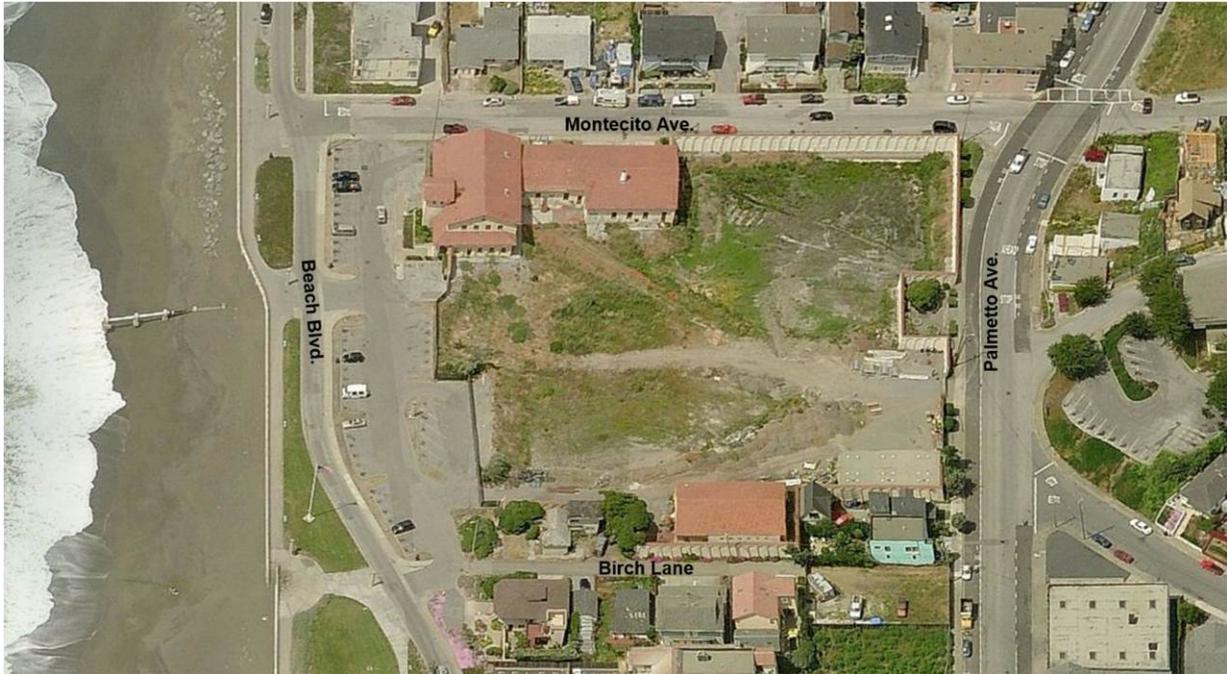


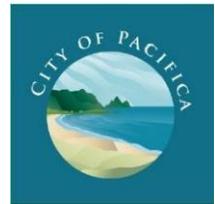
# Coastal Hazards Study

## 2212 Beach Boulevard, Pacifica



*Prepared for:*

## EXECUTIVE SUMMARY



**City of Pacifica**  
170 Santa Maria Ave  
Pacifica, CA 94044

*Prepared by:*



**moffatt & nichol**  
2185 N. California Blvd.  
Walnut Creek, CA 94596

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# City of Pacifica Coastal Hazards Study

## 2212 Beach Boulevard Development

### EXECUTIVE SUMMARY

#### Introduction

The City of Pacifica owns a 3½ acre property located at 2212 Beach Boulevard and is taking steps for redevelopment to include a public library and visitor-serving uses such as a hotel, restaurant and retail space. The oceanfront site is located in one of Pacifica's oldest neighborhoods and provides unique opportunities for public access to the coast.

The City completed a variety of planning processes and environmental review by 2013. Since then, there has been increasing focus on regional studies<sup>1</sup> that document known risks that affect the City of Pacifica such as bluff erosion and sea level rise. These regional studies recognize the need for local government to evaluate specific locations and determine short, medium and long term risk. These local studies will provide decision-makers with an understanding of the hazards and a basis for developing solutions.

In response the City commissioned this additional study of potential coastal hazards for 2212 Beach Boulevard including tides, waves, and sea level rise; tsunamis; and bluff erosion. A summary of the conclusions is provided in this Executive Summary. A detailed description of the analysis can be found in the following Coastal Hazards Study Technical Report for 2212 Beach Boulevard.

#### Coastal Hazards

Present-day coastal hazards found to affect the project site are limited, and related to flooding caused by wave overtopping during high tides and the very rare occurrence of a significant tsunami event.

#### Flooding from Tides, Waves and Sea Level Rise

Water levels during high tides do not pose a flood hazard in themselves. Current water levels during high tide are on the order of +7.4 feet (with respect to NAVD88<sup>2</sup> datum), while the 1% annual flood event would raise the sea level to +8.7 feet NAVD88. These values combined with sea level rise projected for both mid-century and end-of-century are well below the crest of the seawall (+26 feet NAVD88) that fronts the 2212 Beach Boulevard property.

