MoundBasin

GROUNDWATER SUSTAINABILITY AGENCY

ITEM 8D
MBGSA
BOARD MEETING
FEBRUARY 18, 2021

SGMA REQUIREMENTS

- SGMA requires minimum 50-yr future projections of groundwater conditions, including water budget for the basin
- Must use >= 50 yrs. of *historical* hydrology
- Must use most recent conditions for baseline estimate of future water demands
- Must evaluate potential effects on water demand due to:
  - Land Use Change
  - Population Change
  - Climate Change

FUTURE CONDITIONS KEY ASSUMPTIONS

- Discussed with Board on 9/17/2020
- Hydrology
  - 1943 – 2019 (77 yrs.) is proxy for future conditions
    - Wide range of conditions during this period
- Groundwater Pumping
  - Agricultural – per MBAWG
    - Ranges from 2,873 AFY in wet yrs. to 3,548 AFY in dry yrs.
  - City of Ventura planned pumping = 4,000 AFY
  - Two industrial wells – same as recent historical pumping

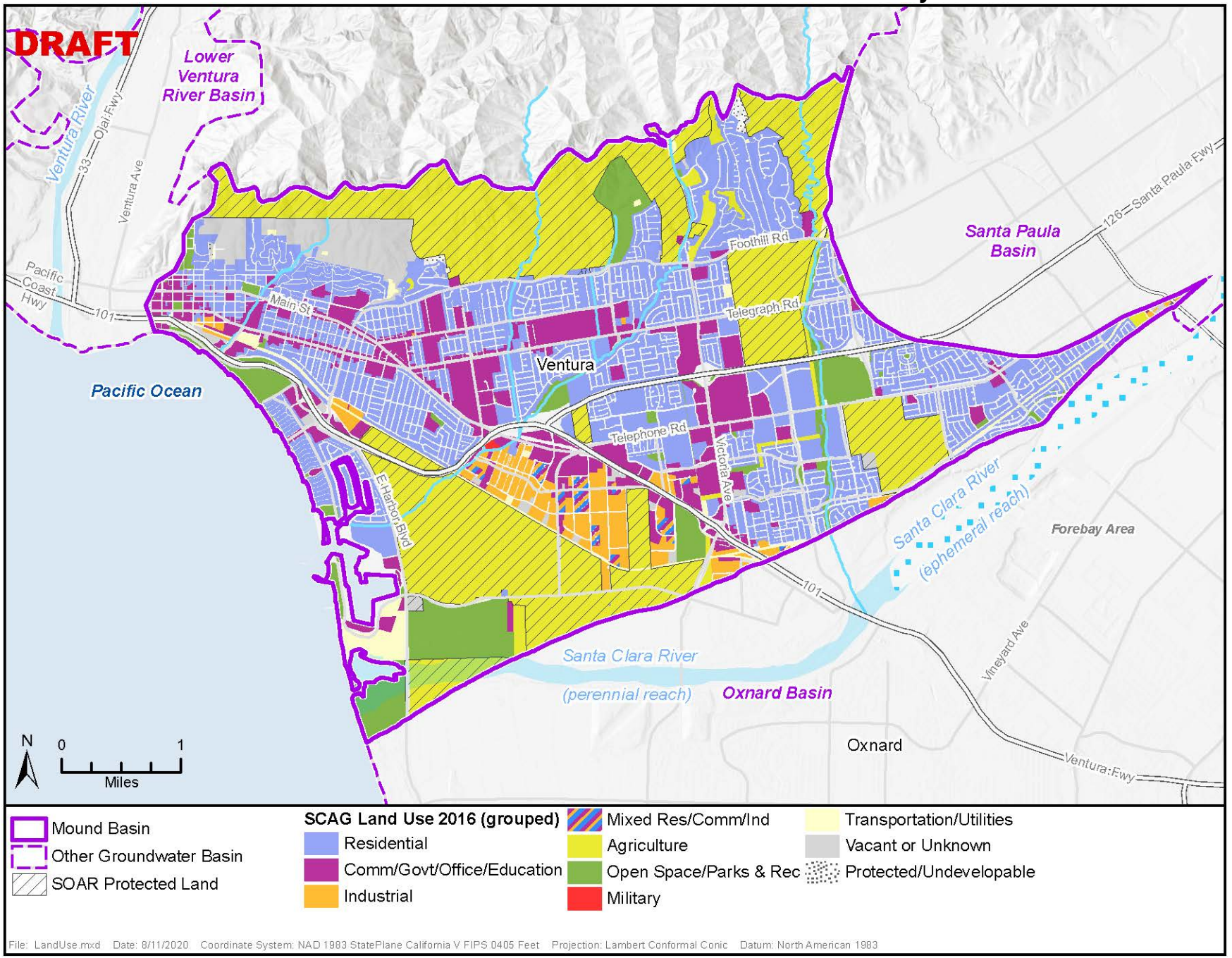
FUTURE CONDITIONS KEY ASSUMPTIONS (CON'T)

- Adjacent Basins
  - Santa Paula – assume future pumping consistent with recent pumping (adjudicated)
  - Oxnard Basin – used FCGMA "Reduction with Projects Scenario from GSP per FCGMA staff recommendation
    - Adjustments made to reduce unrealistically high groundwater levels in Oxnard Basin Forebay (GW levels above land surface)
- Artificial Recharge (UWCD)
  - Existing Freeman Diversion operations + planned expansion project per UWCD staff

SGMA REQUIRED ANALYSIS

- Land Use Impact
  - Assume no material change due to SOAR voter initiatives approved through 2050.
  - City has net zero policy for development
- Population Change
  - Same as above.
- Climate Change
  - Evaluated climate change using DWR change factors for 2030 and 2070 climate change conditions

Mound Basin Land Use and SOAR Boundary



MODEL SCENARIOS

- Historical: 1985-2019 (calibration/verification model)
- Baseline: This simulation employs the future assumptions described above.
- 2030 Climate Change: Baseline inputs modified using DWR 2030 "climate change factors"
- 2070 Climate Change: Baseline inputs modified using DWR 2070 "climate change factors"
- 2070 Climate Change without Freeman Diversion Expansion Project: Same as "2070 Climate Change" scenario, but w/o expansion project.
- Particle tracking to evaluate seawater intrusion risk

KEY RESULTS
GROUNDWATER LEVELS

1. Future groundwater levels are predicted to be higher than historical levels due to anticipated increases in Oxnard Basin groundwater levels.
2. The impact of climate change on groundwater levels is typically less than approximately 5 ft.
3. The impact of the Freeman Diversion expansion project is almost undetectable.

SELECTED MODEL OUTPUT LOCATIONS

Figure 1a. Historical and Projected Groundwater Levels, Mugu Aquifer at Marina Park

