

Bolinas Lagoon North End Restoration Project

**Phases 1 & 2: Site Conditions and
Conceptual Designs**

State of the Lagoon

March 30, 2017

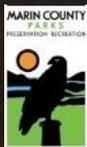
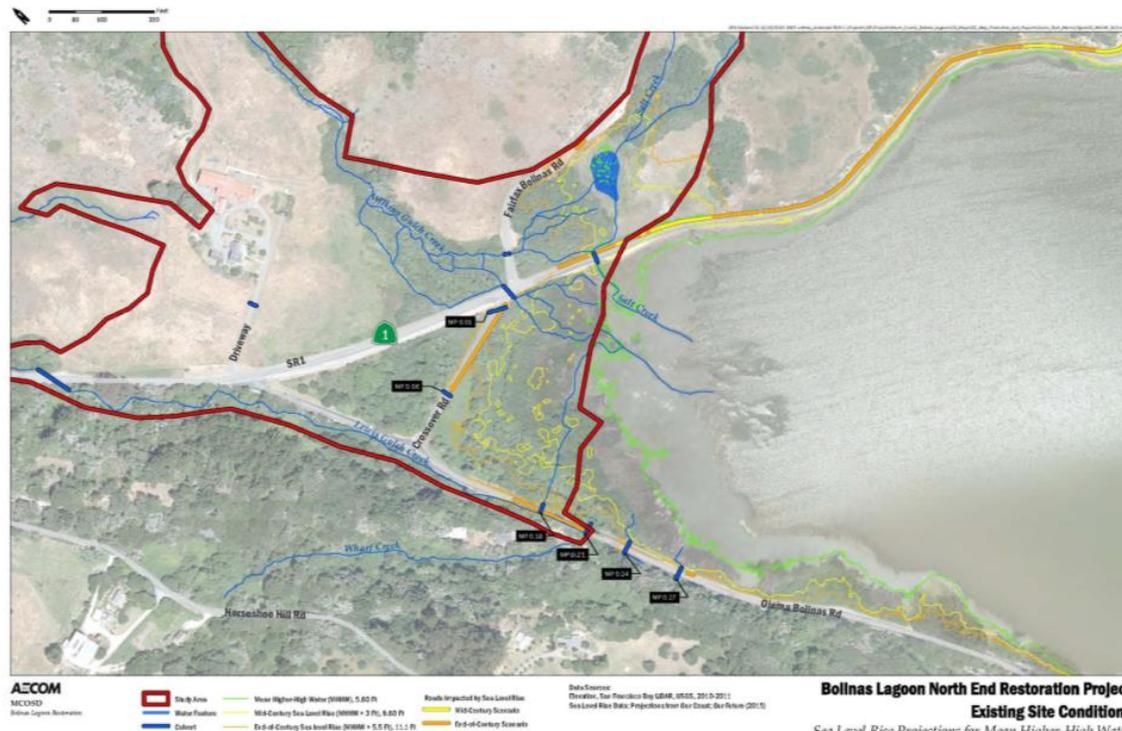
AECOM, Watershed Sciences, Carmen Ecological
Consulting, Peter Baye Consulting



Overview of the Project

- Characterize environmental conditions of:
 - uplands, streams, roads, fringing marsh, & lagoon habitats
- Identify issues and concerns
 - Flooding (expected to worsen with sea-level rise (SLR))
 - Degraded stream corridors and riparian areas
 - Roadway safety
- Conceptual design solutions

Consideration of restoration, land use and ownership, cost, reducing flooding, climate resiliency, and safety



Overview of Goals

- Rehabilitate/enhance stream and riparian corridor habitat and connection with the lagoon
- Improve road safety and reduce flooding
- Adapt to Sea Level Rise

