

Flood Control Zone 7: Santa Venetia

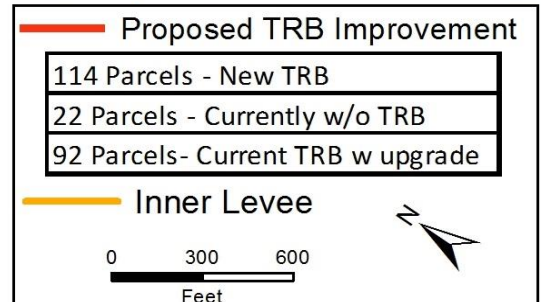
*Proposed Project
Information & Questionnaire*

Timber-Reinforced Berm and Levee Improvements

Proposed Project Overview:

Zone 7 is proposing a Timber-Reinforced Berm (TRB) Improvement Project designed to protect Santa Venetia from 100-year floods, as well as reducing related maintenance costs. The project would replace the existing TRB with a new TRB that is one to three feet taller and made of a durable wood composite material that would not require replacement until approximately 2050. The new TRB would also be more deeply anchored, thereby improving the TRB's ability to hold back high tides.

The location of the improved TRB would be roughly the same footprint as the existing TRB, however some locations that do not currently have a TRB will have one built on top of the existing levee. In locations where it is feasible, an alternative design may be proposed that involves using only one timber wall which is anchored to weights that would be buried in a widened earthen levee.



Overview of Existing TRB Conditions:



Above: Example TRB recently rebuilt and held back tides in 2017. Tides this high occur every year.



Above: An example TRB that needed to be rebuilt.



Above: Santa Venetia's streets, businesses, homes, and community facilities flooded due to high tides in the early 1980s. This occurred before completion of the TRB.

- Behind homes on Vendola drive sits a levee and timber-reinforced berm (TRB) which was installed in 1983 by the Marin County Flood Control & Water Conservation District – Zone 7.
- TRB installation in '83 was completed, largely on private residential properties, following two years in a row of devastating and widespread floods in Santa Venetia, to prevent flooding in your community when the tides in Las Gallinas Creek reach high levels.
- The TRB consists of two vertical panels of wood filled with soil and installed on top of the levee. Typically, the wood panels have to be replaced every 20 years due to deterioration.
- While the old TRB system has worked so far for high tides, the deterioration of the timber, compounded with the rising sea levels and sinking land elevations, threatens its ability to protect Santa Venetia from flooding.
- An analysis completed by a geotechnical consultant as part of a comprehensive levee analysis in partnership with the U.S. Army Corps of Engineers (USACE), indicated that high tides would likely damage the TRB and flood the community well before they rose high enough to reach the top of the TRB.
- Additionally, the analysis revealed that some sections of the earthen levee without the TRB are not high enough to hold back expected high tides over the next few decades.
- The TRB and levee system is maintained by Zone 7 where property owners provide permission through temporary rights-to-enter. This process is not cost-effective and historically there have been a handful of property owners who deny Zone 7 staff and contractors permission to enter and maintain the TRB. Therefore, maintenance is not comprehensive and potential weak spots remain along the system.

Historic Increases in High Tides

California Energy Commission¹ states that over the past century, sea level has risen nearly eight inches along the California coast. Accordingly, the Federal Emergency Management Agency's (FEMA) models of 100-year flooding elevations in and near San Francisco Bay have increased the flood elevations significantly since the TRBs were installed in Santa Venetia in 1983. FEMA's latest model² in March 2016 raised the 100-year tidal flooding elevation nearly one foot in Santa Venetia.

Meanwhile, Zone 7's 2016 elevation settlement survey, which is conducted every four years, shows Santa Venetia and its levee system continuing to slowly sink. The combination of sea level rise and land sinking that has already taken place has left the current levee and TRB system vulnerable to potential flooding at FEMA's 10-year stillwater tide level. That tide level does *not* account for storm surges which could raise the water level even higher. FEMA's current 10-year stillwater tide elevation is 8.5 feet, which is only slightly lower than the 8.7-foot water levels that caused floods in the 1980s.

Projected Increases in High Tides

Marin County's BayWAVE Sea Level Rise Vulnerability Assessment³ indicates that by the year 2050, stillwater tide levels are projected to rise 20 inches from their current elevation. A 2013 geotechnical analysis⁴ predicted that land will sink up to three to four inches every 10 years for the next several decades. Without improvements to the TRB and levee system, these expected environmental and physical changes could heavily impact the Santa Venetia neighborhood.

Need for Project: Benefits and Cost

A 10-year flood has a 95.8% chance of occurring and a 100-year flood has a 26% chance of occurring over the next three decades. According to FEMA's water surface elevation analyses and USACE's depth-damage functions⁵, a 10-year flood would cause over \$13 million in damage to Santa Venetia and a 100-year flood would bring that cost to over \$32 million. Utilizing FEMA's benefit-cost analysis system⁶, which uses an algorithm that considers these damages and probabilities, the proposed TRB and levee improvement project, which is estimated to cost \$5 million, would result in a damage savings of \$27 million over a 30-year period. This presents a benefit-cost ratio of approximately 5:1. It should be noted that this does *not* take into account further sea level rise, which is expected to also increase frequency and damage due to flooding events.

