



West Trail Living Shoreline Project

Progress Update

**San Mateo County Harbor District
Board of Harbor Commissioners Meeting**

November 20, 2019



Stormwater Improvements

- Improve aesthetics and function
- Reduce maintenance needs

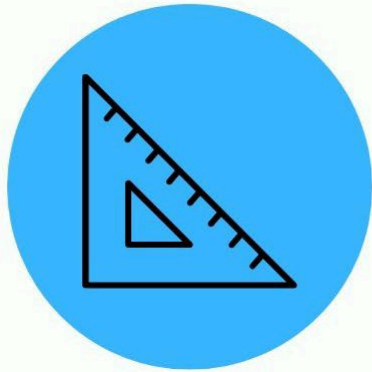


Shoreline Protection

- Protect trail from chronic erosion
- Use multi-benefit, nature-based techniques



Progress



**Data
Collection**

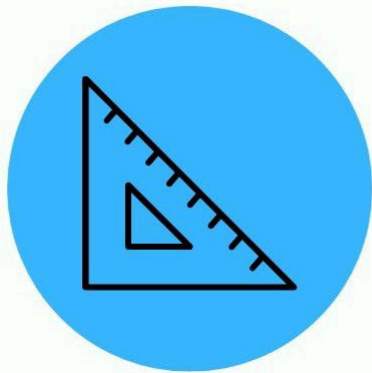
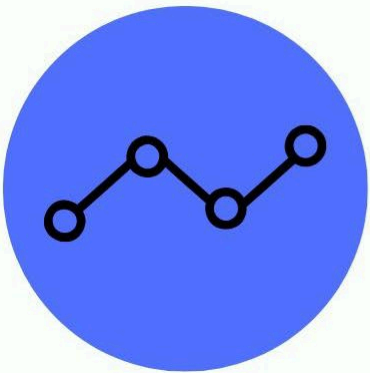
**Concept
Design**

Engineering

Permitting

Construction

Progress



**Data
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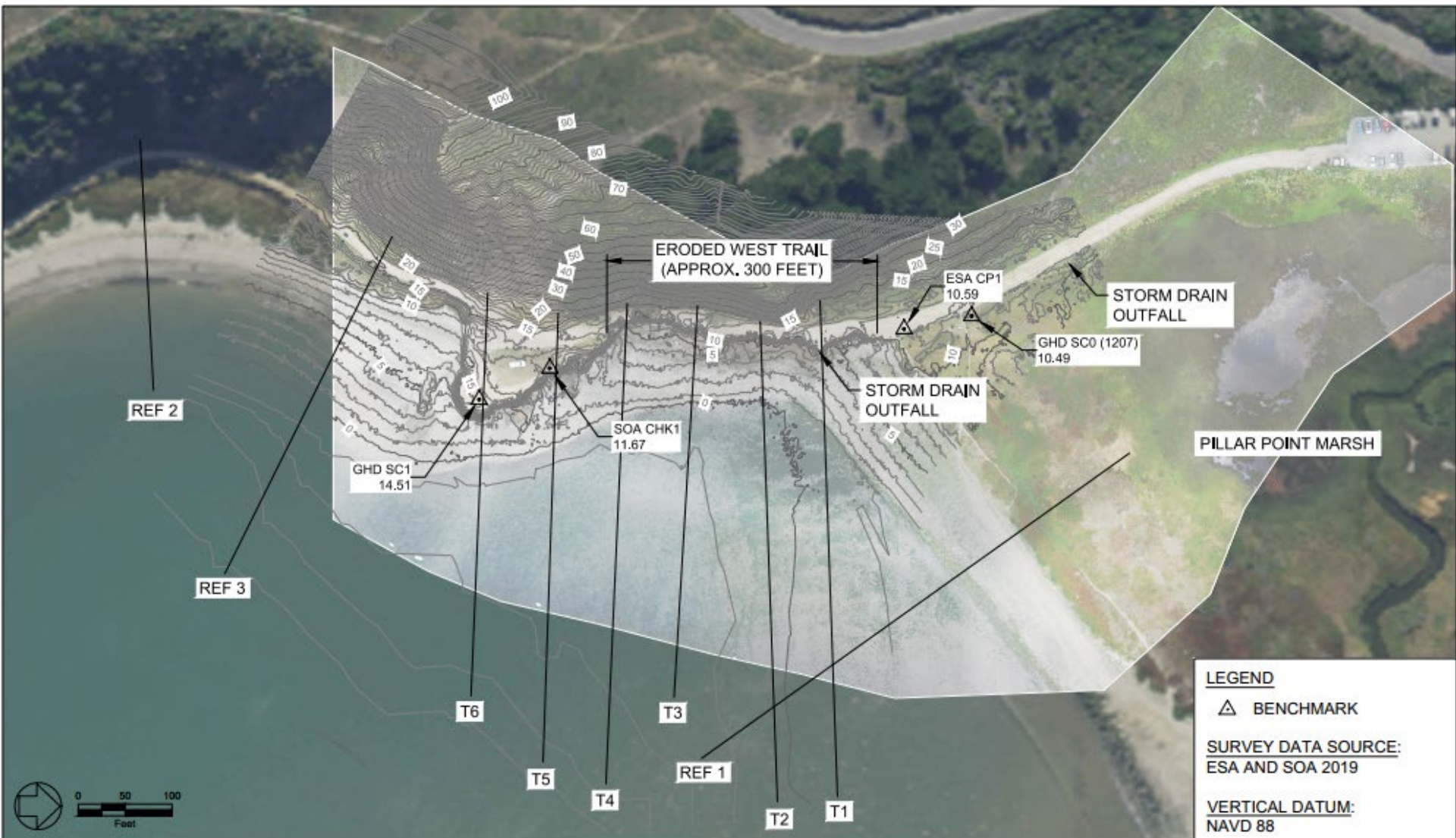
Topographic / Bathymetric Survey, Wave Data Collection,
Sediment Sampling, Biological Surveys