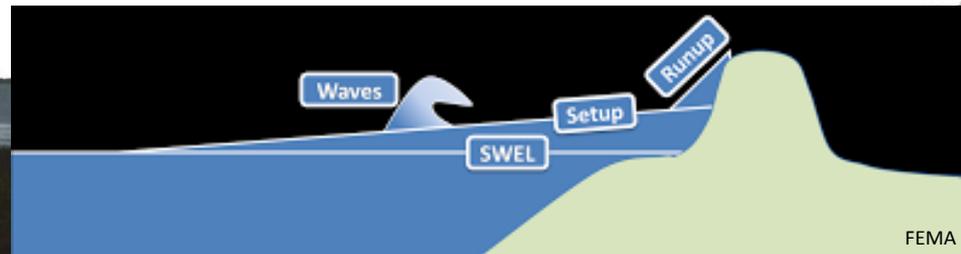
Goals are interconnected



Climate Change and Sea Level Rise

Adaptation

- Sea level rise scenarios consistent with County's approach (NAVD88)
 - Mean Higher-High Water (MHHW) Current: 5.6 Ft
 - Mid-Century Sea Level Rise (MHHW + 3 Ft): 8.6 Ft
 - End-of-Century Sea Level Rise (MHHW + 5.5 Ft): 11.1 Ft
- Design Elevations are even greater (15.5+ Ft)
 - Includes SLR, SWEL (Stillwater Elevation: astronomical tide + storm surge + freshwater discharge), & freeboard

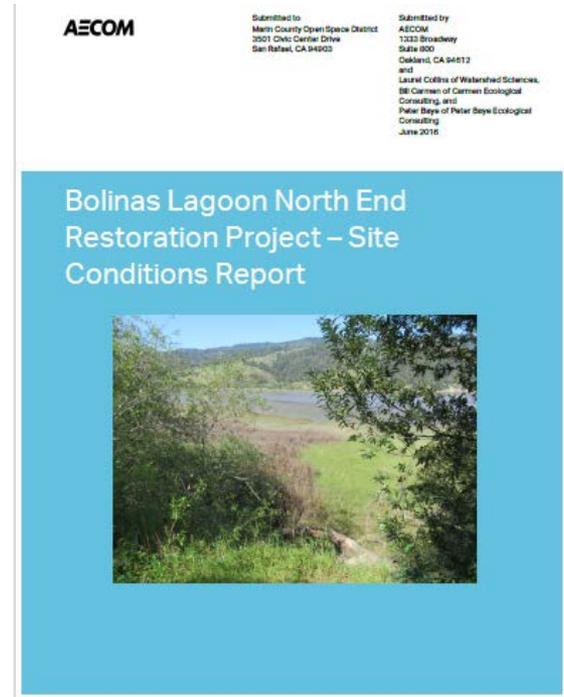


Phase 1: Existing Conditions Report

- Report comprised of field, desktop, and literature surveys

- Topics:

- Stream Hydrology/Geomorphology
- Vegetation and Wildlife
- Cultural Resources
- Traffic, Infrastructure, and Safety
- Regulatory Environment
- Sea Level Rise
- Additional Data Needs



Available: <http://www.marincountyparks.org/depts/pk/our-work/os-main-projects/north-end-project>

Phase 2: Conceptual Design Alternatives

- Conceptual Design Alternatives Development
 - Results of Phase 1 Site Conditions Report
 - Partner input (BLAC, stakeholders, public)
 - Technical expertise
- Final Report
 - 3 Alternatives + phasing
 - Opportunities & constraints analysis
 - Cost estimates
- Geotechnical boring report and piezometer installation
 - Subsurface engineering analysis - road stability & groundwater
- Landscape architecture renders

Potential Roadway Modifications

Types of changes:

- Bridges and Causeways (viaduct-like structures)
- Raised roadway on fill/embankments with culverts
- Retaining walls
- Roadway relocation

Baseline understanding:

- Different roadway changes **enable** different restoration options
- Removal of Crossover Road will increase safety and won't increase traffic congestion

