

Overview of Fill Types for Habitat Restoration Projects in SF Bay



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Control

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Presentation to the San
Francisco Bay Conservation
and Development Commission

Summary of Talk

- Why fill matters?
- Quick survey of projects and types of fill seeking BCDC approval in coming years
- Summary of known unknowns

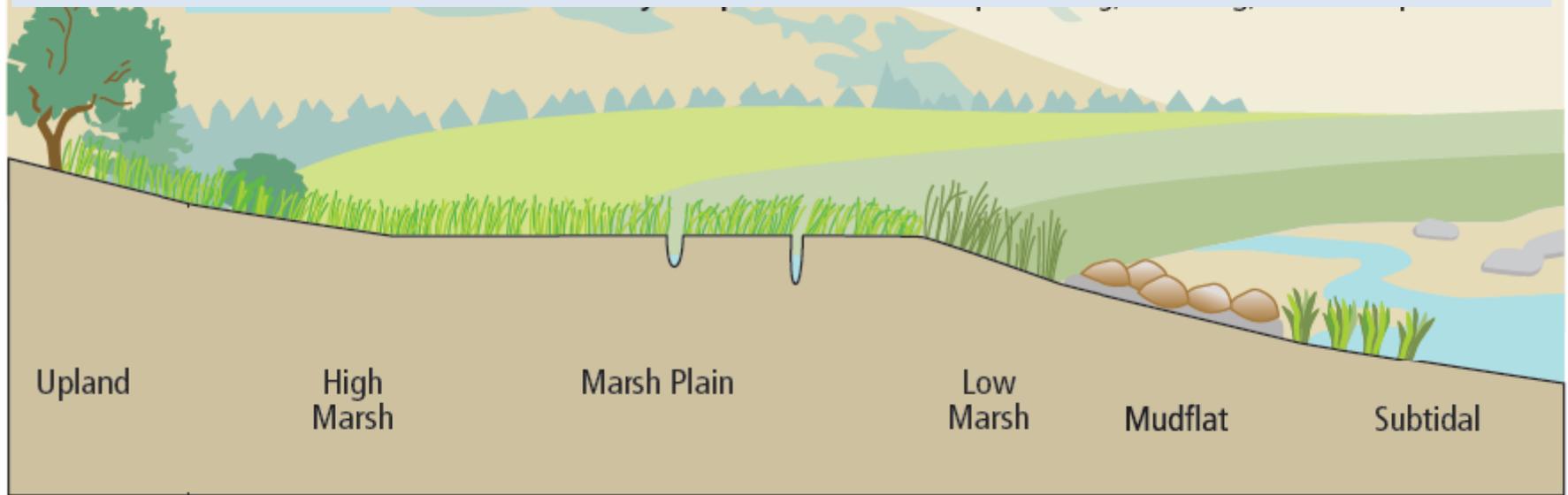


Why Fill Types Matter

- Fill usually represents the largest impact and most costly part of any restoration project
- Moving fill around is large cost and highest potential impacts to the environment
- Fill may be in short supply and thus a finite resource and needed for SLR



