SANTA CRUZ MID-COUNTY GROUNDWATER SUSTAINABILITY PLANNING

Advisory Committee Meeting #11

SANTA CRUZ MID-COUNTY GROUNDWATER AGENCY

Wednesday, September 26, 2018, 5:00 – 8:30 p.m.
Simpkins Family Swim Center, Santa Cruz

Welcome and Introductions

- Groundwater Sustainability Plan (GSP) Advisory Committee
- Staff
- Public

Meeting Objectives

- Share and discuss what the groundwater model tells us about pumping impacts by use type and location.
- Share and discuss proposed minimum thresholds for chronic lowering of Groundwater Levels, and receive initial input from Advisory Committee.
- Discuss and provide Advisory Committee input on a draft proposal for developing measurable objectives.

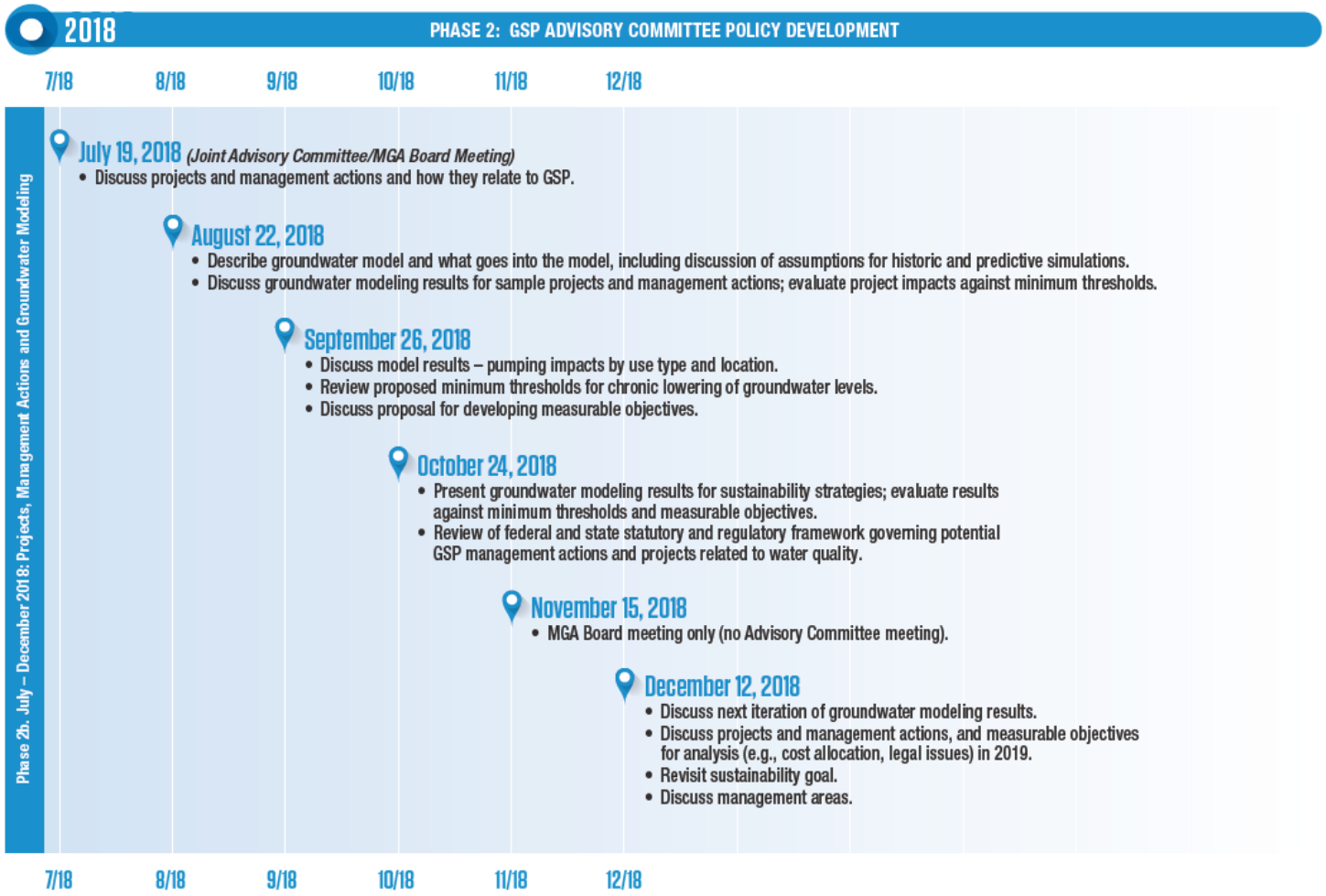
Agenda

5:00	Welcome, Introductions, Objectives, Agenda, GSP Project Timeline and Iterative Process Review, Project Updates
5:10	Oral Communications
5:20	Pumping Impacts on Key Sustainability Indicators
6:35	Public Comment
6:45	*Break*
7:00	Proposed Minimum Thresholds for Chronic Lowering of Groundwater Levels
7:20	Draft Proposal for Developing Measurable Objectives
8:10	Public Comment
8:20	Confirm August 22, 2018 Advisory Committee Meeting Summary
8:25	Recap and Next Steps
8:30	*Adjourn*

GSP Project Timeline and Iterative Process

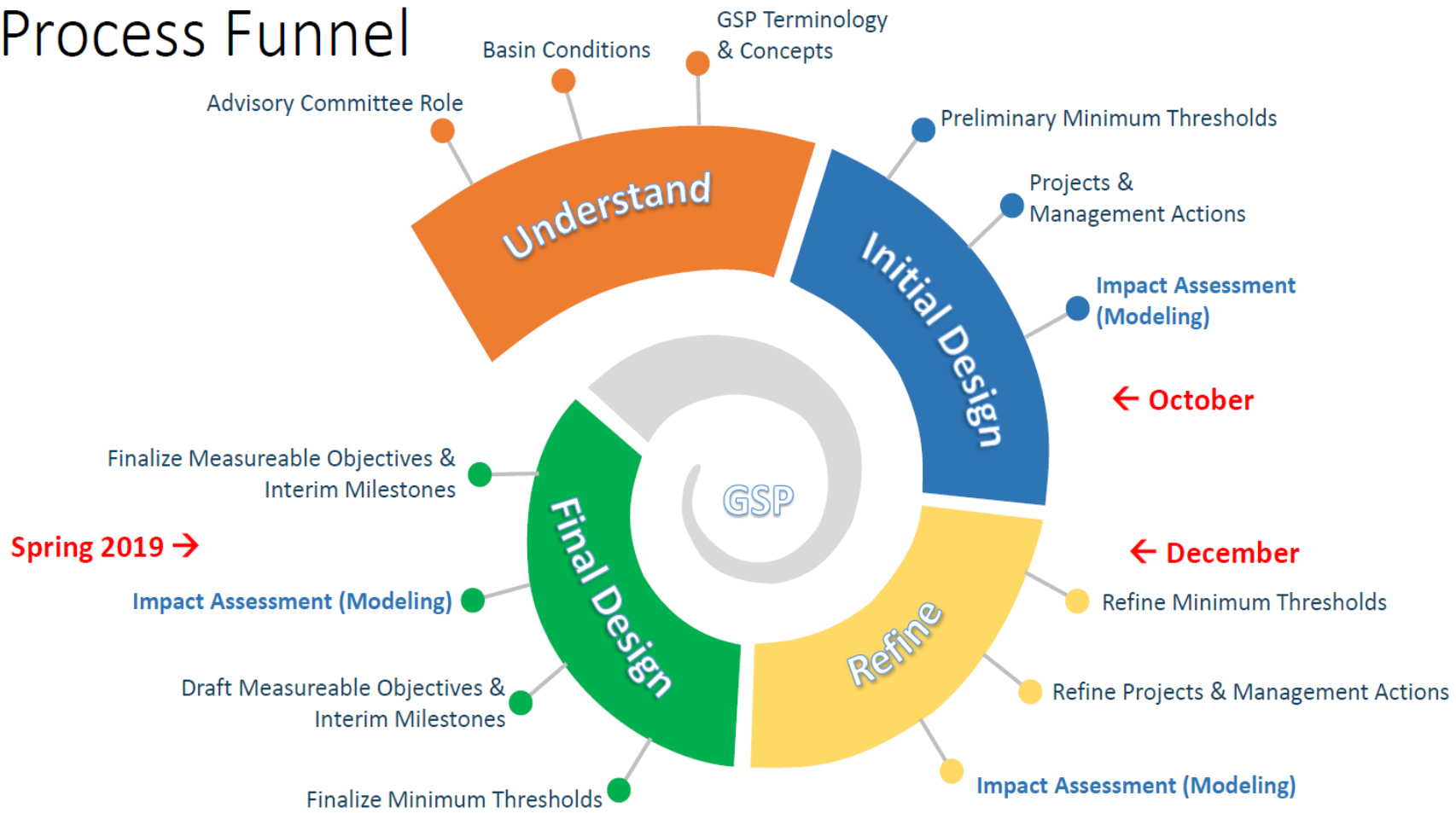
GSP Project Timeline – Phase 2

Santa Cruz Mid-County Groundwater Basin Groundwater Sustainability Plan Process Overview — July–December 2018



Iterative Process

Process Funnel



Share

Project Updates

Oral Communications

Topics

1. Pumping Impacts on Key Sustainability Indicators
2. Proposed Minimum Thresholds for Chronic Lowering of Groundwater Levels
3. Draft Proposal for Developing Measurable Objectives

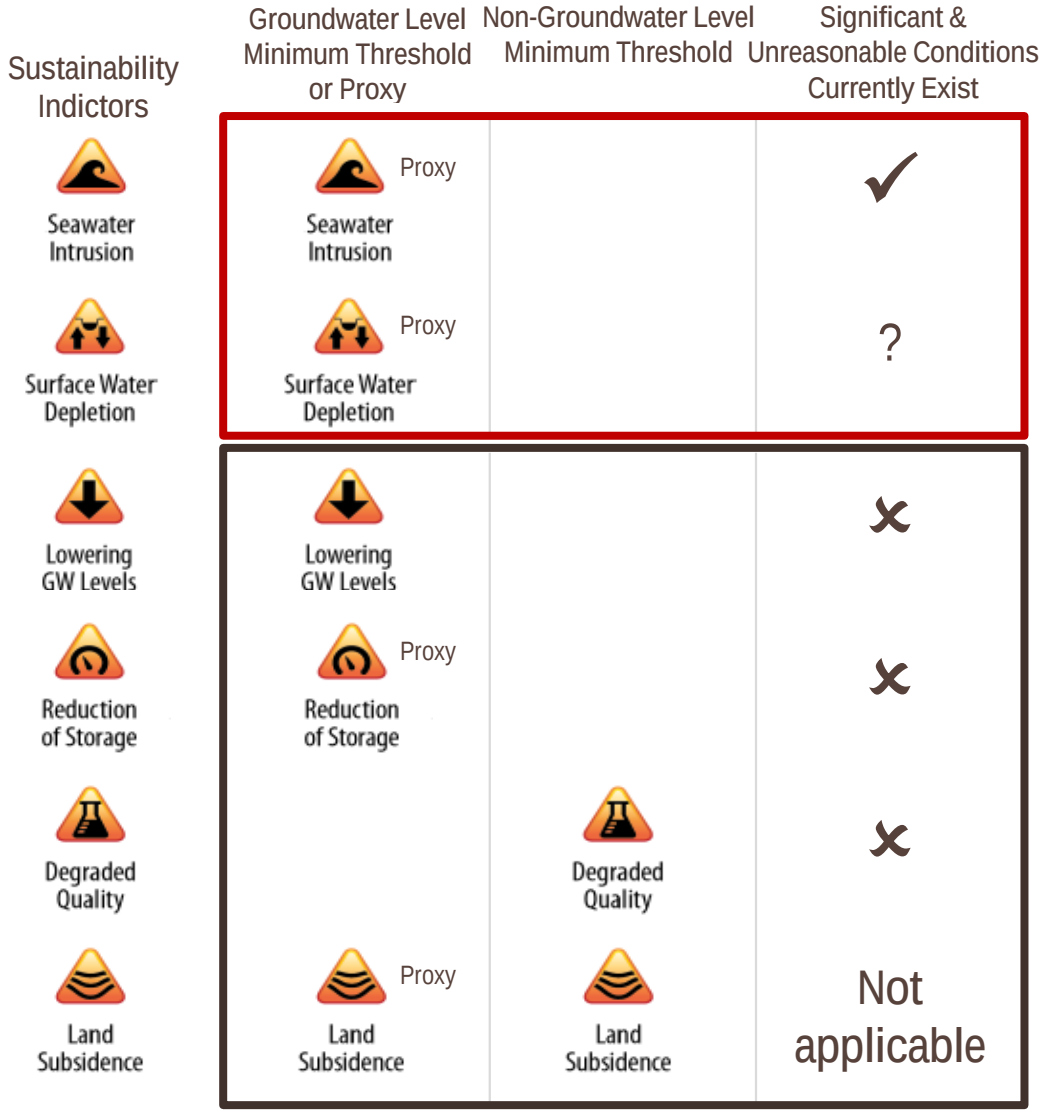
Pumping Impacts on Key Sustainability Indicators

Modeled changes in Inland Pumping and Use

Modeled changes at Pajaro Valley Boundary

Modeled changes in Municipal Pumping

Sustainability Indicators Relying on Groundwater Levels



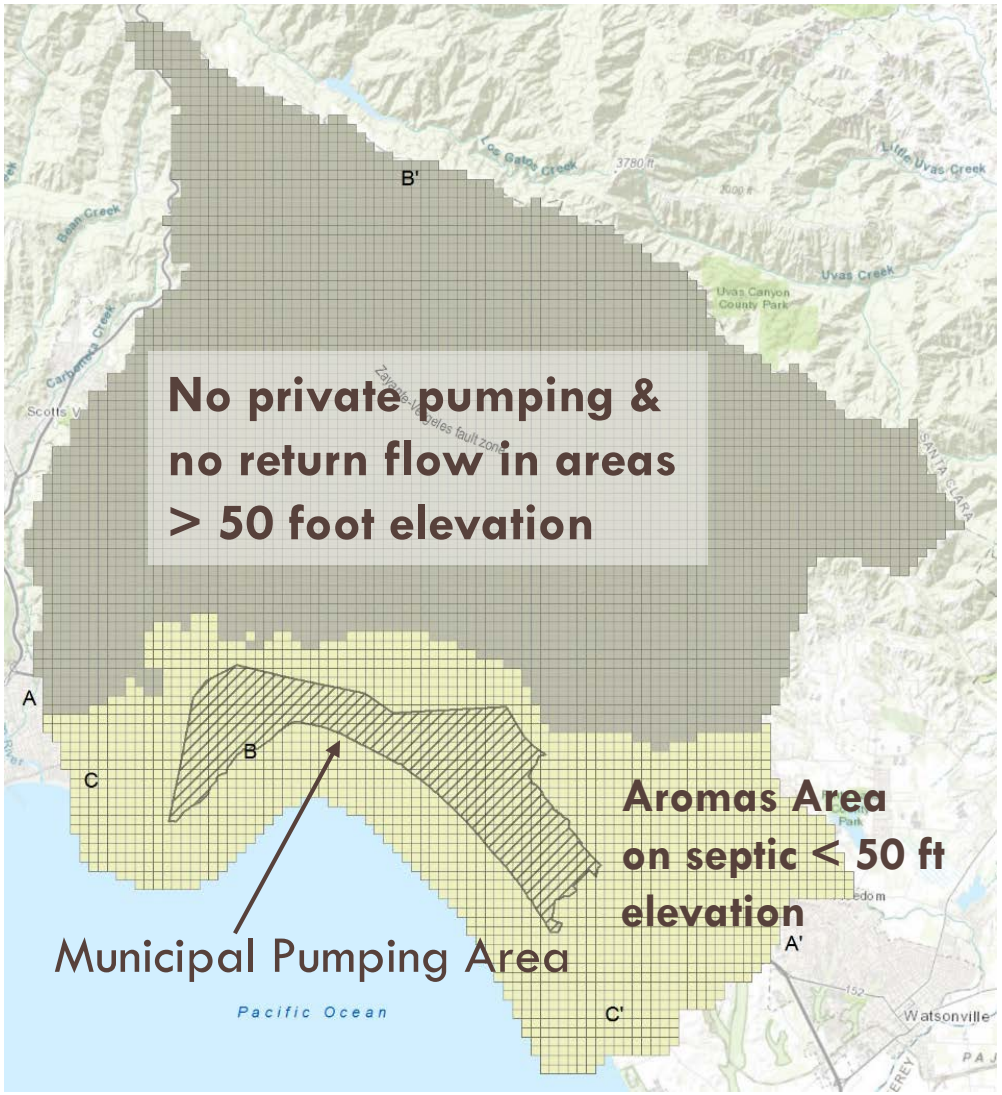
Projects/Management Actions Needed

What does it take to get groundwater levels above protective elevations?

