



# Cardiff Beach Living Shoreline Project



**Brian Leslie** | GHD

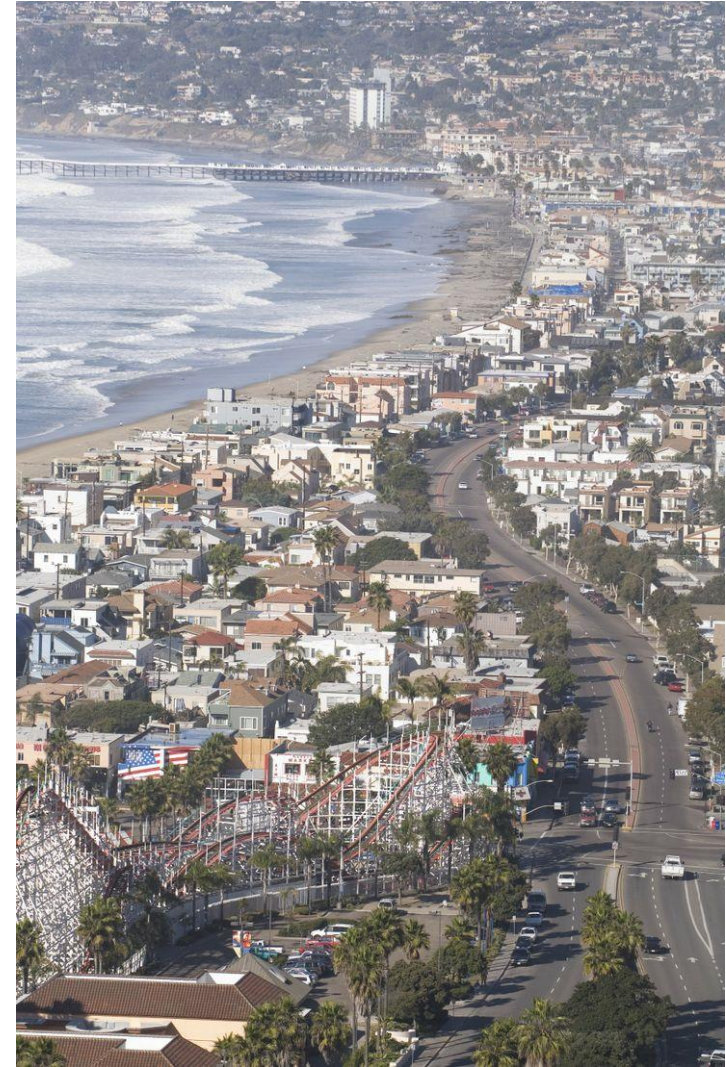
**Pete Milligan, PE** | City of Encinitas