Commonalities among Alternatives

- **Roadways:**
 - Removing Crossover Road
 - Reconfiguring “the Wye”
 - Raising Hwy 1, Olema Bolinas Road and Fairfax-Bolinas Road
 - Upgrading culverts at Fairfax-Bolinas Road and Olema Bolinas Road
- **Upgrading Lewis Gulch Creek Culverts/Bridges:**
 - Hwy 1 north of Wilkins Ranch
 - Olema Bolinas Road
- **Restoration (rehabilitate & enhance):**
 - Wilkins Gulch Creek & Lewis Gulch Creek
 - Vegetated shoreline/soft erosion protection
 - Improving habitat for wildlife and plants
 - Preservation of Wilkins Ranch viewshed

Alternative 1

Draft Conceptual
Not to Scale



Phase 1

- Crossover Road Removed
- Reconfigure Intersection

Phase 2

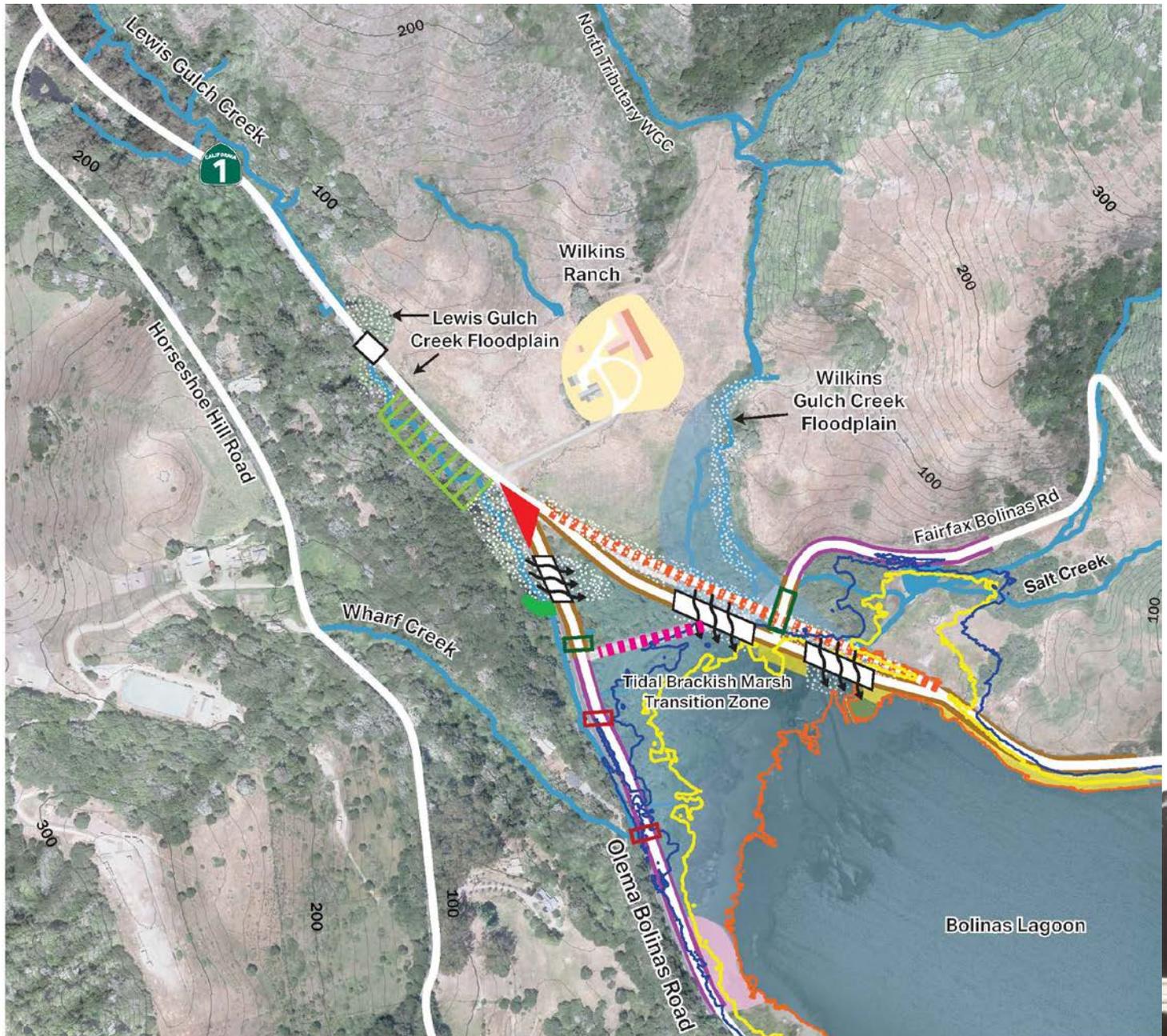
- Reactivate LGC Alluvial Fan and WGC Alluvial Fan
- Add Bridge/Causeway
- Raise Roadway
- Decommission Rd
- Vegetated Berm (Lewis Gulch Creek)
- Surface Water Flow
- Sub Surface Water Flow
- Vegetated Shoreline/Soft Erosion Protection
- Floodplain Grading
- Upgrade/Add Culvert

