Santa Maria River Levee Repairs

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2015 FMA Annual Conference
September 8-11, 2015
Santa Maria River
Santa Maria River Levee

- 26 Miles Compacted Sand
- Rock Slope Protection Facing
SM River Levee Quick Facts

- Built 1959 – 1963; Part of Santa Maria Project
- Built by US Army Corps of Engineers
- Designed to a flow of 150,000 cfs
- Owned and Operated by Santa Barbara County Flood Control District
- Protects 80,000 Residents, and Thousands of Acres of Prime Ag Land
Historic Photos – 1966 - 1969

1969 - 1994
Early Damages lead to Studies and Treatments
No permanent Solutions

Below – SM Levee in 1966
Failed Section
1994 – The Questions Start

- Questions on Rock Degradation
- Various Test Trenches Investigated
- No Real Conclusions

Santa Barbara County Flood Control and Water Conservation District

January 10, 1994

Colonel Robert L. VanAntwerp, District Engineer
U.S. Army Corps of Engineers
Los Angeles District
100 N. Los Angeles St., Rm 6132
Los Angeles, CA 90012

RE: Santa Maria River Levee

Dear Colonel VanAntwerp:

On August 16, 1993, the Santa Barbara County Flood Control District (District) joined the U.S. Army Corps of Engineers (Corps) on an inspection of the Santa Maria River Levee. This inspection was requested by the District resulting from increased concerns over the integrity of the Levee rock slope protection. The District raised concerns over the effectiveness of the rock and the ability of the Levee to withstand a Standard Project Flood, or a lesser magnitude event.

On September 14, 1993, the Corps performed another inspection focusing on the Levee rock. Corps staff from the Geotechnical Branch were in attendance. There appeared to be hesitancy by Corps staff to either concur or refute the District’s concern over the rock integrity.

In either case, the District requested copies of the Inspection Report from both of these inspections. Additionally, you assured me on September 21, 1993, in Santa Barbara that the District would receive a report on the Levee integrity prior to the winter storm season. The District, however, has not received a report or copies of either inspection.

The District remains concerned over the rock facing of the Santa Maria River Levee. If the Corps takes the position that a problem does not exist with the Levee, the District would simply like documentation to that effect. If the Corps feels that a deficiency does exist, the District would like to work with the Corps to find a solution to the problem. If you have any questions please contact Tom Foyman, Engineering Manager, at 805-568-3440.

Sincerely,

[Signature]

Phillip M. Demery
District Director
1998 Breach – North Levee

- Meandering Flows Impinge in Levee
- 1000 feet of Levee lost
- Flow was less than 30,000 cfs
- Breach Plugged in 24 hours
2005

DROWNED NEW ORLEANS: THE AFTERMATH OF HURRICANE KATRINA
Santa Maria River Levee
Big Push Timeline

- 2005 – Katrina Devastates New Orleans, FEMA Seeks Levee Certifications
- 2007 – FEMA Maps Valley
- 2007 County Prepares Alternative Analysis
- 2008 – Design Deficiency Report
- 2009 – ARRA Allocates $48 Million
- 4 Corps Colonels, LA District
  - Dornstauder, Magness, Toy, Colloton
Santa Maria River Levee Repair
Alternatives Analysis
Site Assessment

• Hydraulic Conditions
• Variations within Reaches

• Erosion Potential
• Critical Section (Reach 4)
Scour Analysis

• 10-year Bank-Full Discharge
• 3 Conditions Evaluated
  • Median Velocity and Depth
  • Maximum Depth
  • Maximum Velocity
• Maximum 8 Feet of Scour
Erosion Treatment Concepts

Sheet Pile Wall

Soil Cement

Figure 2. Sheet Pile Wall
Rock Rip-Rap

Articulated Concrete Block
Gabion Mattress

Jet Grouting
Secondary Measures

• Groins
• Bioengineering
• Graded Pilot Channel
• Slurry Walls
• Grouted Rock
Comparison of Alternatives

- Reliability
- Constructability
- Geotechnical
- Environmental
- O&M
- Cost
## Recommended Alternative

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<tr>
<th>Alternative</th>
<th>Weighting</th>
<th>Cost</th>
<th>Reliability</th>
<th>Constructability</th>
<th>Operation and Maintenance</th>
<th>Environmental Impacts</th>
<th>Geotechnical</th>
<th>Total Score</th>
<th>Rank</th>
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<td>56</td>
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### Rankings:
1 - Doesn't meet Project objectives
2 - Marginally meets Project objectives
3 - Somewhat meets Project objectives
4 - More strongly meets Project objectives
5 - Fully meets Project objectives

### Weighting Factors:
1 - Considered in project design (objective met if possible)
2 - Lower level of importance (objective should be met)
3 - High level of importance (objective must be met)

### Total Score Calculation:
Total Score = Sum of Weighting Factors X Rankings
Soil Cement Typical Section

Approx. Material Quantities (Per Levee Foot):
- Site Clearing = ±40 S.F. = ±4.4 S.Y.
- Grading = ±52 S.F. = ±5.8 S.Y.
- Toe Excavation and Backfill = ±13.7 C.Y.
- Soil Cement = ±5.3 C.Y.
- Upper Levee Geotextile/Bioengineering = ±16 S.F.

Scale: 1" = 10'
APPEND. 100-YEAR WSEL △

EXISTING AND FUTURE GRADE

CHANNEL INVERT

±8' SCOUR

STEEL SHEET PILE WALL

±8'

±15'

±46'

±69'

EXISTING LEVEE ±18'

APPROX. MATERIAL QUANTITIES (PER LEVEE FOOT)

STEEL SHEET PILE = ±69 S.F.
AGGREGATE BASE FOR LEVEE CROWN = ±0.3 C.Y.

SCALE: 1" = 10'

Sheet Pile Wall Typical Section
Groundbreaking October 2009
CONSTRUCTION CONTRACTORS

PHASE I (Reaches 1 & 2)
Rodney Williams Construction, Inc. $10,031,900

PHASE II (Reach 3)
Wood Brothers, Inc. $11,747,087

PHASE III (Bradley Canyon Extension)
John Madonna Construction Co., Inc. $6,748,165
Excavation – Phase I
On-site Soil Cement Batch Plant
Combi-wall in Environmentally Sensitive Areas
Completed Section of Levee
FEMA Remapping

Santa Barbara County, CA
Santa Maria Levee Failure Analysis
Santa Barbara County Flood Control & Water Conservation District

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