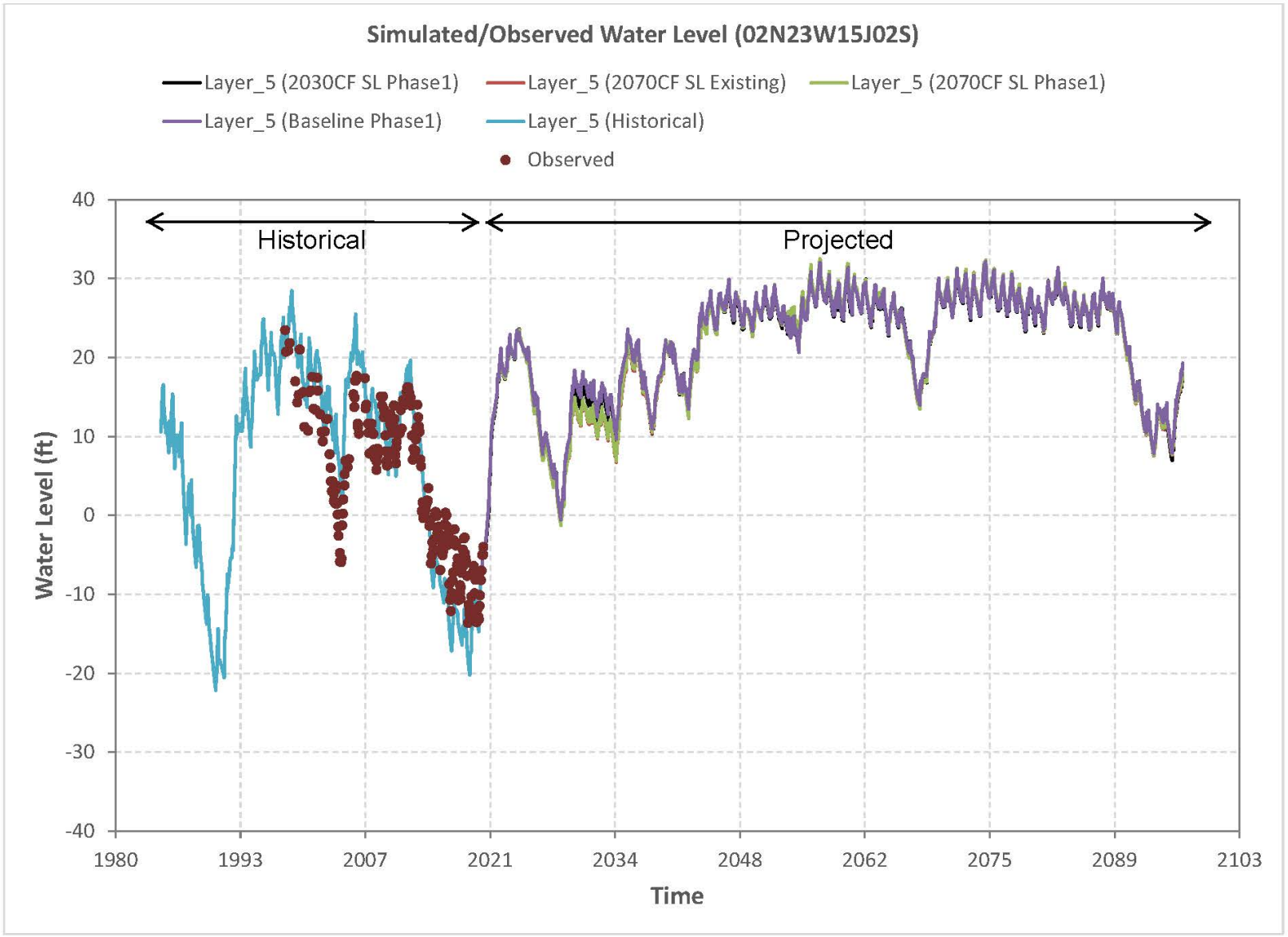


Figure 1c. Historical and Projected Groundwater Levels, Mugu Aquifer at Camino Real Park

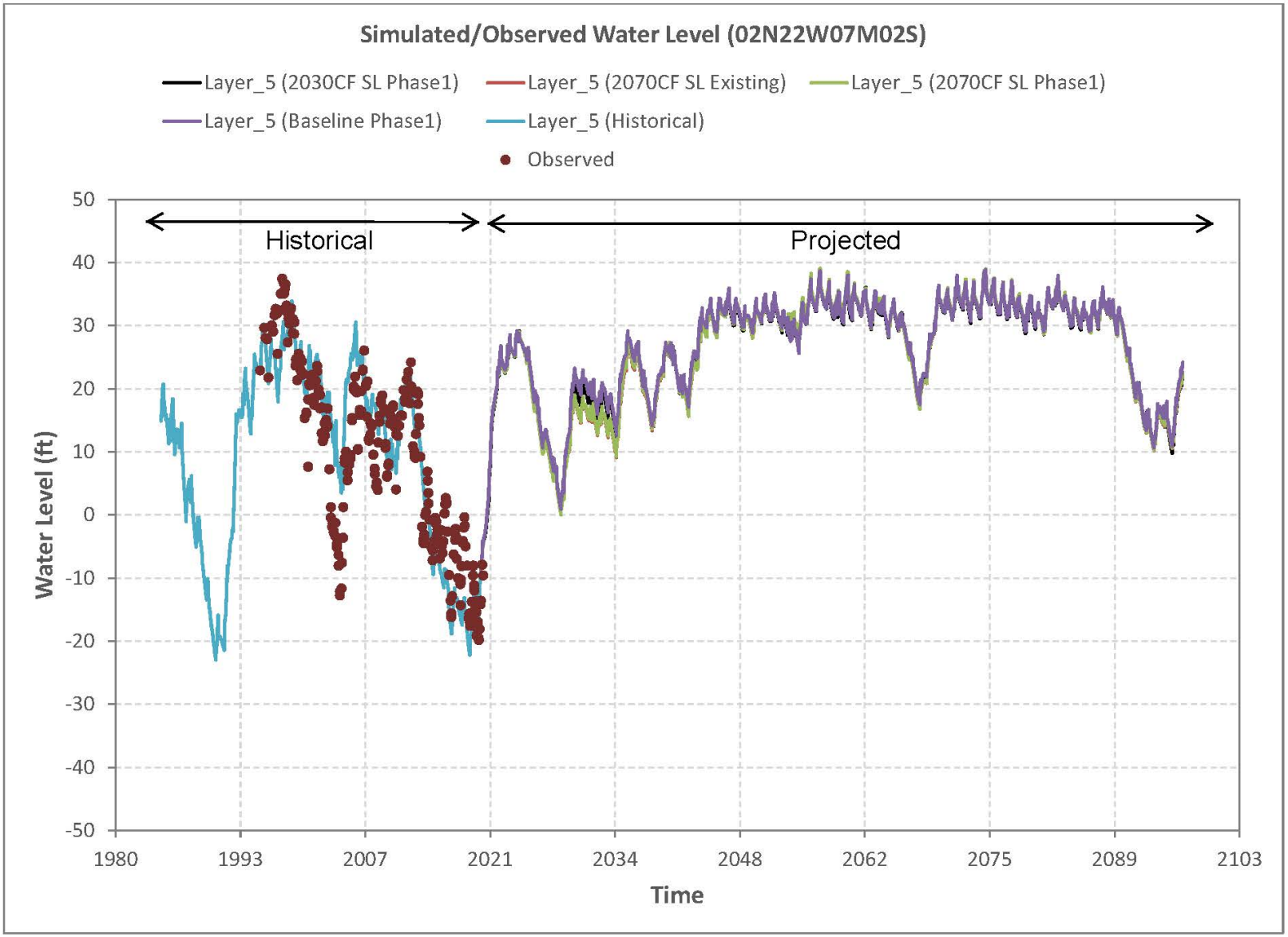


Figure 1b. Historical and Projected Groundwater Levels, Hueneme Aquifer at Marina Park

