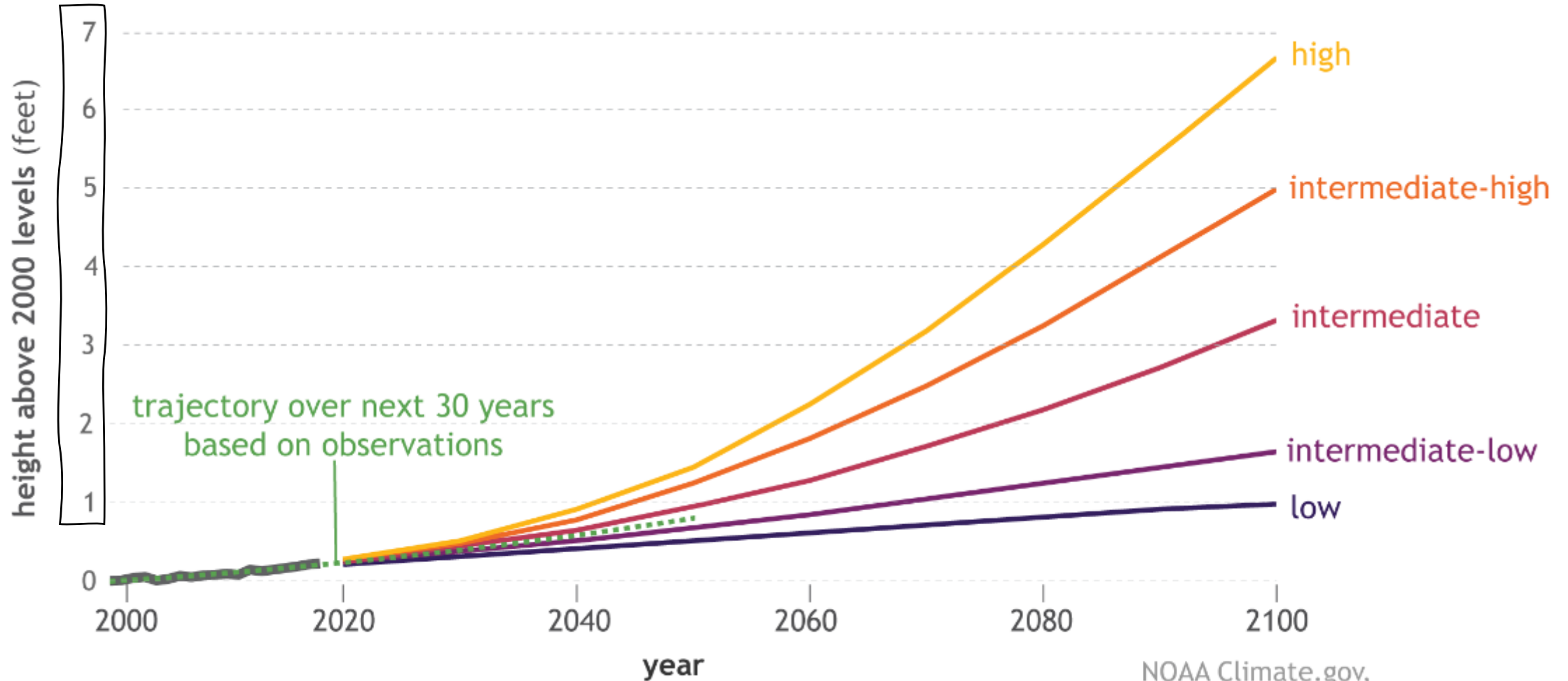


# **One Size Does Not Fit All: Sea-Level Rise Adaptation Solutions Require Site-Specific Phased Approaches**

April 23, 2024



# A wide range of predicted sea-level rise (SLR) rates



NOAA Climate.gov,  
adapted from Sweet et al., 2022

