East Bay Plain Subbasin

# Groundwater Sustainability Plan Development

Technical Advisory Committee Meeting

July 14, 2021

# Agenda

- **Welcome & Introductions**
- **Roll Call**
- **Review of Key SGMA Definitions**
- **Future Scenario**
- **Sustainable Management Criteria (SMC) Evaluation**
- **Next Steps**

*SGMA: Sustainable Groundwater Management Act*

# Review of Key SGMA Definitions

# Review of Key SGMA Definitions
## Sustainability Indicators & Undesirable Results

### Six Sustainability Indicators

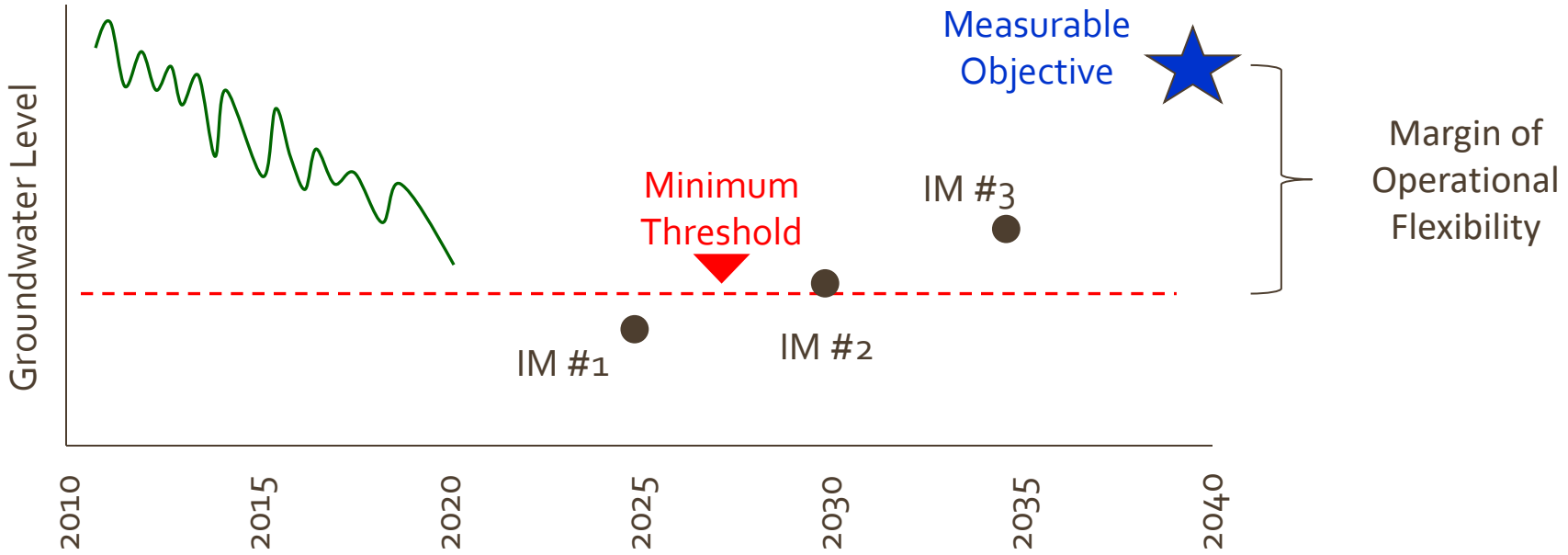
- Chronic Lowering of Groundwater Levels
- Reduction in Groundwater Storage
- Seawater Intrusion
- Degradation of Water Quality
- Land Subsidence
- Depletion of Interconnected Surface Water

**Undesirable Results (URs):**

- Significant and unreasonable occurrence of conditions that adversely affect groundwater use
- Must identify specific causes and effects to avoid
- Must specify processes and criteria relied on to define URs

**Sustainable Yield: Maximum pumping that avoids URs**

# Review of Key SGMA Definitions
## Sustainable Management Criteria (SMC)




**Minimum threshold (MT):** Numeric value for each sustainability indicator used to define when undesirable results occur.

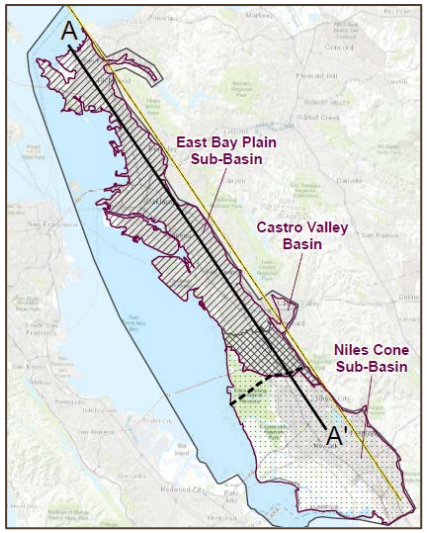
**Measurable objectives (MO):** Specific, quantifiable goals to maintain or achieve Basin's sustainability goal.

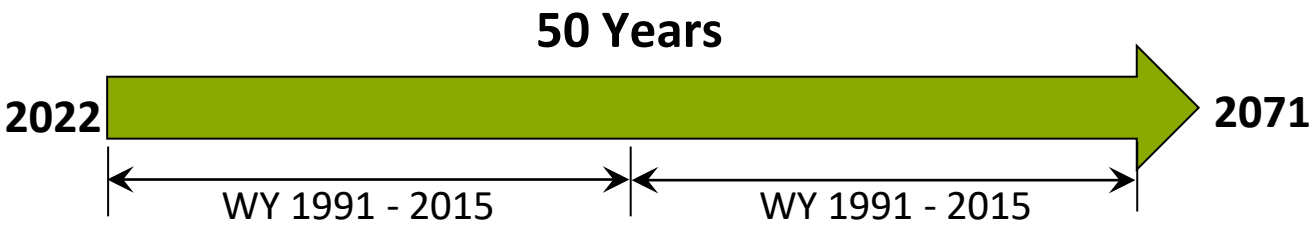
**Interim milestone (IM):** Target value representing measurable groundwater conditions, in increments of 5 years.

# Future Scenario

# Future Scenario

## Period, Pumping, Development, and Climate Change




- EBP Subbasin pumping based on average from 2002 – 2015
- Niles Cone Subbasin pumping based on average from 2011 – 2020

- Level of development consistent with approved land use plans

- Used DWR guidance for climate change / sea level rise
  - Sea level rise 2 feet

# Future Scenario

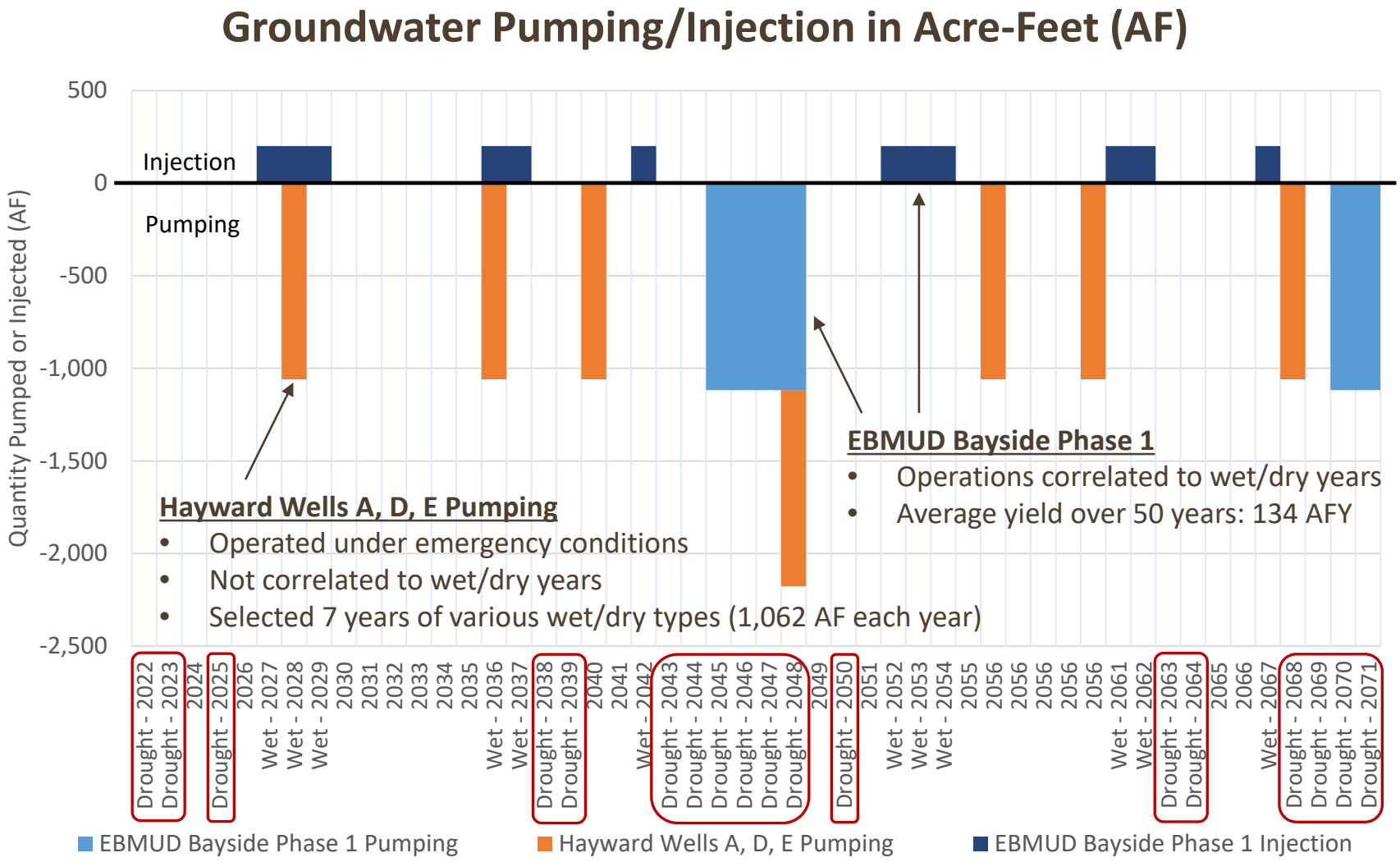
## Projects Reasonable to Occur to Meet Water Demands

