East Bay Plain Subbasin Groundwater Sustainability Plan (GSP) Periodic Evaluation and Amendment

General Stakeholders Meeting

June 18, 2026

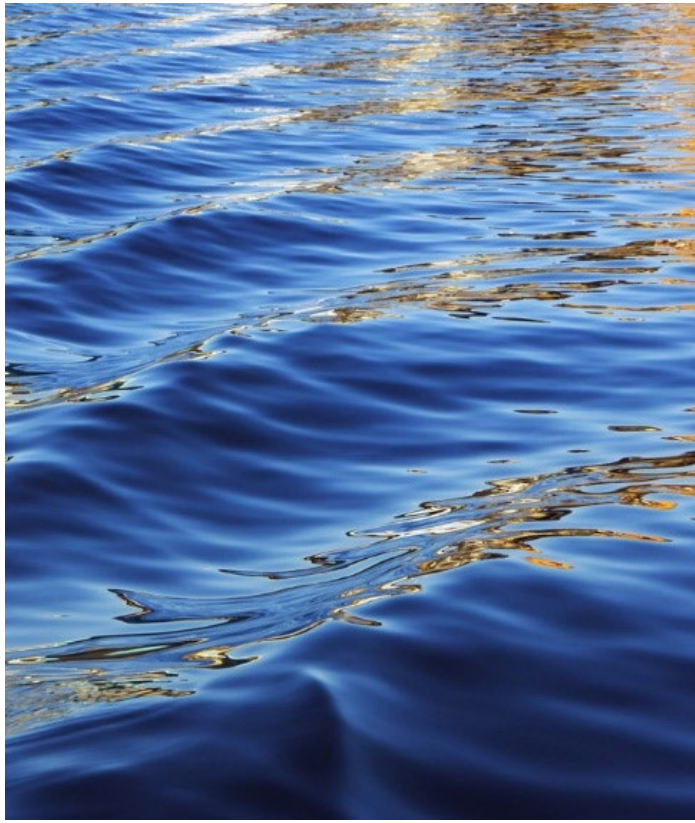
Meeting Objectives

- Discuss approach to evaluating potential future pumping impacts on coastal groundwater-dependent ecosystems (GDEs) and the simulation results
- Discuss approach to addressing Department of Water Resources' (DWR's) corrective action to estimate the quantity and timing of depletions of interconnected surface water (ISW)
- Gather input from stakeholders

Agenda

- Welcome & Introductions
- East Bay Plain Subbasin GSP Background
- Groundwater Modeling Scenarios
- GDEs Simulation Setup & Results
- ISW Simulation Methodology
- Comments & Questions
- Next Steps
- DWR Updates

East Bay Plain Subbasin GSP Background

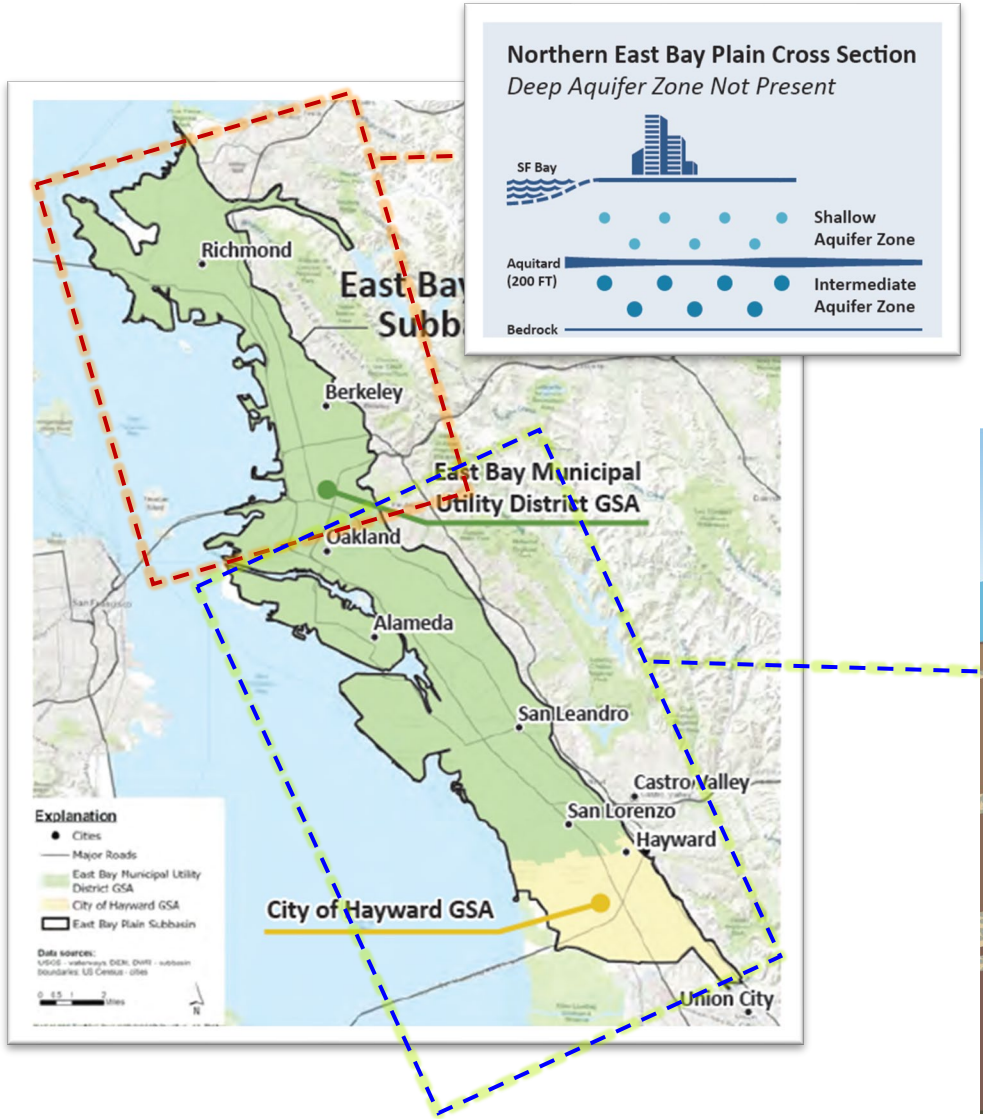


East Bay Plain Subbasin

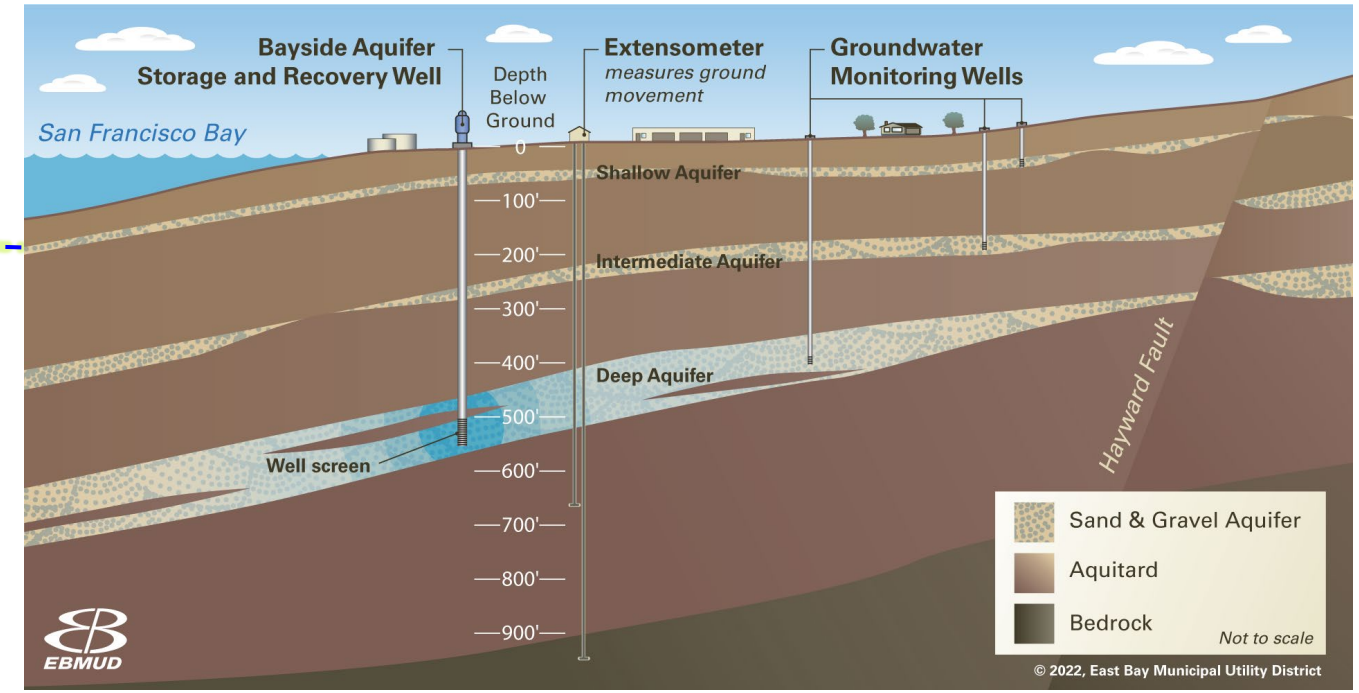
- East Bay Plain (EBP) Subbasin is managed by EBMUD GSA and the City of Hayward GSA
- Medium-priority basin
- Primarily urban (94%)
- Limited groundwater pumping of around 3,600 acre-feet annually, primarily for irrigation and industrial uses
- 2022 EBP Subbasin GSP approved by DWR in July 2023 with 9 recommended corrective actions
- Subbasin is sustainable under current conditions relative to the six sustainability indicators

EBMUD: East Bay Municipal Utility District
GSA: Groundwater Sustainability Agency

EBP Subbasin Cross-Section

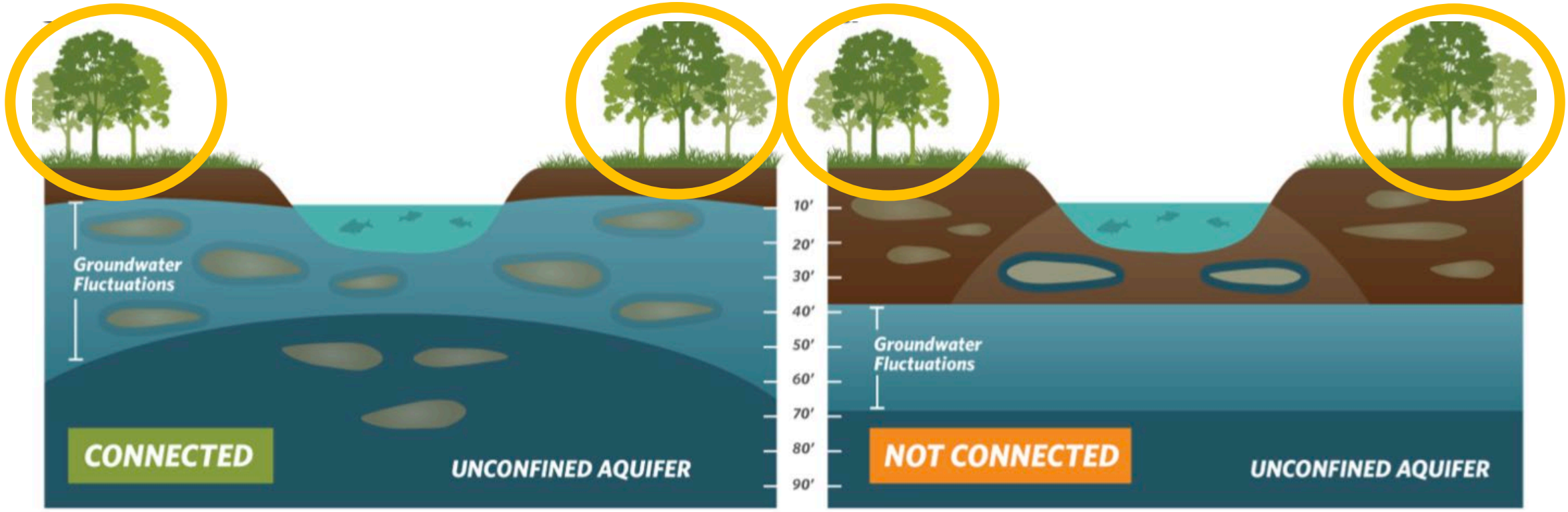


- Three Principal Aquifers: Shallow, Intermediate, and Deep
- Most pumping occurs in the Intermediate and Deep Aquifers
- SF Bay only connects to upper portion of Shallow Aquifer
- Aquitards protect Intermediate and Deep Aquifers from seawater intrusion and shallow groundwater impacts



What is a Groundwater Dependent Ecosystem?

GDEs are specifically defined under SGMA as "ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (23 CCR § 351(m)).