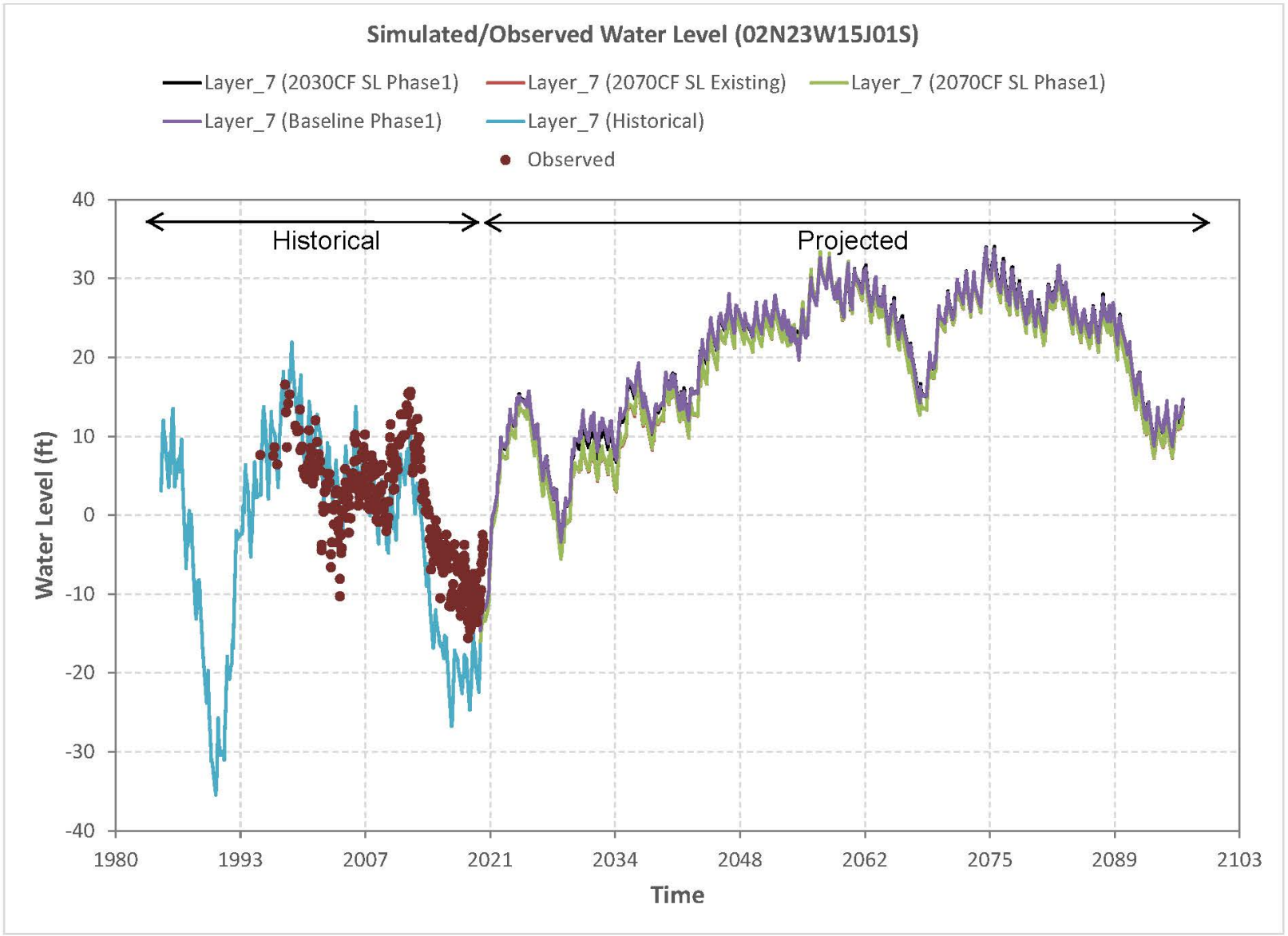
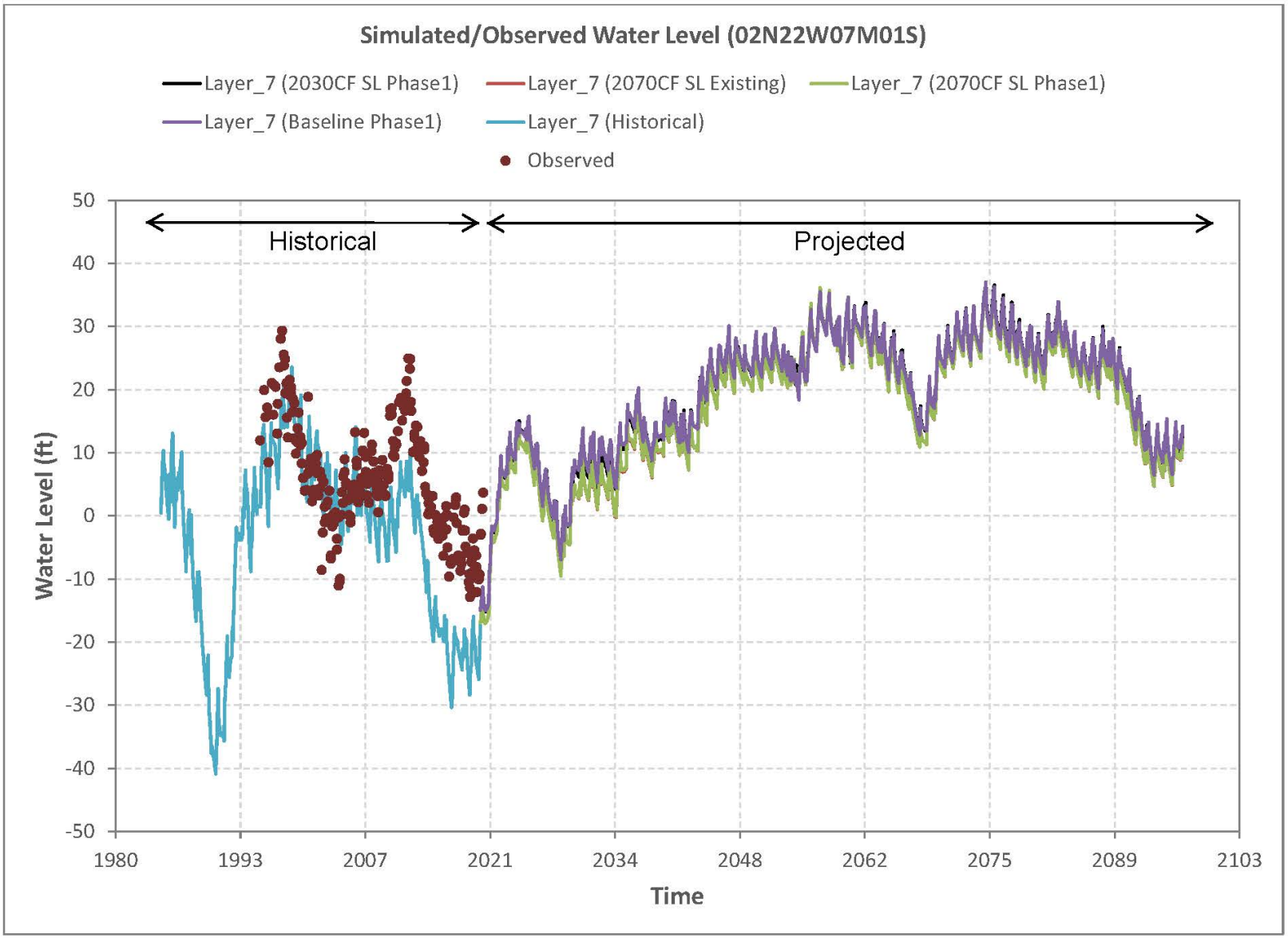


Figure 1d. Historical and Projected Groundwater Levels, Hueneme Aquifer at Camino Real Park



SEAWATER INTRUSION RISK EVALUATION

- Aquifers are exposed to seawater at subcrop approximately 10.5 miles offshore.
- Between subcrop and shoreline, aquifers are believed to be protected from seawater by thick sequence of fine-grained deposits (aquitard)
- Historical movement of seawater from subcrop toward shoreline was estimated using historical model using particle tracking
  - No landward movement of seawater in Mugu Aquifer
  - Approximately 0.5 miles of average landward movement in Hueneme Aquifer over last century*