Suite of Habitat Types



Upland

High
Marsh

Marsh Plain

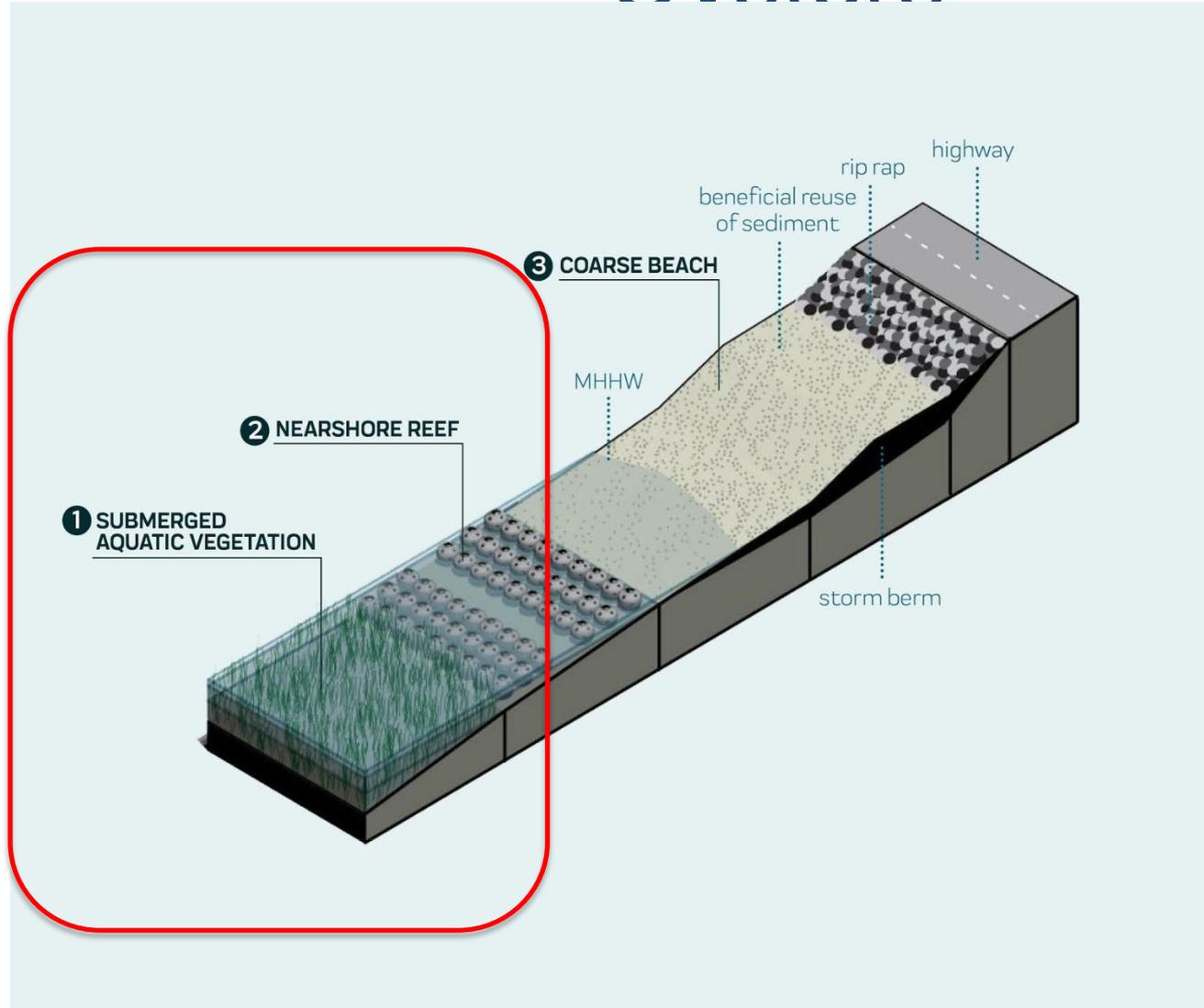
Low
Marsh

Mudflat

Subtidal



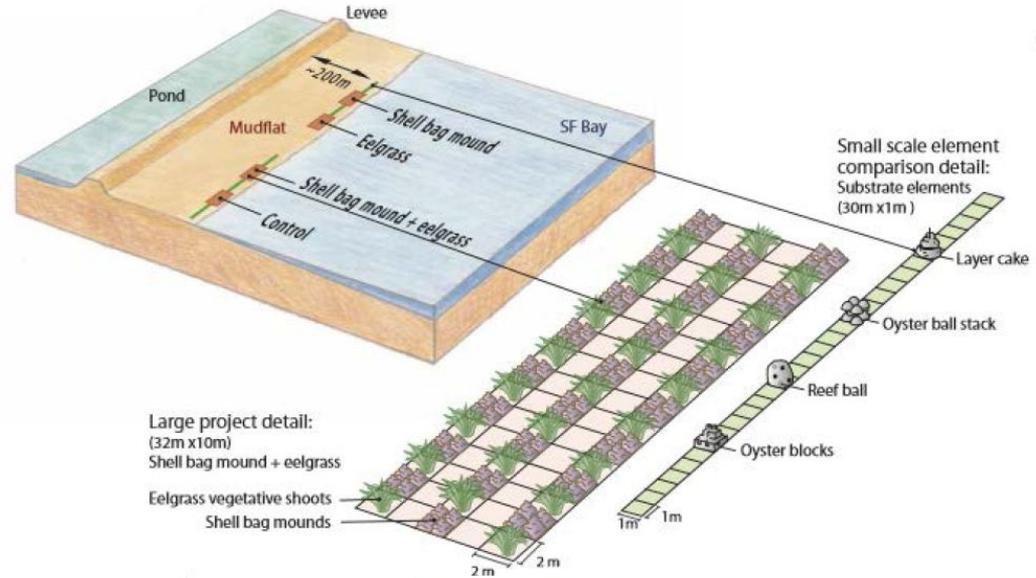
Fill for Sub-Tidal Reefs and Oysters



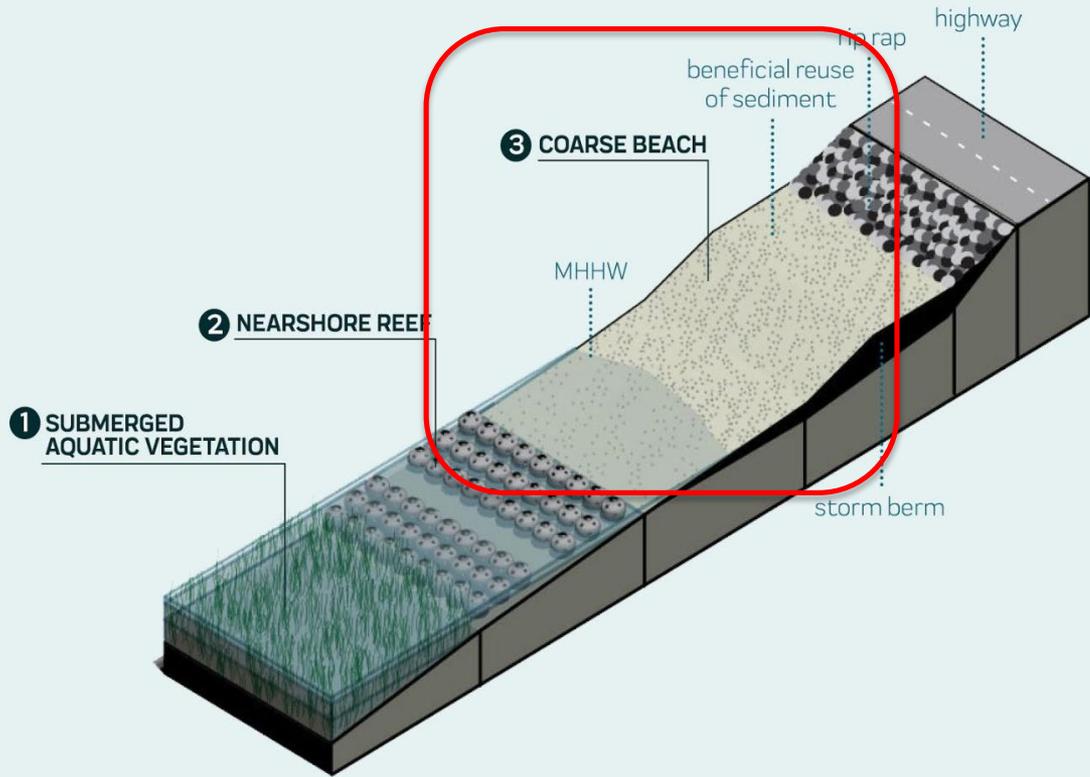
- Shotcrete concrete blocks specialty designed for oysters with metal wire netting
- Reefs electric and otherwise
- Eelgrass and any plant anchors