# California agencies leading the way with SLR vulnerability assessments (SLRVAs) and adaptation plans (APs)

## Senate Bills

Ocean Protection  
Council Funding  
for Municipalities

## Department of Toxic Substances Control

Guidance for  
Contaminated Sites

## Bay Area Water Quality Control Board

Amended Orders for  
Coastal Landfills

# Coastal inundation: from above and below



From: California State SLR Principles 2020

## Surface Water Inundation

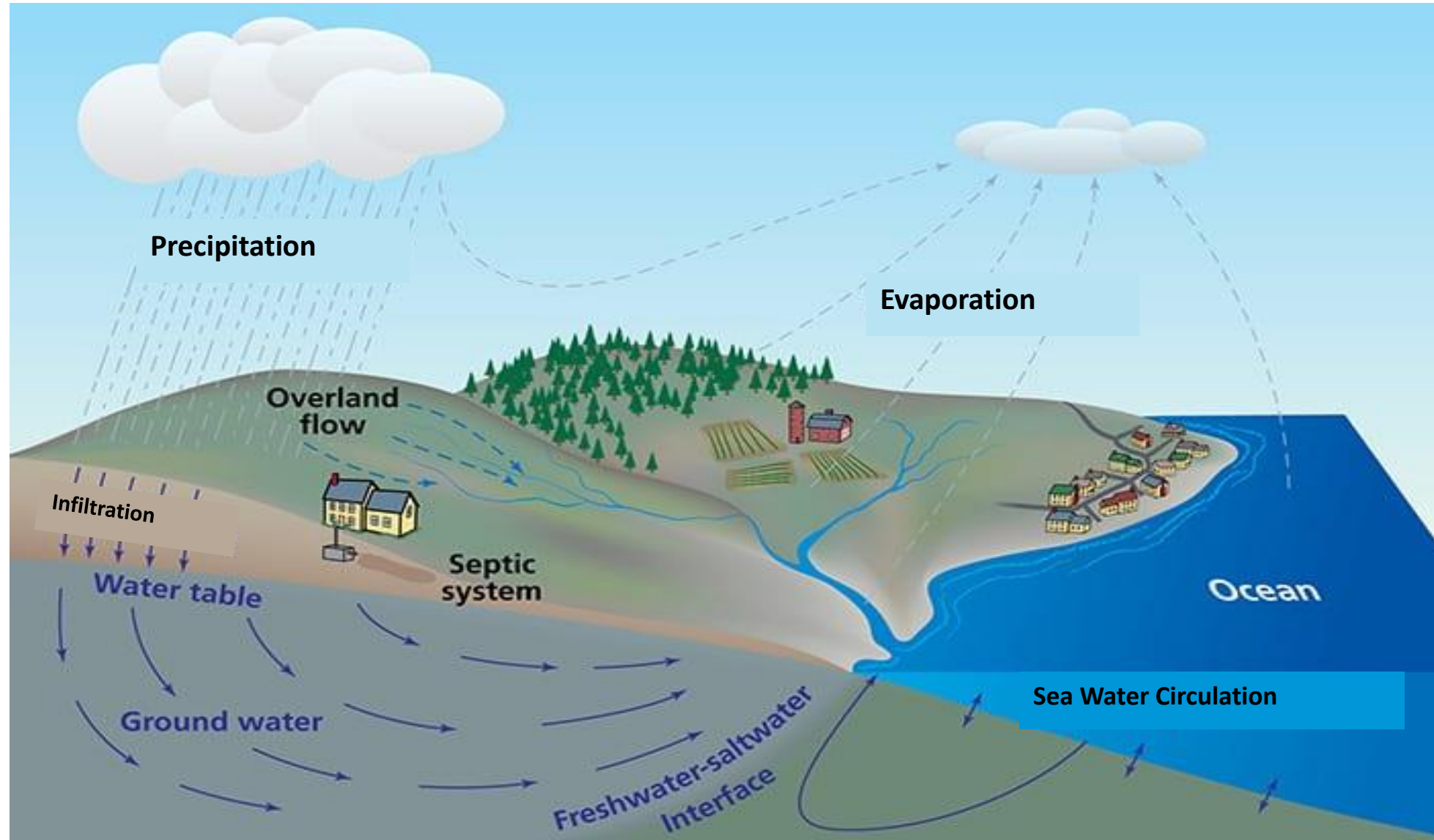
## Groundwater Rise and Emergence



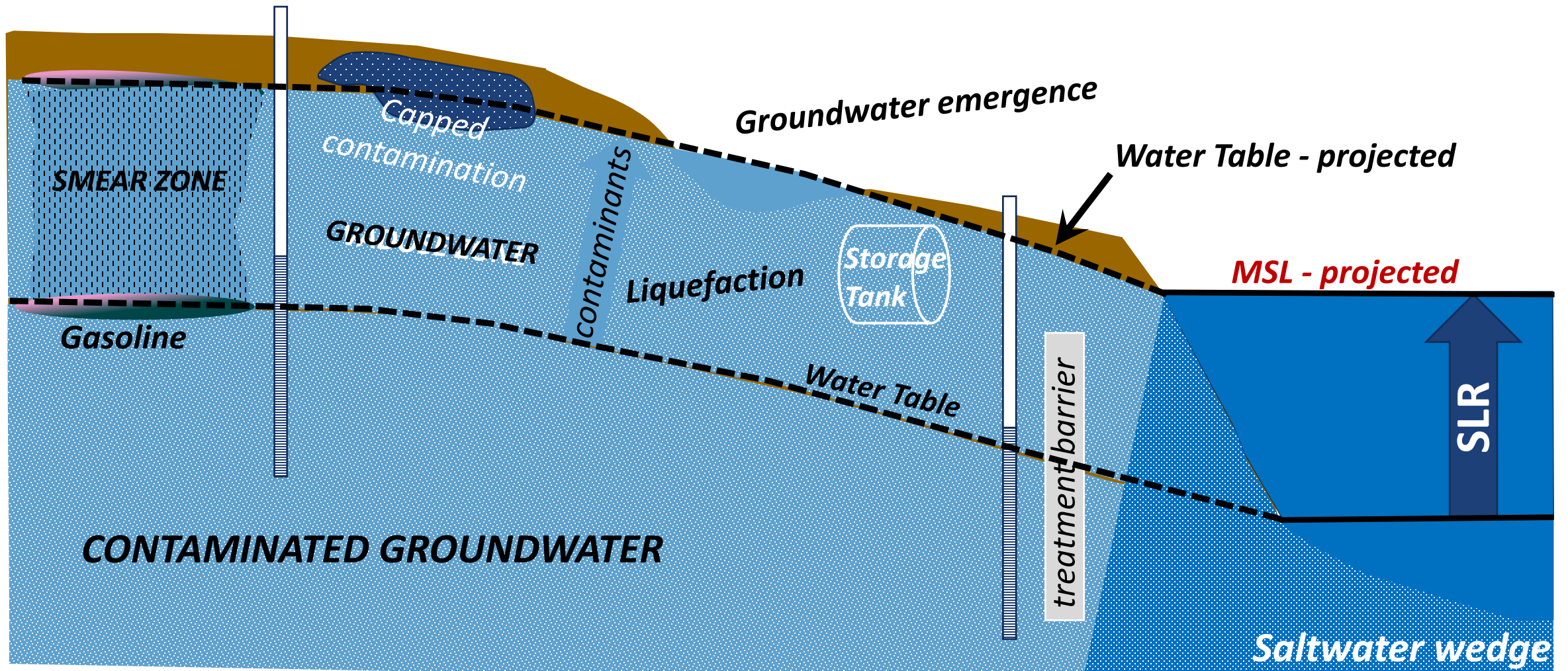
From: May et al. 2022



