URS

May 23, 2016

Mr. Wesley Wright, PE
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Mr. Wright,

AECOM has completed the review of the as-built plans, BRINSAP reports and load rating calculations for the Austin Avenue bridges over the North San Gabriel River and South San Gabriel River. AECOM also reviewed the Condition Assessment and Evaluation of the bridges performed by Wiss, Janney, Elstner Associates, Inc. (WJE). The following are our findings and recommendations:

The load rating calculations performed by Barnhart Constructors, Inc. for the 2013 BRINSAP report are mathematically correct and appear to be prepared with sound engineering procedures. Two ratings were calculated, Inventory Rating and Operating Rating. According to the Texas Department of Transportation (TxDOT) *Bridge Inspection Manual*, Inventory Rating is the load, including loads in multiple lanes, which can safely utilize the bridge for an indefinite period of time. The Operating Rating is the maximum permissible live load that can be placed on the bridge. Due to the load factors involved with each rating, the Operating Rating is higher than the Inventory Rating. According to TxDOT policy for off-system bridges, structures may be posted at the Operating Rating level if all condition ratings given in a biannual inspection are 6 or above. For any condition ratings below 6, the bridge must be posted at Inventory Rating level. The truck load for modern design has a designation of HS-20 so load ratings are calculated using a HS-20 truck and are expressed in terms of an equivalent HS-truck. Any rating above HS-20 does not require a load posting since this indicates the bridge has sufficient capacity to carry modern truck loads.

The load ratings for the Austin Avenue bridges are HS-15.9 for Inventory and HS-26.5 for Operating. The condition rating of the superstructure in the 2013 BRINSAP report was a 5. This resulted in the bridge being posted for the Inventory Rating. When the bridge had a previous condition rating of 6, load posting was not required by TxDOT policy since the Operating rating exceeded HS-20. The bridges are currently load-posted for 48,000 lbs. gross and 21,000 lbs. tandem-axle. During our kick-off meeting, AECOM was informed that the WJE report was reviewed by TxDOT, and TxDOT is allowing the BRINSAP condition rating of the girders to be increased from a 5 to a 6. Subsequently, TxDOT further clarified by letter on May 2, 2016 that these bridges had been reclassified from on-system bridges to off-system bridges; as a result, the bridges are still required to be load-posted but at higher loading (68,000 lbs. gross and 34,000 lbs. tandem-axle), per TxDOT. TxDOT is providing new load posting signs for this revised loading, for installation.

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On April 28, 2016, Patrick Hays, PE, Douglas Hively, PE and Anagha Parkar, EIT of AECOM performed a site assessment of both bridges to confirm the findings of WJE's report. The assessment was done visually from the ground and by walking the sidewalks on the deck. Generally, AECOM is in agreement with the WJE report. Supporting field notes can be found attached to this letter. Specifically, AECOM agrees with WJE that the minor section loss observed in the girders does not occur in the critical load-carrying sections.

The City of Georgetown expressed concern to AECOM about removing the load-posting signs and requested options to preserve or replace the bridge so that the bridge would not have to be reposted in the near future. AECOM's options follow.

Strengthen the under-capacity girders for HS 20 loads. At a minimum, the girders that have an Inventory Rating of less than HS 20 could be strengthened by field-welding cover plates to the bottom flanges. This would increase the stiffness of the girder and increase the live load carrying capacity. If a future inspection reduces the condition rating back down to a 5, the girders will have an Inventory Rating greater than HS 20 when a load rating calculation is performed. Also recommended with this option is replacing the deck expansion joints to mitigate water leakage which causes deterioration of the girders, bearings and substructure. Water will still continue to penetrate the deck at intermediate joint locations in the deck. Therefore, maintenance intervals should be increased.