**Migration rates in the most permeable zones of the aquifer would be considerably (many times) higher.*

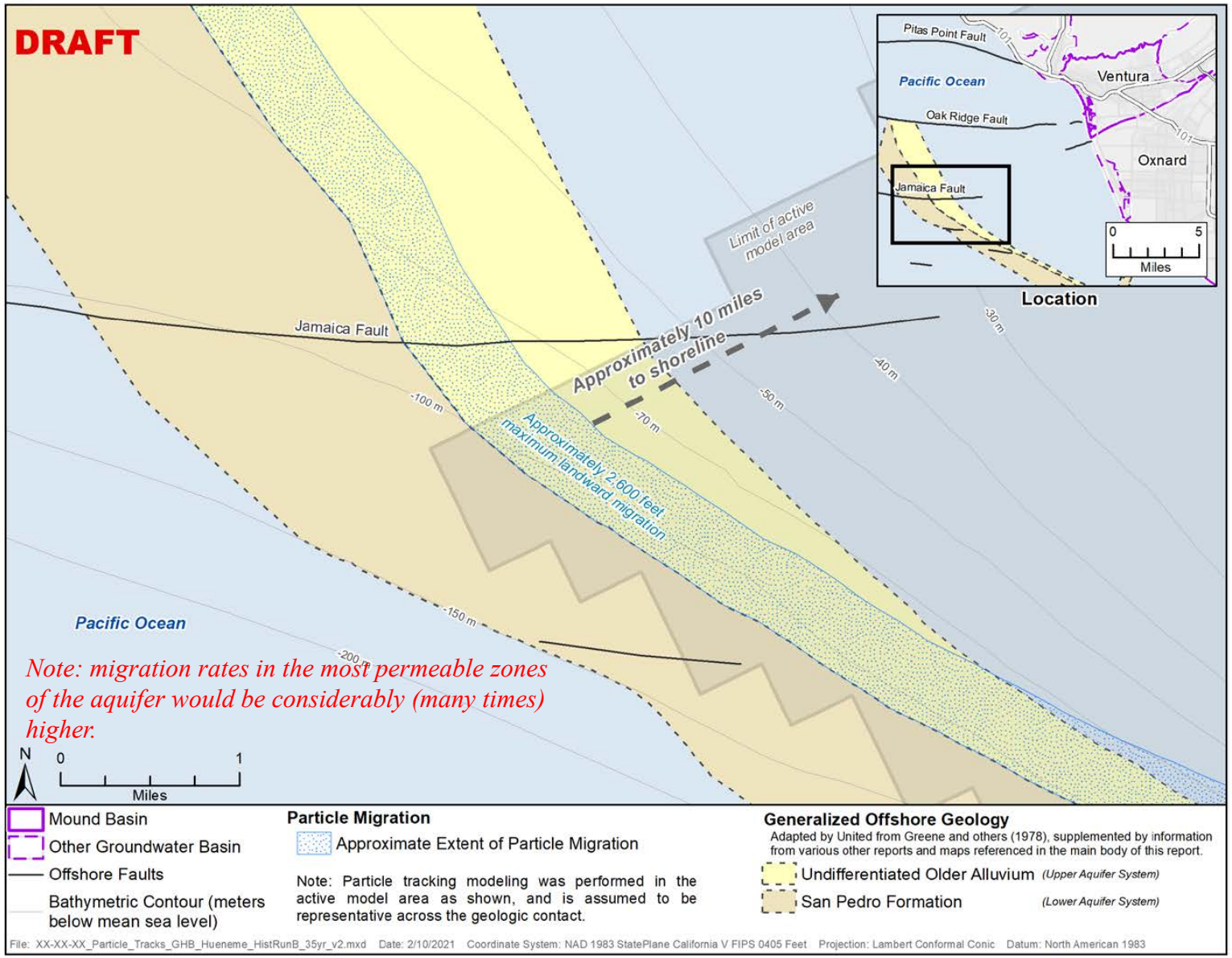


Figure 3 Estimated Historical Extent of Landward Seawater Movement in the Hueneme Aquifer.

SEAWATER INTRUSION RISK EVALUATION (CON'T)

- Conclusions:
  - Seawater is not migrating landward in Mugu Aquifer
  - Timeframe for seawater to migrate from current estimated location in Hueneme Aquifer to shore is longer than SGMA planning horizon
- However, if a short circuit pathway for seawater migration into aquifers exists nearshore (possible along faults or "stratigraphic windows"), onshore flow of seawater could occur much sooner.

SEAWATER INTRUSION RISK EVALUATION (CON'T)

- Particle tracking of groundwater flow directions and flow rates along the shoreline was performed to evaluate risk of onshore migration via a near shore short-circuit pathway.

20 years of Flow Migration in Hueneme Aquifer from Shoreline *

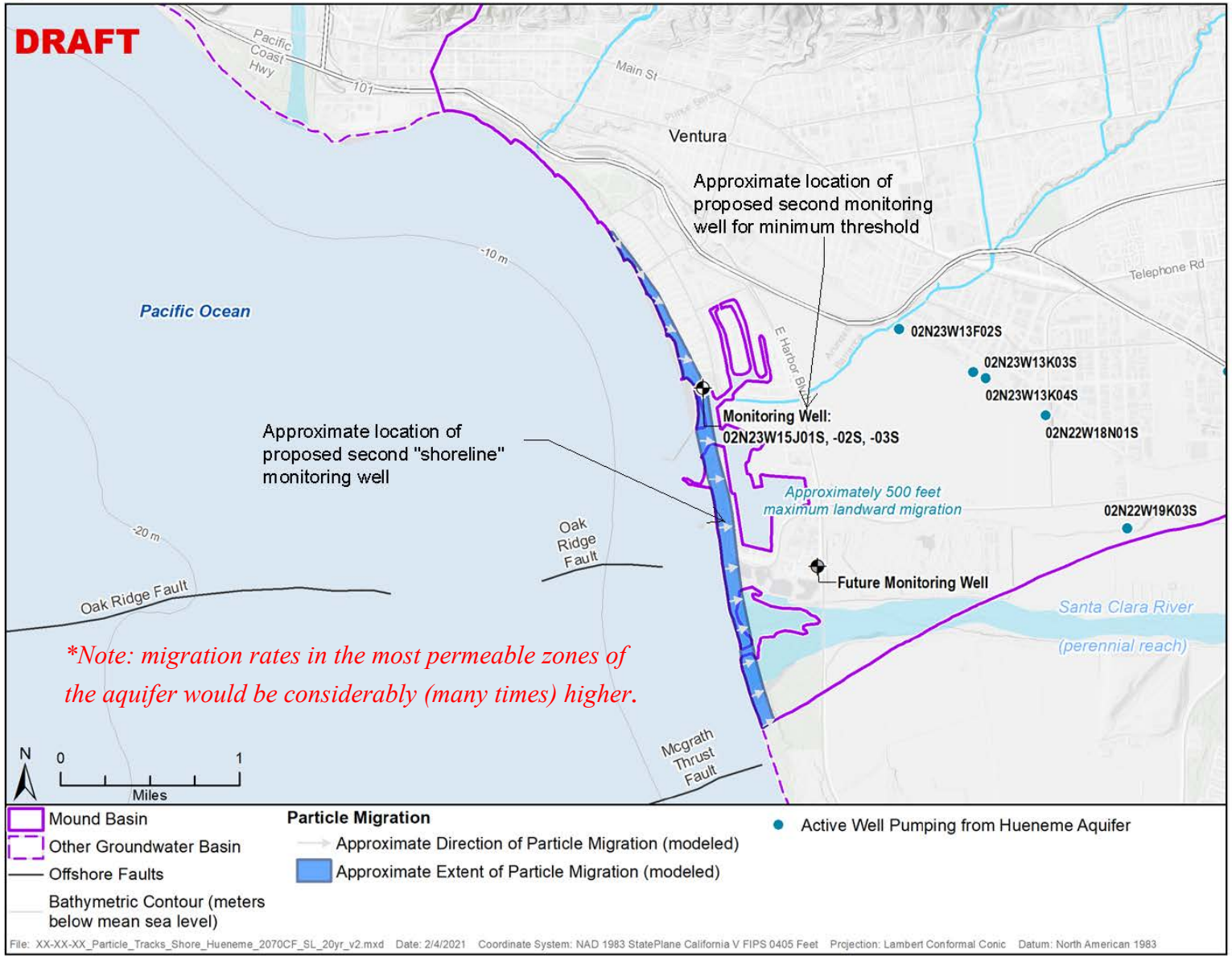


Figure 2a Estimated Landward Movement of Groundwater During 20-Year GSP Implementation Period (with 2070 Climate Change and Sea Level Rise).