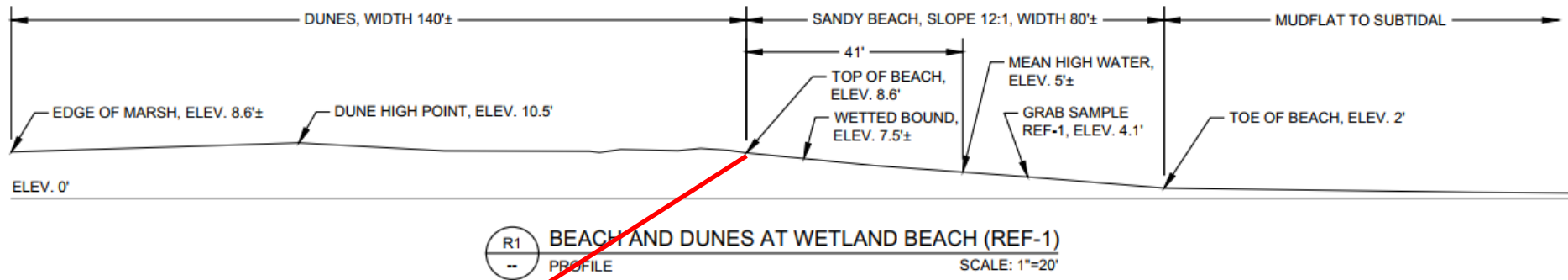
Topographic & Bathymetric Survey



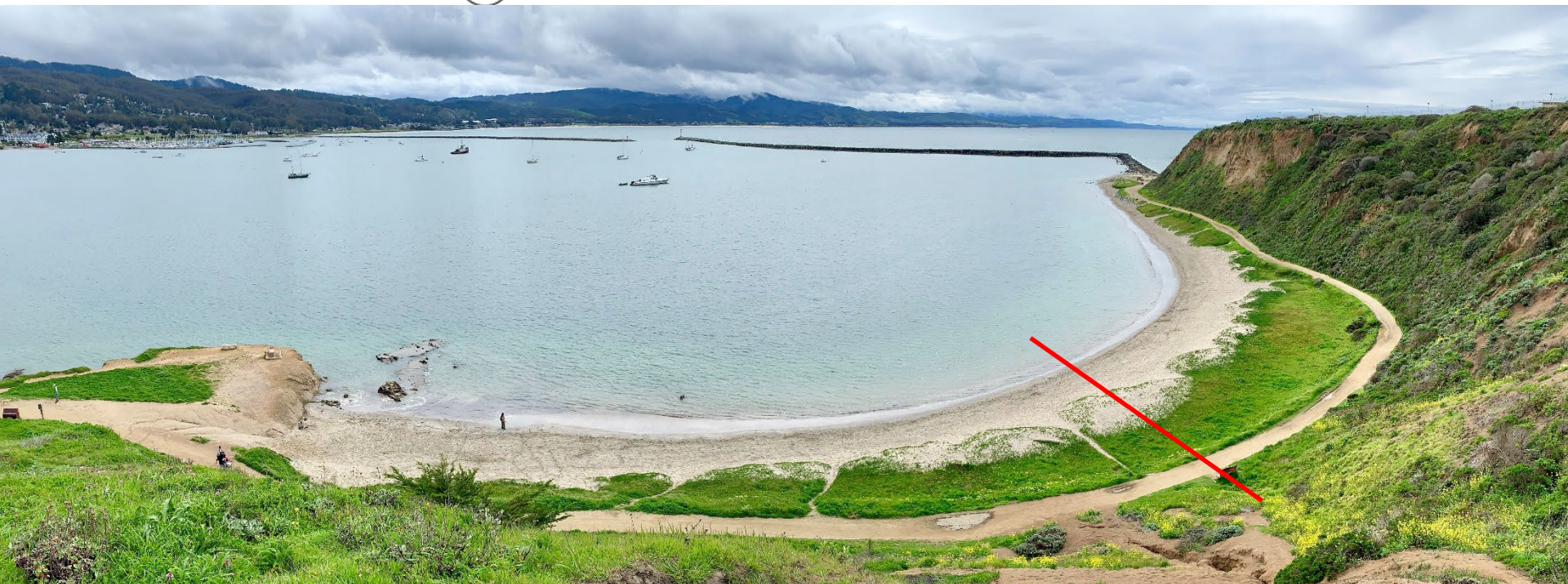
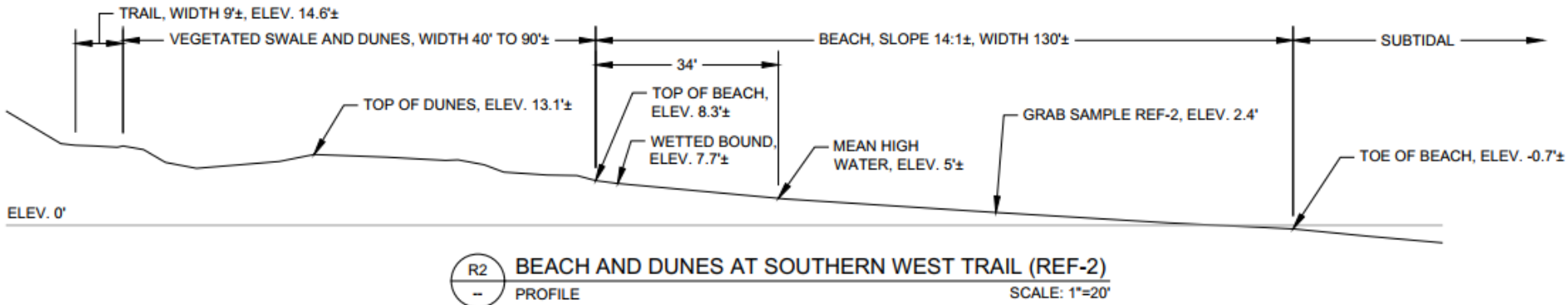
Topographic & Bathymetric Survey (Aerial Survey and Imagery by Sierra Overhead Analytics)



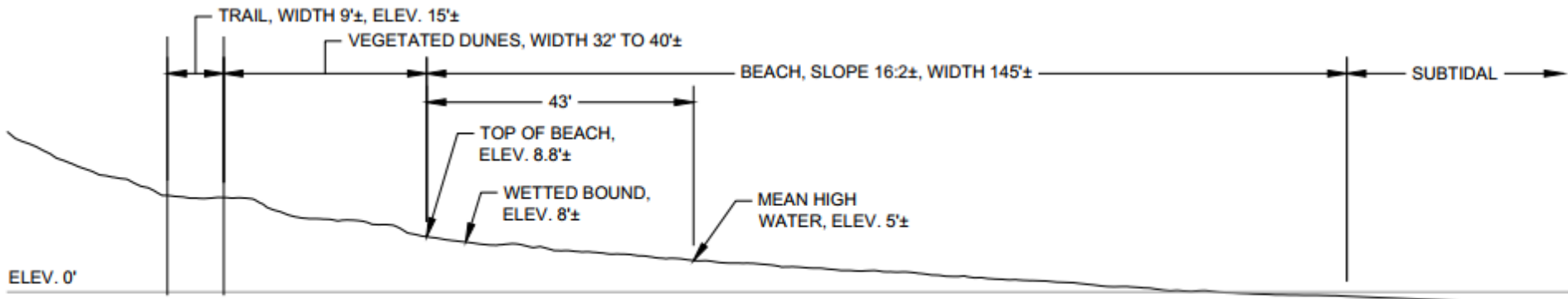
Reference Site Transect – Beach and Wetland to North



Reference Site Transect – Beach and Dunes to South (Wide Dune Condition)



Reference Site Transect – Beach and Dunes to South (Narrow Dune Condition)



BEACH AND DUNES AT SOUTHERN WEST TRAIL (REF-3)

REFERENCE PROFILE

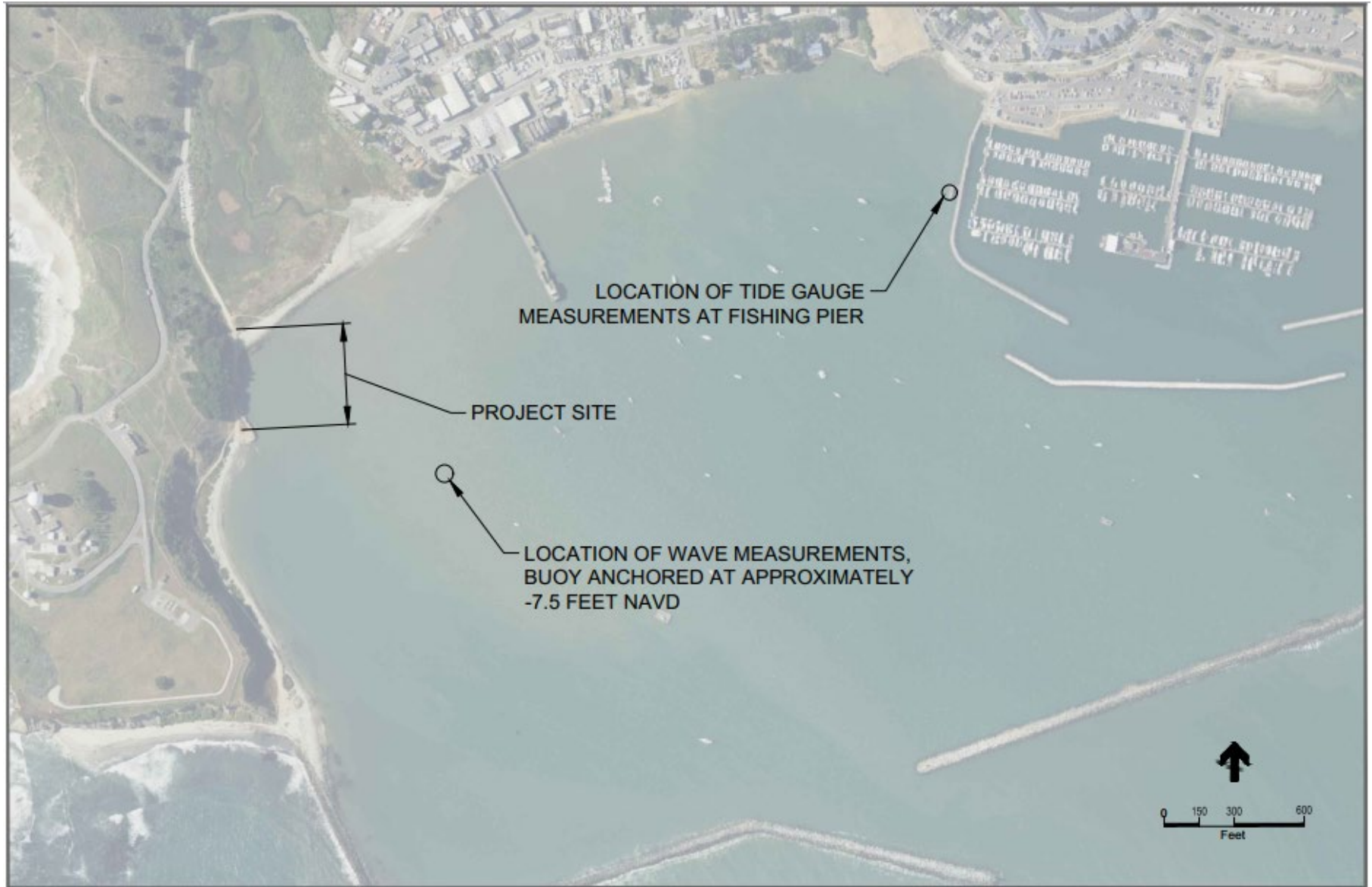
SCALE: 1"=20'