Phase 3

- Upgrade/Add Culvert (s)
- Vegetated Shoreline/Soft Erosion Protection
- Stream Rehabilitation
- Raise Roadway

Project Features

- MHHW (5.6')
- Late Century SLR (11.1)
- Mid Century SLR (8.6)
- Road
- Existing Stream



Alternative 1

- Rehabilitate/enhance the connection of Wilkins Gulch Creek to the floodplain *downstream* of Wilkins Ranch
- Minimal grading necessary to remove barriers to flow
- Highway 1 would be elevated onto a causeway in two sections
- Lewis Gulch Creek restoration and bridge/culvert upgrades
(*same as all alternatives*)

Alternative 2

Draft Conceptual

Not to Scale



Phase 1

- █ Crossover Road Removed
- █ Reconfigure Intersection

Phase 2

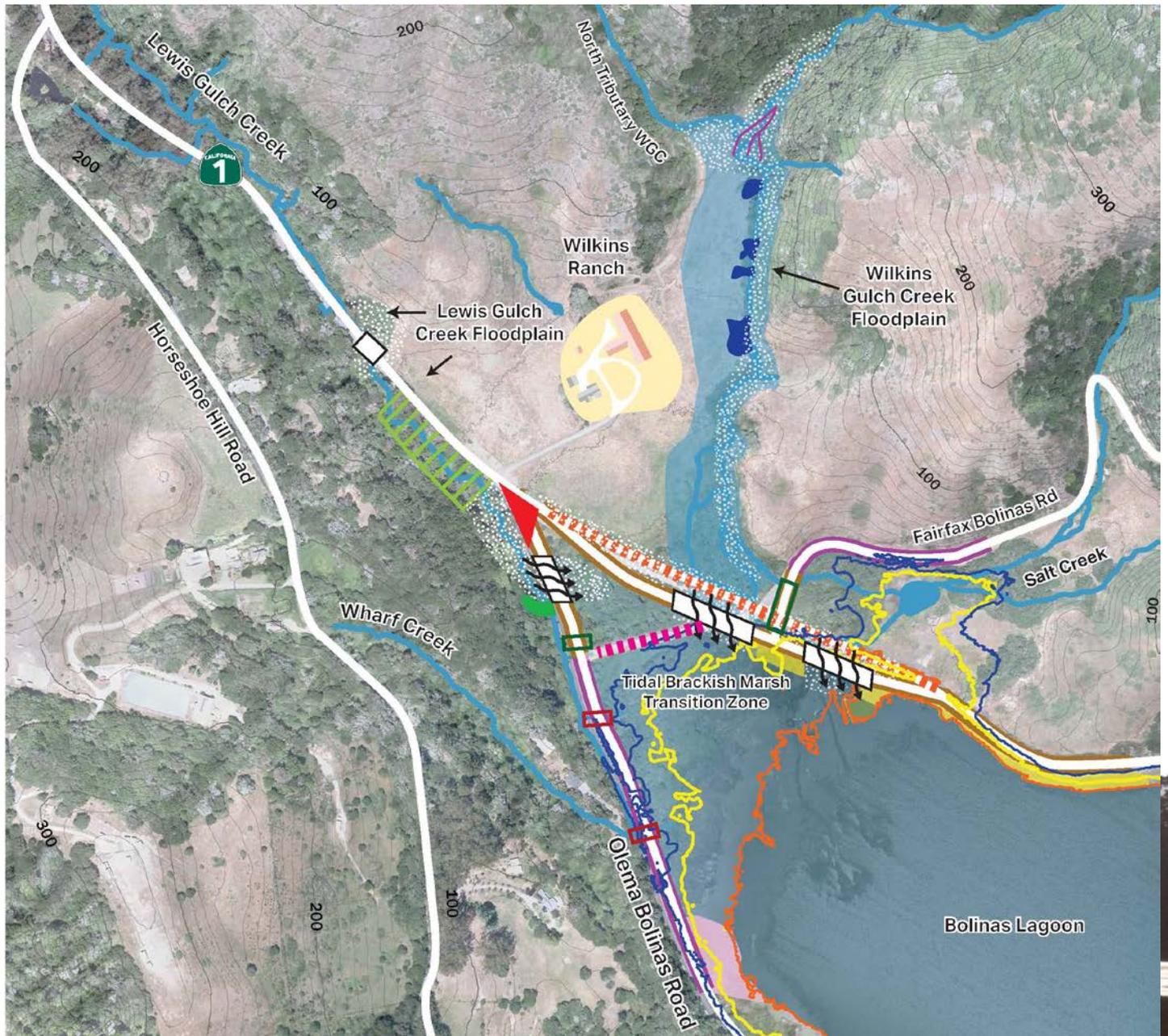
- █ Reactivate LGC and lower WGC Alluvial Fan
- Add Bridge/Causeway
- Raise Roadway
- Decommission Rd
- █ Vegetated Berm (Lewis Gulch Creek)
- Surface Water Flow
- > Sub Surface Water Flow
- Vegetated Shoreline/ Soft Erosion Protection
- Floodplain Grading on LGC, along SR 1, and lower WGC
- Upgrade/Add Culvert

Phase 3

- Upgrade/Add Culvert (s)
- Vegetated Shoreline/ Soft Erosion Protection
- Stream Rehabilitation
- Raise Roadway
- Upper WGC Floodplain Grading
- Reactivate upper WGC Alluvial Fan
- █ Plug and Pond
- █ Stream Braid

Project Features

- MHHW (5.6')
- Late Century SLR (11.1')
- Mid Century SLR (8.6')
- Road
- █ Existing Stream



Alternative 2

- Reconnect Wilkins Gulch Creek to *upstream end* of former surface of alluvial fan & allow the stream to:
 - Develop new or reoccupy relict channel(s) to the lagoon
 - Using plug-and-pond technique (habitat and cost)
- Highway 1 would be elevated onto a causeway in two sections