### EBMUD Bayside Phase I

### Hayward Emergency Wells

# Future Scenario

## Pumping and Injection of Future Projects

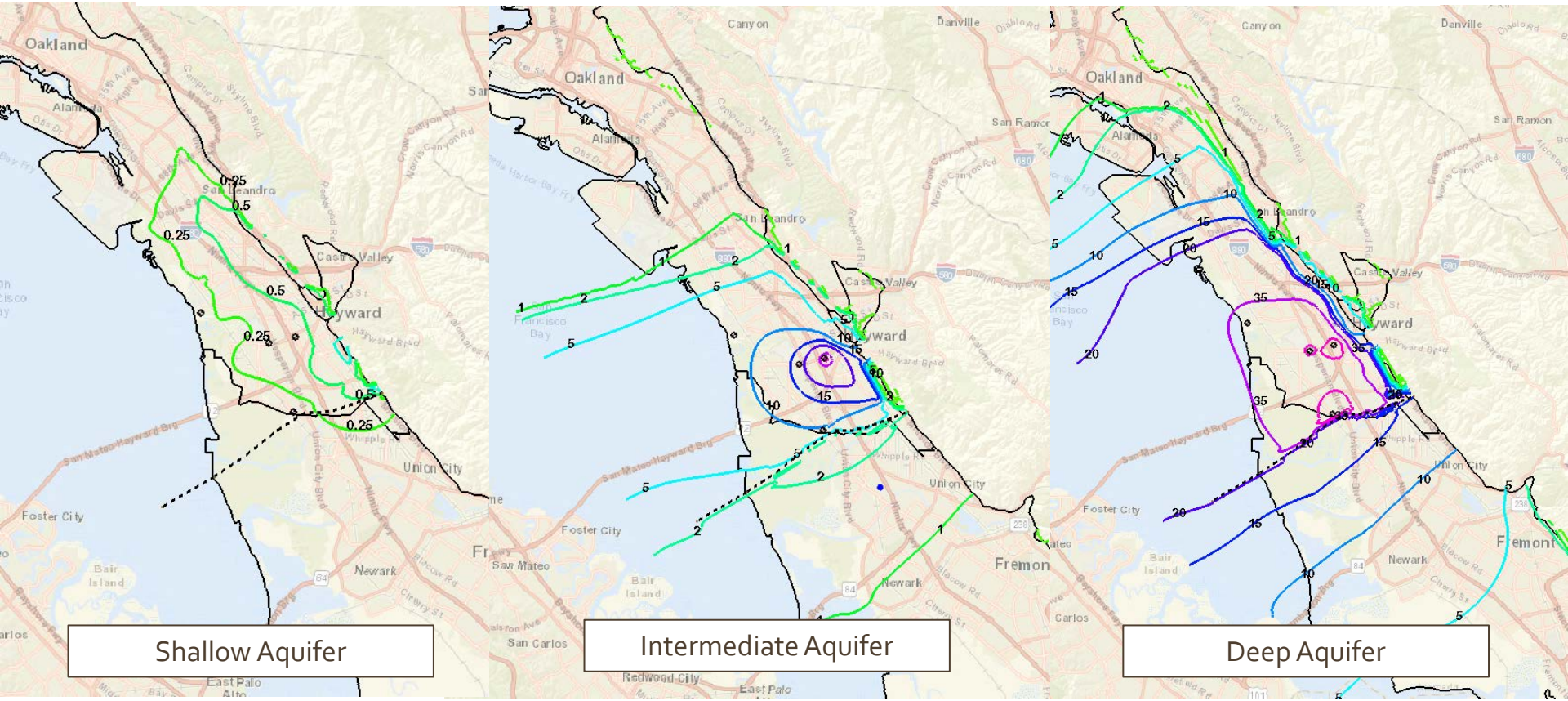


# Future Scenario

## Model Results –August 2048

**Maximum Groundwater Elevation Decrease from Baseline (ft)**

*(End of 6-year drought concurrent with emergency pumping by Hayward; 4 years of EBMUD pumping and 2 months of Hayward pumping)*