- Move pumping inland
- River water for in-lieu or managed recharge
- Recharge of treated water
- Managed aquifer recharge of stormwater
- Conservation/curtailment

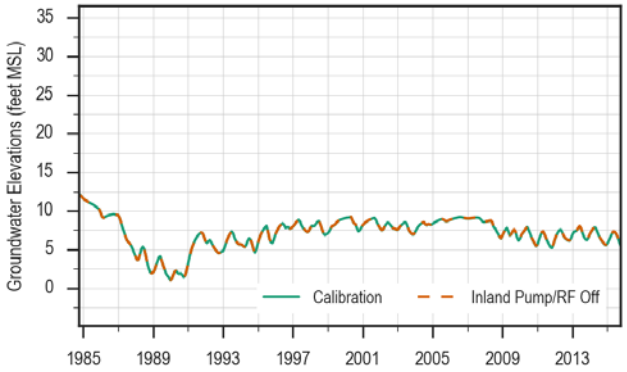
Sensitivity of Inland Pumping

- Evaluate inland private pumping effect on coastal groundwater levels during calibration period



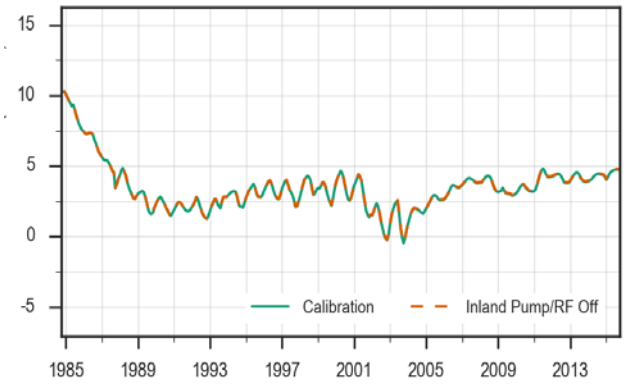
Simulated Coastal Groundwater Levels

Purisima A — Soquel Point Medium Layers: 7

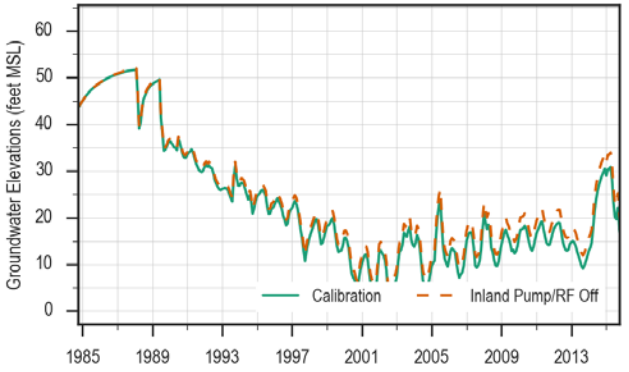


Purisima A

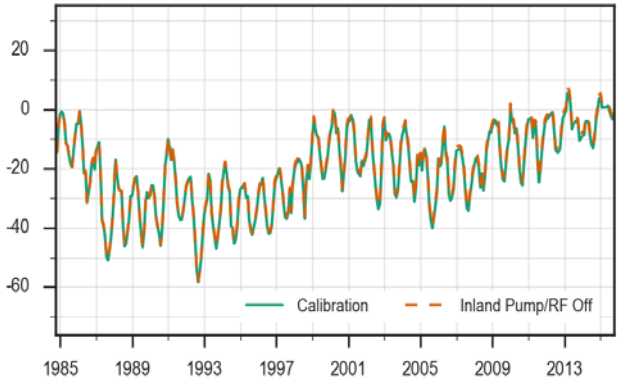
Purisima F — SC-A2A/SC-A2AR Layers: 3



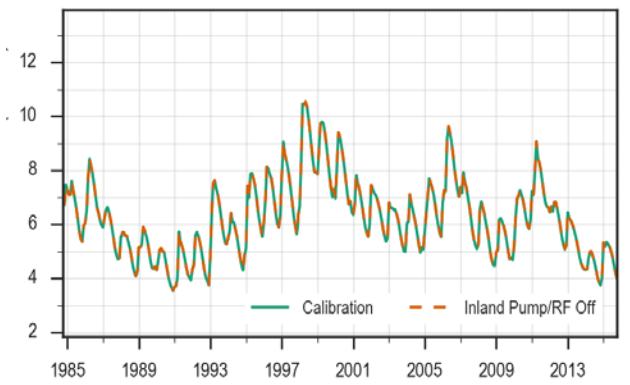
Tu Unit — SC-13A Layers: 9



Purisima BC — SC-9C/SC-9CR Layers: 5



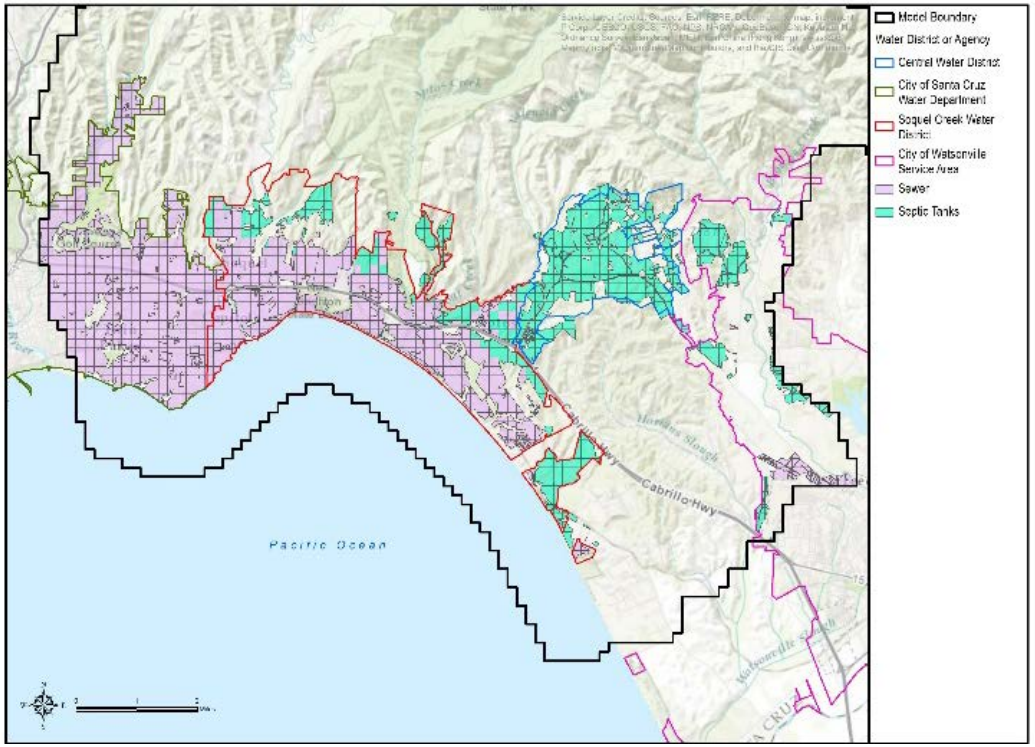
Aromas — SC-A3A Layers: 2



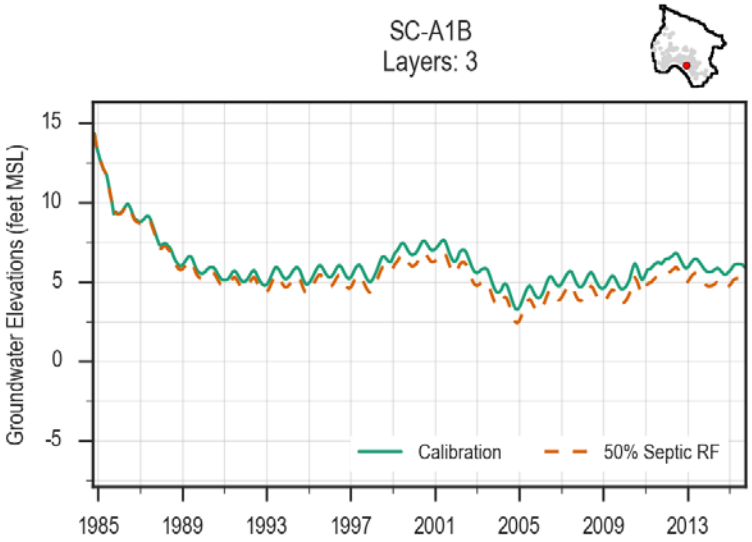
Inland pumping has small effect at coast but need to test effect of non-municipal pumping in Aromas area (Purisima F and Aromas) & effect on surface water

Sensitivity of Septic Return Flow

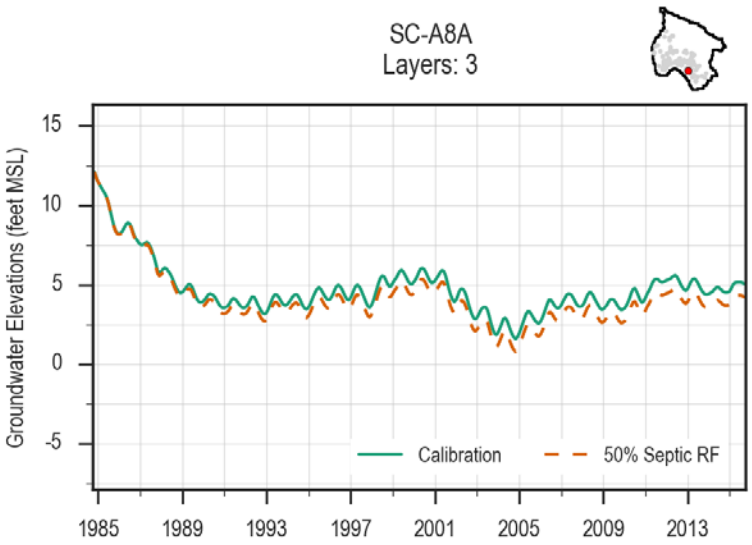
- Evaluate effect of assumption that 90% indoor wastewater to septic is return flow
- Reduce septic tank return flow from 90% to 50%

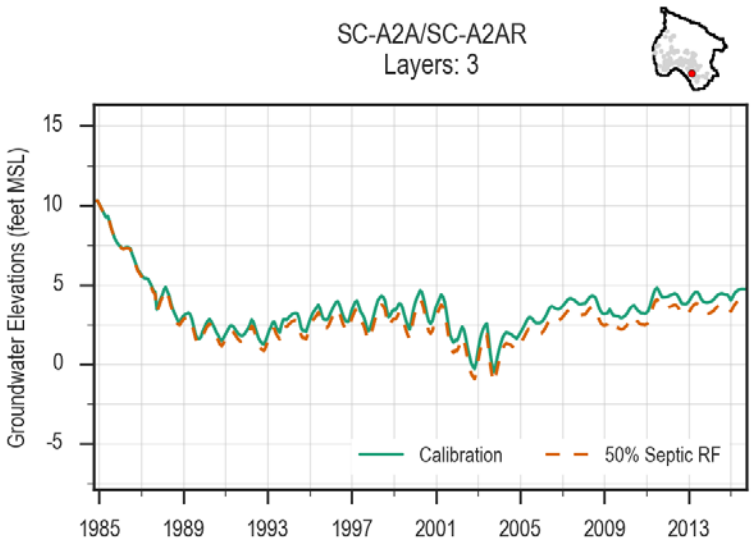


Simulated Coastal Groundwater Levels



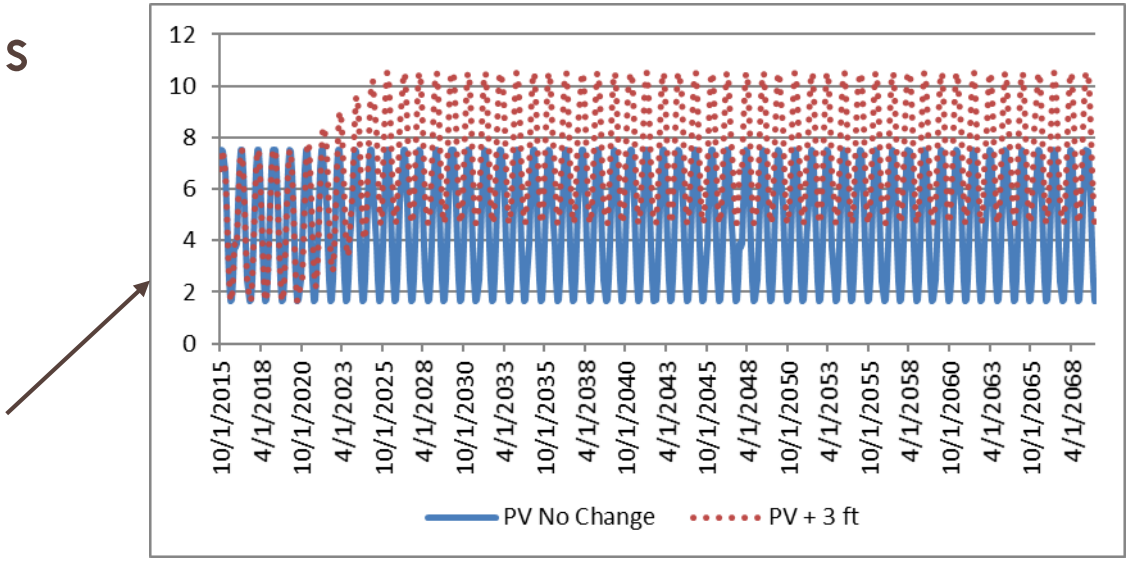
Septic return flow assumption has small effect on coastal groundwater levels





Sensitivity to Pajaro Valley Boundary

- Evaluate effect of Pajaro Valley Boundary Condition
- PVWMA Basin Management Plan analysis estimated 1-2 feet groundwater level increase in Lower Aromas with Selected Alternative
- Test sensitivity by increasing boundary head 3 feet over time in Aromas

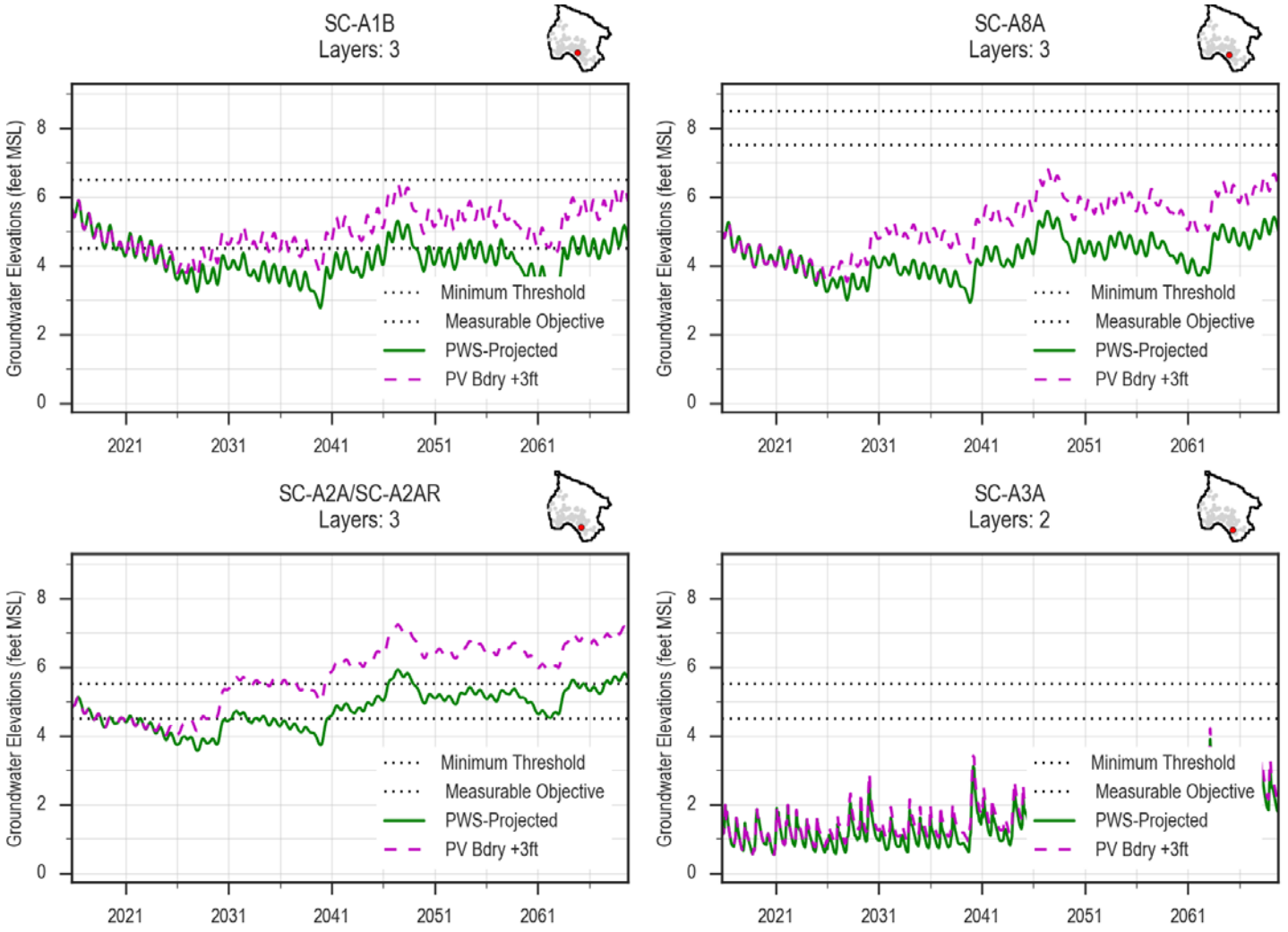


Simulated Aromas Area Groundwater Levels

Improvement in Pajaro Valley groundwater levels benefits groundwater levels in the Aromas area