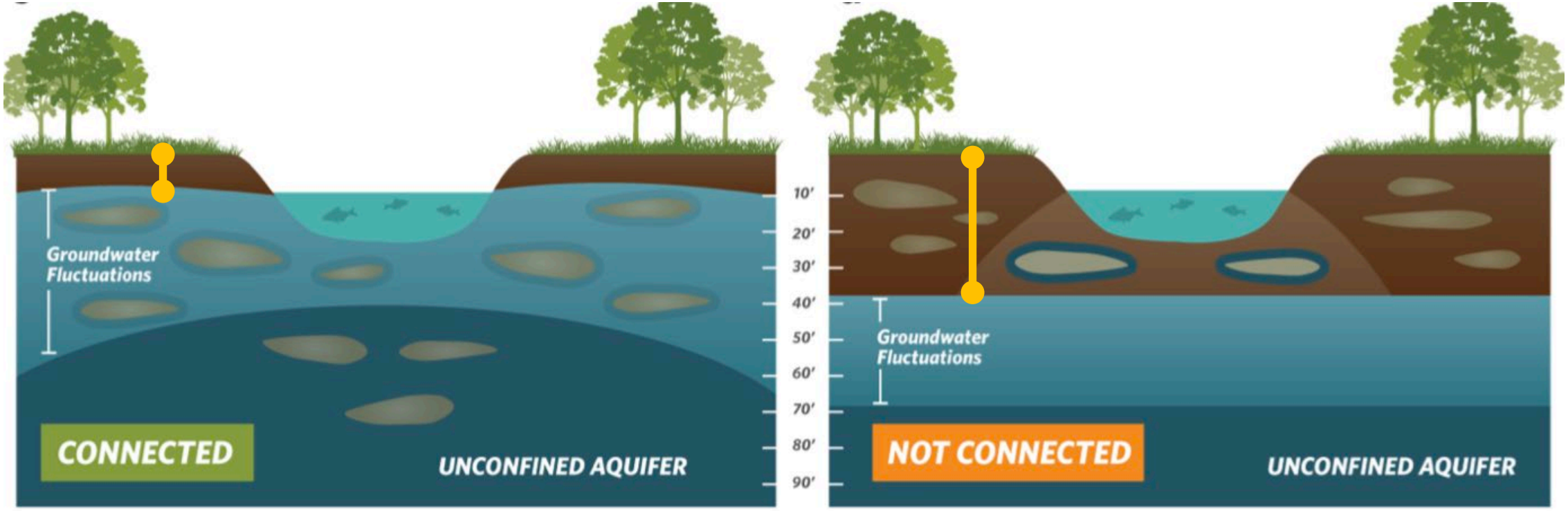
Figures from The Nature Conservancy (2019)

SGMA: Sustainable Groundwater Management Act

Is it a GDE?

Besides vegetation type there are two key measures:

- Depth to groundwater (DTG)
- Plant rooting depth



Figures from The Nature Conservancy (2019)

Why Map Groundwater Dependent Ecosystems?

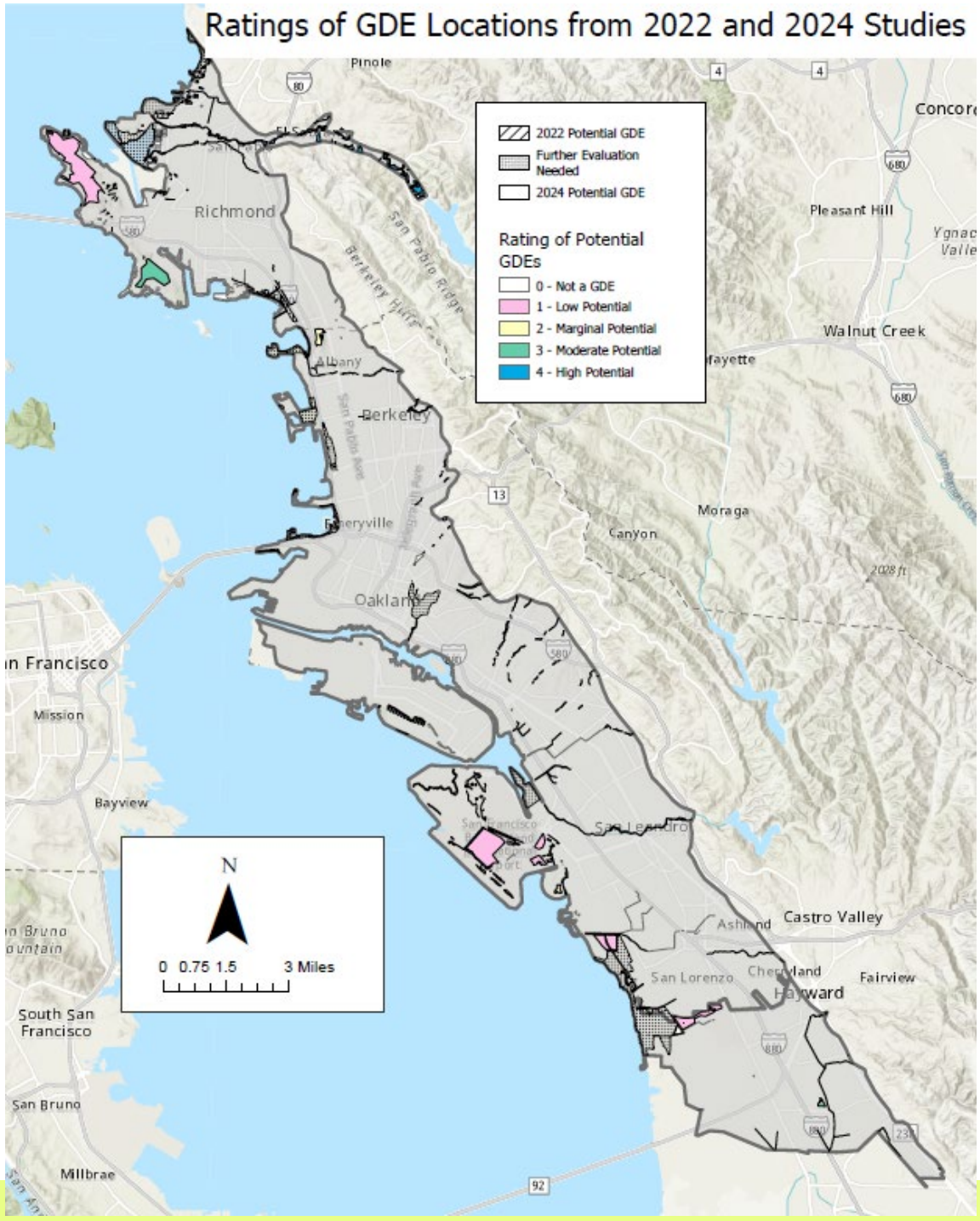
SGMA requires that the interests of all beneficial uses and users, including environmental users of groundwater, be considered in the development and implementation of GSPs (Water Code § 10723.2).

Regulations include specific requirements for GSPs to identify GDEs and consider them when determining whether groundwater conditions are having potential effects on beneficial uses and users.

GSAs must also assess whether sustainable management criteria (including minimum thresholds and measurable objectives) may affect the interests of beneficial uses and users of groundwater such as GDEs.

EBP Subbasin GDEs Studies

- 2022 EBP GSP identified potential GDEs using available GDE datasets and the methodology in the 2018 TNC guidance document
- In 2024, GSAs contracted with Environmental Science Associates (ESA) to conduct a biological study and refine potential GDE areas
  - Field surveys performed and desktop mapping analysis considered newer GDE datasets
  - Potential GDE areas rated for likelihood of being groundwater dependent
  - Additional potential "coastal GDEs" located near the Bay are currently being further evaluated



EBP Subbasin GDEs Studies

2024 Study Approach – How we Identify/Classify GDEs

Multiple Datasets used to identify potential GDEs

- National Wetlands Inventory (NWI)
- Natural Communities Commonly Associated with Groundwater (NCCAG)
- Alameda County Flood Control & Water Conservation District
- Global Groundwater Dependent Ecosystems map

Desktop GIS review and field surveys to refine potential GDE mapping

Assign Depth to Groundwater (DTG) at each potential GDE

Modeled DTG for period between 1990 and 2015 (monthly timestep)

GDE Classification Exercise

EBP Subbasin GDEs Studies

2024 Study Approach – How we Identify/Classify GDEs

Classification Scheme

GDE Classification	Criteria
0 - "Not GDE"	Survey or aerial imagery showed area is developed or concrete-lined channels
1 - "Low Potential"	Only one data source indicates potential GDE, or other info such as aerial imagery suggests unlikely GDE
2 - "Marginal Potential"	At least one data source shows the area as a potential GDE, but with little corroborating evidence from subjective data sources like aerial imagery.
3 – "Moderate Potential"	Two or three data sources show the area as a potential GDE.
4 – "High Potential"	There was agreement between at least three data sources and the potential GDE polygon was field verified.

Data Sources

- Datasets from previous slide
- Aerial Imagery
- Observed or simulated groundwater levels needed to be within 100 feet below ground surface (BGS) for each month from water year 1990 to 2015
- Maximum rooting depths of dominant plant species had to exceed the minimum depth to groundwater (DTG) within each polygon during the growing season
- Field surveys

*Low confidence of GDE potential (score of 1 to 2) does not indicate the absence of a GDE. *Only polygons rated 0 confirmed as not GDEs.
*Coastal GDEs identified as "potential GDEs requiring further evaluation"

Interconnected Surface Water (ISW)

ISW is defined under SGMA as "surface water that is hydrologically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted" (23 CCR § 351(o))

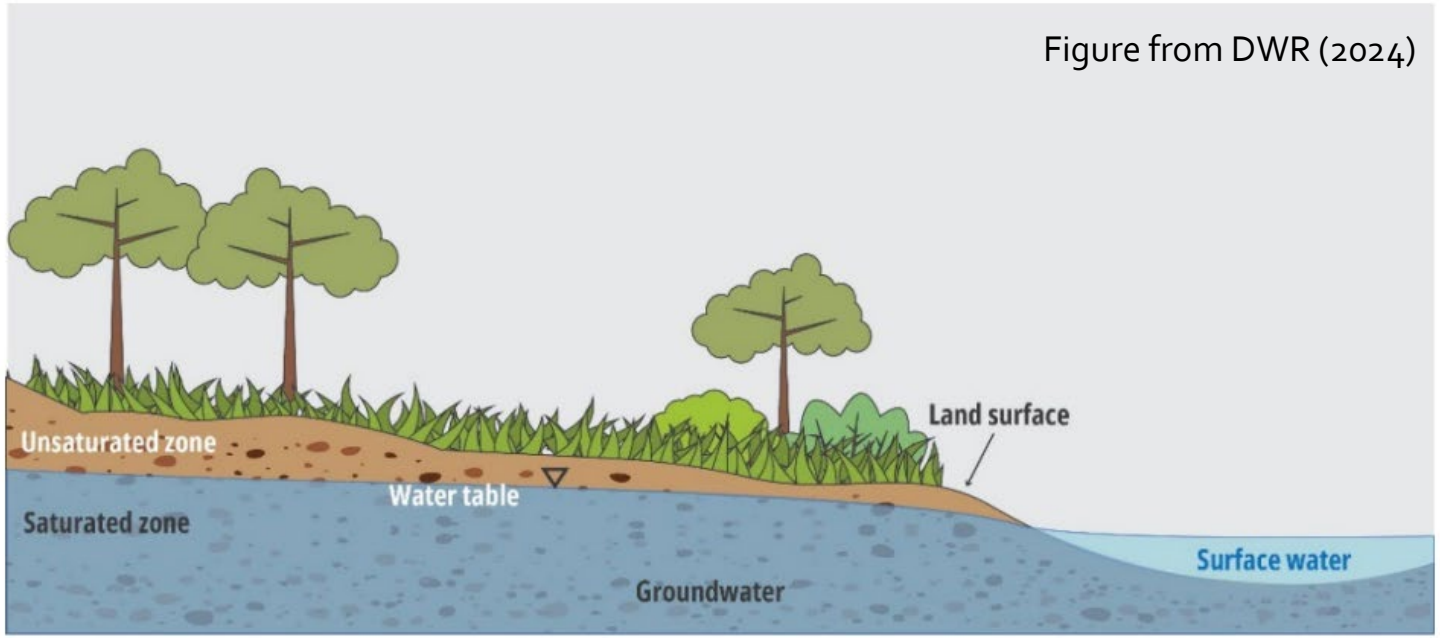


Figure from DWR (2024)

SGMA identifies that an undesirable result occurs if groundwater pumping in a basin causes depletions of ISW that significantly and unreasonably impact beneficial uses of the surface water

EBP Subbasin ISW Depletion Sustainable Management Criteria (SMC)