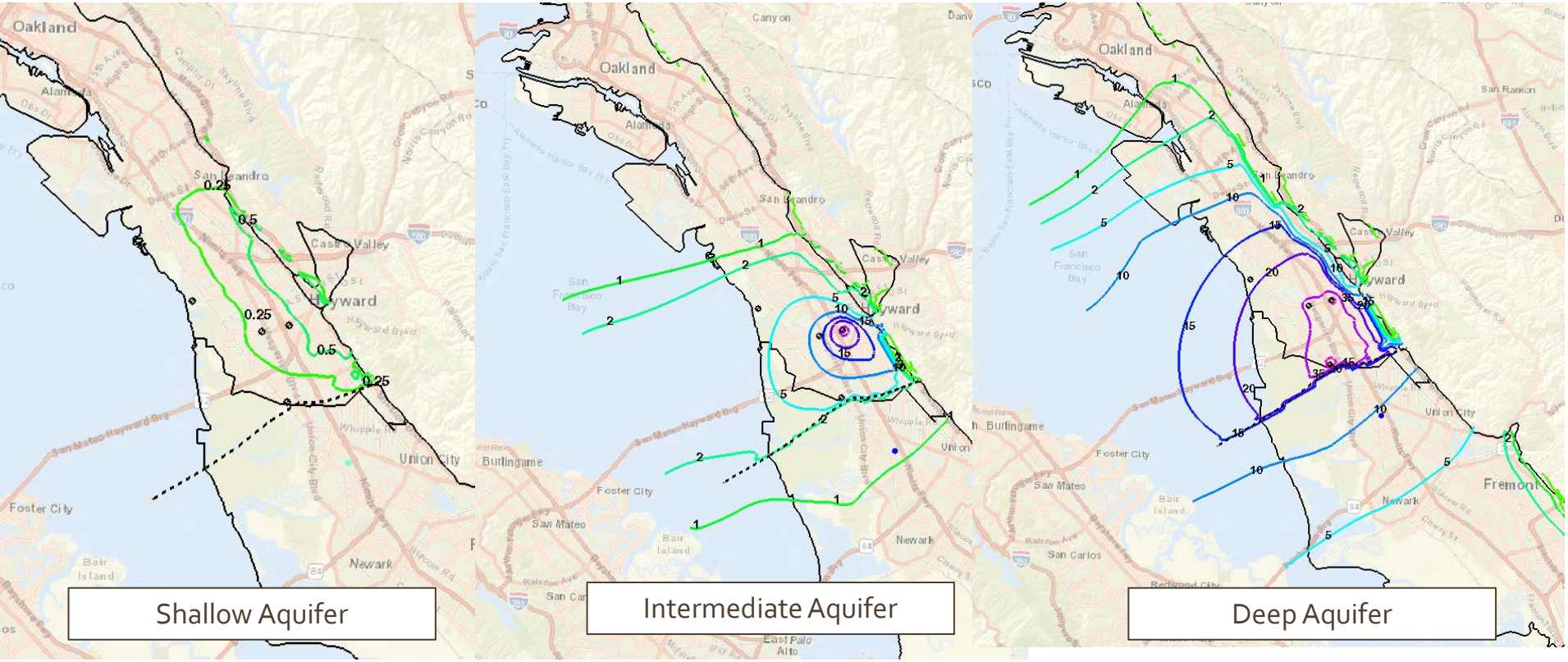


# Future Scenario

## Model Results – August 2060

**Groundwater Elevation Decrease from Baseline (ft)**

*(2-month Hayward pumping & no EBMUD pumping)*

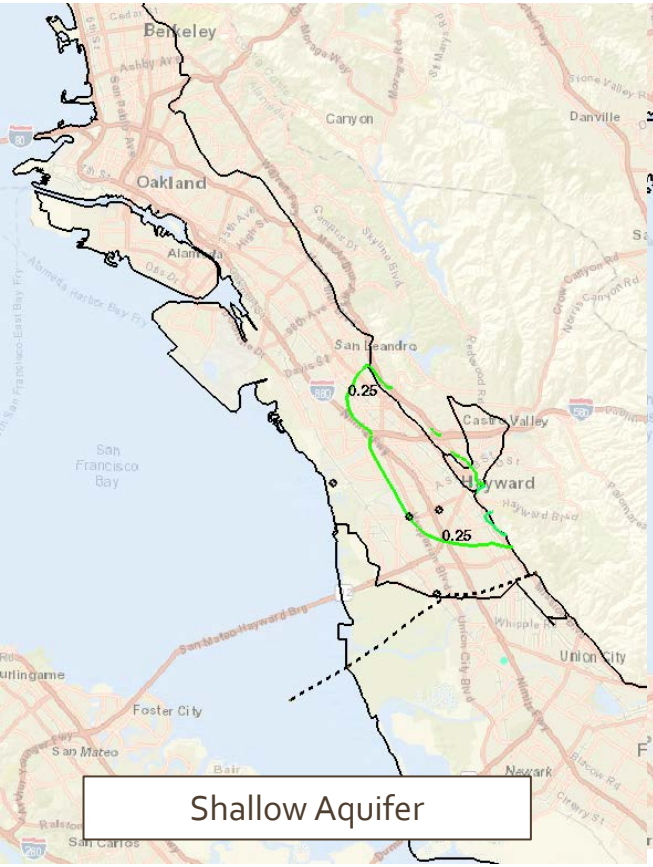


# Future Scenario

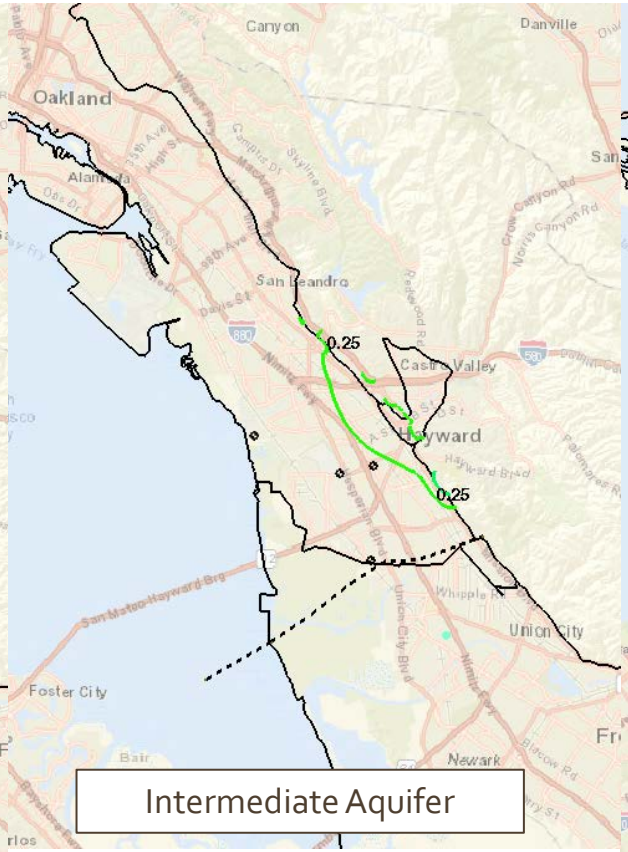
## Model Results – September 2066

**Groundwater Elevation Decrease (feet) from Baseline**

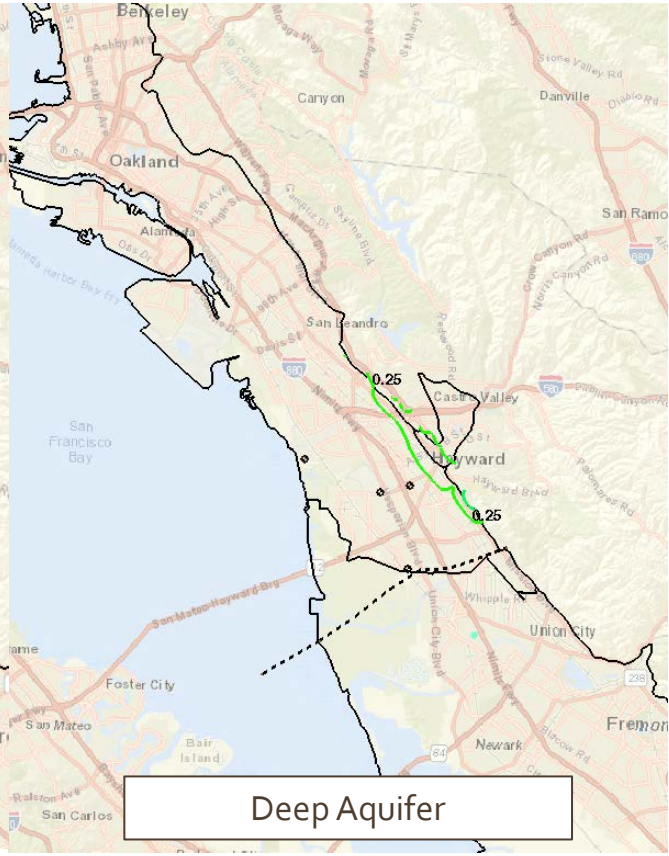
*(after 4 years no pumping/injection)*




Shallow Aquifer




Intermediate Aquifer



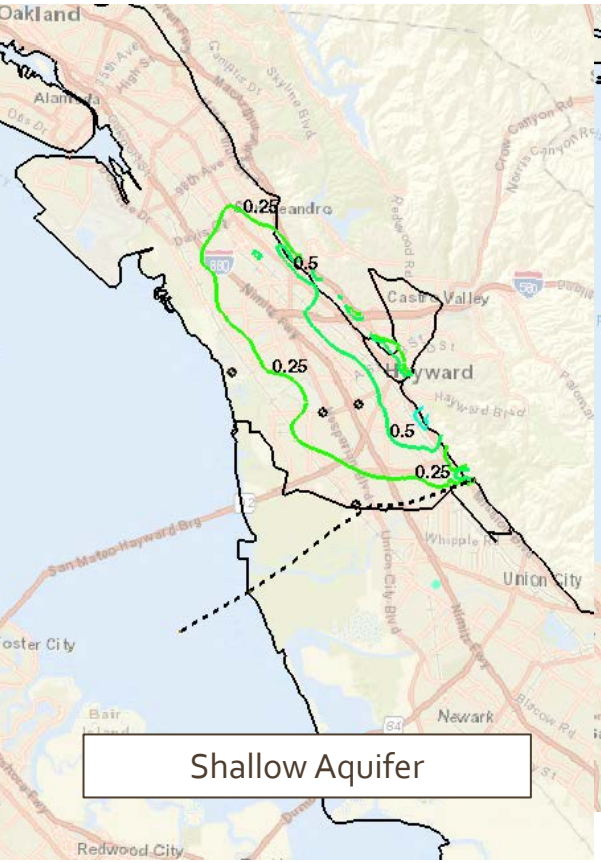

Deep Aquifer

# Future Scenario

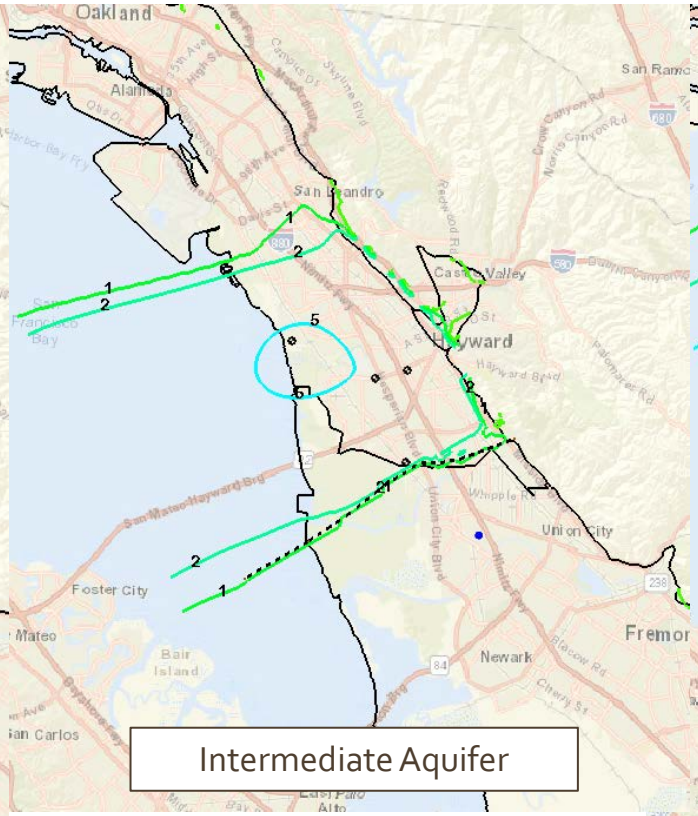
## Model Results – September 2071

**Groundwater Elevation Decrease (feet) from Baseline**

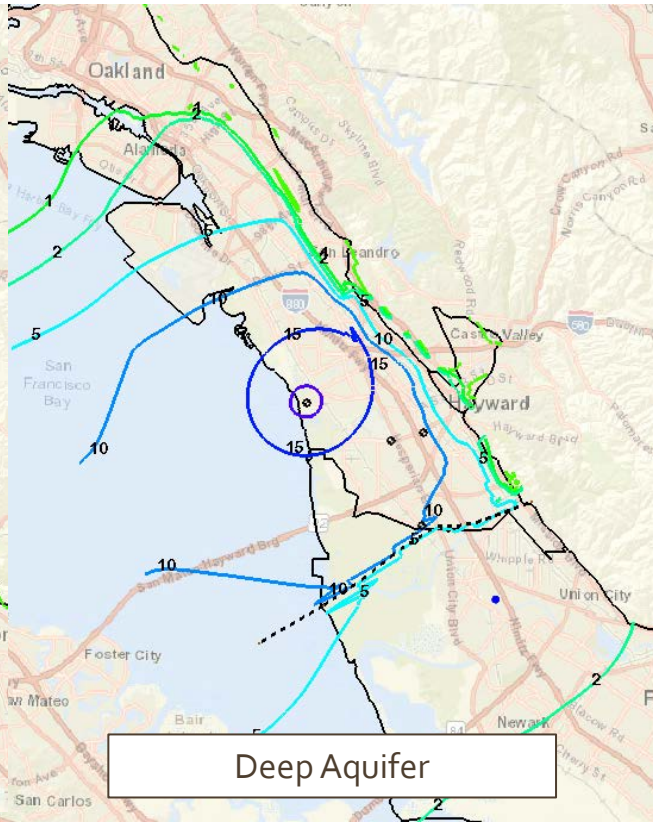
after 2 years EBMUD pumping & no Hayward pumping




Shallow Aquifer




Intermediate Aquifer

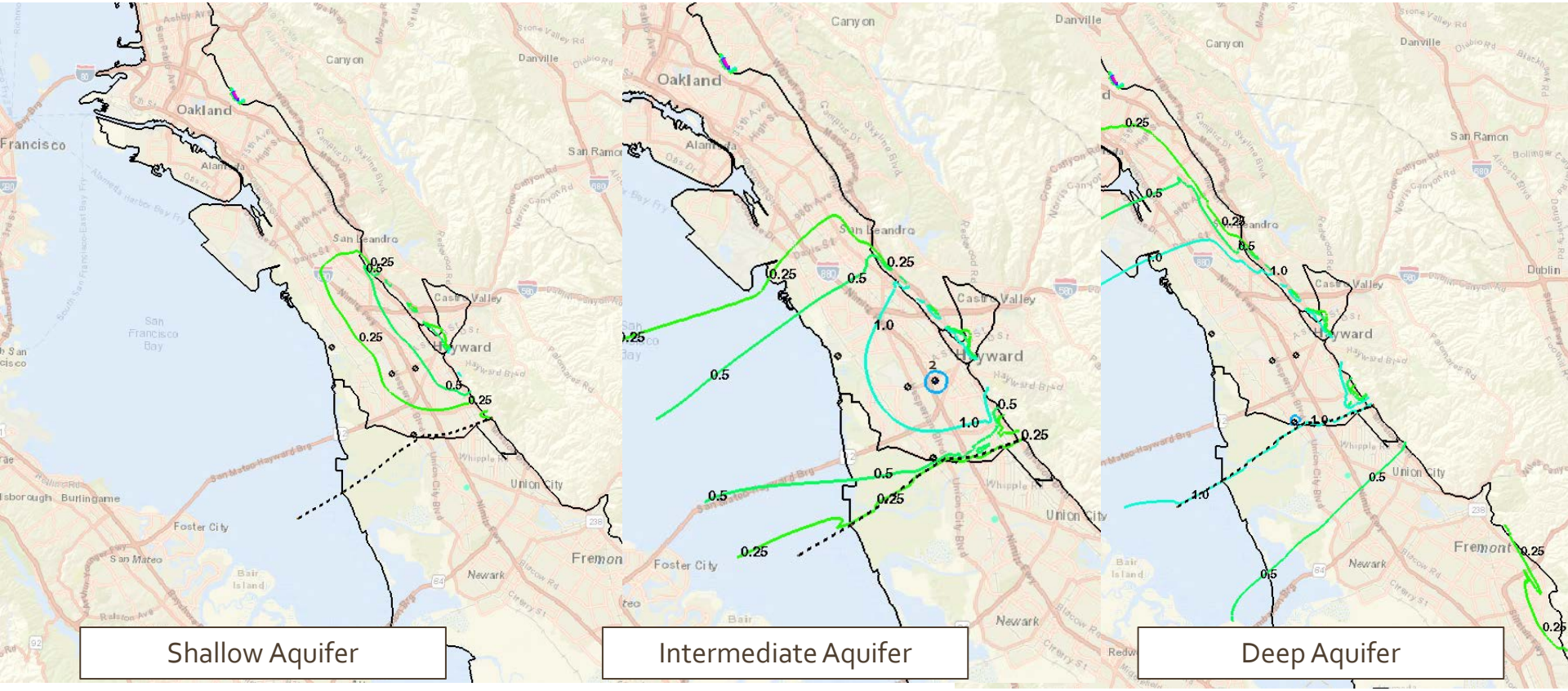



Deep Aquifer

# Future Scenario

## Model Results – Steady State for 50 Years

**Groundwater Elevation Decrease (feet) from Baseline**



# Future Scenario

## Model Results – Evaluation of Potential Impacts to Streams

### No change in connectivity

| | Total Cells | # of Cells Connected | | % Change |
|---|---|---|---|---|
| | | Baseline | Future Scenario | |
| Wildcat | 28 | 21 | 21 | 0% |
| San Pablo | 64 | 63 | 63 | 0% |
| San Leandro | 34 | 34 | 34 | 0% |
| San Lorenzo | 49 | 30 | 30 | 0% |

