



# Urban Levee Evaluations Project

## Rough and Ready Island Urban Study Area Summary

The California Department of Water Resources (DWR) Division of Flood Management conducted a levee evaluations program to assess the existing conditions of levees in California's Central Valley from 2008 to 2015. The Urban Levee Evaluations (ULE) Project addressed approximately 350 miles of Project<sup>1</sup> and non-Project<sup>2</sup> levees. Non-Project levees are considered appurtenant and are included under the ULE Project, as appropriate, when these levees protect part of a basin partially protected by Project levees. The Urban Non-Project levees were divided into 8 study areas, protecting populations of 10,000 people or more. The primary objective of the evaluation was to assess if the levees meet ULE criteria under a potential 200-year flood event. The levees were divided into reaches/sub-reaches for evaluation. For reaches/sub-reaches not meeting ULE criteria, conceptual remedial alternatives and screening-level Class 4 cost estimates were prepared.

### Study Area

The Rough and Ready Island Study Area includes 5.6 miles of levees within the City of Stockton in San Joaquin County, California. The study area was divided into eleven reaches/subreaches for screening-level static analyses, and fifteen segments for screening-level seismic analyses. The Rough and Ready Island Study Area contains both frequently and intermittently loaded<sup>3</sup> levees as defined in the *Urban Levee Design Criteria* (DWR, 2012).

### Analyses

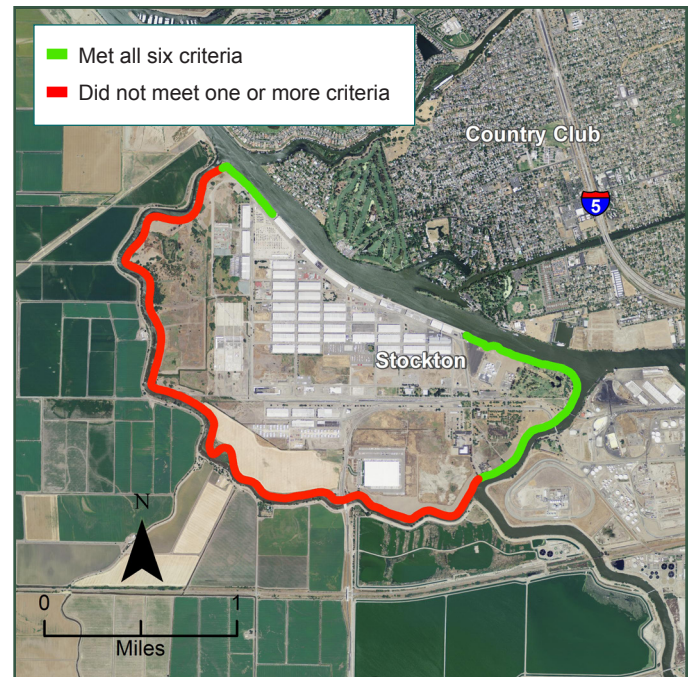
Levees in each reach/subreach were analyzed for six static ULE criteria at the 200-year water surface elevation (WSE): erosion risk, freeboard, through-seepage, under-seepage, landside slope stability, and waterside slope stability.

In addition, a seismic vulnerability evaluation was performed using a 200-year return period seismic event. The assessment results were used to classify intermittently loaded levees as having high, medium, or low vulnerability with respect to post-seismic flood protection ability. Frequently loaded levees were classified as meeting or not meeting ULE criteria, and conceptual remedial alternatives and cost estimates were prepared.

### Results

For the Rough and Ready Island Study Area, approximately 2.0 miles of levee met all static ULE criteria at the 200-year WSE. The reaches/subreaches that failed to meet static ULE criteria were further evaluated to identify conceptual remedial alternatives. The dimensions of these alternatives were verified by analyses, and then a screening-level Class 4 cost estimate was prepared for planning purposes. The chart on the following page summarizes the findings of the existing condition static assessments.

The seismic assessment classified 0.5 miles of intermittently loaded levee as having low seismic vulnerability and 2.4 miles as having high seismic vulnerability. In addition, 1.4 miles of frequently loaded levees were classified as meeting ULE criteria and 2.2 miles as not meeting ULE criteria. Seismic remediation is not required under ULE criteria for intermittently loaded levees.