Living Shoreline Nearshore Linkages

Create oyster reefs & eelgrass habitats that also protect shoreline



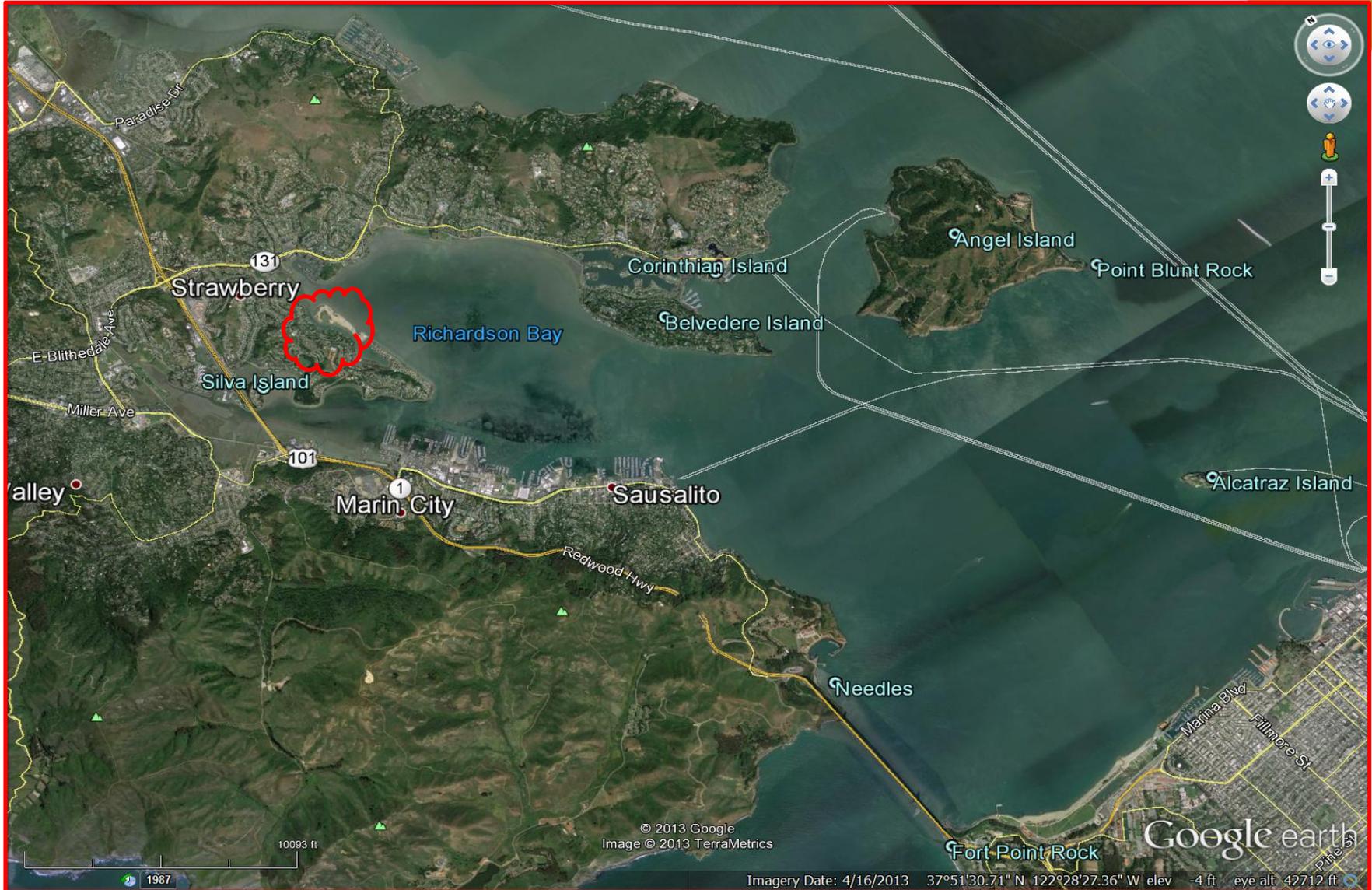
Fill for Bay Beaches



Mixed grain size depending on wave climate

- Sandy foreshore
- Mixed gravel/cobble beach and berm
- Oyster shell
- Wood or rock for groins to hold sediment
- Woody debris for shoreline complexity