### No Decrease in Streamflow

| | Baseline (cfs) | Future Scenario (cfs) | % Decrease |
|---|---|---|---|
| Wildcat | 4.4 | 4.4 | 0% |
| San Pablo | 6.5 | 6.5 | 0% |
| San Leandro | 8.8 | 8.8 | 0% |
| San Lorenzo | 15.7 | 15.7 | 0% |

*cfs: cubic feet per second*

# SMC Evaluation

# SMC Evaluation

## Chronic Lowering of Groundwater Levels

| Undesirable Results | Effects on beneficial users or uses | Data Gaps |
|---|---|---|
| • Declining GW levels unrelated to drought resulting in water supply wells no longer providing enough GW for beneficial uses or users | • Reduction in well capacity<br>• Impacts to GDEs | • Limited historical groundwater level data<br>• Limited wells in the North<br>• Limited data on GDEs |

**Interim Criteria for URs**

- 25% of Spring RMS well levels < MT
- 2 consecutive Spring measurements (March) in non-drought years
- At least 1 RMS in North + 1 in South

- 25% is at the lower end of a reasonable range from 20 to 50% and provides a balance to avoid URs
- Spring water levels less influenced by localized pumping

# SMC Evaluation

## Chronic Lowering of Groundwater Levels

| Interim MTs | Justification |
| --- | --- |
| Shallow Aquifer<br>50 feet below ground surface | Based on minimum well seal depth requirement for water supply and industrial wells |
| Intermediate / Deep Aquifer<br>-50 feet mean sea level (MSL) | Allows for sufficient available drawdown in deeper wells to maintain their capacity |
| GDEs<br>7.5 feet below baseline conditions in shallow wells | • 25% of maximum rooting depth<br>• 30-foot max rooting depth for most plants used per TNC guidance |

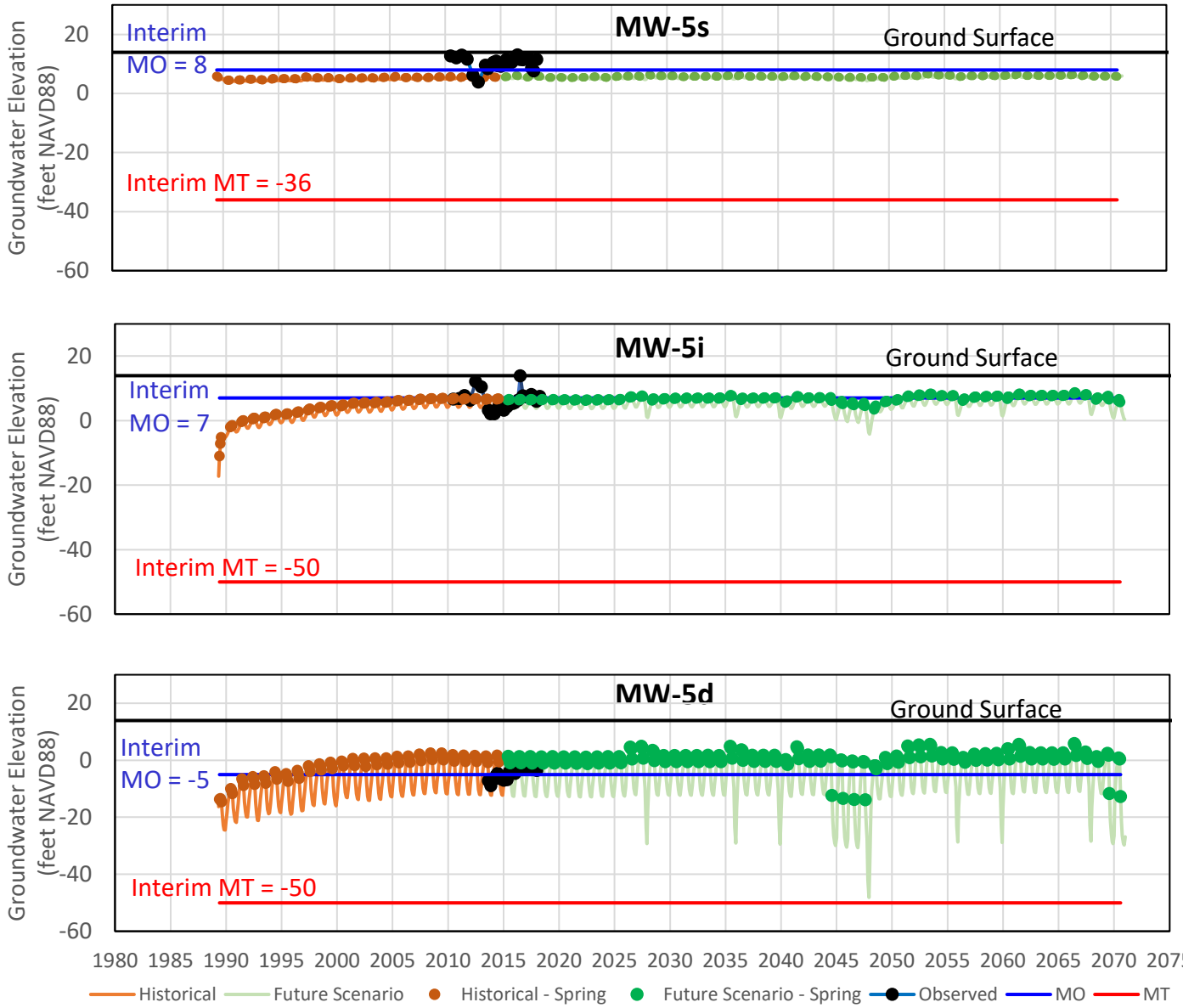
### Interim MO and IMs

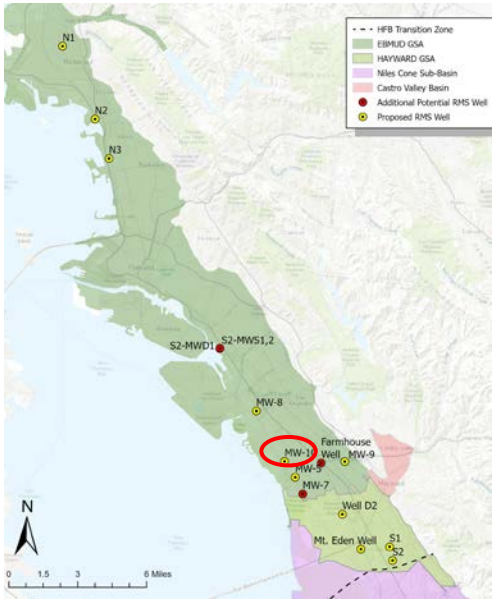
- Average of historical data, when recent data (<10 years) is available
- If no data or recent data is unavailable, groundwater model results are used

*TNC = The Nature Conservancy*

# SMC Evaluation

## Chronic Lowering of Groundwater Levels

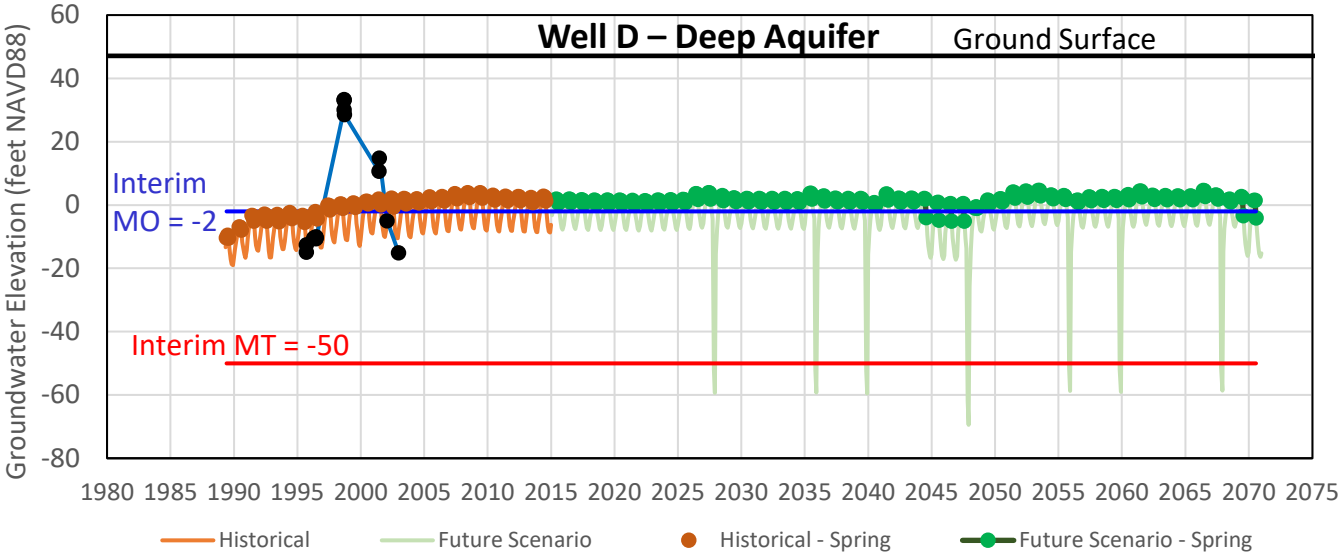


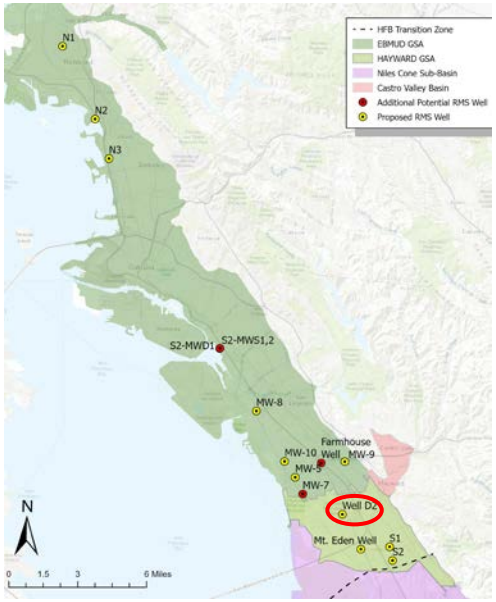




*Spring = March, April, May*
*MO = Measurable Objectives*
*MT = Minimum Threshold*
*s = Shallow Aquifer Zone*
*i = Intermediate Aquifer Zone*
*d = Deep Aquifer Zone*

