

# SAM Vulnerability Assessment: Final Results

## *Adaptation Planning for a Wastewater Treatment Plant Using Compound Flood Analyses*

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**February 12, 2024**

**SAM Board Meeting**



# Sewer Authority Mid-Coastside Facility (SAM)

- Screening study (Cozzolino 2022) used CoSMoS to assess vulnerabilities
- No FEMA Flood Insurance Rate Map on Pilarcitos Creek
- Historic flooding
- Concern about sea level rise (SLR)
- Adaptation planning needs



Ⓢ Underground Stairwell

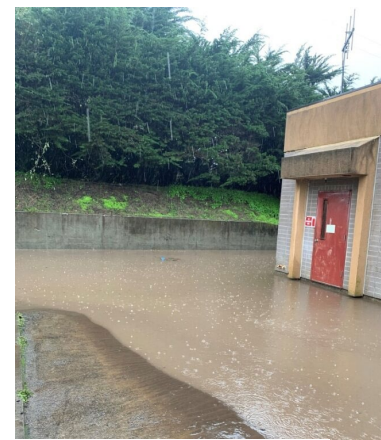
← Stormwater Flow

● Catch Basin

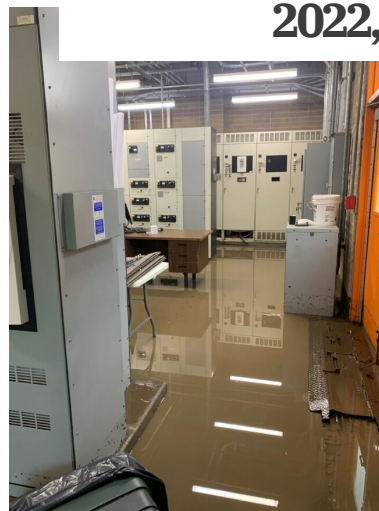
Note: All stormwater is detained and processed on site

# Outline

- › Scope of Work
  - Conceptual and Numerical Model
  - Flooding Response Scenarios
  - Adaptation Strategies
  - *\*Support for FEMA funds*
- › Model Approach/ Calibration
- › Vulnerabilities
- › Adaptation



**Flooding during December 31, 2022, Storm**



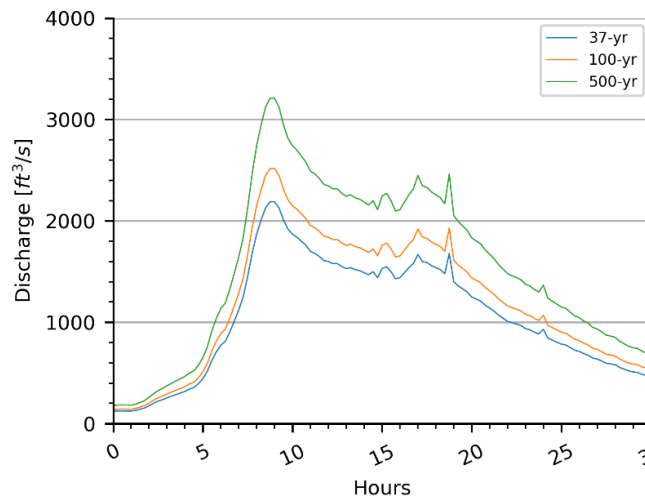
# Conceptual Site Model



# Fluvial Model – Delft Flow - FM

## › Pilarcitos Creek and Kehoe Watercourse Discharge

- U.S. Geological Survey (USGS) gage on Pilarcitos Creek
- 37 year - December 31, 2022
- 100-year storm–Derived from USGS data
- 500-year storm–Derived from USGS data
- Roughness from vegetation data