With respect to waves, given the presence of the beach and seawall, present day hazards are limited to the combination of high wave conditions and high tides, which result in elevated water levels and increase the potential of wave overtopping. Present day wave overtopping typically causes limited ponding on the street and promenade immediately behind the seawall. Wave overtopping would not directly affect the 2212 Beach Boulevard property.

With mid-century (2050) and end-of-century (2100) projections for sea level rise<sup>3</sup>, currently estimated to range from 5 to 24 inches by 2050 and 17 to 66 inches by 2100, wave overtopping

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<sup>1</sup> These include the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT 2013) State of California Sea-Level Rise Guidance Document, March 2013 Update; FEMA 2014 Preliminary Flood Insurance Study for San Mateo County, California; Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future; San Francisco Littoral Cell Coastal Regional Sediment Management Plan (2015-6); and others (See References: pages 18 and 19 of Technical Report).

<sup>2</sup> North American Vertical Datum of 1988 establishes a point of reference for measuring coastal conditions.

<sup>3</sup> Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future (NRC, 2012).

of the seawall will increase correspondingly. Given that the beach and the seawall will continue to be maintained, it is estimated that water from wave overtopping would be generally limited to a distance of approximately 40 feet from the seawall, and at its maximum, reaching only the road adjacent to it. (The site at 2212 Beach Boulevard is separated from the seawall by a landscape area, as well as the promenade and Beach Boulevard.) When the beach narrows, as may occur after a significant storm, wave overtopping could lead to temporary ponding in the road area and parking area fronting the Beach Boulevard property. This is shown in Figures 1 and 2.

### Tsunami

Temporary inundation from rare tsunamis represents a potential hazard for the Beach Boulevard property and surrounding areas of the City. A tsunami event with a 0.4% annual chance of occurrence (one that occurs on average once every 250 years) such as the USGS SAFRR scenario could result in short term inundation of a few inches (less than 1 foot of ponding) for existing conditions, as shown in Figure 3. A very large and even more infrequent event, such as the CalEMA scenario (0.1% annual chance of occurrence, which occurs on average once every 750 to 1000 years) would result in more inundation, as shown in the CalEMA maps. This is also shown in Figure 3. Such a large tsunami has a low probability of happening because many causal factors have to occur simultaneously, such as:

- A very large earthquake would have to occur (of a magnitude greater than the 1906 San Francisco Earthquake).
- The earthquake would have to occur precisely at a location that would impact Pacifica significantly. This means the earthquake would have to be in the subduction zone of Alaska or along the Aleutian Islands. (Tsunamis from the South Pacific tend to dissipate by the time they reach Pacifica).
- The earthquake would have to result in a very large rupture of the earth's crust, with a significant deformation of the ocean floor.

### Bluff Erosion

Bluff erosion (also referred to as bluff retreat<sup>4</sup>) is not estimated to be a direct hazard to development of 2212 Beach Boulevard, as the existing seawall prevents erosion and encroachment into the project site. This report assumes that the seawall and other protection in place are properly maintained.

### **Conclusion**

The presence of the beach and seawall, and continued maintenance of these elements, limits exposure to flooding from tides, waves and sea level rise, and to bluff erosion. However, based on the analysis summarized above, rare and infrequent tsunamis are the one hazard that could potentially result in inundation along the City's coastline, including the site at 2212 Beach Boulevard. The buildings' design can take these risks into account and engineering solutions can be applied to address them.

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<sup>4</sup> Bluff retreat is what is observed, while erosion is the process causing the retreat.



