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February 7, 2011

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Mr. Bimal Devkota, Division Chief
City of Baltimore Department of Transportation
7 East Redwood Street – 2nd Floor
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Attention: Mr. Omar Davis

Robert J. Halbert

Project: Baltimore City Project 1038
On Call Bridge Design

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Michael L. Krupsaw
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Subject: Fort Avenue Bridge Staging Assessment

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Dear Mr. Davis:

As requested, RK&K has performed a cursory review of the Fort Avenue plan set provided by Baltimore City to assess the feasibility of reconstructing the bridge in stages and maintain vehicular traffic. Further, understanding that the City's primary goal for this project is the safety of the public and the contractor's forces, RK&K was also tasked to assess any safety or structural issues that might be presented by staged construction. Presently, with the exception of the sidewalk on the south side of the bridge, the City proposes to close the bridge to traffic during the reconstruction. This letter presents a summary of our assessment and its conclusions.

The existing bridge is a three span structure that is orientated approximately east and west with the center span over the CSX Railroad. The proposed bridge will be a single span structure that is approximately 40 feet shorter and three feet higher than the existing bridge. The total out-to-out width of the proposed bridge matches the existing bridge width. The new bridge will carry several utilities below the deck with the exception of the two 20" water mains which will be carried on the sidewalk behind the proposed parapets.

As noted, the current plans depict closing the bridge to vehicular traffic while allowing full pedestrian access throughout the duration of construction. The new bridge framing and abutments will be built in two stages to maintain the existing utility services and pedestrian access across the bridge.

For the purposes of this assessment, RK&K considered the possibility of maintaining one lane of traffic in each direction while retaining the pedestrian access on the south sidewalk. The bridge can be built with two phases but the construction joint is moved to the center of the bridge. Assuming a clear space of 2' for a temporary barrier at the edge of the deck there remains 22'-9" clear for traffic operations between the toe of the barrier and the edge of curb.

In addition to an increase in the duration of the construction, this alternative would result in additional construction costs to account for additional MOT pay items (barrels, barriers, temporary pavement markings, etc.) and additional support of excavation running parallel to Fort Avenue to account for the grade difference. This alternative would also increase the horizontal shift of the utilities by 21-feet which would complicate the ability to maintain service and the need to perform this relocation under live traffic. Finally, this alternative would not permit the City to install conduit and supports for the relocated utilities from above the deck. Requiring this work to be done from "below" would significantly impact the cost and duration of the utility work due to the presence of an operating railroad.

A second alternative considered by RK&K consists of maintaining one lane of alternating traffic which would be controlled by temporary signals at each end of the bridge. Pedestrian access would be maintained on the south sidewalk in the same manner presently proposed. This alternative would still allow construction of the bridge in two phases but the construction joint is moved closer to the center of the bridge. Assuming a clear space of 2' for a temporary barrier at the edge of the deck there remains up to 22'-9" clear for traffic operations between the toe of the barrier and the edge of curb. This alternative impacts costs and construction duration similar to the first alternative but adds the cost of the temporary traffic signals.

Each of the alternatives considered during this assessment would result in substantial increases in the cost and duration of the Fort Avenue Bridge reconstruction project. There are several other circumstances at the site that significantly complicate the ability to maintain vehicular traffic, both from both cost/duration and safety perspectives. These include:

- The COMAR requirement to increase the vertical clearance over CSXT by raising the grade of the bridge deck by approximately four feet.
- The need to maintain service and to relocate the multiple major utilities on the bridge.
- The presence of businesses and residences which preclude the ability to shift the bridge.
- The presence of the operating railroad below.

As part of this assessment RK&K reviewed the following inspection reports:

- "CSXT Bridge No. BAM 1.0, Fort Avenue over CSX Transportation" as prepared by HDR Engineering, Inc. dated September 25, 2007. This report was prepared for CSXT.
- "Bridge No. BC 8022, Fort Avenue over CSX Railroad" as prepared by STV dated January 28, 2011. This report was prepared by the City's bridge inspection consultant.

Both of the reports conclude that the bridge is in a significantly deteriorated condition which warrants replacement. There are three items of particular note that will be discussed here. First, in order to maintain two lanes of traffic the travel lanes must be shifted right or left as far as possible without riding on the existing sidewalk. Unfortunately there is insufficient width between sidewalks to provide a reasonable width for two traffic lanes as well as placing a temporary concrete safety barrier on both sides of the shifted lanes. Because there must be a barrier adjacent to the cut line of the superstructure, i.e. where traffic must be protected from going over the edge of the bridge, the lane carrying traffic in the opposite direction will be riding directly adjacent to the sidewalk. The inspection reports note that the height of the existing curb has been reduced over time to as little as 1". This condition creates a safety hazard where a vehicle could easily ride up on the sidewalk. Since there has been a commitment to maintain pedestrian access at all times during the project the existing sidewalk adjacent to the temporary lanes must be used before the new sidewalk on the other side of the bridge can be placed in service. Although a concrete safety barrier could be placed on top of the sidewalk the condition of the structural members below and adjacent to the sidewalk is such that additional loading above that imparted by pedestrians should be avoided.

Second, the concrete girders supporting the sidewalk and the concrete encased steel beams supporting the roadway adjacent to the sidewalk are in poor condition with instances of exposed reinforcing steel with areas of 100% section loss and exposed steel beam flanges with "major section loss". Although RK&K did not perform a load rating of the beams the report prepared by HDR notes that, in the case of the concrete girders supporting the sidewalk, "Load carrying capacity has been reduced." The same report goes on to state that, in the case of the concrete encased steel beams supporting the roadway, "Load carrying capacity has been significantly reduced." The report also recommends the erection of temporary concrete barriers on the bridge deck to "... preclude vehicles from parking on the shoulders or entering onto the sidewalks of the bridge." As noted above, the use of staged construction will necessitate the use of the shoulder as a temporary travel lane.

Lastly, staging the construction of the bridge requires the demolition of a portion of the structure while maintaining traffic on the remaining portion of the bridge. Throughout the superstructure there are areas where

there are major concrete spalls on the underside of the roadway surface with significant section loss (100% in some areas). The vibrations created during demolition may exacerbate problems at the areas where significant deterioration already exists. If the demolition activities result in any increased deterioration on the existing portion of the bridge it is possible that this may create a worsened condition that precludes the ability to continue to maintain traffic.

Therefore, while understanding the limited scope of RK&K's assessment of this project, it is apparent that the decision to close the bridge to vehicular traffic during the reconstruction is sound and likely represents the safest alternative. In addition, the duration of the project is minimized by detouring traffic. Maintaining traffic during construction would likely increase the cost of the project by 25% to 30% and increase the duration of the work by approximately six (6) months. In addition, redesign effort would further present a significant cost increase and further delay the project. The condition of the bridge is such that further delay should be avoided and the bridge replaced as soon as possible.

By detouring vehicular traffic the contractor will be allowed to proceed with the work unencumbered by the presence of the travelling public, which not only increases the safety of the public but also the contractor's forces. Finally, the condition of the existing bridge, particularly the elements supporting the roadway where lanes would be maintained, creates a significant concern regarding the safety of the travelling public.

If there are any questions pertaining to the contents of this letter please do not hesitate to contact me at 410-462-9352.

Sincerely,



Stuart A. Montgomery, P.E.
Associate

Attachments

SAM

cc: TEM/File 106-146-13

SAM

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