# About me...



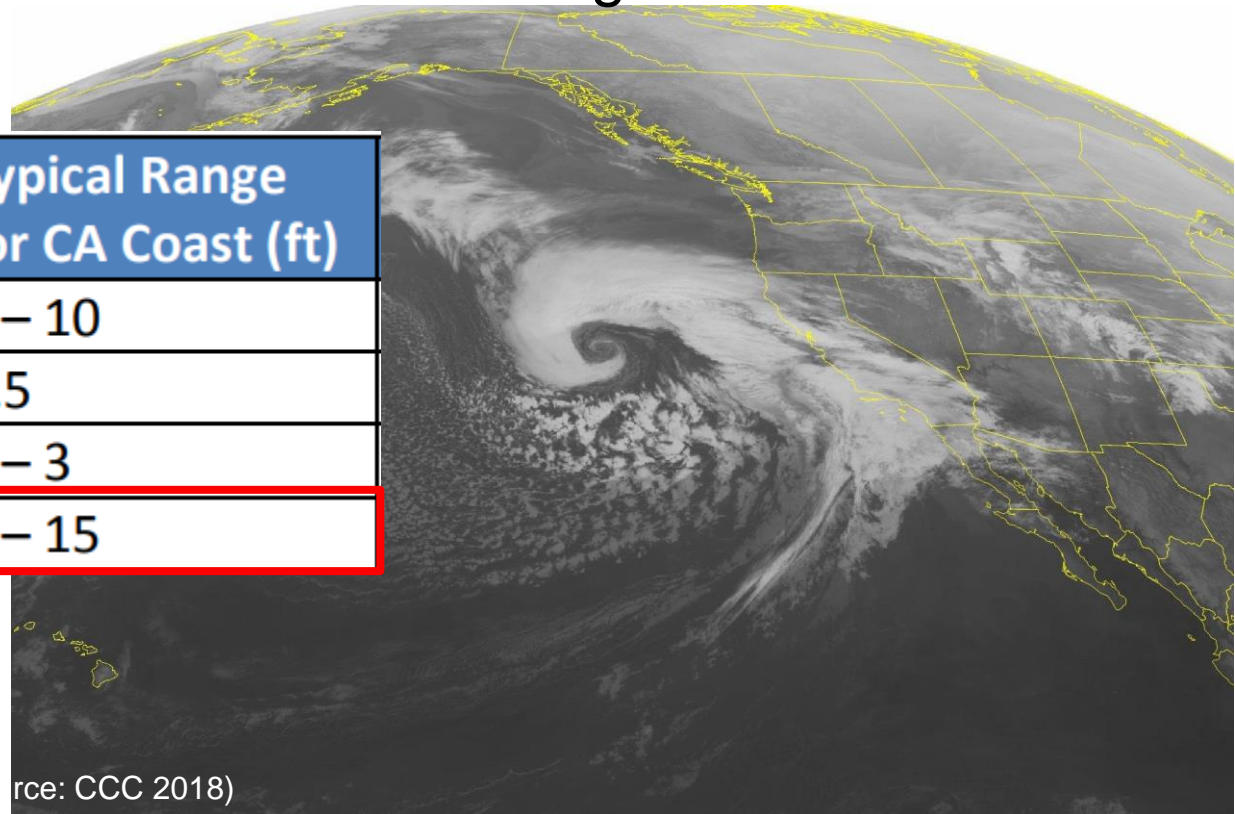
# San Diego Coastline



# West vs. East Coast Differences

- Beach nourishment less frequent, smaller volumes
- Storm surge is small, wave runup is large
- Seawall projects are generally contentious
- Dunes not included in nourishment design

Factors Affecting Water Level	Typical Range for CA Coast (ft)
Tides	3 – 10
Low pressure	1.5
Storm Surge	2 – 3
Storm Waves	3 – 15



# Coastal Storm Damage - Erosion



# Coastal Storm Damage – Wave Runup & Flooding



# Planning for change...



## CALIFORNIA COASTAL COMMISSION SEA LEVEL RISE POLICY GUIDANCE

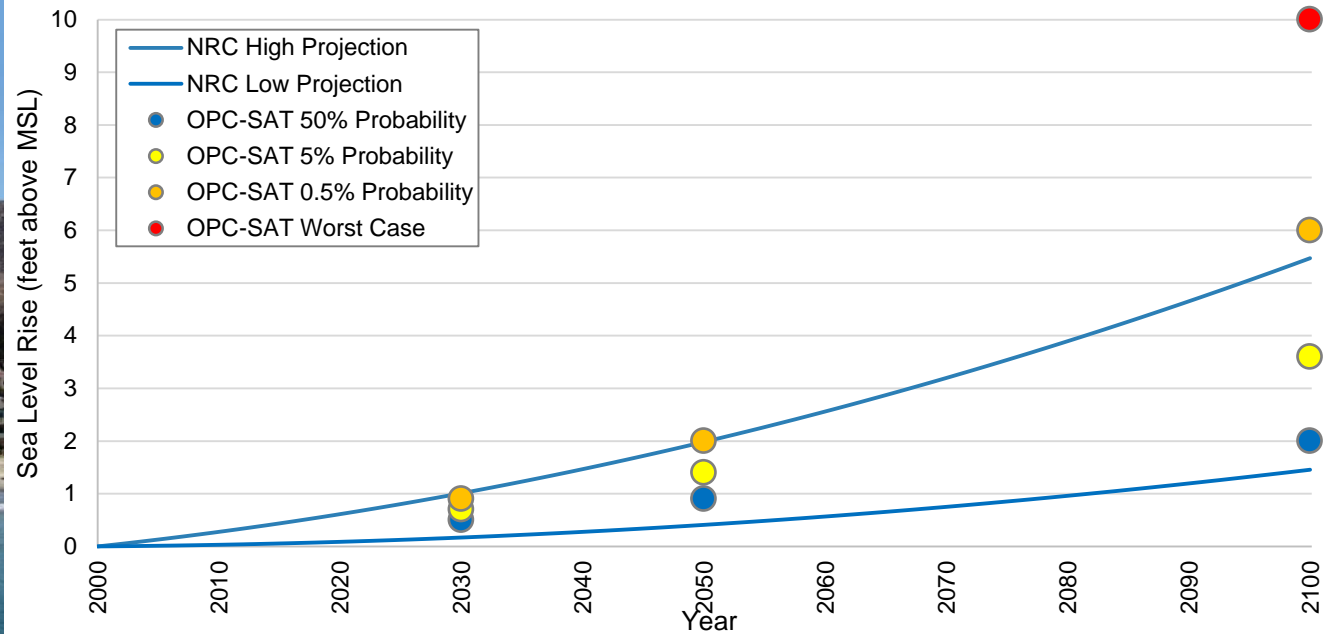
*Interpretive Guidelines for Addressing  
Sea Level Rise in Local Coastal Programs  
and Coastal Development Permits*



