INTEROFFICE COMMUNICATION

TO: Nick Chaney, District Bridge Engineer
FROM: Brian Ross, Structures & Pavements
DATE: October 6, 2025 (Revised 11/20/2025)
SUBJECT: Abbreviated Structure Type Study (STS) for bridge TRU-88-0430 (SFN: 7805713)

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-88-0430 is a 3-span prestressed non-composite concrete box beam bridge carrying SR 88 over Mud Run. The structure was constructed in 1996 with a rehabilitation in 2011. The current wearing surface is 3" of asphalt concrete w/ type 3 waterproofing. The 2025 bridge inspection report rates the bridge general appraisal (GA) as fair condition (5). The GA rating is driven by fair deck/superstructure ratings. There is spalling on the deck underside/bottom flange of box beams 9, 7, 6 and 5 in span 1. Strands are exposed in the edge of beam 7. Significant efflorescence is present at these locations. Facia beams have spalled at the pier caps. The substructure (rated 7) shows minimal distresses.

With the accumulating delaminations and spalls in the conc. box beams and accelerated degradation expected, a superstructure replacement is warranted. While the substructure is rated as good (7) suggesting that a full replacement is not required per BDM C401.4 and dead load calculations were performed to verify whether the increase was greater than 15 percent. Initially, the increase of dead load was found to be 36 percent. Further investigation was done to identify avenues to reduce this to an acceptable amount. Ultimately, it was determined that the use of lower density concrete in the composite deck would yield acceptable dead load increases. Three alternatives have been investigated:

- **Conc. Box Beam w/ Composite Deck** – Dimensions of box beams have not changed significantly from original SCD used (PSBD-1-81) to current (PSBD-1-25). Minimum retrofitting would be needed to replace in kind. There is a minimum 6" thickness required for the composite deck. However, for multiple span box beams and additional 2" is recommended as a sacrificial haunch (BDM 308.2.3.3.e2). The increase in profile would need to be accounted for in the designed replacement. In-kind PSBB replacement with a non-composite deck and AC wearing surface is not being considered due to inadequate expected lifespan.
- **Steel Beam w/ Composite Deck** – A Steel beam superstructure will require modifications to the substructure to accommodate the change in loading configuration. Steel beams will also require a protection coating system.
- **Conc. Slab** – Modifications to the substructure will be required to replace with a concrete slab. This alternative will likely have additional deadload compared to existing design – foundation bearing capacity would need to be examined.

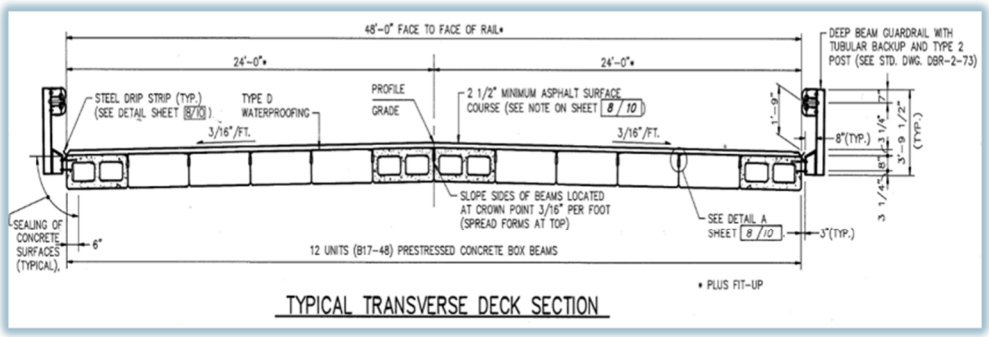
For superstructure replacement of TRU-88-0430 the preferred structure type is a Conc. Box Beam w/ Composite Deck. Exact cost differences between steel & conc. box beam superstructures were not examined. The preservation needed for the steel beam PCS makes box beams the preferable alternative. A concrete slab will require substructure modification/replacement for the increased deadload along with an expected longer construction time and higher cost. The composite PSBB alternate will require roadway profile modification to an extent to be determined during design. The replacement design shall maintain the existing hydraulic opening. The proposed bottom deck cord elevations should match or exceed the existing elevations. Minimal corrective work is needed for the substructure.

To conclude, the recommended choice is Prestressed Concrete Box Beams with a Composite Deck. The 6-inch composite deck will utilize lower density concrete (125 lbs./cf) to minimize the dead load. Furthermore, the additional 2 inches for sacrificial haunch will be omitted to limit the overall dead load increase to 16%. If subsequent design results in a higher dead load than expected, lower density concrete (125 lbs./cf) should also be considered for the prestressed box beams themselves.

Dead Load Comparison

PID 123665

CRS TRU SR 0088 04.30



TYPICAL TRANSVERSE DECK SECTION

EXISTING		PROPOSED	
Box Beam End Area =	4.16 sq ft	Box Beam End Area =	4.16 sq ft
Number of Box Beams =	12	Number of Box Beams =	12
Asphalt Deck Thickness =	3.50 in	Concrete Deck Thickness =	7.00 in
Asphalt Deck Width =	48.00 ft	Concrete Deck Width =	48.00 ft
Railing Load =	100.00 lb/ft	Railing Load =	200.00 lb/ft
Unit Wt of Concrete (BEAMS) =	150.00 lb/cf	Unit Wt of Concrete (BEAMS) =	150.00 lb/cf
Unit Wt of Asphalt (DECK) =	150.00 lb/cf	Unit Wt of Concrete (DECK) =	125.00 lb/cf
Dead Load / Foot =	9781 lb / ft	Dead Load / Foot =	11381 lb / ft
Total Bridge Length =	90.50 ft	Total Bridge Length =	90.50 ft
Total Dead Load	885203 lb	Total Dead Load	1030003 lb

DEAD LOAD INCREASE = 16.36%

CONCRETE Deck THICKNESS	Minimum Concrete Deck Thickness = 6" for a Single Span Box Beam Minimum Concrete Deck Thickness = 8" for a Multispan Box Beam (Sacrificial Haunch Depth is 2") (BDM 308.2.3.3.e.2) This is a Multi-Span Box Beam with a Speed Limit > 45mph, so a min 8" min thickness deck is required, the dead load is increased by 35%±. If we allow a 6" min thickness deck with lightweigh concrete deck, the dead load is increased by 16%±

A