# New Year's Eve 2022 Storm

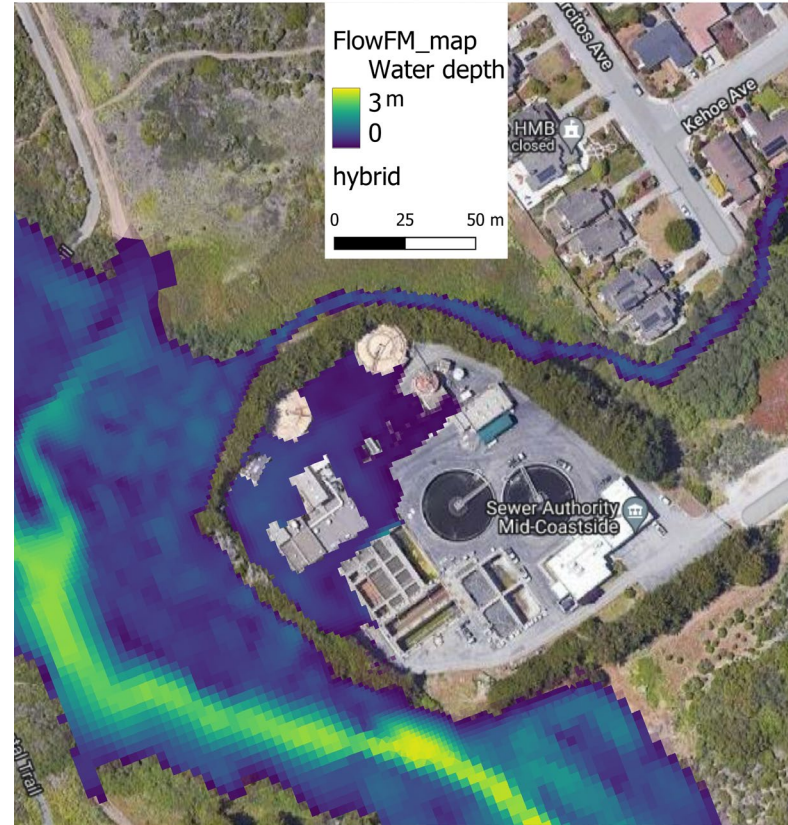


Flood depths up to 2 feet on the facility and 6 feet in the basement

# New Year's Eve 2022 Storm



# Facility Flooding



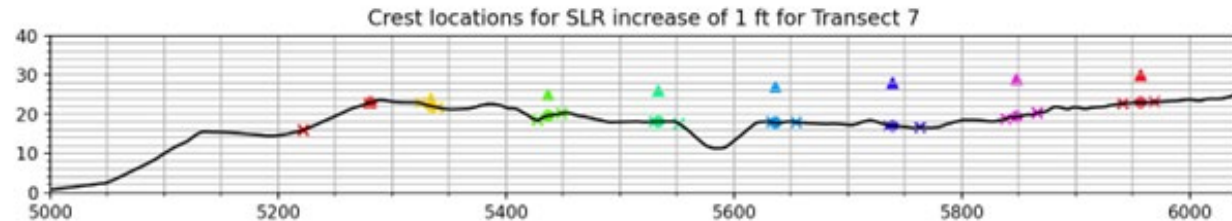
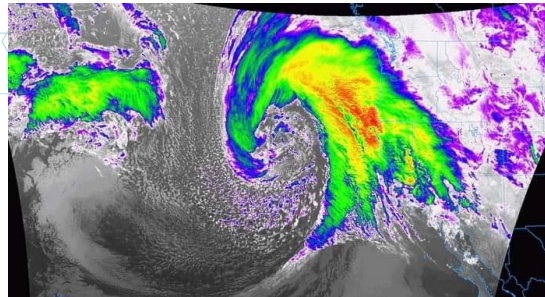
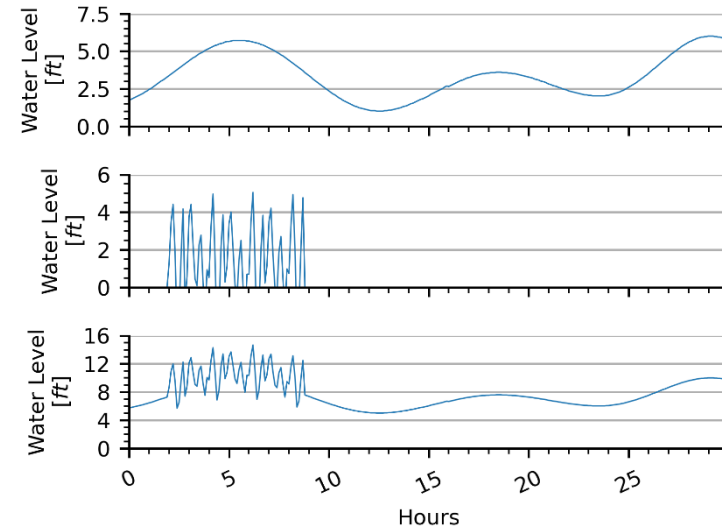
Dec. 31- Observed and Modeled conditions