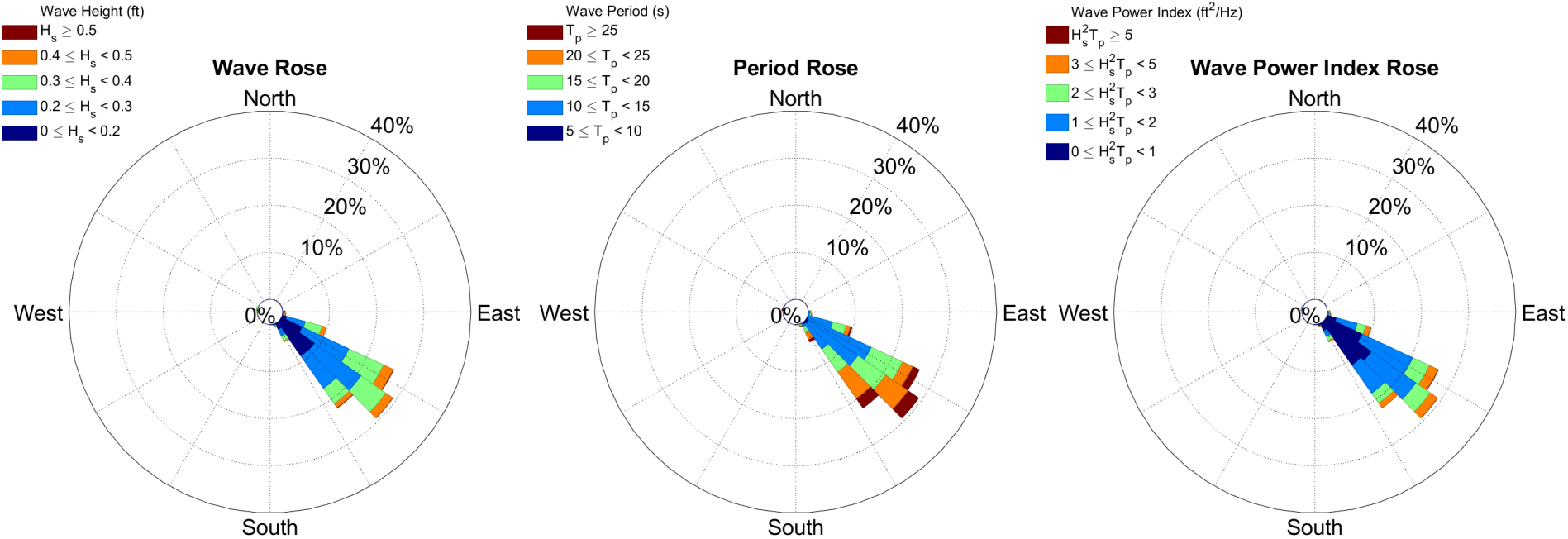
Wave & Water Level Data Collection



Wave Buoy & Water Level Gauge Locations

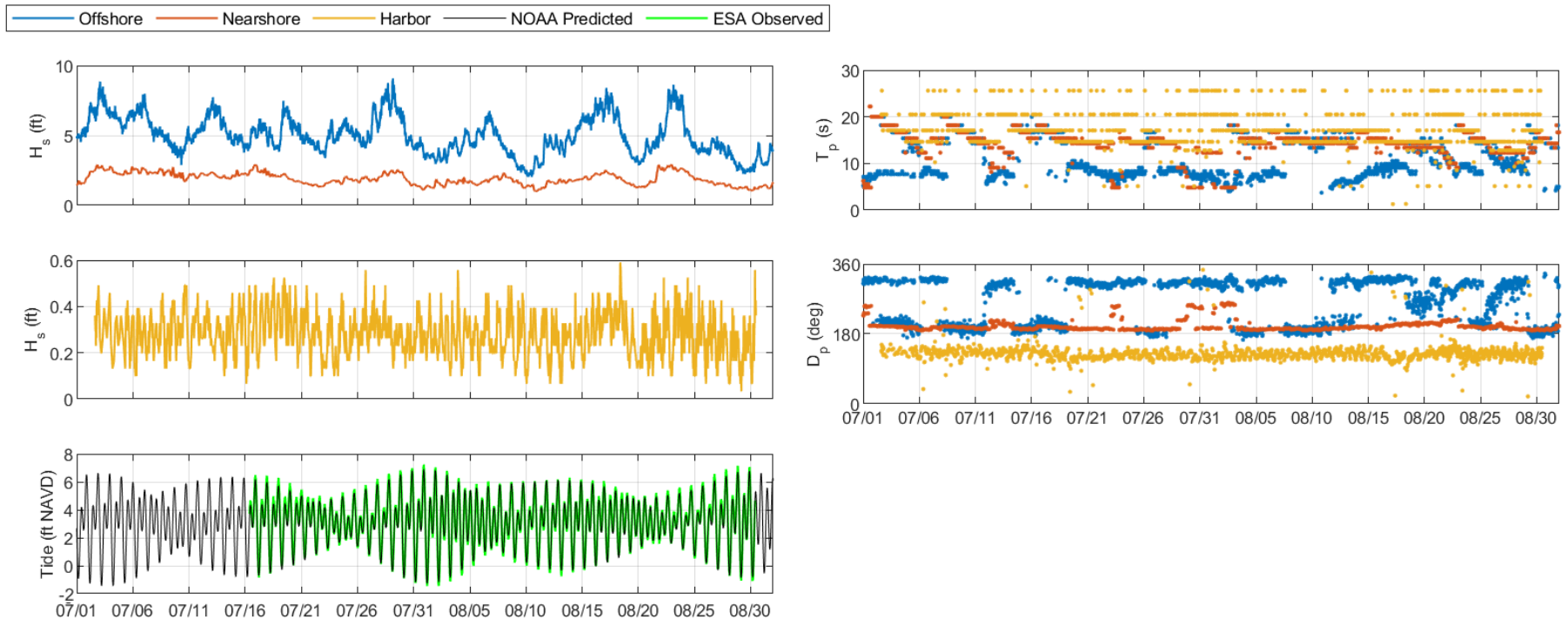


Preliminary Wave Findings



- Wave climate primarily calm, but intermittent periods of long period swell propagating through entrance / breakwater toward site.
- Long period waves on order of 0.5 feet at 17-20+ seconds
- Predominant angle consistent with wave diffraction through entrance