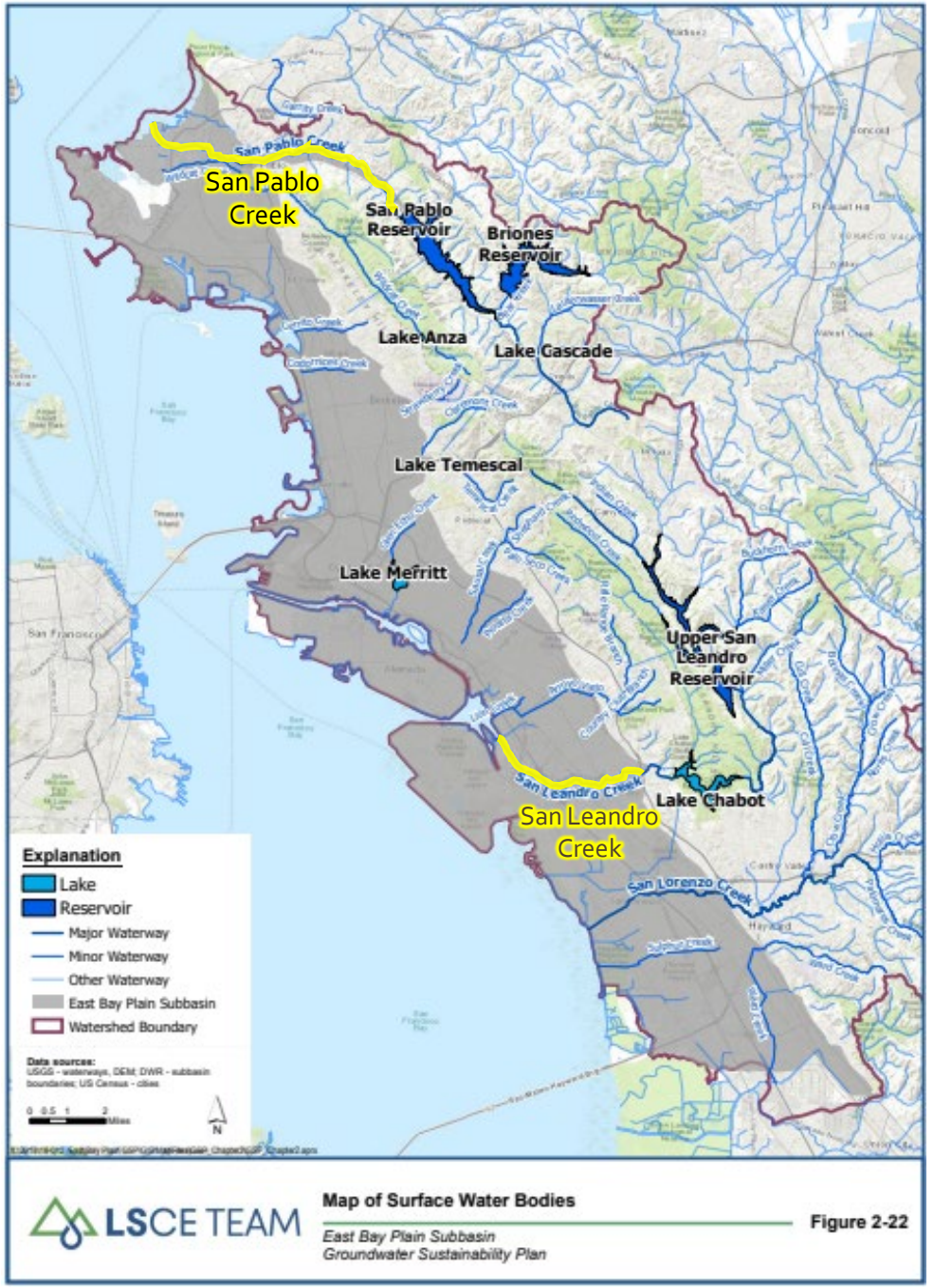
2022 GSP ISW Depletion SMC

Measurable Objectives (MO)	Interim Minimum Threshold (MT)	Undesirable Results	Objectives Currently Met
Low end of model-derived range of groundwater level fluctuations in Shallow aquifer near creeks	2 feet below MO	More than 50% of representative monitoring wells exceed MT for two consecutive spring measurements	✓

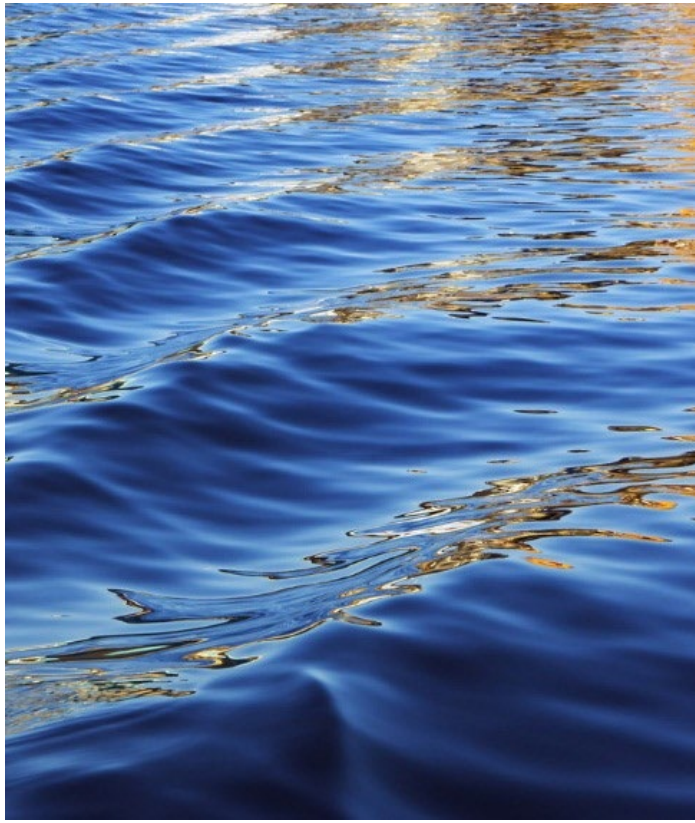
- DWR ISW corrective actions for 2022 GSP
  - Identify ISW systems and estimate the quantity and timing of depletions
  - Consider utilizing the ISW guidance, as appropriate, when issued by the DWR to establish quantifiable minimum thresholds, measurable objectives, and management actions
  - Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing.
- Draft ISW white papers released in 2024, with a draft guidance document expected later in 2026

EBP Subbasin ISW Characterization Status

- In 2023, LSCE Team completed the stream isotope study of San Pablo and San Leandro Creeks
  - San Pablo Creek is a gaining stream with inputs from ~20-years old groundwater and imported water below I-80
  - San Leandro Creek is mostly a losing stream, with Lake Chabot releases, runoff, and imported water supplying its flow
- In 2022 GSP, up to 10 shallow monitoring wells may be installed (50 ft deep) near San Pablo and San Leandro creeks; none completed yet
- As part of GSP updates, available data to determine locations and number of wells needed to best fill this data gap is being evaluated



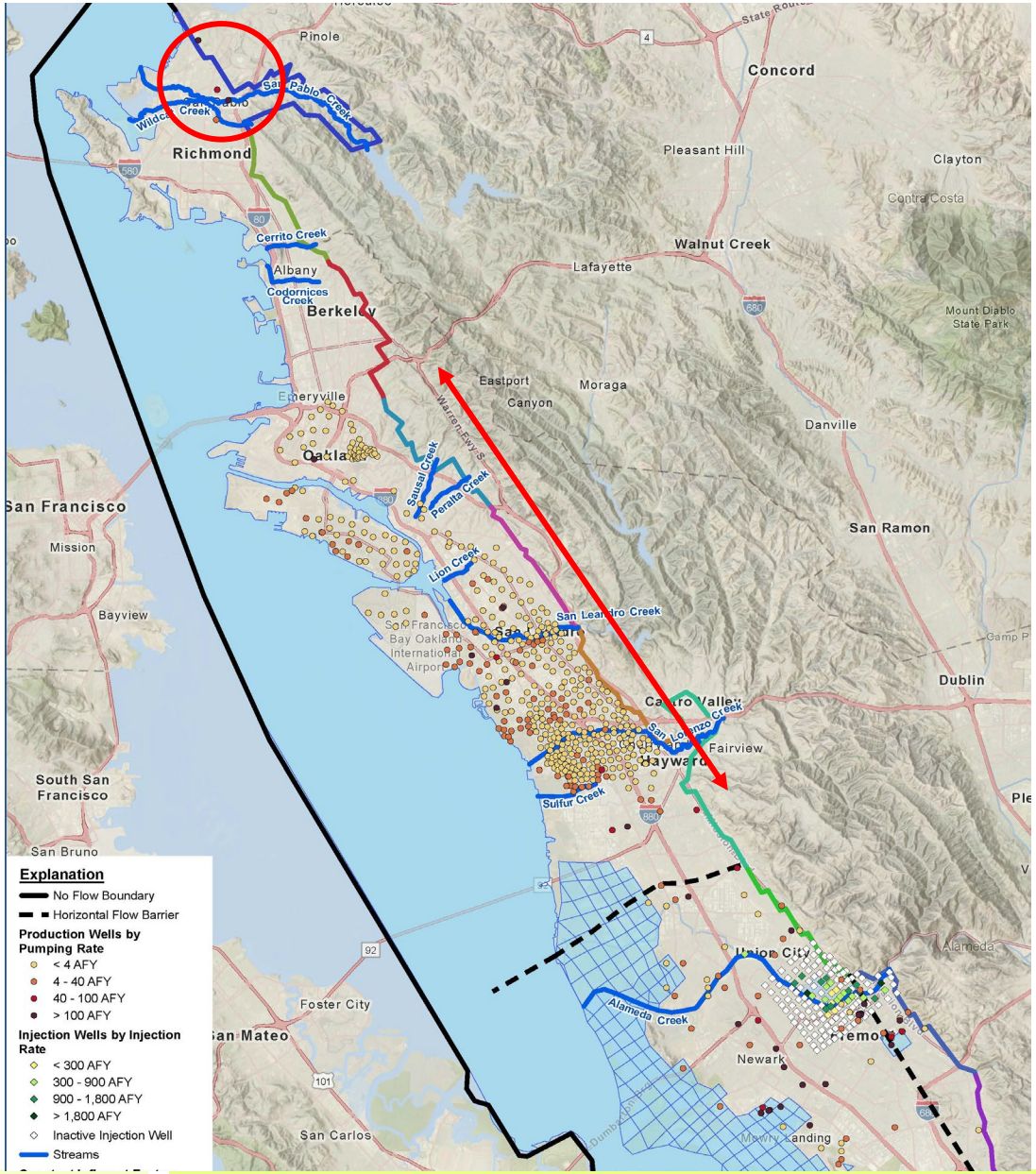
Groundwater Modeling Scenarios



EBP Subbasin Groundwater Model

- Developed for GSP submitted in January 2022
- Model layering simulates three aquifers (Shallow, Intermediate, and Deep) with 12 model layers
- Model grid squares are 1,000 by 1,000 feet
- San Francisco Bay represented as constant head boundary (with linear rise in sea level for future time period)
- Mountain front recharge from East Bay Hills

EBP Subbasin Groundwater Model



- Dots show location of existing production wells
- Vast majority of wells are very small residential irrigation wells
- Three production wells in Richmond/San Pablo area in far northern portion of subbasin (in red circled area)
- Remaining wells located in Oakland or further south (in area of red double-sided arrow)

Baseline Scenario – Future Existing Use of Groundwater

- Continue existing use of groundwater in the future
- Sea level rise of two feet between 2025 and 2075
- Groundwater recharge same as historical
- 50-Year future simulation period

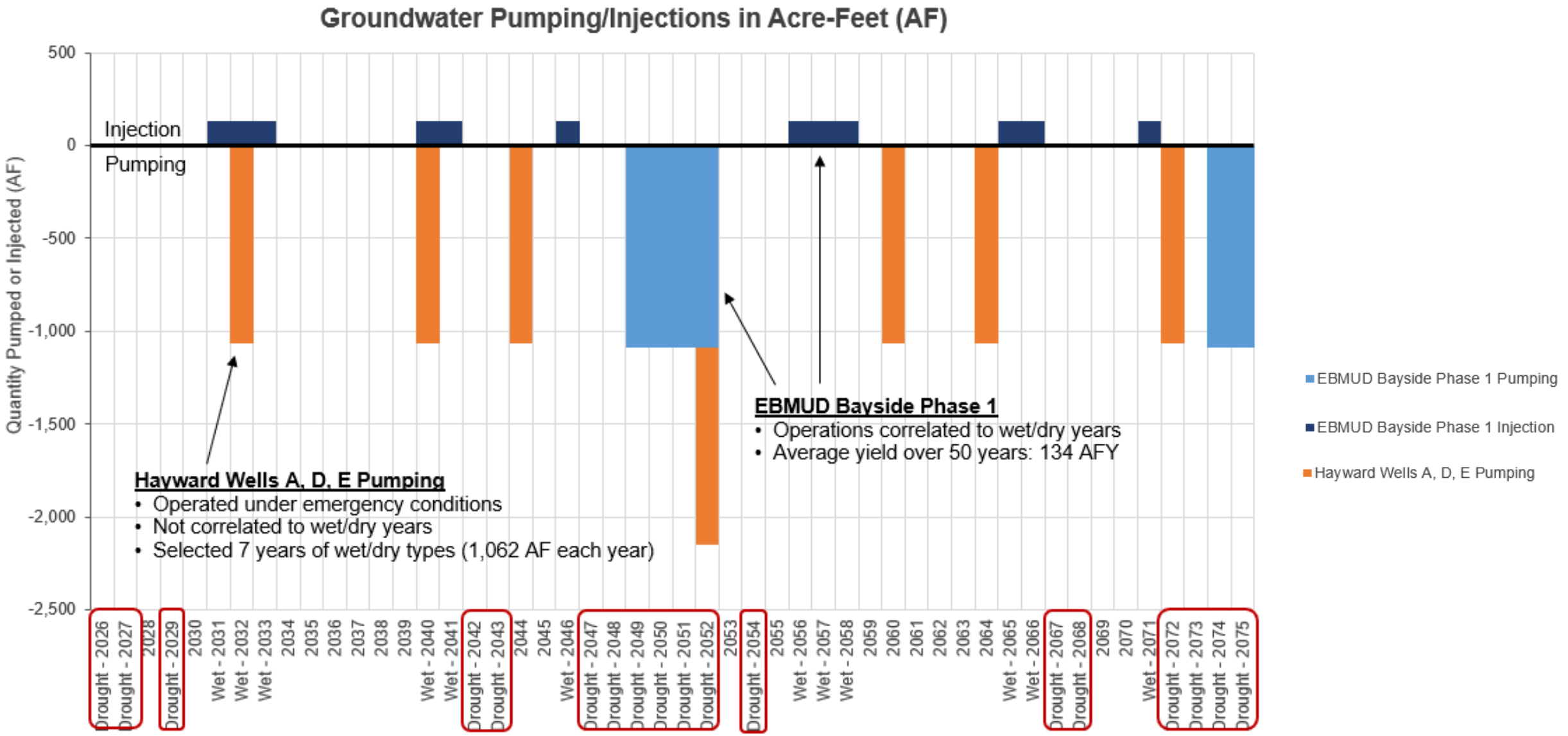
Model Scenario – Future Potential Additional Use of Groundwater