# SMC Evaluation

## Chronic Lowering of Groundwater Levels

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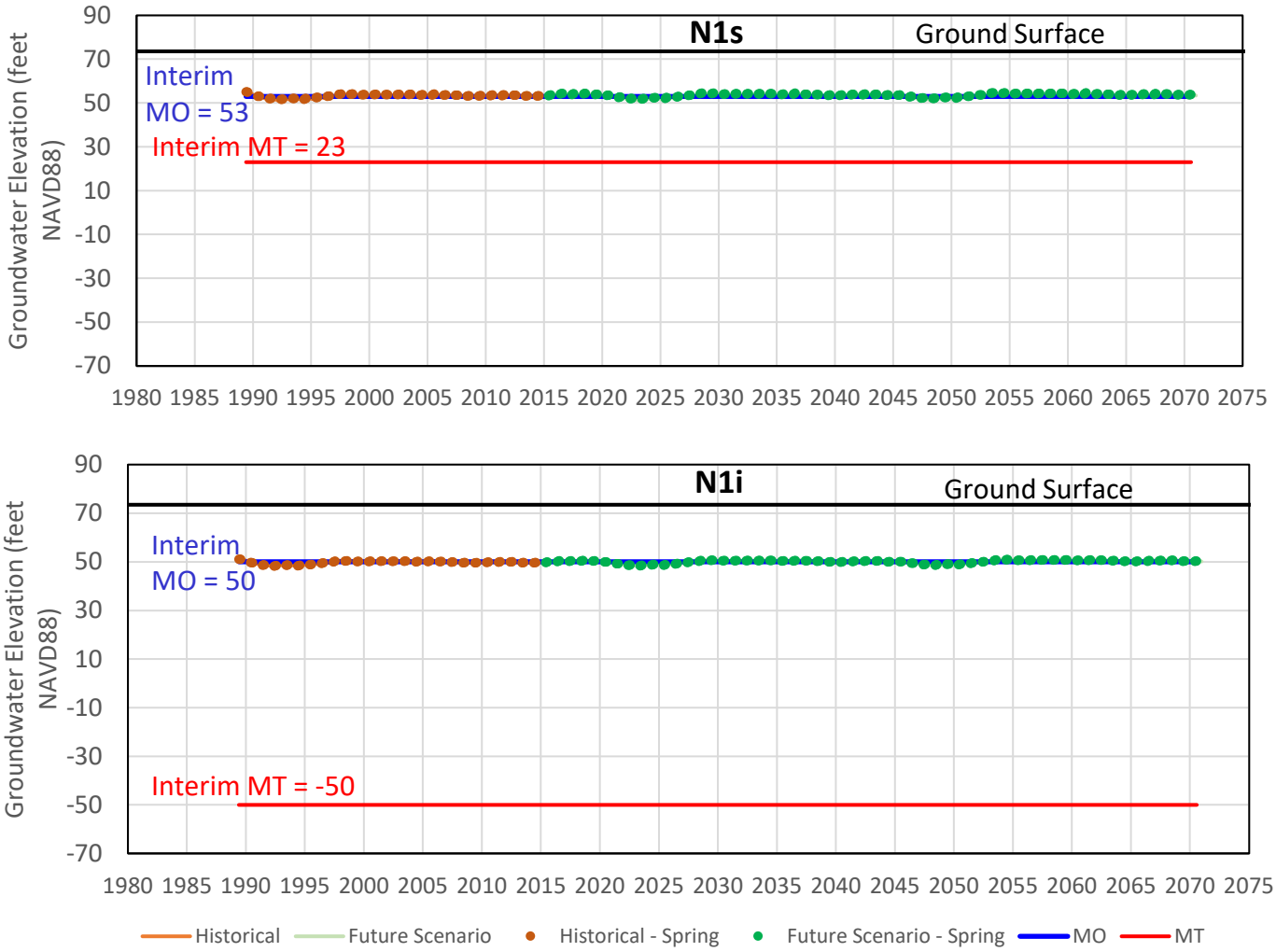
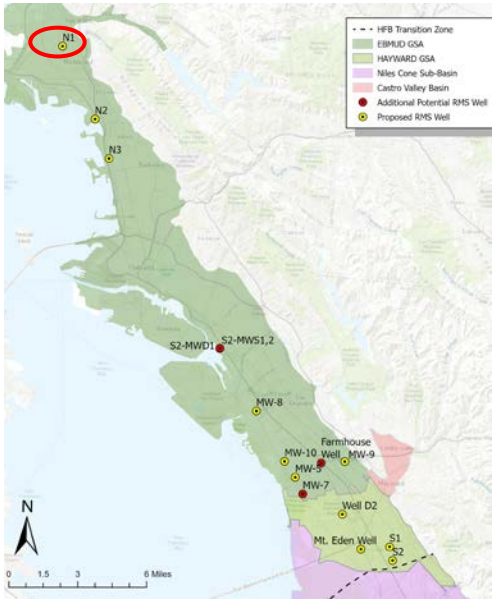
# SMC Evaluation

## Chronic Lowering of Groundwater Levels

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*d = Deep Aquifer Zone*

# SMC Evaluation

## Chronic Lowering of Groundwater Levels

Questions

# SMC Evaluation

## Reduction in Groundwater Storage

| Undesirable Results | Effects on beneficial users or uses | Data Gaps |
|---|---|---|
| • Excessive regional GW pumping that results in significant and unreasonable long-term reduction in groundwater storage | • Reduction in well capacity | • Lack of direct measurements of pumping |

**Interim Criteria for URs**

- Average annual subbasin pumping exceeds sustainable yield for 5-year period
- 5 years balances short-term extreme needs while not allowing for long-term overpumping

# SMC Evaluation

## Reduction in Groundwater Storage

**Interim MT**

12,500 AFY over 5-year period

**Justification**

- Initial sustainable yield estimate
- Estimated 2 MAF of excess storage in EBP Subbasin

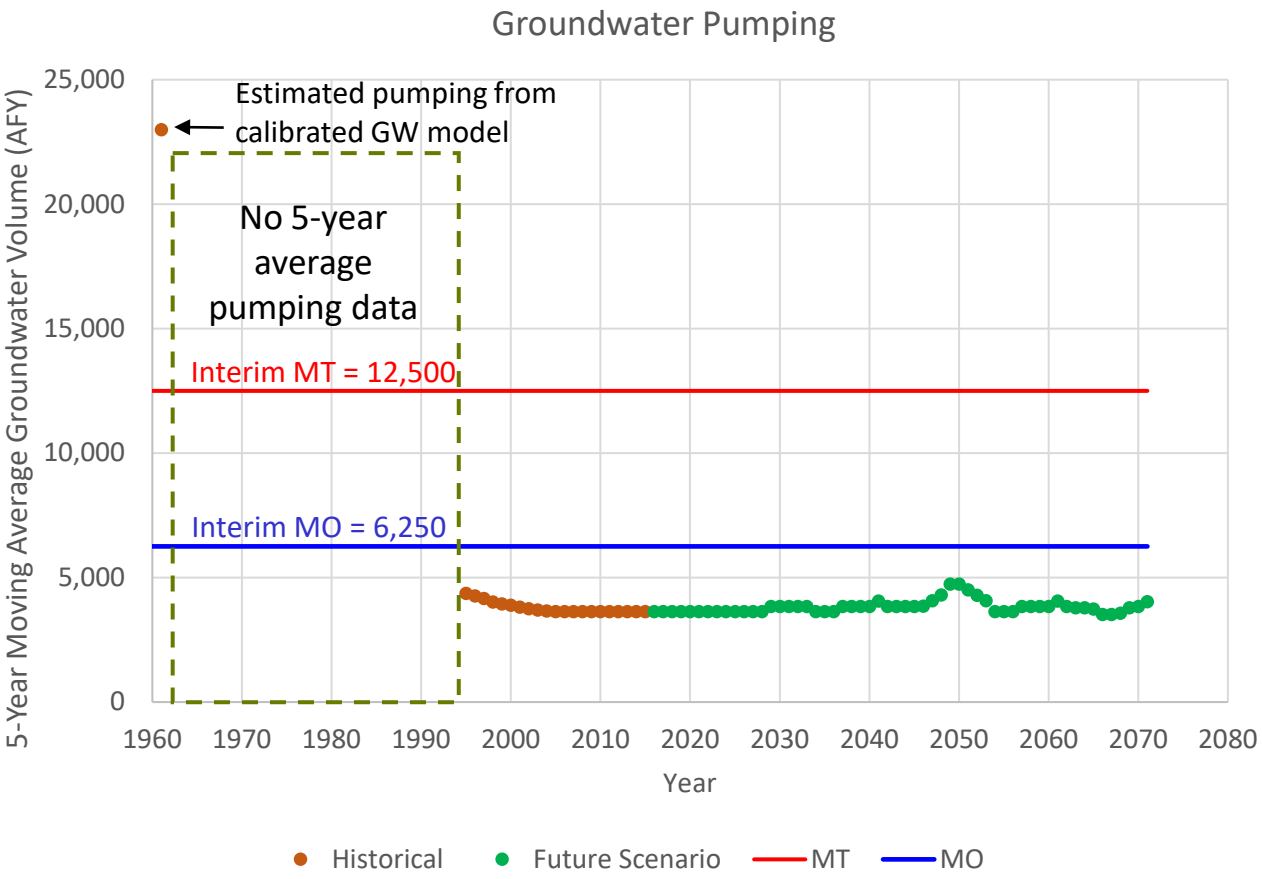
**Interim MO and IMs**

- Reasonable range would be 20 to 50% less than MT
- Use 50% to be conservative = 6,250 AFY

*MAF = Million acre-feet*

# SMC Evaluation

## Reduction in Groundwater Storage



# SMC Evaluation

## Reduction in Groundwater Storage

Questions

# SMC Evaluation

## Seawater Intrusion

| Undesirable Results | Effects on beneficial users or uses | Data Gaps |
|---|---|---|
| • Migration of saline Bay water into existing fresh water aquifers that are or could be developed for water supply | • Precludes beneficial use for drinking water | • Lack of chloride measurements and shallow wells near Bay margin |

**Interim Criteria for URs**

- GW levels in Water Table Aquifer Zone (upper 50 feet) used as a proxy
- GW elevations above MSL near the Bay margin

- Water Table Aquifer is the only aquifer connected to the Bay with significant clay layers below
- Seawater intrusion is not expected if shallow GW levels are maintained above MSL

# SMC Evaluation

## Seawater Intrusion

### Interim MT

- 25% increase in onshore area between the 5 ft MSL contour line and Bay margin
- 25% increase in chloride concentration in sentinel wells