Example - Aramburu Island Beach Demonstration Project – Built 2011/2012



Shoreline Design

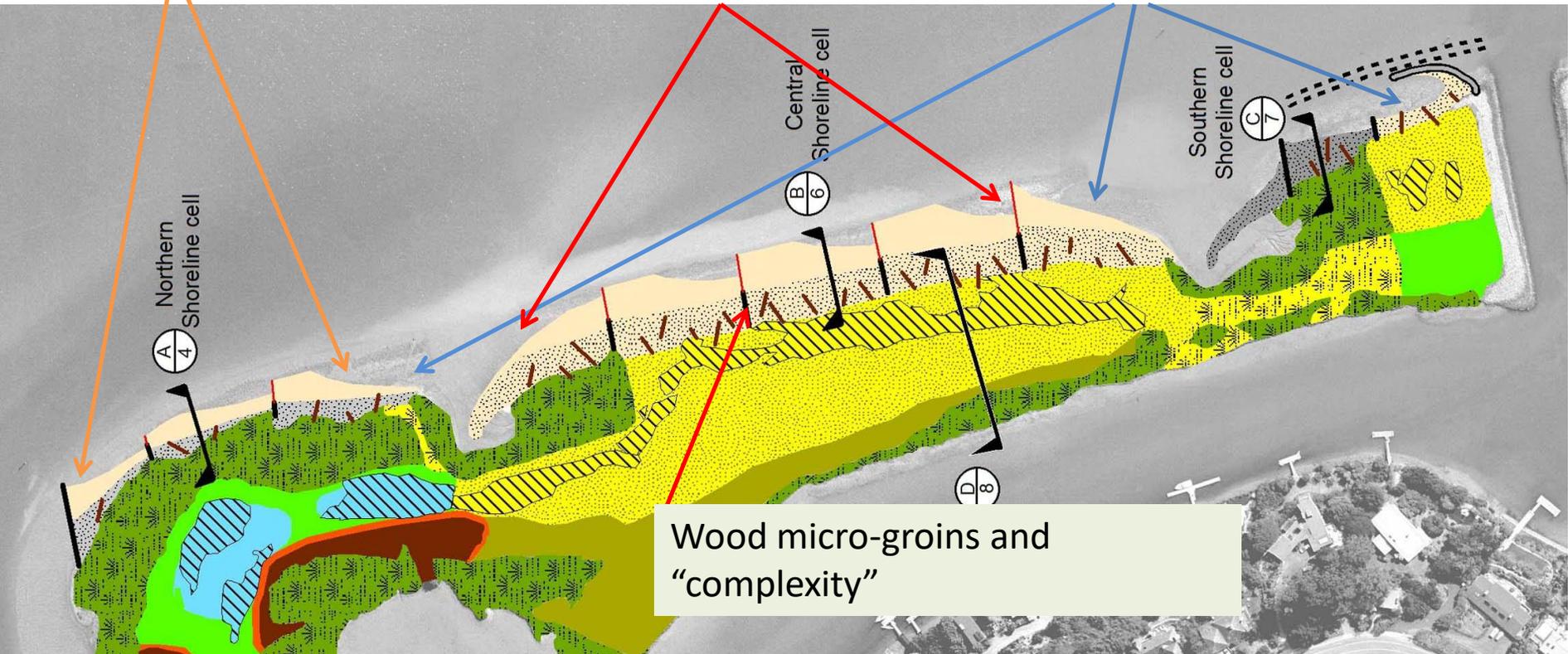
Lowest wave energy

Highest wave energy

Oyster shell at north end

Mixed gravels and oyster shell – central cell

Coarser sediments at south facing slopes





Initial coarse sand beach profile and initial placement of oyster shell hash





Sandy Foreshore Construction 2012

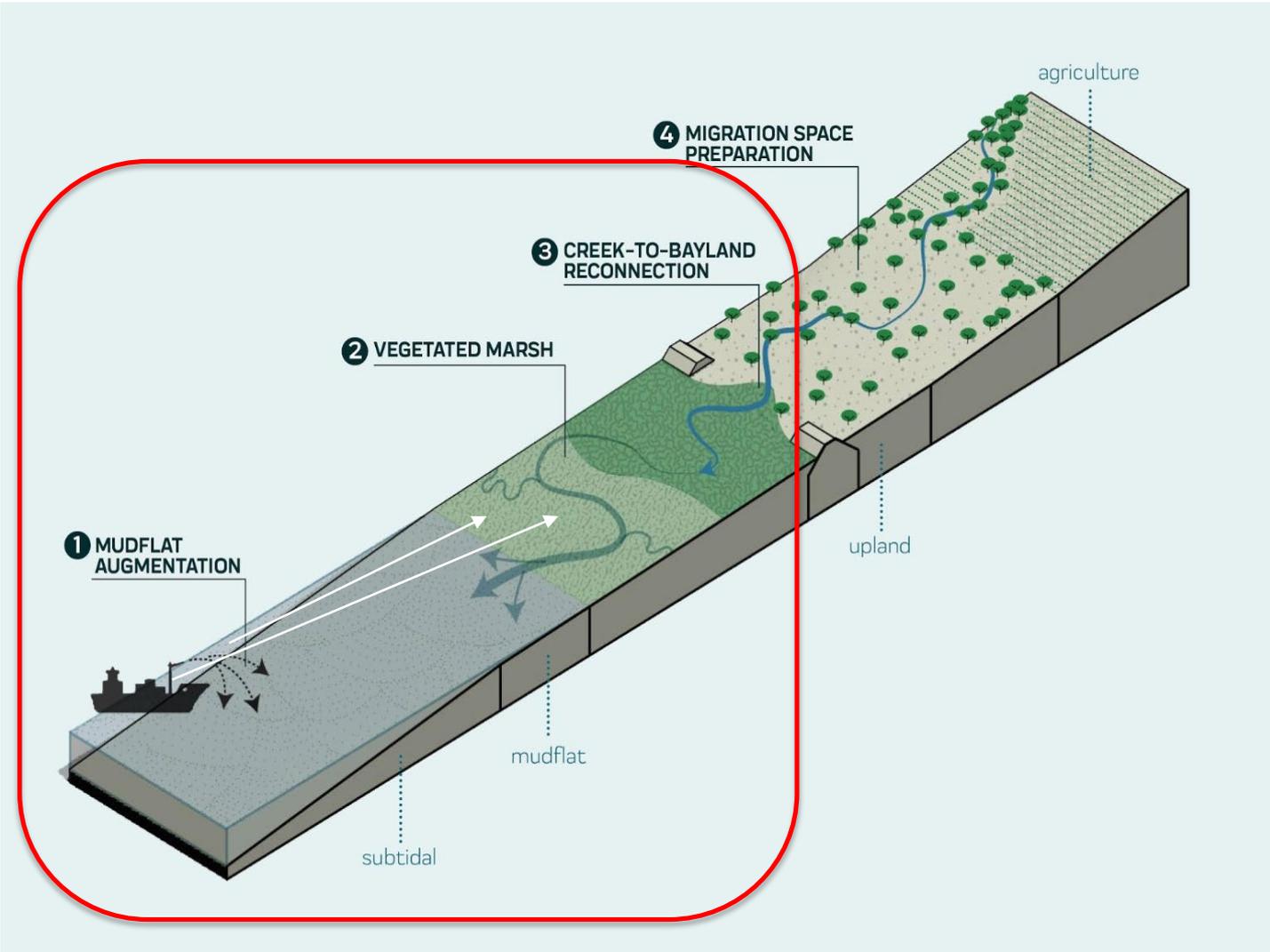


Monitoring Photos 2012-2013



Dec 5, 2012 post-construction
Sept, 2013 post significant southern
storms

Fill for Marsh Augmentation



Sacrificial islands

Thin-lift dredge placement

Habitat islands and mounds

Wave fetch berms

Flood Protection levees for utilities and property

Thin-Lift Dredge Placement