# Coastal Models – Xbeach and Modified Bruun

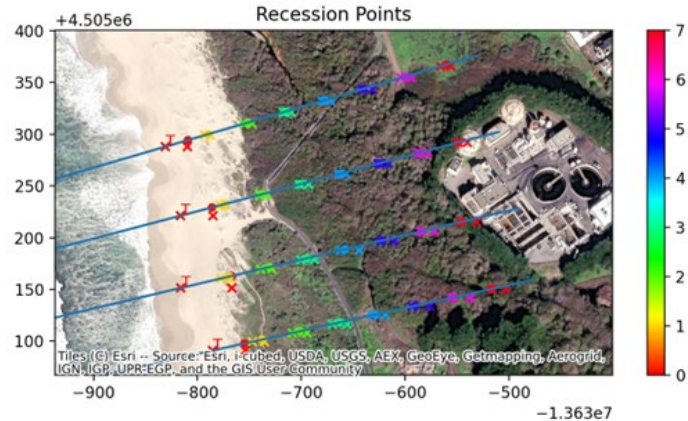
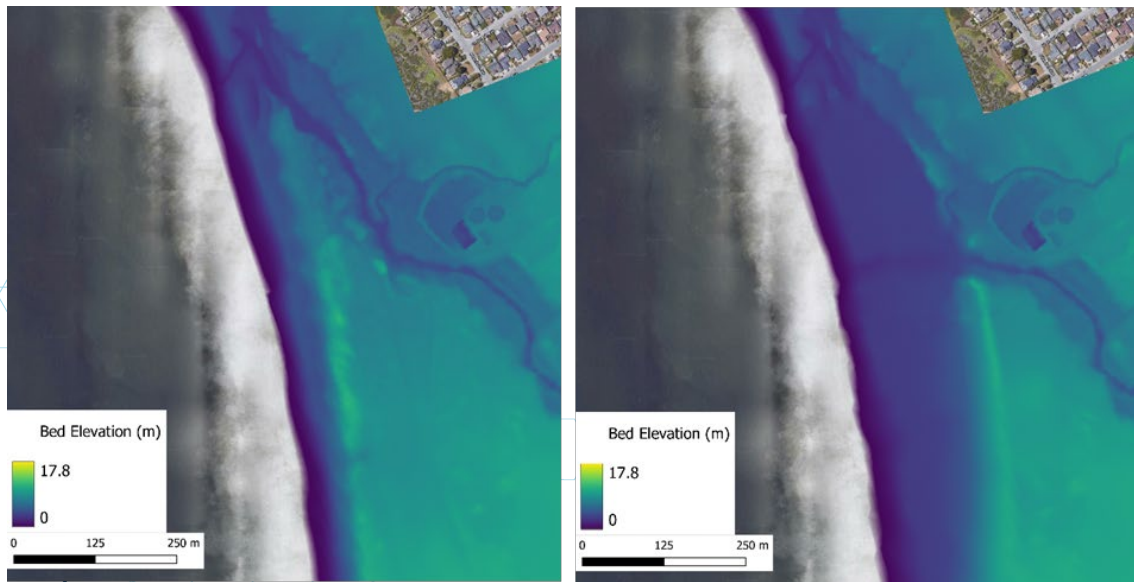
## › Ocean Conditions

- January 5, 2023, storm induced setup
- SF >59 feet at 16 sec
- 10 feet of additional water (setup) above king tide
- Sea level rise – 1 to 7 feet