50 years of Flow Migration in Hueneme Aquifer from Shoreline *

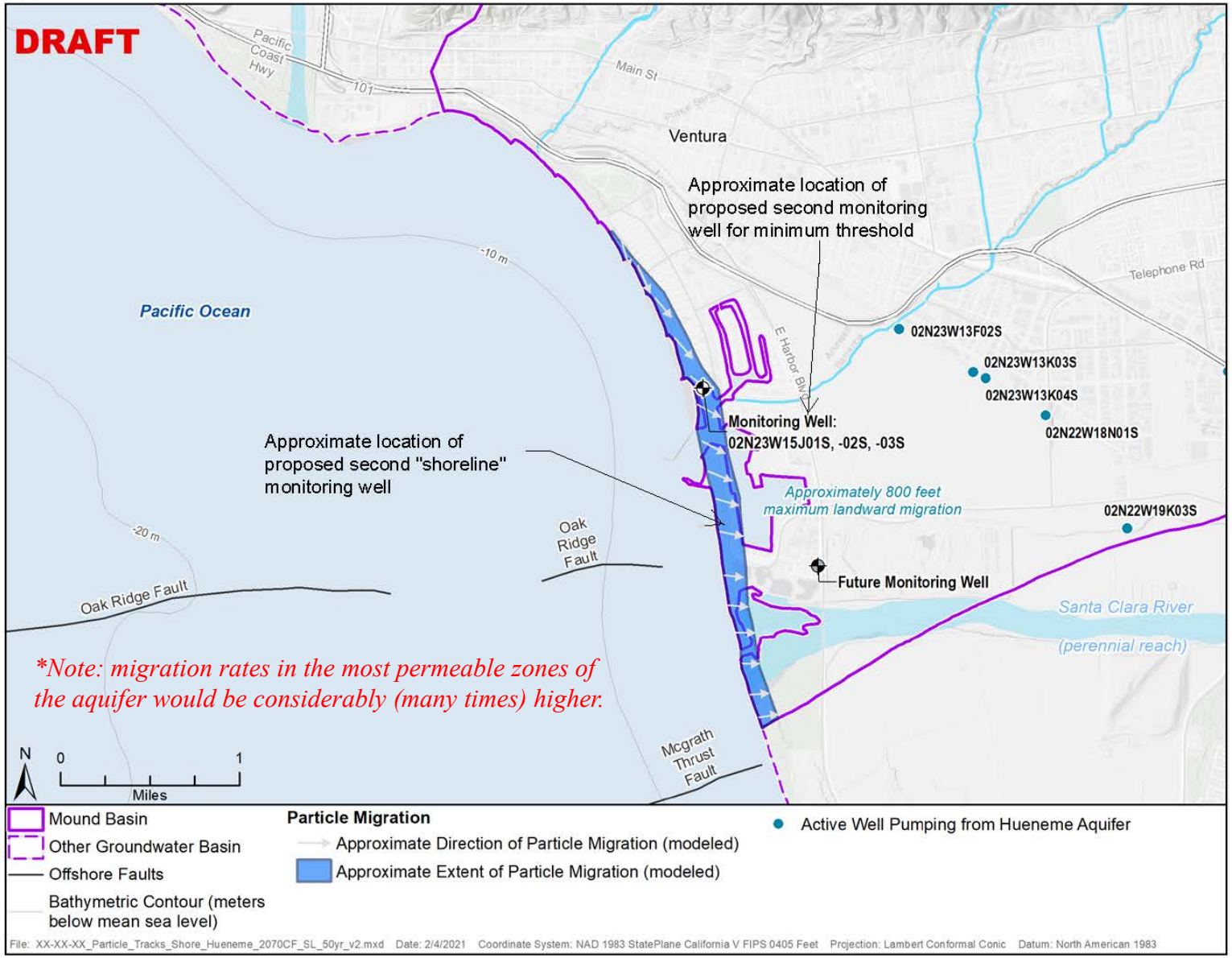


Figure 2b Estimated Landward Movement of Groundwater During 50-Year SGMA Planning Period (with 2070 Climate Change and Sea Level Rise).

KEY RESULTS OF SHORELINE FLOW EVALUATION

1. Particle tracking results suggest that groundwater will flow offshore in the Mugu Aquifer.
2. Particle tracking results suggest that groundwater will flow onshore in the Hueneme Aquifer at an average rate of approximately 1/8 of a mile per 20 years.
   - Note: Migration rates in the most permeable zones of the aquifer could be considerably (many times) higher.

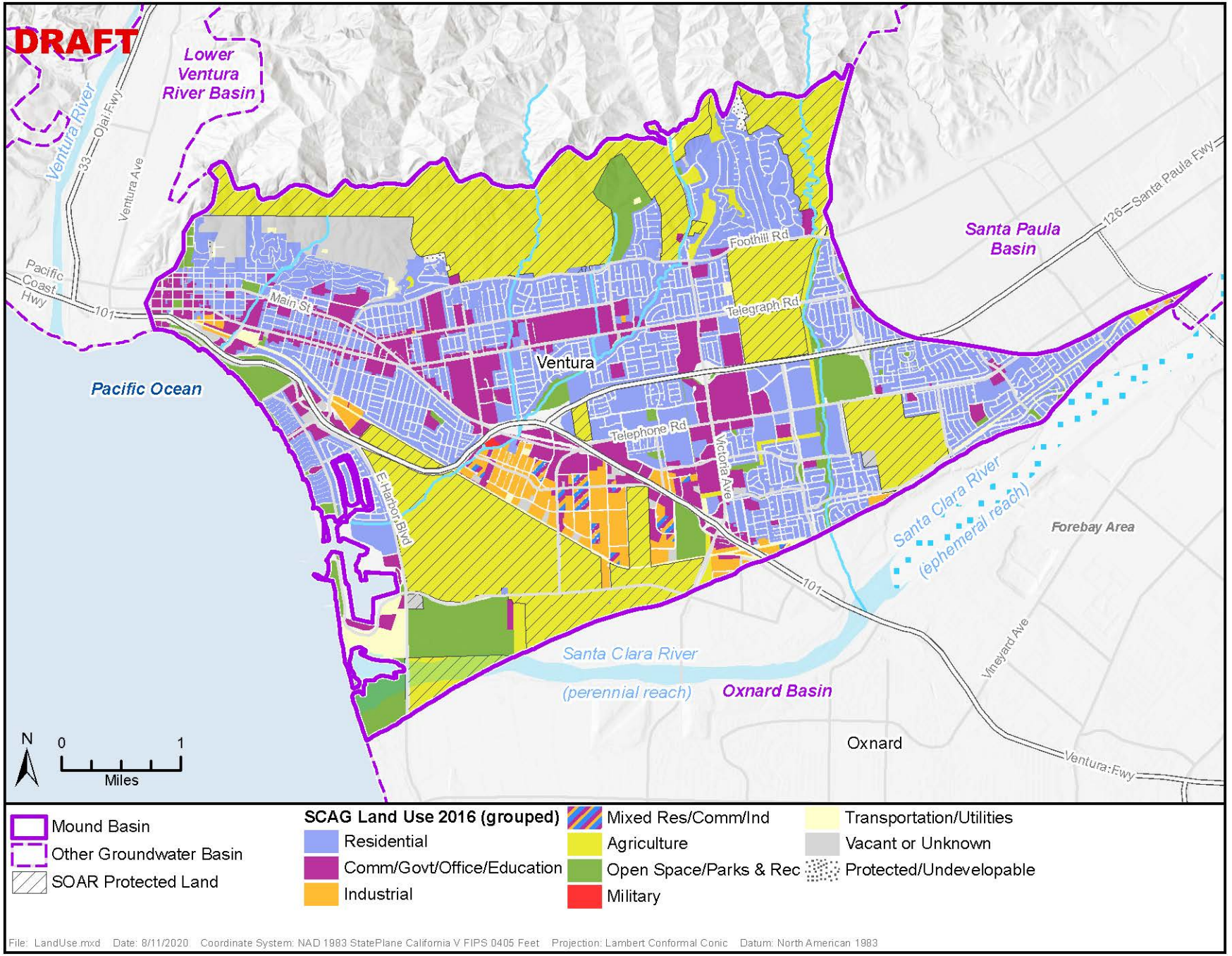
SUSTAINABLE MANAGEMENT IMPLICATION #1

- Seawater intrusion is not anticipated to be an issue for the Mound Basin during the 50-year SGMA planning horizon; however, a monitoring and contingency plan is warranted to address potential short-circuit pathways for seawater.