¹ http://pacinst.org/publication/the-impacts-of-sea-level-rise-on-the-california-coast/?qclid=EAiaIQobChMI64Ciq83F3QIVB2t-Ch1c3grzEAYASAAEgK0xfD_BwE

² <http://www.r9map.org/Pages/ProjectDetailsPage.aspx?choLoco=21&choProj=231>

³ <https://www.marincounty.org/main/marin-sea-level-rise/baywave/vulnerability-assessment>

⁴ <http://marinwatersheds.org/resources/publications-reports/las-gallinas-creek-levee-evaluation-reports-and-documents>

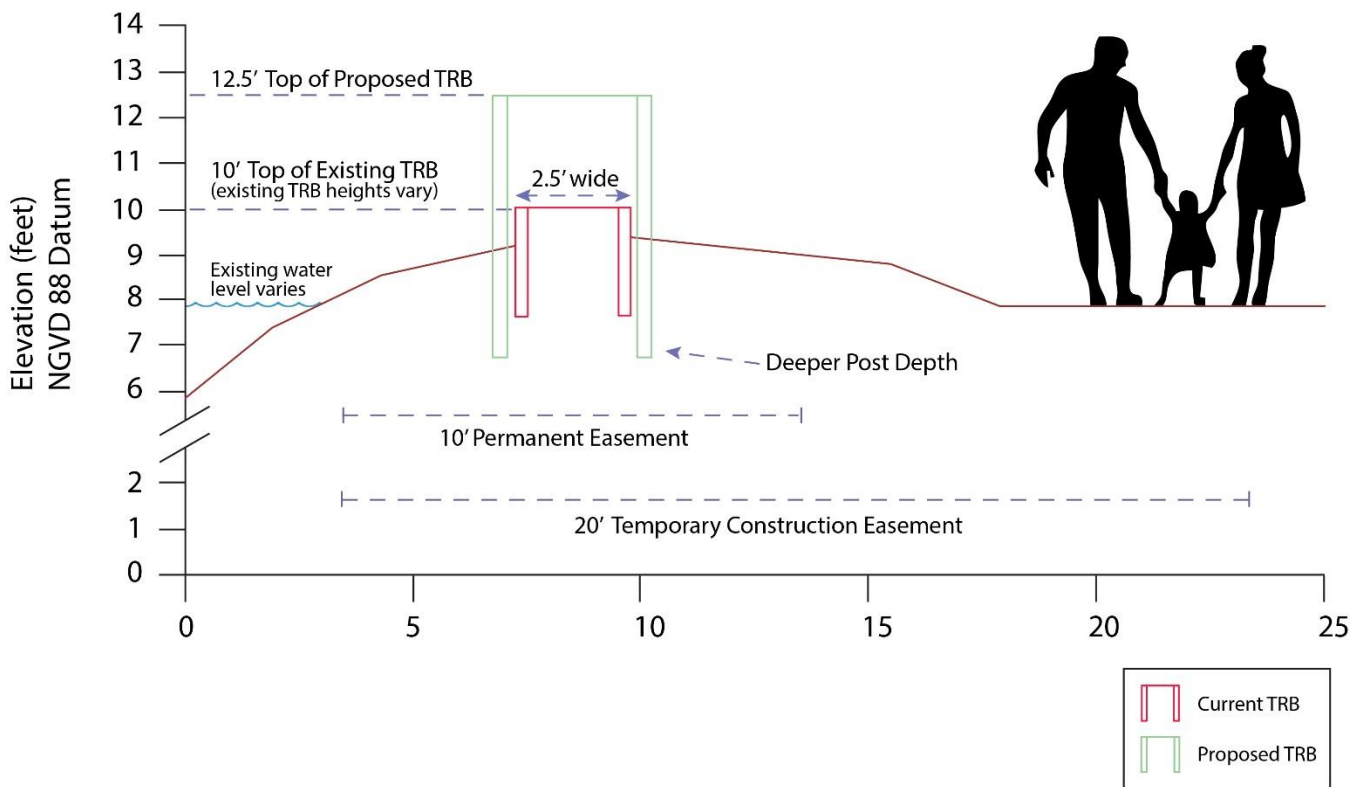
⁵ <http://www.dtic.mil/docs/citations/ADA255462>

⁶ <https://www.fema.gov/benefit-cost-analysis>

Easements Associated with Proposed TRB and Levee Improvement Project

Easements are rights granted to one entity for specific use of a portion of property owned by another. That there is not an easement allowing Zone 7 to access, monitor, and repair the existing TRB is highly unusual for such a critical facility. Under the proposed project, Zone 7 would request a 10-foot wide permanent easement centered on the TRB to provide ongoing maintenance to the improved TRB and levee system (see graphic below). Stairs or ramps to cross the TRB and access docks will be accommodated, along with needed gates or fences. Additionally, up to two weeks of construction would be required in each backyard and during that time, a temporary 20-foot wide easement would be necessary.

Comparison between Current and Proposed Timber-Reinforced Berm (TRB) and Proposed Easements



Note: all dimensions and elevations are approximate and will change depending on final design and vary by location.