# Recent regulatory focus: SLR impacts on groundwater & contaminants

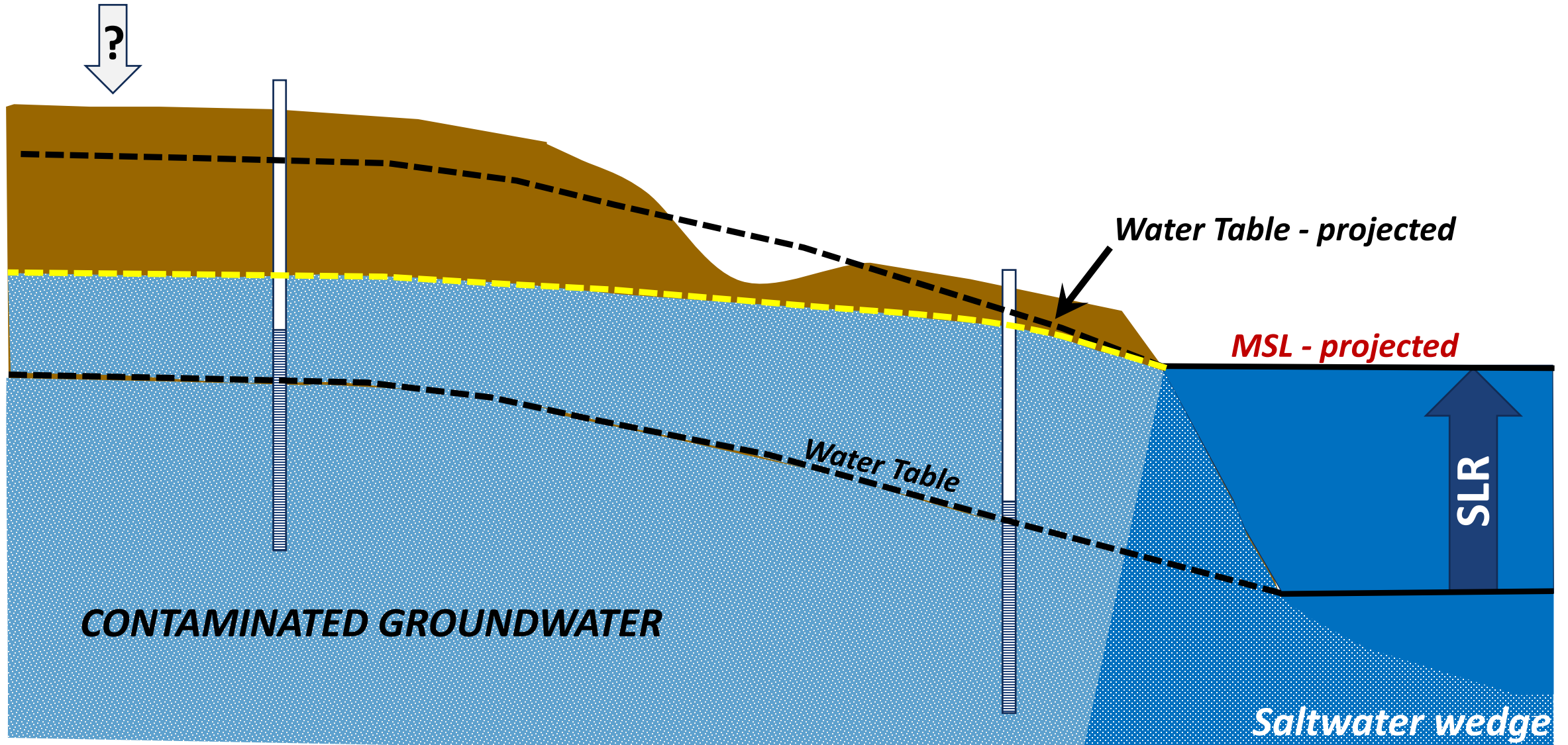


# SLR-induced groundwater rise may impact remediation sites and landfill integrity

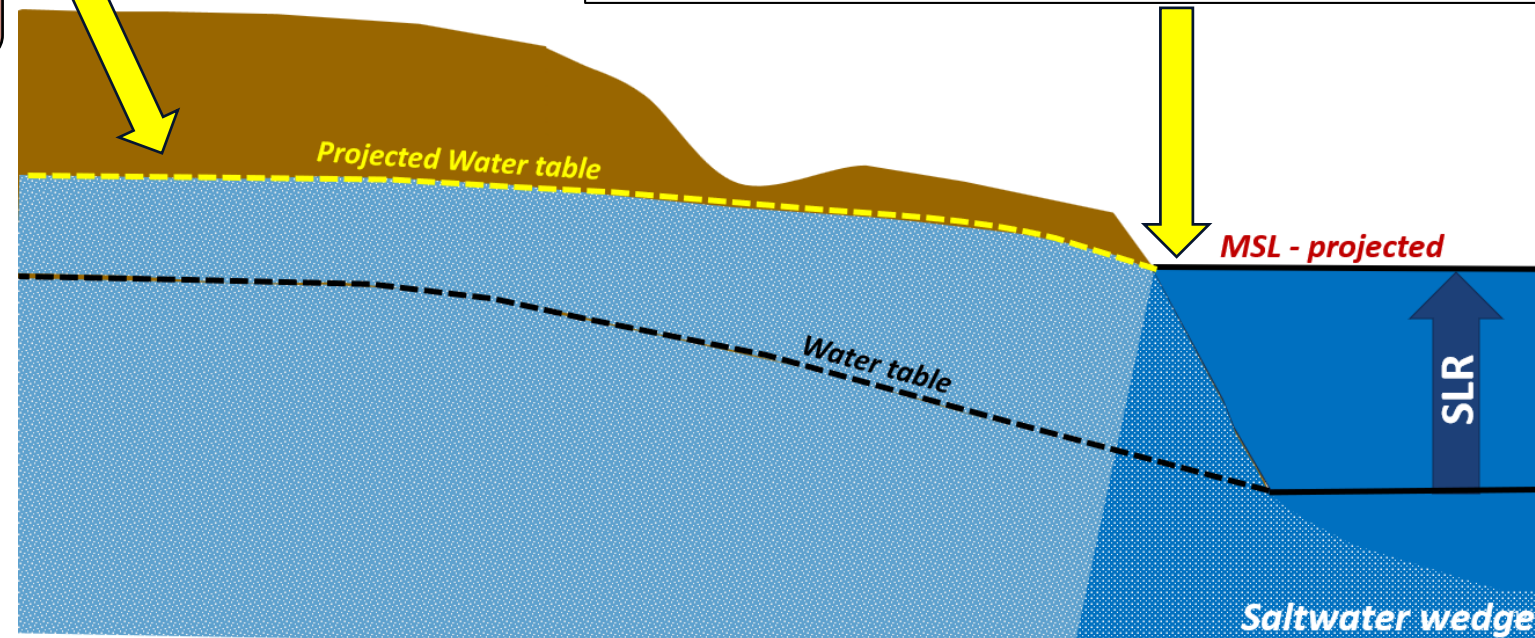
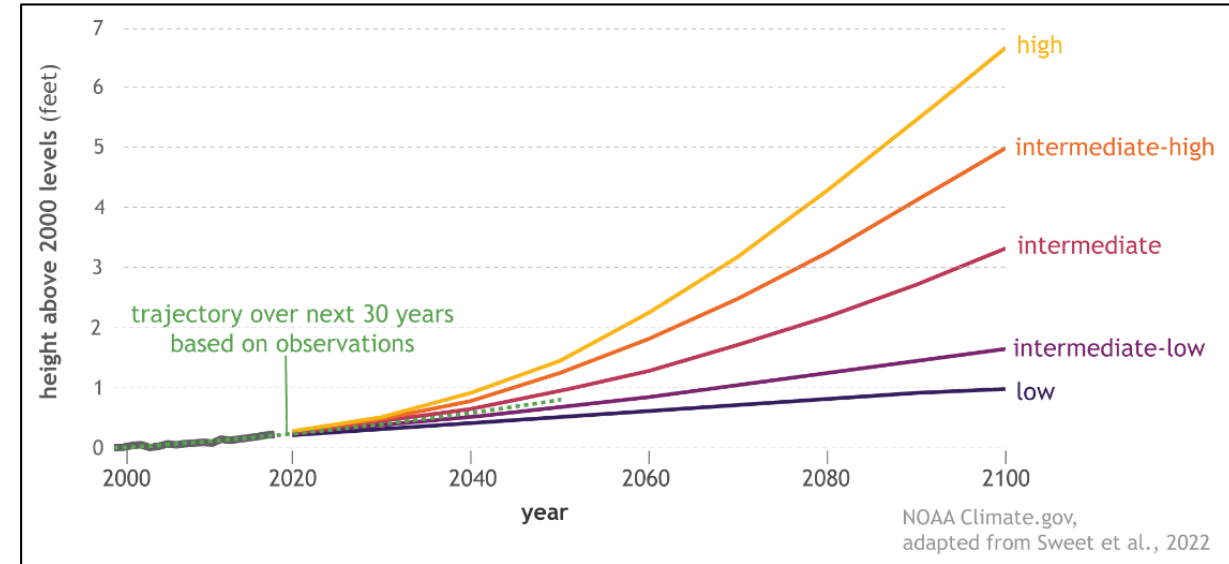
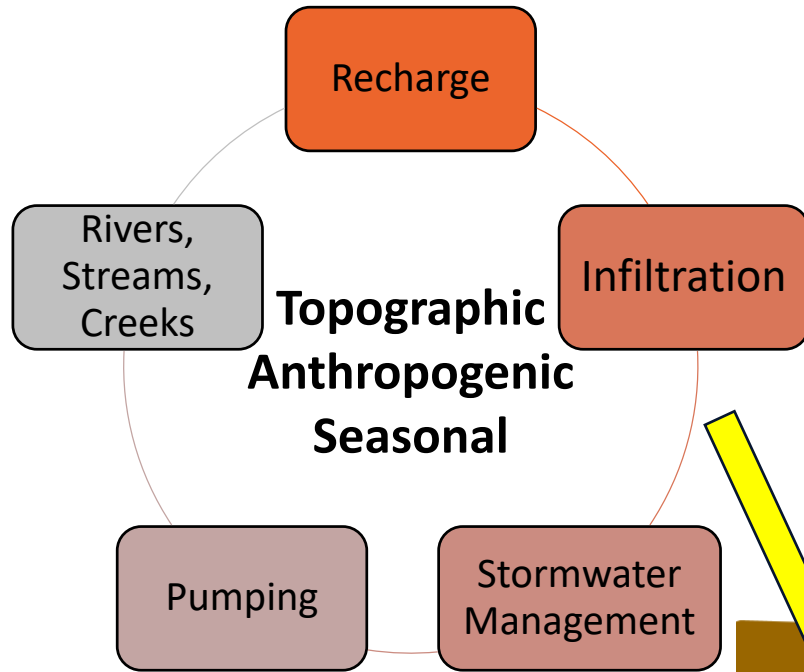


