Clarksburg Small Community Flood Risk Reduction Feasibility Study

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Outline

- Feasibility Study Introduction
- Recommended Levee Improvements
- Non-structural Measures
- Multiple Objective Concepts
- Conclusions
- Questions and Discussion
Feasibility Study
Introduction
Small Community Flood Risk Reduction Program

- Small Community Flood Risk Reduction Program
  - Local assistance program with the objective of reducing flood risk to 34 Central Valley small communities protected by State Plan of Flood Control facilities.
  - For communities with populations of 200 and 10,000 residents.
  - Supports the continued viability of rural-agricultural populations, agricultural enterprises, and commercial operations.
  - Follow-up to State’s Central Valley Flood Protection Plan and Regional Flood Management Plans
  - Phase 1 - Feasibility studies of structural and nonstructural flood risk reduction projects.
  - Subsequent Phases - Design and implementation of projects (Guidelines in October 2019, funding must be committed by June 2020)
Community of Clarksburg

Located in southeast Yolo County within the primary zone of the Sacramento-San Joaquin Delta. 16 miles south of City of West Sacramento
Community of Clarksburg

- Founded in the mid-1800s
- Population = 1,700, Approximately 1/3 of the population live in the town and 2/3 live outside of the town.
- Agricultural region with notoriety for its wine production.
Clarksburg Study Area
Two stakeholder meetings were held:

- Initial meeting with stakeholders about concerns regarding levee penetrations and encroachments, evacuation planning, and levee improvement funding.
- Later in the study, a public meeting was held with over 40 attendees who learned about the study process, the recommended alternative, and the next steps.
Flood Risk

- Clarksburg has not flooded since its original levee system was constructed in the early 1900s.
- Acts like a bath tub. If any levee breaches, then this bath tub would fill up.
- Water surface elevations as highest along the Sacramento River, and thus a breach there would produce the deepest floodplains.
- Past studies have shown stability, seepage, and some erosion issues along this stretch of levees. There are also several penetrations and encroachments.
Clarksburg Levees
Clarksburg Levees

Past Performance of Clarksburg Project Levees – RD150

Clarksburg Flood Risk Reduction Feasibility Study

HDR

Dec 2018

FIGURE 5
Recommended Levee Improvements
Study Considerations

A suite of structural alternatives were developed and evaluated against the project goals/objectives:

- Flood reduction benefit
- Agricultural sustainability
- Costs and ability to pay
- Also considered:
  - Discussions with Reclamation Districts and key stakeholders
  - Constructability
Evaluation of Alternatives

- Started with 11 preliminary alternatives
- Screened them down to 4 final alternatives based on stakeholder input and assessment
  - Alternative 4 - Fix-in-place adjacent to the town and north
  - Alternative 5 - Ring Levee
  - Alternative 9 - Fix-in-place adjacent to the town
  - Alternative 11 - Fix-in-place adjacent to the town and north with flood gates (on Elk Slough

- Evaluation of Final Alternatives:

<table>
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<tr>
<th>Criteria</th>
<th>Alternative 4</th>
<th>Alternative 5</th>
<th>Alternative 9</th>
<th>Alternative 11</th>
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<td>Funding Capacity</td>
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<td>Acceptability</td>
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<td>Total</td>
<td>18</td>
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Recommended Levee Improvements

- **Description** – Remediate known problems of levees along Elk Slough and the Sacramento River from town to the West Sacramento cross levee
  - Combination of seepage berms and cutoff walls
  - Preliminary costs $44 million to $52 million
  - Benefits much of the basin
  - Phasing to be determined
    - Prioritize levees adjacent to town and biggest deficiencies
Recommended Levee Improvements
### Remediation Alternatives

- **Remediation Alternative 1** – preferred.
- **Remediation Alternative 2** may be considered if land acquisition, stakeholder interests, environmental or cultural resource conflicts, cost, or other pertinent limitations apply.

<table>
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<th>Reach</th>
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<th>Remediation Alternative 1</th>
<th>Remediation Alternative 2</th>
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<td>H</td>
<td>1.52 to 0.00</td>
<td>Combined Drained Stability and Seepage Berm – Width ≥ 81 Feet Thickness at Levee Toe ≥ 6 Feet Thickness at Berm Toe ≥ 3 Feet</td>
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<td>Depth to lower permeability strata greater than excavation depth using conventional cutoff wall equipment.</td>
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<td>Combined Drained Stability and Seepage Berm – Width ≥ 90 Feet Thickness at Levee Toe ≥ 6.5 Feet Thickness at Berm Toe ≥ 3 Feet</td>
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<td>Cutoff Wall – Levee Degrade ≈ 6 Feet Cutoff Depth Below Degraded Levee ≥ 16 Feet</td>
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<td>Cutoff Wall – Levee Degrade ≈ 6 Feet Cutoff Depth Below Degraded Levee ≥ 70 Feet</td>
<td>Combined Drained Stability and Seepage Berm – Width ≥ 82 Feet Thickness at Levee Toe ≥ 6 Feet Thickness at Berm Toe ≥ 3 Feet</td>
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<td>Cutoff Wall – Levee Degrade ≈ 6 Feet Cutoff Depth Below Degraded Levee ≥ 40 Feet</td>
<td>Combined Drained Stability and Seepage Berm – Width ≥ 75 Feet Thickness at Levee Toe ≥ 5 Feet Thickness at Berm Toe ≥ 3 Feet</td>
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Other Measures
Non-structural Measures

- Emergency Flood Fight Plan enhancement (Pumphouse Road)
- Levee Relief Cuts
- Voluntary Structure Elevation & Floodproofing (to critical infrastructure and residences)

- Other policy changes: Recommending changes to National Flood Insurance Program by FEMA
Multiple Objective Concepts

- The opportunities investigated included:
  - A specific habitat restoration opportunity on Elk Slough through the installation of floodgates
  - Potential recreational enhancements through the extension into Clarksburg of Branch Line Trail in West Sacramento
  - Potential recreational enhancements through improved boating access on Elk Slough.
Conclusions
Conclusions

- In addition to future small communities funding from DWR, the study also identified other possible funding mechanisms.
- Also conducted an environmental constraints analysis.
- Although the town has never flooded, these critical repairs from the recommended alternative would provide the substantial reduction in flood risk.
- Other studies and plans are also looking to address flood risk in the basin.
Acknowledgements

- **Elisa Sabatini** – Yolo County Manager of Natural Resources

- **MBK Engineers** – Project Management, Stakeholder Engagement, Hydraulics

- **HDR Engineering, Inc.** – Planning, Geotechnical, Environmental

- **Douglas Environmental** – Multi-Benefit Analysis

- **Larsen Wurzel & Associates, Inc.** – Financial Analysis

- **California Department of Water Resources** – Granting Agency
Questions and Discussion
Backup slides
Typical Remediation Cross-Sections
Drained Stability Berm

Drained stability berm: remediates through seepage, stability, or through seepage and stability deficiencies
Soil-Bentonite Cutoff Wall

Soil-bentonite cutoff wall (up to 70 feet remediation depth): remediates through seepage and underseepage deficiencies, and landside seepage-related instability deficiency
Combination seepage-stability berm:
remediates through seepage and underseepage when a landside slope instability deficiency also exists.