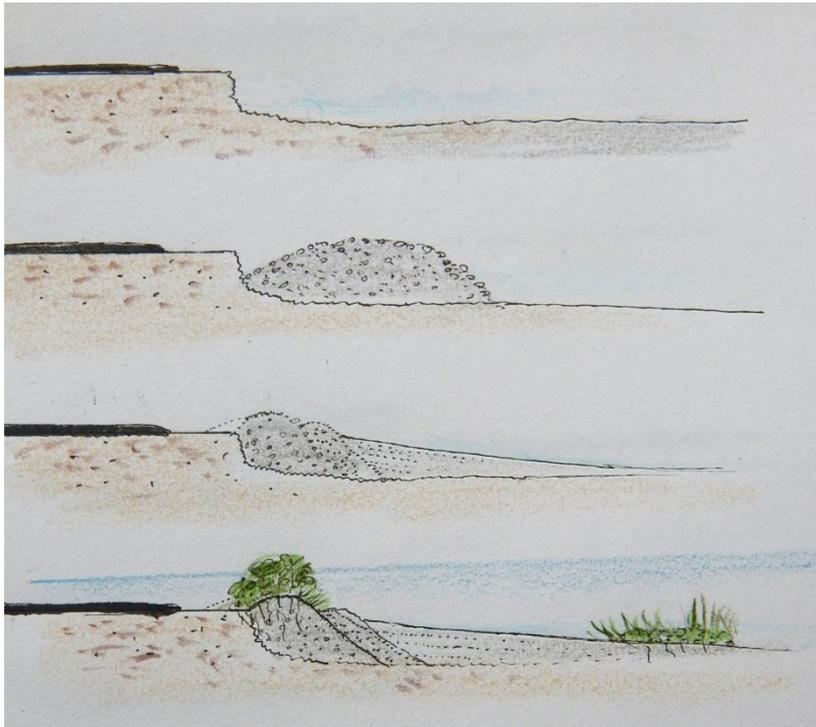
spray being turned on, spoon method 18-in test plot



Marin Pilot Project Proposal

Thin-lift from Coyote Creek Flood
Control dredge into Bothin Marsh

Coarse grained gravel berm to
protect eroding marsh edge



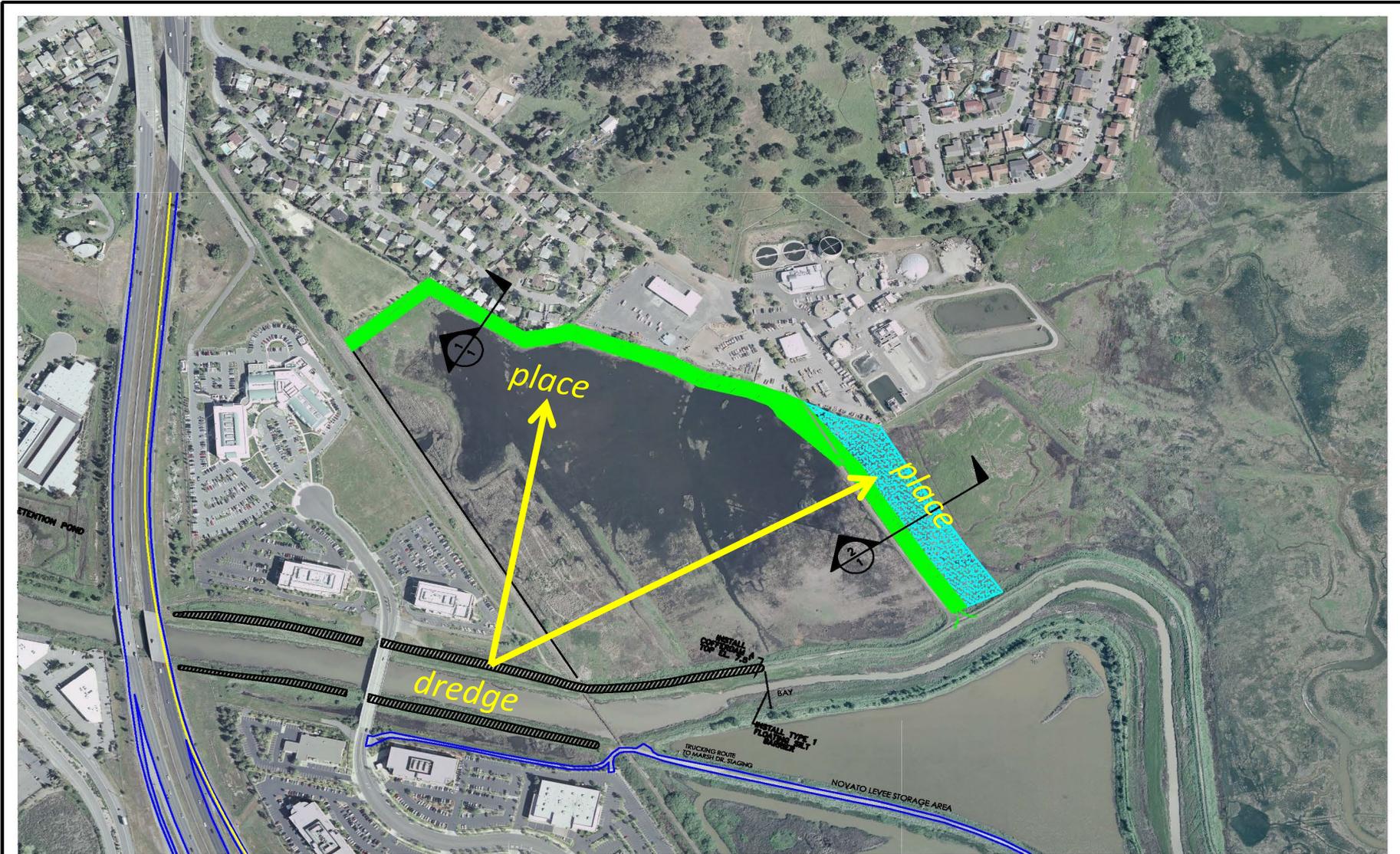
Coyote Creek to Bothin Marsh Dredge Sediment Beneficial Reuse Feasibility Study

January 30, 2017

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Coastal Ecologist

Novato Creek Dredge Sediment Reuse



COUNTY OF MARIN DEPARTMENT OF PUBLIC WORKS 3501 CIVIC CENTER DRIVE, SAN RAFAEL, CA 94913	SCALE 0 500' 1000'		NOVATO CREEK SEDIMENT REMOVAL 2016 SPOIL DISPOSAL PLAN	COUNTY PROJECT NO. 2016-01	FLOOD CONTROL PROJECT NO. Z1653
	DATE 1/8/16	DRAWN J.C.D.		CHECKED D.N.	