PROPOSED SEAWATER INTRUSION SMC

- Undesirable Result: Seawater intrusion east of Harbor Blvd.
  - No current or anticipated future beneficial uses of groundwater west of Harbor Blvd.
  - Protect existing beneficial uses east of Harbor Blvd.
- Minimum Threshold:
  - Seawater in monitoring wells near Harbor Blvd.
- Measurable Objective:
  - No indication of seawater in monitoring wells near Harbor Blvd.

Mound Basin Land Use and SOAR Boundary



SEAWATER INTRUSION MONITORING RECOMMENDATIONS

- Construct one additional "shoreline monitoring well"
  - Shoreline monitoring wells provide early detection of seawater and provide time for GSA to implement contingency measures before seawater reaches Harbor Blvd.
- Construct one additional monitoring well along Harbor Blvd. for SMC monitoring
- Estimate cost ~$500,000 each
  - Pursue SGMA implementation grant

Proposed Monitoring Wells for Seawater Intrusion

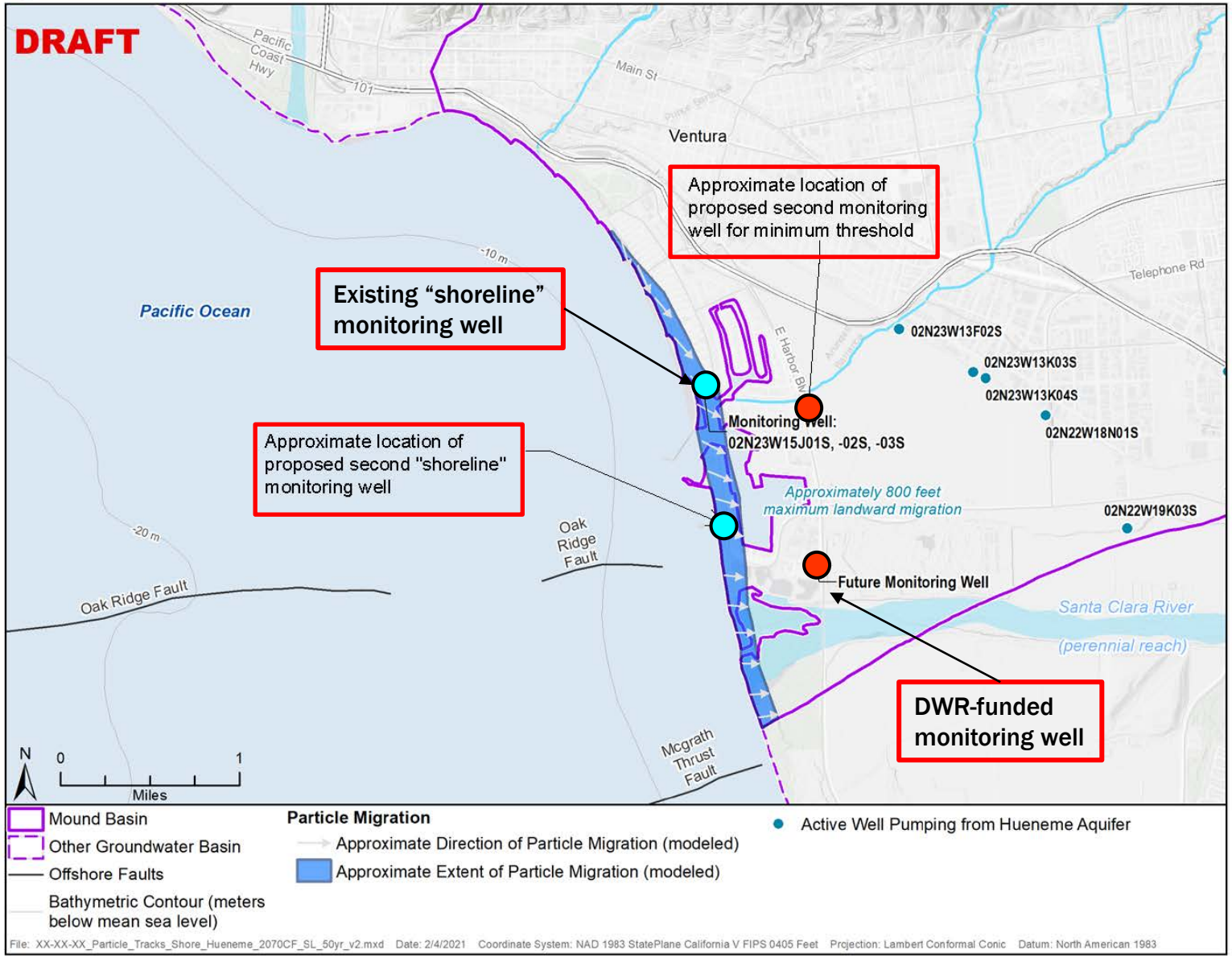


Figure 2b Estimated Landward Movement of Groundwater During 50-Year SGMA Planning Period (with 2070 Climate Change and Sea Level Rise).

SUSTAINABLE MANAGEMENT IMPLICATION #2

- Subsidence is not anticipated because modeling results suggest that future groundwater levels will remain above historical low levels.

- Therefore, inelastic land subsidence is not anticipated to be an issue for the Mound Basin during the 50-year SGMA planning horizon.

PROPOSED SUBSIDENCE SMC

- Undesirable Result: Measurable inelastic subsidence due to groundwater pumping west of Harbor Blvd.
  - "Coastal Area" west of Harbor Blvd. is susceptible to land subsidence
    - City sewer main running along Harbor Blvd has low slope
    - Sea level rise impacts to Coastal Area predicted – subsidence would exacerbate sea level rise impacts
- Minimum Threshold:
  - Groundwater levels below historical low levels as a proxy for potential onset of subsidence
    - Note: areas east of Harbor Blvd. are less susceptible to effects of subsidence, but it is unlikely that groundwater levels could be sustained below historical lows east of Harbor Blvd. without causing groundwater levels to drop below historical lows in Coastal Area
- Measurable Objective:
  - GW levels during wet periods sufficient to prevent dropping below historical lows during droughts

Figure 4a. Historical and Projected Groundwater Levels, Mugu Aquifer at Marina Park with Example Measurable Objective and Minimum Threshold