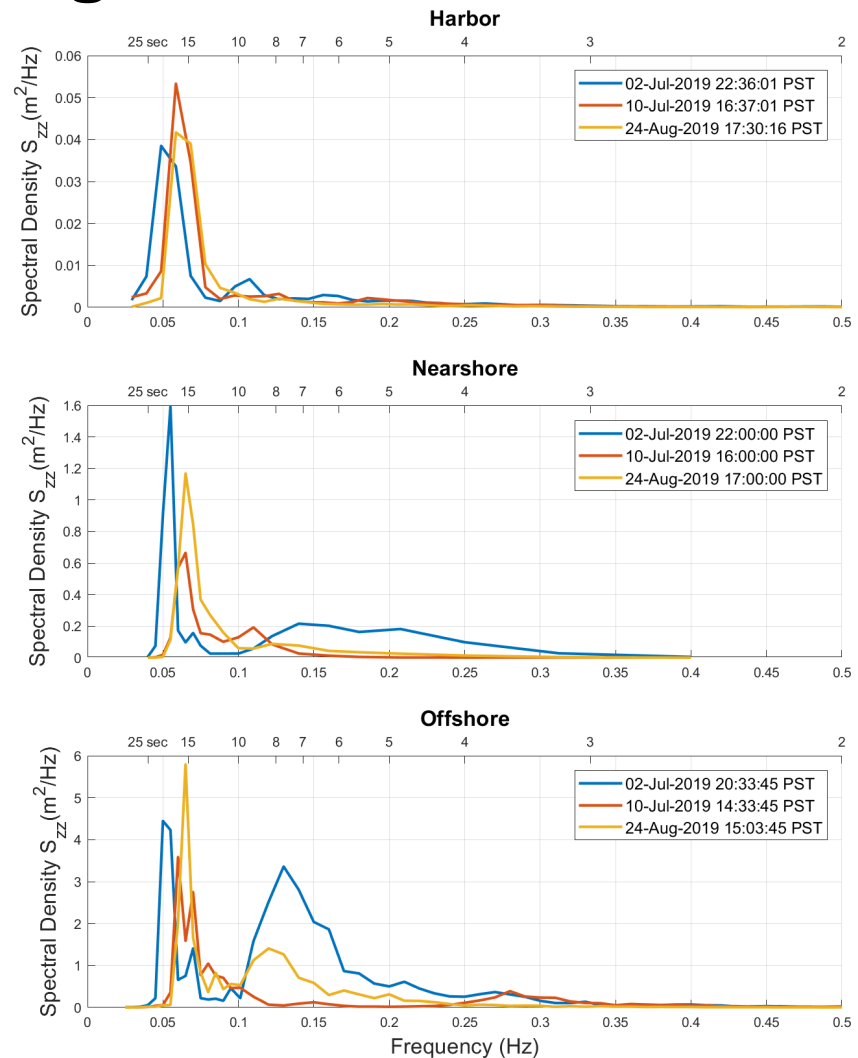
Preliminary Wave & Water Level Findings



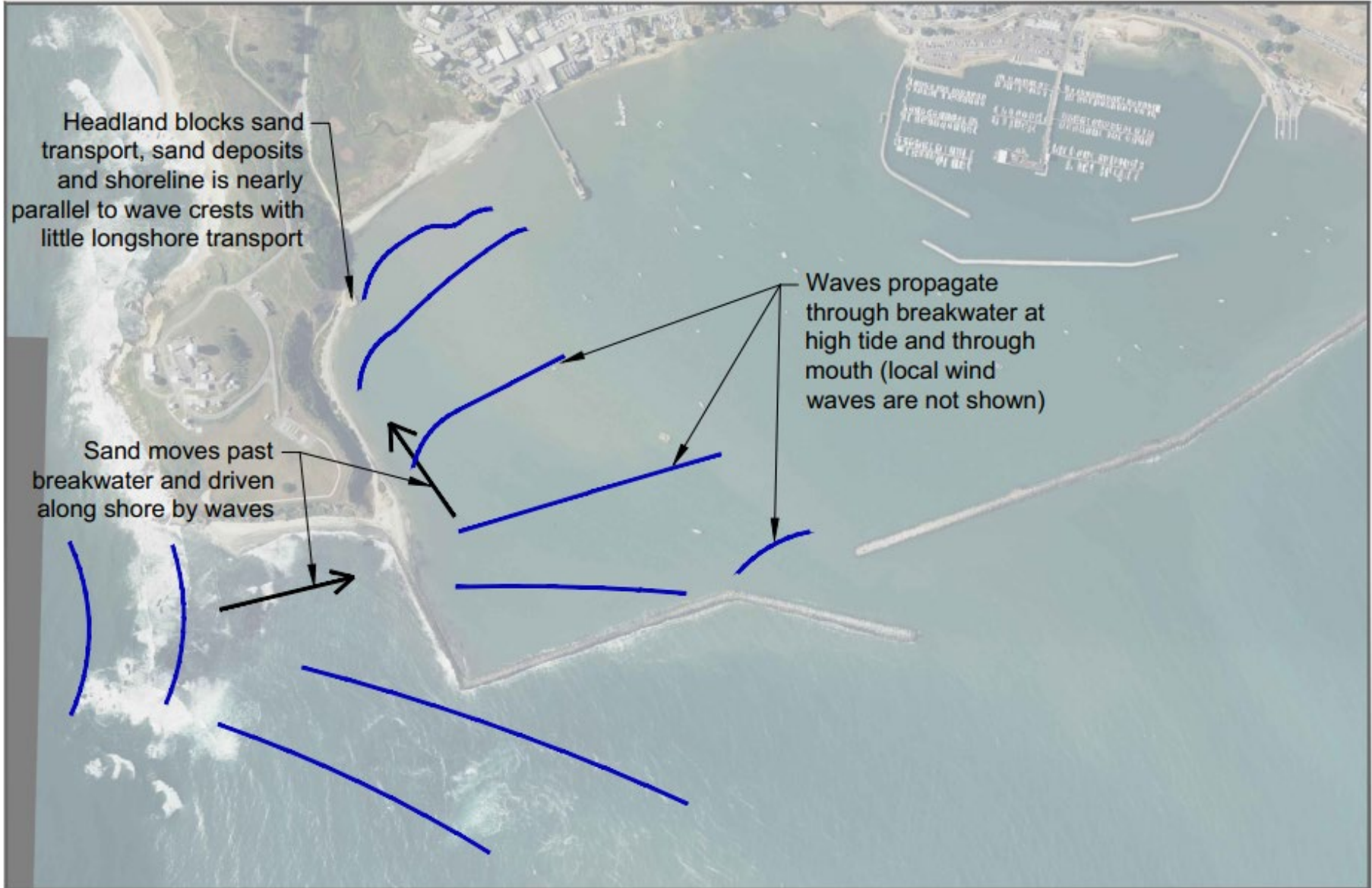
- Waves in harbor strongly influenced by tide: High tide transmission, low tide extreme damping
- Long-period energy in harbor consistent with offshore measurements
- Water levels: Measured tide range greater than predicted; high tides higher and low tides lower than predicted by NOAA

Preliminary Wave Findings

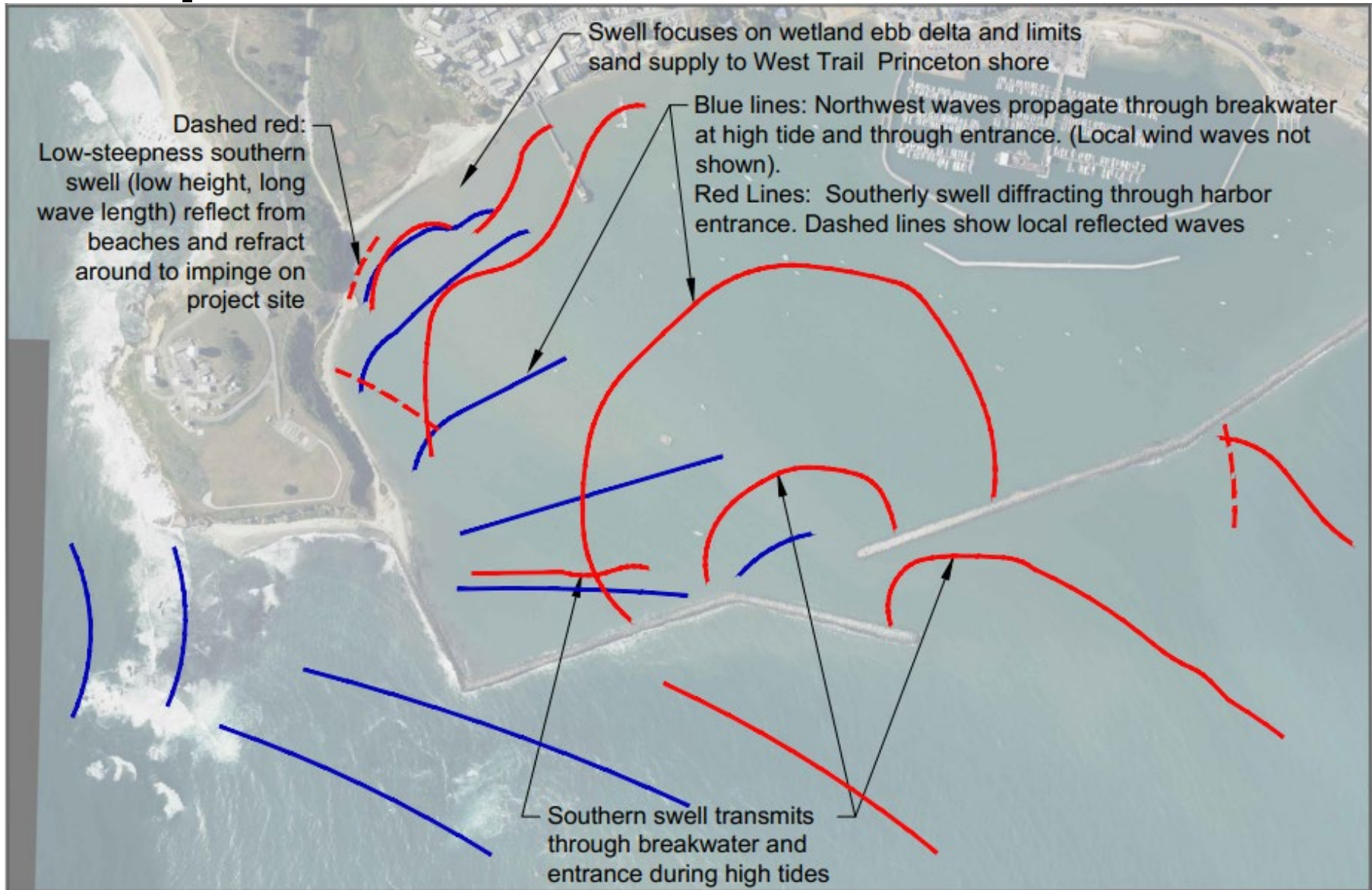
- Wave spectra of selected south swell events
- Long-period energy coherent from
 - Offshore at Monterey (bottom)
 - Nearshore, outside of harbor (middle)
 - Inside of harbor (top)
- Short period energy filtered out as comes toward shore