# Groundwater response to SLR is not linear

Regional Conditions



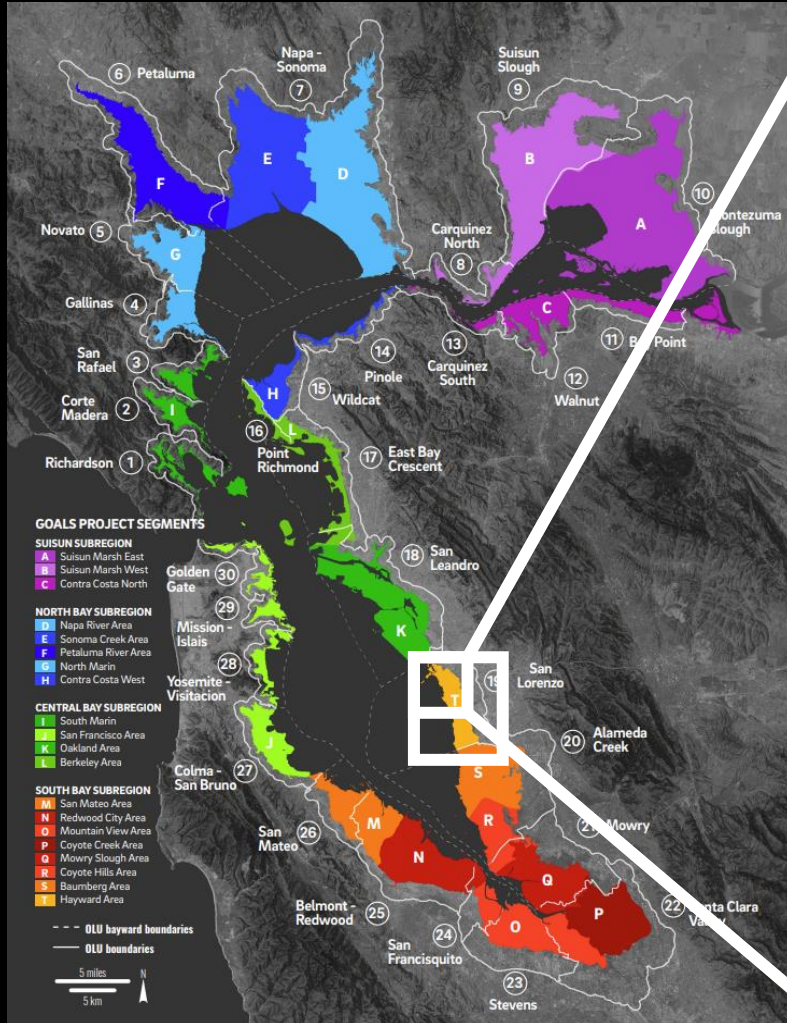
# Future boundary conditions for groundwater are highly uncertain