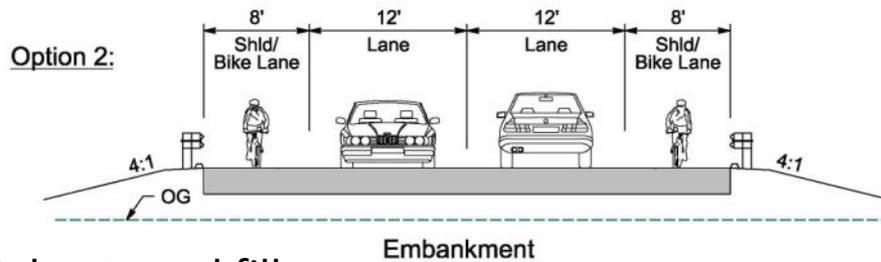
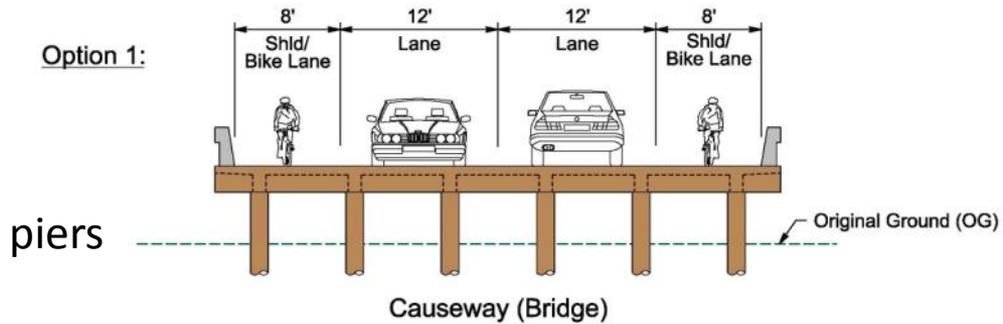


Alternative 3

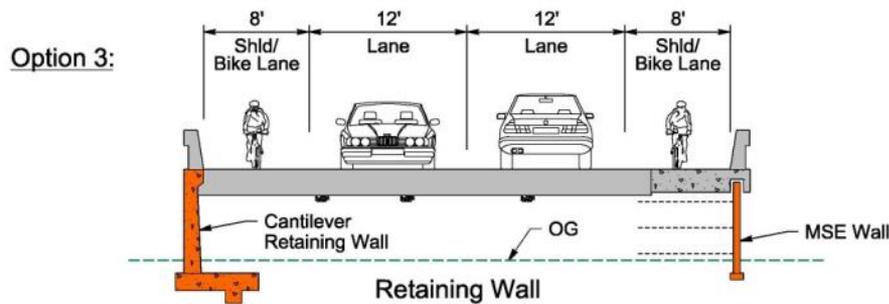
- Reconnect Wilkins Gulch Creek to *upstream end* of former surface of alluvial fan & allow the stream to:
 - Develop new or reoccupy relict channel(s) to the lagoon
 - Using plug-and-pond technique (habitat and cost)
- Highway 1 elevated on a single-span causeway over Wilkins Gulch and Salt creeks
- Fairfax Bolinas Road elevated on causeway and fill

Alternatives Summary Table

| Alternative | Floodplain Connectivity | | Roadway Raising | | | Reconfigure Wye | Vegetated Shoreline Resilience | Lewis Gulch Creek |
|-------------|-------------------------|----------------|--------------------|--------------------|------------------|-----------------|--------------------------------|-------------------|
| | Wilkins Gulch Cr | Lewis Gulch Cr | Highway 1 Causeway | Fairfax-Bolinas Rd | Olema Bolinas Rd | | | Culvert Upgrade |
| 1 | Lower | ✓ | Double | Fill | Fill/Bridge | ✓ | ✓ | ✓ |
| 2 | Partial | ✓ | Double | Fill | Fill/Bridge | ✓ | ✓ | ✓ |
| 3 | Partial | ✓ | Single Long-span | Causeway | Fill/Bridge | ✓ | ✓ | ✓ |