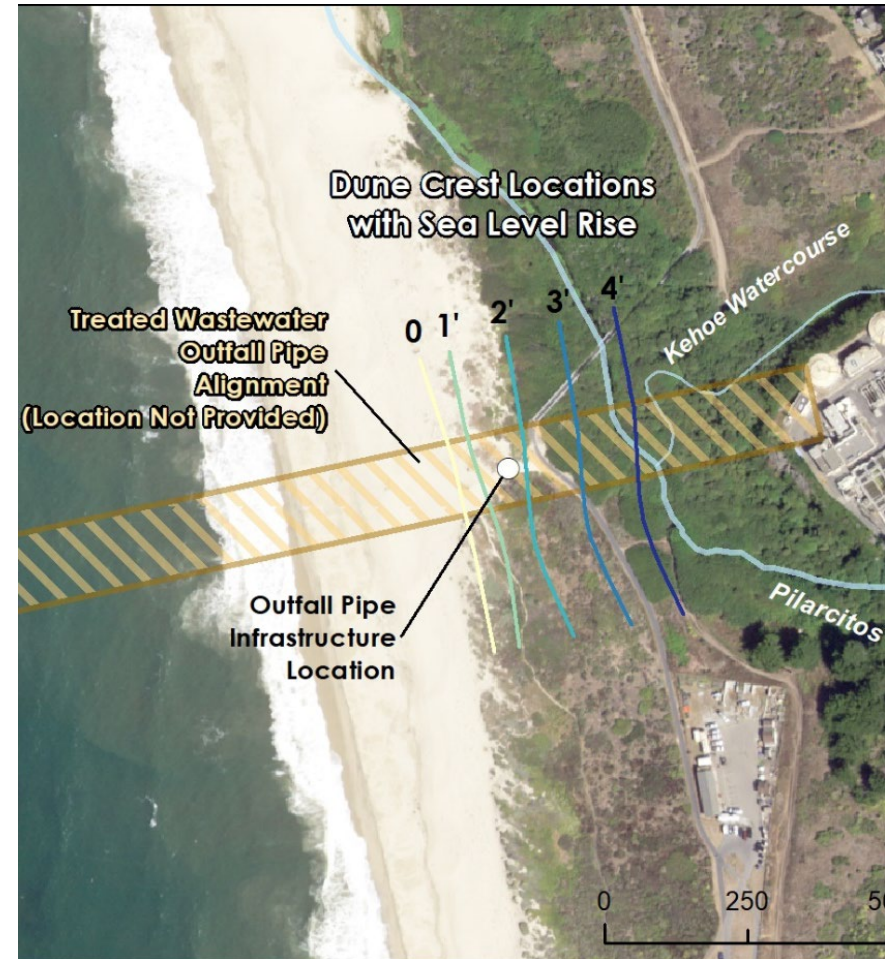
# Dune Erosion Evolved DEM

- › Modeled dune erosion for each 1' of sea level rise
- › With 4' of sea level rise, Pilarcitos outlet channel relocates in front of the facility
- › Adds a compound flood or coastal confluence flood risk



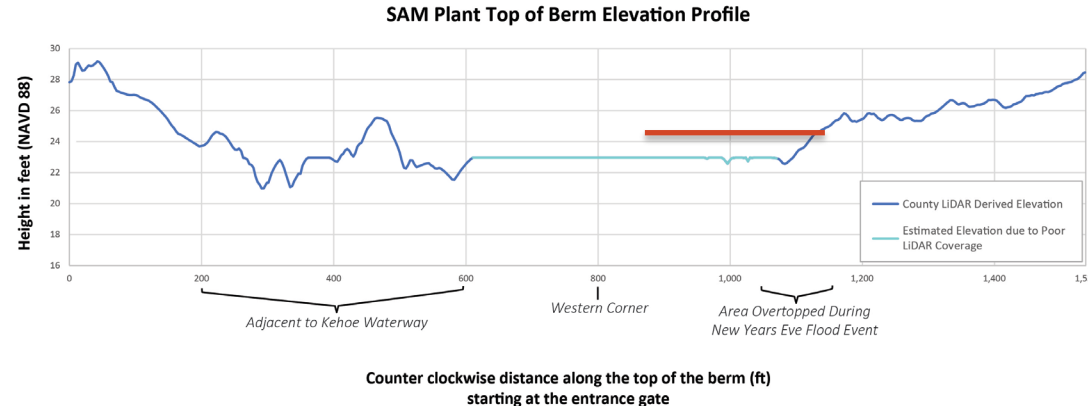
# Dune Erosion Tipping Points

- > <2 feet of dune erosion impacts outfall release valve and access vault
  - Outfall pressure release vent allows outflow to not back up during high tides
  - Failure would be potential pipe rupture, with discharge of treated effluent on beach
  