Operation of EBMUD Bayside Phase 1 Replacement Well for Injection (wet years) and Extraction (drought 3+ years)

Operation of Hayward Emergency Supply Wells A, D, and E

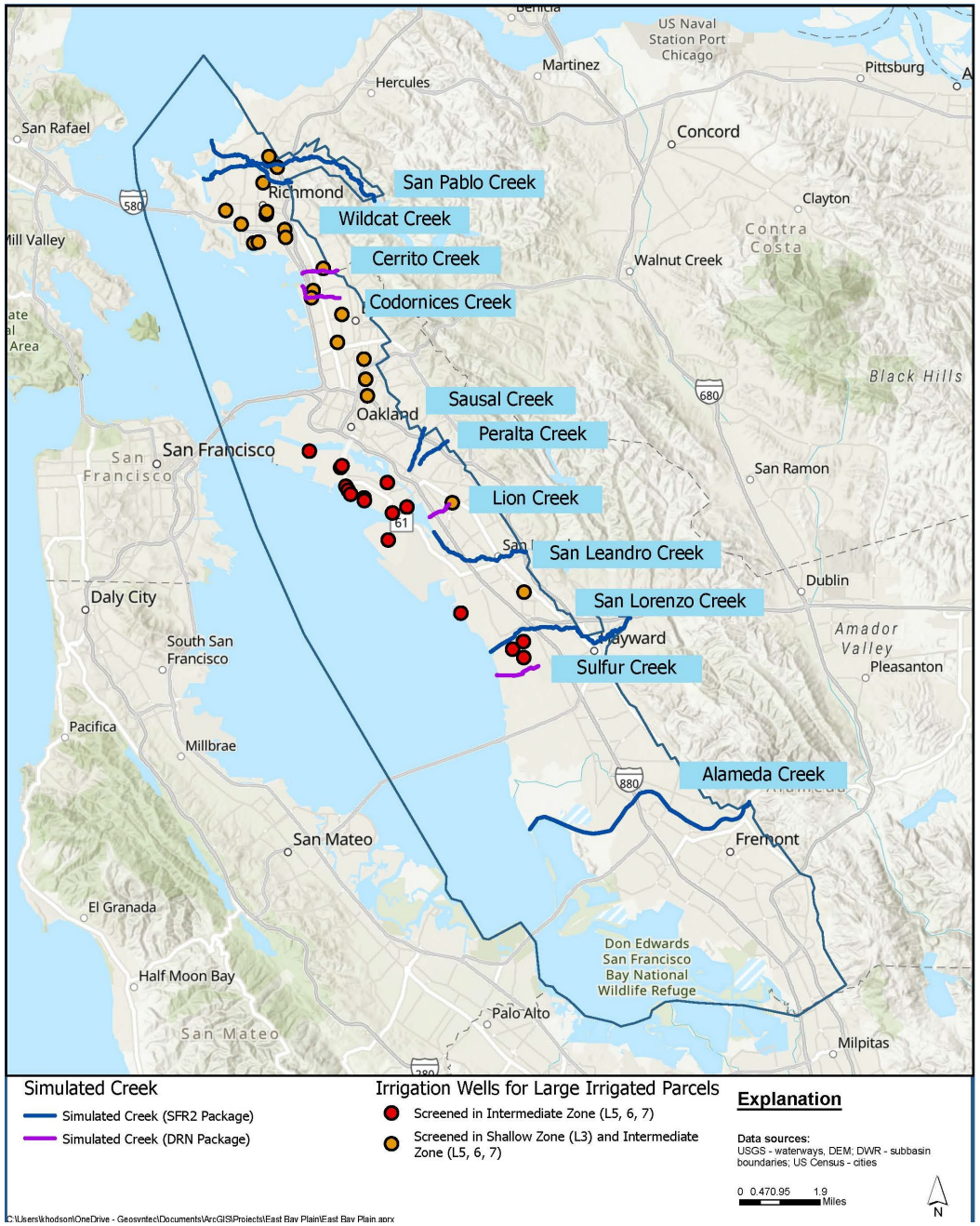
Large EBMUD irrigated parcels switch from surface water to groundwater

EBMUD supplemental groundwater supply for San Leandro Creek to enhance stream conditions


Groundwater Pumping/Injections in Acre-Feet (AF)
Quantity Pumped or Injected (AF)
500
0
-500
-1,000
-1,500
-2,000
-2,500
Injection
Pumping
Hayward Wells A, D, E Pumping
• Operated under emergency conditions
• Not correlated to wet/dry years
• Selected 7 years of wet/dry types (1,062 AF each year)
EBMUD Bayside Phase 1
• Operations correlated to wet/dry years
• Average yield over 50 years: 134 AFY
Drought - 2026
Drought - 2027
2028
Drought - 2029
2030
Wet - 2031
Wet - 2032
Wet - 2033
2034
2035
2036
2037
2038
2039
Wet - 2040
Wet - 2041
Drought - 2042
Drought - 2043
2044
2045
Wet - 2046
Drought - 2047
Drought - 2048
Drought - 2049
Drought - 2050
Drought - 2051
Drought - 2052
2053
Drought - 2054
2055
Wet - 2056
Wet - 2057
Wet - 2058
2059
2060
2061
2062
2063
2064
Wet - 2065
Wet - 2066
Drought - 2067
Drought - 2068
2069
2070
Wet - 2071
Drought - 2072
Drought - 2073
Drought - 2074
Drought - 2075
EBMUD Bayside Phase 1 Pumping
EBMUD Bayside Phase 1 Injection
Hayward Wells A, D, E Pumping

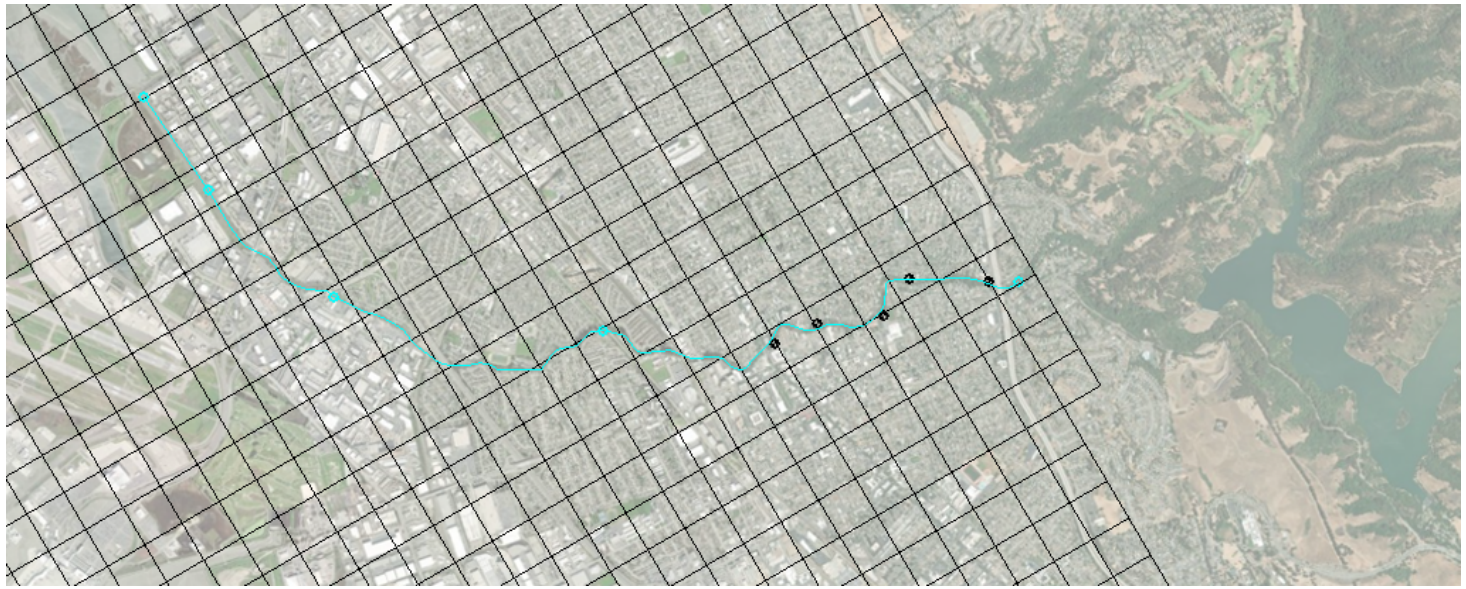
Large Irrigated Parcels

- Several parcels comprising 223 acres located throughout Subbasin
- Combined total groundwater pumping of 781 AFY with wells operating only during 6-month dry season (April – Sept)
- New irrigation wells pump primarily from Intermediate/Deep Aquifers with some Shallow Aquifer pumping in certain areas (especially northern portion of subbasin)

