

MEMORANDUM

To: Lilliam Escalera
From: Don Skelton, P.E.
C.C.: Bill Howell, P.E.
Date: June 5, 2018

Subject: Bridge 150125 (Gandy Boulevard over US 19) Replacement
Recommendation
State Road No. 55 (US19) from 66th Avenue to 118th Avenue
FPN 435914-1-22-01, Pinellas County

The PD&E Reevaluation Study along US 19 from 66th Avenue North to 118th Avenue North in Pinellas County, has identified a need to increase the capacity of the Gandy Boulevard (SR 694) overpass of US 19 from four to six lanes to meet future traffic demands. This memorandum documents the evaluation of options to replace versus widen the existing Gandy Boulevard/Park Boulevard (SR 694) bridge over US 19 (Bridge 150125).

Existing Bridge 150125 – Gandy Blvd over US 19

The existing structure (Bridge 150125) carries eastbound and westbound Gandy Boulevard over US 19 with a single point urban interchange (SPUI) configuration underneath the bridge. The bridge is a 3-span continuous steel plate girder superstructure supported by multi-column piers with driven piles. While the alignment is on a slight curve with a 3-degree (1910') radius, the beams are chorded with bent plates at the bolted field splice locations.

The existing bridge typical section consists of a 76'-4" wide structure that accommodates four 12'-0" wide travel lanes, 4'-9 1/2" wide outside shoulders, 7'-0" wide inside shoulders, and a 2'-0" wide median barrier. The deck has a 5.0% superelevated cross slope on the travel lanes and the outside shoulders, and has a flat cross slope on the inside shoulders and under the median barrier.

Current Bridge Condition:

Bridge 150125 was constructed in 1977 and was last inspected on 4/30/2015. Per the inspection report, the bridge sufficiency rating is 76.2 and the health index is 87.70. The sufficiency rating, ranging from 0% to 100%, considers structural adequacy; functional obsolescence and level of service; and essential use for the public. The structure is neither Functionally Obsolete nor Structurally Deficient. The NBI rating for the deck is 6 (satisfactory), the superstructure is 7 (good), and the substructure is 7 (good). The NBI rating, 0 (failed condition) to 9 (excellent condition), evaluates the physical condition of each component. A structure becomes structurally deficient if one of the NBI ratings fall below 4.

In 2012, Bridge 150125 was load rated using the Load Factor Rating (LFR) method. The bridge has an operating rating factor is 1.26 and the inventory rating factor is 0.76, which occurs in the girder cross-frames. Six cross-frames, connecting Beams 2 and 3, have inventory ratings of less than 1.0. The lowest operating and inventory rating for the main girders are 1.80 and 1.08, respectively, which occurs at the bearing line between Spans 2 and 3.

Since the inventory rating is less than 1, the existing bridge capacity does not meet the requirements from Chapter 7 of the FDOT Structures Manual, Volume 1 (SM V1). Per Figure 7.1.1-1 of the SM V1, replacement or strengthening of the bridge is required unless a design variation is approved.

Additional items to note within the latest bridge inspection report include:

- The existing minimum vertical clearance of the bridge is 16'-0". US 19 has asphalt pavement and the existing 16'-0" clearance does not allow for additional thickness of asphalt if required for future milling/resurfacing.
- The bridge superstructure has been hit by a vehicle at least one time. The bottom flanges of Beams 2-1 and 2-2, and the cross frames between those two beams have since been repaired. The repair was located around the mid-span of Span 2.

Proposed Bridge – Gandy Blvd. over US 19

The proposed bridge typical section will consist of a 106'-8" wide structure that accommodates three 11'-0" wide traffic lanes and 8'-0" wide inside and 10'-0" wide outside shoulders in each direction. A median 36" single-slope barrier and 36" single-slope barriers on the outside are provided.

Two options are being considered; widening of the existing structure, and replacing the existing structure.

