

North Half Moon Bay (Pillar Point Harbor), California

Continuing Authorities Program (CAP) 111 Project

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Coastside Sea Level
Rise Forum
May 24, 2016

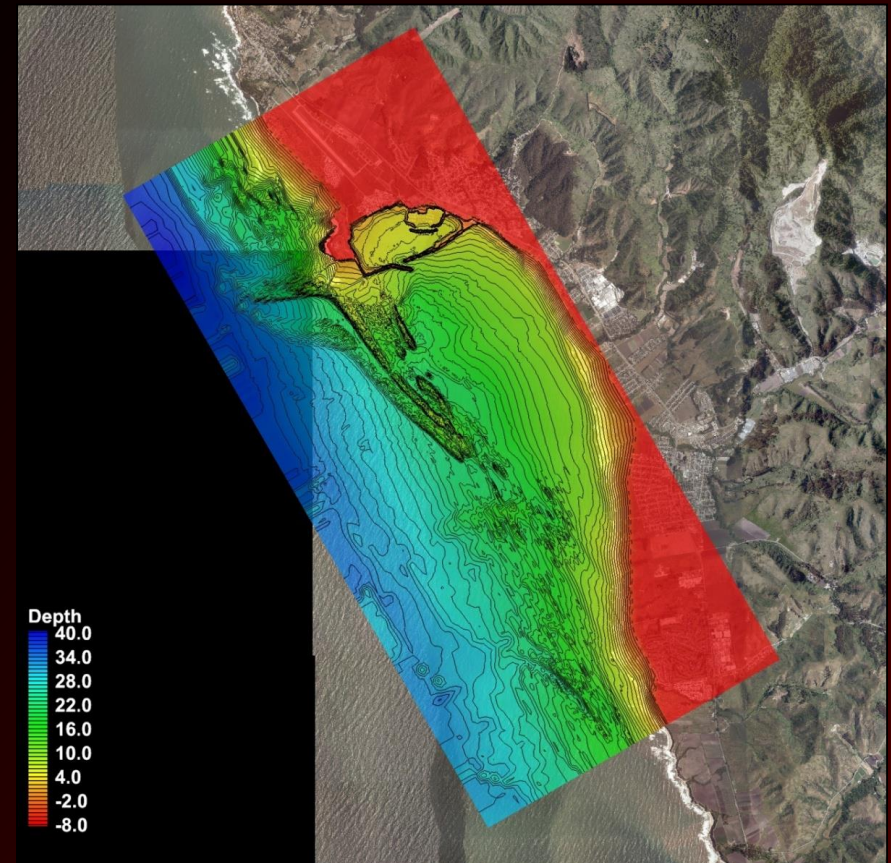


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Outline

- Introduction and Setting
- Statement of the Problem
- Design Objectives
- Design Measures
- Method of Analysis
 - Numerical Modeling
- Results
- Conclusions



Project Development Phases

CAP 111: *Mitigation of [FUTURE] Damages Caused by a Federal Navigation Project*

- New Congressional authorization is not needed
- The federal funding limit is \$5M
- The Non-Federal Sponsor (SMCHD) shares in the costs as prescribed in the Section 111 legislation

Completed (216 IA Report)



In Progress

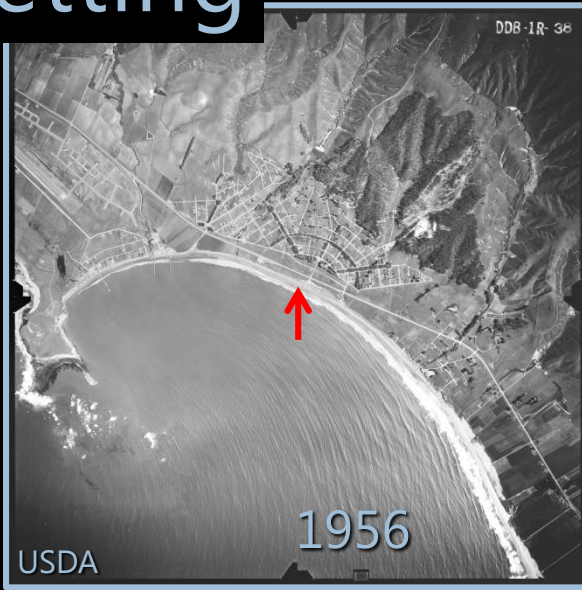


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Feasibility Phase Products

- This presentation summarizes findings from coastal engineering analysis
- Feasibility findings are summarized in a Detailed Project Report (DPR) and appendices
- DPR is undergoing final editorial review
- DPR does not demonstrate that there are sufficient benefits to justify a Federal investment