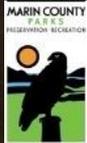


Culverts and fill



Culverts under roadway and through wall

Typical Sections for Hwy 1 or Olema-Bolinas Rd

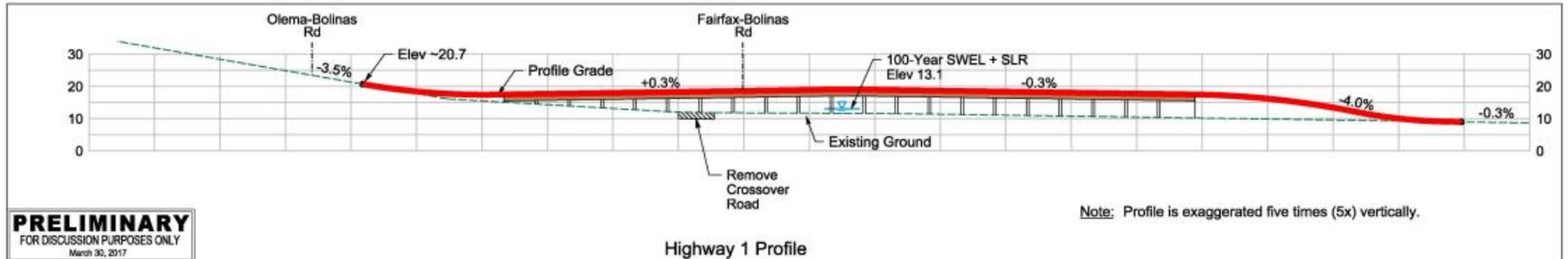


**Bolinas Lagoon
North End Restoration Project**

Reconfigured Wye Intersection



Highway 1



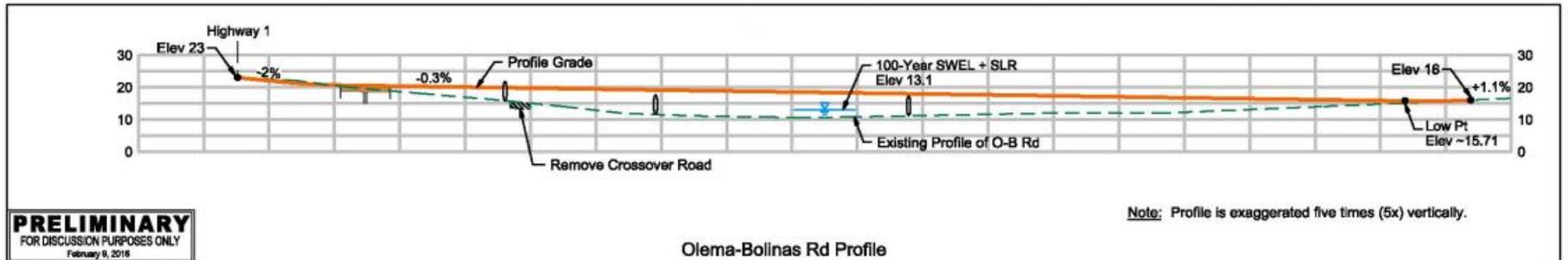
Bolinas Lagoon North End Restoration Project



Highway 1 Plan and Profile Conceptual Design



Olema-Bolinas Road



PRELIMINARY
FOR DISCUSSION PURPOSES ONLY
February 9, 2016

Note: Profile is exaggerated five times (5x) vertically.