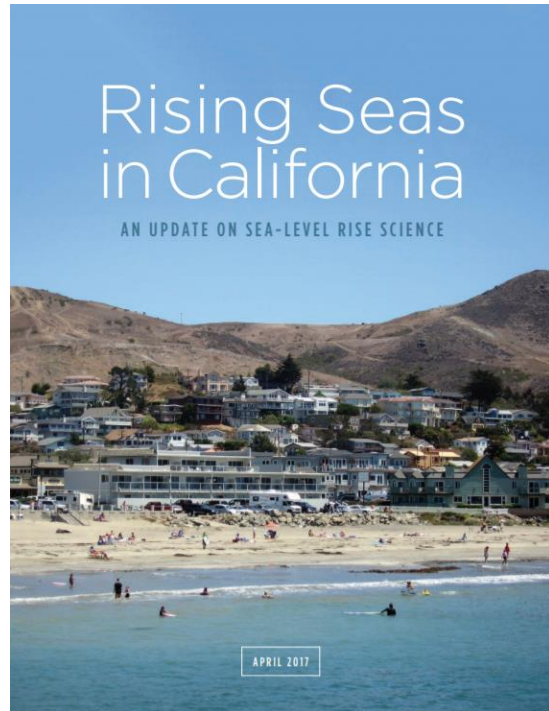
Original Guidance unanimously adopted – August 12, 2015  
Science Update unanimously adopted – November 7, 2018

# Southern California Sea Level Rise Projections

NRC 2012 vs. OPC-SAT 2017\*



\*OPC-SAT (2017) projections assume emission scenario RCP 4.5. Worst Case scenario (Red Circle) developed by DeConto and Pollard (2016).





# Common Concern - “Coastal Squeeze”



Oceanside, CA

# Cardiff Beach Living Shoreline Project



Existing

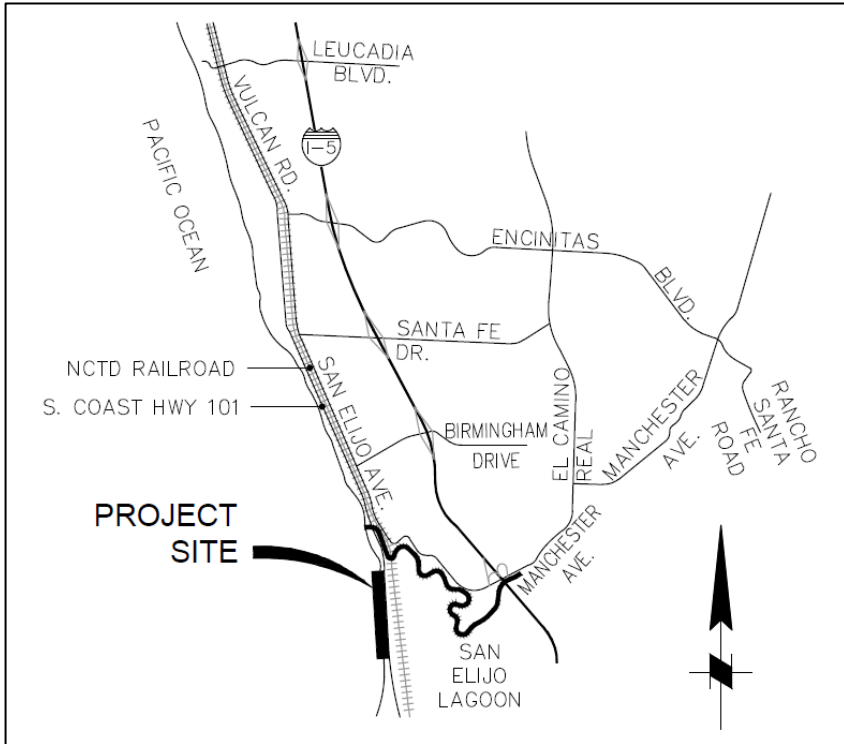
(Source: M&N 2016)