### Justification

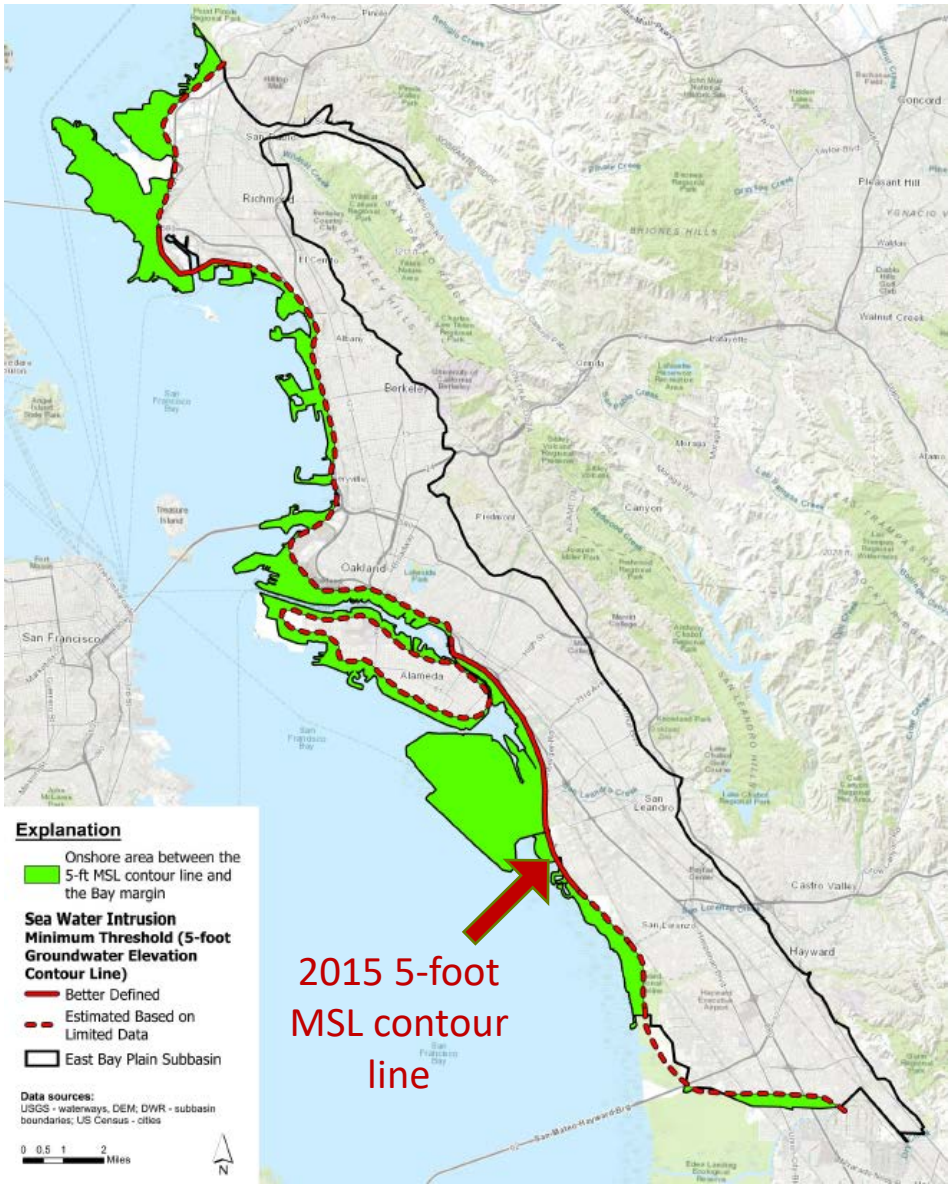
- 25% is at the lower end of a reasonable range from 20 to 50%
- Provides a balance to avoid significant and unreasonable impacts

### Interim MO and IMs

- Position of 5-foot MSL contour line based on 2015 Spring GW levels

# SMC Evaluation

## Seawater Intrusion




- Area between 2015 5-foot contour and Bay margin: ~16,000 acres
- 25% increase in area: ~20,000 acres

# Questions

# SMC Evaluation

## Degradation of Water Quality

| Undesirable Results | Effects on beneficial users or uses | Data Gaps |
|---|---|---|
| • Significant and unreasonable degradation of GW quality caused by GSA projects and management actions | • Precludes beneficial use for drinking water | • Lack of historical concentration data to establish baseline concentrations |

**Interim Criteria for URs**

- Exceedance of MCL for key constituents: TDS, chloride, nitrate, arsenic

# SMC Evaluation

## Degradation of Water Quality

### Interim MT

- MCLs:
  TDS – 500 mg/L
  Chloride – 250 mg/L
  Nitrate – 10 mg/L
  Arsenic – 10 ug/L
- If baseline concentration already exceeds MCL, assign 20% increase from baseline

### Justification

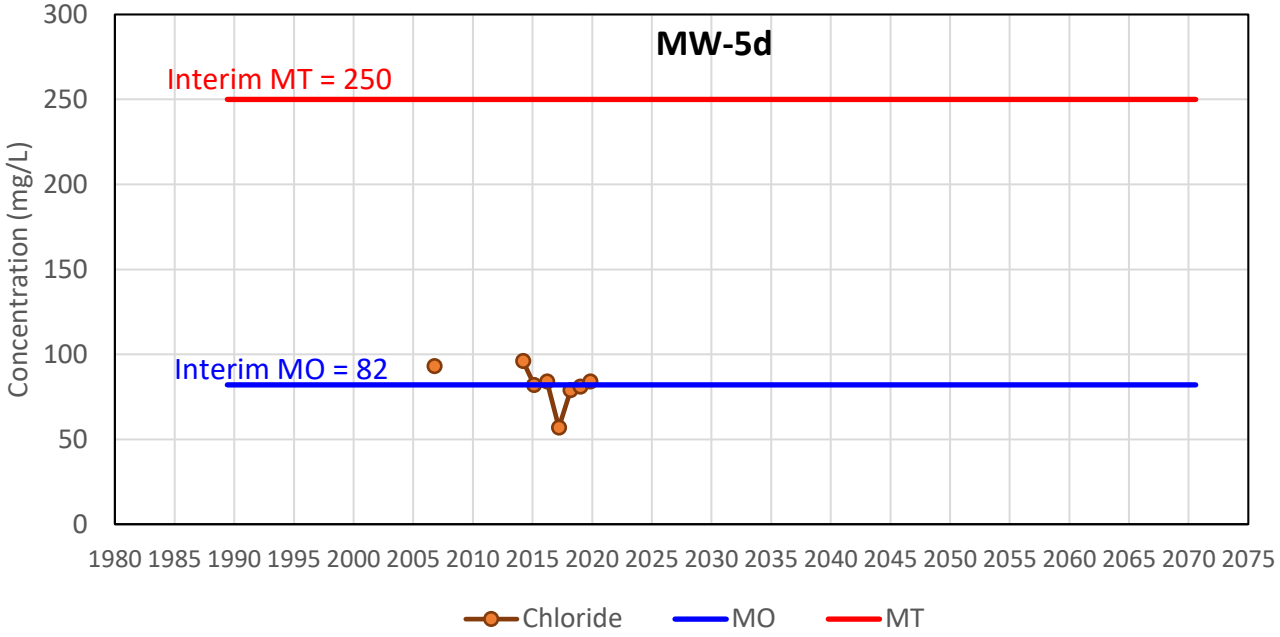
- GW quality is generally acceptable if below an established MCL
- 20% increase is based on evaluation of 3 potential sources of fluctuations:
  (1) analytical lab methods
  (2) sampling methods
  (3) variability in GW system

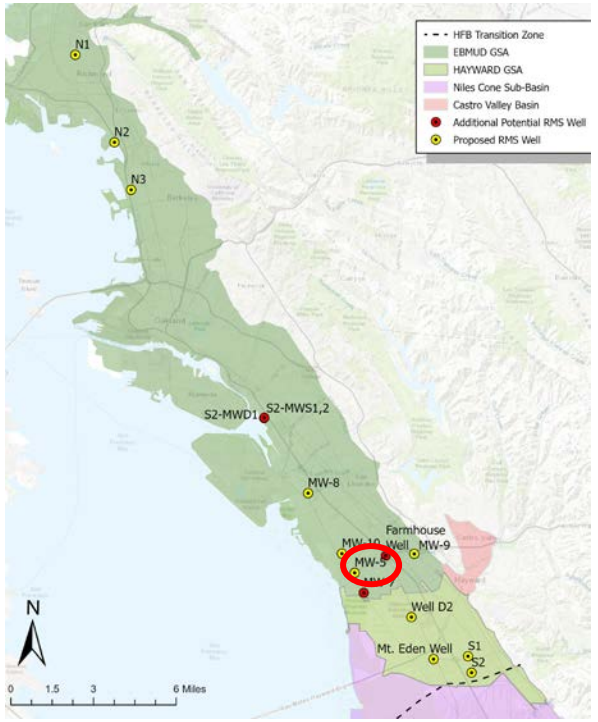
### Interim MO and IMs

- Average baseline concentrations where data is available

# SMC Evaluation

## Degradation of Water Quality




*MO = Measurable Objectives*
*MT = Minimum Threshold*
*d = Deep Aquifer Zone*

# SMC Evaluation

## Degradation of Water Quality

Questions

# SMC Evaluation

## Land Subsidence

| Undesirable Results | Effects on beneficial users or uses | Data Gaps |
|---|---|---|
| • Inelastic subsidence due to excessive GW groundwater pumping that causes damage at a regional scale to public infrastructure critical for public health and safety | • Damage to critical public infrastructure such as levees, flood control channels, water supply aqueducts | • Subsidence has only been directly measured in the EBP Subbasin using the extensometers near EBMUD's Bayside well |

**Interim Criteria for URs**

- GW levels used as a proxy; based on historical Spring lows
- Better data for historical Spring water levels compared to Fall
- 25% of RMS wells fall below MT for two consecutive non-drought years
- Intermediate / Deep Aquifer only; subsidence not expected in Shallow Aquifer

# SMC Evaluation

## Land Subsidence

| Interim MT | Justification |
| --- | --- |
| South EBP<br>-50 feet MSL (Spring) | • Observed / modeled historical lows in Intermediate and Deep Aquifer Zones |
| North EBP<br>-20 feet MSL (Spring) | • Observed historical low for one well in Intermediate Zone<br>• Water levels and narrative from Richmond wellfield pumping |