Setting



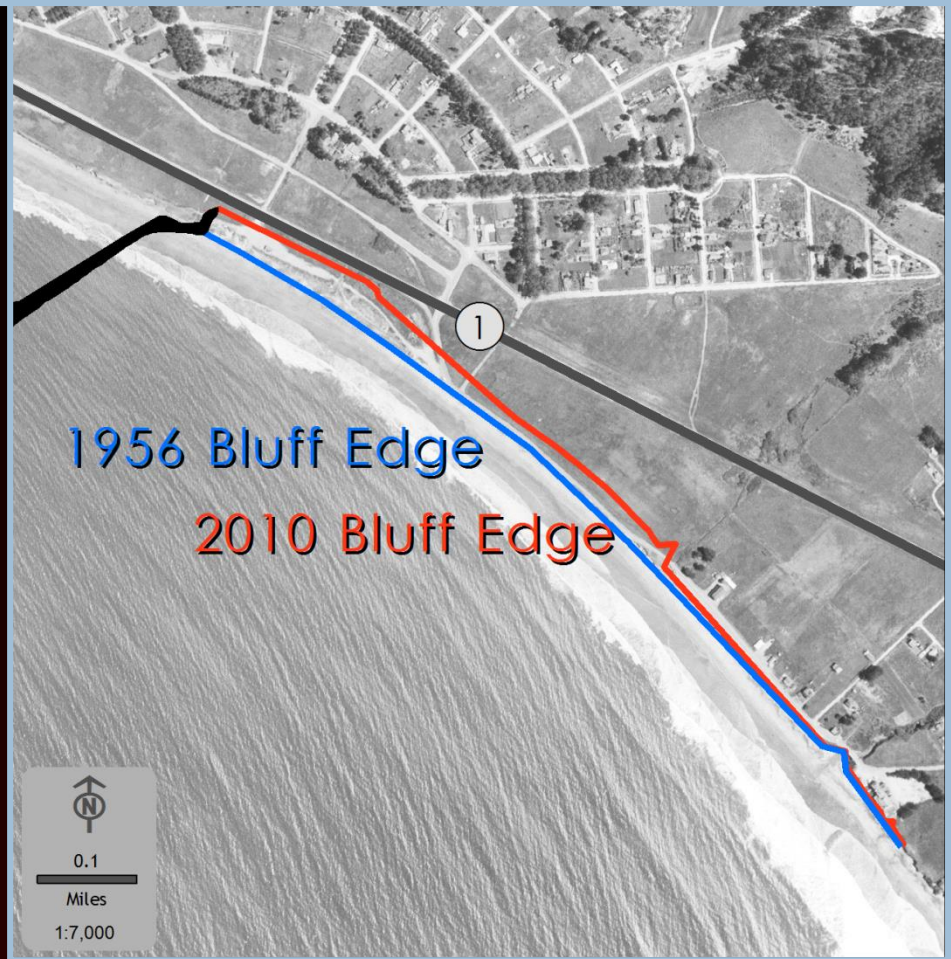
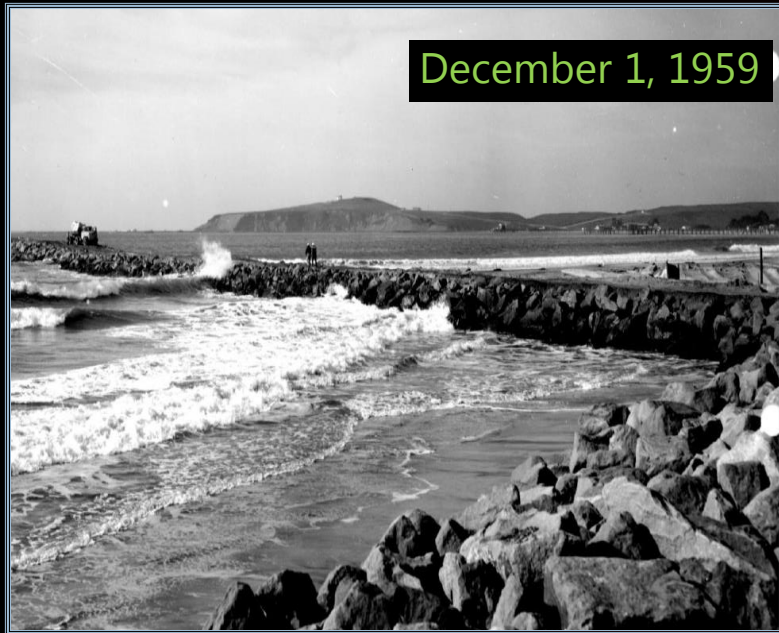
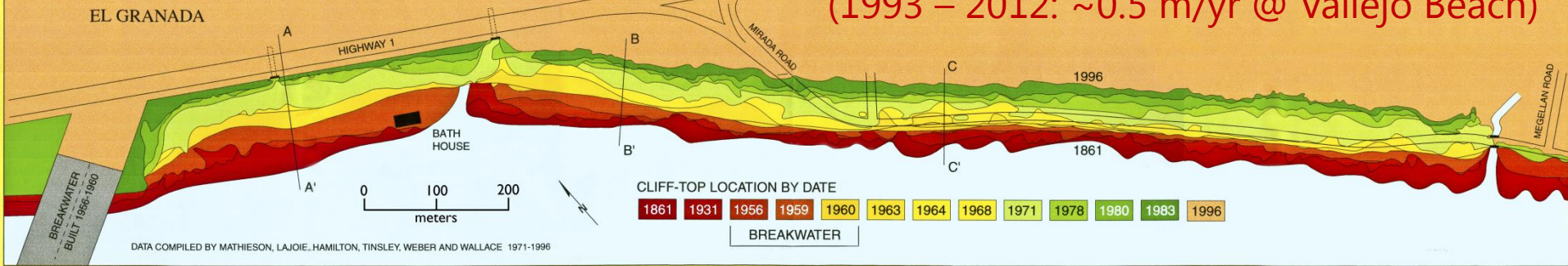
2013