Sediment placement at Novato Creek

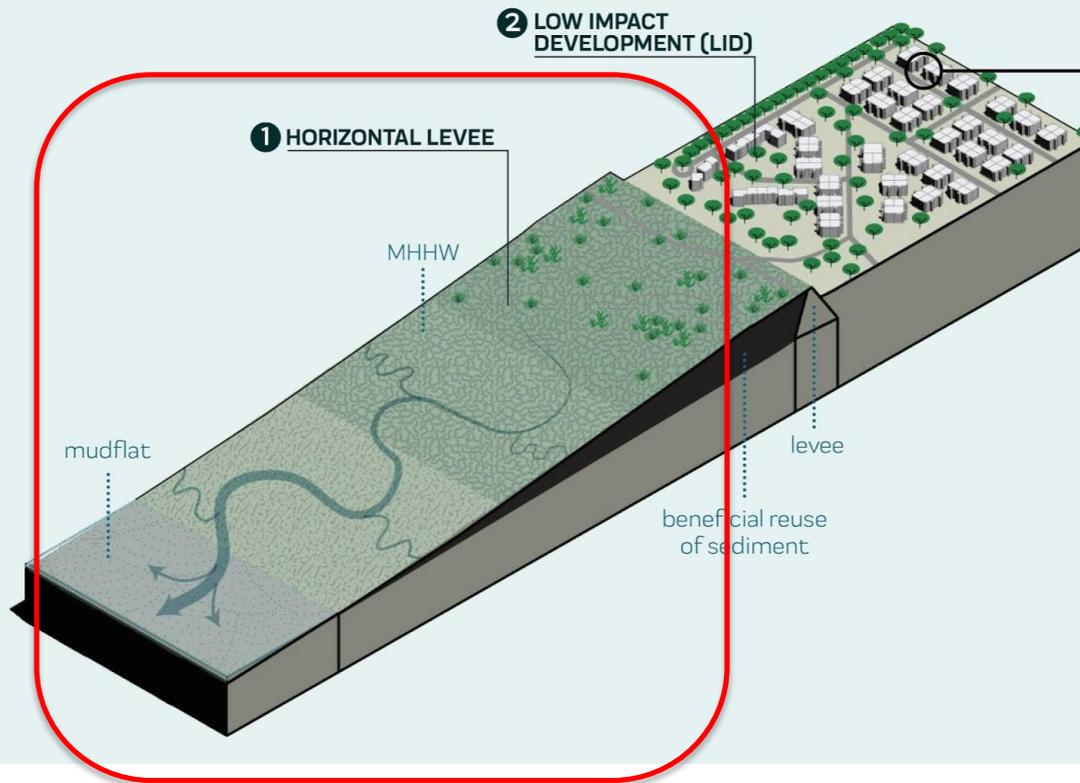


Bay Fill for Marshes

- Large deep fill volumes
- Middle Harbor only Bay approved project
- Major Impact



Horizontal Levees and T-Zone



Engineered fill for levee core (Geotech approved)

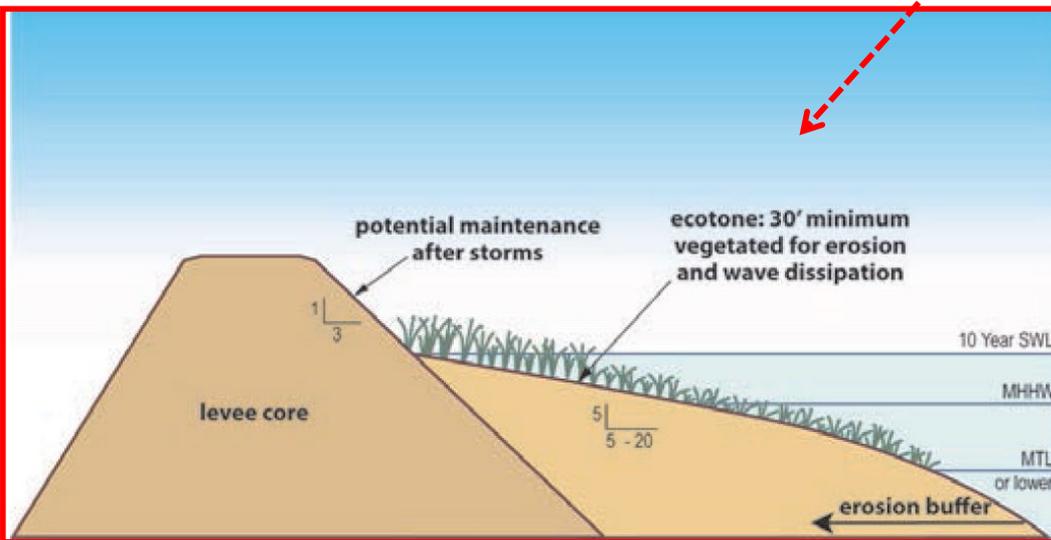
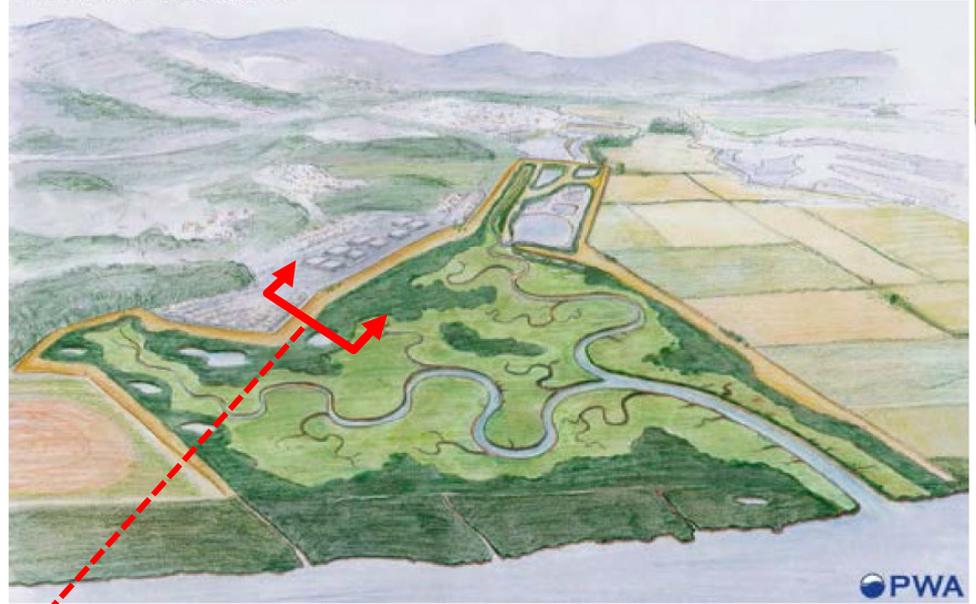
Non-engineered fill for ecotone slopes (10: to 40:1) typical