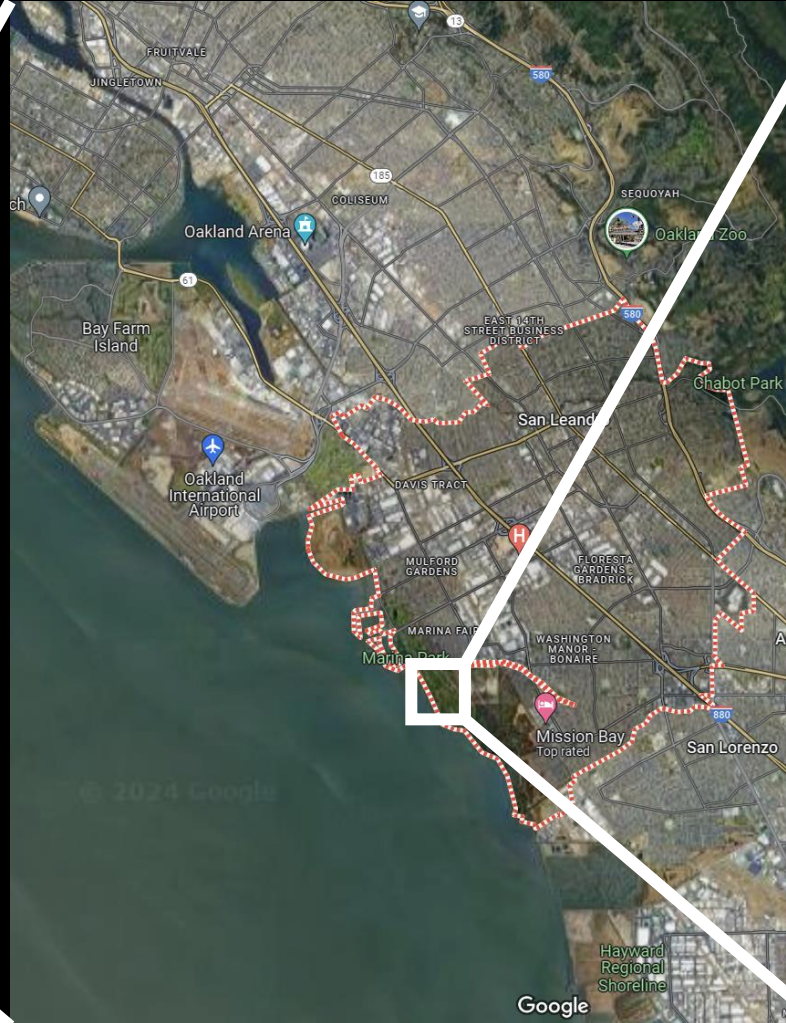


# Adaptation strategies required at multiple scales

San Lorenzo Operable Land Unit (OLU)