PWS-projected = projected demand

PV Bdry +3ft = increase Pajaro boundary by 3 ft



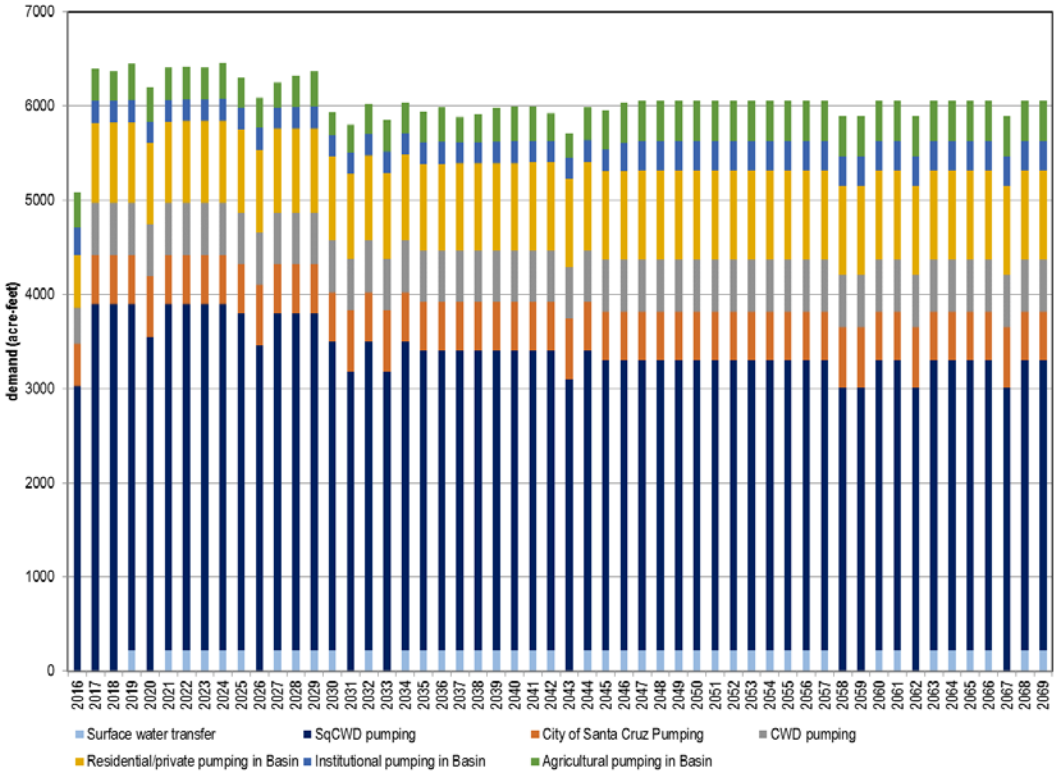
Municipal Pumping Effects

- Groundwater Demand Assumptions
- Simulate Climate Change from Historical Catalog
- Sea Level Rise Based on Mean Projections
- Pumping Redistribution
- Test Reduced Pumping, which could be achieved by
  - Surface Water Transfer
  - Additional Supply for In-Lieu Recharge
  - Conservation/Curtailment
- Evaluate Simulated Groundwater Levels vs. Sustainable Management Criteria for Seawater Intrusion

Groundwater Demand Assumptions

- CWD pre-drought average 2008-2011
- SqCWD 2015 Urban Water Management Plan projections
  - 3,900 afy → 3,300 afy
- City of Santa Cruz cooperative agreement
- Pre-drought estimates for non-municipal pumping
- Demand projections may be underestimated →

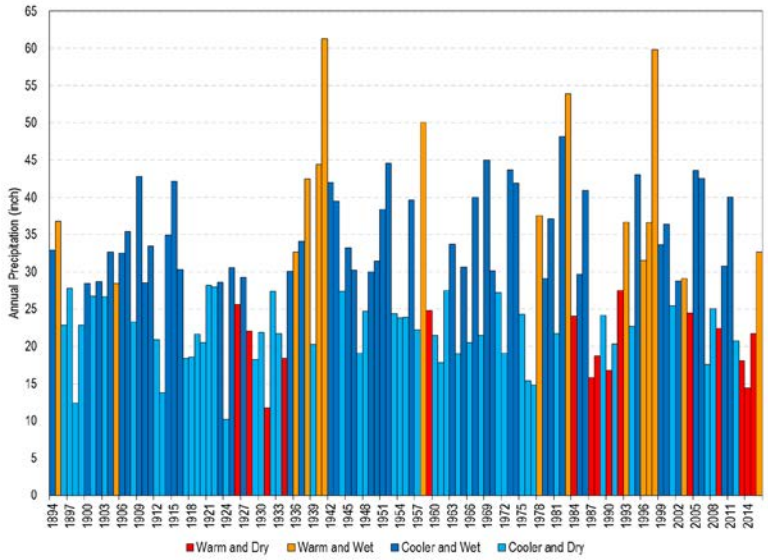
No Projects Projected Groundwater Demand in Basin

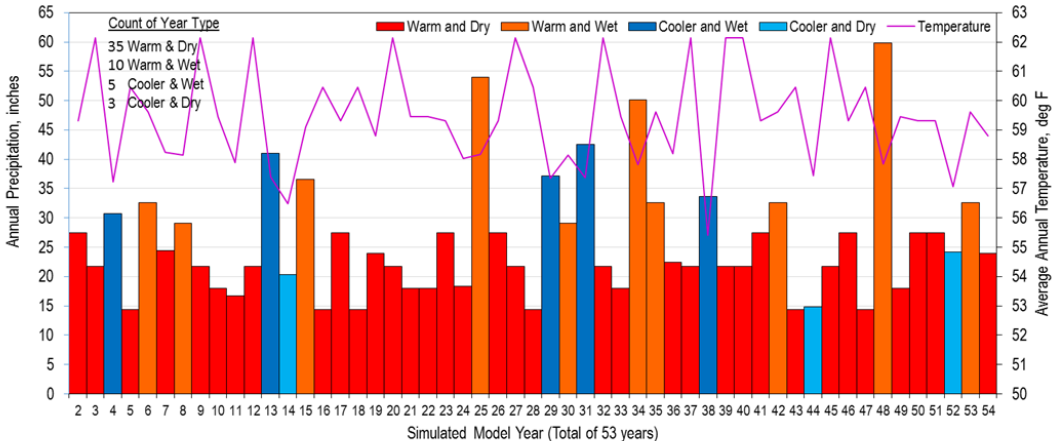


New laws facilitating Accessory Dwelling Units
Land use changes, such as cannabis cultivation
Higher demand would increase size of project/action needed to achieve sustainability

Climate Based on Historical Catalog

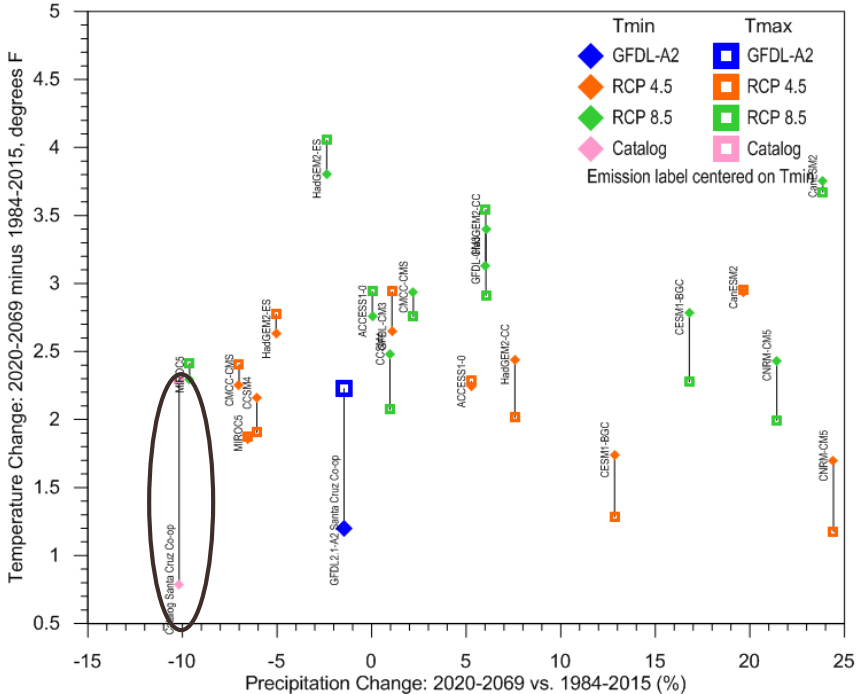
- Simulate 50+ years as required for GSP
- Select mostly warm years from 1909-2016
- +1.5 degree F
- -10% Rainfall





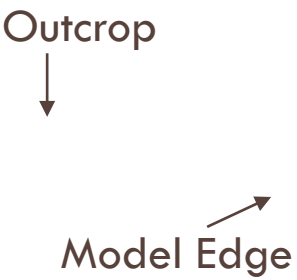
Catalog Climate vs. CMIP5

- Compared to most recent ensemble of Global Circulation Models (CMIP 5)
- Drier than most CMIP 5 models for Santa Cruz
- Not as hot as most CMIP 5 models for Santa Cruz



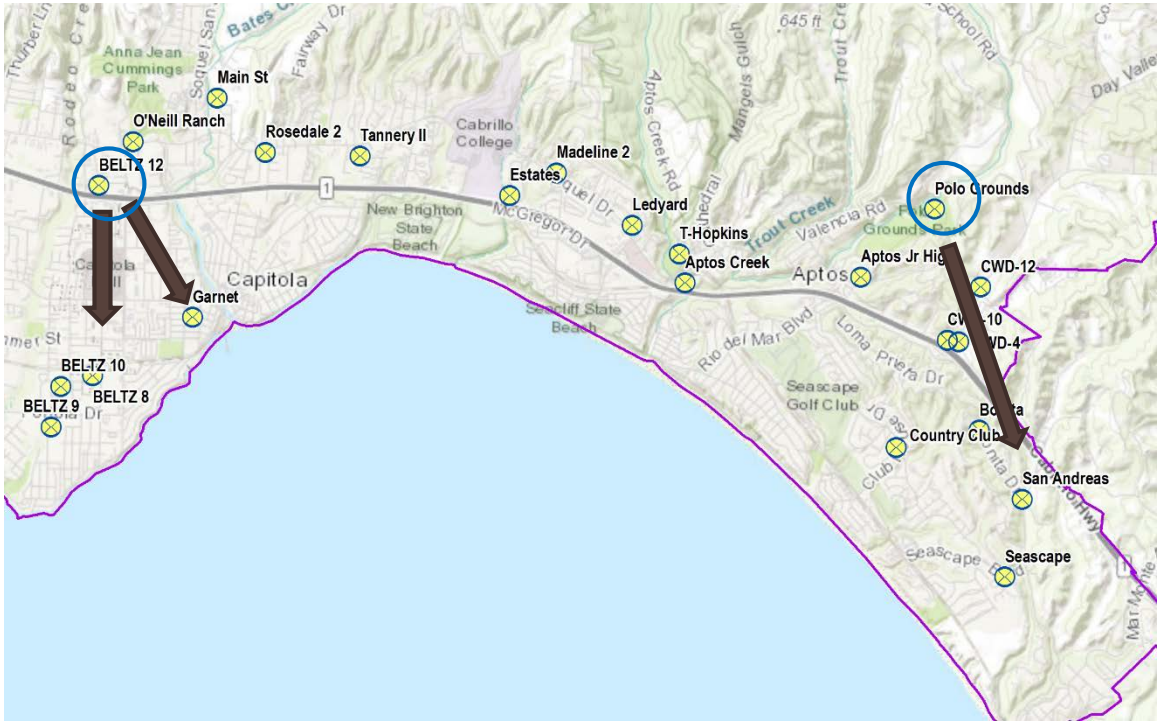
Sea Level Rise

- Based on mean projections from National Research Council 2012 report: 2070 vs 2000: +1.5 feet
- Applied at offshore General Head Boundary
- Also add 1.5 feet to groundwater level proxies as Sustainable Management Criteria for seawater intrusion
  - Protective elevation is relative to sea level



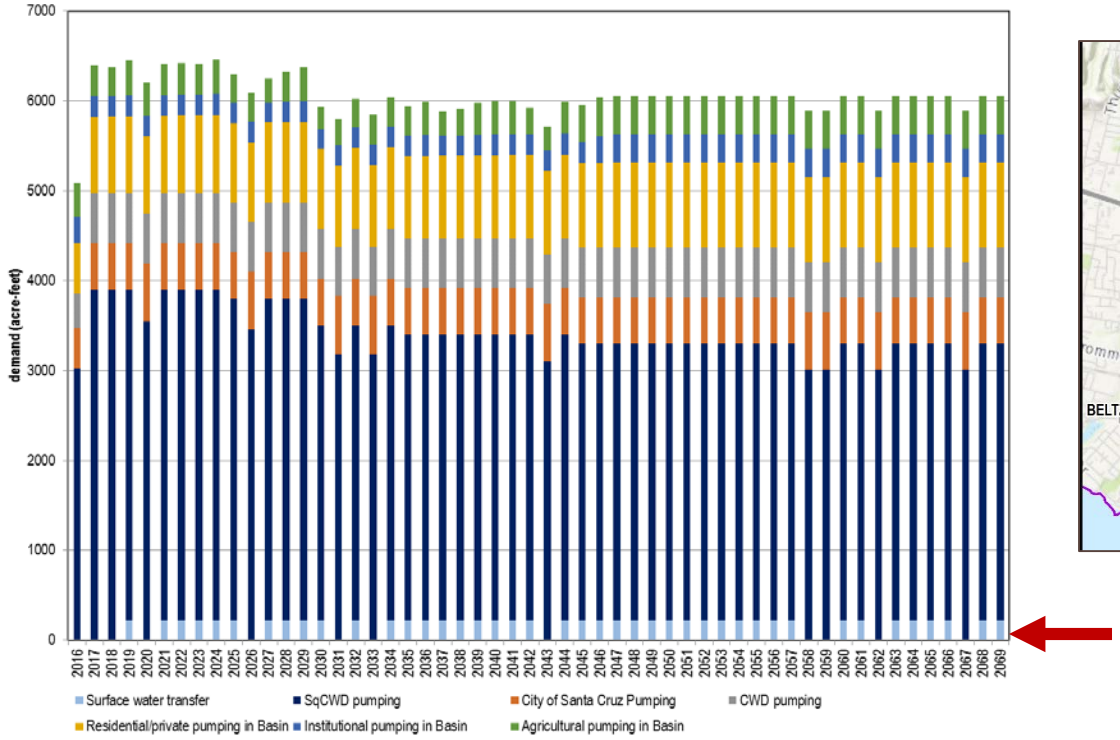
Pumping Redistribution

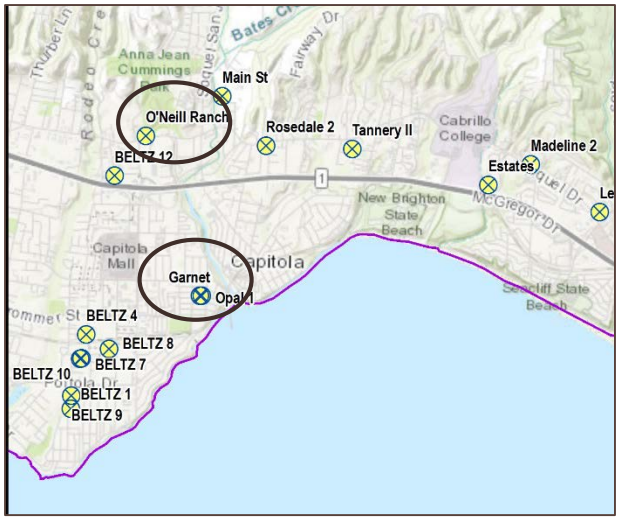
- Operating limits at Beltz 12 and Polo Grounds wells
- Reduce Tu pumping at O'Neill Ranch well
- Redistribute pumping closer to coast
  - Compared to Pure Water Soquel Projected Existing Conditions