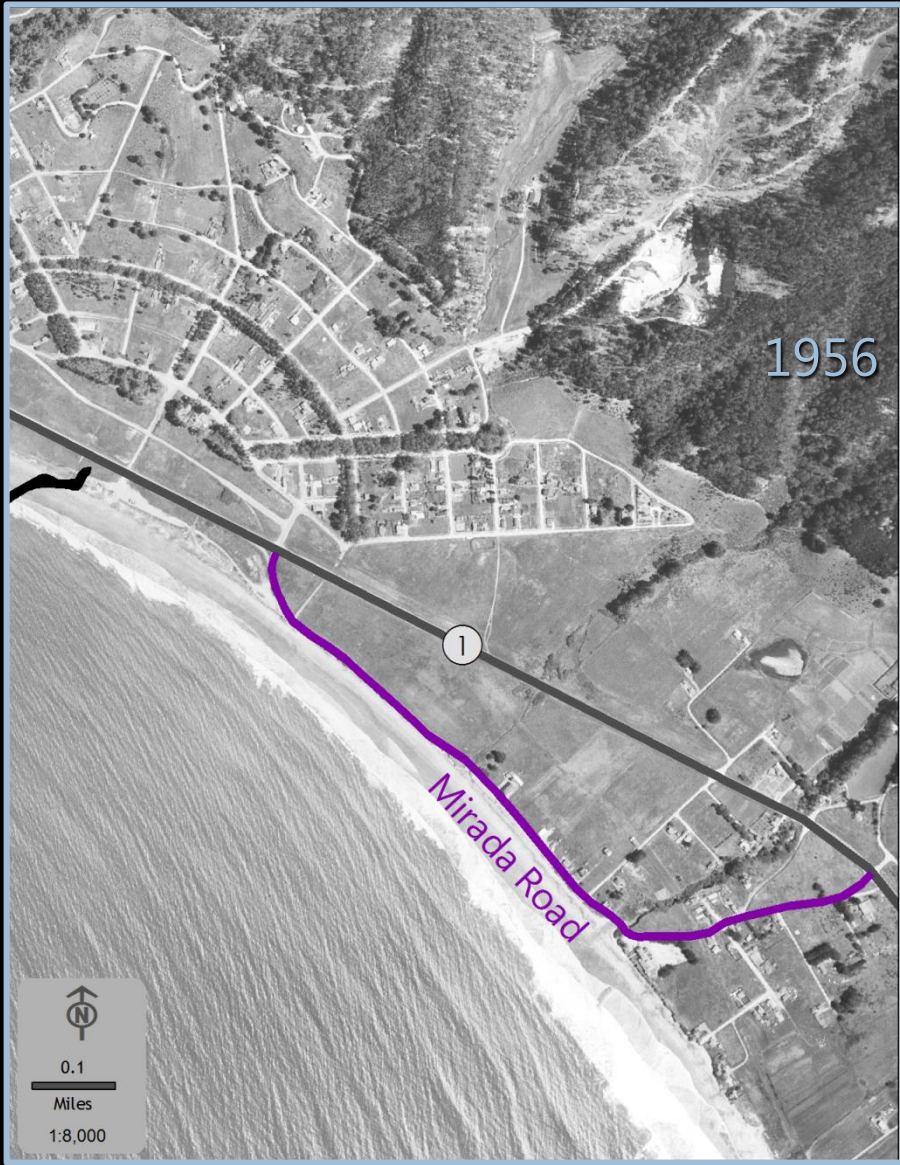


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Bluff Retreat

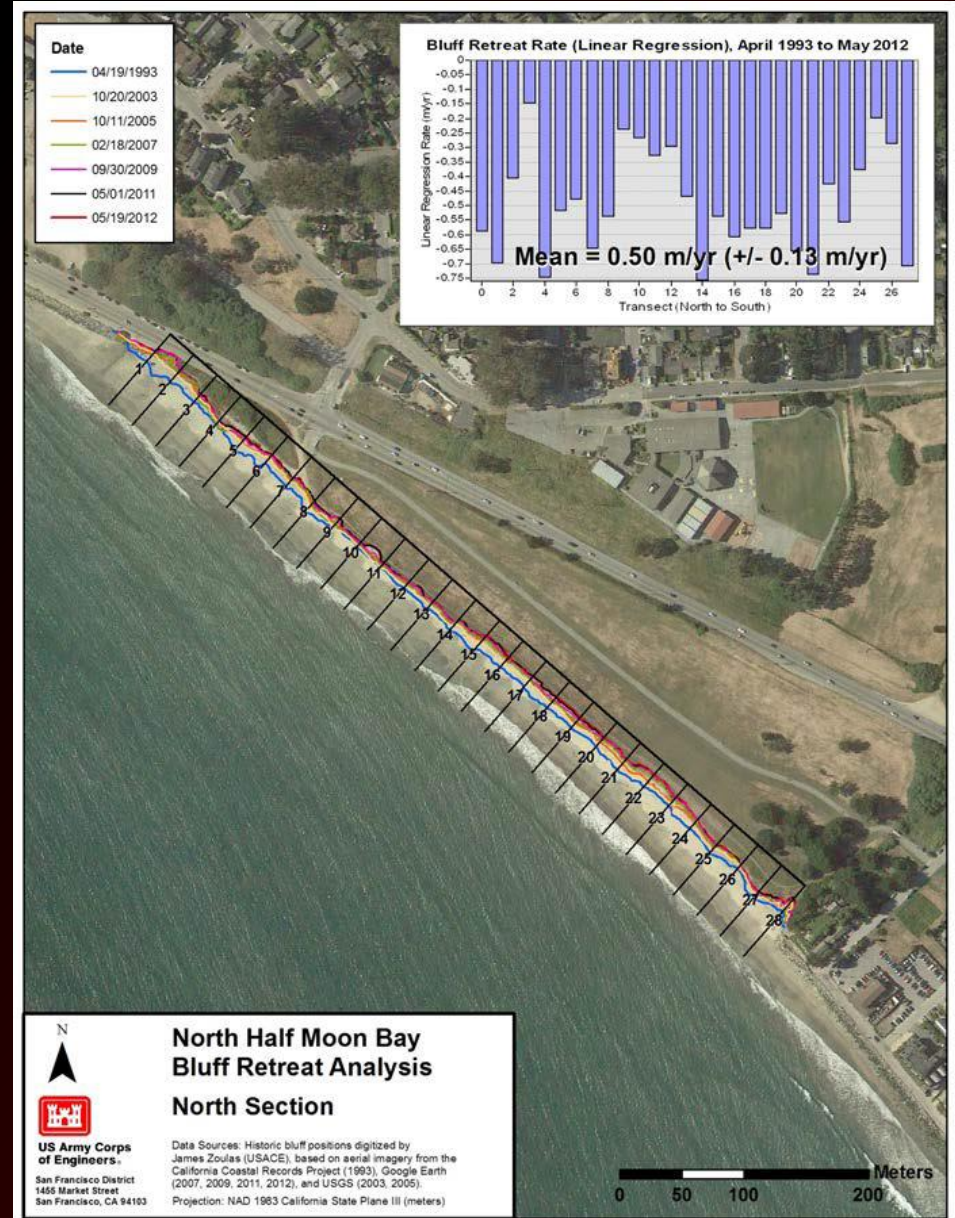
(1993 – 2012: ~0.5 m/yr @ Vallejo Beach)





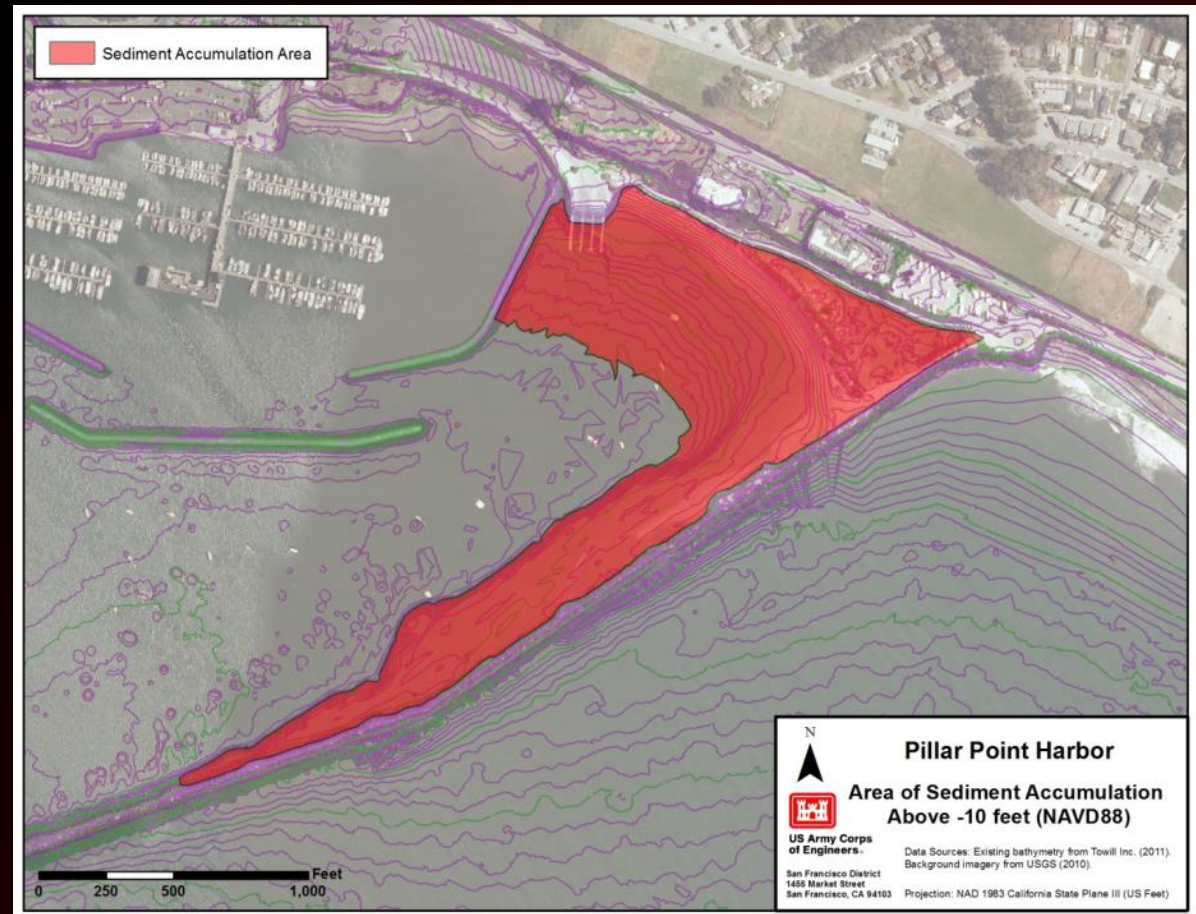
Statement of the Problem

- Rapid erosion of coastal bluff and beach down coast of the harbor
- Excessive shoaling of sand in the harbor
- Changes in hydrodynamic conditions and net sediment transport
- Sand deficit at Surfers Beach
- Leaking of sand through East Breakwater