- > 4 feet of dune erosion from sea level rise changes mouth location



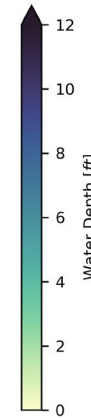
# Adaptation Strategies

- › Protect – Elevate existing earthen berms
- › Accommodate – Elevate critical components
  - Vegetation management
  - Expand adjacent Caltrans wetland
- › Relocate or retreat



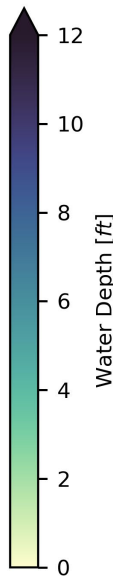
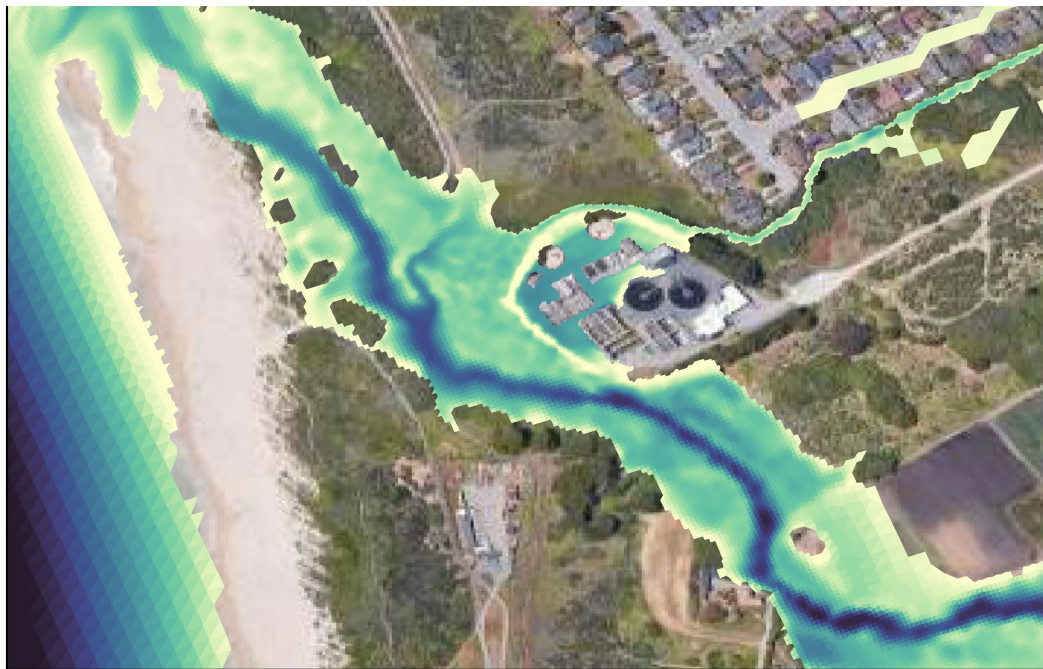
# Adaptation—Increase Berm Elevation

- › 100-year event
- › Adaptation: Increase berm elevation +3 ft
- › Similar to the emergency repair
- › **Eliminates flooding in facility**



# Design Storm – 500-Year Event

- › Pre-emergency repair
- › 500-year discharge
- › Support FEMA grant application to examine relocating electrical building in collaboration with SRT Consultants



# Design Storm — 500-Year event + SLR 4 Ft

- › SLR evolved DEM
- › 500-year discharge
- › Berm crest elevation of 27 ft
- › Support FEMA grant application to examine relocating electrical building