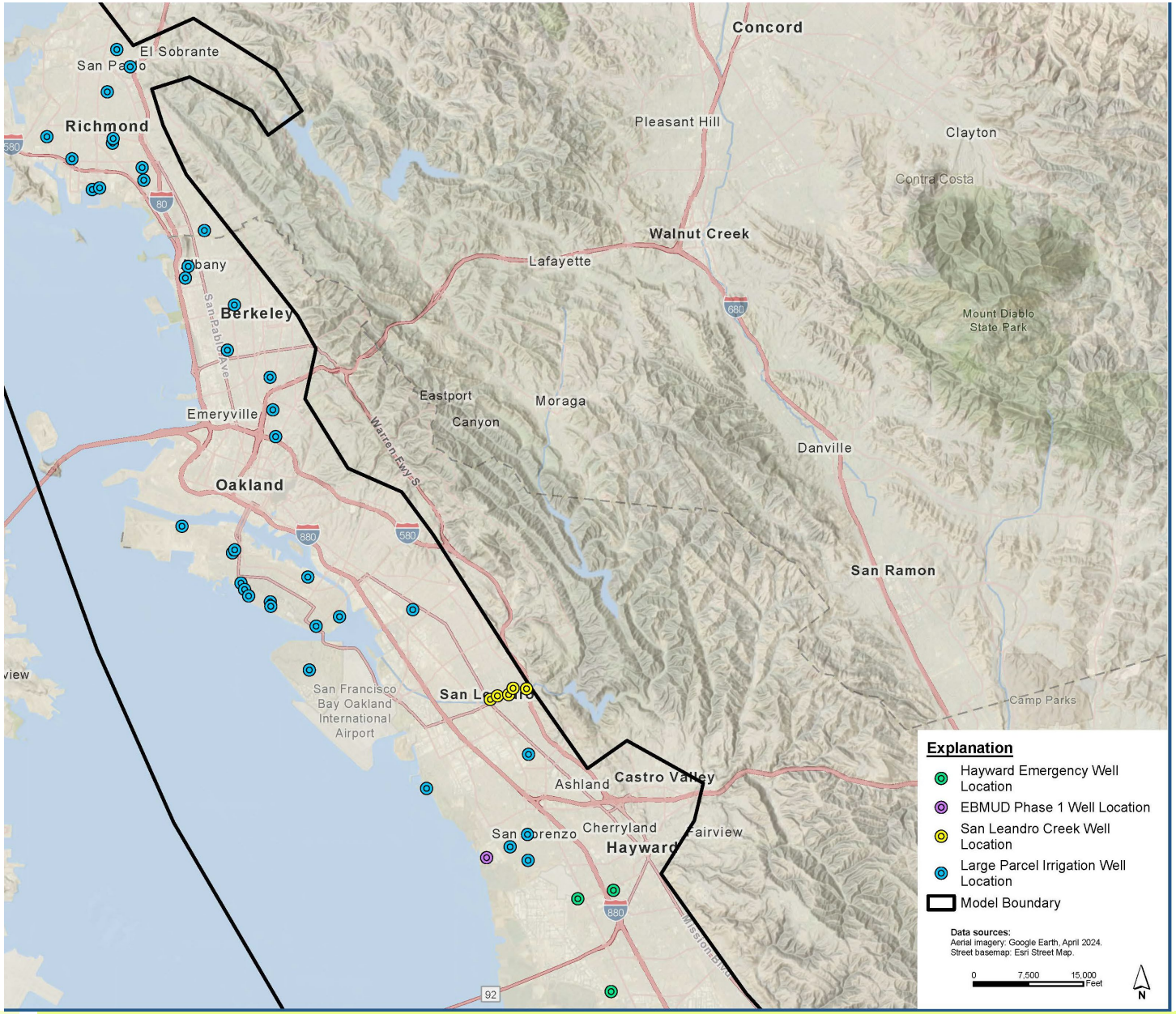


San Leandro Creek Supplemental Pumping

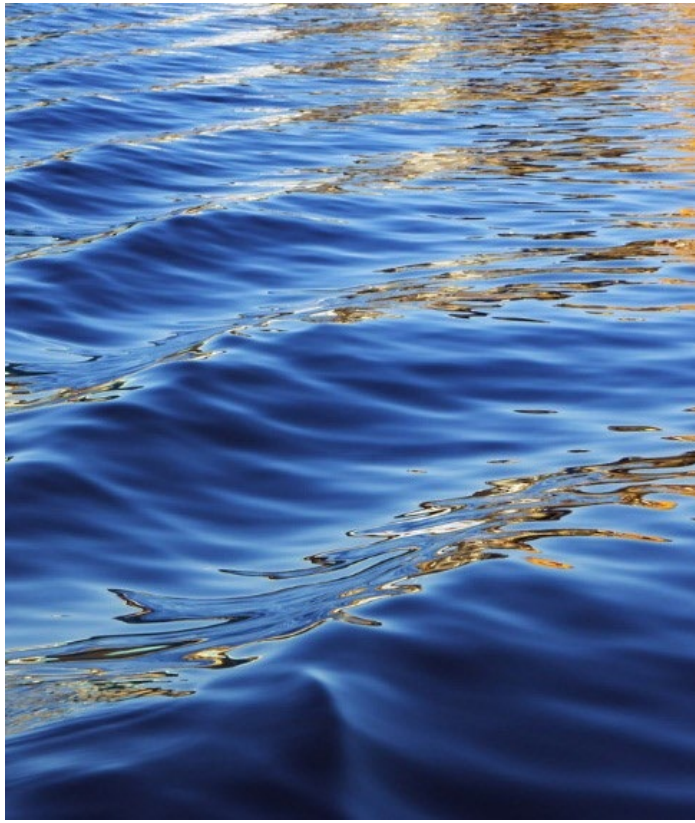
- 5 wells located along upstream reaches of San Leandro Creek within EBP Subbasin boundaries
- Combined total groundwater pumping of 180 AFY with wells operating only during 6-month dry season (April – September)
- New wells pump from Intermediate Aquifer
- Pumped water is put into the Creek



Scenario Features



GDE Simulation Setup & Results

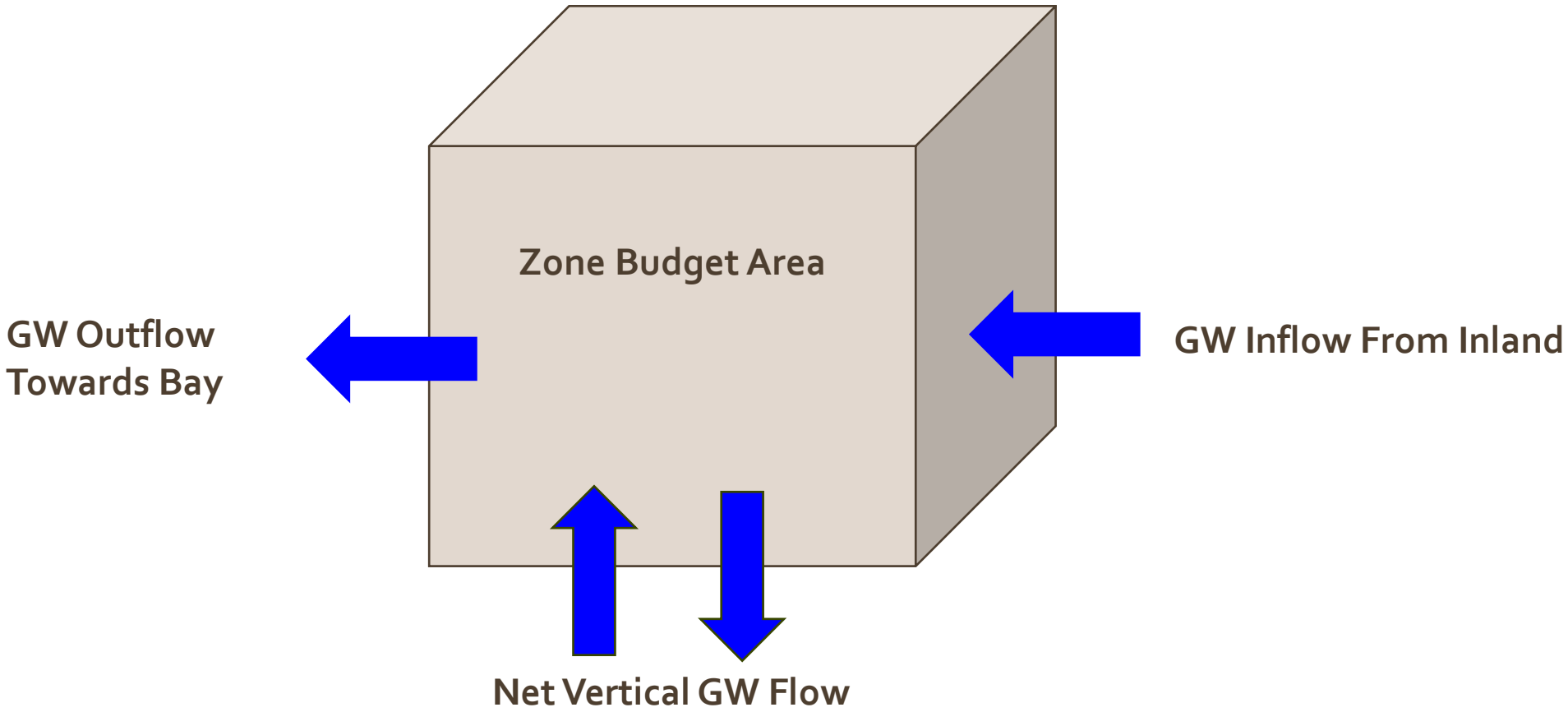


Model Setup for GDE Simulations

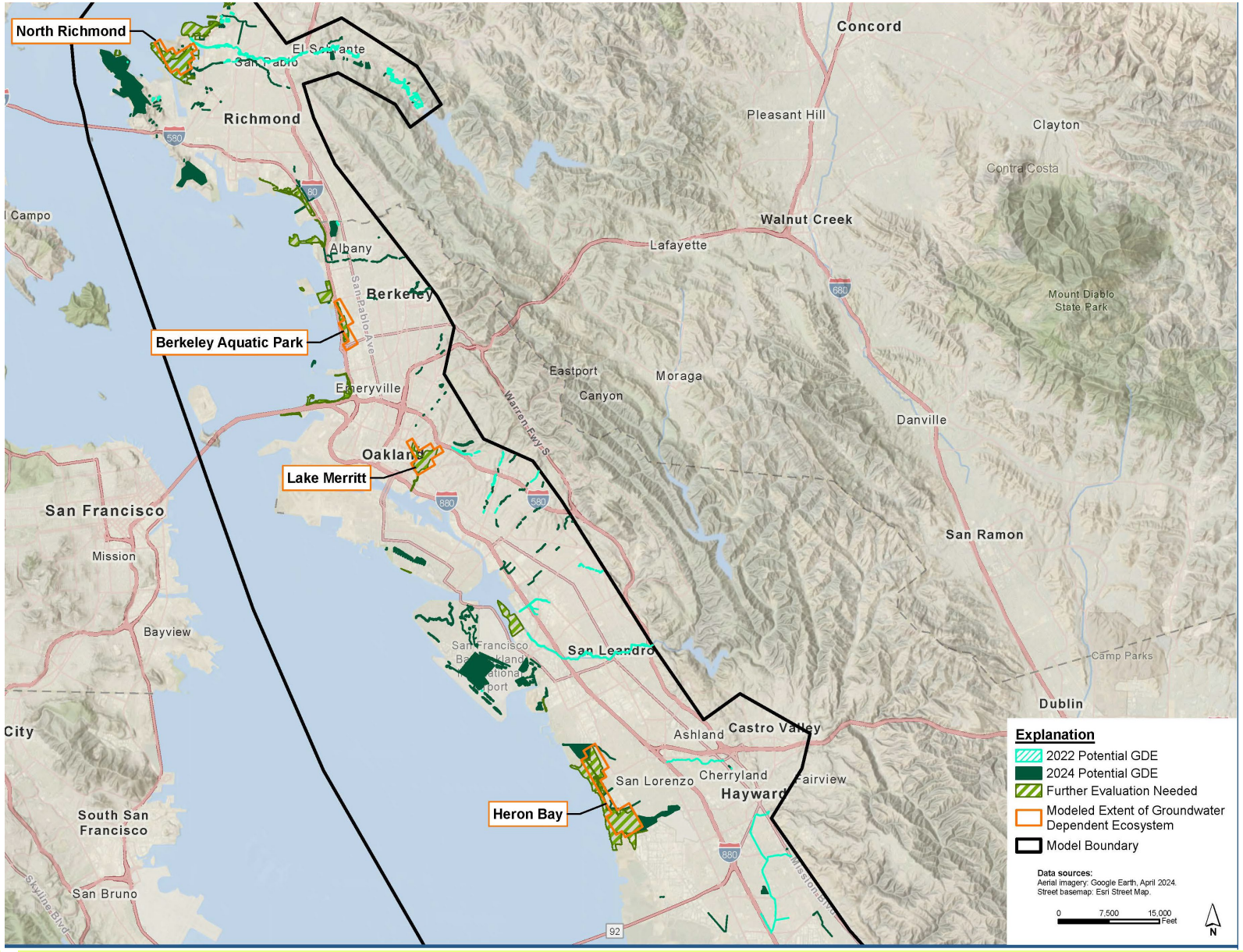
- Selected four major focus areas for simulation of drawdown and fluxes in coastal GDEs – Richmond, Aquatic Park (Berkeley), Lake Merritt (Oakland), and Heron Bay (San Lorenzo/Hayward)
- Added three hypothetical observation wells within or near four coastal GDE focus areas
- Added zone budget area for each coastal GDE focus area
- Simulated two feet of sea level rise between 2025 and 2075
- Evaluated changes in groundwater elevations and groundwater fluxes