Design Objectives

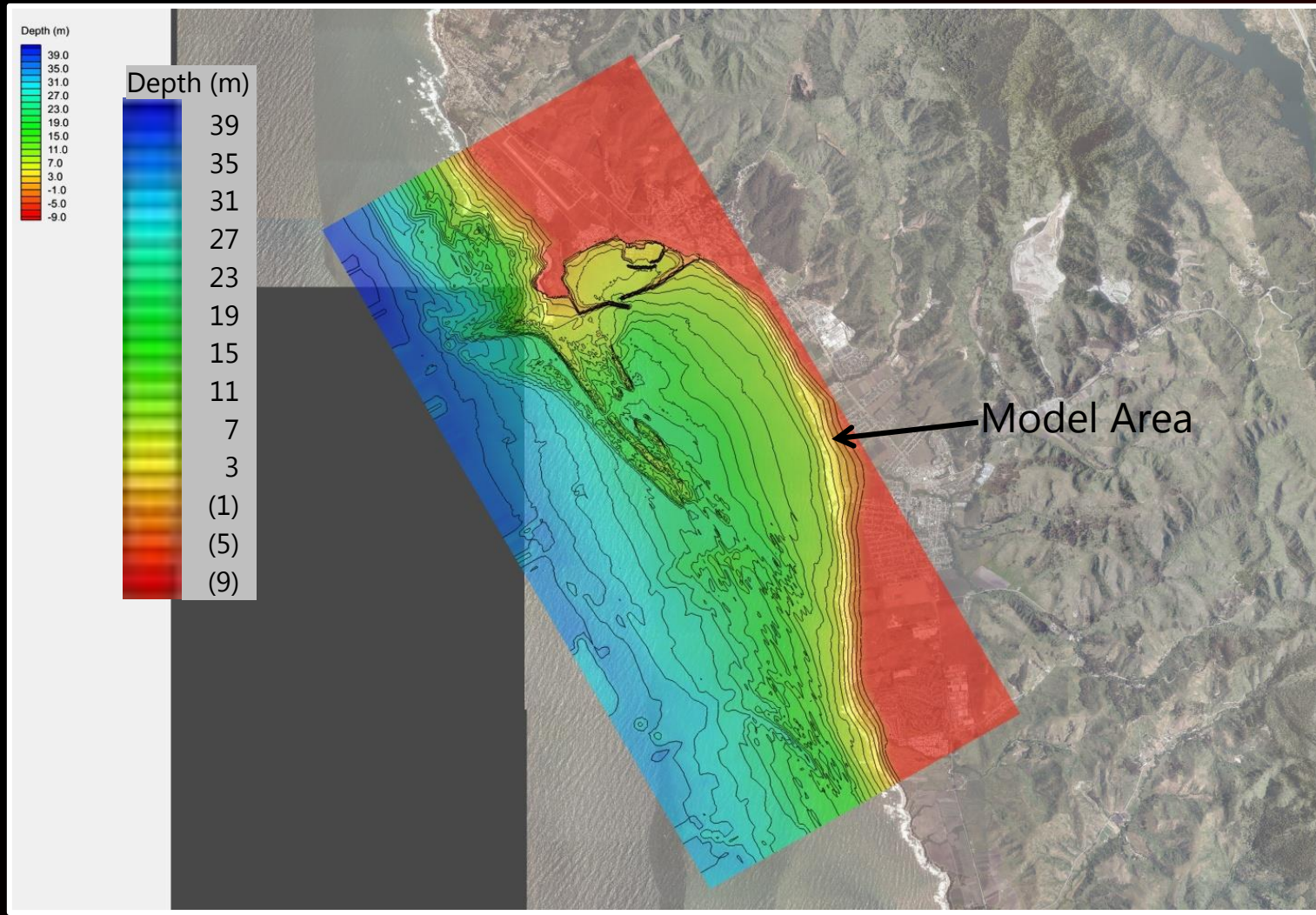
- Reduce damages associated with ongoing erosion at Surfer's Beach
- Improve navigation in Pillar Point Harbor by removing sand shoal



Design Measures Considered (7 Total)

- Two scenarios of beach fill (1-2)
- Sealing of voids in East Breakwater (3)
- Adding an opening (notch) to the East Breakwater (4)
- Placement of dredged material near harbor mouth (5)
- Spur breakwater (6)
- Managed retreat (7)
- Several of the 7 were screened out based on cost and acceptability
- 4 were modeled - 2 beach fill measures and 2 involving modification of the East Breakwater