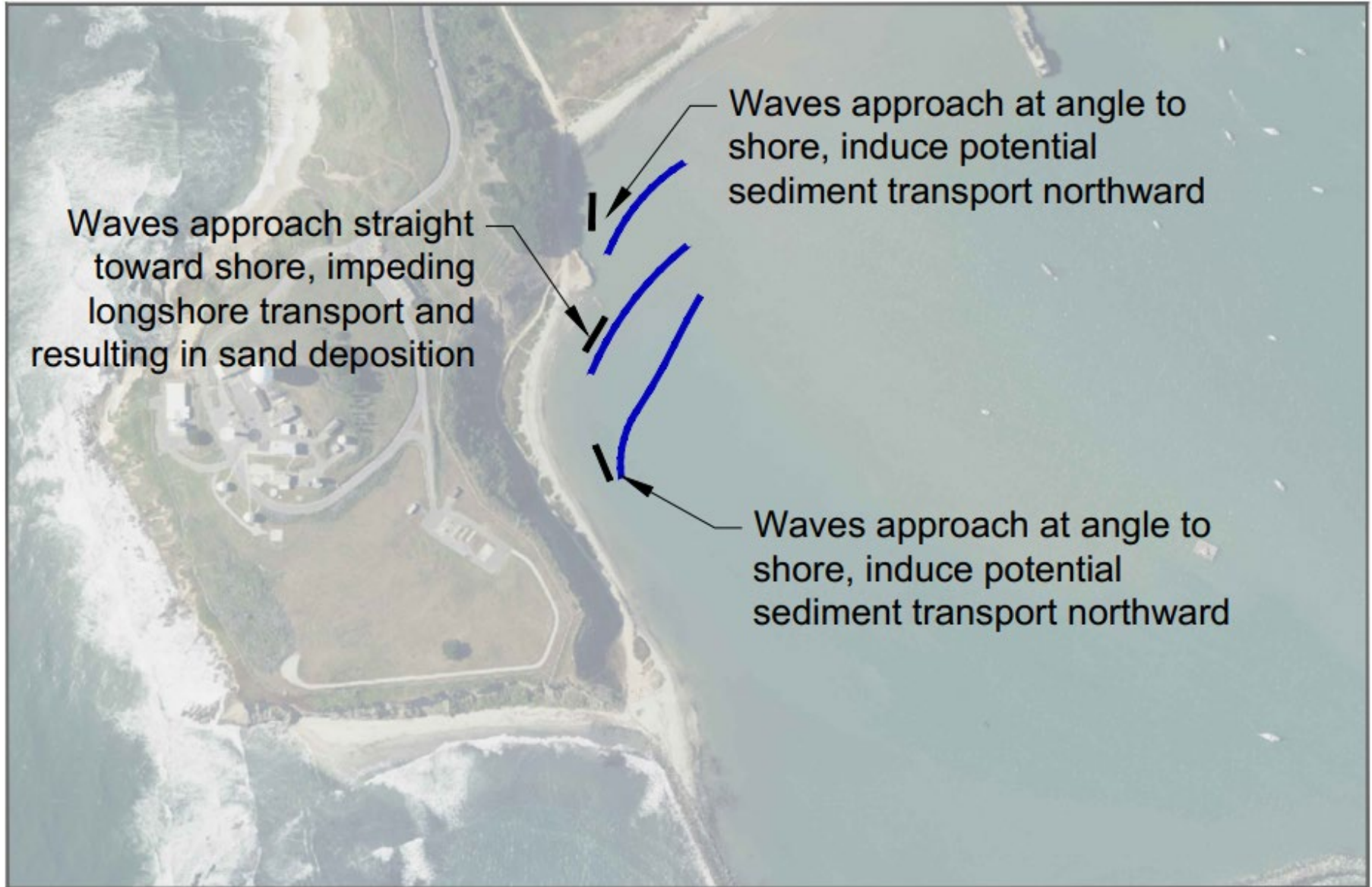
Wave and Sediment Transport Concept



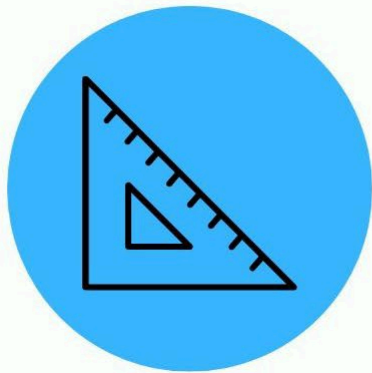
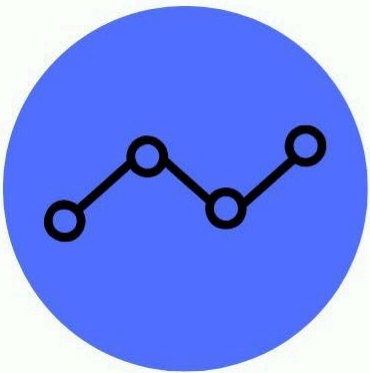
South Swell (Red) and North Swell (Blue) Conceptual Wave Patterns