City of San Leandro



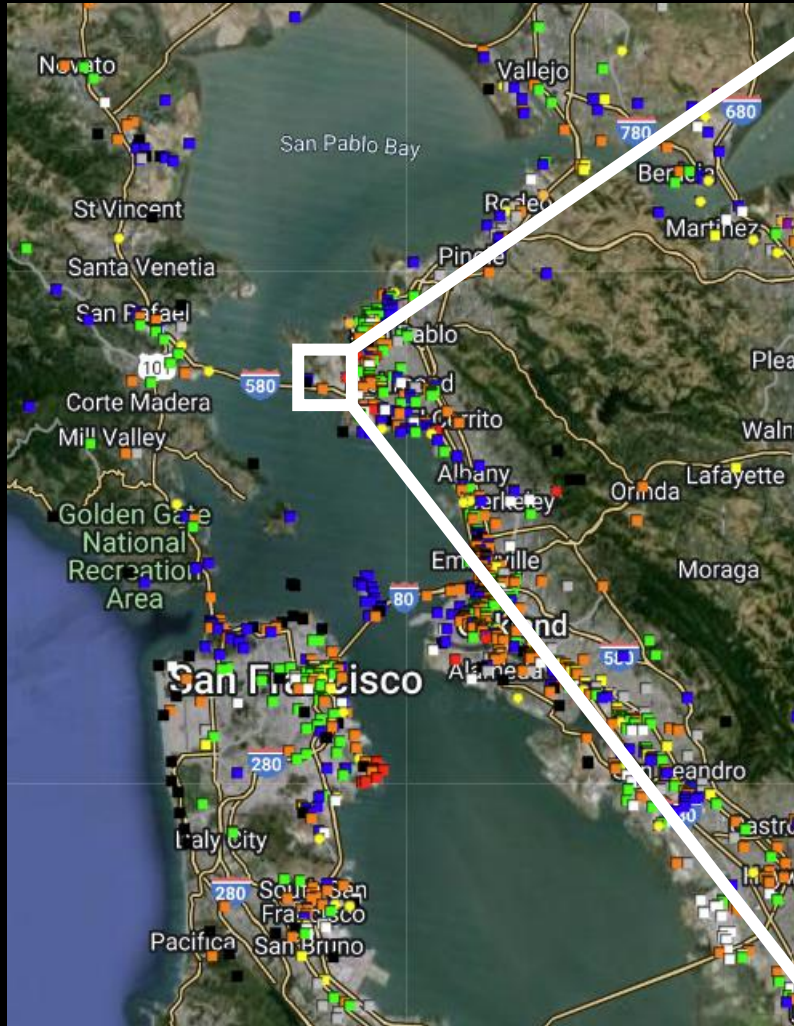
Coastal Landfill Site



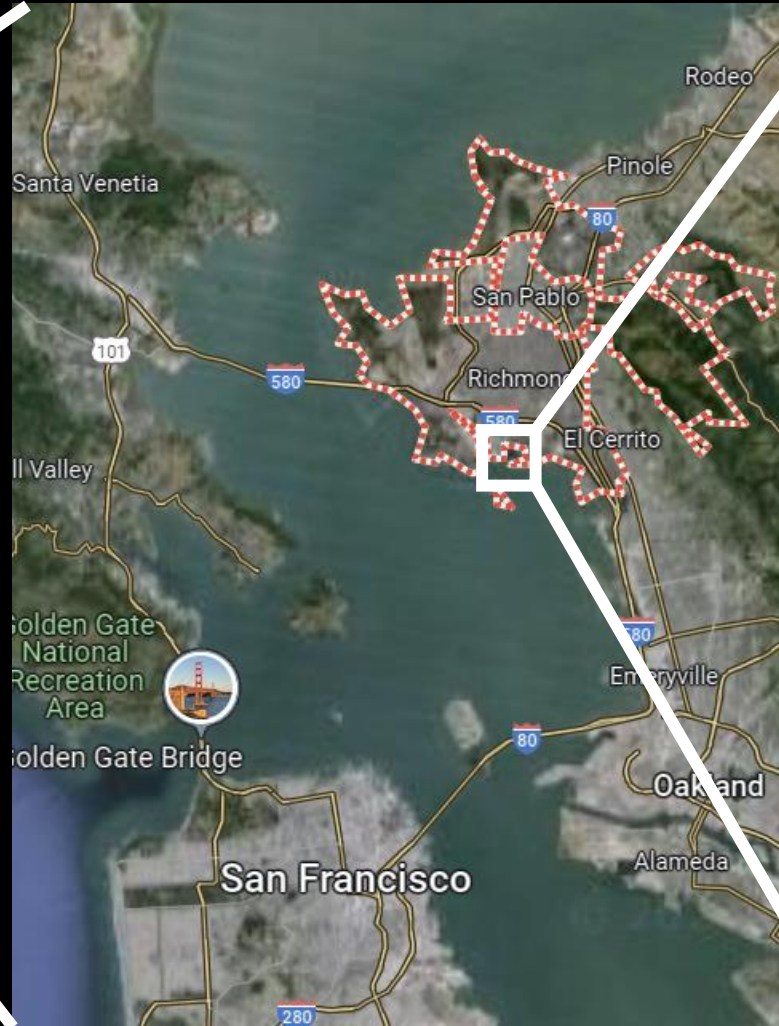


# Adaptation strategies required at multiple scales

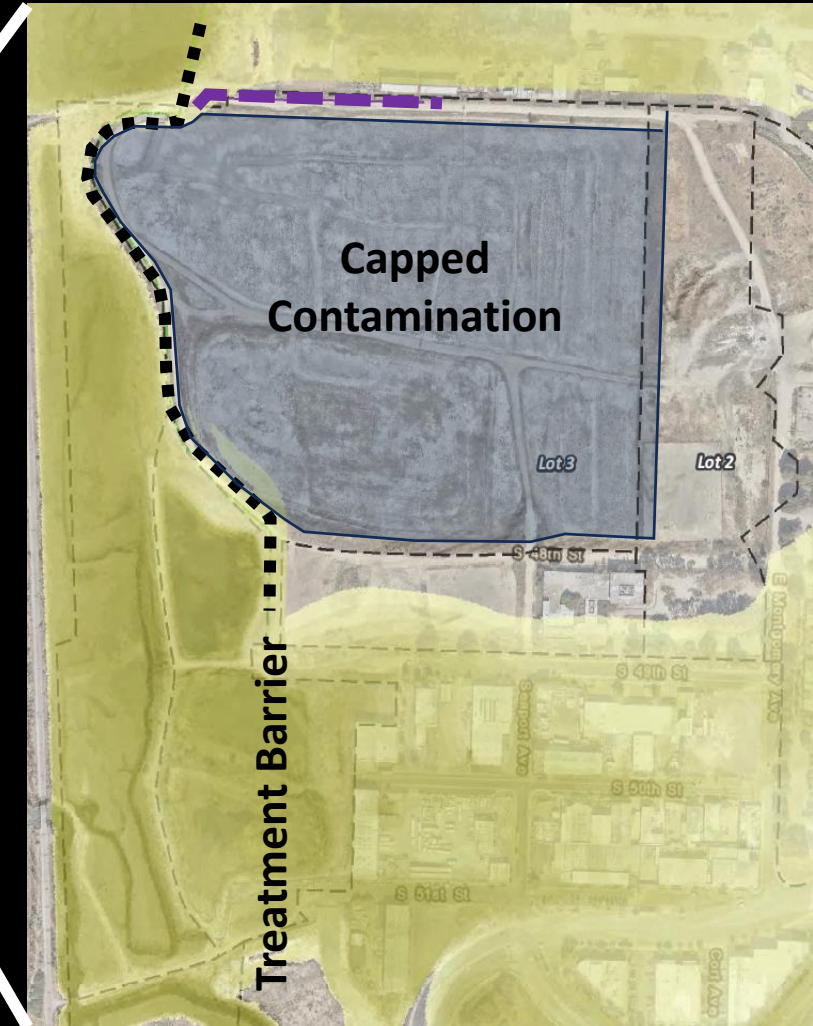
# East Bay Crescent OLU



# City of Richmond



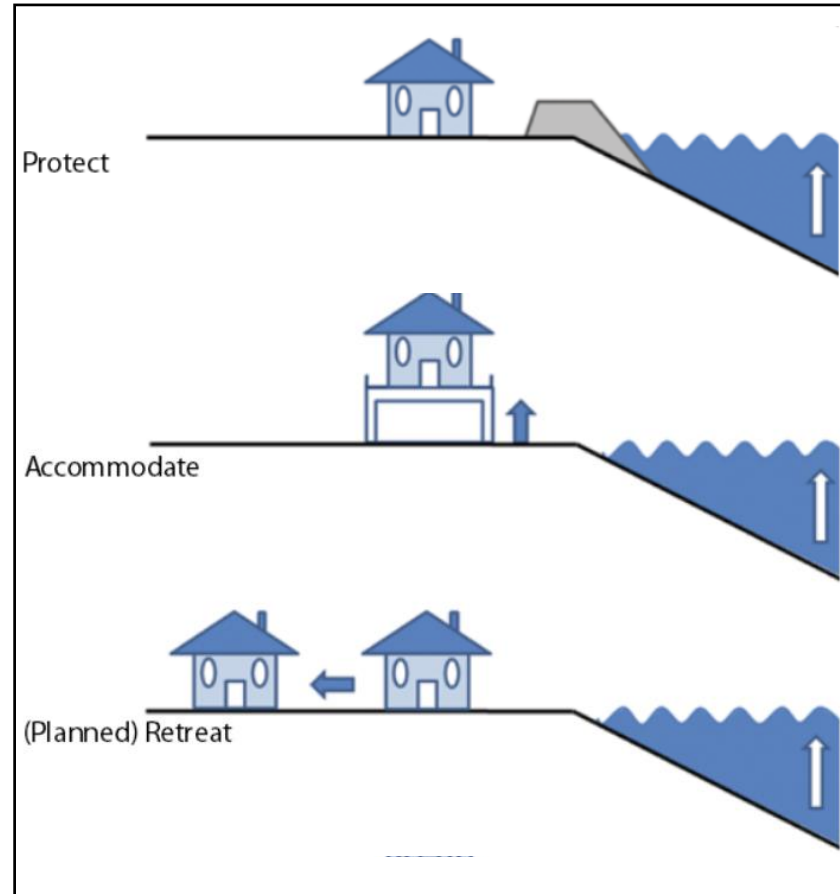
## Remediation Site



# Adaptation Strategies

## Surface Water Inundation

- Levees
- Raise structures, grades
- Green stormwater infrastructure
- Acquire and/or protect migration space

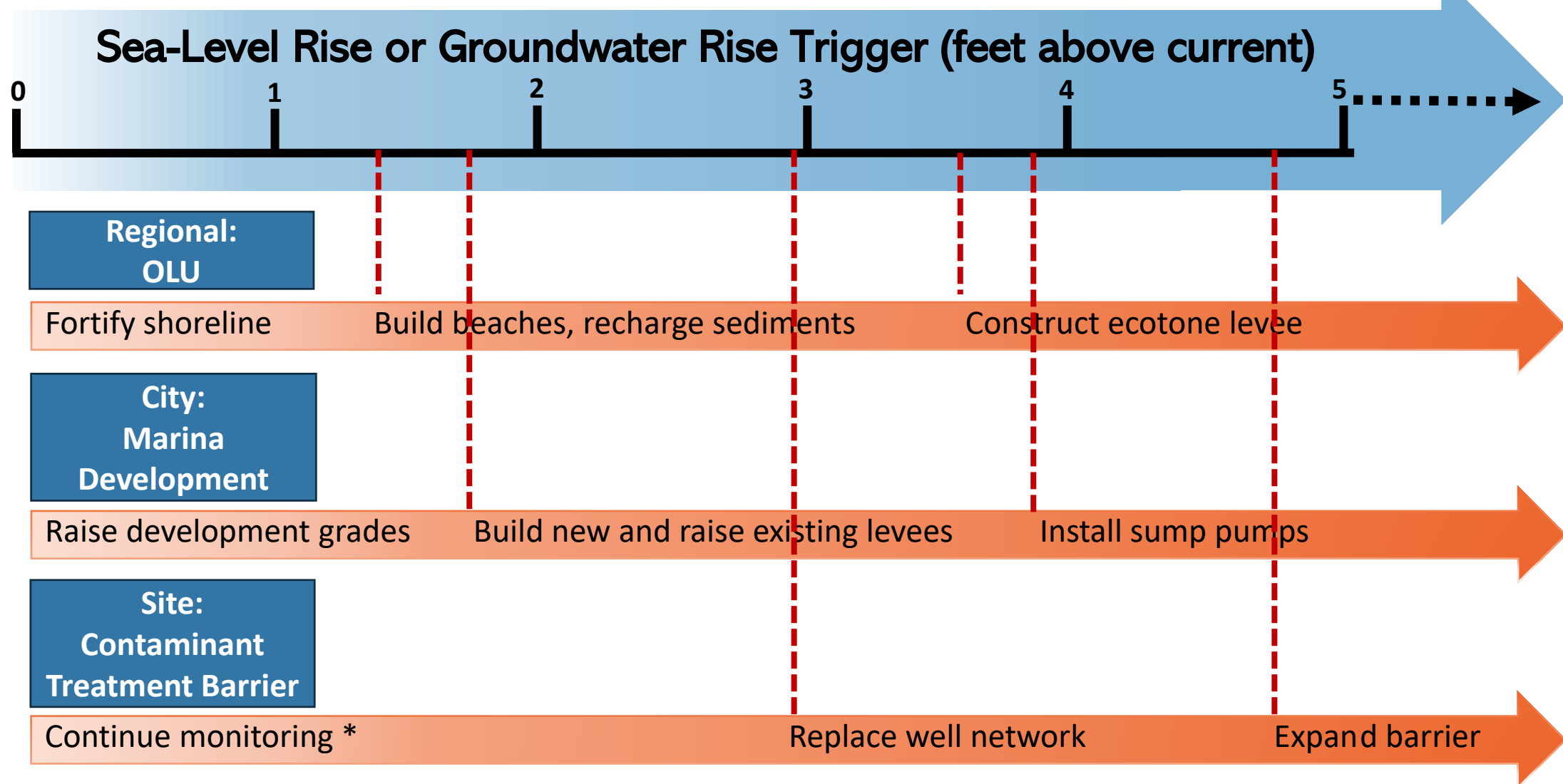


*Adapted From: IPCC Coastal Zone Management 1990*

## Groundwater Rise and Emergence

- Cutoff walls
- Extraction wells
- Re-engineer a treatment barrier

# Uncertainties create the need for phased adaptation strategies



\*subject to 5-year review and/or contingencies

# SLR adaptation solutions require site-specific phased approaches

## CHALLENGES

Groundwater typically not considered

Groundwater response is not linear

Varied scale of required adaptations

Remedy resilience at contaminated sites

High degree of uncertainty



## SOLUTIONS

Include in SLRVAs and adaptation plans

Conduct site-specific evaluations

Collaboration between stakeholders

Agency guidance and requirements

Phased adaptations based on triggers





# Thank you

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