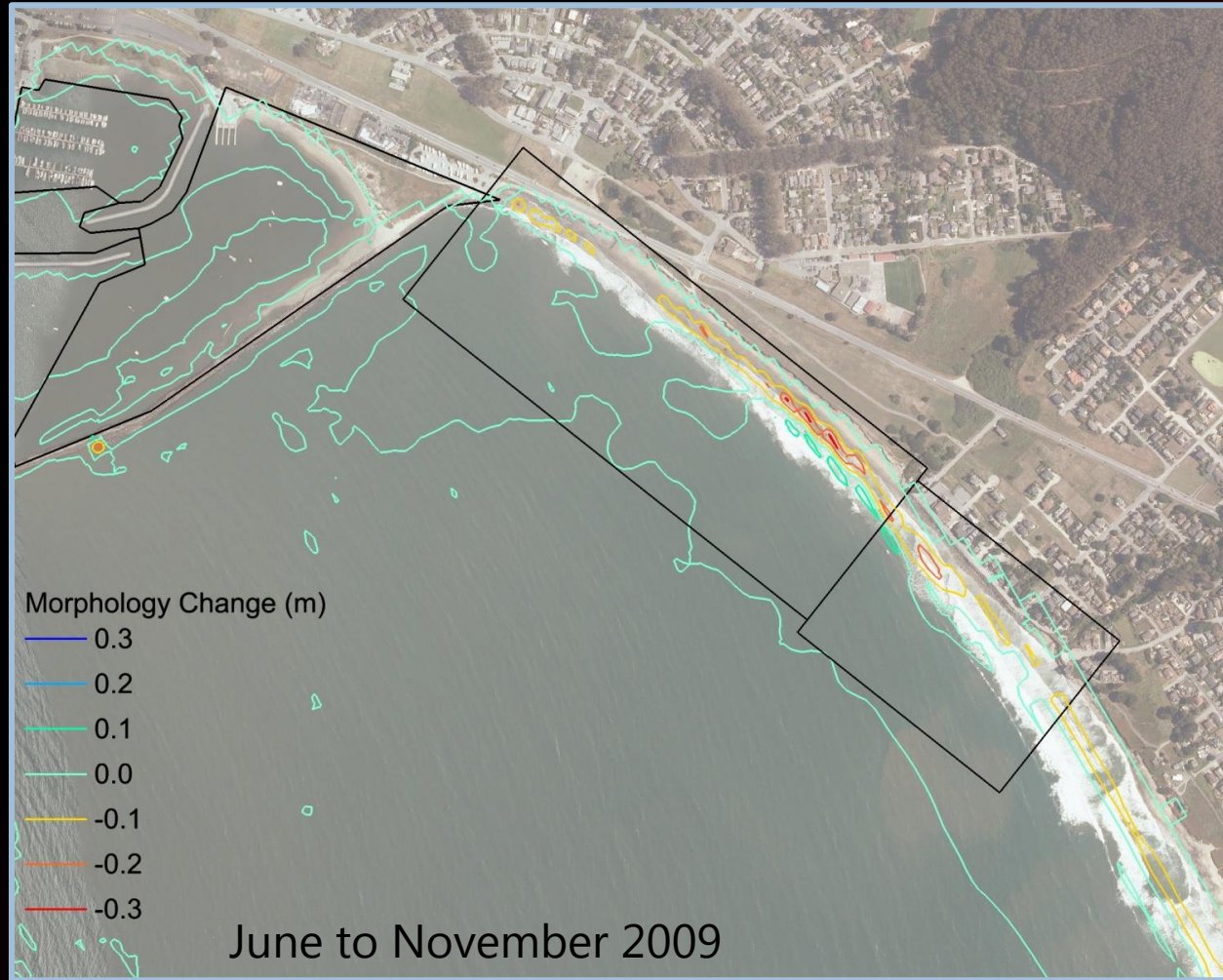
Numerical Modeling of Design Measures



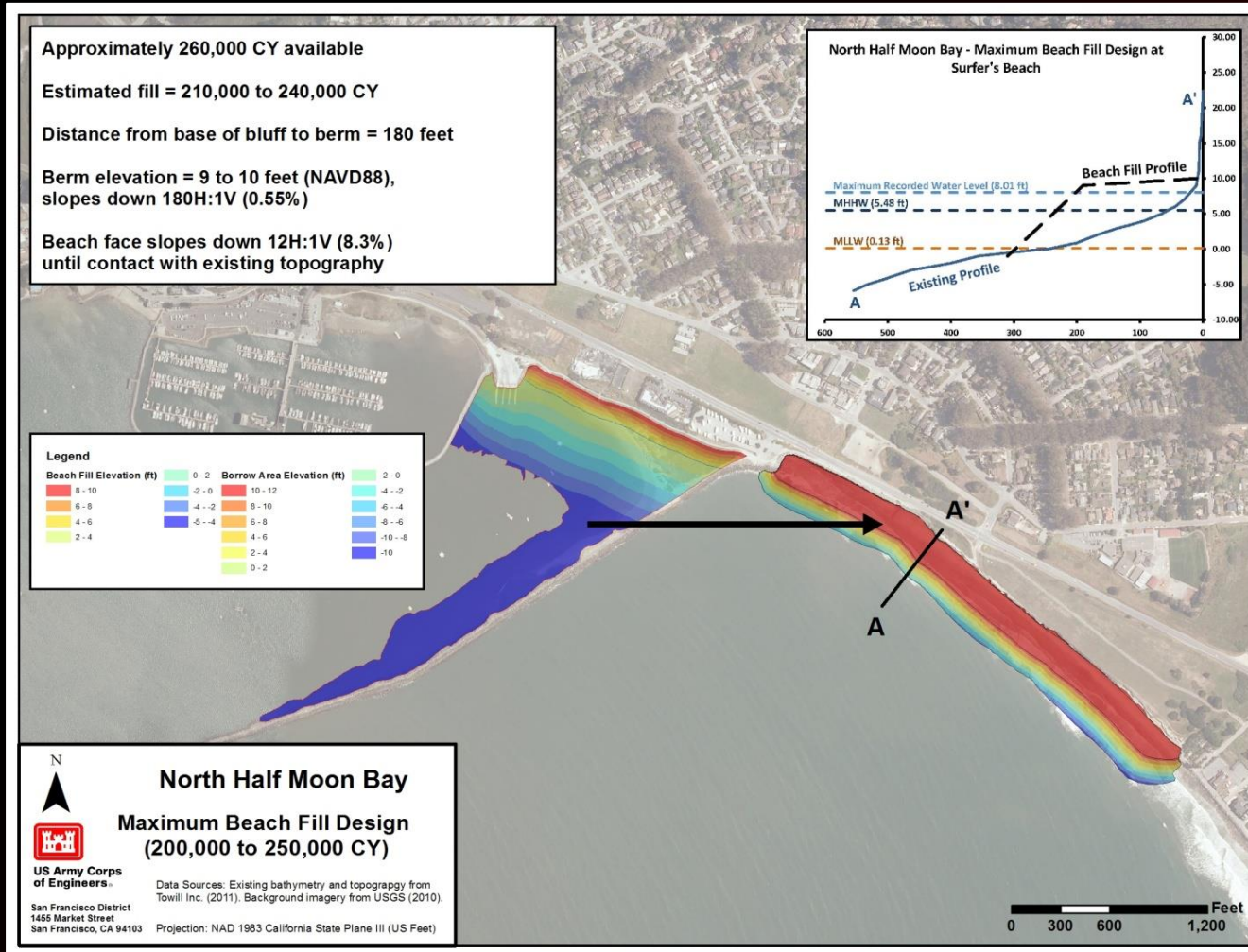
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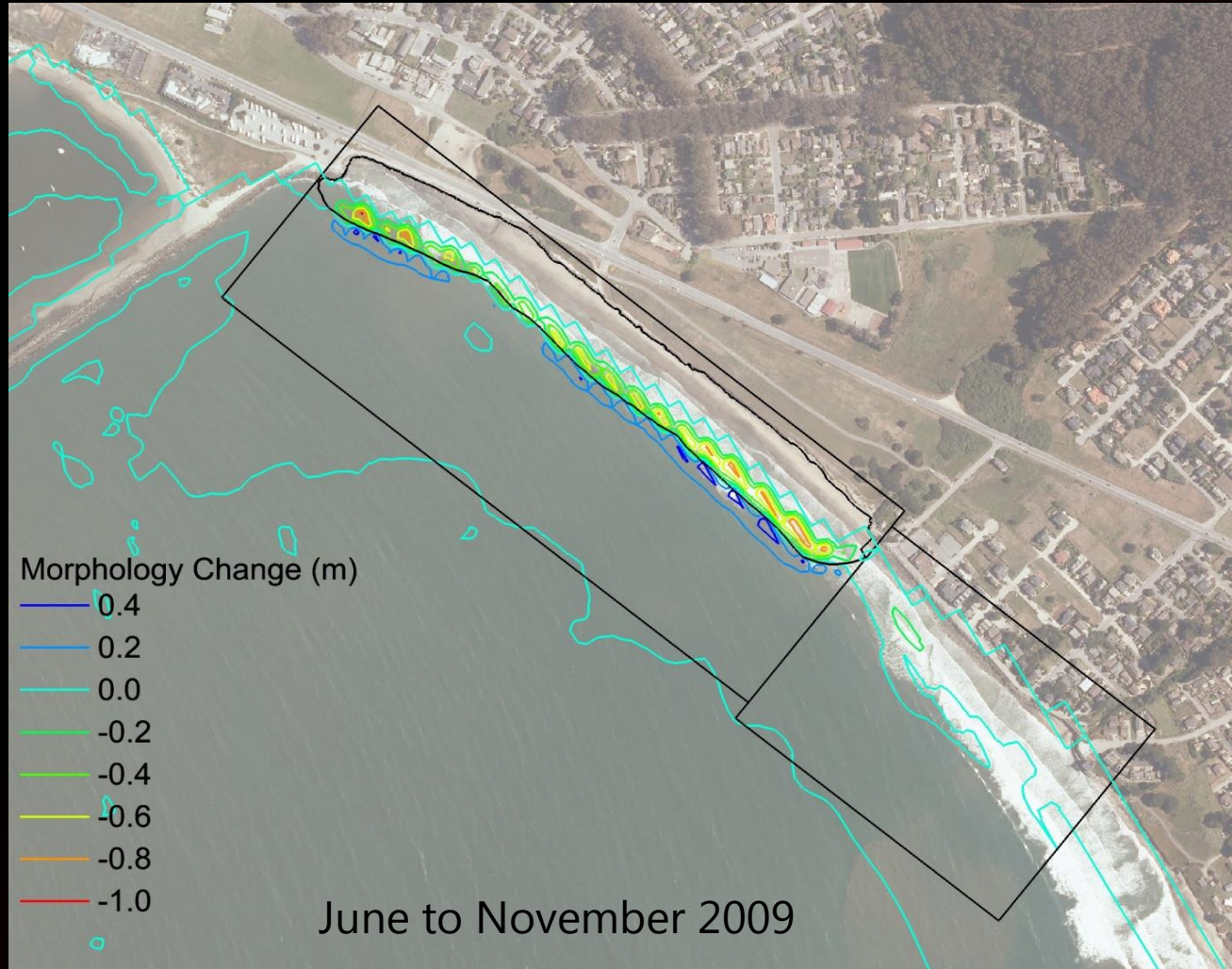
Modeled erosion and accretion: Existing Conditions