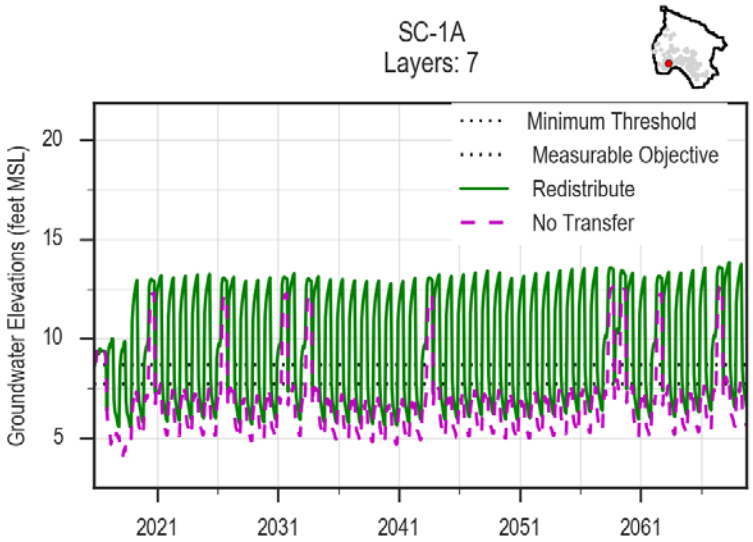
Surface Water Transfer

- Assumed pilot transfer to SqCWD continues indefinitely
- 215 AFY pumping reduction at O'Neill Ranch and Garnet wells from November-April



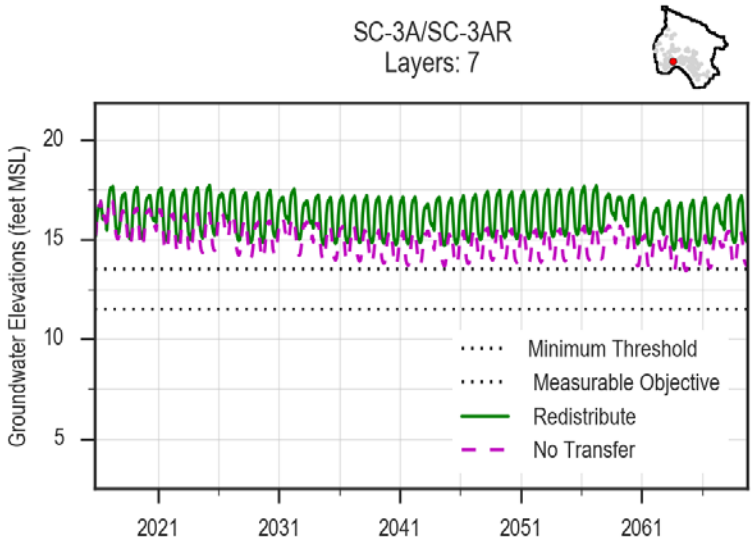


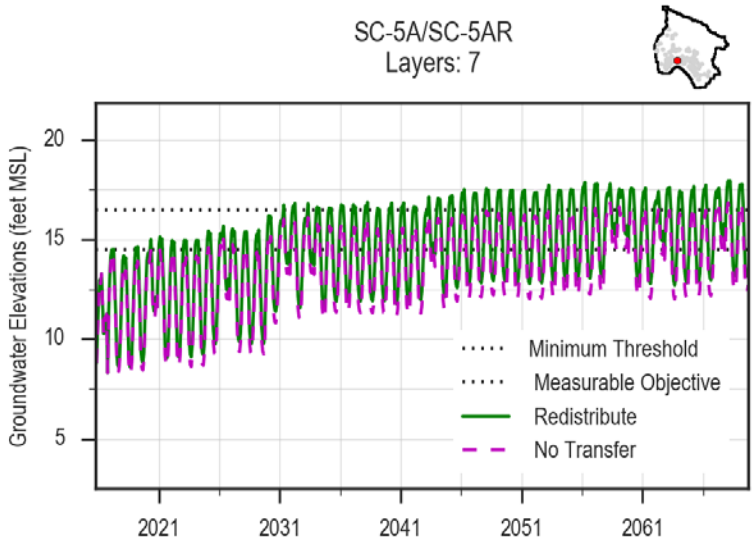
Effect of Surface Water Transfer on Purisima A Unit



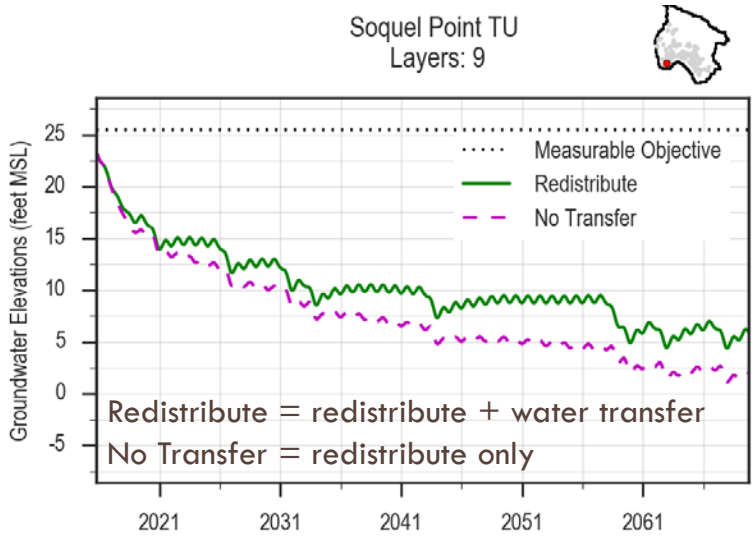
Surface water transfer (or other in-lieu recharge source) helps recover A unit

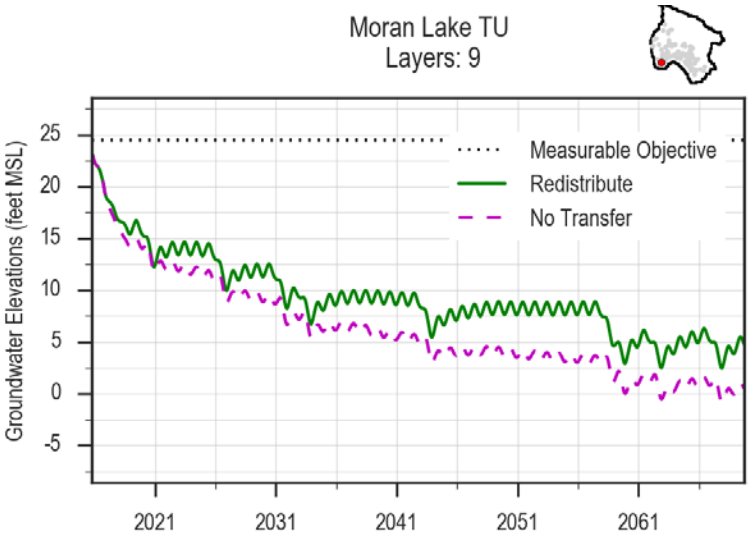
Redistribute = redistribute + water transfer
No Transfer = redistribute only

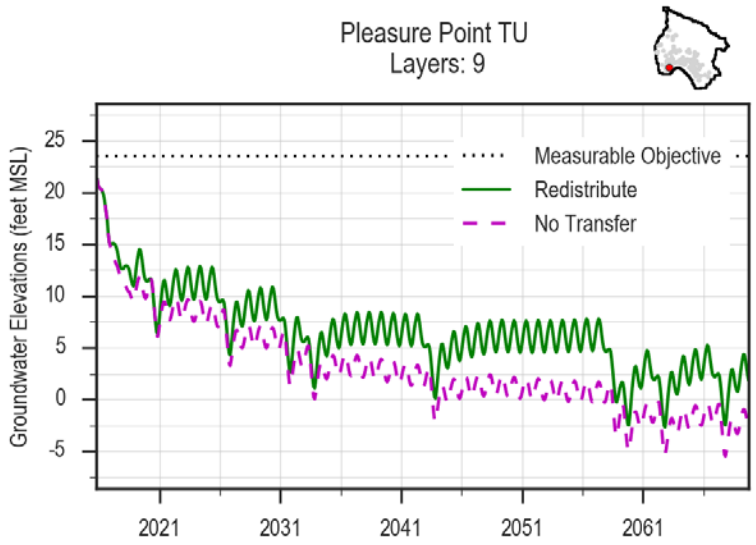




Effect of Surface Water Transfer on Tu Unit







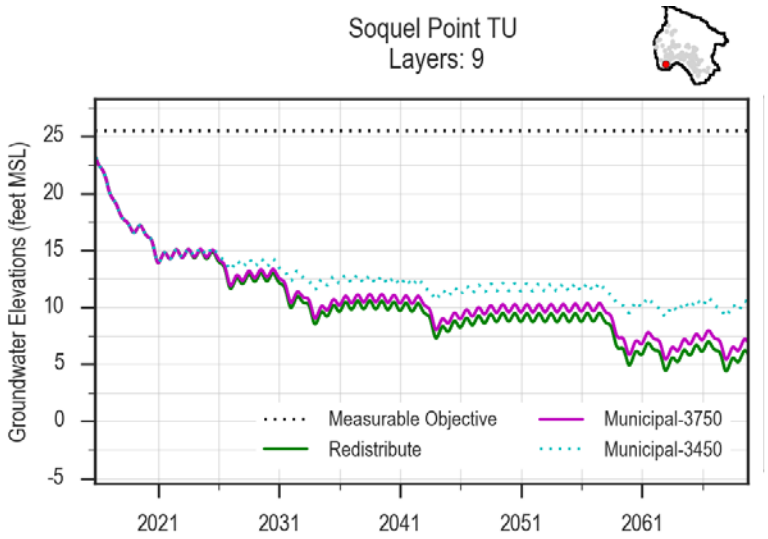
Potential Measurable Objectives Calculated using Ghyben-Herzberg Relationship Based on Bottom of Tu Unit (no existing wells at this location)

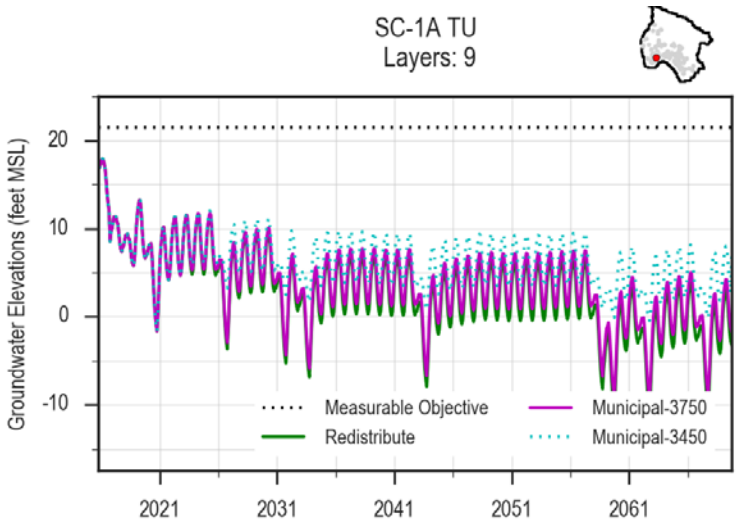
Projected pumping for Tu may be too high to be sustainable even with surface water transfer (or other in-lieu recharge)

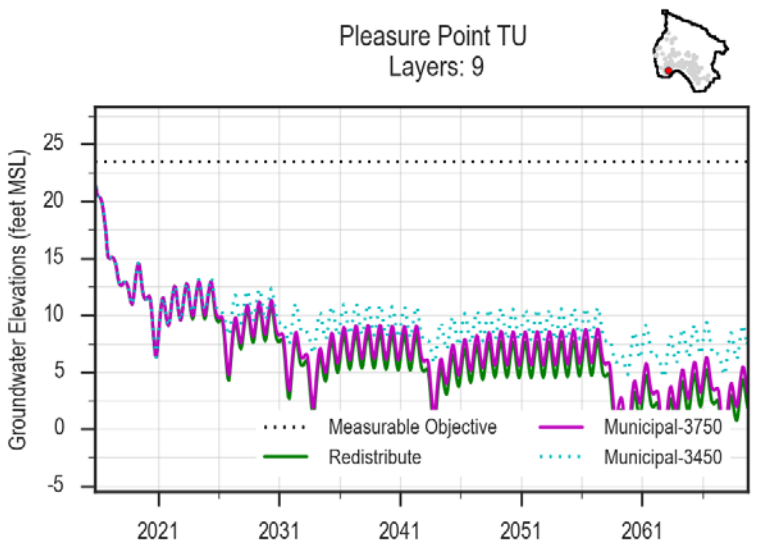
Pumping Reductions

- Projected municipal pumping ~ 4,500 AFY
- Reduced pumping scenarios
  - ~3,750 AFY (SqCWD reduced to minimum projected demand, 15% reduction in summer pumping for all municipal users)
  - ~3,450 AFY (SqCWD reduced to minimum projected demand, 35% reduction in summer pumping for all municipal users)

