

MEMO

TO: City of Hudson

FROM: Euthenics, Inc.

DATE: February 14th, 2025

SUBJECT: Review of Pedestrian Facility on Boston Mills Road Bridge

CC:

Mr. Kosco,

The goal of this memo is to analyze the opportunity to install a reduced width pathway on the existing, Boston Mills Road Bridge over Lake Forest (Brandywine Creek) as part of the City's Boston Mills Road Trail Project as a cost-savings measure. The current project programmed to install a new 8-10-foot wide, multi-purpose path from an existing path near Omni Parkway to Lake Forest Drive, along the north side of Boston Mills Road. The new path will connect to a city-designed sidewalk to be constructed along Lake Forest Drive.

Currently, the project design incorporates a separate, pedestrian bridge over Lake Forest, paralleling the existing road bridge. The introduction of the separate pedestrian bridge was introduced as part of the project's preliminary study in 2021. The decision to construct a separate pedestrian bridge was based upon the limited space along the existing bridge for a larger width, multi-purpose path and Summit County requirement to avoid structural impacts to the bridge, such as bridge widening. This memo will serve a formal review of the feasibility of adding a pedestrian facility on the existing bridge over Lake Forest on Boston Mills Road.

Geometric Review:

The existing bridge is a single-span, non-composite, prestressed, concrete box beam bridge having a length of 66.77 feet and an operational width of 34 feet from face to face of railings. See sketch of existing bridge cross section below.

ODOT guidelines utilize existing roadway characteristics to determine normal design criteria. The bridge over Lake Forest on Boston Mills Road is classified as rural based on existing roadway characteristics. According to ODOT's Transportation Information Mapping System (TIMS), the roadway is a collector with an average daily traffic of approximately 5,500 vehicles. The roadway has a posted speed limit of 35 MPH and a design speed of 40 MPH. ODOT's Location and Design (L&D) Manual, Volume 1, Figure 301-2 shows a required minimum lane width of 11 feet. ODOT L&D Manual Volume 1, Figure 302-3 shows a required minimum lateral clearance of 6 feet. These figures are shown below.

RURAL LANE WIDTHS ^(A)	301-2
	REFERENCE SECTIONS 301.1.2

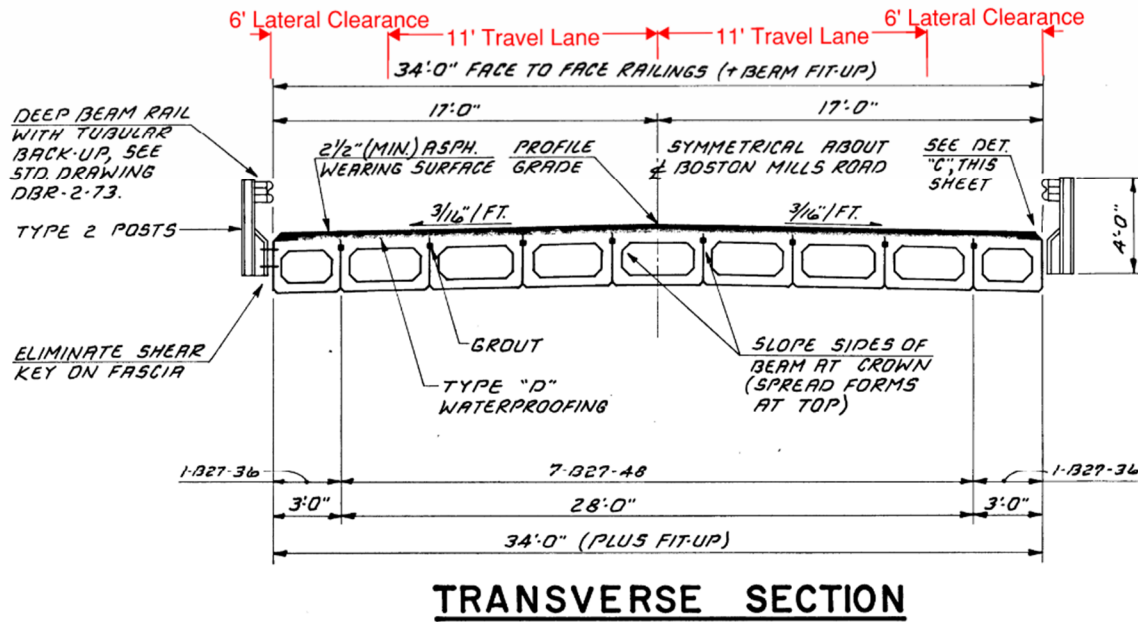
Functional Classification	Traffic	Minimum Lane Widths (ft.)										
	Design Year ADT	Design Speed (mph)										
		20	25	30	35	40	45	50	55	60	65	70 or >
Interstate, Other Freeways, and Expressways	ALL	--	--	--	--	--	--	12	12	12	12	12
Arterial	> 2000	--	--	--	--	12	12	12	12	12	12	12
	400 to 2000	--	--	--	--	11	11	11	12	12	12	12
	< 400	--	--	--	--	10	10	11	11	11	11	11
Collector	> 2000	11	11	11	11	11	11	11	11 ^(C)	11 ^(C)	--	--
	400 to 2000	10	10	10	11	11	11	11	11	11	11	--
	< 400	10	10	10	10	10	10	10	11	11	11	--
Local	> 2000	11	11	11	11	11	11	11	11 ^(C)	11 ^(C)	--	--
	400 to 2000	10	10	10	10	10	11	11	11	11	--	--
	< 400	9	9	9	9	9	10	10	11	11	--	--