Wave-Driven Sediment Transport Concept at Site



Progress



**Data
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Permitting

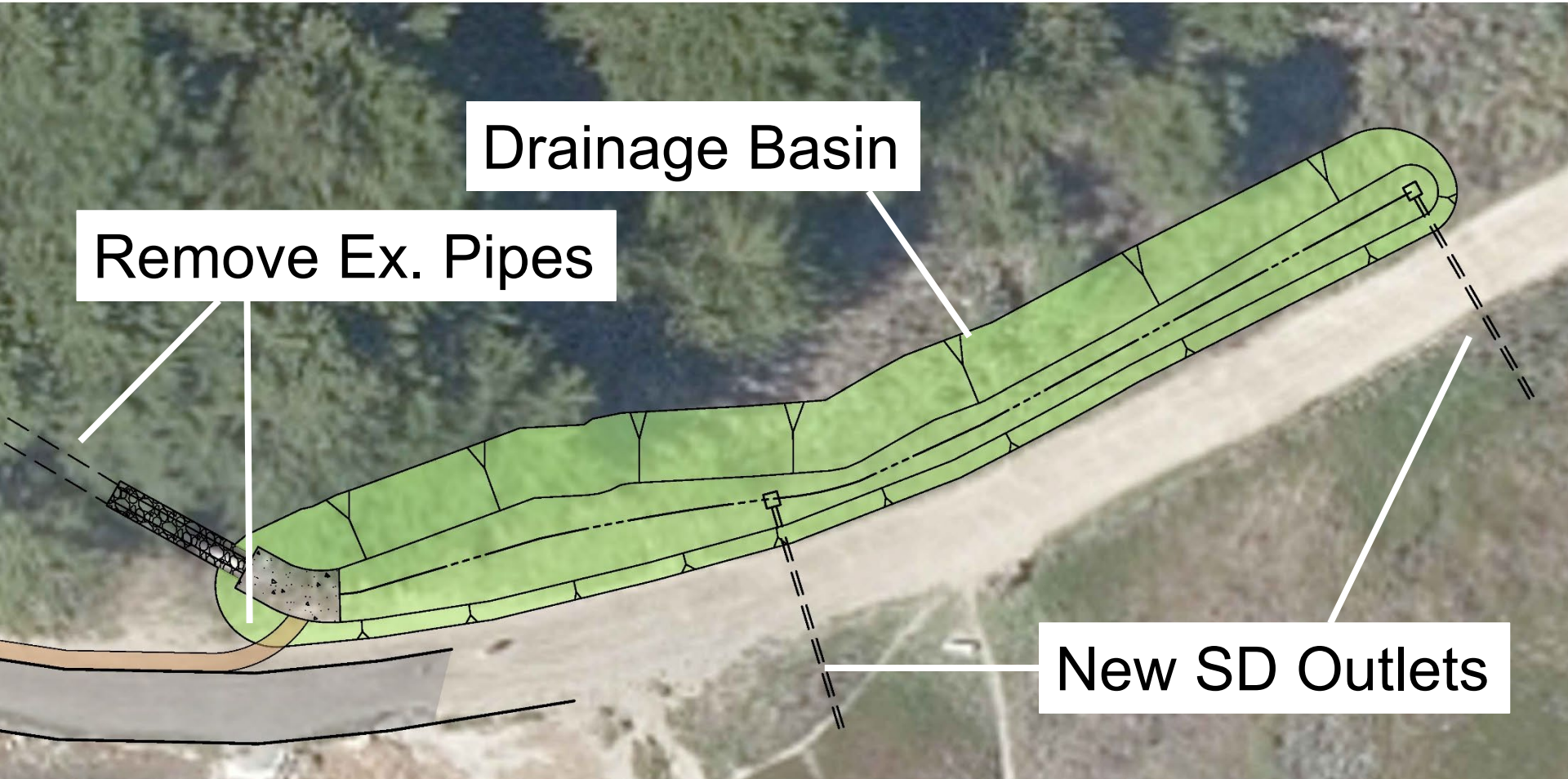
Construction

Stormwater Improvements
Living Shoreline & Trail

STORMWATER IMPROVEMENTS



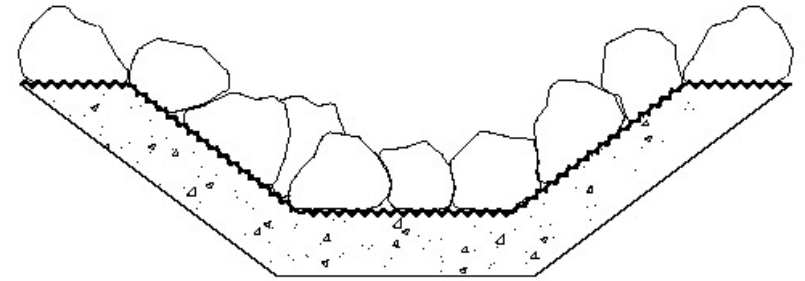




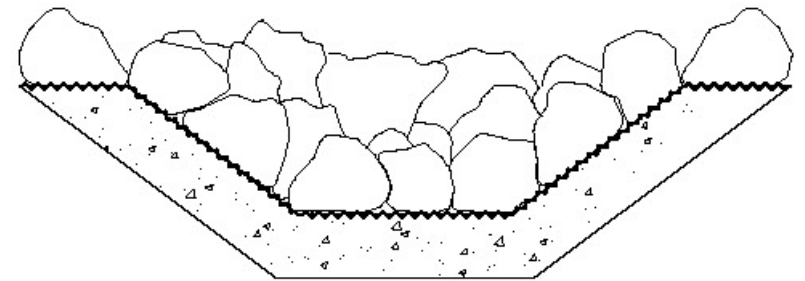
Drainage Basin

Remove Ex. Pipes

New SD Outlets



Rock-lined Channel



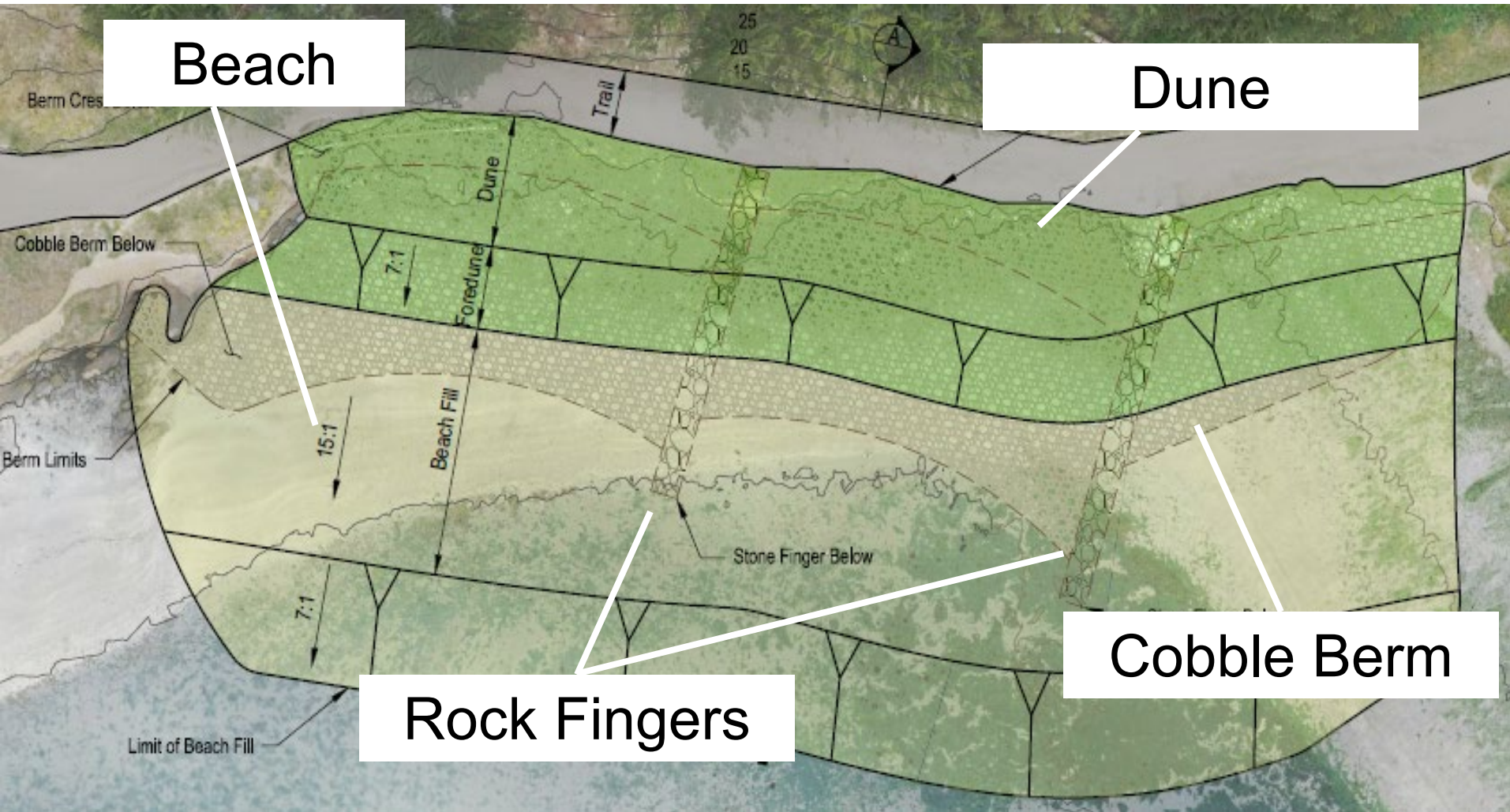
Check Dam

SHORELINE PROTECTION

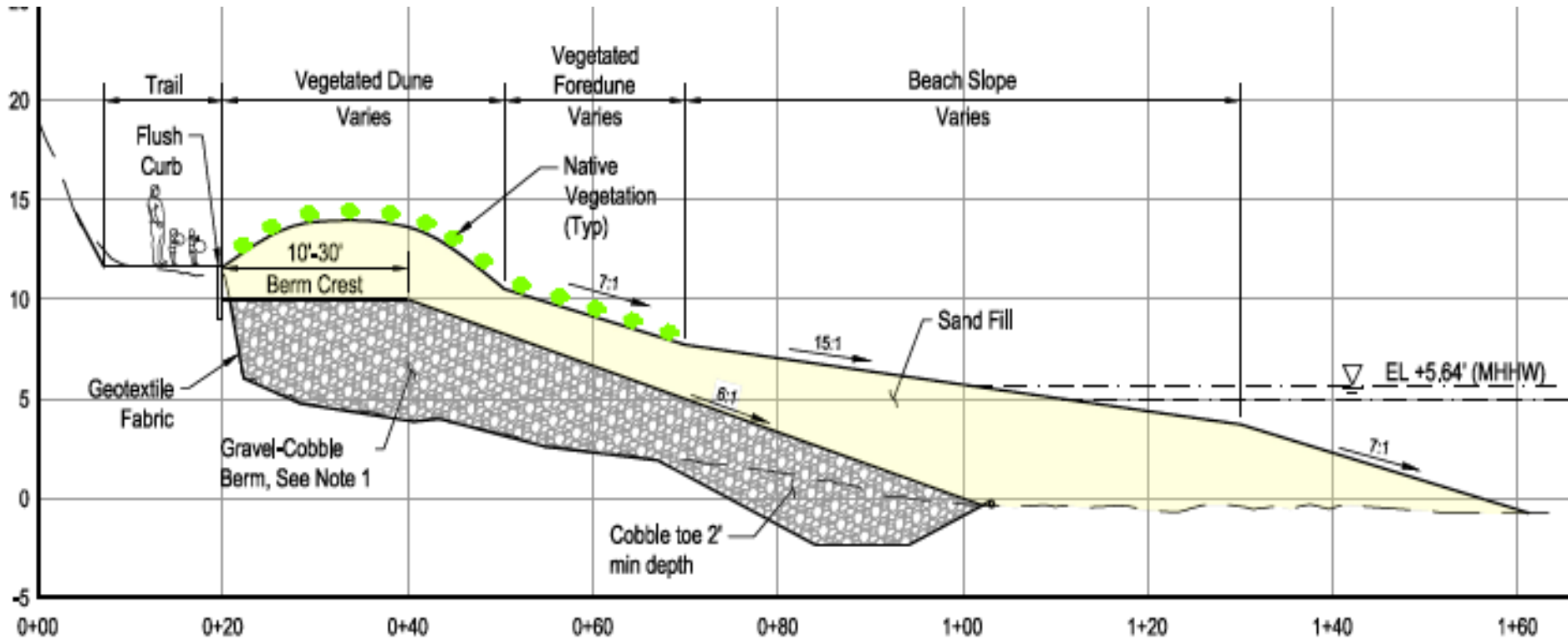




30% Design of Living Shoreline & Trail



30% Design of Living Shoreline & Trail



Mixed Sand / Cobble Beach

March 2016



November 2017



Surfer's Point, Ventura, CA

Permitting and Agency Consultation

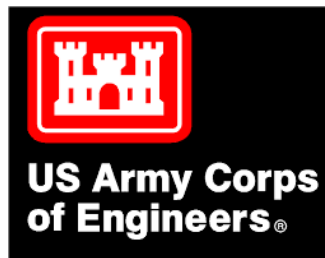


Permitting and Agency Consultation

Multiple Permits Required:

- *U.S. Army Corps of Engineers*—Individual Permit CWA Section 404; RHA Section 10.
- *Regional Water Quality Control Board*—Section 401 Water Quality Certification/Waste Discharge Requirement.
- *Coastal Commission/County*—Consolidated Coastal Development Permit.

Consultations: U.S. EPA; NOAA Fisheries (NMFS); Cal Department of Fish and Wildlife; Regional Water Quality Control Board 2.



Permitting and Agency Consultation Accomplishments

- Identified all necessary permits/consultations and required studies/surveys.
- Held initial meetings with agencies.
- Presented project at Army Corps Multi-Agency Meeting.
- Identified and addressed agency questions and concerns.
- Began preparation of permit applications.



Next Steps

- Wave and Water Level Data Collection (Redeployed 23rd October)
- Permitting (Ongoing, began in October)
- Final Engineering Design (Ongoing, 30% submittal 13th November)
- CEQA (18th November kick-off)
- Construction Documents out to Bid (late Summer 2020)
- Construction (planned Fall 2020)

Acknowledgements

- Peter Baye – coastal biologist
- Bradley Damitz – permitting specialist
- SOA – topographic survey
- Robert Mooney, MTS – eelgrass survey and EFH assessment