Coastal Groundwater Levels
Tu Unit

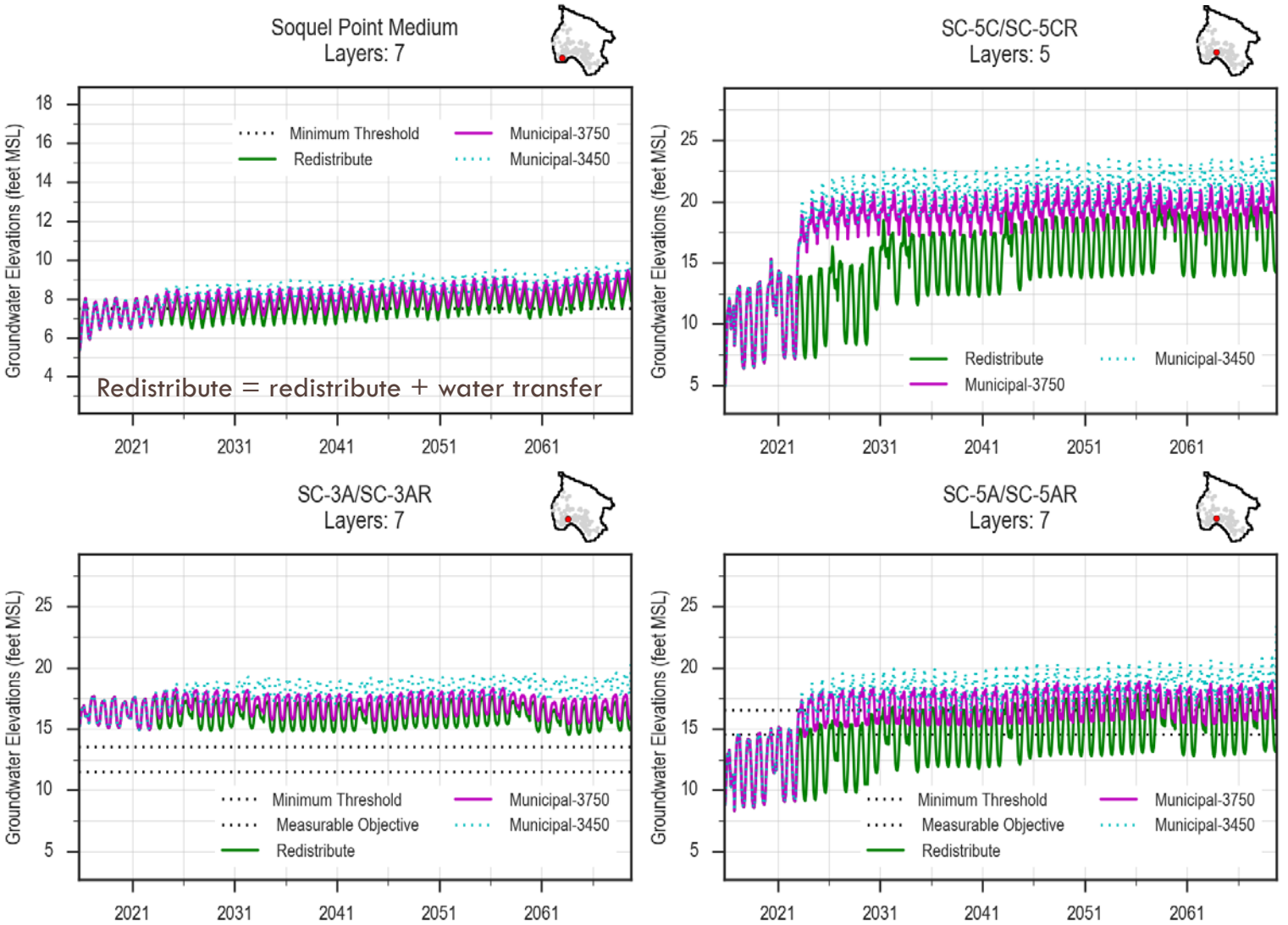




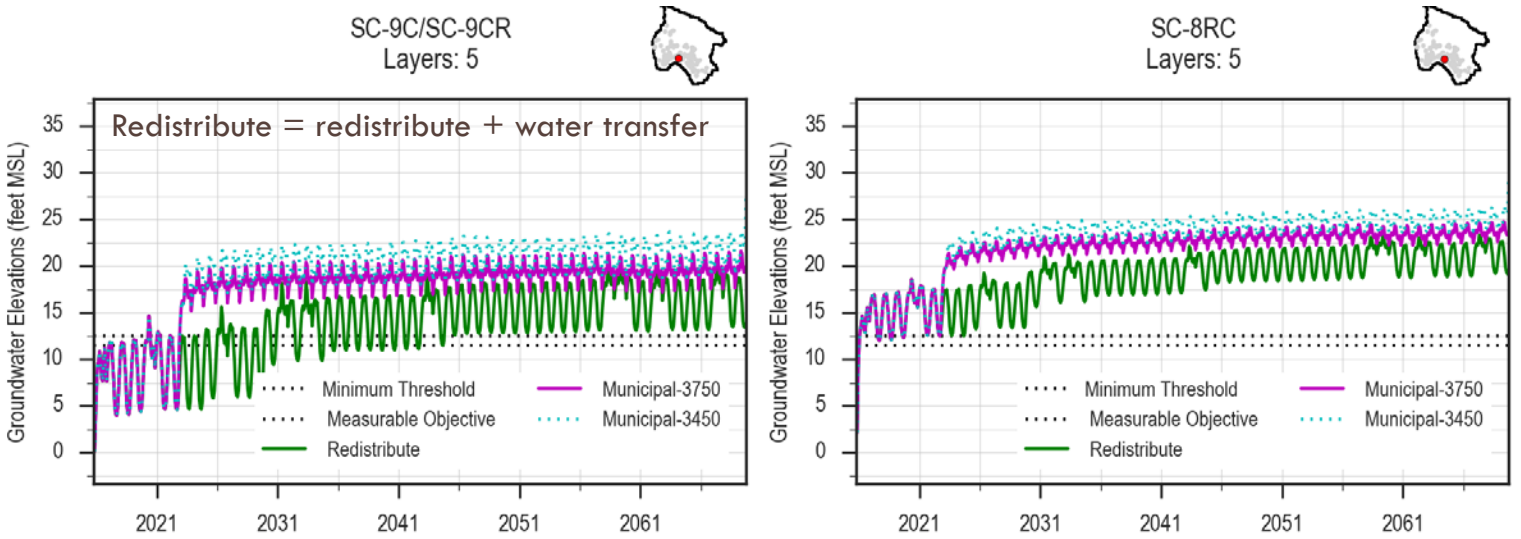


Indicates less pumping in Tu unit needed to achieve sustainability

Coastal Groundwater Levels
Purisima A

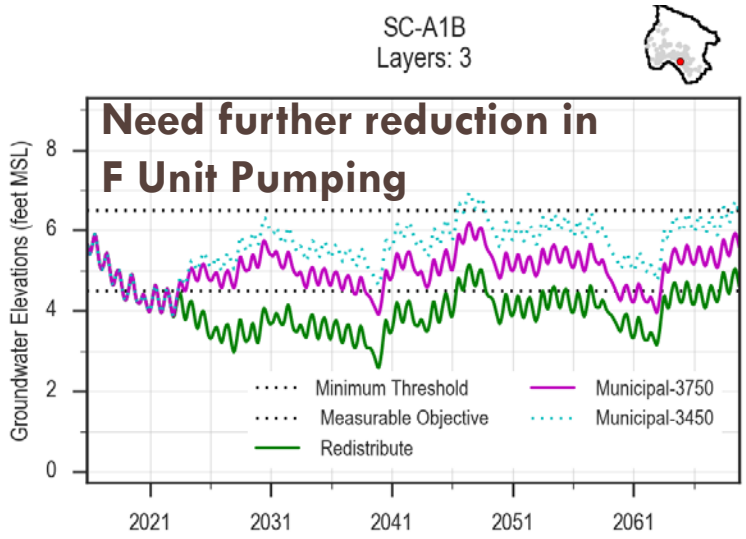


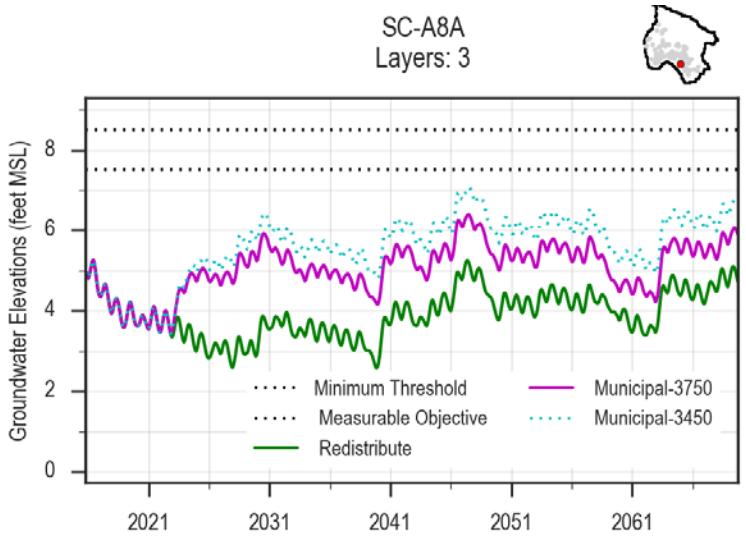
Coastal Groundwater Levels
Purisima BC

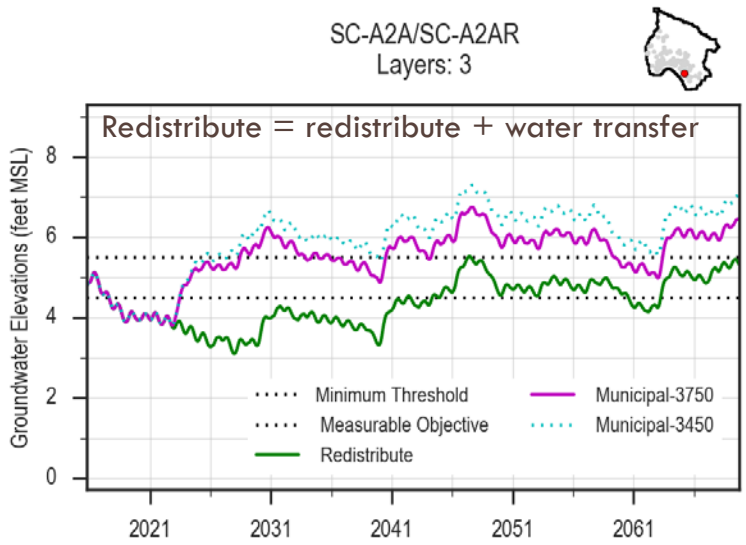


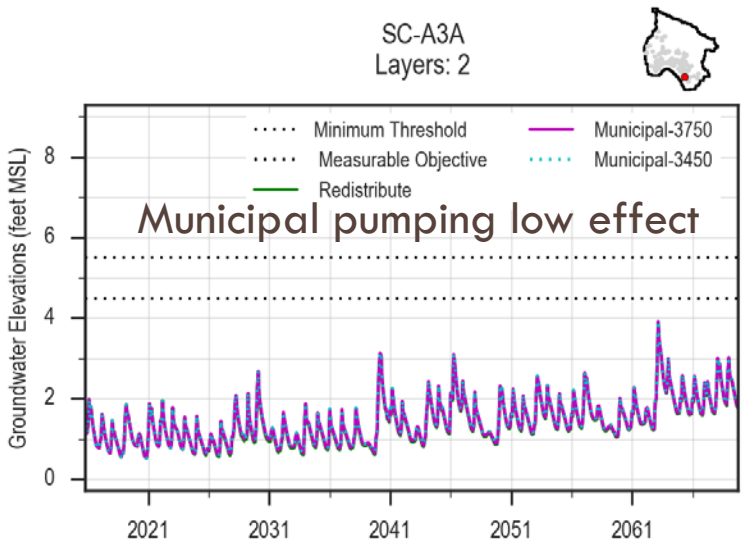
Purisima A/BC unit does not need complete reduction to achieve sustainability

Coastal Groundwater Levels
Purisima F/Aromas









Municipal Pumping Effect

- At 3,450-3,750 AFY municipal pumping, further redistribution is required to achieve Sustainable Management Criteria for seawater intrusion
- Shifting pumping from Tu Unit and Aromas to Purisima A/BC appears promising
- Effect of non-municipal pumping in Aromas should be evaluated
- Estimated pumping based on reduced pumping should only be used as benchmark for managed recharge projects

Discussion on Pumping Impacts

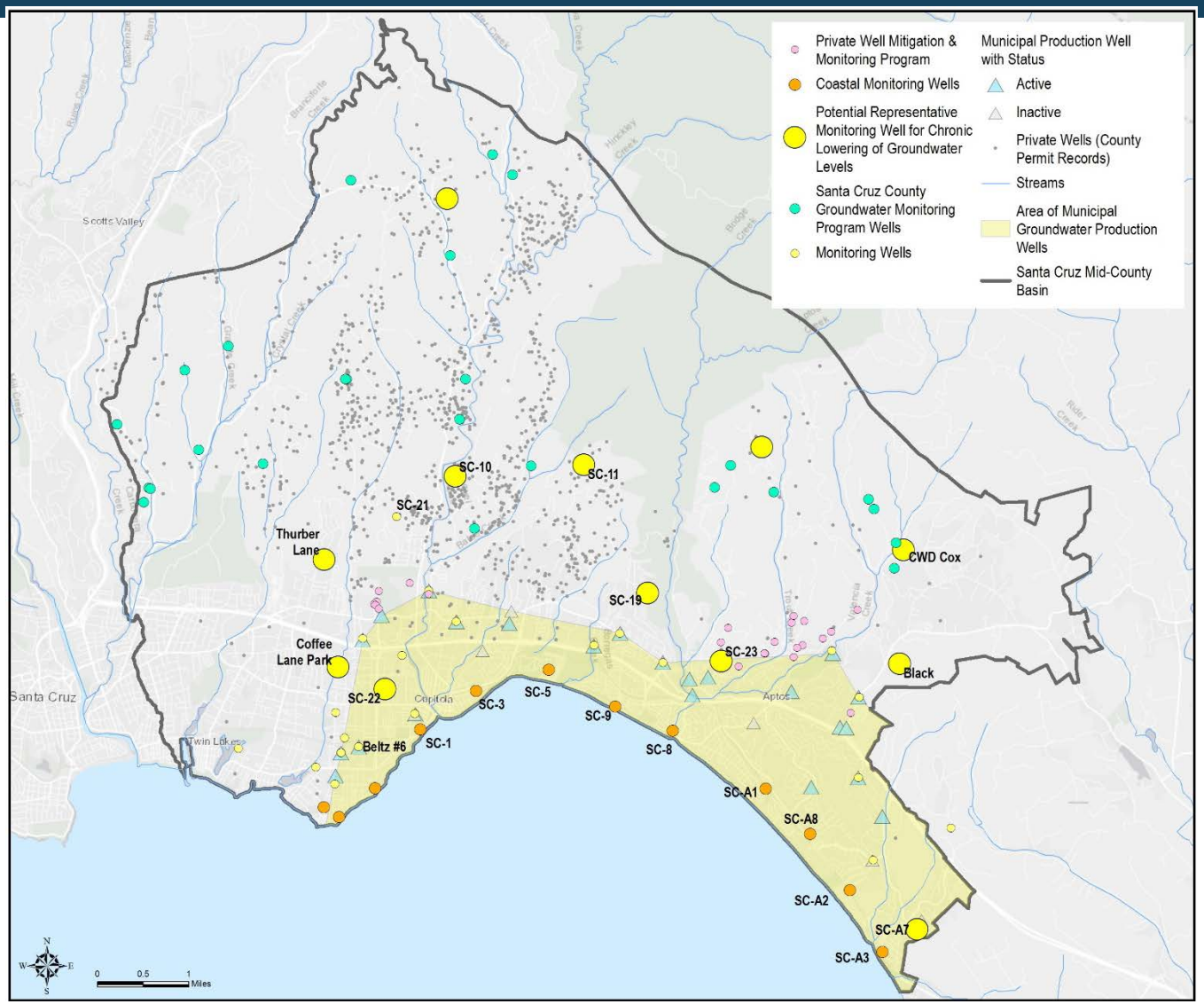
- Problem statement
- Findings
- What else to model for?

Public Comment

Break

Proposed Minimum Thresholds for Chronic Lowering of Groundwater Levels

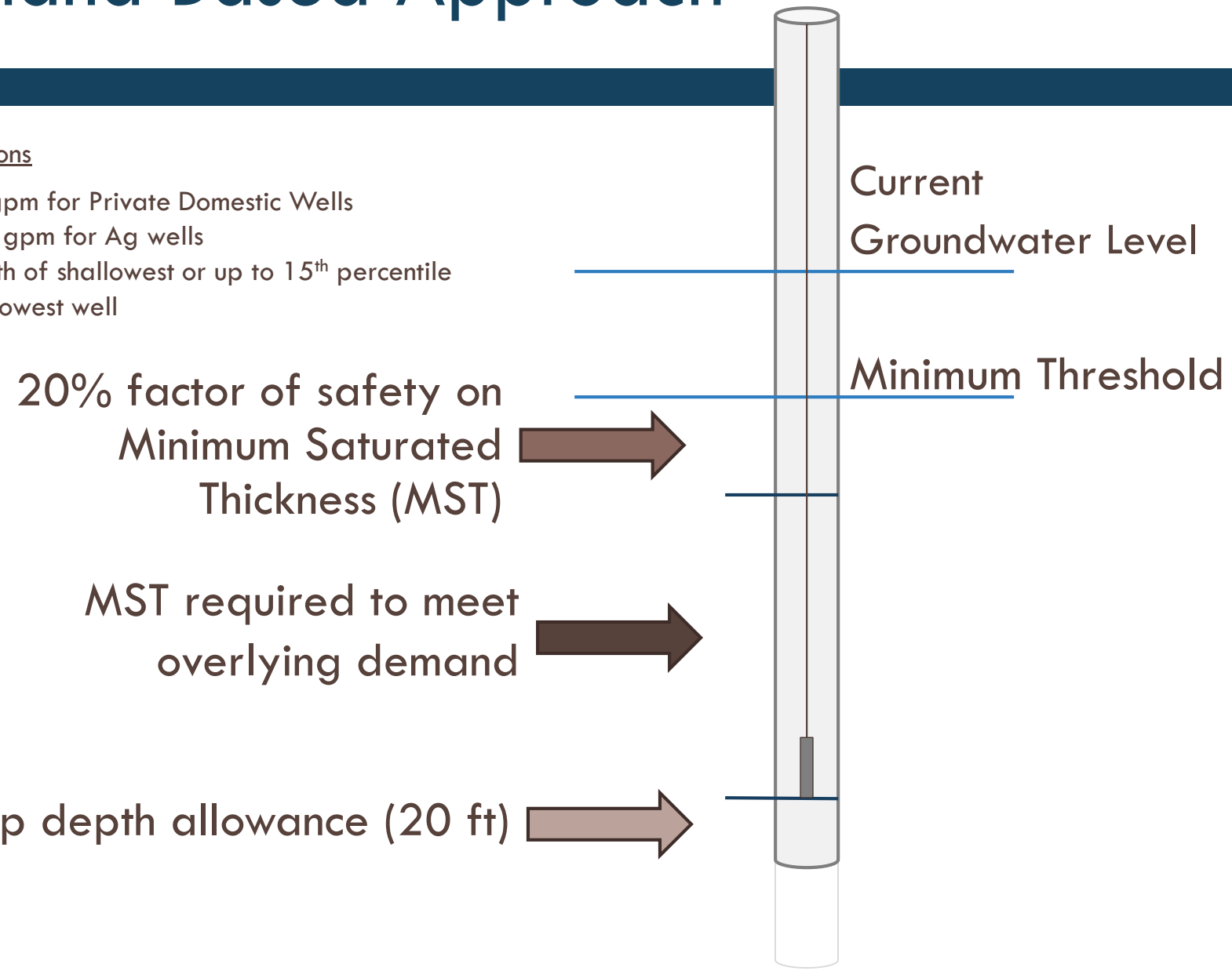
Staff Recommended Representative Monitoring Well Locations