With Project

## Construction underway!



# Project Location – Cardiff State Beach, Encinitas, CA



# HWY 101 Vulnerabilities

## Wave Overtopping & Undermining



# An ever changing system...



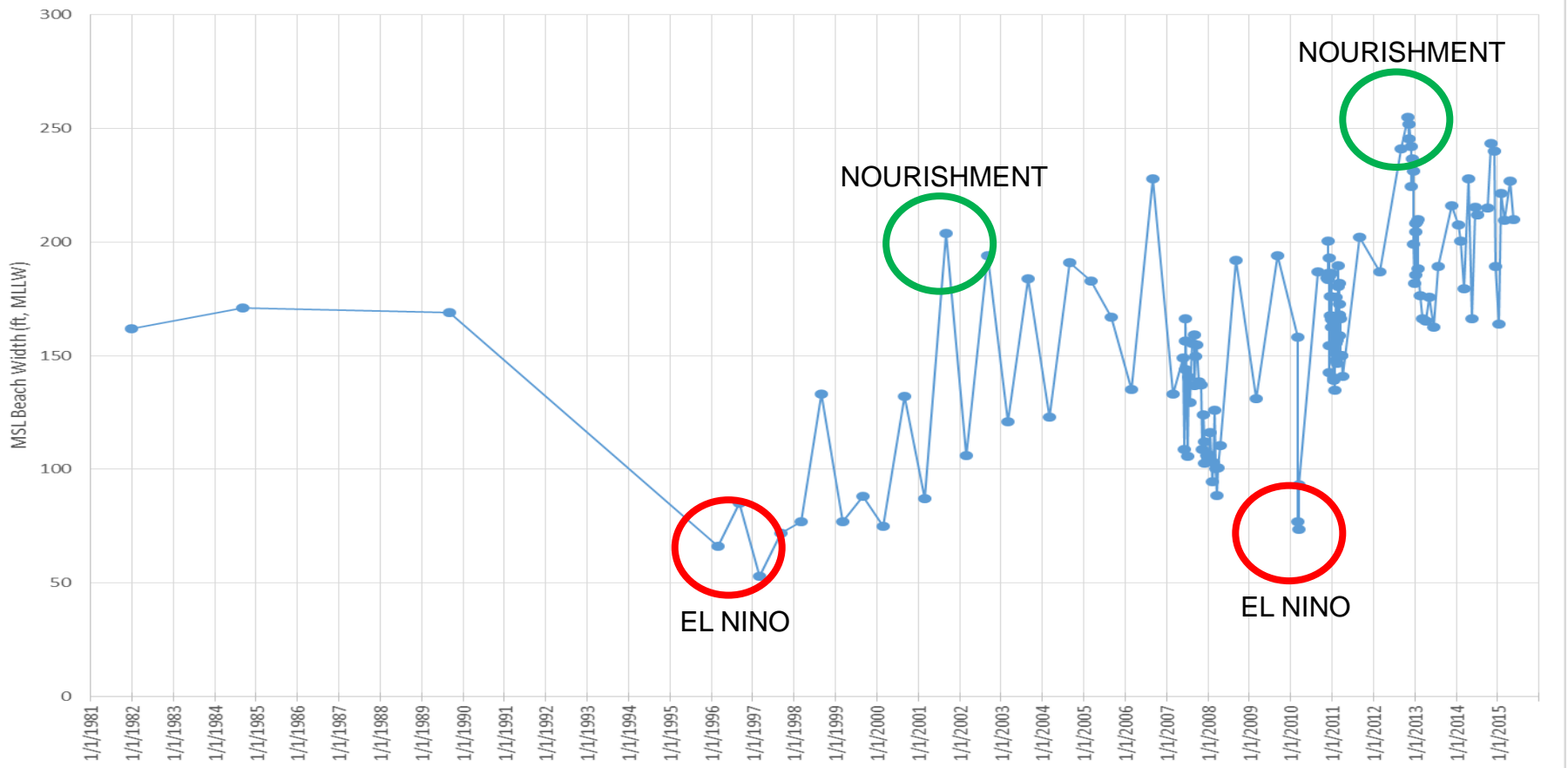
2017



1998

(Source: M&N 2016)

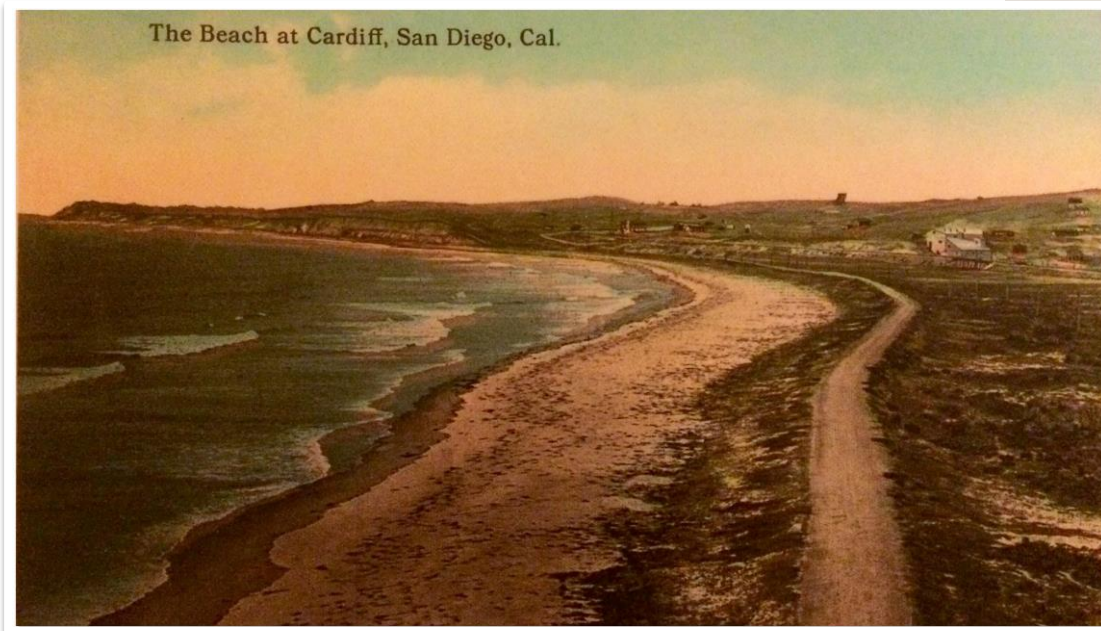
# Cardiff Beach Width Change (1981 to present)