If treating wastewater then need gravel layers

Large fill footprint

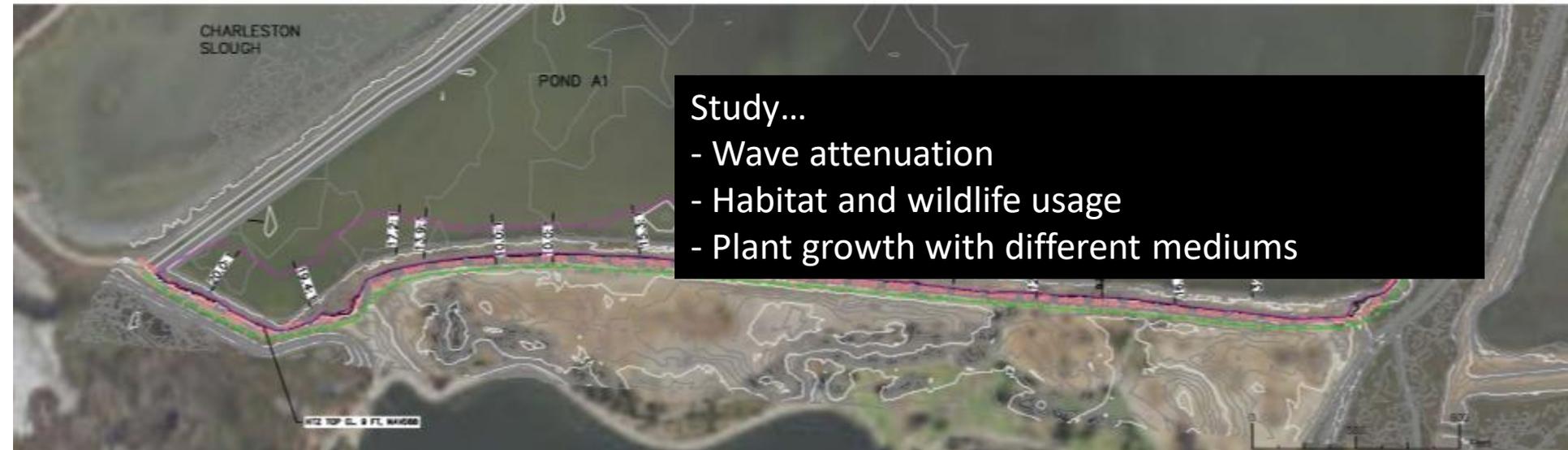
Hamilton Wetland Restoration

Wave-damping bench providing habitat & erosion protection for levee



South Bay Salt Ponds Ecotone Levee Slope Experiment (nronosed)

SKETCH OF MOUNTAIN VIEW POND A1 HTZ WITH VARYING SLOPES
(10H:1V, 12H:1V, 20H:1V, 30H:1V, 40H:1V, AND TRANSITIONS)