Demand Based Approach

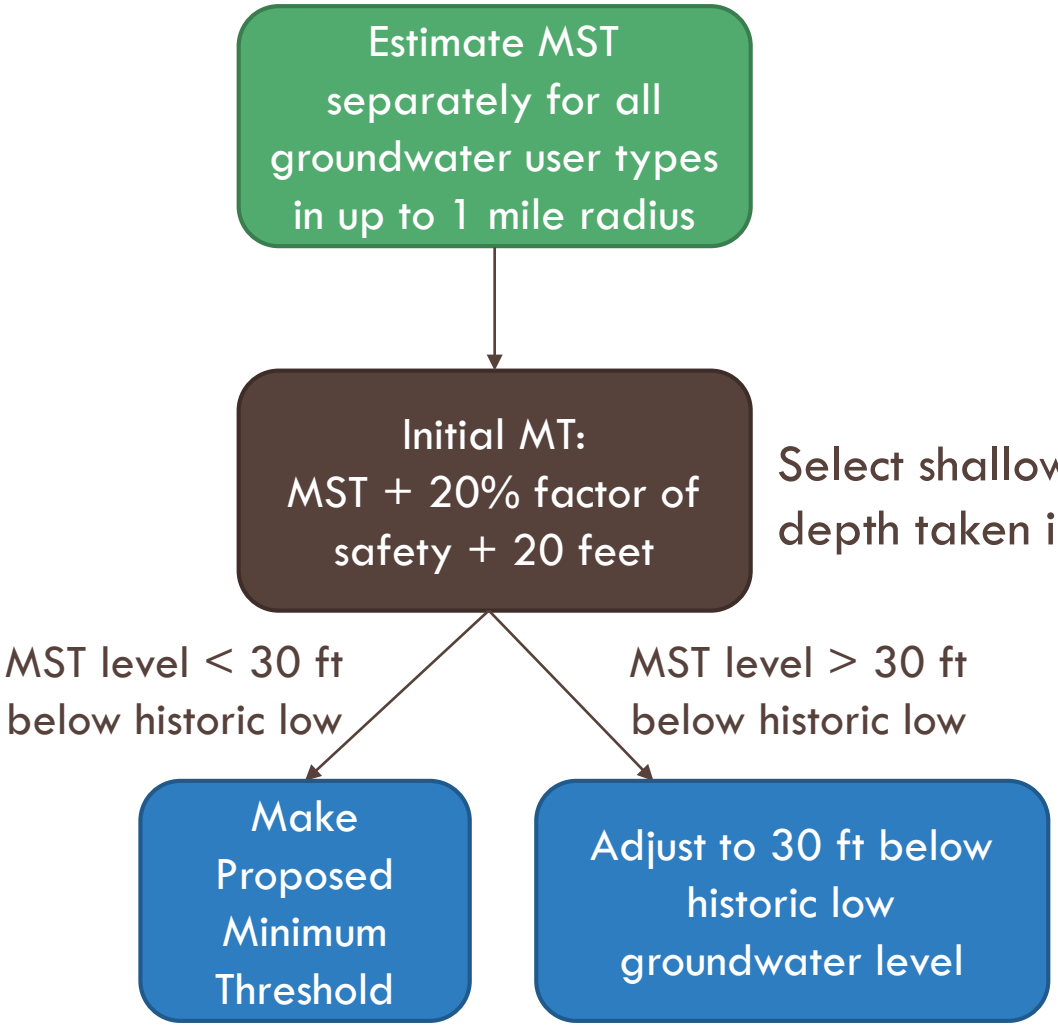
Assumptions

- 15 gpm for Private Domestic Wells
- 250 gpm for Ag wells
- Depth of shallowest or up to 15th percentile shallowest well

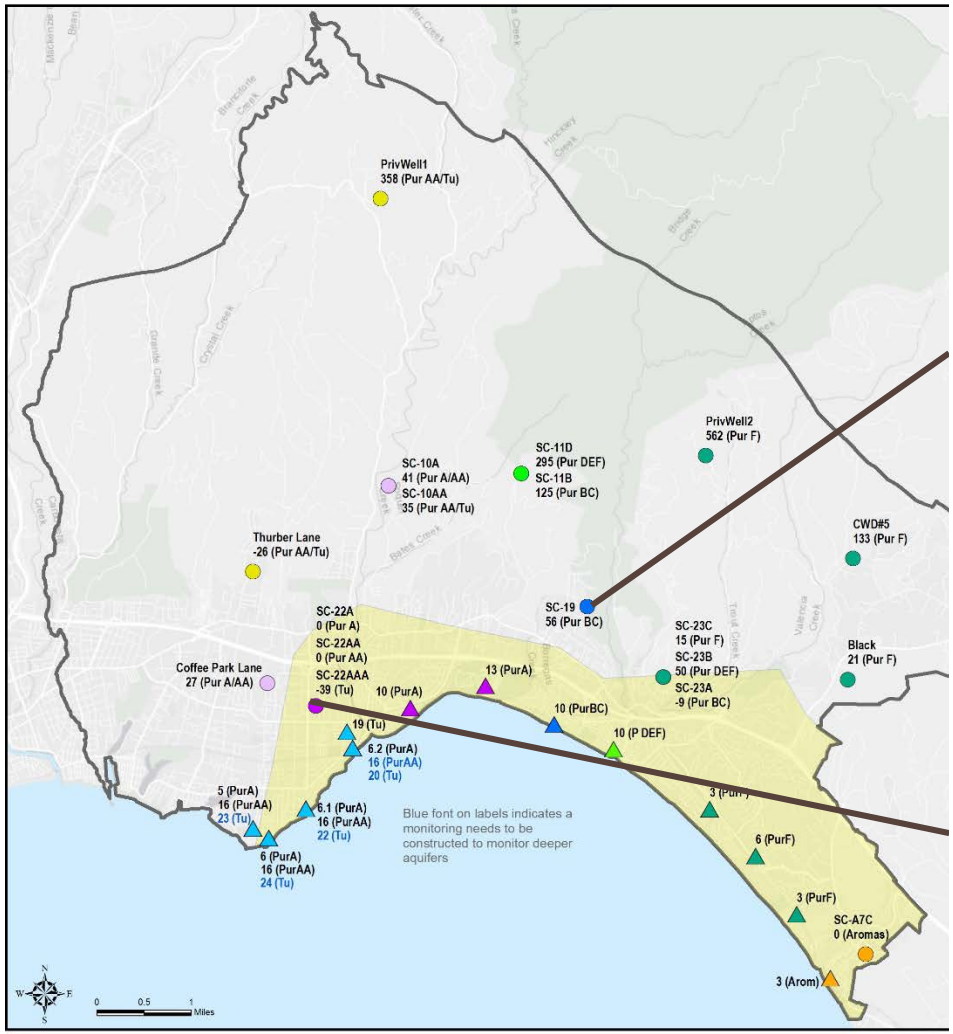


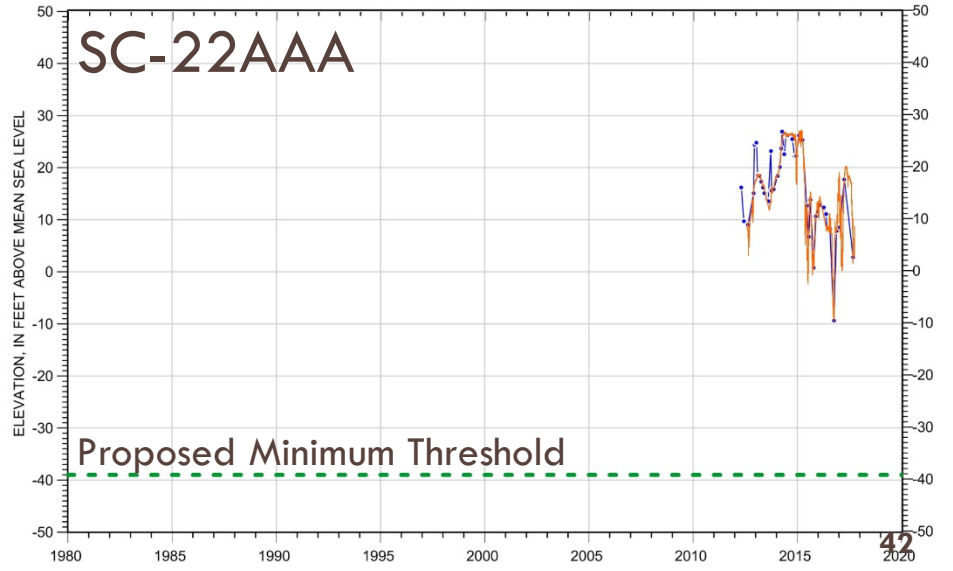
Process for Assigning Minimum Thresholds

Abbreviations:
MST = minimum saturated thickness
MT = Minimum Threshold

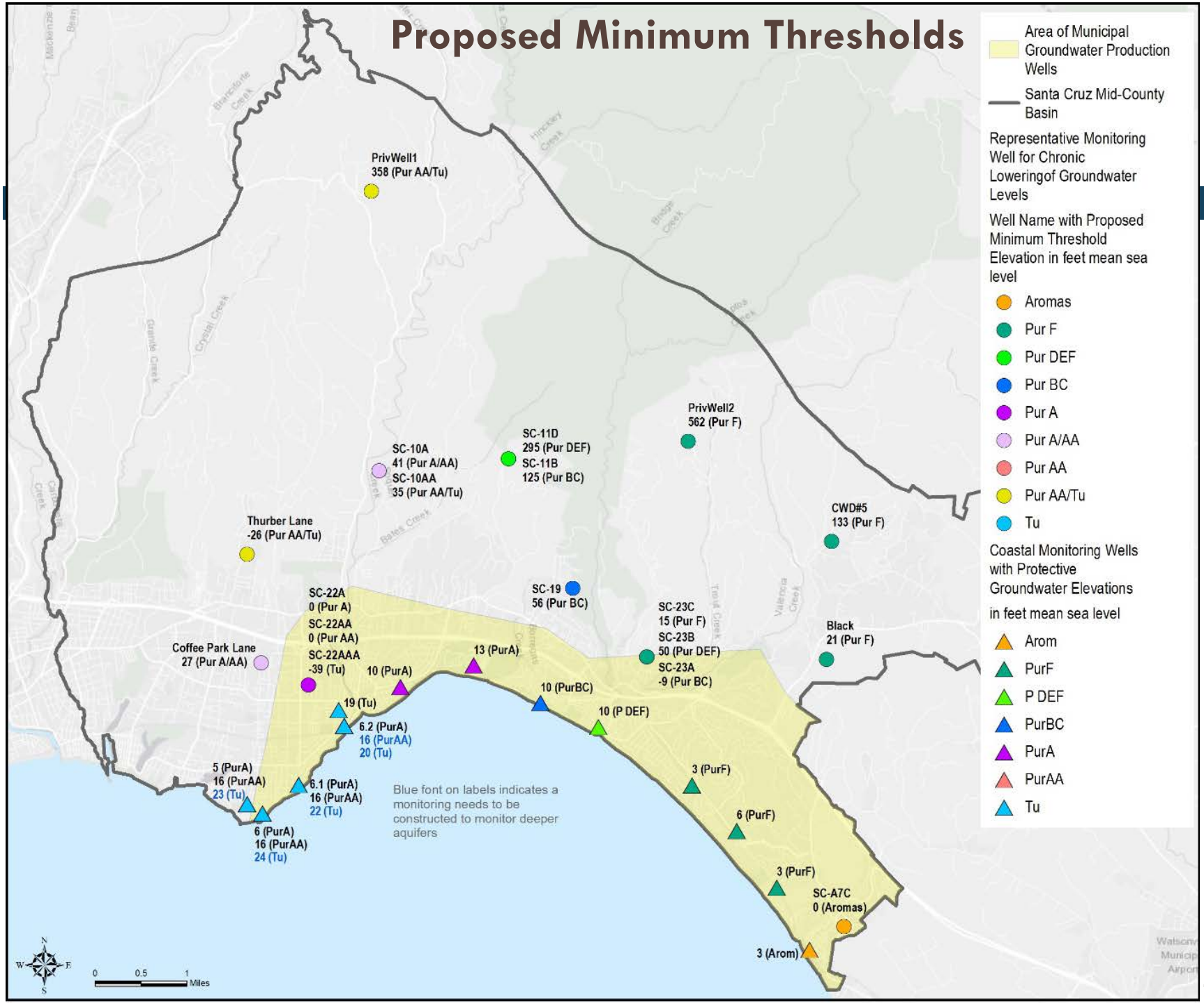


Examples of Minimum Thresholds Developed





Proposed Minimum Thresholds



Discussion on Minimum Threshold Approach for Chronic Lowering of Groundwater Levels

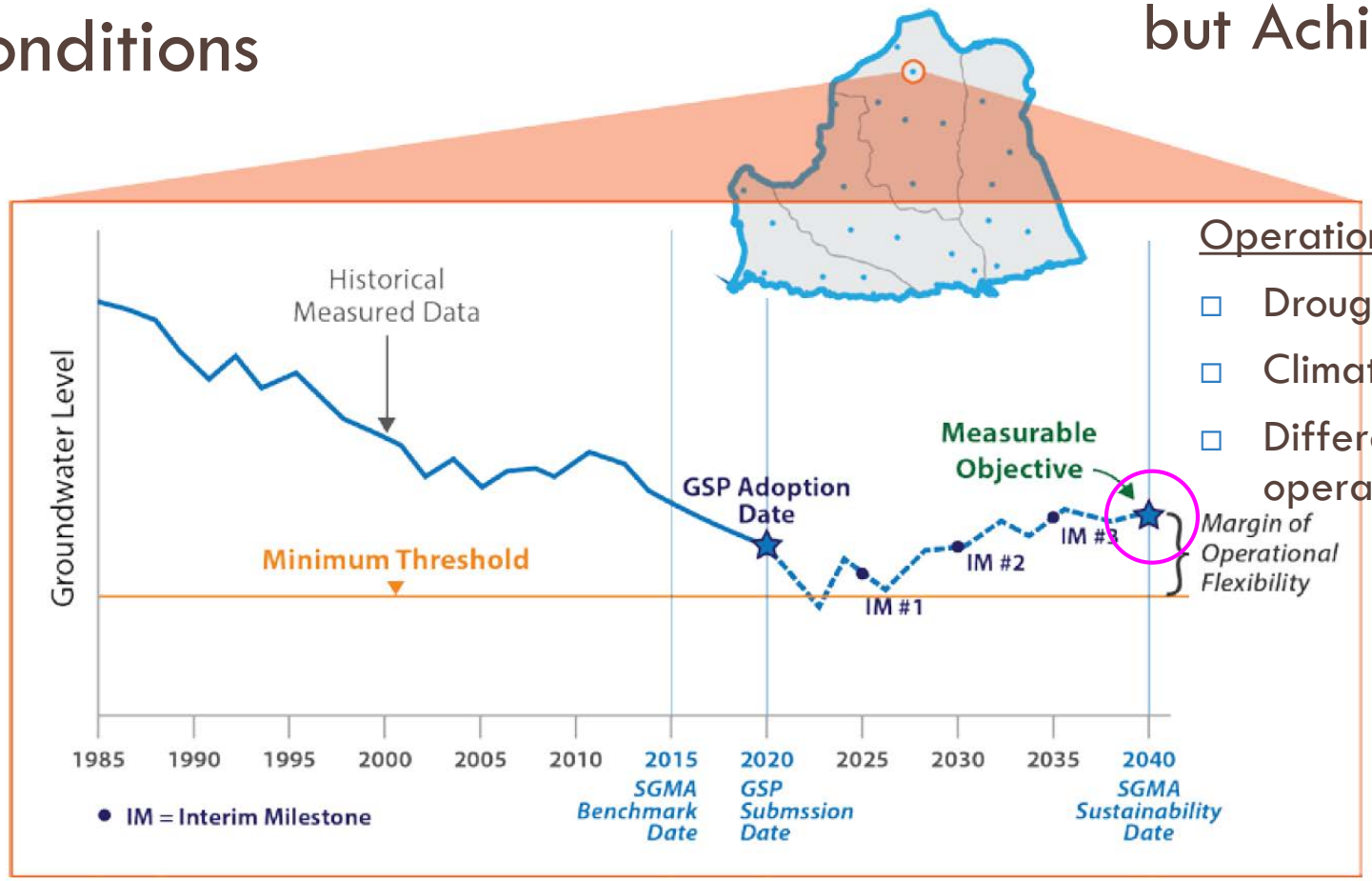
Draft Proposal for Developing Measurable Objectives

1. **Seawater Intrusion**
2. **Chronic Lowering of Groundwater Levels**
3. Reduction in Groundwater in Storage
4. Depletion of Interconnected Surface Water
5. **Degraded Groundwater Quality**
6. Subsidence

What are Measurable Objectives?