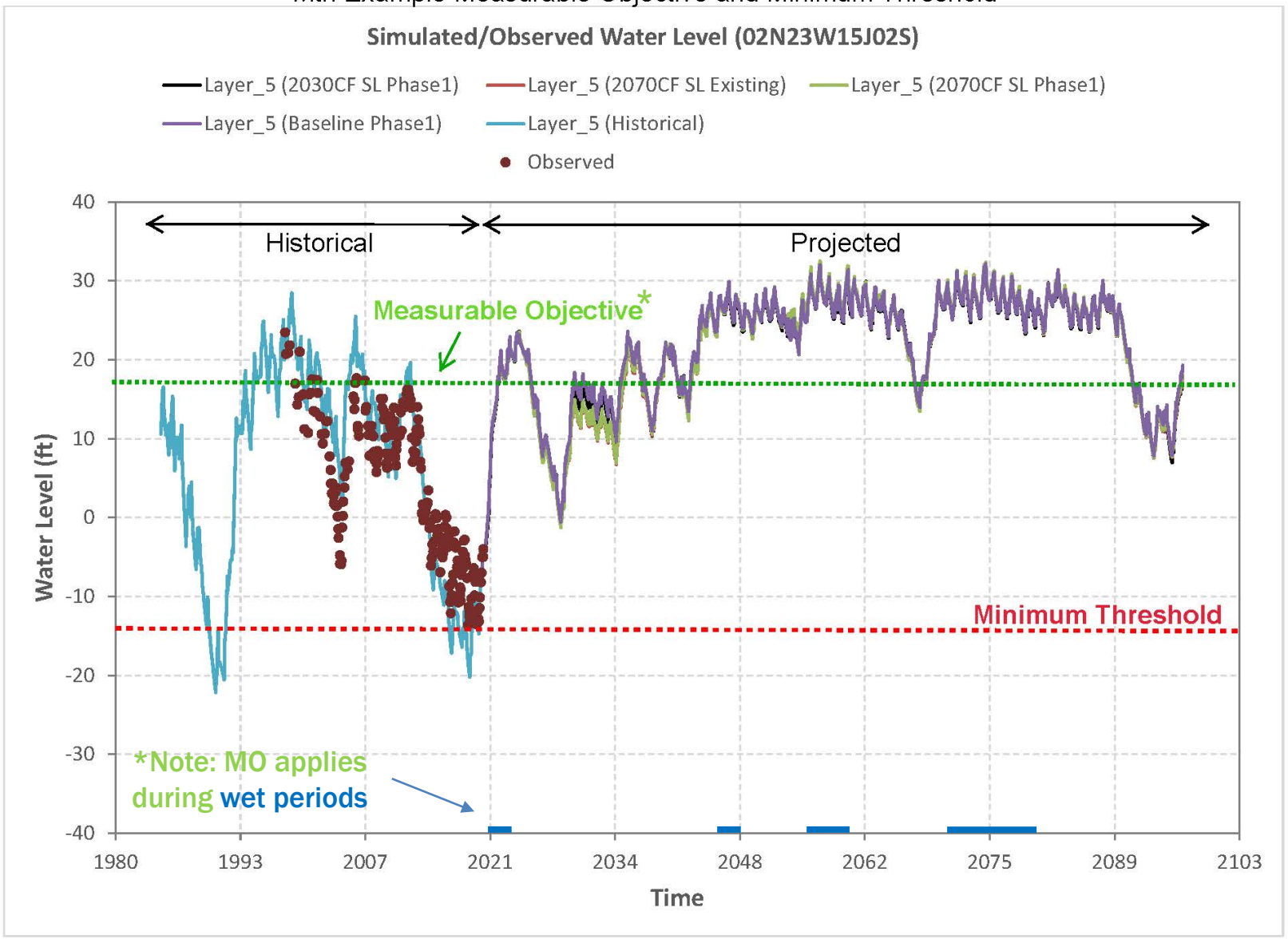


Figure 4c. Historical and Projected Groundwater Levels, Mugu Aquifer at Camino Real Park with Example Measurable Objective and Minimum Threshold

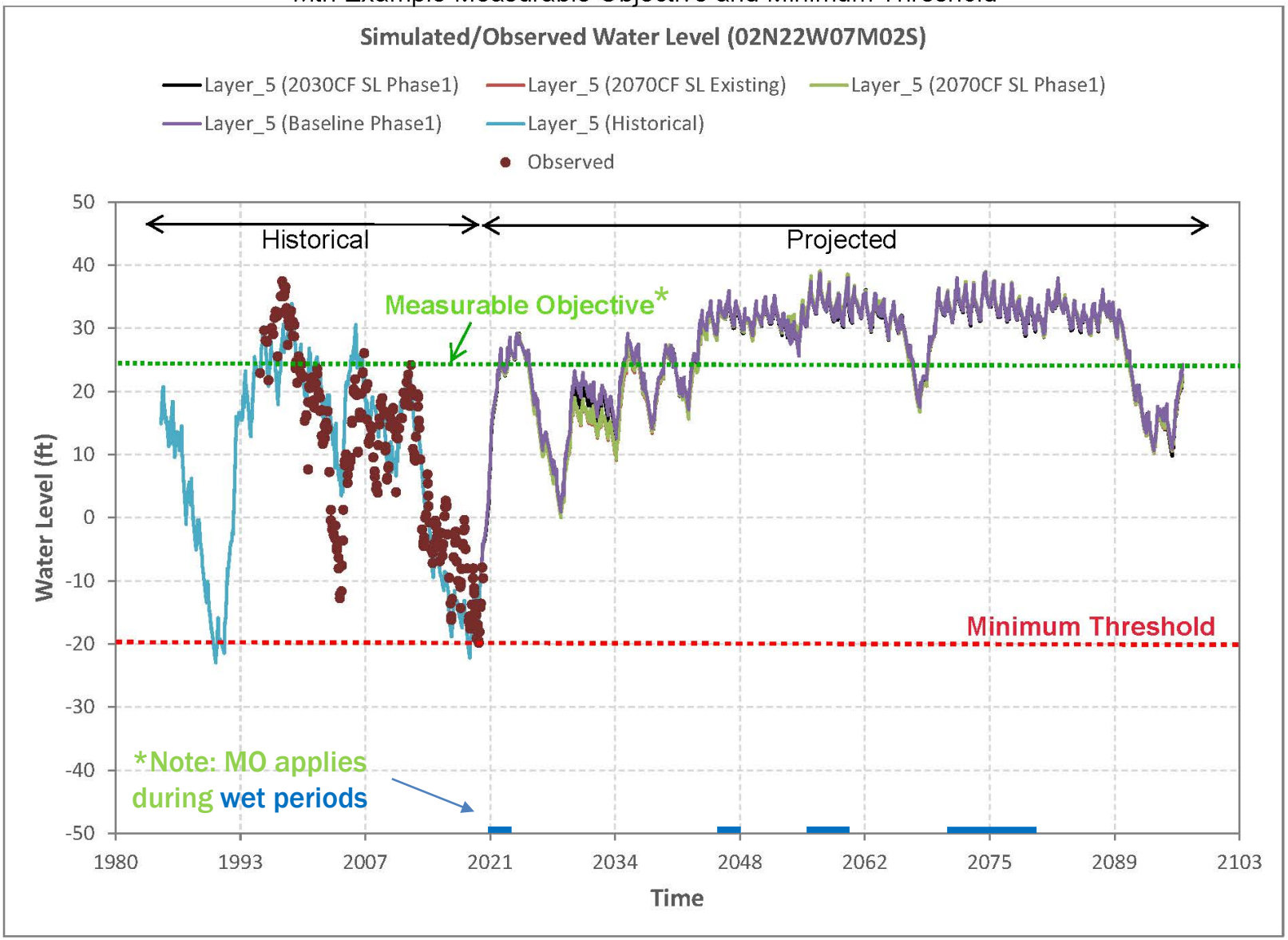


Figure 4b. Historical and Projected Groundwater Levels, Hueneme Aquifer at Marina Park with Example Measurable Objective and Minimum Threshold

