# INTEROFFICE COMMUNICATION

TO: Nick Chaney P.E., District Bridge Engineer
FROM: Brian Ross P.E., Structures & Pavements
DATE: February 29th, 2024
SUBJECT: Brief Structure Type Study (STS) for bridge TRU-422-1559 (SFN: 7807082) PID: 118715

This memo serves as a brief structure type study for the subject bridge to assist in establishing a rehabilitation or replacement strategy. The conclusions of this study are based upon analysis of the existing structure design, previous project history, existing conditions, and field observations.

TRU-422-1559 is a 125' 3-span non-composite prestressed concrete box beam (PSBB) bridge carrying US 422 over Mosquito Creek. The structure was constructed in 1971 and rehabilitated with an asphalt concrete overlay in 2010. This structure is currently programmed to receive repairs and an asphalt overlay during the summer of 2024 on PID 102752. The current asphalt concrete wearing surface varies between 3-4" w/ waterproofing. The HS20 Modified legal load limit is 150%. The 2023 bridge inspection summary indicates the bridge is currently in satisfactory condition with a GA of 6. The GA rating is driven by the satisfactory deck/superstructure and substructure ratings. Leakage is evident in joints 2, 3, 4, and 6 throughout all 3 spans. Saturation was present in at the forward abutment in beams 12,13, and 14. Edge spalls have formed in box beam 5 in spans 1 and 2 and box beam 14 in span 1. No strands are directly exposed at this time. The substructure (rated 6) shows isolated spalls in both the rear and forward abutments some with exposed reinforcement. The channel (rated 7) is in good condition. This structure features structurally separated concrete sidewalks and railings to allow over the side drainage through a slot opening. There is severe deterioration present in the right sidewalk over the openings. Repairs made to these areas have limited effectiveness.

With the accelerated degradation expected and repairability issues with the slot draining sidewalks, a superstructure replacement is warranted. The substructure has a satisfactory rating (6) suggesting that a full replacement is not required per BDM C401.4. The replacement structure type will be influenced by pedestrian access, deck drainage limitations, and MOT concerns. The district examined 2 superstructure options:

- Prestressed concrete box beam w/ composite deck superstructure including sidewalk with an alternative drainage solution.
- Steel beam w/ composite deck superstructure including sidewalk and scuppers.

In discussions with the City of Niles it was requested that the replacement structure maintain pedestrian access on both sides of the structure. Providing adequate deck drainage in conjunction with curb and sidewalks will be the primary constraint in the structure replacement. The steel beam superstructure type would allow for scuppers to be placed along the curb line. However, heavy modification or complete reconstruction of the abutments and piers would likely be required to accommodate the changed loading configuration when switching from PSBB to steel beams.

With this limitation the district's preferred superstructure type is a prestressed concrete box beam w/ composite deck. The added composite deck may require roadway profile modification to an extent to be determined during design. The replacement design shall maintain the hydraulic opening with the proposed bottom deck cord elevations matching or exceeding the existing elevations. Since sidewalk is required, an alternative drainage solution will need to be designed by the consulting agency.