Desired groundwater conditions

Not enforceable but Achievable



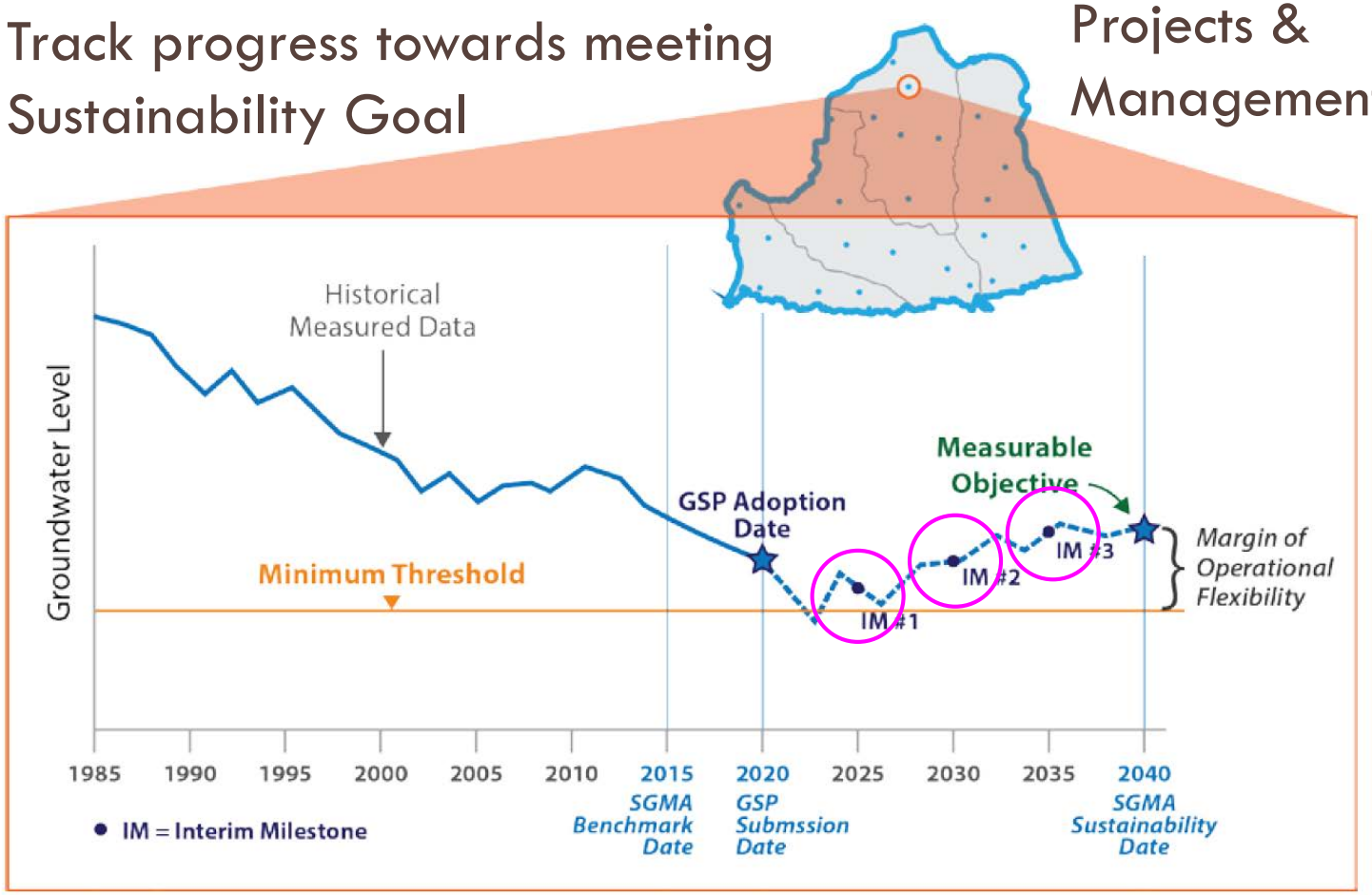
Operational Flexibility

- Droughts
- Climate change
- Different basin operations

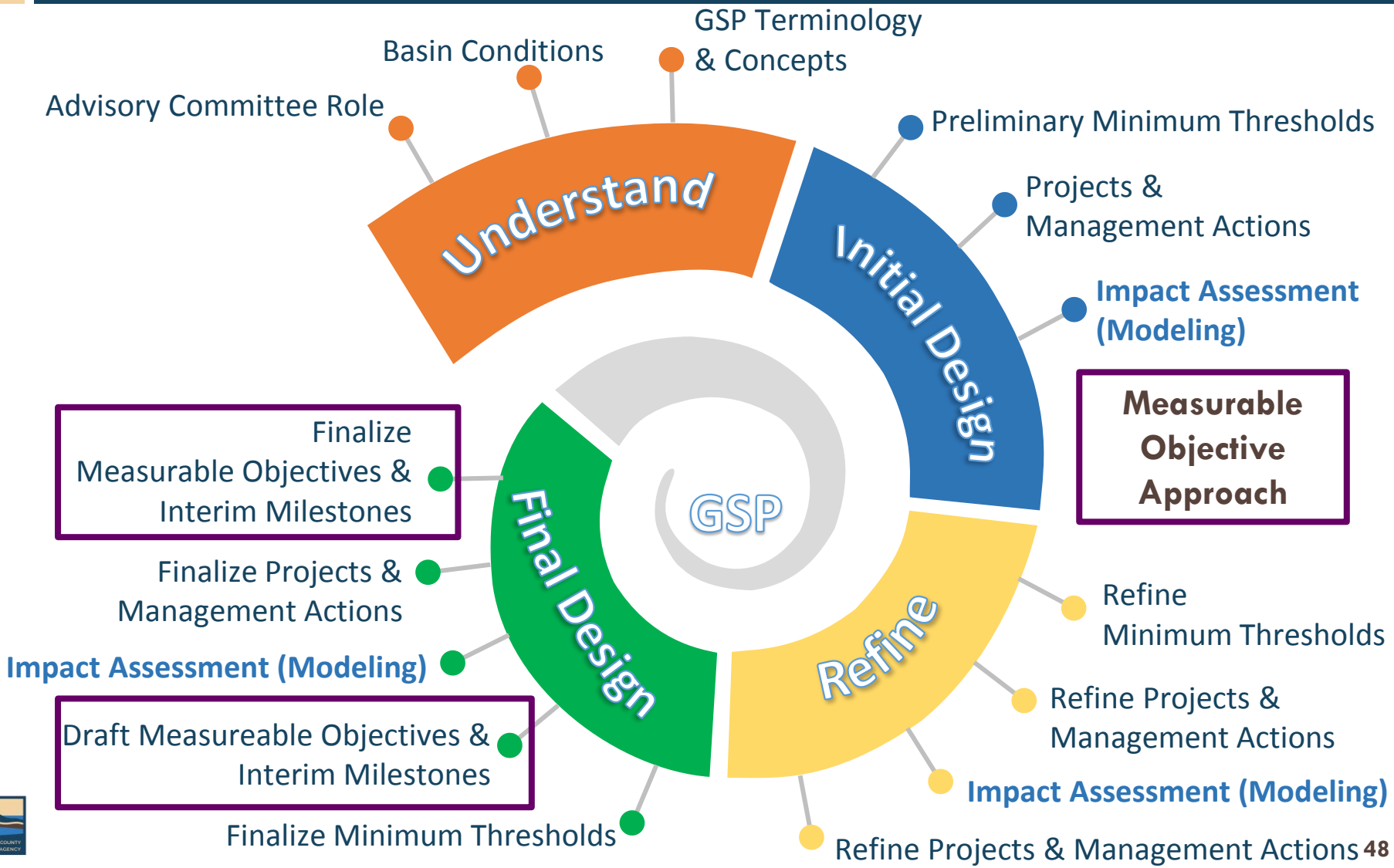
What are Interim Milestones?

- Defined at 5-year increments
- Track progress towards meeting Sustainability Goal

Coordinated with Projects & Management Actions



Iterative Process

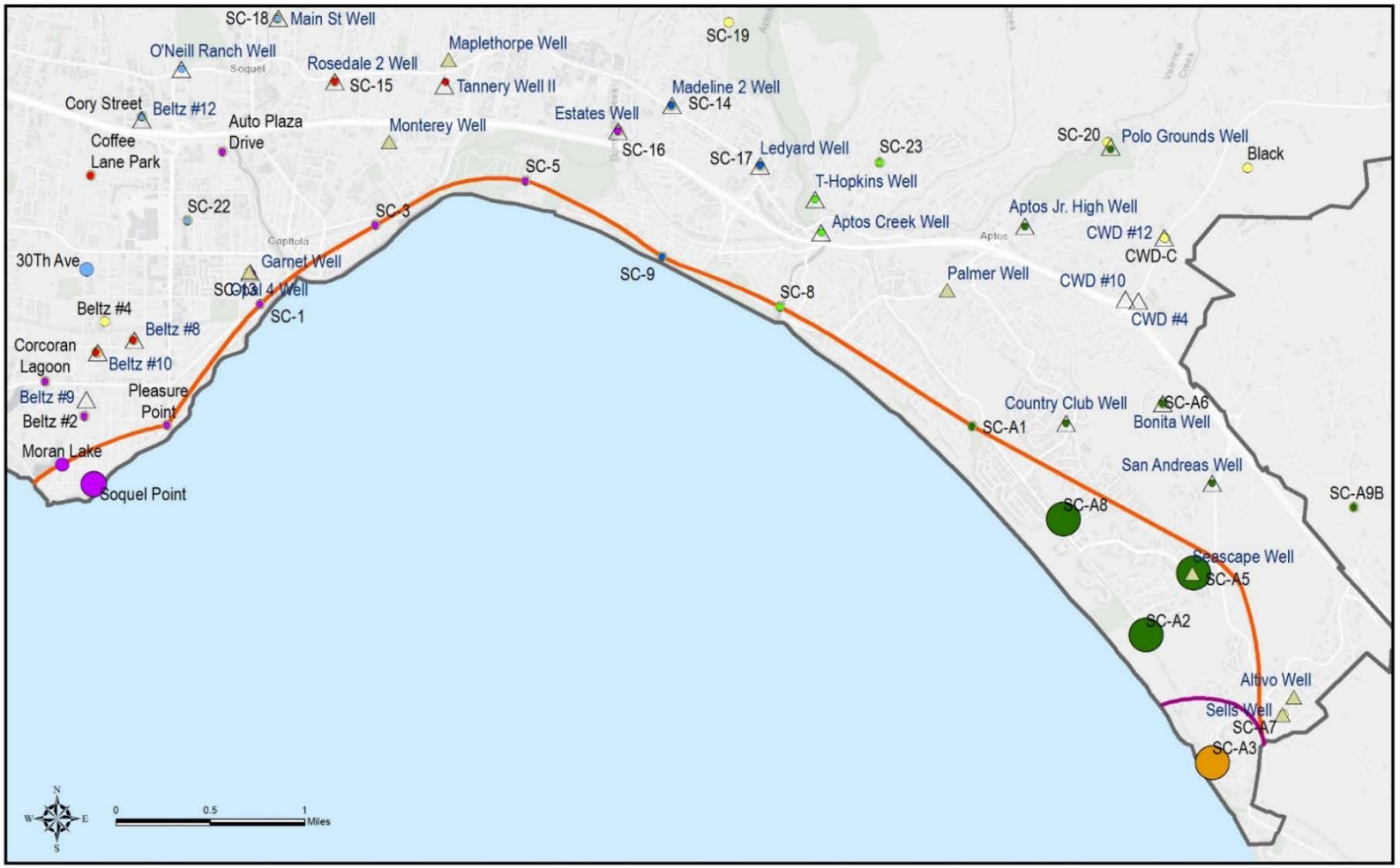


Measurable Objective Approach for Seawater Intrusion

Sustainable Management Criteria	Protective Groundwater Elevations	Chloride Isocontour
Minimum Threshold	Current Protective Elevations; at least 70% of simulations* protective of seawater intrusion at coastal wells	250 mg/L
Measurable Objective	Increase Protective Elevations to where 100% of simulations* protective of seawater intrusion at coastal wells	100 mg/L

* Offshore hydrogeologic properties are uncertain. Uncertainty analysis was carried out when developing protective groundwater elevations that varied hydrogeologic properties to produce 100 randomized parameter datasets or simulations per well