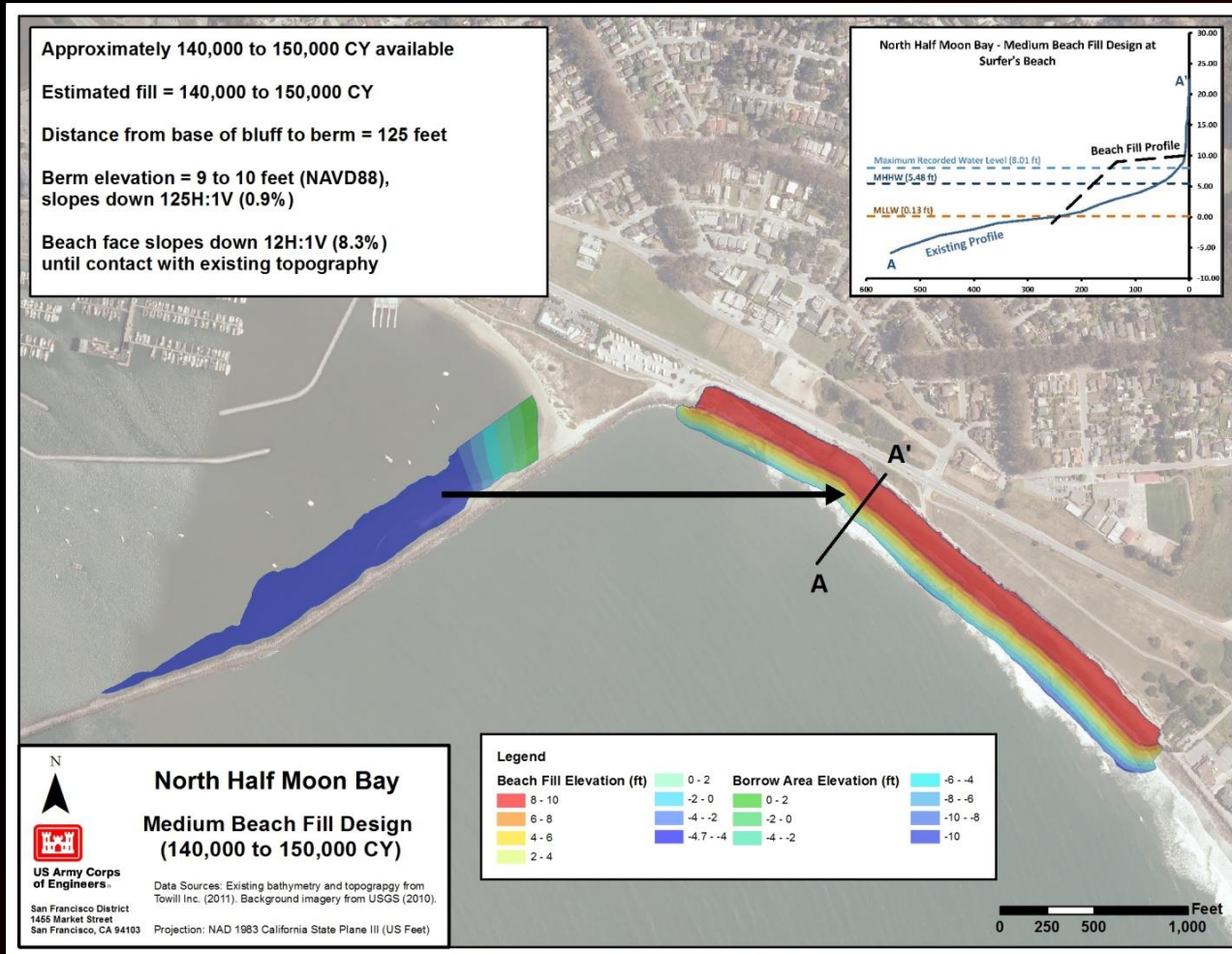
Engineering Model Results: Maximum Beach Fill (Design Measure 1)