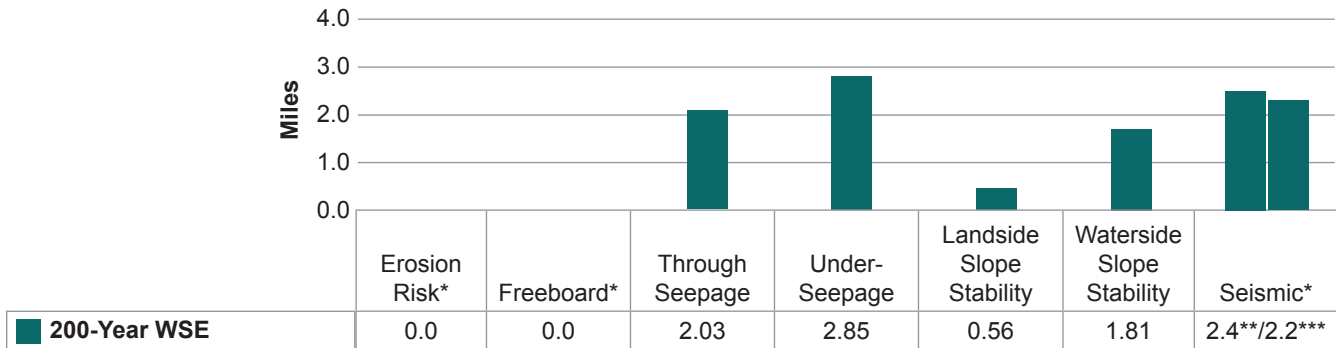


Rough and Ready Island Levees

#### Footnotes:

- 1 Project Levee – A levee or flood wall that is a facility of the State Plan of Flood Control as defined in *Public Resources Code Section 5096.805*.
- 2 Non-Project Levee – A levee or flood wall that is not a project levee as defined above.
- 3 As defined in the *Urban Levee Design Criteria* (DWR, 2012), frequently loaded levees are defined as levees that experience a WSE of 1 foot or higher above the elevation of the landside toe at least once a day for more than 36 days per year on average. Levees not meeting the definition of frequently loaded levees are defined as intermittently loaded levees.

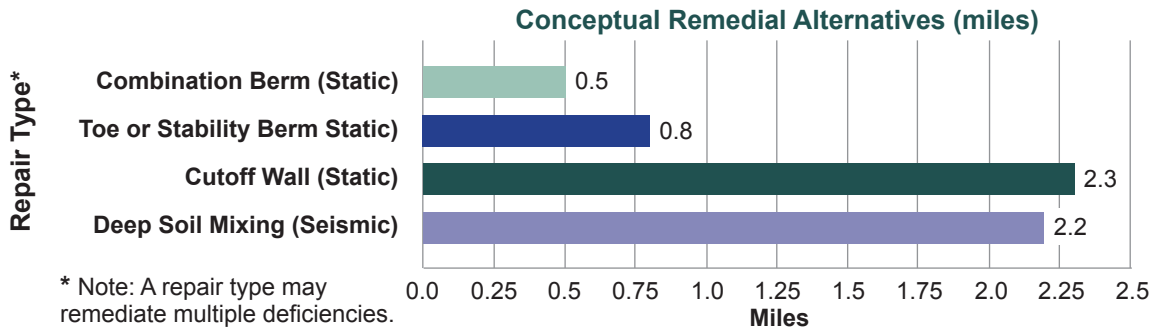
### Total Miles of Levee That Do Not Meet Static ULE Criteria



\* Erosion and freeboard deficiencies and seismic vulnerability were identified as portions of reaches where criteria were not met.  
 \*\* Intermittently loaded levee  
 \*\*\* Frequently loaded levee

### Conceptual Remediation

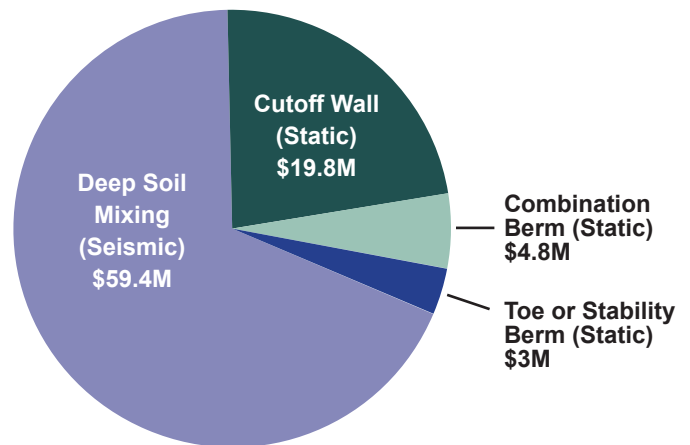
Because of the levees' urban setting, property access on the landside is often limited. Therefore, typical conceptual static remedial alternatives in the Rough and Ready Island Study Area consist of: installing cutoff walls along the centerline of the levees to address seepage and stability deficiencies; combination and toe or stability berms to address seepage and stability along the landside of the levee; waterside slope stability; and seismic vulnerability deficiencies. The total length of each type of repair to bring levees up to the ULE 200-year WSE criteria is depicted in the graph below.



### Costs

Screening-level Class 4 cost estimates were prepared on a 2013 basis<sup>4</sup>. Class 4 estimates are not design-level cost estimates. However, they do include construction cost and owners' "soft" costs, such as permitting, legal, environmental mitigation, and contingency. The total estimated costs of conceptual static remedial alternatives to bring levees up to the ULE 200-year WSE criteria are shown in the adjacent pie chart.

### Total Remediation Costs (\$87 Million) [200-Year WSE]



### References:

*Geotechnical Evaluation Report Volume 1, Existing Conditions – Rough and Ready Island Study Area, Urban Levee Evaluations Project.* Kleinfelder, April 2015.

*Geotechnical Evaluation Report Volume 2, Remedial Alternatives – Rough and Ready Island Study Area, Urban Levee Evaluations Project.* Kleinfelder, April 2015.

### Footnotes:

<sup>4</sup> 2013 Basis – Industry construction cost derived from 2008 data with a 4 percent escalation included per year.

Reference sources for this document are available at <http://www.dwr-lep.com/ath>  
 For further general DWR information or to obtain copies of DWR publications, please contact DWR Public Affairs (916) 651-7512 or <http://www.water.ca.gov/publicaffairs.cfm/>

