full bearing assembly. As the work requires an in-kind replacement meeting the dimensional constraints of the present installation, either of the other bearing manufacturers would have needed to reverse engineer the existing bearing housing and spherical insert. This would have required partial or complete disassembly of the existing bearing housings, preparation of the necessary drawings and then a lead of approximately 6 to 8 months to procure the bearing housing. Based on these factors, we conservatively estimated that the full bearing assembly could take up to 1 year to procure using the reverse engineering



process and would arguably require the bridge to be taken out of service for at least some of this time.

In considering the above findings:

- Due to the need to guarantee fit-up with the existing structure
- Due to the need to replace the bearings in a limited operational shutdown where there was not time to fully reverse engineer the existing bearing assemblies
- Due to the need to procure the product according to an advanced timeframe

Timken was selected as the preferred provider and the project was advanced in consultation with Timken dating back to February 2016. When the buy America discussion was initiated in August 2016, we did attempt to obtain some form of documentation as to the previously discussed product lead time from the alternate bearing manufacturers. However, we have not been successful in obtaining a response, likely as there is no commercial benefit to them providing this information. Notwithstanding, Timken provided a clear advantage over the two alternate suppliers and they are regarded as the only practical option for this work, short of substantially expanding the scope, project duration and resultant cost of the work.

If you have any questions on the information documented in this letter, please do not hesitate to contact me at (215) 340-5830.

Sincerely,

A handwritten signature in black ink, reading 'Robert J. Tosolt, P.E.'.

Robert J. Tosolt, P.E.  
Stafford Bandlow Engineering