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Subject: Carlsbad Boulevard Upper Sidewalk Widening Shading Impact Analysis

1. Introduction

The project to rehabilitate the existing beach access structures on the coastal bluff along Carlsbad Boulevard, from Pine Avenue to Tamarack Avenue includes the widening of upper sidewalks to cantilever an additional 18 inches over the existing slopes. The slopes are vegetated with native vegetation (refer to the Landscape Assessment Memo for details), and the proposed cantilever has the potential to change the amount of sun the existing and proposed plants receive throughout the day.

KTUA constructed a geolocated three-dimensional model of the existing and the proposed sidewalk and slope areas in SketchUp, then used the cast-shadow feature in SketchUp to analyze the shadows cast by both the current and the proposed sidewalk.

The team selected spring equinox to analyze the shadows, since the daytime and nighttime hours are equal at equinox, and will provide a good average amount of exposure to study. The slope faces west-southwest and does not receive full sunlight until mid-morning during any part of the year. The team therefore selected mid-morning (10:00 AM) as the starting time to compare the shadows cast by the existing versus the proposed sidewalk, since this is a time approximately halfway between fully shaded at sunrise and fully exposed at noon.

2. Analysis

The models show that the shadows cast by the proposed expanded walkway would extend an average of approximately 3.2 linear feet down farther at 10:00 AM on Spring Equinox (March 20). Refer to Figure 1 for a graphic illustrating this difference. This graphic is exported from the SketchUp model, and shows the existing shadows in gray, and the proposed shadows in red. There are signs that native plant material does not grow well under the existing cantilever where it is relatively dark. This may also be due to a safe location for local animals to feed on the vegetation from this space protected from above, away from predatory birds.

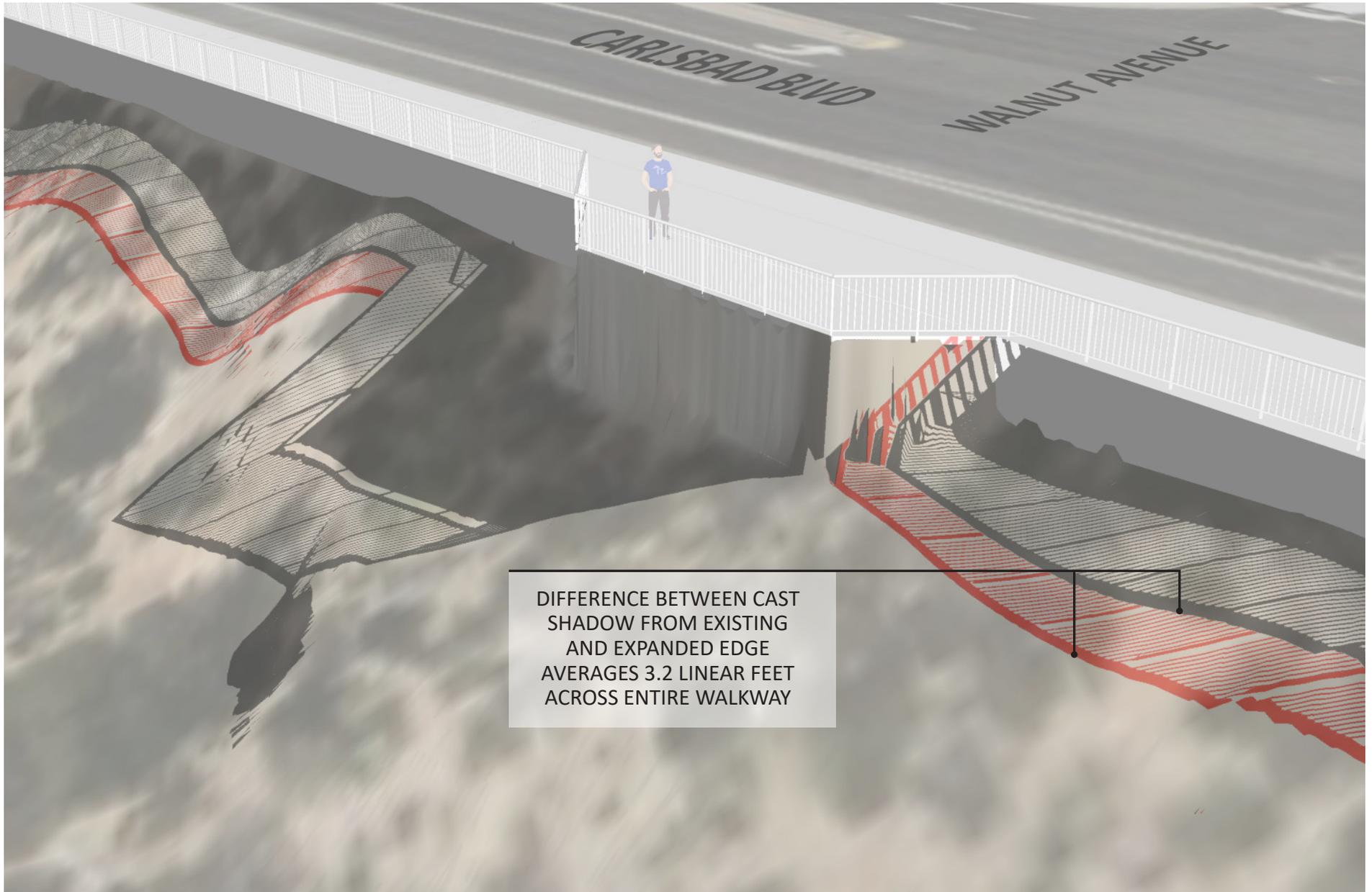
Figure 2 shows a rough outline of the proposed expansion and potential cast shadow limit at March 20, overlaid on a photograph of existing conditions.

Additionally, due to the slope aspect, the slope with existing conditions is in full sunlight from 11:38 AM until Sunset. With the proposed cantilever, the slope would be in full sun starting at 11:45 AM until Sunset. The plants, therefore, would receive seven more minutes of shade under the proposed conditions than under the existing configuration.

3. Conclusion

It is KTUA's opinion that the slight increase of shading (seven minutes of additional shade in the morning before full sun exposure for the rest of the day) would not hinder the re-establishment of native plants in the slope areas disturbed by the proposed project. The same species of plants that exist on the slope currently would grow on the slope with the upper walkway cantilevered 1.5 feet farther west.

Some vegetation would grow more at the drip line of the cantilever and other vegetation would be more sparse based on more evaporation from increased sunshine. The current plant matrix along the top of the slope is highly diverse, so a slight decrease in vegetation will not make much of a difference in visual impacts.



SPRING EQUINOX (MARCH 20TH) SHADOW AT 10 A.M.



**BOARDWALK
EXPANSION**



SPRING EQUINOX (MARCH 20TH) SHADOW LINE AT 10 A.M.
SHADOW EXTENDS 3.2' AVERAGE ALONG ENTIRE WALKWAY

FIGURE 2

Addendum

This document contains information and data from a study that was prepared for a prior version of the proposed Project. The data contained within remains relevant and applicable to the proposed Project; however, may contain information that is no longer representative of the proposed Project. Please reference the Initial Study Mitigated Negative Declaration document for any information pertinent to the proposed Project description.