Measurable Objective Approach for Seawater Intrusion



Measurable Objective Approach for Seawater Intrusion

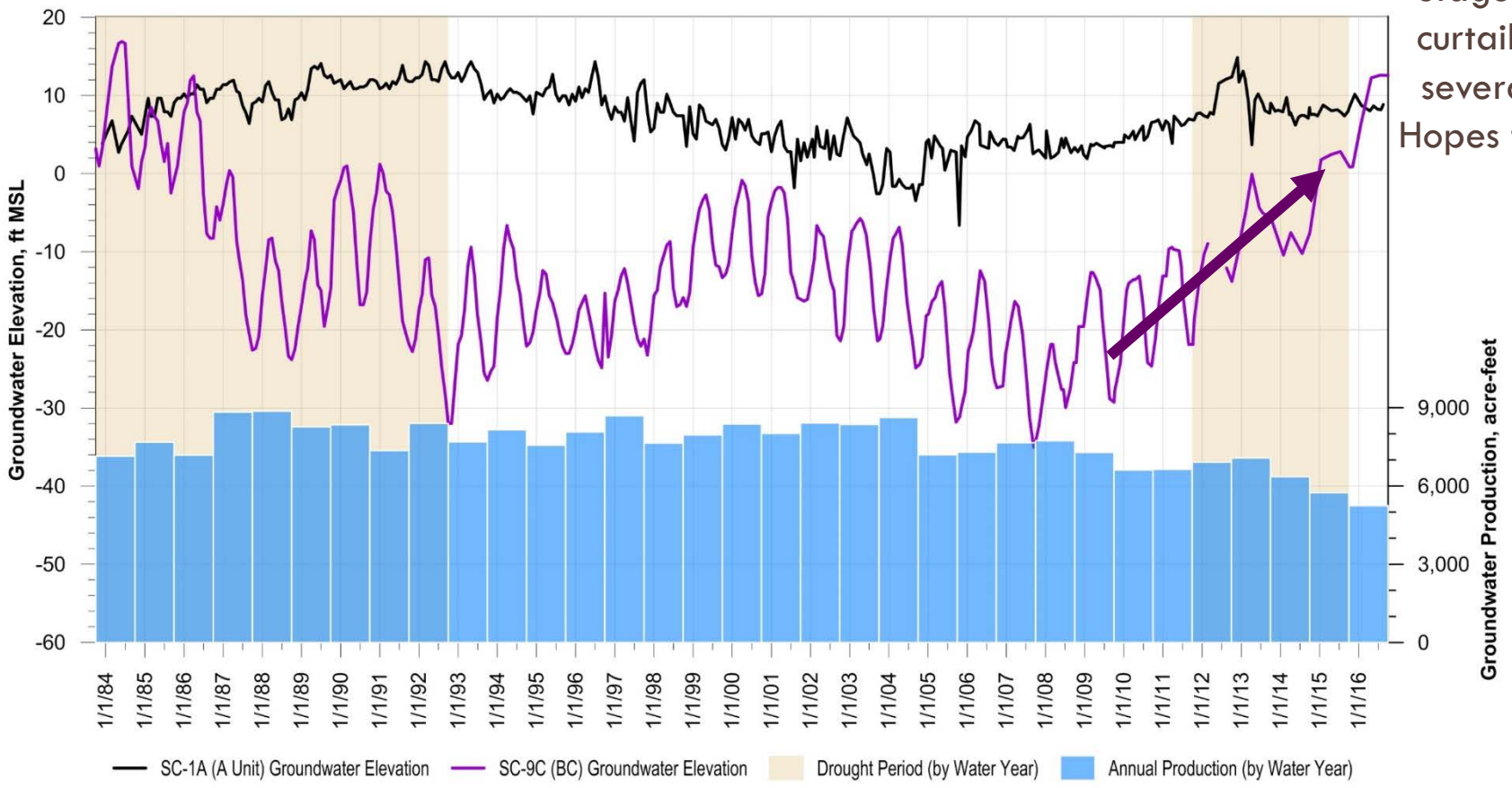
Discuss approach

- Protective Elevations
- Chloride Isocontour

Measurable Objective Approach for Chronic Lowering of Groundwater Levels

- No chronic lowering of groundwater levels currently occurring in the Basin

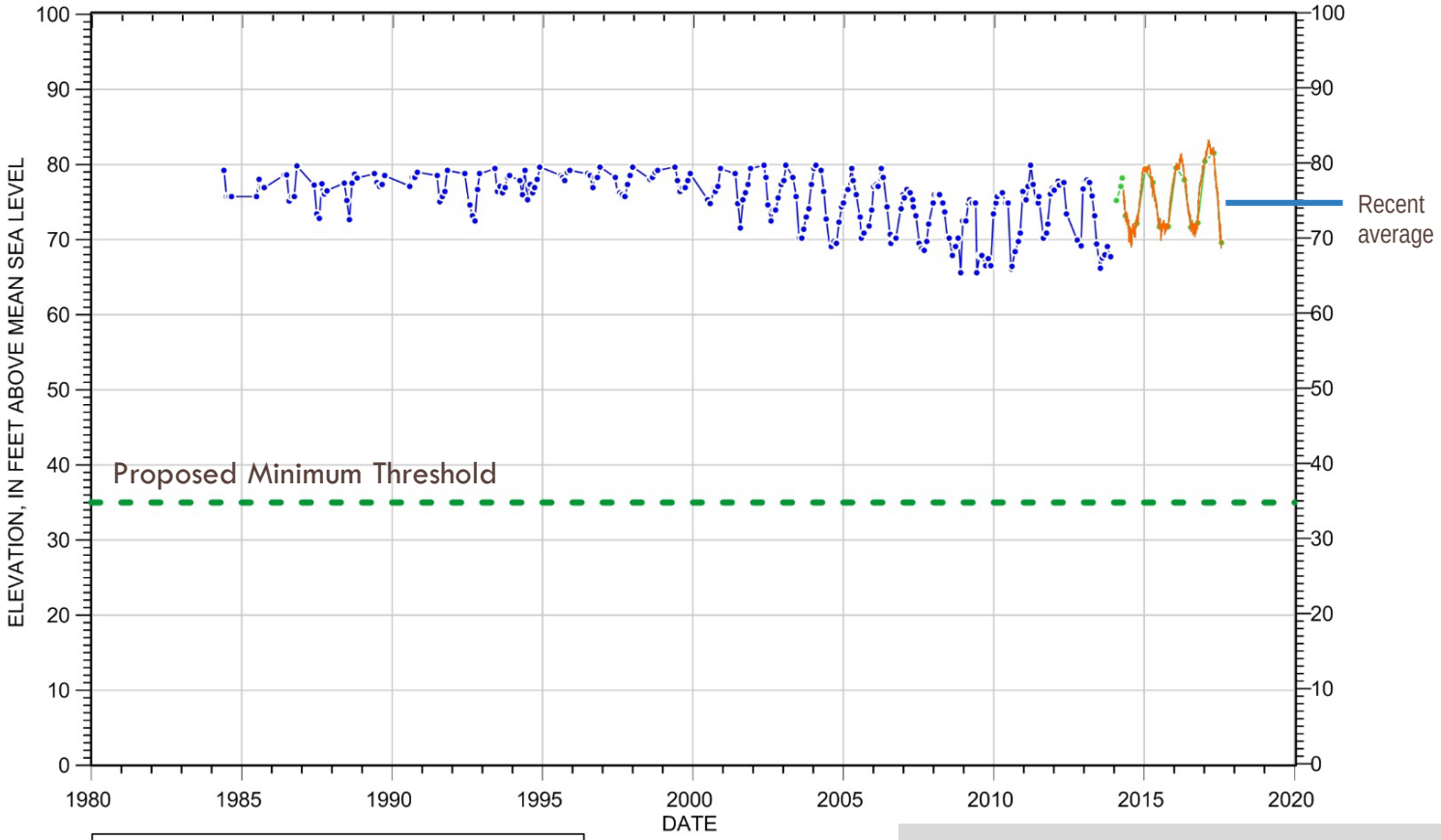
SqCWD Stage 3 usage curtailment for several years. Hopes to lift that



Measurable Objective Approach for Chronic Lowering of Groundwater Levels

- Improved groundwater levels suggest groundwater users may be satisfied with groundwater levels where they are and that the vast majority can meet their typical water demand at current levels
- Measurable Objectives can be selected from:
  - Current groundwater levels,
  - Average groundwater levels over a certain period (e.g., 2013 - 2017),
  - Groundwater levels at some specific time in the past, or
  - Some other approach

Measurable Objective Approach for Chronic Lowering of Groundwater Levels



Technical staff recommends:
Recent (2013 – 2017) average
Accounts for seasonal fluctuations

Discuss Measurable Objective Approach for Chronic Lowering of Groundwater Levels

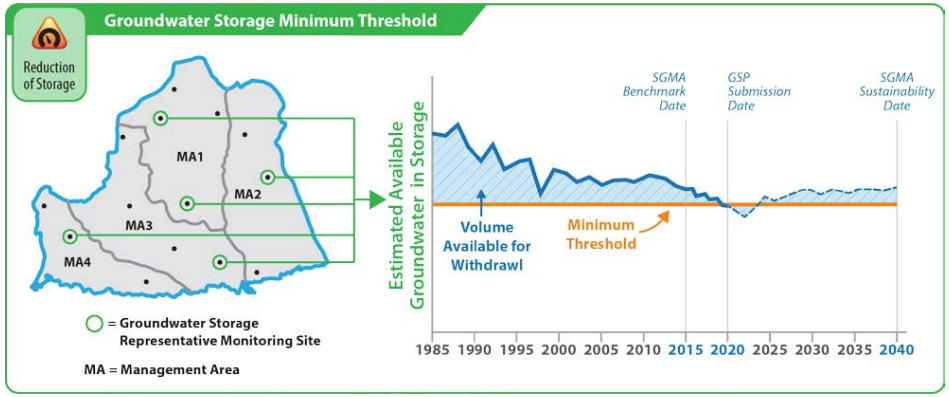
- Current groundwater levels,
- Average groundwater levels over a certain period (e.g., 2013 - 2017),
- Groundwater levels at some specific time in the past, or
- Some other approach

Measurable Objective Approach for Depletion of Interconnected Surface Water

- More work still to be done on this Sustainability Indicator to develop Minimum Thresholds
- Groundwater elevations will be Minimum Thresholds & Measurable Objective proxies for streamflow
- Measurable Objectives to allow for more groundwater flow into relevant creeks, streams, and water bodies than Minimum Thresholds – i.e. higher groundwater levels
- Needs discussion in the Surface Water Working Group

Discuss Measurable Objective Approach for Depletion of Interconnected Surface Water

Measurable Objective Approach for Reduction of Groundwater in Storage



Metric is a single volume for the Basin

- Not yet considered by the Advisory Committee
- Expected that once Minimum Thresholds & Measurable Objectives are set for all other Sustainability Indicators, resultant Basin groundwater in storage changes will provide the information needed to establish Minimum Thresholds & Measurable Objectives for reduction of groundwater in storage

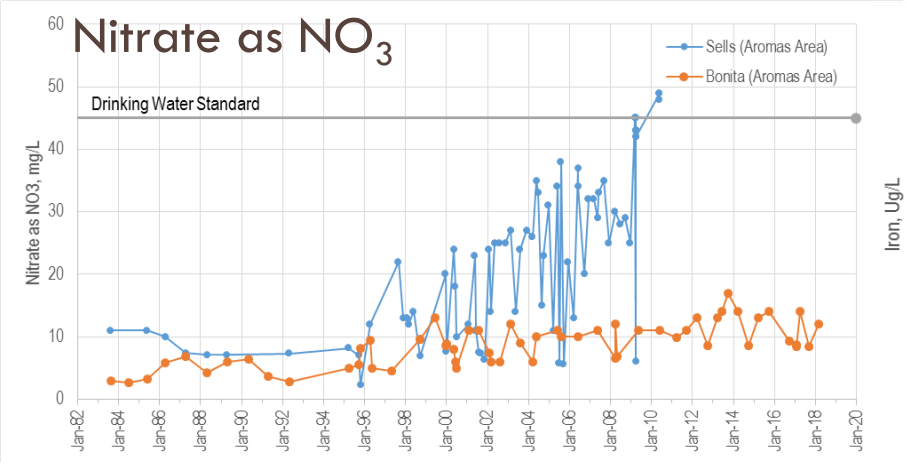
Discuss Measurable Objective Approach for Reduction of Groundwater in Storage

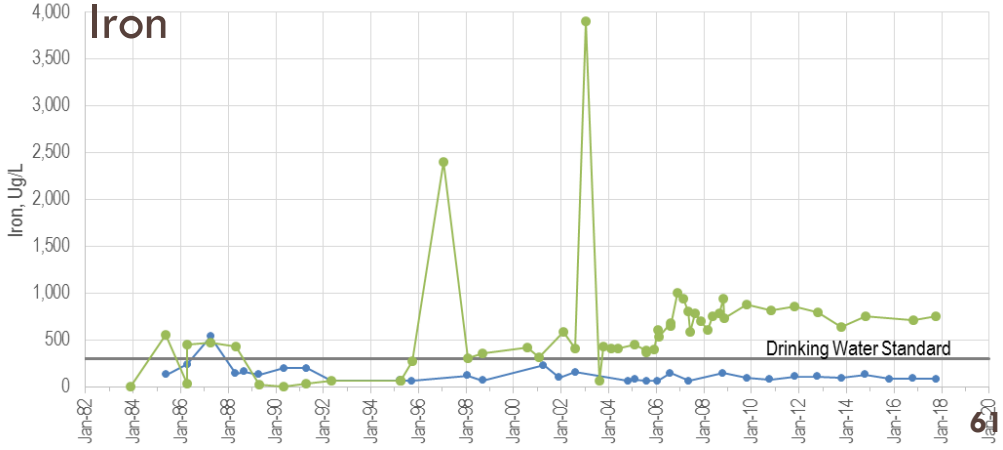
Measurable Objective Approach for Degraded Groundwater Quality

- Basin has good native groundwater quality, with the exception of elevated iron, manganese, arsenic, and chromium VI from naturally occurring sources, and seawater intrusion
- Groundwater distributed by municipal agencies meets all drinking water standards (treated if exceeds standards)
- Minimum Thresholds are drinking water standards
- Measurable Objectives proposed to be based on recent average or minimum historical concentrations

What happens when quality already fails to meet drinking water standards?

- If the quality is not related to the use of groundwater then it is not an undesirable result
  - High nitrates in the Aromas area from septic tanks
  - High iron and manganese in the Purisima aquifer occurs naturally
- SGMA states any undesirable results occurring before Jan 1, 2015 need not to be addressed by GSA. They can chose to do so if they want to





Minimum Thresholds & Measurable Objectives

Constituent	Unit	Current Basin Status	Representative Monitoring Well Minimum Threshold	Representative Monitoring Well Measurable Objective
chloride	mg/L	good quality	250	average *
TDS	mg/L	good quality	1,000	average *
nitrate as N	mg/L	elevated around 10 mg/L	10	average *
iron	µg/L	good quality	300	average *
manganese	µg/L	good quality	50	average *
arsenic	µg/L	naturally elevated but generally < 1 µg/L	10	average *
chromium, total	µg/L	naturally elevated but < 40 µg/L	50	minimum concentration measured
chromium VI	µg/L	naturally elevated	drinking water standard not yet set	minimum concentration measured
perchlorate	µg/L	localized but <= 1.2 µg/L	6	< 0.15
organic compounds		naturally non-detect	drinking water standards	MCLG

Note: not all constituents are listed here

* 2013 - 2017

Minimum Thresholds & Measurable Objectives may not be able to be set for iron and manganese in the Purisima wells as concentrations fluctuate significantly

Discuss Measurable Objectives Approach for Degraded Groundwater Quality

- Aromas Area
- Purisima Area

Measurable Objectives Approach for Subsidence

- No Sustainability Management Criteria will be developed because this Sustainability Indicator is not applicable in the Mid-County Basin

- Discussion

Public Comment

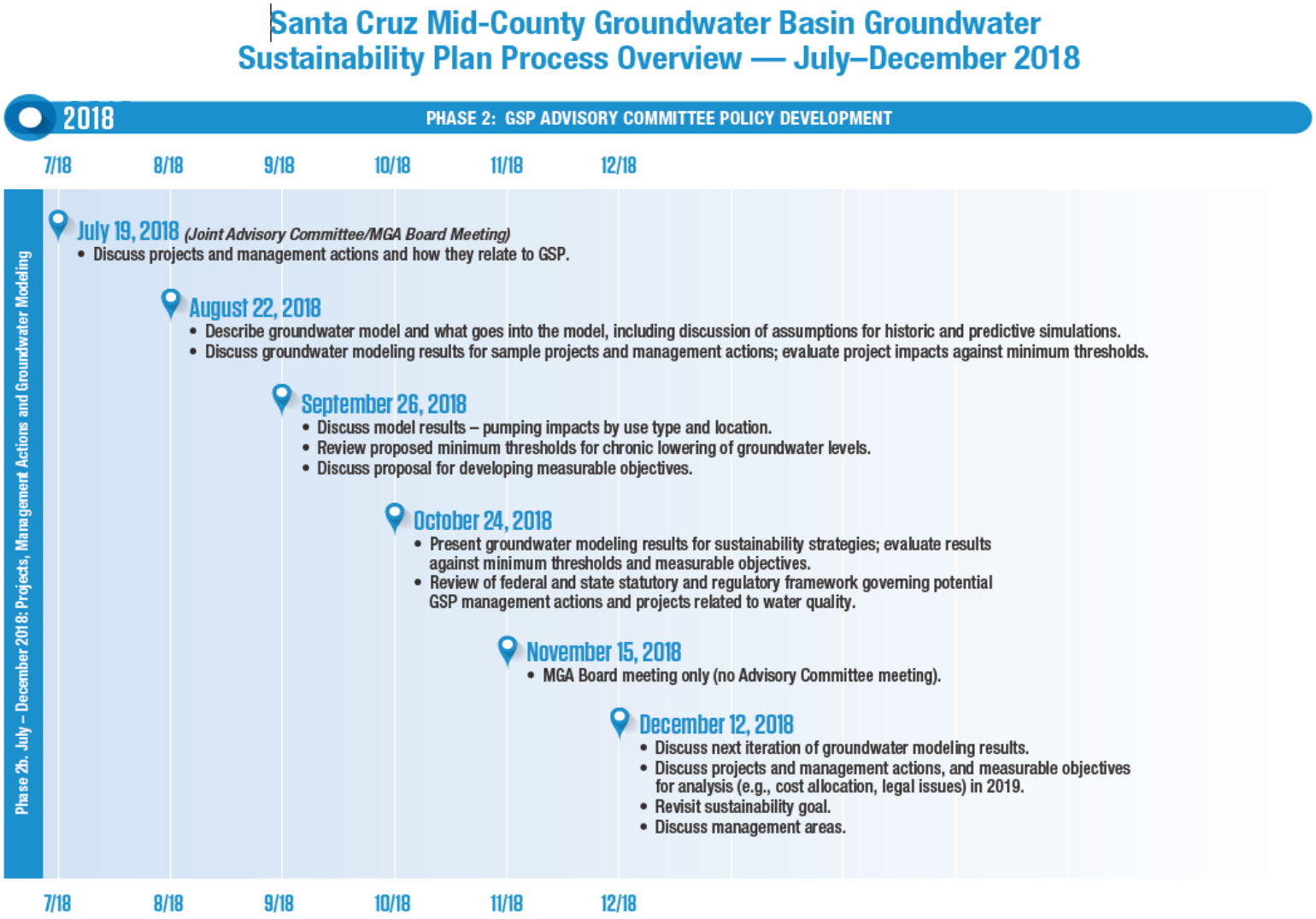
Confirm

August 22, 2018

GSP Advisory Committee Meeting Summary

Recap and Next Steps

GSP Project Timeline – Phase 2



Next Steps: Meetings 12 and 13

- **October 24 Meeting (#12)**
  - Groundwater modeling results for sustainability strategies; evaluate results against Minimum Thresholds and measurable objectives
  - Review of federal and state statutory and regulatory framework governing potential GSP management actions and projects related to water quality
- **No November Meeting**
  - MGA Board meeting only, no Advisory Committee meeting
- **December 12 Meeting (#13)**
  - Discuss next iteration of groundwater modeling results
  - Discuss projects and management actions, and measurable objectives for analysis (e.g., cost allocation, legal issues) in 2019
  - Revisit sustainability goals
  - Discuss management areas

THANK YOU!

FOR ANY QUESTIONS, PLEASE CONTACT:

DARCY PRUITT, Senior Planner
831.662.2052
dpruitt@cfscc.org

SANTA CRUZ MID-COUNTY GROUNDWATER AGENCY

www.midcountygroundwater.org