DOKKEN ENGINEERING

City of Oceanside, CA

Project Study Report

October 2017

Prepared by: Dokken Engineering

Prepared for: City of Oceanside

ATTACHMENT F:
BRIDGE WIDTH MEMO

DOKKEN ENGINEERING

MEMORANDUM

Company:	**City of Oceanside**
Attention:	**Gabor Pakozdi P.E.**
From:	**Anthony C. Powers, P.E.**
Subject:	**Coastal Rail Trail – Loma Alta Creek Bridge Width / 2334/300**
Date:	**September 25, 2017**

In a letter dated August 21, 2017, the Oceanside Bicycle and Pedestrian Committee (OBPC) recommended that the clear width of the Coastal Rail Trail (CRT) Bridge over Loma Alta Creek be increased to 14 feet from the proposed 12 feet. The committee's recommendation was based on the following considerations:

- Safety
- Current Use and Futures Path Use Growth
- Caltrans *Highway Design Manual* Criteria
- Consistency with Existing Portions of the CRT

The purpose of this memo is to address the concerns about the bridge width and desire for overlooks raised by the OBPC. It is important in considering the design guidance and design criteria for Class I bike path width to distinguish between those that apply to portions of the path off of the bridge, and those that apply specifically to the bridge, though they are closely related. This memo is focused on bridge width, based on an approach path consisting of 10 feet of paved path with 2-foot shoulders, but will also discuss the requirements for path width as they relate to the bridge width.

Reference will be made herein to the Caltrans *Highway Design Manual (HDM)* and the American Association of State Highway and Transportation Officials *Guide for the Development of Bicycle Facilities (AASHTO Bike Guide).* Design criteria in the *HDM* are required for the design of Class I bike paths, whereas criteria in the *AASHTO Bike Guide* are guidelines, but not required.

Safety

According to the *AASHTO Bike Guide,* the minimum operating width for a bicyclist is 4.0 feet, with 5.0 feet preferred. The "design bicyclist" is 2.5 feet wide, allowing 1.5 feet for maneuverability within the 4.0-foot minimum operating width, or 2.5 feet within the preferred width. Similarly, according to the AASHTO *Guide for the Planning, Design and Operation of*

Pedestrian Facilities (AASHTO Ped Guide), two people walking side by side or passing in opposite directions require 4.67 feet (typically rounded up to 5.0 feet, or 2.5 feet per pedestrian). Preferred shy distance from railings is 2 feet, with 1.0 foot acceptable, according to the *AASHTO Bike Guide*.

Based on these dimensions, a 12-foot wide bridge can accommodate two cyclists passing allowing for either the minimum operating width with preferred shy distance (2.0'+4.0'+4.0'+2.0'=12.0') or preferred operating width with minimum shy distance (1.0'+5.0'+5.0'+1.0'=12.0'). A 14-foot bridge width accommodates the two passing cyclists with preferred operating widths and shy distances (2.0'+5.0'+5.0'+2.0'=14.0'). A 12-foot bridge width will also accommodate two cyclists and a pedestrian with minimum operating widths and shy distance for the cyclists, but with a reduced shy distance of 0.5 feet for the pedestrian (1.0'+4.0'+4.0'+2.5'+0.5'=12.0'). A 14-foot bridge width accommodates the two cyclists and a pedestrian with minimum or better operating widths and shy distances for the cyclists and pedestrian (1.5'+4.0'+4.0'+3.0'+1.5'=14.0').

The additional 2 feet of structure width provided by a 14-foot bridge would provide more operating space to accommodate multiple users and would reduce the potential for conflicts. In practice, cyclists tend to resort to single file on bridges and/or wait to pass when pedestrians are present. The addition of an overlook at the central pier or abutments would break up the length of constrained width on the bridge, providing an additional location for passing pedestrians.

Caltrans *HDM* and *AASHTO Bike Guide* Criteria

The minimum clear width of a bicycle path on a structure between railings is 10 feet according to the *HDM*, which indicates that it is desirable to match the width of the path plus shoulders. The *HDM* mandates a minimum path width of 8 feet, with 10 feet preferred and flanked by 2-foot shoulders. The *HDM* recommends a path width of 12 feet or more (plus shoulders) where heavy traffic is anticipated, but does not define heavy traffic. A 12-foot bridge provides for the minimum path width (8 feet) plus shoulders (two at 2feet) and exceeds the minimum structure width of 10 feet.

The *AASHTO Bike Guide* recommends that the clear structure width between railings provide 2 feet clear from the edges of the path (i.e., 2-foot shoulders), but allows for it to match the path width if "constrained". With a minimum path width of 10 feet, this would indicate a preferred bridge width of 14 feet, with 10 feet acceptable if constrained, matching the *HDM* criteria.

The *AASHTO Bike Guide* calls for a minimum path width of 10 feet (with 8 feet allowed where pedestrians are scarce and bike volume is low) and recommends wider paths of 11 feet to 14 feet if:

- Pedestrians comprise 30% or more of path traffic,
- The total volume of path users (all types) in the peak hour exceeds 300, or
- There is significant use by in-line skaters, children or trike riders.

These usage criteria will be discussed in the next section.

Current Use and Futures Path Use Growth

The OBPC provided bicycle counts at the intersection of South Coast Highway and Eaton Street, approximately five blocks south of the project site. The OBPC counted over 550 cyclists in the three-hour period of 8:00 am to 11:00 am on a Saturday morning.