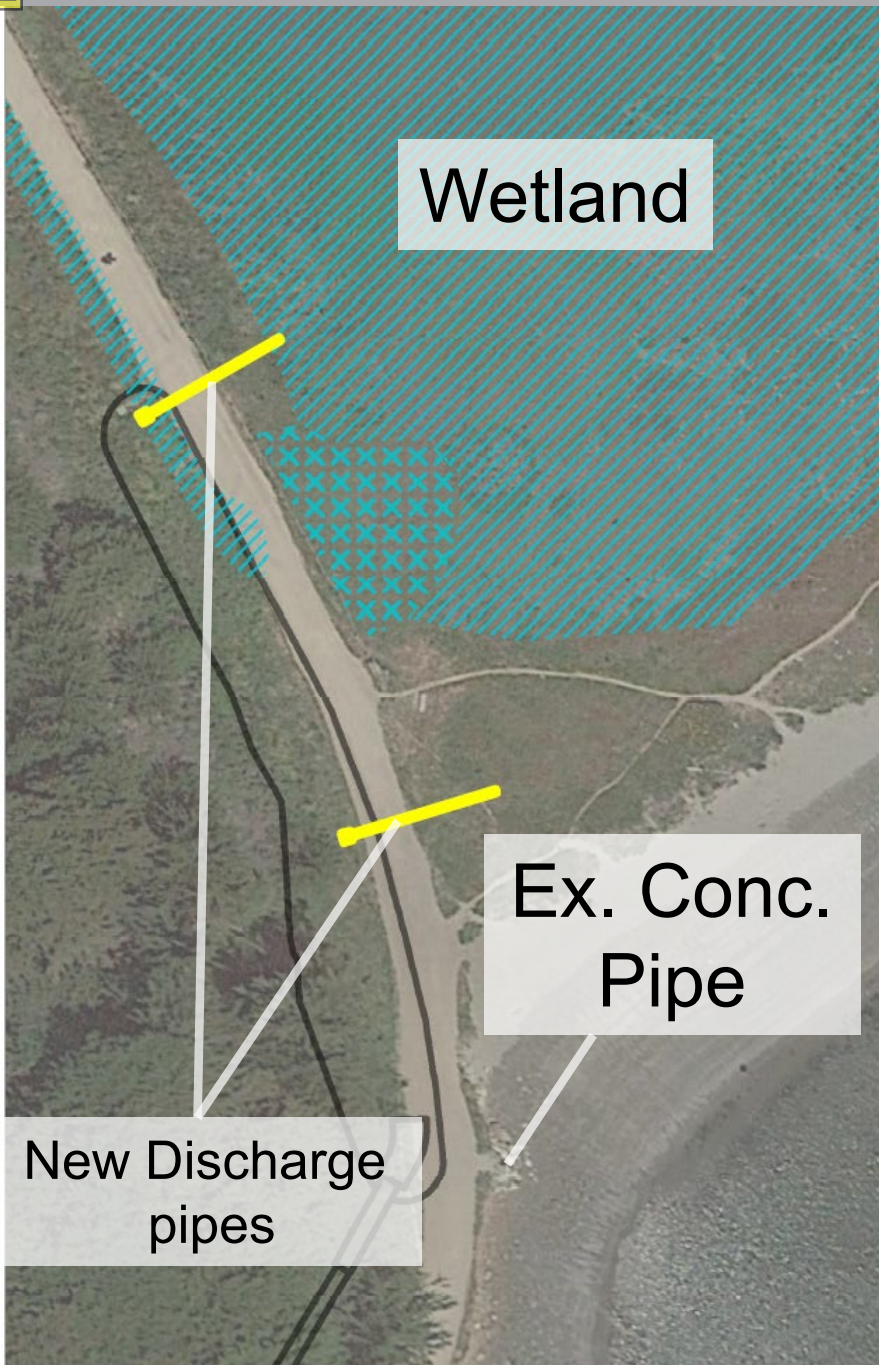




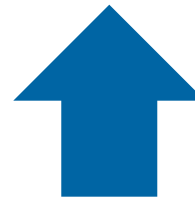
www.ghd.com

Supplemental Slides





Changes in Discharge Post- Construction



Flows - **0.14 CFS**



Volume - **12,096 CF**

Wave & Water Levels: Next Steps

- Continue measuring waves through February 2020 to understand North Pacific winter swell behavior
- Develop hindcast of waves to describe wave climate at site
- Estimate wave runup
- Continue measuring water levels to inform datums and calculations of wave runup, design components

Application of Natural Infrastructure Guidelines to Design a Living Shoreline for Project Site

TOWARD NATURAL SHORELINE INFRASTRUCTURE TO MANAGE COASTAL CHANGE IN CALIFORNIA

A Report for:

California's Fourth Climate Change Assessment

Prepared By:

Sarah Newkirk¹, Sam Veloz², Maya Hayden², Bob Battalio³, Tiffany Cheng³, Jenna Judge⁴, Walter Heady¹, Kelly Leo¹, Mary Small⁵

1 The Nature Conservancy

2 Point Blue Conservation Science

3 Environmental Science Associates

4 National Oceanic and Atmospheric Administration

5 California State Coastal Conservancy

Report link: energy.ca.gov/sites/default/files/2019-07/Oceans_CCCA4-CNRA-2018-011.pdf



Case Studies of Natural Shoreline Infrastructure in Coastal California

A COMPONENT OF IDENTIFICATION OF NATURAL INFRASTRUCTURE OPTIONS FOR ADAPTING TO SEA LEVEL RISE

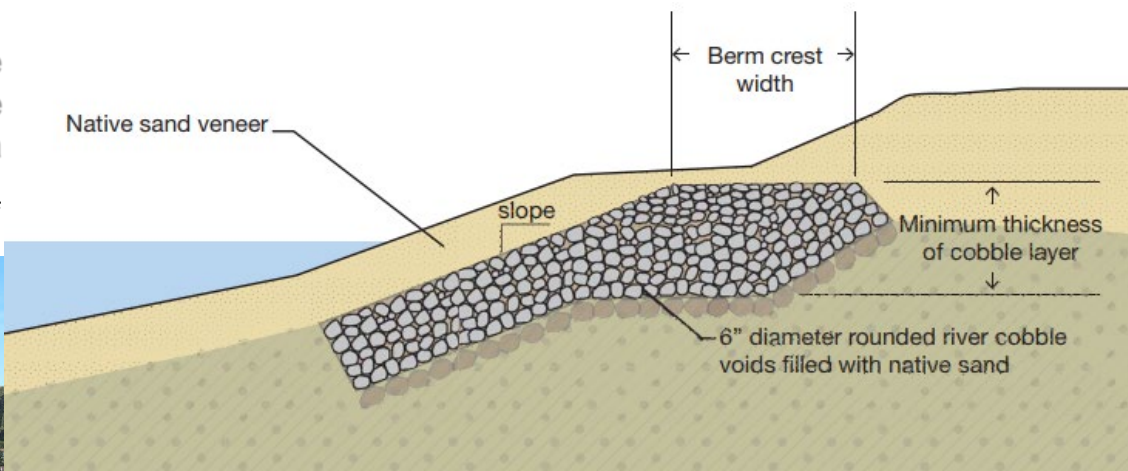


Report link: https://coastalresilience.org/wp-content/uploads/2017/11/tnc_Natural-Shoreline-Case-Study_hi.pdf

Cobble- gravel Berms for Shore Adaptation

- Dissipate wave energy and act as a “backstop,” limiting landward extent of shoreline erosion
- Can provide habitat equivalency for marine invertebrates and enhance natural aesthetics
- Traversable and friendly to recreational access

Source: Toward Natural Shoreline
Infrastructure to Manage Coastal Change
in California
energy.ca.gov/sites/default/files/2019-07/Oceans_CCCA4-CNRA-2018-011.pdf



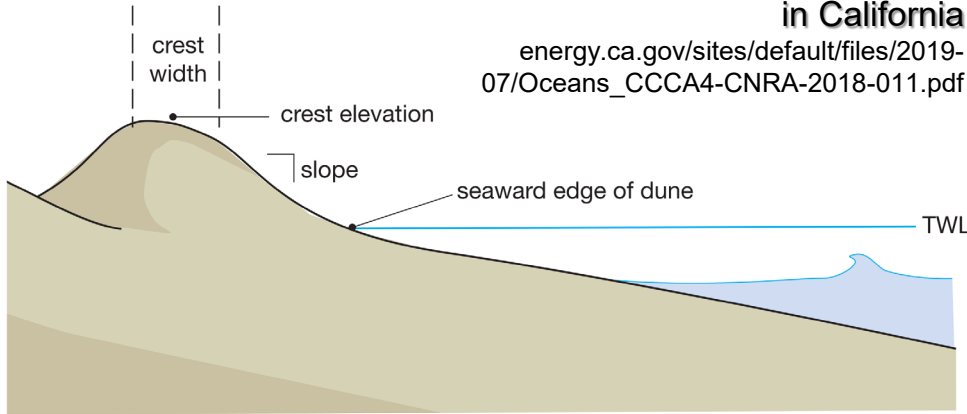
Pacifica State Beach Photos Peter Baye



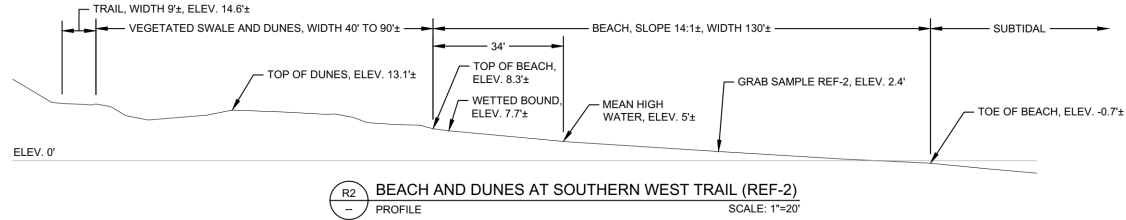
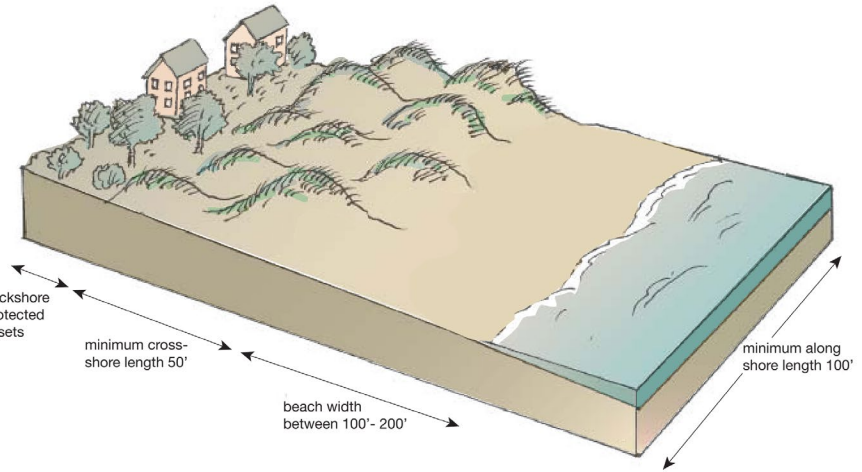
Dunes for Shore Adaptation