Deck and bearing replacement / repair of concrete substructures. The deck in its current condition allows water to seep through the expansion joints and the intermediate deck joints. This is causing the girders, diaphragms and bearings to corrode. It is also staining the substructure and causing concrete spalls which expose reinforcing. A deck replacement would greatly mitigate further deterioration of the girders and substructure. The new deck would not be filleted at the diaphragms with intermediate deck joints like the existing deck. Instead, deck joints will only be required at the ends of simple spans and continuous girder units. This will keep moisture off the intermediate diaphragms and will further reduce corrosion. The bearings under the 40' spans show rust and thus their movement is limited. Replacing these bearings with elastomeric bearings that are not susceptible to rust is recommended. This could be done by jacking the girders during the deck replacement process.

Modern concrete decks are 8 ½" thick compared to the current 7" deck. The increased deck thickness would warrant an analysis of the girders to see if they could adequately carry the additional weight of a thicker deck. Regardless of the analysis results, shear connectors should be added to the top flange of the girders to create a composite connection with the concrete deck. This will increase the load carrying capacity of the girders to ensure that no future load-posting will be necessary. It is possible that the approach roadway and abutment backwall will have to be modified to align with the top of the thicker deck that may have to sit higher than the current deck.

The deck will probably have to be replaced to the current width. This does not allow for increasing the width of the vehicular lanes and sidewalks. Under this assumption, this also does not allow for keeping at least two lanes open on the bridge during replacement. If the deck was replaced in stages, two lanes could be kept open in the first stage, but the deck isn't wide enough to accommodate two lanes of traffic during the second stage and detours would be required. Replacing the deck to its current configuration would still provide suboptimal conditions for bicyclists and pedestrians using the narrow sidewalks. Additionally, it may be challenging to meet requirements of the Americans with Disabilities Act (ADA).

Alternately, if the sidewalk was only reconstructed on one side of the bridge, it could be wider and more accommodating for non-vehicular traffic. This may require a slight shift in the traffic lanes as they approach the bridges.

It is also recommended that the concrete spalls on the substructure be repaired when the deck is replaced.

Bridge widening and deck replacement. Some of the problems discussed with the deck replacement could be solved by widening the bridge (superstructure and substructure) during replacement. The replacement could be done in phases so that two lanes of traffic could be kept open during construction. Lane and sidewalk widths could be increased. The widening would require additional girder lines and substructures for support. It may be difficult to make the widening aesthetically pleasing below the deck and could be viewed negatively by users of the trail below.

Bridge replacement. There are many more options for improving the functionality and strength of the bridge when a full replacement is considered. The bridge would be constructed with a wider deck allowing for wider traffic lanes and sidewalks, and bike lanes that could tie in with the trails below. The bridge could be constructed in phases which would allow two lanes of traffic to remain on Austin Avenue during construction. The options for aesthetic enhancements are limitless and could be selected with the public's involvement. Improved lighting for trail users could be incorporated. The entire bridge could be constructed with concrete that would reduce maintenance costs over the life of the bridge. A target life span of 75 years for the new bridge would ensure that the bridge could accommodate truck loads and increased traffic projections for the life of the bridge.

Conclusion. As TxDOT has subsequently revised the condition rating of the girders and has clarified the bridge classification (off-system), the confirmation of the load-posting and the increased posted gross and tandem-axle loads, AECOM recommends the City of Georgetown consider the strengthening, widening, or replacement options discussed above as a means of elimination of the load posting signs.

The WJE report discussed the carbonation progression of the concrete deck in regards to service life modeling. According to their testing, carbonation of the concrete is in progress and corrosion of the deck reinforcement is

expected to accelerate over the next 15 to 30 years which will lead to more concrete spalls. If the deck is not replaced, it is recommended that a frequent maintenance schedule be followed to repair any spalls that develop.

AECOM thanks you for this opportunity to review the provided information and hopes this letter has sufficiently addressed the City of Georgetown's concerns regarding the options for preserving or replacing the Austin Avenue bridges. Recommendations are preliminary, conceptual in nature and are subject to change upon further investigation. If requested, AECOM is available to look further into the development of these options.

Sincerely,

Douglas R Hively

5-23-16

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Attachments: Austin Ave. Bridge over North San Gabriel River Observation Checklist
Austin Ave. Bridge over South San Gabriel River Observation Checklist