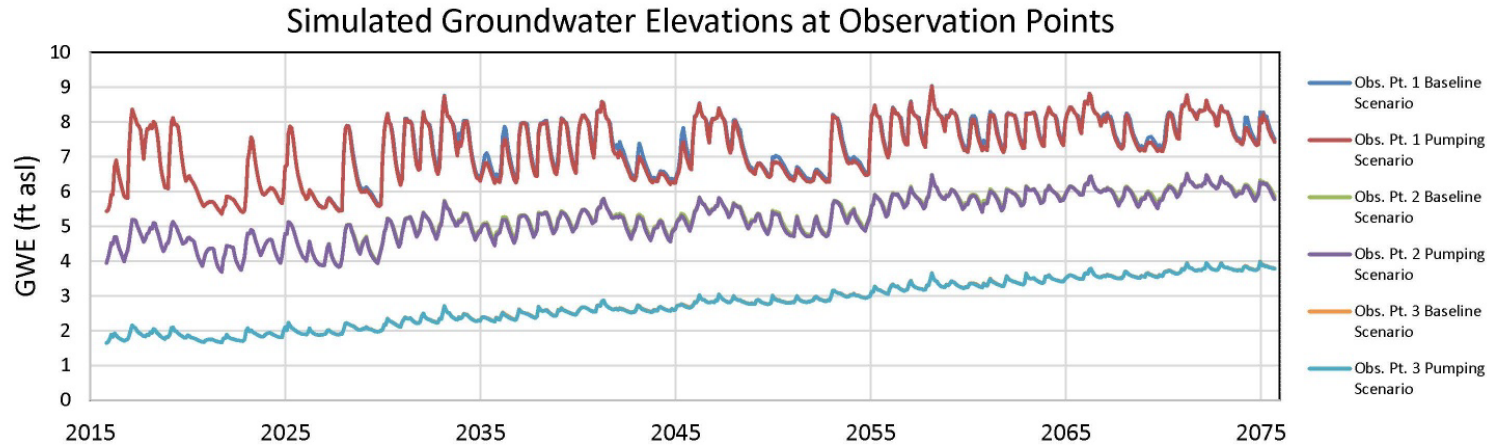
Model Setup for GDE Simulations

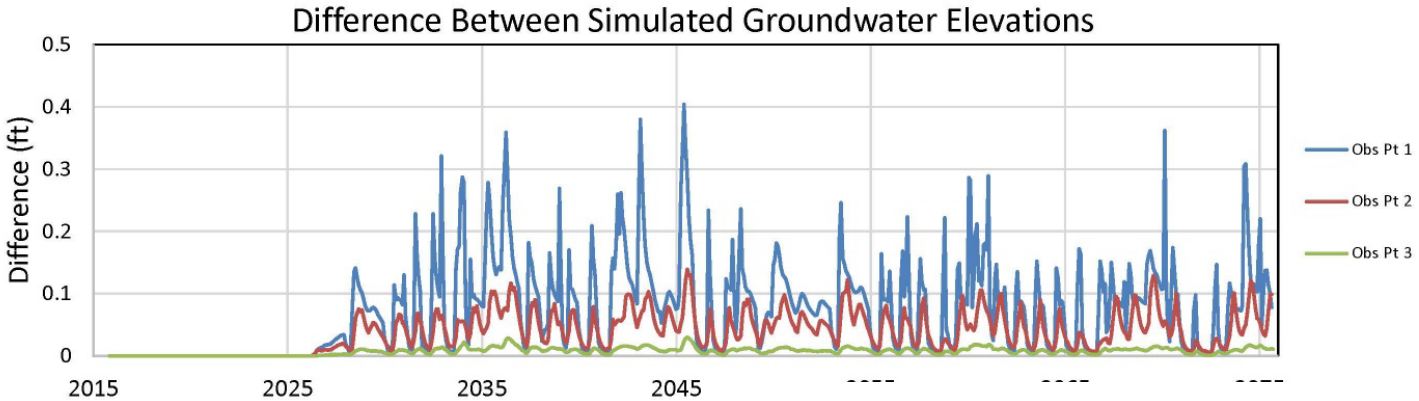
- Zone Budget Concept

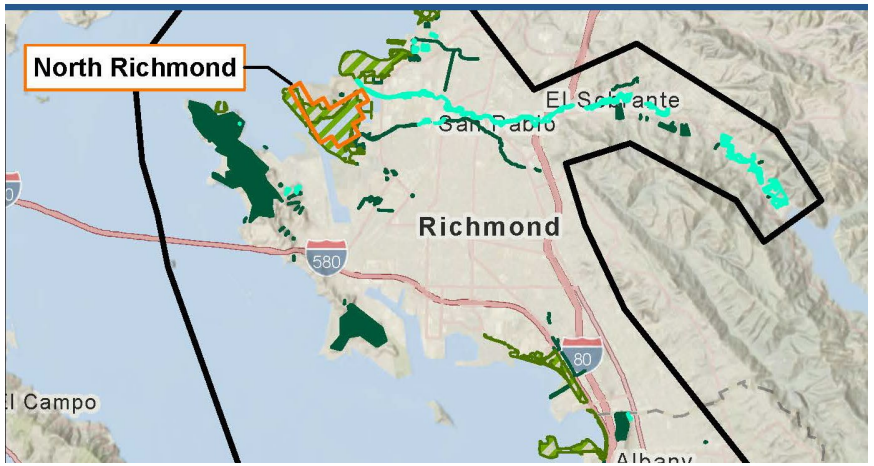


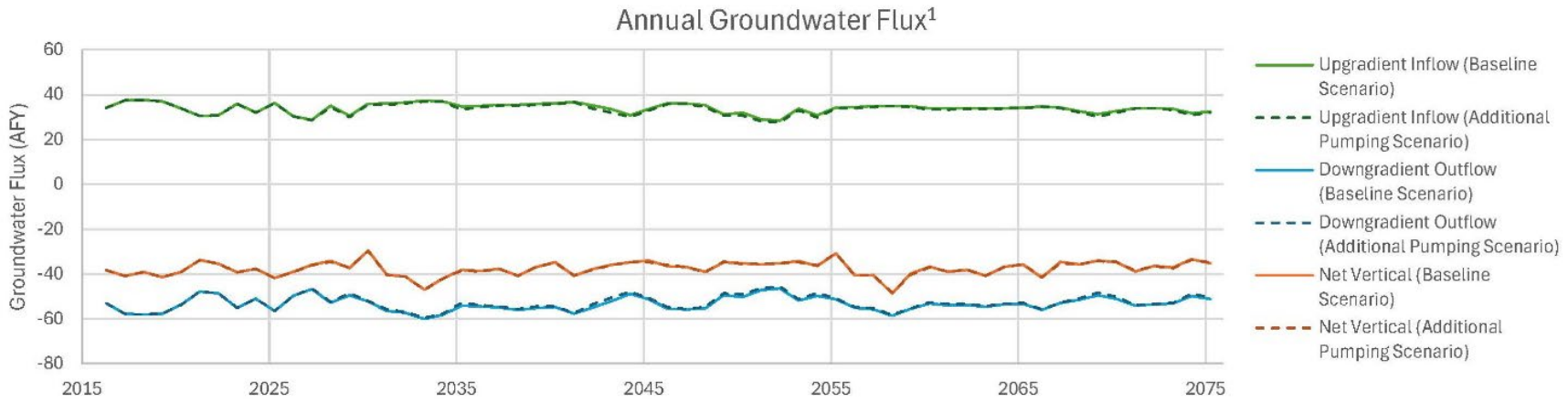
GDE Model Simulation Areas



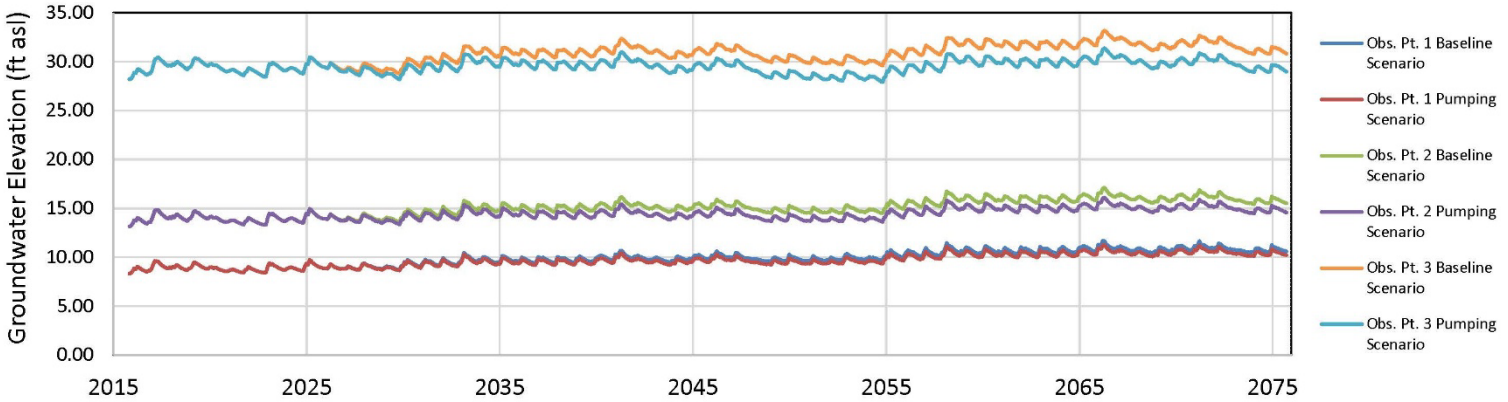

Simulated Groundwater Elevations at Observation Points
GWE (ft asl)
10
9
8
7
6
5
4
3
2
1
0
2015
2025
2035
2045
2055
2065
2075
Obs. Pt. 1 Baseline Scenario
Obs. Pt. 1 Pumping Scenario
Obs. Pt. 2 Baseline Scenario
Obs. Pt. 2 Pumping Scenario
Obs. Pt. 3 Baseline Scenario
Obs. Pt. 3 Pumping Scenario


Difference Between Simulated Groundwater Elevations
Difference (ft)
0.5
0.4
0.3
0.2
0.1
0
2015
2025
2035
2045
Obs Pt 1
Obs Pt 2
Obs Pt 3

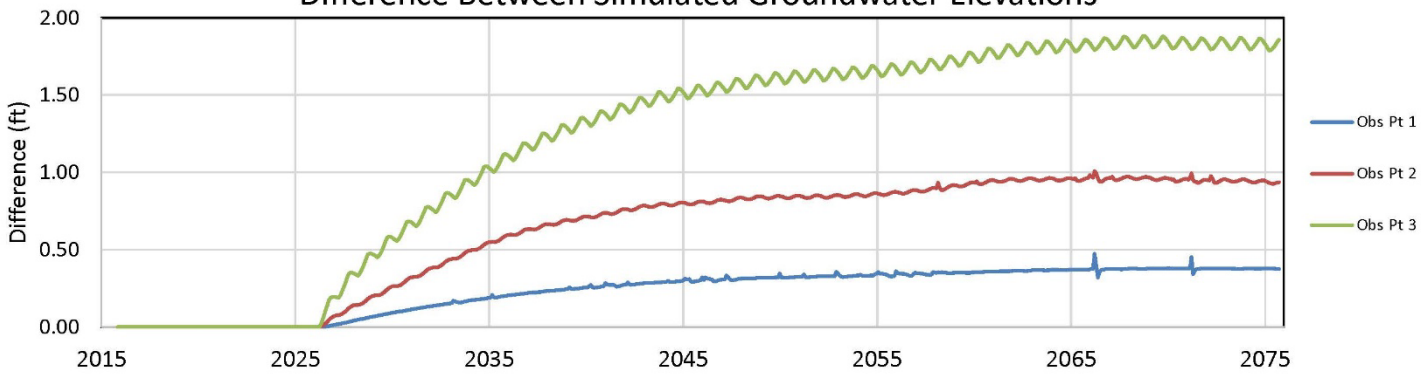

North Richmond
El Sobrante
San Pablo
Richmond
580
80
l Campo
Albany

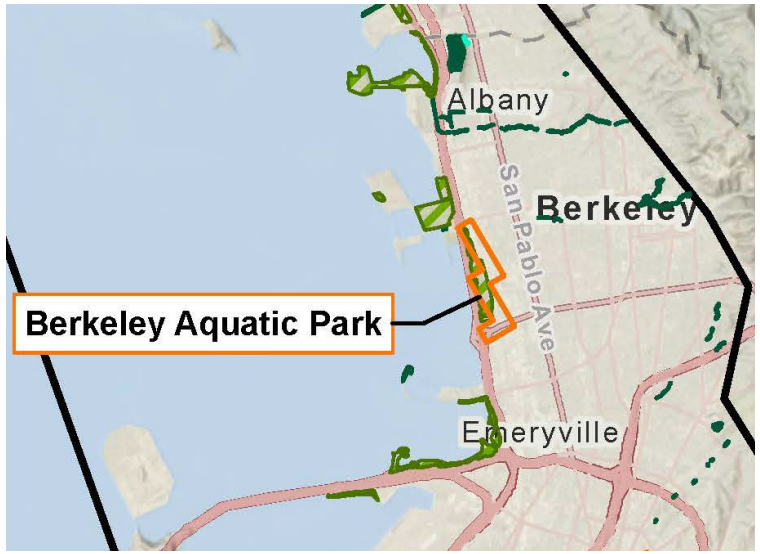

Annual Groundwater Flux[1]
Groundwater Flux (AFY)
60
40
20
0
-20
-40
-60
-80
2015
2025
2035
2045
2055
2065
2075
Upgradient Inflow (Baseline Scenario)
Upgradient Inflow (Additional Pumping Scenario)
Downgradient Outflow (Baseline Scenario)
Downgradient Outflow (Additional Pumping Scenario)
Net Vertical (Baseline Scenario)
Net Vertical (Additional Pumping Scenario)