(Source: M&N 2016)

# Green/Grey Hybrid Solution

1. Decrease vulnerability of HWY 101
2. Restore dune habitat
3. Beneficially reuse sand
4. Improve public access
5. Share lessons with others



(Source <https://www.nap.edu/read/18811/chapter/5#70>)

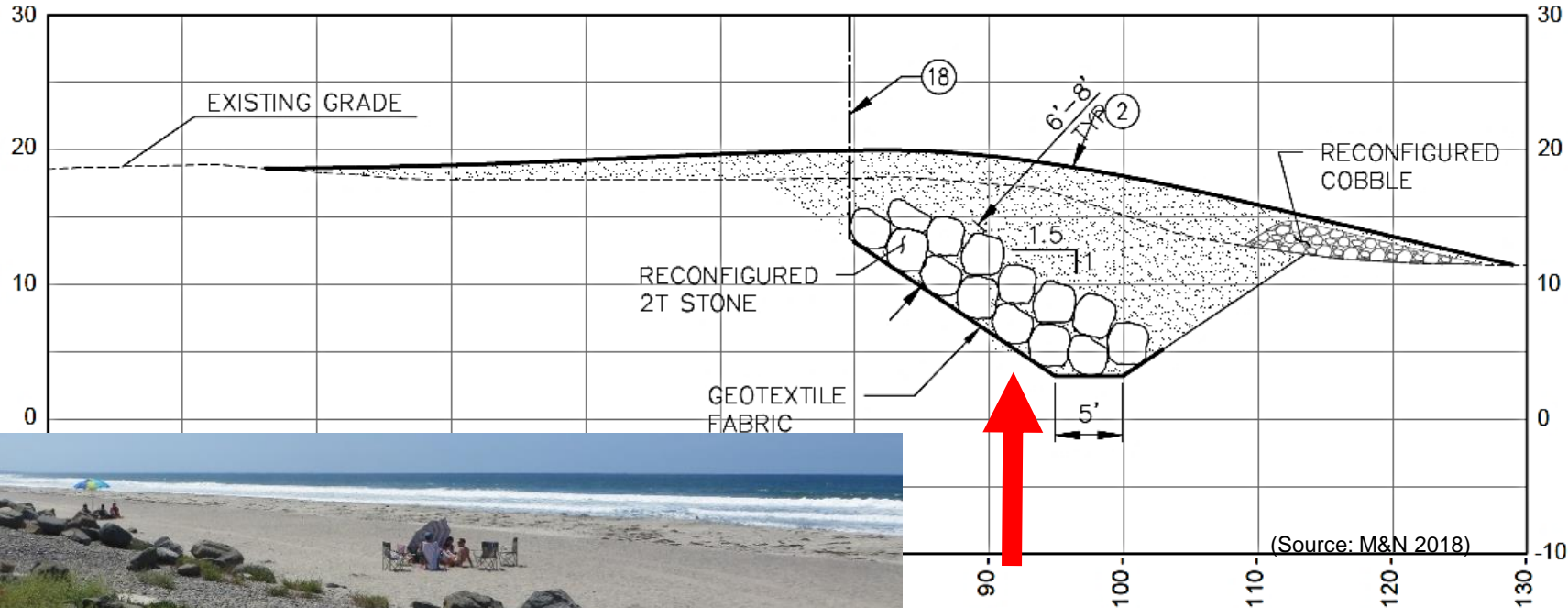