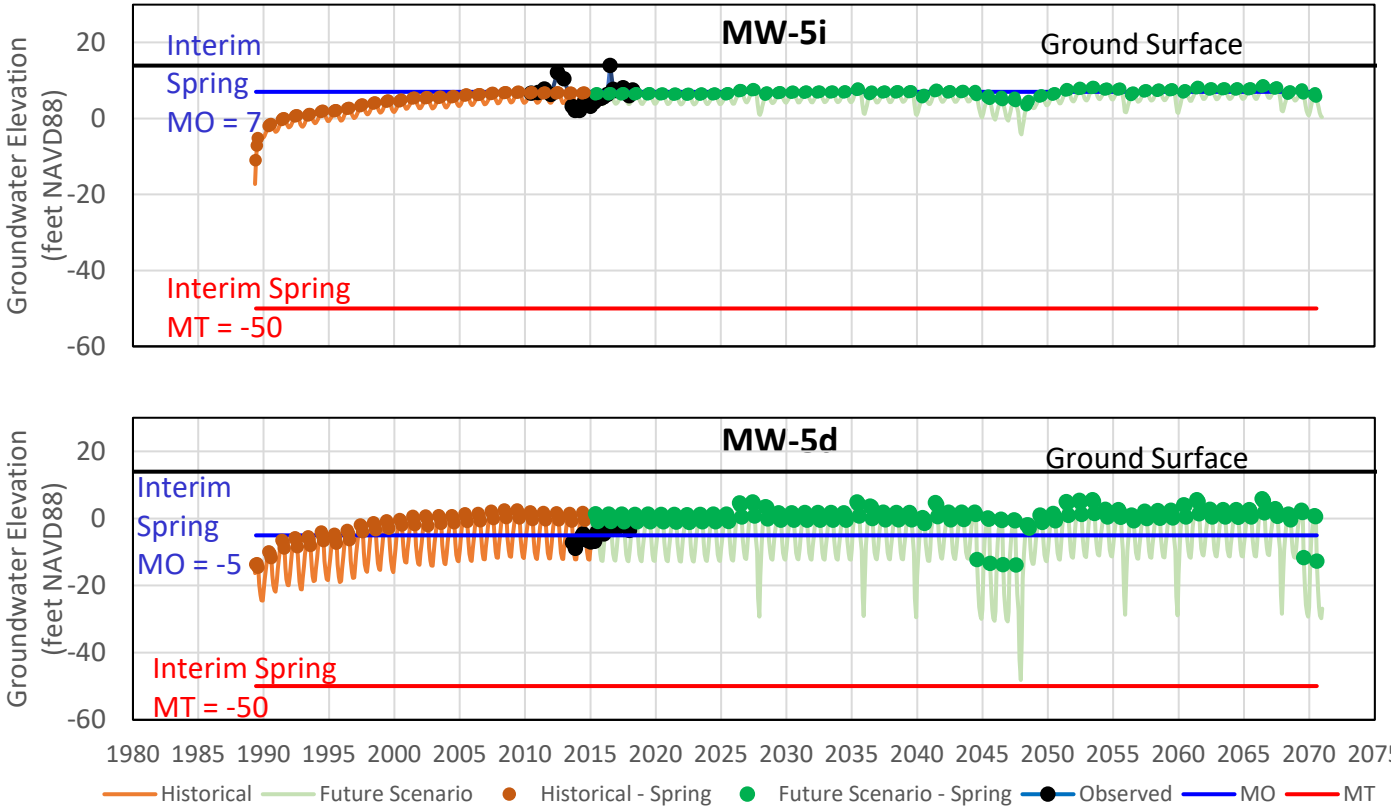
**Interim MO and IMs**

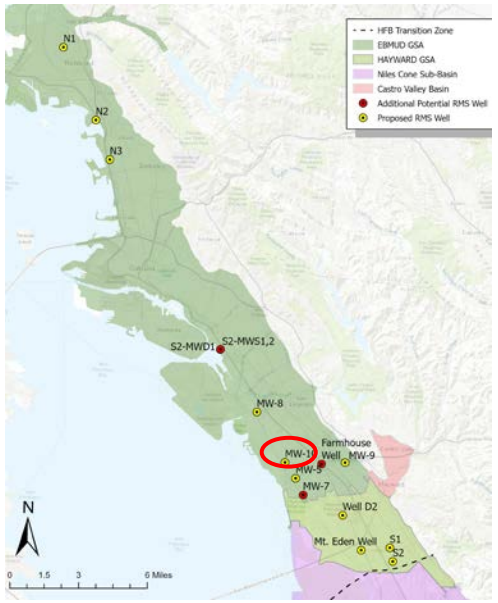
- Average spring groundwater levels in intermediate and deep aquifers when recent data (<10 years) is available
- If data is unavailable, groundwater model results are used

*MSL = Mean sea level*

# SMC Evaluation

## Land Subsidence

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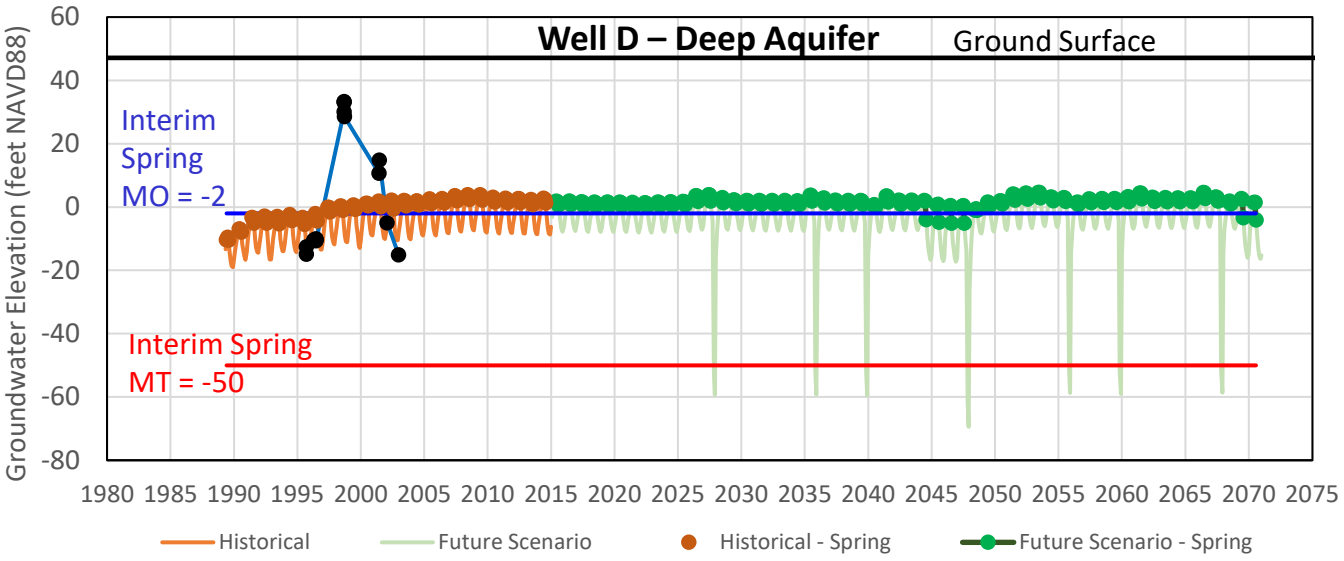
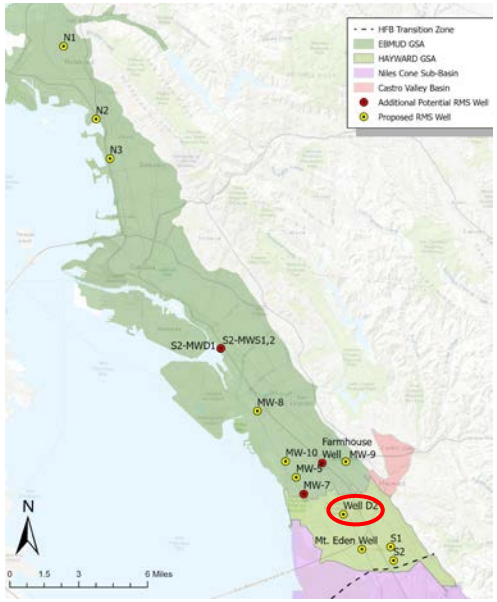
# SMC Evaluation
## Land Subsidence

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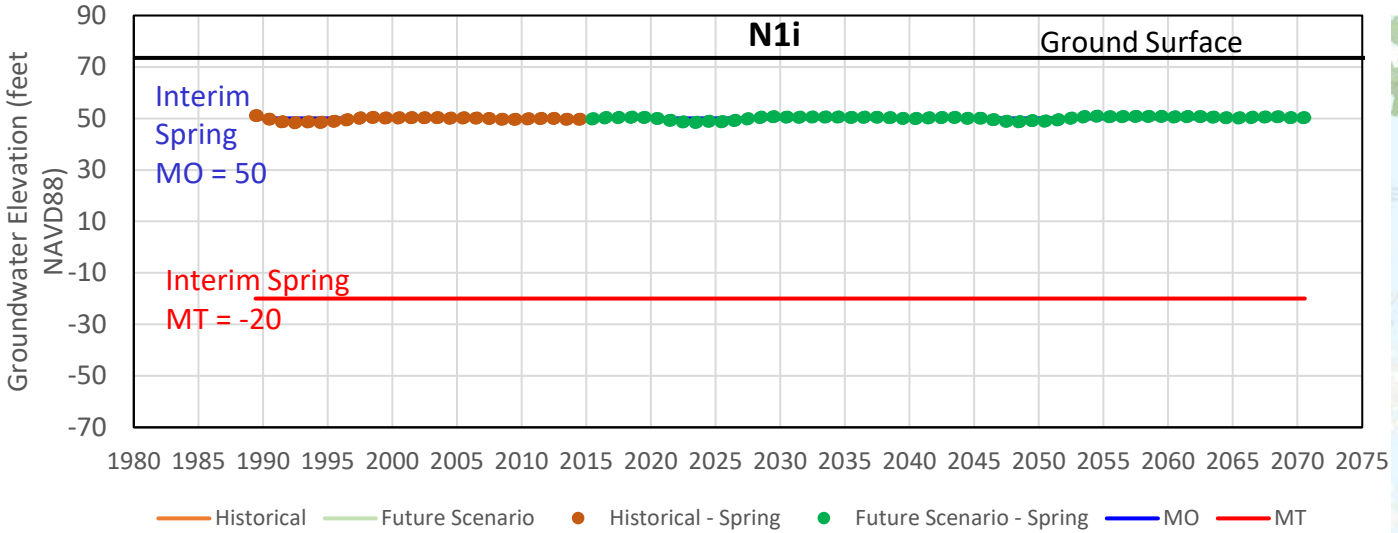
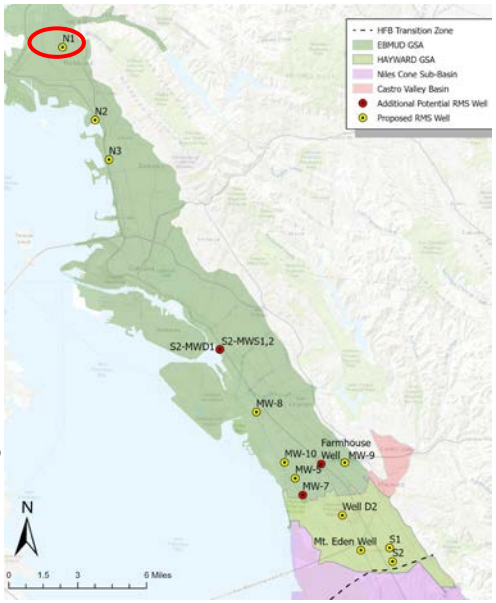
# SMC Evaluation
## Land Subsidence