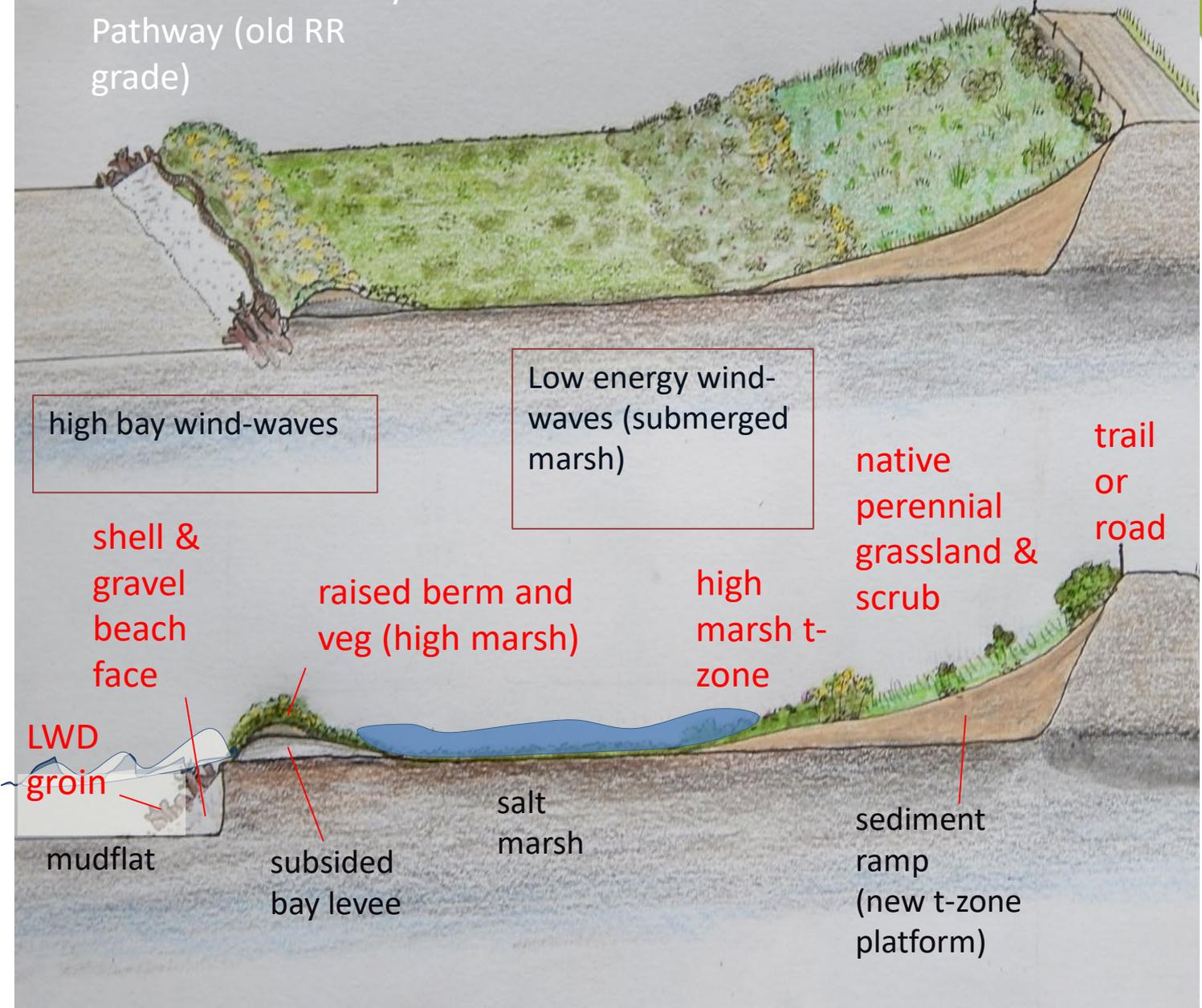


Study...

- Wave attenuation
- Habitat and wildlife usage
- Plant growth with different mediums

Marin modified horizontal levee

Sausalito-Mill Valley
Pathway (old RR
grade)



high bay wind-waves

Low energy wind-waves (submerged marsh)

shell & gravel beach face

raised berm and veg (high marsh)

high marsh t-zone

native perennial grassland & scrub
trail or road

LWD groin

mudflat

subsided bay levee

salt marsh

sediment ramp (new t-zone platform)



Known Unknowns



- Eco-tone levee slopes that balance wind-wave erosion benefits with enormous costs to move sediment (*Salt Ponds, Novato*)
- Approaches to placed dredge sediments to nourish mudflats without impacting the environment (*offshore-SFEI/Corps, thin lift-Marin Novato/McInnis*)
- Limits of beaches for erosion control (*Marin DPW Aramburu, ESA Surfers Point*)



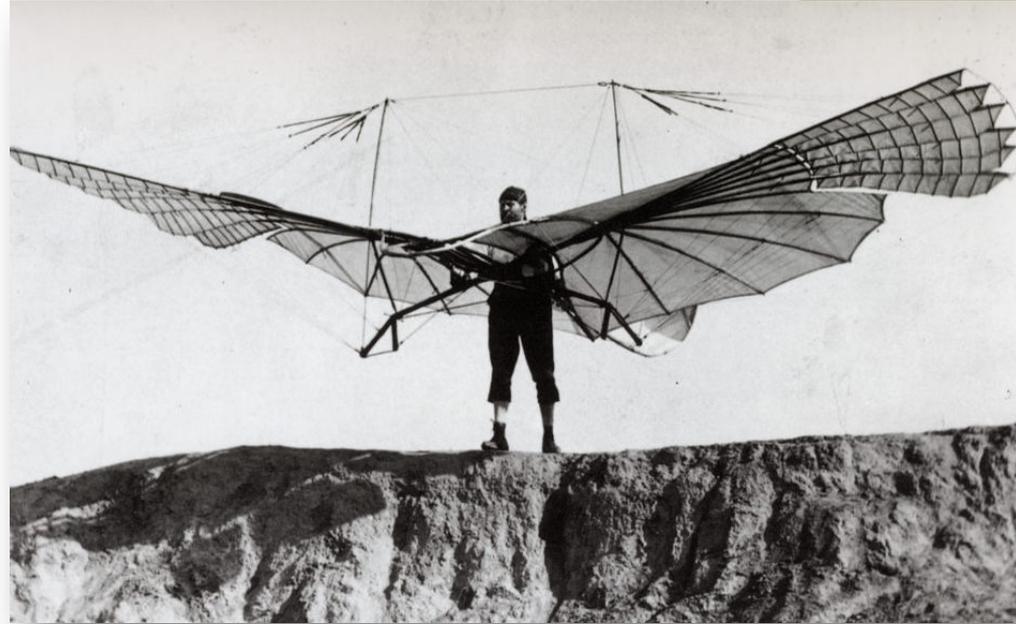
Known Unknowns #2



- Cost-effectiveness of constructed T-zone wetlands systems for habitat, wastewater treatment and wind-wave erosion protection (*ESA H. levee pilot, Oro Loma*)
- How to break up wind-wave energy in deep fill dredge disposal projects (*ESA, Baye, Leventhal, BCDC wind-wave workshop*)
- How to engage the community in the difficult trade-offs involved in SLR adaptation (*Marin Game of Floods*)

Why Pilot Things?

- Figure out what works where
- Hone our designs for cost-effectiveness
- Understand impacts and tradeoffs
- Leverage grant funding \$\$\$
- Build consensus and public support through working project examples



Marin has been a leader in pilot projects to-date