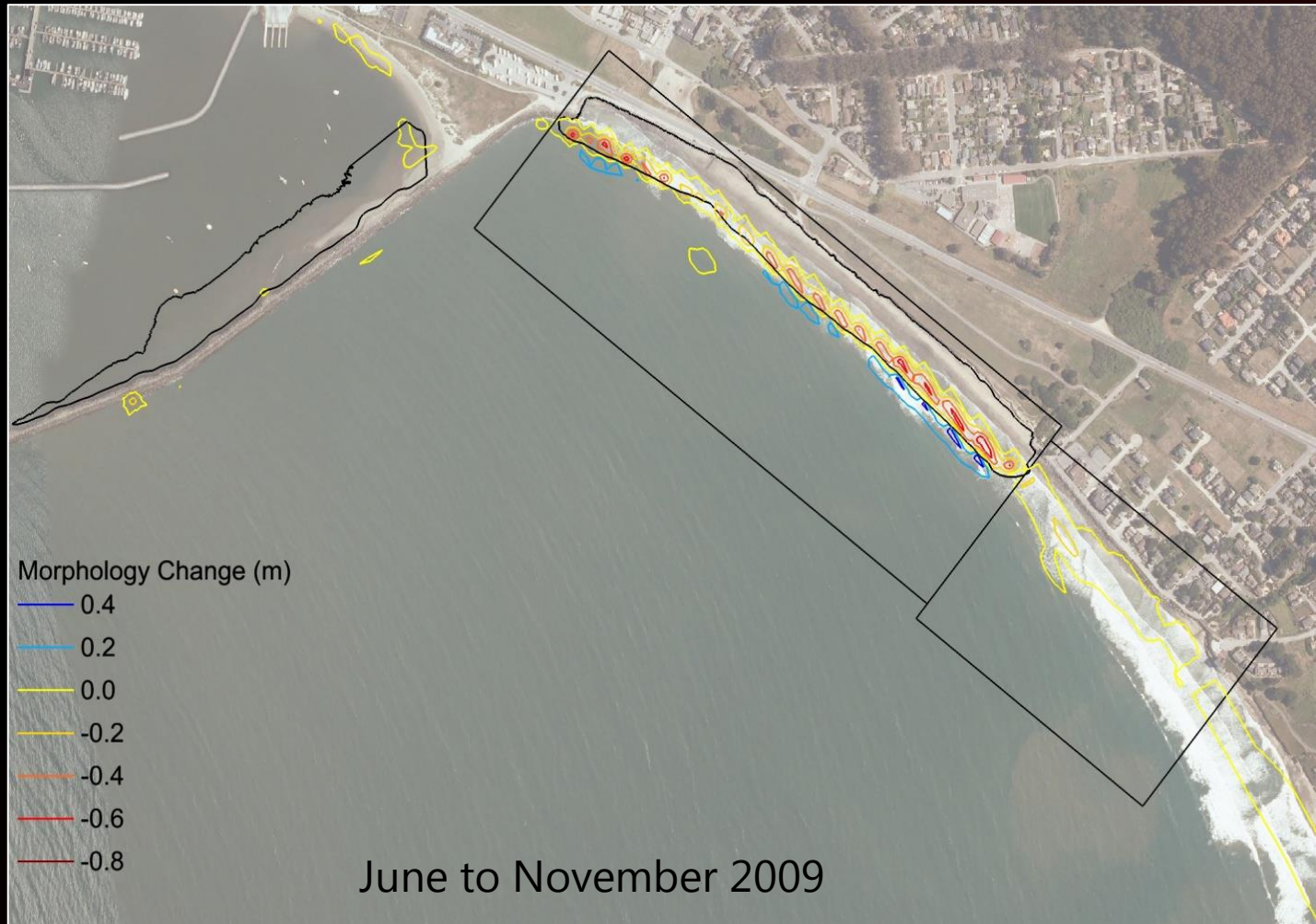
Modeled erosion and accretion: Maximum Beach Fill



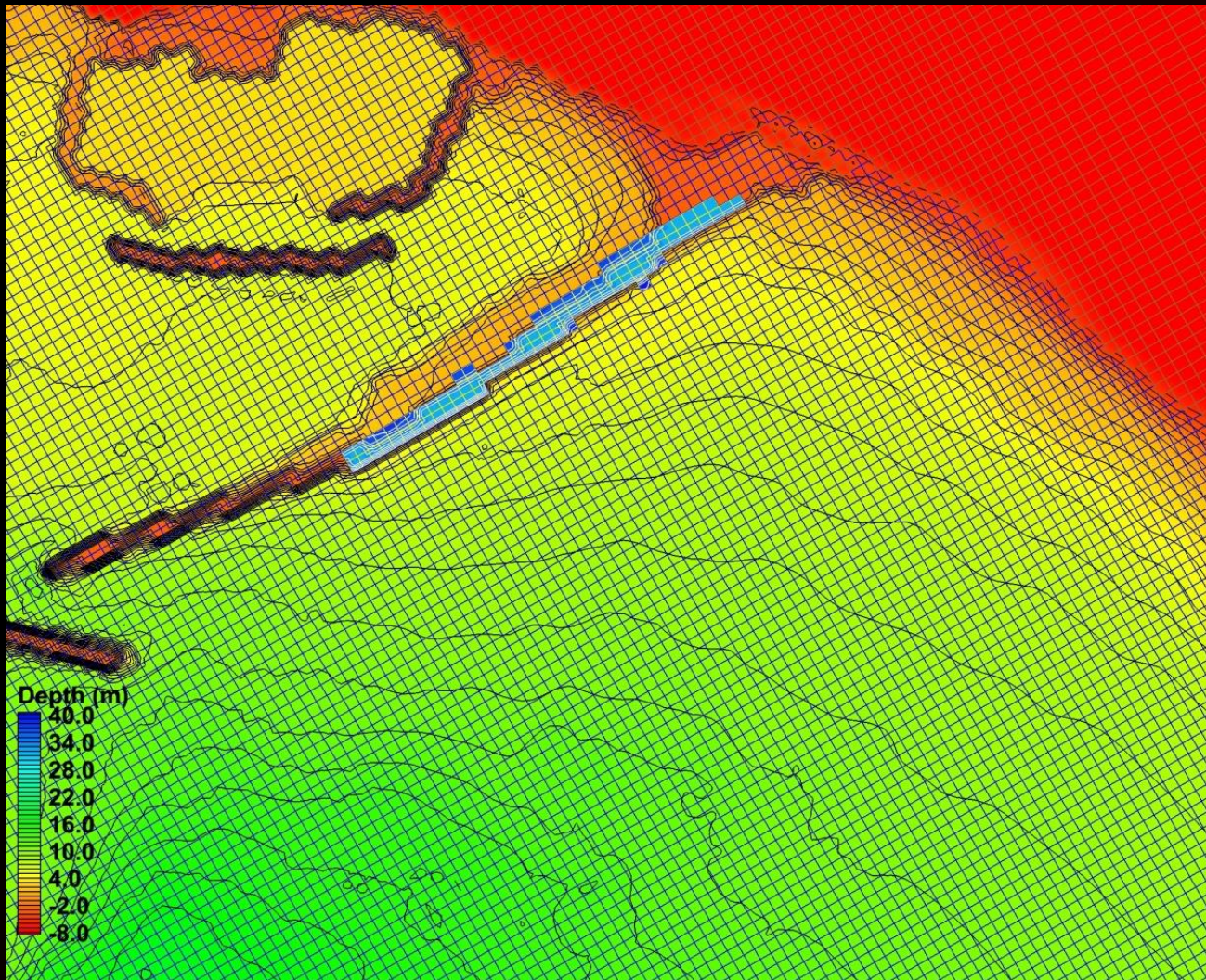
Engineering Model Results: Medium Beach Fill (Design Measure 2)