# Project Elements

1. Buried Revetment
2. Cobble Berm
3. Sand Dune
4. Dune Habitat Area
5. Public Access



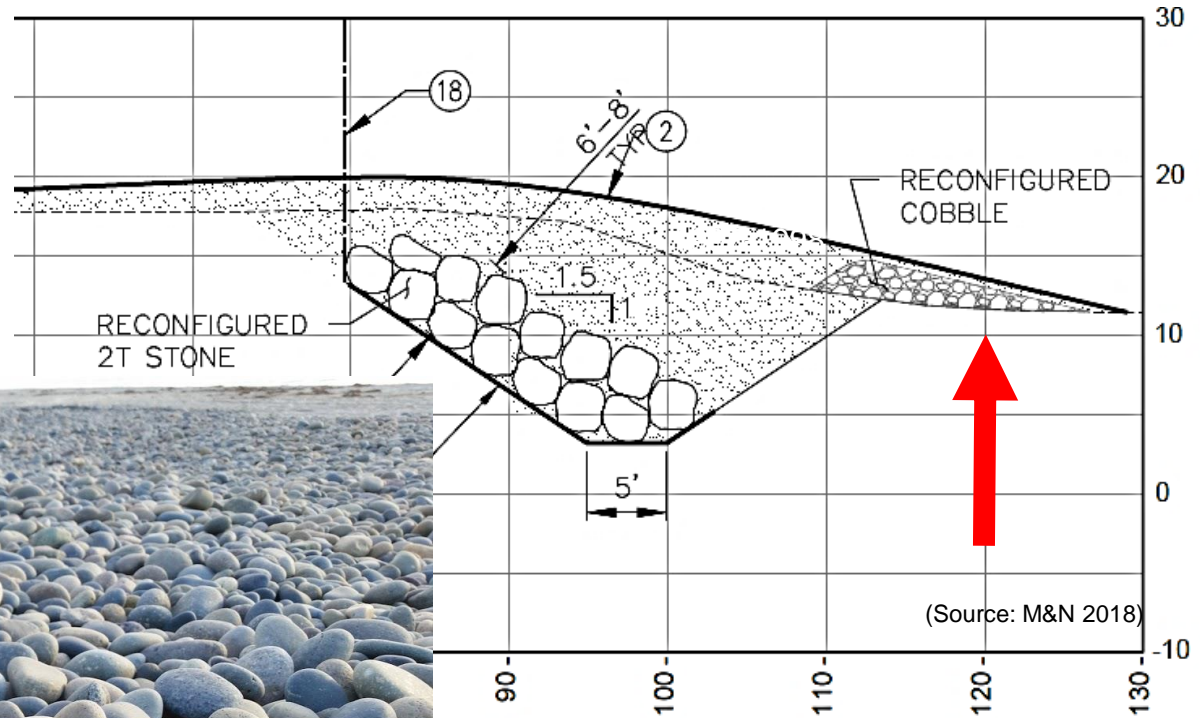


# Project Element – Buried Revetment





# Project Element – Cobble Berm

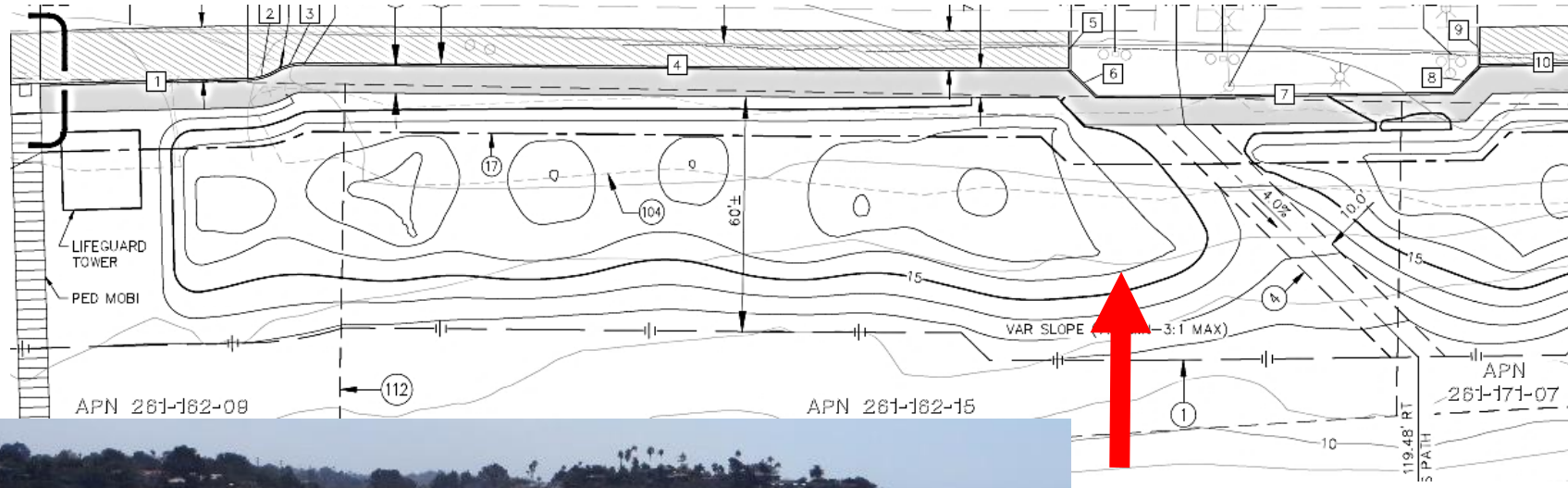


(Source: M&N 2018)