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*i = Intermediate Aquifer Zone*

# Questions

# SMC Evaluation

## Surface Water Depletion

| Undesirable Results | Effects on beneficial users or uses | Data Gaps |
|---|---|---|
| • Increase in streamflow depletion rate that results in significant and unreasonable effects to potential beneficial uses/users | • Insufficient water for beneficial uses/users such as for aquatic species and GDEs | • Limited to no data on streamflow and stream-aquifer interconnection for major streams |

**Interim Criteria for URs**

- ***Shallow*** GW levels near major streams used as a proxy
- 50% of RMS wells fall below MT for two consecutive non-drought years
- 50% is reasonable because of small number of shallow RMS wells near streams

# SMC Evaluation

## Surface Water Depletion

**Interim MT**

2 feet below MO

**Justification**

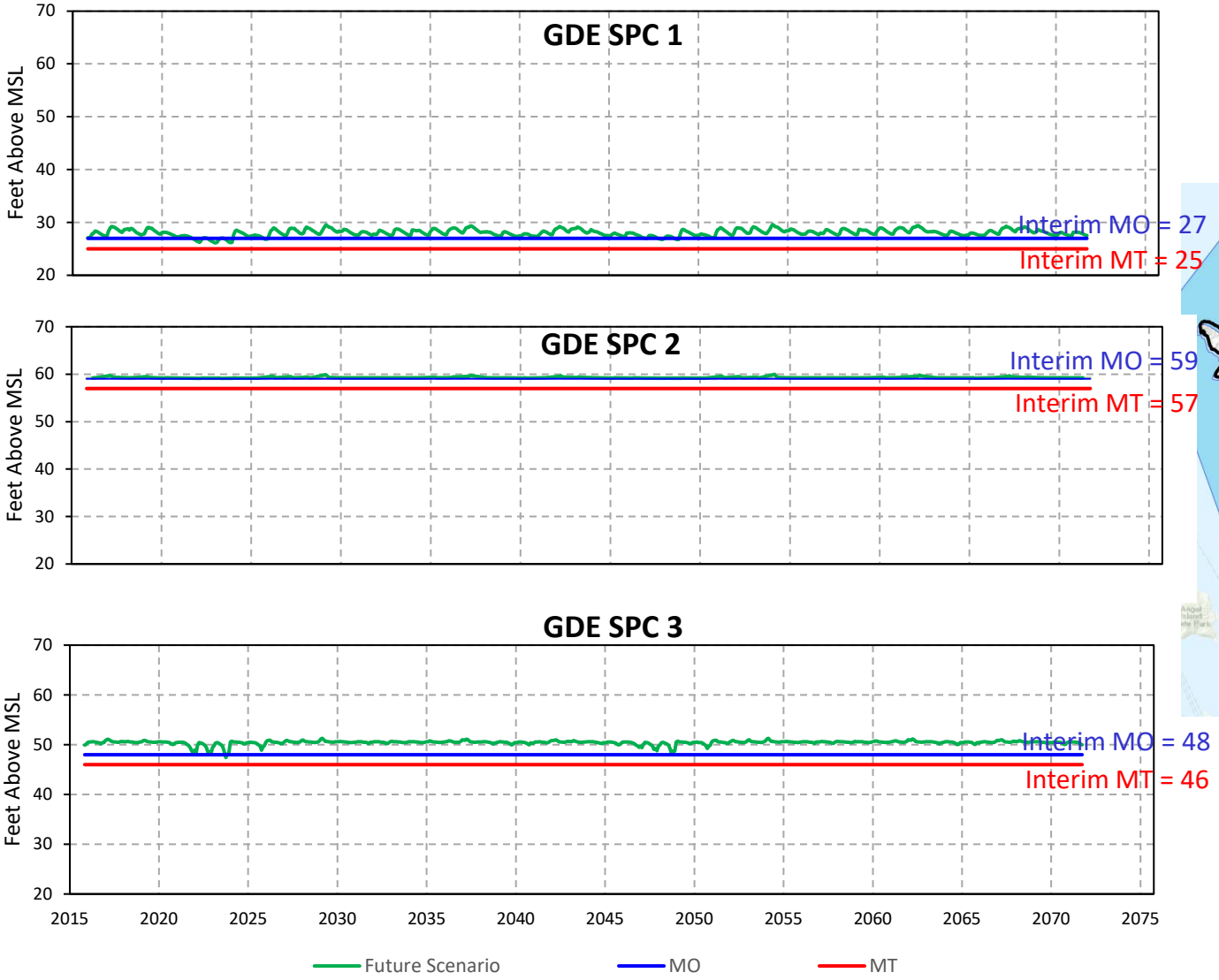
- Based on GW model runs
- Difference between baseline conditions and sustainability (pumping at 3,600 AFY versus 12,500AFY)
- Shallow GW levels decreased between 0 – 1.8 feet

**Interim MO and IMs**

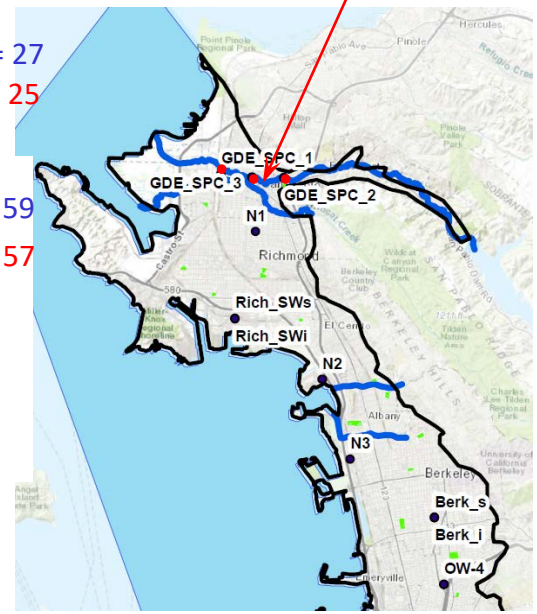
- Low end of model-derived range of GW level fluctuations

# SMC Evaluation

## Surface Water Depletion




**San Pablo Creek (SPC)**




*MO = Measurable Objectives*
*MT = Minimum Threshold*

# SMC Evaluation

## Surface Water Depletion

Questions

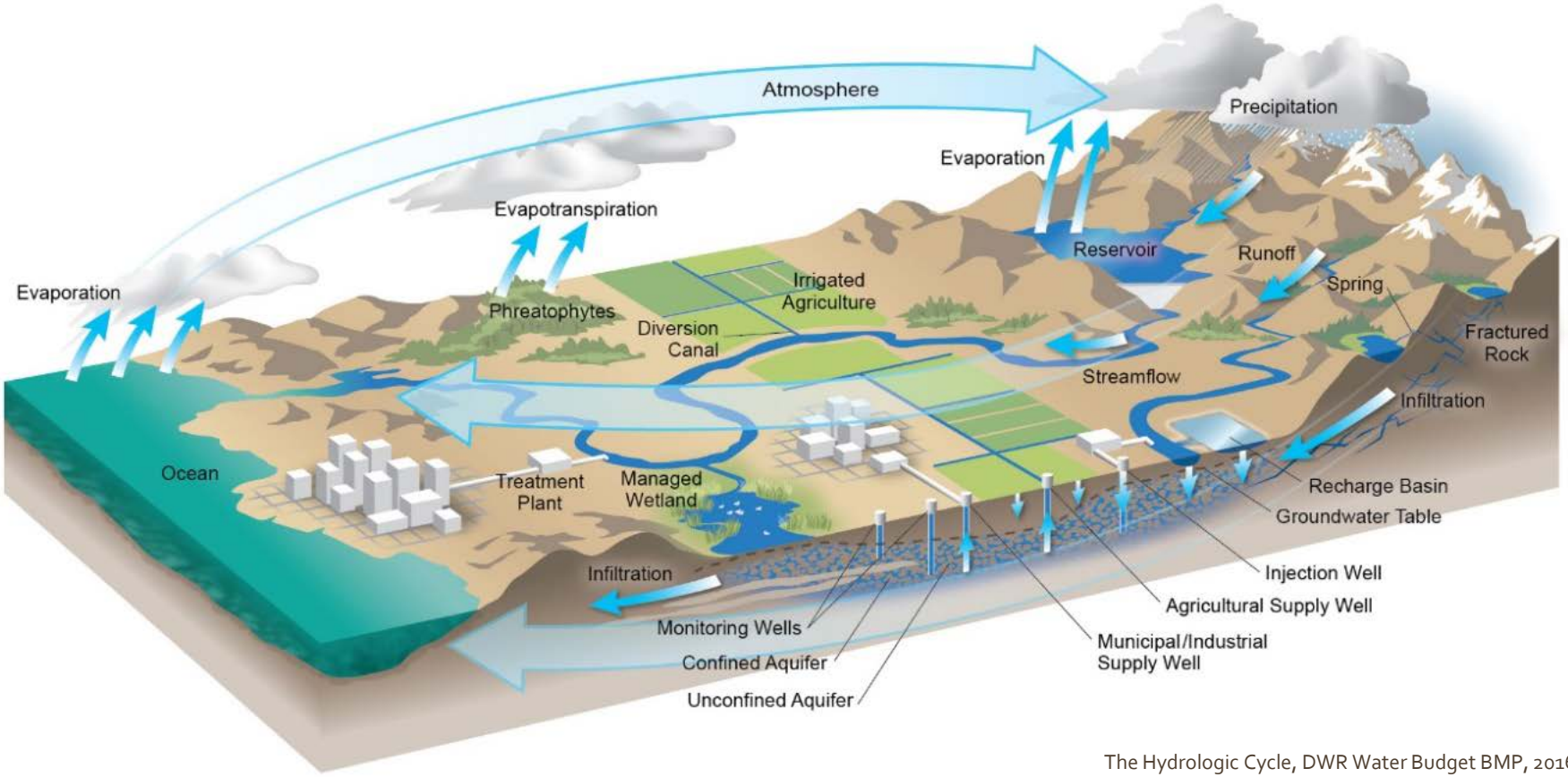
# Next Steps

- **Continue drafting the Plan**
  - Draft GSP for public review in early September

- **Future meetings**
  - Stakeholder C&E Meetings: August 16 and October 20

*C&E: Communication & Engagement*

# Questions




The Hydrologic Cycle, DWR Water Budget BMP, 2016