Bolinas Lagoon North End Restoration Project



Olema-Bolinas Road Conceptual Design Alternatives

Vegetated Shoreline Protection

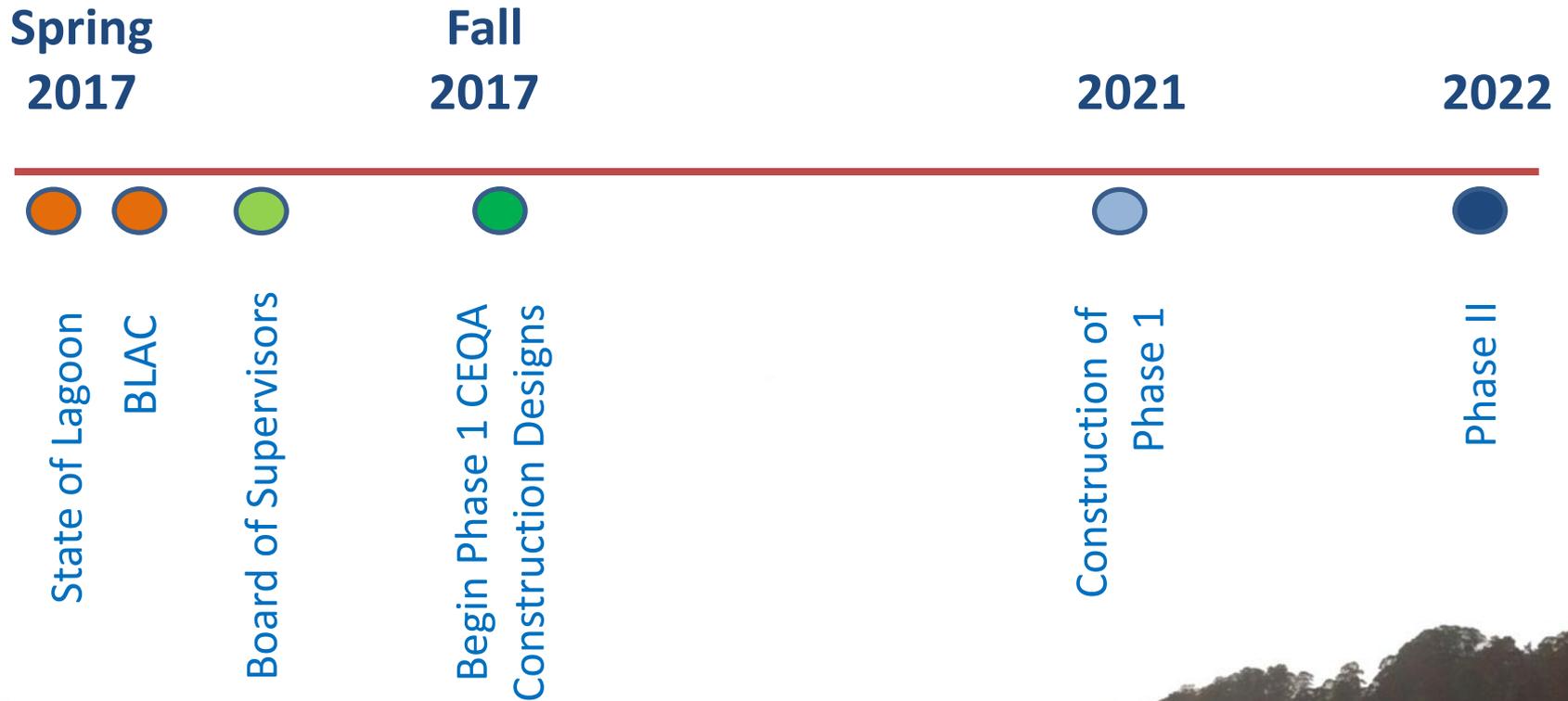
- Ecologically-based approach
- Reduces reliance on hard-engineered approaches
- Wave attenuation and wave runup height reduction during extreme high winter tides and onshore winds



In Summary

- Alternatives developed by technical experts
- Input & review by BLAC, public, and partner agencies
 - GFNMS, PRNS, GGNRA, County DPW, Caltrans
- Initial phases of long-term project underway
 - Safety components in Phase 1
- The project is:
 - Good for people and wildlife;
 - Aims to safeguard the community;
 - Aims to adapt landscape/habitat to SLR; and
 - An excellent example of local community action

The North End Project 2017 and Beyond



Next Steps

- Please Fill out comment cards
- Questions or comments? Contact:
 - Veronica Pearson, Project Manager, Marin County Parks
415-473-5086
 - vpearson@marincounty.org
 - Website: <http://www.marincountyparks.org/depts/pk/our-work/os-main-projects/north-end-project>
- Our team of experts is in the back to answer your questions
- Several more opportunities to discuss this project as we go to the BLAC, Board of Supervisors, and begin CEQA
- Final Opportunities and Constraints Report



Discussion / Q & A



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Project Manager, Marin County Parks
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