# Project Element – Sand Dune



(Source: M&N 2018)



# Project Element – Dune Habitat Creation



# Project Element – Public Access Improvements





# Project Element –Monitoring

- Dune performance (UCLA & SIO)
- Vegetation Establishment (SELC)



(Source: Sergededina.com)

# Project Element – Maintenance & Adaptation

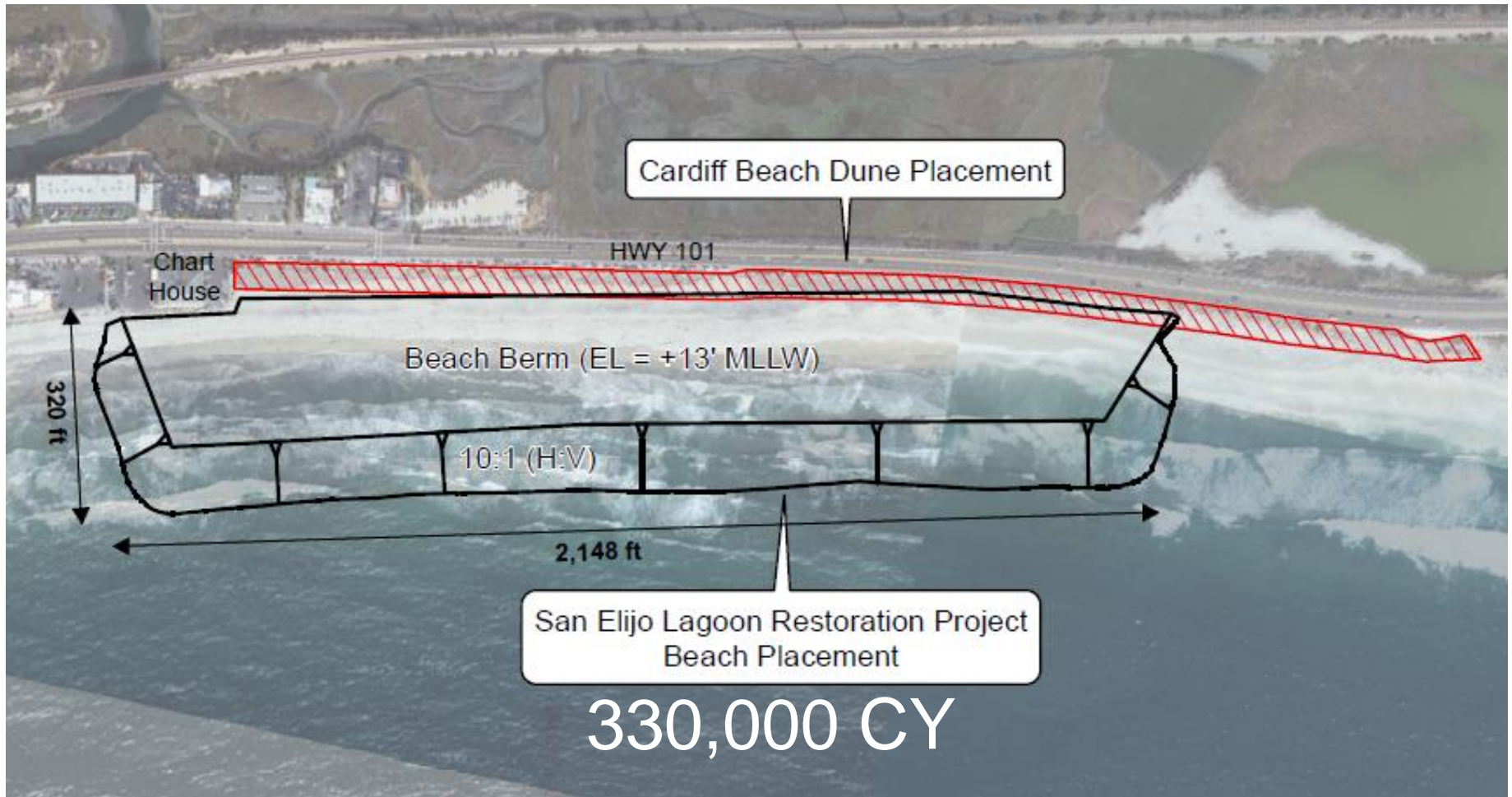


# Project Challenges

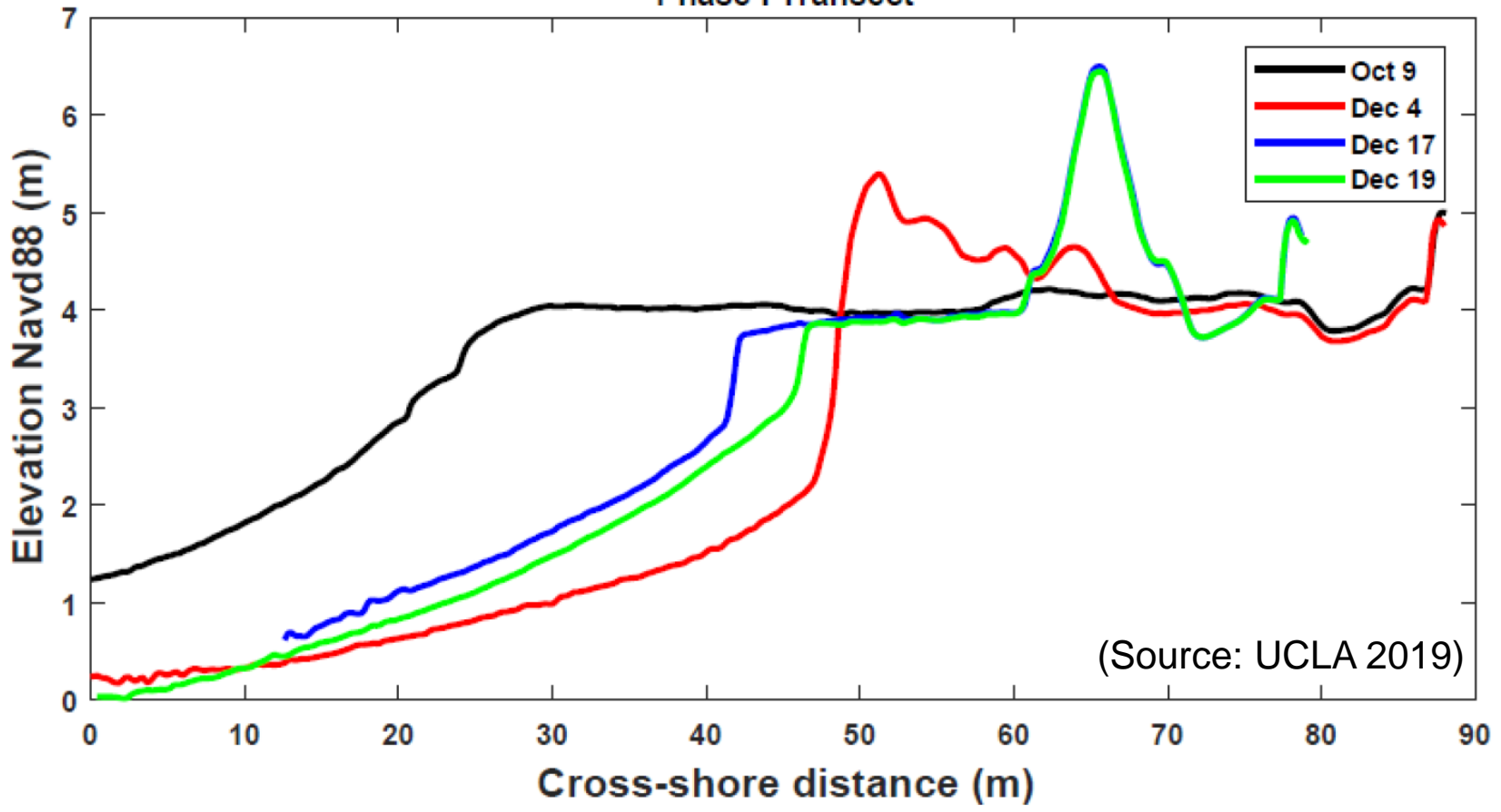
- Dunes vs. Traditional Armoring
- Trade-offs (e.g. view sheds vs. protection)
- Winter Construction
- Sensitive species



# Nourished Beach - San Elijo Lagoon Restoration Project



### Phase I Transect



(Source: UCLA 2019)



Photo by Lea Squires – 1/18/19



Photo by Lea Squires – 1/18/19

# Sensitive Species



Western Snowy Plover

Grunion





# Project Funding

## ~ \$3.5M for Planning though Construction

- State Coastal Conservancy
- Ocean Protection Council – Prop 1
- City of Encinitas
- California Coastal Commission
- SANDAG
- USFWS



## Construction Schedule

- Estimated completion (April 2019)
- 5 Year Monitoring & Reporting (2019 – 2024)





**[www.ghd.com](http://www.ghd.com)**