CRITERIA FOR EXISTING NON-FREEWAY BRIDGES TO REMAIN	302-3
	REFERENCE SECTION 302.1

Functional Classification	Design Year ADT	Minimum Lateral Clearance (A)		Minimum Vertical Clearance
		On Bridge (B)	Under Bridge (E)	
Expressways and Arterials	> 4000	6 ft. (C)	Curbed or Treated Shoulder Width Plus Barrier Clearance (F)	14 ft.
	≤ 4000	3 ft.		
Collector	> 4000	6 ft. (C)		14 ft.
	2001 - 4000	3 ft.		
	1001-2000	2 ft.		
	400-1000	2 ft.		
	< 400	0		
Local	> 4000	(G)		14 ft.
	2001 - 4000	3 ft.		
	1001-2000	2 ft.		
	400-1000	2 ft. (D)		
	< 400	0 (D)		

Additionally, ODOT's Multimodal Design Guide states that wherever possible, sidewalk widths across bridges should be the same as the clear width of the existing connecting sidewalks. In other words, the width of the pathway up to the bridge should be the same width as the pathway on the bridge. Euthenics does not recommend shifting lanes or reducing the lateral clearance on the south side of the bridge to increase the available space for the pedestrian facility on the north side.

The existing, two 11-foot lanes and two 6-foot shoulders fully utilize the existing bridge's 34-foot operational width, as shown on the transverse section below.



Therefore, there is no additional room to accommodate the pedestrian facility on the bridge.

In addition, the City of Hudson staff indicated that based upon discussions with the Summit Co. Engineer's Office in January, 2025, that reduction of lane widths or berm widths should be avoided.

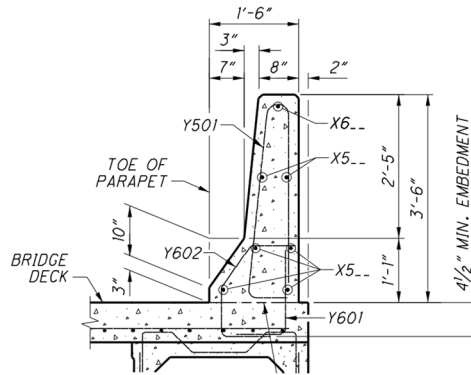
As minimum lane widths and clearances are crucial for ensuring safety, promoting efficient traffic flow, and enhancing the comfort of all road users, Euthenics does not recommend reducing any of the required geometric lane and shoulder widths on the bridge.

Structural Review:

Per ODOT's Multimodal Design Guide, the structural design of a shared use path on bridges should be designed in accordance with the ODOT Bridge Design Manual (BDM) and AASHTO LRFD Bridge Design Specifications. In addition, engineers use AASHTO's "Manual for Assessing Safety Hardware" (MASH), that provides guidelines for crash testing and evaluating the safety performance of roadside safety features.

Based on these design manuals, pedestrian facilities must be separated from vehicular traffic by a MASH-approved protective barrier. Considering roadway speed, impact angle, and potential vehicle impact type on roadside safety hardware, the barrier should meet a minimum acceptance level of Test Level 3 (TL-3). The crash testing guidelines in MASH establish minimum requirements that a roadside safety feature must meet to demonstrate satisfactory impact performance. To be approved for TL-3, the protective barrier must pass testing with both cars and trucks at 62 mph and a 25-degree impact angle. A specific example of a railing that meets MASH TL-3 is the 36-inch New Jersey Shape Concrete Bridge Railing per ODOT Standard Drawing

BR-1-13 with example shown below. This is one example, but other barriers meeting MASH TL-3 requirements could be considered.



In addition to separating the pedestrian facility with an approved protective barrier, the existing exterior railing would also need to be modified or replaced to meet pedestrian path design requirements. Per ODOT's Multimodal Design Guide, this would require the pedestrian railing be a minimum of 42" high (above the trail surface). The railing's openings between horizontal or vertical members on railings, should be small enough that a 6-inch sphere cannot pass through them in the lower 27 inches. For the portion of railing that is higher than 27 inches, openings may be spaced such that an 8-inch sphere cannot pass through them.

Based on these requirements, adding a pedestrian facility to the existing bridge is not feasible for the following reasons:

- Geometrically, there is no width to accommodate a protective barrier meeting the MASH TL-3 requirements.
- Structurally, there is no approved or feasible method to anchor a MASH TL-3 protective barrier to the top of a pre-existing box beam bridge as anchoring the barrier would damage the bridge-beams reinforcing steel.
- Furthermore, since the bridge is non-composite, which means that the full weight of the barrier would be carried by the beam(s) directly beneath it (i.e. the load would not be distributed to all beams). The existing bridge was not designed to carry the weight of an additional concrete barrier, therefore, it is likely that the bridge does not have the structural capacity to carry the vehicular traffic required and support an additional barrier. Consideration of a barrier would require County approval and hiring an engineer to further investigate the structural capacity.
- Modifying or replacing the existing railing to meet pedestrian requirements is not feasible, since the existing mounting points and anchor bolts would not support an increased moment arm from taller posts.

Based on our Structural Review, it is not feasible to add a pedestrian facility to the existing bridge.

Conclusion:

Euthenics examined the feasibility of introducing a reduced-width pathway along the existing Boston Mills Road over Lake Forest. Based upon the bridge's existing geometry, structure type, and County/State requirements, it is not geometrically nor structurally feasible to add a pedestrian facility onto the existing bridge carrying Boston Mills Road over Lake Forest and maintain safe vehicle passage and pedestrian pathway compliant with County and State requirements.

If you have any questions, please don't hesitate to contact our office.

Best Regards,



Ashley Wright, PE, PTOE
Project Manager