The City of Oceanside has performed full-day counts of bicyclists on Pacific Street near Oceanside Boulevard, and full-day bicyclist and pedestrian counts on the existing CRT near Elm Street and on the San Luis Rey River Trail (SLRRT) near College Boulevard using automated counters. There were 780 bicyclists counted on Pacific Street, 140 pedestrians and 90 cyclists on the CCRT, and 300 pedestrians and 850 bicyclists on the SLRRT. The data provided by the City allows these to be extrapolated to peak hour counts, as shown in Table 1. For the Pacific Street counts, a 40 percent pedestrian split was assumed.

While limited information was available on the OBPC counts, making assumptions based on the City's counts on percent pedestrians and daily distribution of users, peak hour volumes can be extrapolated from these counts using count adjustment factors from the *National Bicycle and Pedestrian Documentation Project*, modified to reflect the local data. In Table 1, the OBPC count was assumed to be taken during peak season, and it was assumed that future use would be 40 percent pedestrians.

TABLE 1 - Estimated Existing Peak Hour Pedestrian and Bicyclist Counts

	Estimated Peak Hour Two-Way Volumes		
Location	**Pedestrians**	**Bicyclists**	**Total**
S. Coast Hwy. at Eaton	168	252	420
Pacific St. at Oceanside Blvd.	89	119	208
SLRRT at College	45	128	173
Existing CRT at Elm	15	14	29

The South Coast Highway and existing CRT counts would be expected to provide relatively direct prediction of future use of the new portion of the CRT. However, these two counts differ by an order of magnitude, making extrapolation difficult. The lower number for the existing CRT likely reflects the short length of the existing path and does not account for future growth, so this would be a lower bound on future CRT traffic at the project site. On the other hand, being on the other side of the railroad tracks, not all the traffic counted on South Coast Highway can be expected to transfer to the CRT, so that would represent an upper bound on future CRT traffic.

The Pacific Street count was taken only three blocks from the project site on a road parallel to the CRT and on the same side of the railroad tracks, providing the most directly applicable data for the project site. While it is impossible to predict the percentage of this traffic that will move to the CRT, considering growth associated with the attractiveness of the extended CRT, it is reasonable to assume that the CRT will carry at least a similar volume.

The SLRRT is generally perpendicular to the CRT. However, being a similar facility to the CRT and being relatively nearby, it may be the best model for predicting future CRT traffic. Assuming 50% transfer of the South Coast Highway users to the CRT when complete would bring those numbers in line with the SLRRT counts and Pacific Street counts. It is therefore, reasonable to assume that future use of the subject portion of the CRT will have total peak hour traffic of approximately 210 users with up to 40 percent pedestrians. This total is below the aforementioned *AASHTO Bike Guide* threshold (300 total users) which would indicate the need for a path wider than 10 feet. However, the 40-percent pedestrian mode split indicated by the City's data exceeds the recommended threshold for a path wider than 10 feet.

Consistency with Existing Portions of the CRT

As noted in the OBPC letter, the existing path width between Wisconsin Avenue and Oceanside Boulevard is 12 feet with 2-foot shoulders. However, there are no structures on the existing path, so consistency is not an issue with the structure width.

Cost of Additional Bridge Width

Increasing the clear width of the proposed two-span, half-through truss bridge from 12 feet to 14 feet would increase the construction cost of the bridge from $1.5 million to $1.8 million (20%). In addition to the increased materials required for the wider bridge superstructure, the increased cost reflects additional substructure costs to support the wider and heavier superstructure, and the fact that the wider truss would need to be shipped in two pieces, increasing shipping and erection costs. Alternately, a change in structure type could be considered, as the cost advantages of the prefabricated steel truss structure are minimized when the width exceeds 12 feet clear.

Retaining wall costs would not be affected by the wider bridge as the bridge width would be matching the approach path width.

If a wider structure is proposed to match the approach path and shoulders (14 feet clear), additional impacts to the park and wetland would be minimal, as the approach retaining wall alignments would not change, and changes to the bridge substructure would be minimal as well. The widening would result in the bridge superstructure being 1 foot closer to the active railroad.

Cost of Adding Overlook(s)

The OBPC letter supports the concept of one or more viewing platforms (overlooks) mid-span to provide a safe spot for users to stop and observe the creek. Addition of a mid-span overlook

to the two-span half-through truss alternative is not practical because it would require interruption of the truss diagonals. However, an overlook could be incorporated into the center pier between the two truss spans. The cost of such an overlook would be between $75,000 and $150,000, depending on how large and how elaborate the platform is. Additional overlooks could be incorporated into one or both of the abutments for a similar cost per each.

Conclusion

If the City wishes to pursue a wider bridge (14 feet clear) with one overlook, the additional cost would be approximately $300,000+$100,000 = $400,000, for a total structure construction cost of $1,900,000. Extrapolation from existing peak hour volumes supports a path width of 10 feet because the predicted peak hour volume of 210 total users is less than the *AASHTO Bike Guide* threshold of 300 for a wider (11- to 14-foot) path. However, a 12-foot wide path is supported based on the expected 40-percent pedestrian mode split, which exceeds the *AASHTO Bike Guide* threshold of 30% percent. With a 12-foot wide path, the desirable clear bridge width would then be 16 feet (12-foot path plus 2-foot shoulders) according to both the *AASHTO Bike Guide* and the *HDM*, with 12 feet considered acceptable in "constrained" circumstances per the *AASHTO Bike Guide* (which exceeds the *HDM* minimum of 10 feet). A 14-foot clear width would be appropriate.

If you have any questions, please feel free to call.

Sincerely,

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