Modeled erosion and accretion: Medium Beach Fill



Engineering Model Results: Sealing East Breakwater (Design Measure 3)



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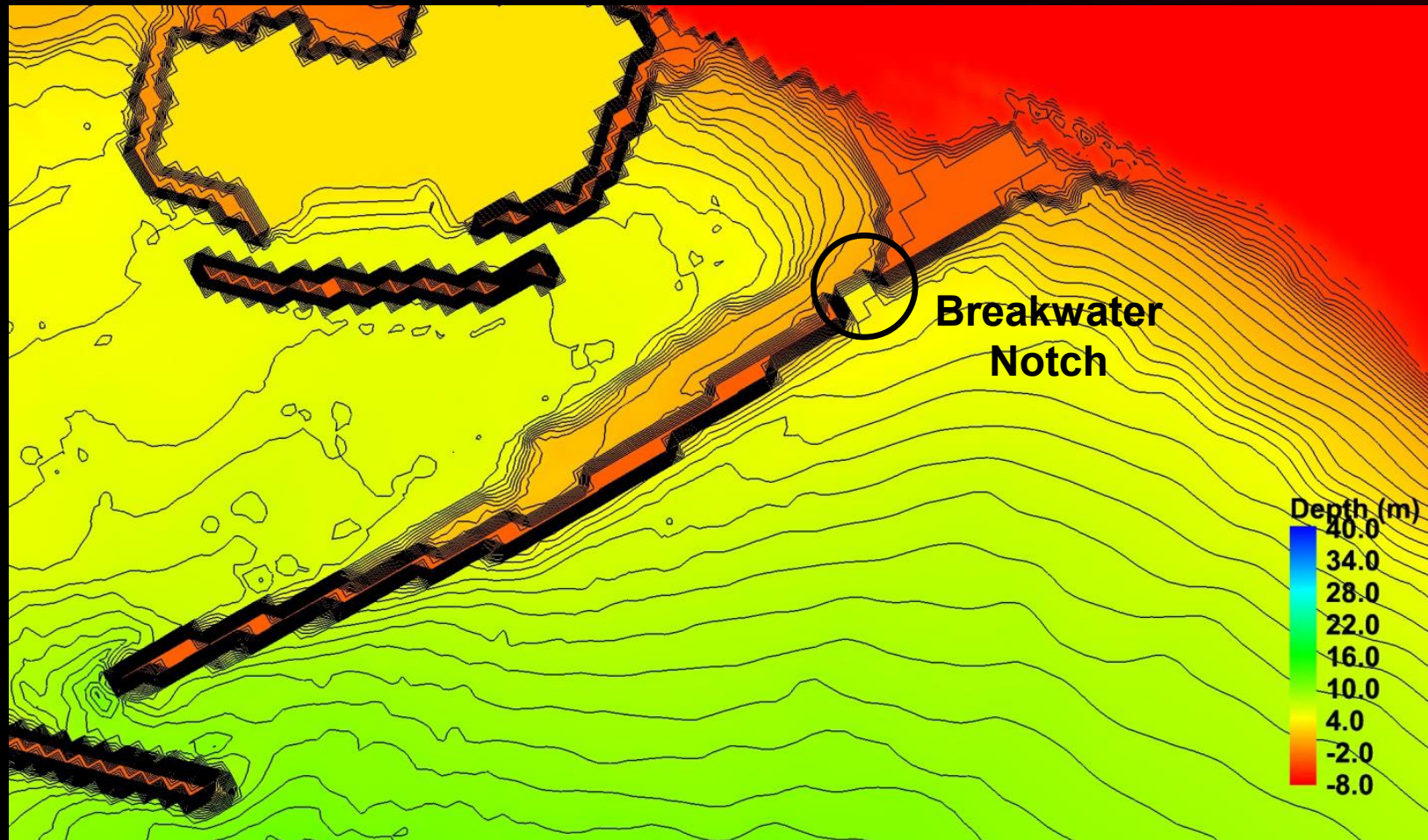
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Modeled erosion and accretion: Sealing East Breakwater



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Engineering Model Results: Notch in East Breakwater (Design Measure 4)



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Modeled erosion and accretion: Notch in East Breakwater



Model Estimate of Beach-Fill Life:

Medium Beach Fill Design (140,000–150,000 yd³)

- Weak El Niño^a (e.g., June 2009 – May 2010)
 - Approximately 24,000 yd³ of sand will erode from the constructed beach. Assuming several consecutive typical years, then all of the placed sand will be gone in approximately 6 years.
 - However, 80 to 90% of the eroded sand will move into the adjacent surf zone in depths of 3 to 10 feet. As a result, approximately 4,000 yd³ per year will leave the project area, giving a total residence time of approximately 36 years.
- Although a strong El Niño winter^b has not yet been modeled, a similar analysis for Ocean Beach (San Francisco) shows that one will notably shorten the beach-fill lifespan.

^a Oceanic Niño Index (ONI) ~ 1.6

^b Oceanic Niño Index (ONI) > 2

Model Results for Breakwater Design

Measures:

- Sealing a section of the East Breakwater could significantly reduce shoaling in the harbor
- Sealing does not appear to have immediate protective benefits at Surfers Beach
- The creation of a notch in the East Breakwater could reduce shoaling in the harbor, and slightly reduce erosion rates at Surfers Beach
- The notch did not result in the immediate erosion of a large quantity of sand from the shoal along the East Breakwater



Conclusions

- Small modifications to the East Breakwater will likely not restore sufficient sediment transport to mitigate beach erosion
- Of the seven design measures, the medium beach fill design will likely be the most effective from an engineering perspective



California Coastal Records Project , 2013

Next Steps and Related Work

- Release of Detailed Project Report and Appendices in Summer 2016
- CSMW-Sponsored Coastal Regional Sediment Management Plan released in September 2015
- Plan includes discussion of sediment-related issues at Surfers Beach and Princeton
- SMCHD is applying for grants for pilot beach nourishment projects at Surfers Beach

Overview of Santa Cruz CRSM Plan

- Coastal Regional Sediment Management Plan (Plan)
- Prepared for CSMW by USACE, MBNMS, and Noble Consultants
- Coastline from Pillar Point to Moss Landing
- Organized into 9 sections
- Appendix addressing special status species

COASTAL REGIONAL SEDIMENT MANAGEMENT PLAN
FOR THE SANTA CRUZ LITTORAL CELL,
PILLAR POINT TO MOSS LANDING



(Source: Adelman and Adelman, 2013)

Prepared for:

The California Coastal Sediment Management Workgroup

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September 2015



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Questions

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and our Posterity, do ordain
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