**Legend**

-  Overtopping Hazard Extent
-  Project Area

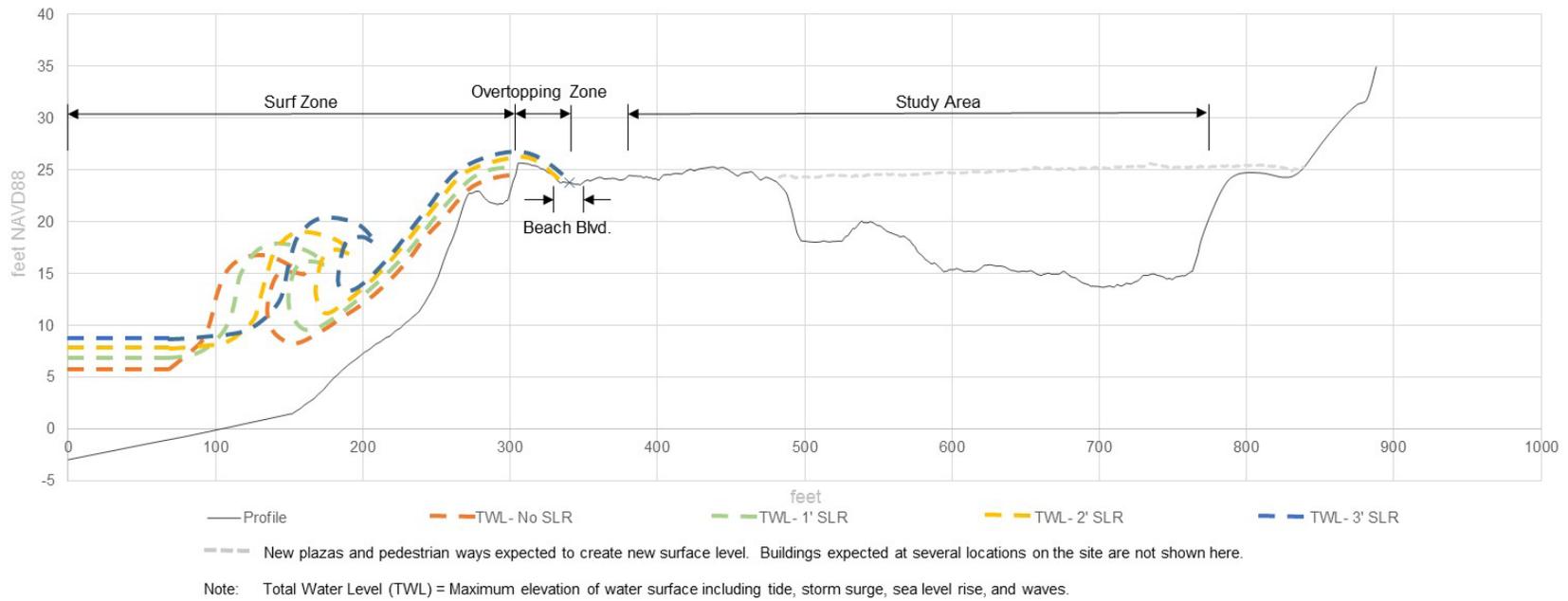


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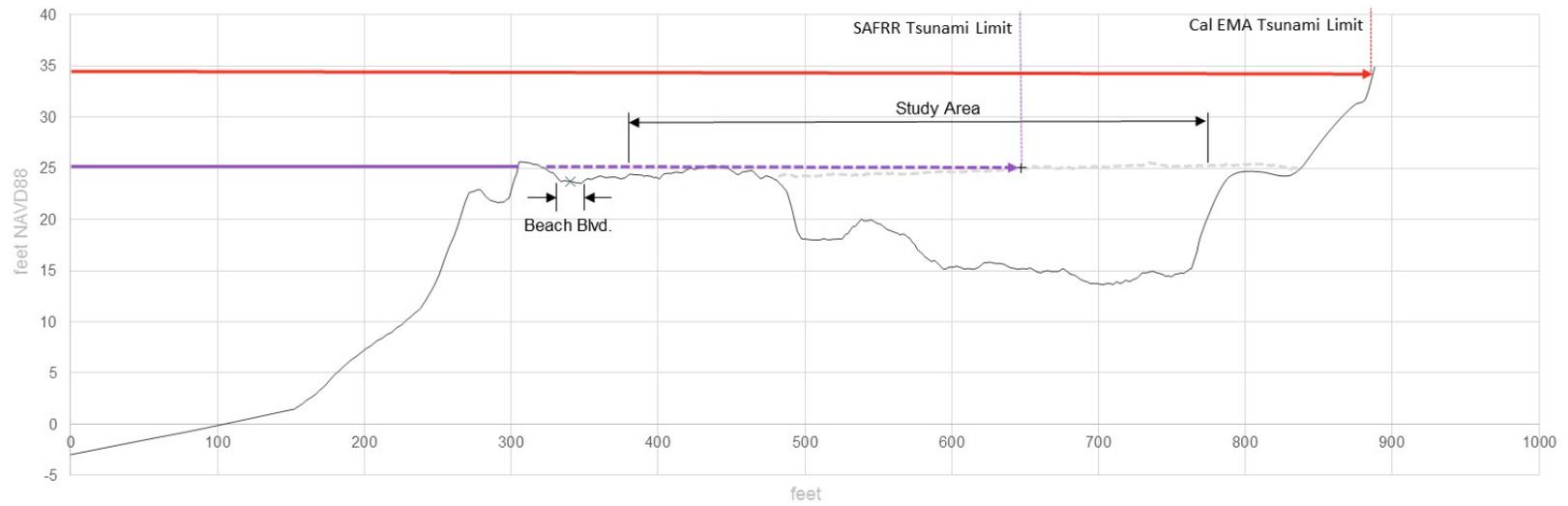


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**Figure 1 - Limits of overtopping hazard accounting for the projected 2100 sea level rise.**



**Figure 2 - Elevation view of wave overtopping hazards associated with sea level rise.**



--- New plazas and pedestrian ways expected to create new surface level. Buildings expected at several locations on the site are not shown here.

SAFRR Tsunami: Hypothetical but plausible tsunami scenario based on magnitude 9.1 earthquake offshore of the Alaskan peninsula.

Cal EMA Tsunami: A combination of maximum considered tsunami scenarios, developed for emergency planning purposes.

**Figure 3 - Elevation view of tsunami hazards.**