Source: Toward Natural Shoreline Infrastructure to Manage Coastal Change in California

energy.ca.gov/sites/default/files/2019-07/Oceans_CCCA4-CNRA-2018-011.pdf



available dune beach width



Source: ESA 2019, DRAFT Geomorphic Assessment and Conceptual Design of Beach and Dunes, memo to GHD October 25, 2019



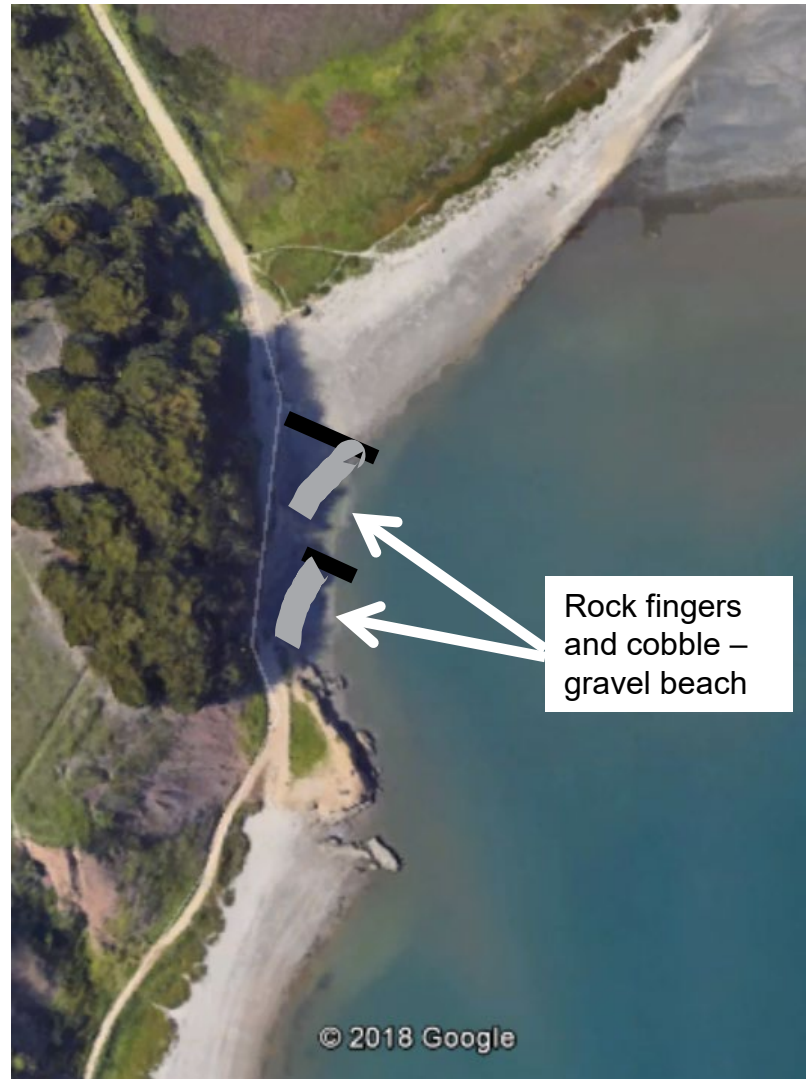
Geomorphic Design Criteria for Natural Infrastructure Components (DRAFT)

Source: ESA 2019, DRAFT Geomorphic Assessment and Conceptual Design of Beach and Dunes, memo to GHD October 25, 2019

Natural Infrastructure Component				
Parameter	Guidelines	Reference Sites	Analysis	Selected
Gravel-Cobble Beach and Berm				
Berm Crest Elevation	0.8x TWL 20 times per year	+4' to +8' NAVD		+8' NAVD
Minimum Berm Width	10 feet			10'
Slope of seaward face	5:1 to 10:1	7:1 to 10:1		6:1
Minimum Footprint	45 feet	30 to 140 feet		45 feet
Minimum Length	330 feet			300+ feet, with retention structures
Orientation relative to waves	Less than 20 degrees			Rotate shore 20 to 30 degrees to attain wave angles of 0 to 15 degrees
Minimum thickness	3 feet	Less than one foot		3 feet
Gravel - Cobble larger Size	6 to 24 Inches	1 to 4 Inches		6 Inches
Gravel - Cobble Shape	rounded	Rounded blocky		Rounded blocky
Sandy Beach and Dune				
Seaward Edge Elevation	0.8x TWL 10 times per year	+9' NAVD +/-		+9' NAVD
Seaward Edge Location	Behind dry sand beach	yes		yes
Dune Footprint (minimum)	50 feet	30 feet		30 feet
Fronting Beach Width (minimum)	100 feet	130 feet		120 feet
Total Footprint (minimum)	150 feet	160 feet		150 feet
Dune Crest Elevation		10.5 to 13 feet NAVD		+13' NAVD
Minimum Longshore Length	100 feet	500 feet		300 feet project length
Orientation relative to waves			Less than 15 degrees	TBD
Beach Elevation		+8'		
Beach Slope		12:1 to 15: 1	10:1 to 25:1	12:1 to 15:1
Beach Reference Size		0.2 to 0.4 mm		



Design Concept: Use “Rock Fingers” to Retain Coarse Sediment at Project Site

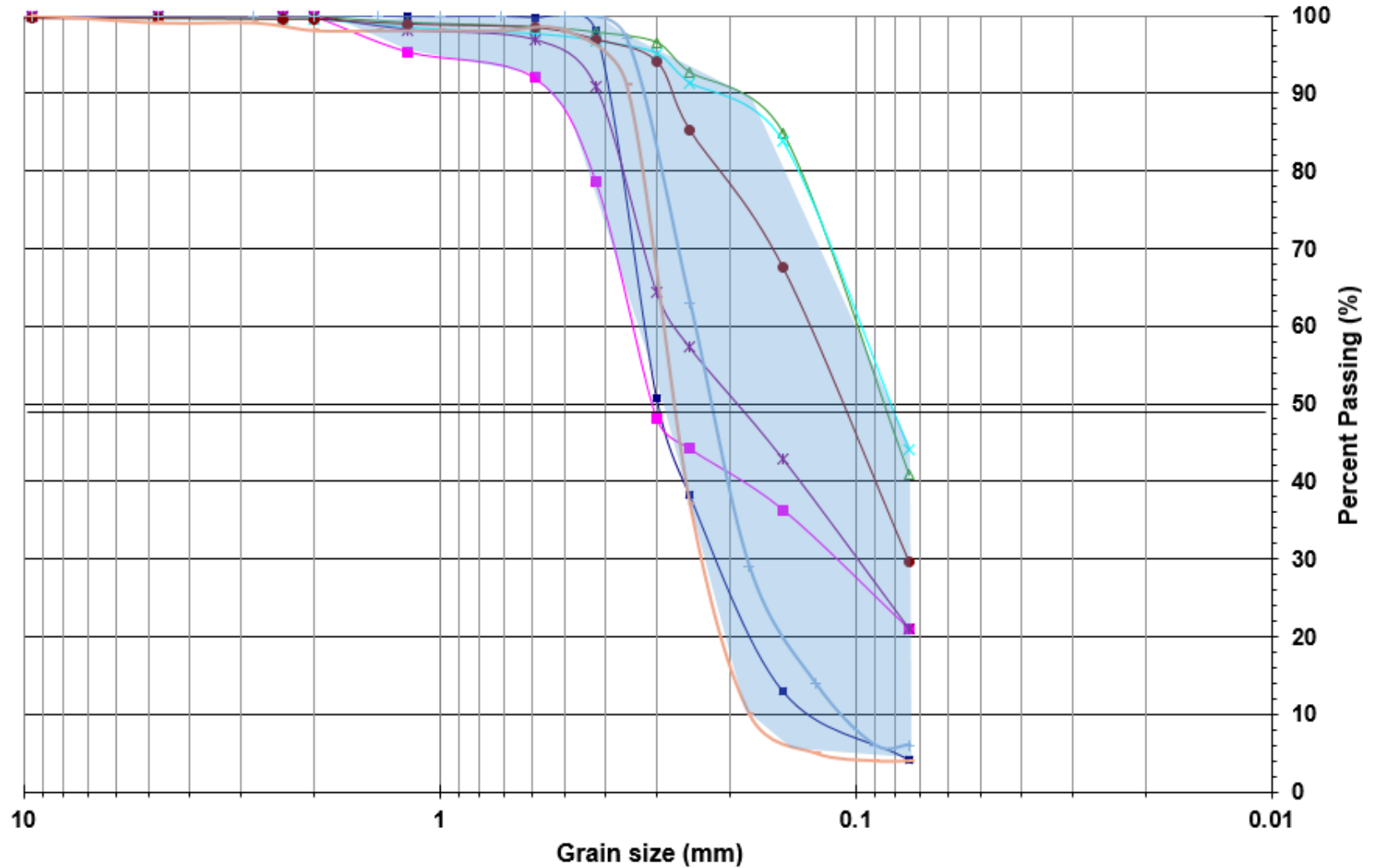


Sediment Sampling & Analysis – Proposed Sediment Sources



Sediment Sampling & Analysis – Results at Project Site

Grain Size Distribution - West Trail Samples



Fieldwork – Rookery Assessment