Simulated Groundwater Elevations at Observation Points

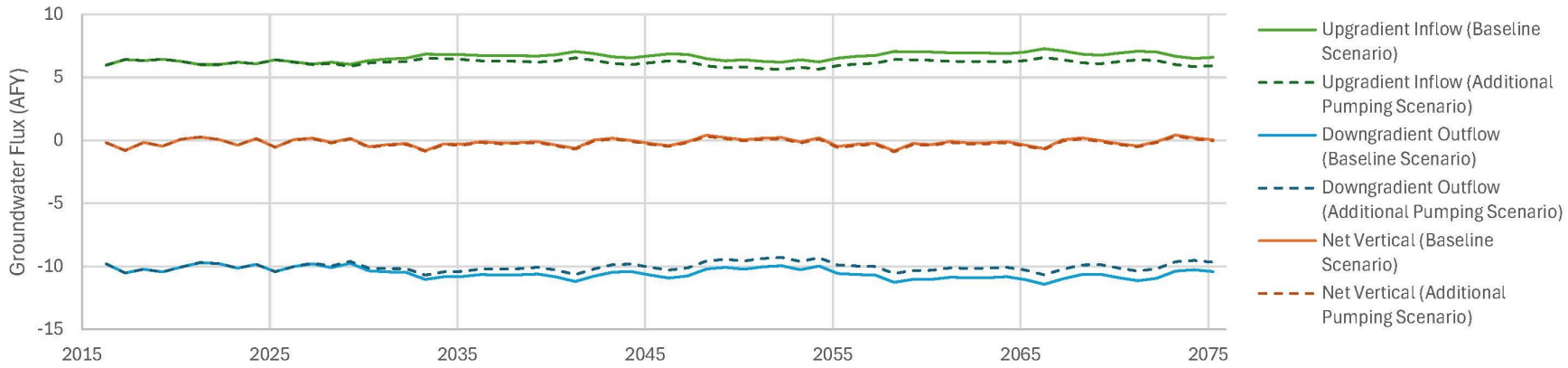


Difference Between Simulated Groundwater Elevations

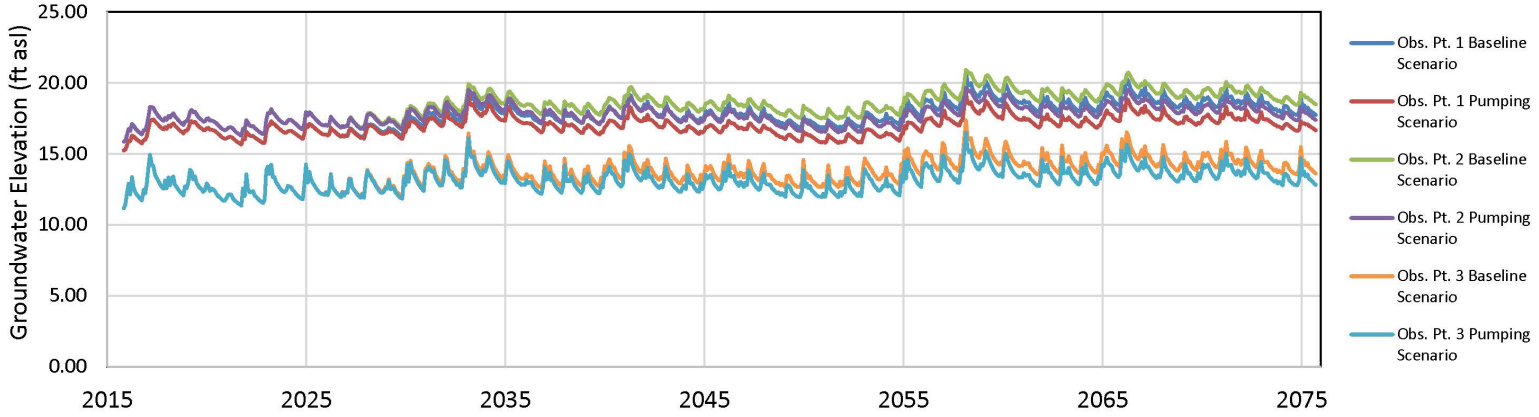




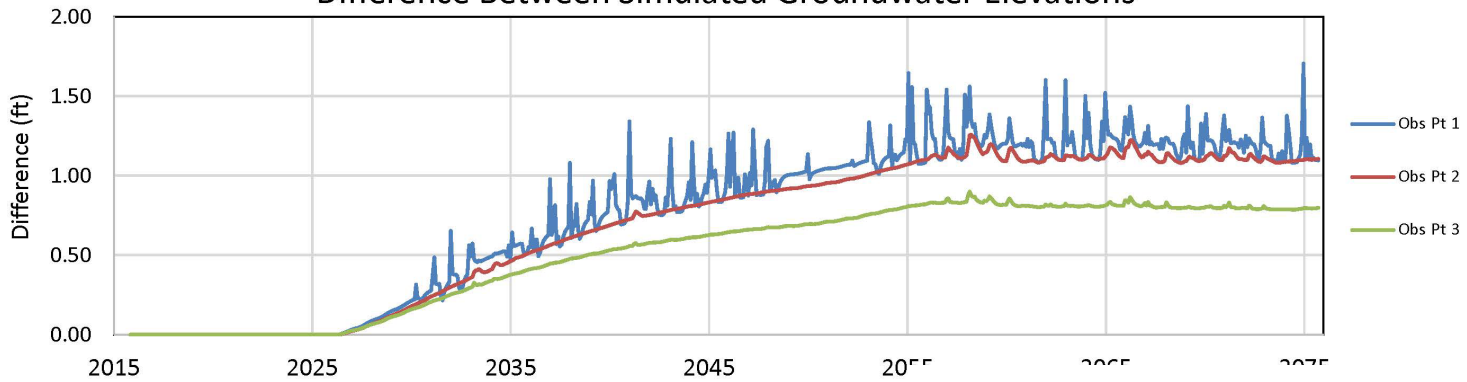
Annual Groundwater Flux[1]

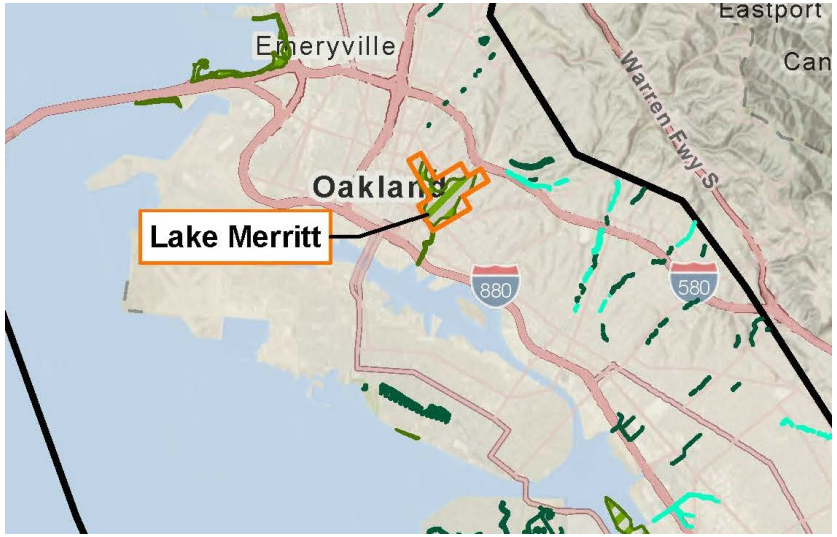


Simulated Groundwater Elevations at Observation Points

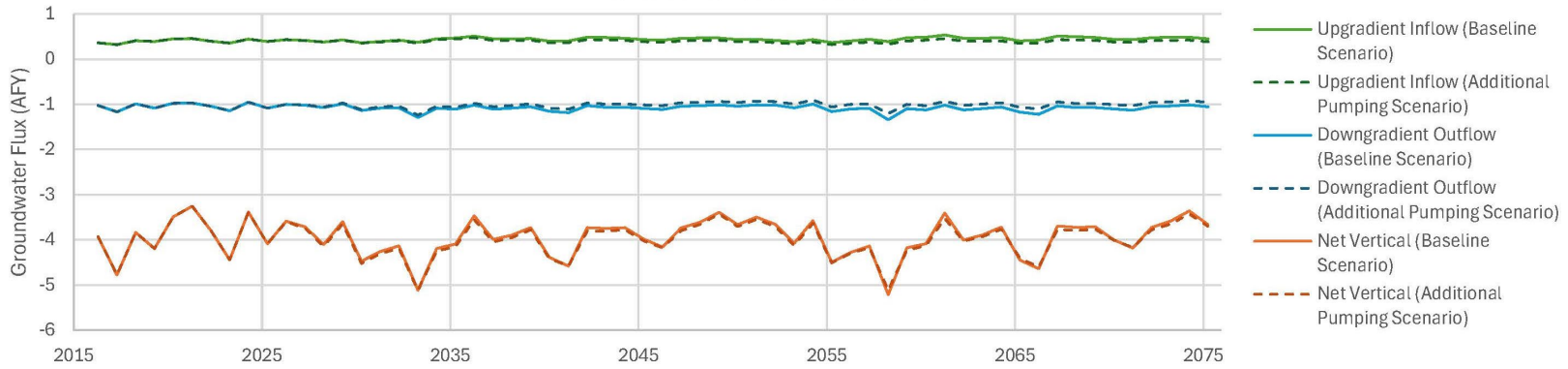


Difference Between Simulated Groundwater Elevations

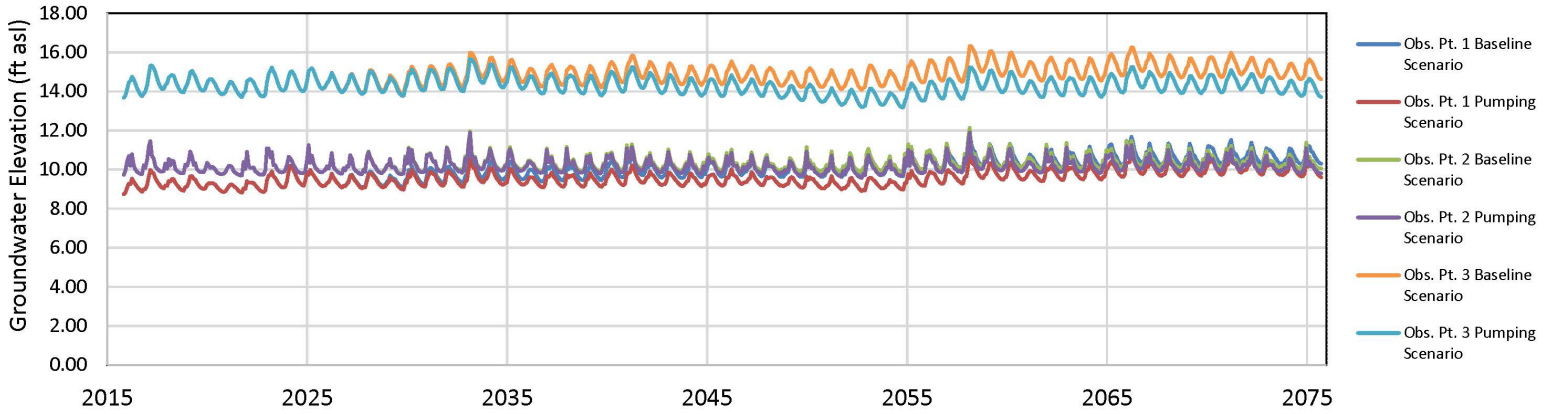




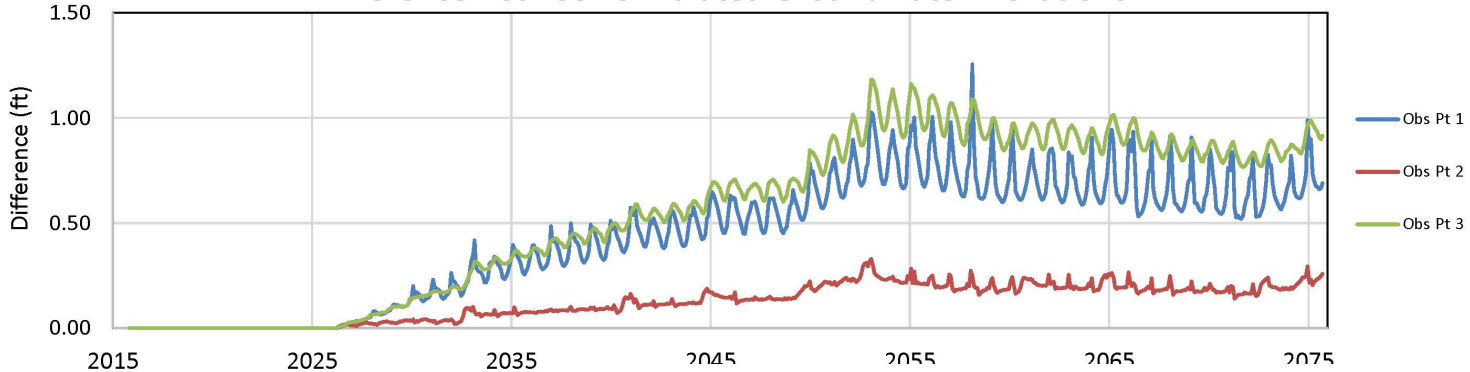
Annual Groundwater Flux[1]

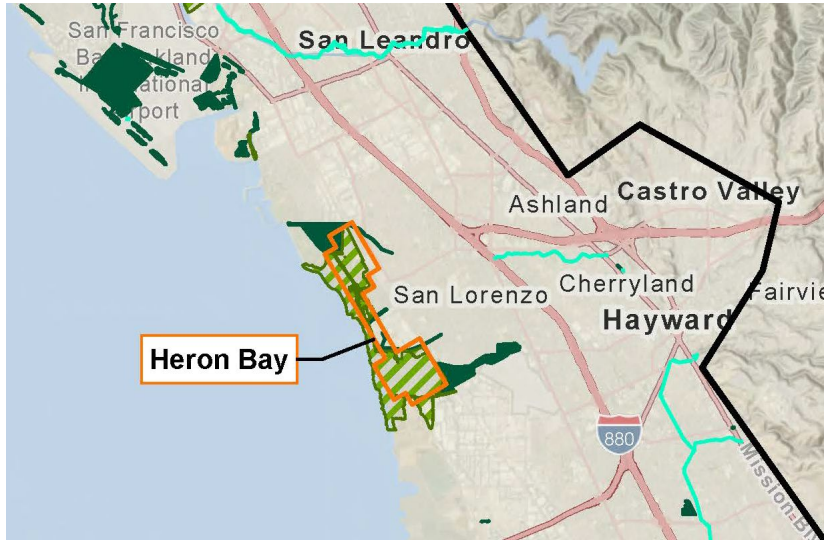


Simulated Groundwater Elevations at Observation Points

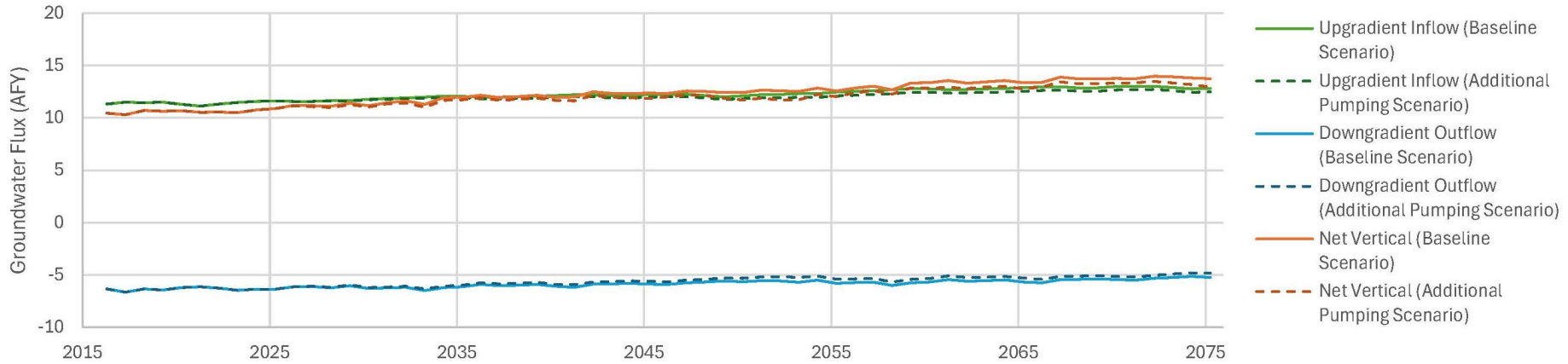


Difference Between Simulated Groundwater Elevations





Annual Groundwater Flux[1]