The widened bridge deck will be sloped at a constant 5% cross slope for the entire bridge deck inclusive of the inside shoulders which would require removal/replacement of deck in the middle of the existing bridge in addition to outside widening. The bridge

replacement option will be designed utilizing urban 0.05 maximum superelevation requirements and a design speed of 45 mph with +0.02% (reverse crown) superelevation.

Widening the bridge requires strengthening of six existing cross-frames. The existing bridge would require a new LRFR analysis of the existing and proposed condition. If any of the other existing elements produce an inventory rating factor less than 1.0, those elements would also require strengthening. Since one of the beams has an inventory rating of 1.08, it is likely at least one beam will require strengthening. Strengthening options for the beams include bolted steel cover plates and carbon fiber reinforced polymers (CRFP) plates.

For the bridge widening, the proposed asymmetrical typical section would require the median barrier to be shifted 6-feet horizontally from its current location. In order to maintain consistent cross slopes on either side of the median barrier, the bridge deck between the middle beams would need to be removed and re-graded. This would require an increase in the thickness of the concrete deck haunches over the girders in this section of the bridge as well as thickening the deck around the new median barrier. The increased weight of the thicker deck overbuild and increased haunch thickness would reduce the structural capacity of the bridge and could cause beam overstressing in the bridge. The deck slope modification will also require a non-standard variable height median barrier on the bridge since the deck elevation will be substantially different on either side of the barrier.

The estimated cost to widen the bridge and the roadway approaches is \$6.9 million versus an estimated cost of \$9.4 million to replace the bridge and reconstruct the roadway approaches. The widened costs includes an allowance for strengthening the cross-frames based on the deficiencies identified in the LFR load rating. No value was assigned to additional strengthening that could be required to bring the LRFR load rating above 1.0 for the entire bridge. Additional strengthening requirements would be dependent upon the results of a LRFR analysis of the bridge.

Additional Considerations

The existing bridge consists of a 3-span configuration with a center span length of 160-feet crossing over a SPUI intersection configuration underneath. The proposed new upgraded SPUI under the bridge requires additional turn lanes to be constructed on the approaches to meet future traffic demands. The proposed future signal phasing requires opposing ramp left turning movements to occur concurrently within the same traffic signal phase. The traffic analysis has recommended dual left turn lanes for the approaching WB and EB ramps. The widened bridge piers of the existing bridge constrict the left turning movement geometry and do not allow for both dual lefts to occur concurrently. Consequently, the bridge widening option only allows construction of a single EB to NB left turn lane. This reduction in turn lanes will not allow the interchange to operate as efficiently as the new bridge option which can accommodate all required turn lanes.

The existing 160-foot span also restricts the amount of widening that can occur along US 19 under the existing bridge. The improved median width along US 19 is constrained to a width of 23.5-feet on the approaches to the existing bridge due to the horizontal clearance restrictions to the existing bridge piers. This median width is not sufficient to allow construction of a pedestrian refuge area within the median. The new bridge option will allow a 32-foot median to be constructed along US 19 which will allow provisions of a pedestrian refuge area in the median per Florida Design Manual Section 212.9, and will increase the safety for pedestrians crossing US 19.

Recommendations:

It is recommended that existing Bridge 150125 should be replaced for the following reasons:

- Bridge replacement will provide a grade separated structure with a new bridge service life.
- The potential to utilize weathering steel for the new bridge would also reduce future maintenance costs when compared to widening the existing painted steel bridge.
- Bridge replacement will improve the vertical clearance to meet the 16'-6" minimum criteria of Table 260.6.1 in the FDM.
- The new bridge will allow construction of all required ramp turning lanes at the SPUI to meet the future traffic demands.
- The new bridge will not constrain the width of US 19 under the bridge and will allow construction of pedestrian refuge areas within the median to increase the safety for pedestrians crossing US 19.
- The cost of replacing the bridge, including retaining walls, is \$2.5 million more than the cost of widening the existing bridge and will increase the overall project cost by only 10%.