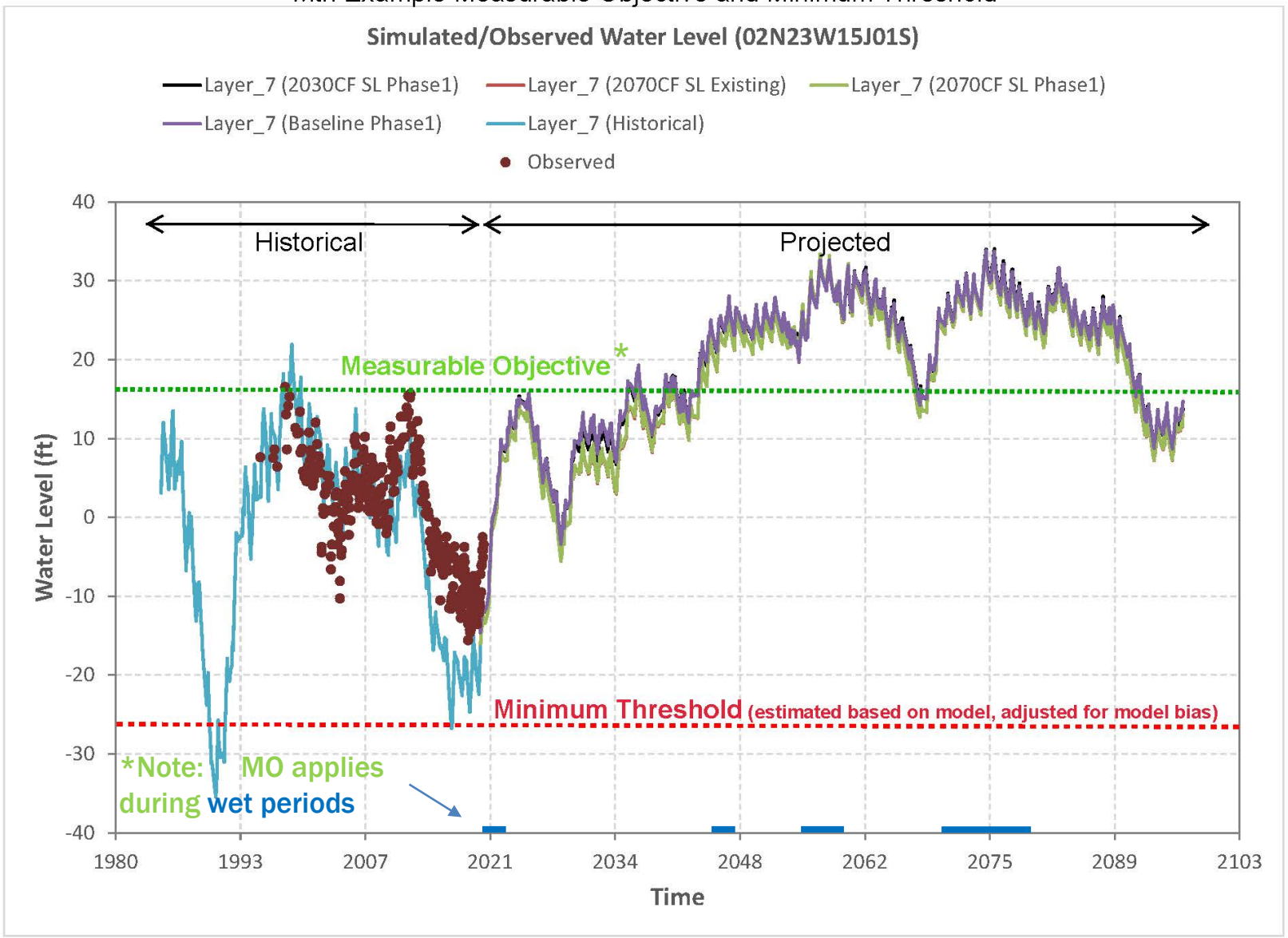
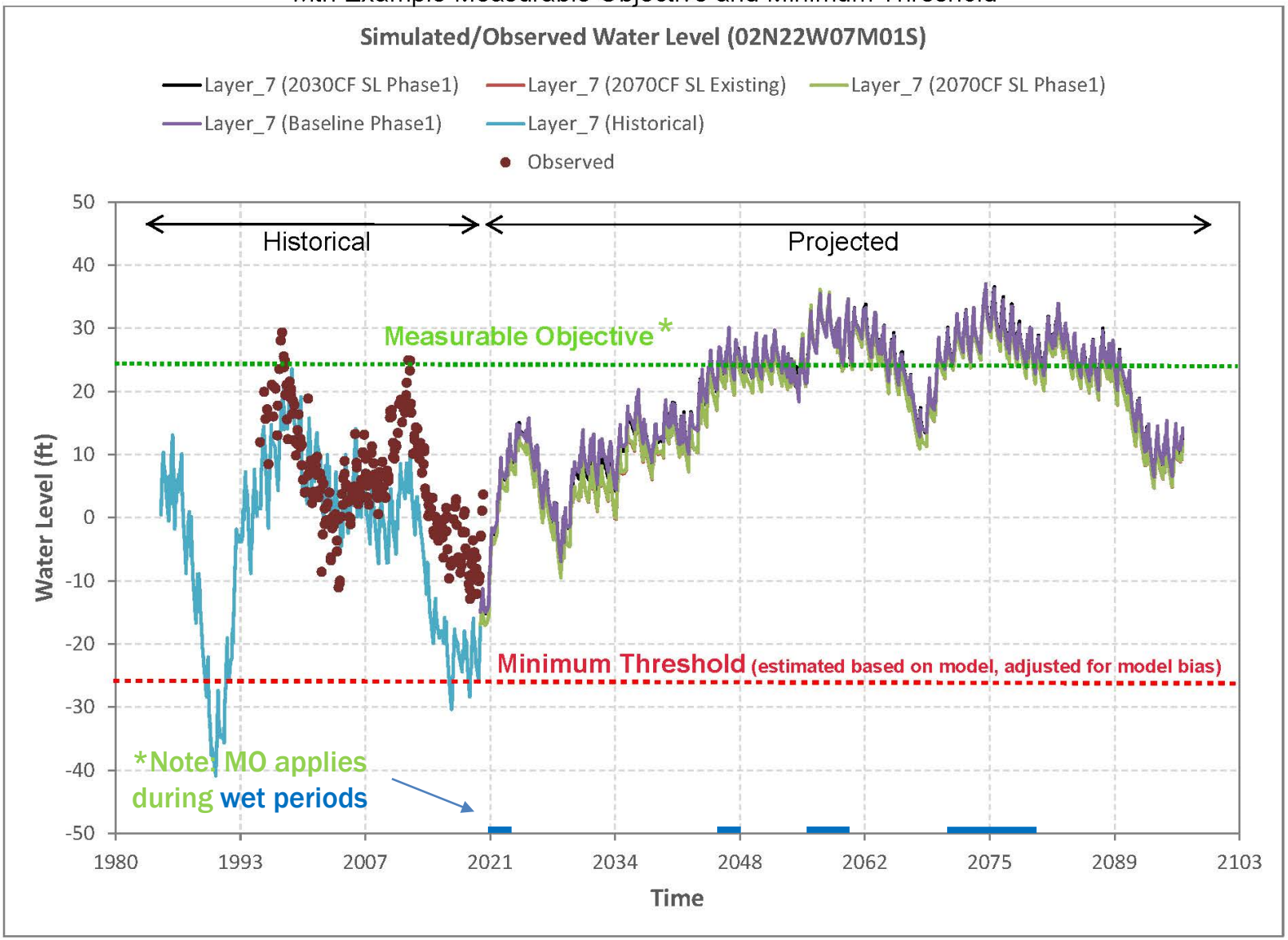


Figure 4d. Historical and Projected Groundwater Levels, Hueneme Aquifer at Camino Real Park with Example Measurable Objective and Minimum Threshold



OTHER SUSTAINABLE MANAGEMENT IMPLICATIONS

- The chronic groundwater level decline and reduction of groundwater storage sustainability indicators will not be controlling factors for sustainable management.
- FCGMA's progress toward achieving its sustainability goal for the Oxnard Basin will be important to track. MBGSA will need to be prepared to adapt its GSP if FCGMA does not meet its sustainability goal or otherwise dramatically deviates from the plans set forth in its initial GSP.

PROPOSED NEXT STEPS

- Board feedback today
- Present at upcoming GSP workshop on March 4
- Review and approve for draft SMC for inclusion in draft GSP at March 18 regular Board meeting

Mound Basin

GROUNDWATER SUSTAINABILITY AGENCY

QUESTIONS & DISCUSSION

United Water CONSERVATION DISTRICT

VENTURA WATER