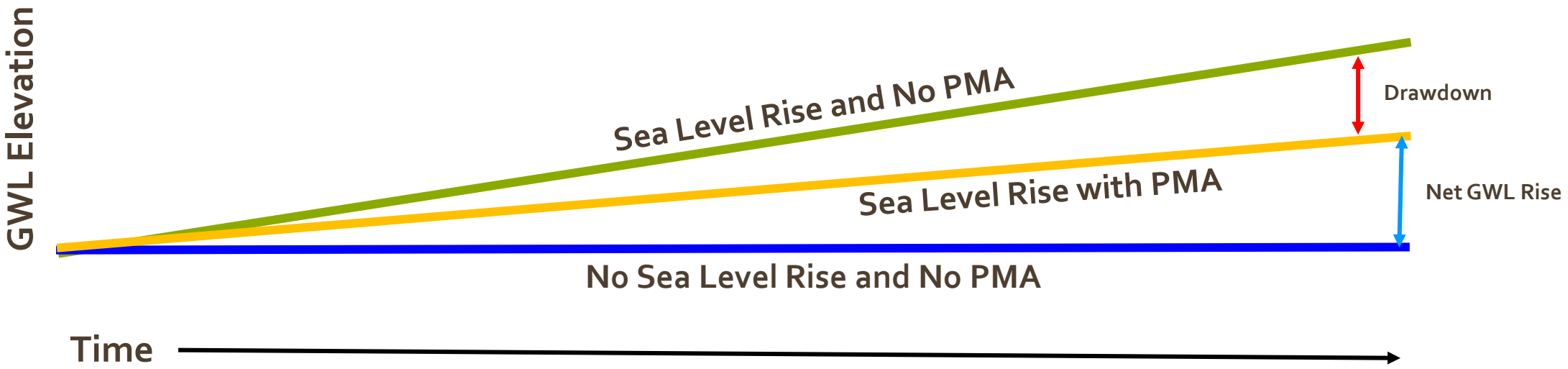


Major Takeaways from GDE Simulations

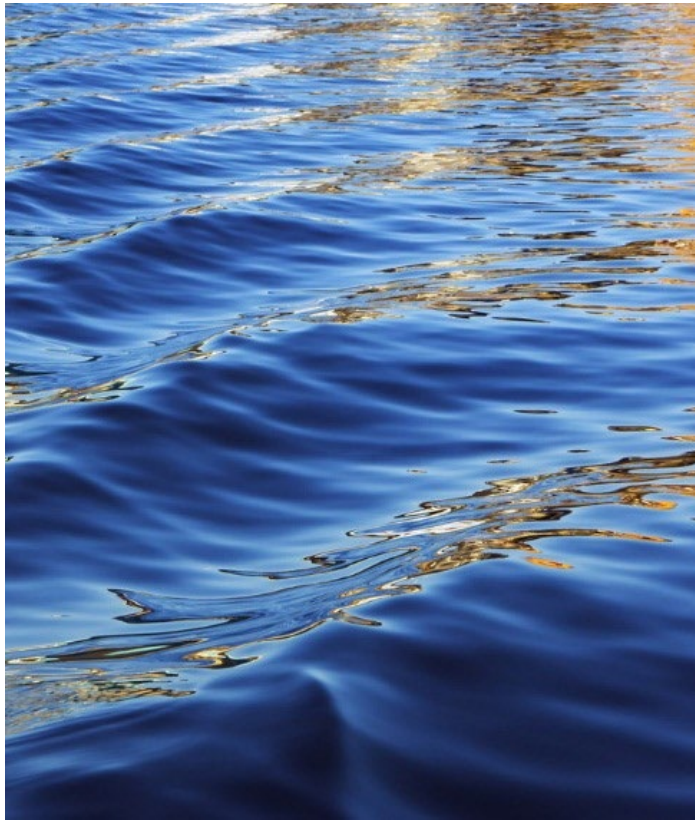
- Drawdowns are minimal at coastal GDEs due to combination of primarily Intermediate to Deep Aquifer pumping and effect of San Francisco Bay constant head
- To the extent that there are small drawdowns at some locations, sea level rise generally causes an equal or greater rise in groundwater levels
- Horizontal groundwater fluxes into/out of coastal GDE areas are generally modest and changes in fluxes due to pumping are small
- Vertical groundwater fluxes into/out of coastal GDE areas are generally small and changes in fluxes due to pumping are negligible
- ESA to review modeling results and provide recommendations

Major Takeaways from GDE Simulations

- SLR is greater than the predicted drawdown, resulting in net rise in GW elevation



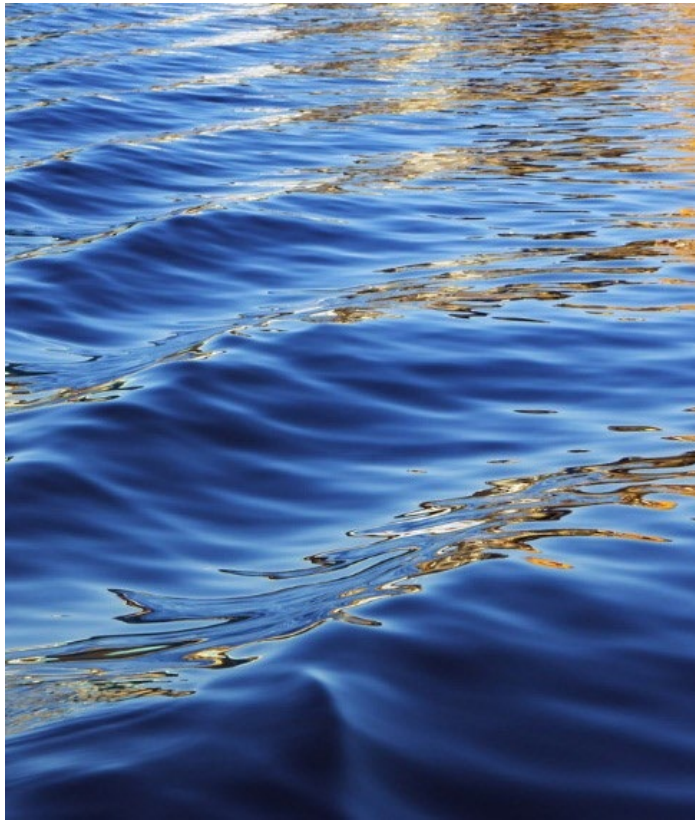
ISW Simulation Methodology



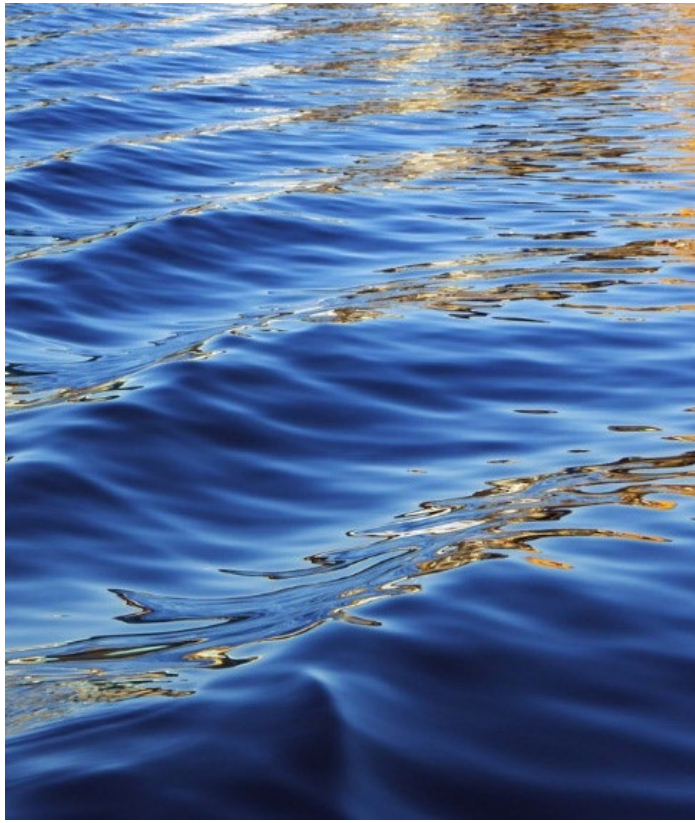
Model Setup for ISW Simulations

- Major creeks (San Pablo, Wildcat, San Leandro, San Lorenzo) simulated with full interaction; minor creeks simulated as drains
- Creeks divided into reaches
- Comparing future baseline with no PMA to future baseline with four new PMA
- Evaluating location, timing, and amount of surface water depletion differences between future baseline and future scenario

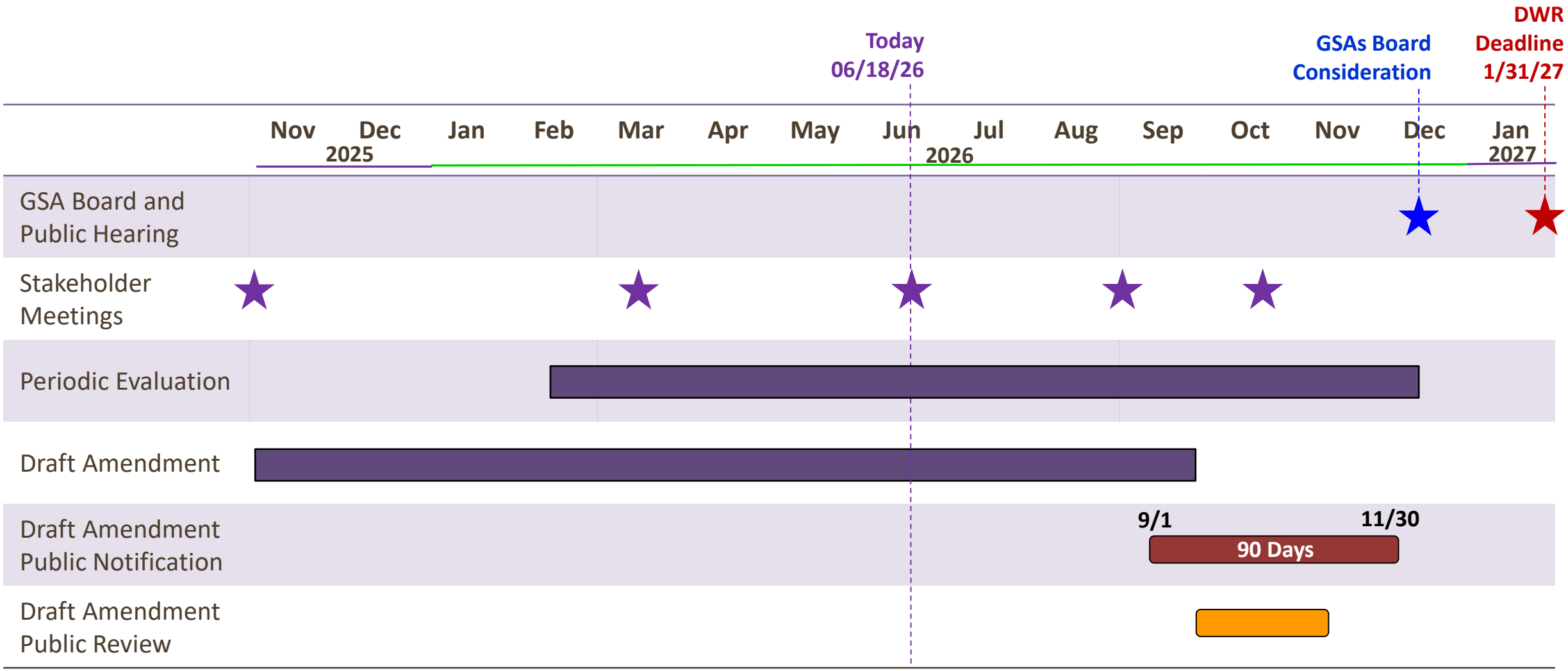
Comments and Questions



Next Steps



Schedule


Today
06/18/26
GSAs Board
Consideration
DWR
Deadline
1/31/27
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
2025
2026
2027
GSA Board and
Public Hearing
Stakeholder
Meetings
Periodic Evaluation
Draft Amendment
Draft Amendment
Public Notification
9/1
11/30
90 Days
Draft Amendment
Public Review

Key Dates for General Stakeholders

Anticipated Upcoming Stakeholders Meetings	• Late August/early September • Late October
Draft GSP Amendment for Public Review	• Released around mid-September • 45-day review period
EBMUD Board and Hayward City Council Consideration of GSP Amendment	• December

Web Resources

- EBMUD and City of Hayward SGMA Webpages
  - www.ebmud.com/sgma
  - www.hayward-ca.gov/your-government/departments/utilities/sustainable-groundwater-management
- East Bay Plain Subbasin Data Management System
  - https://eastbayplaindms.com/
- Sustainable Groundwater Management Act Portal
  - https://sgma.water.ca.gov

DWR Updates