# Results

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- › Observed flooding had minimal impact from coastal processes
- › Post flood repairs provide flood protection for 100-year (1%) discharge
- › Dune erosion from <2 feet of SLR affects outfall pump station
- › Dune erosion from <4 feet of SLR relocates Creek outlet – compound flood risks
- › Adaptation – Berm increase to ~27 feet protect 4 feet SLR and 500-year event
- › Elevate critical facility components by 6+ feet or relocate to onsite location
- › Vegetation management and wetland expansion for stormwater storage not helpful



# Next Steps

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- › Monitoring of groundwater, logbook of observations, and beach conditions including location of Pilarcitos Creek outlet
- › Survey of elevations and geotechnical evaluation of berm
- › Collaborate with City of Half Moon Bay on wetland modification, stormwater management and FEMA insurance classifications.
- › Cost estimation of adaptation strategies to support planning efforts
- › Engineering designs for relocation and berm elevation

integral



David Revell, Ph.D.

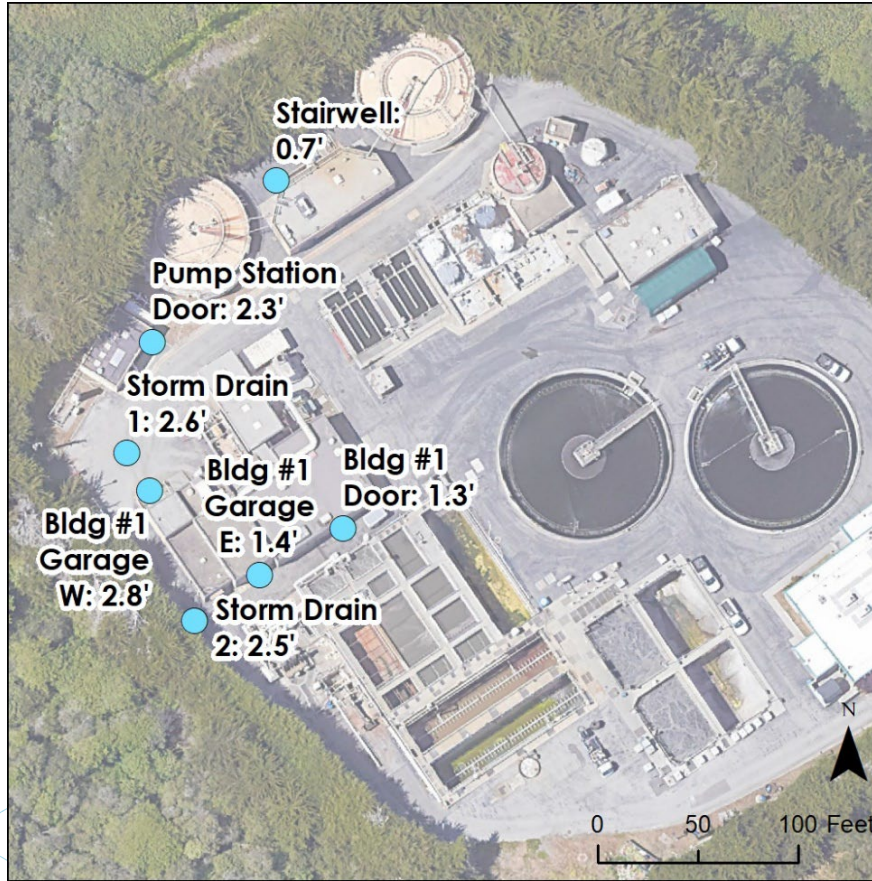
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# Flow return periods

Return period (Years)	Discharge (cfs)
5	1,185
10	1,508
25	1,916
50	2,218
100	2,519
200	2,818
500	3,212

# Flood depths according to model output



A scenic landscape featuring a calm lake in the foreground, reflecting the surrounding mountains and dense evergreen forests. The sky is a clear, deep blue. The word "integral" is overlaid in the center in a white, lowercase, sans-serif font. A thin, light-colored vertical line passes through the letter 'e', extending from the top of the 'e' down to the bottom of the frame.

integral