

PASO ROBLES SUBBASIN GSP DEVELOPMENT

Paso Robles Basin GSAs

City of Paso Robles
County of San Luis Obispo
Heritage Ranch CSD
San Miguel CSD
Shandon-San Juan Water District

September 12, 2018

**Slide 18 Updated 9/19/18*

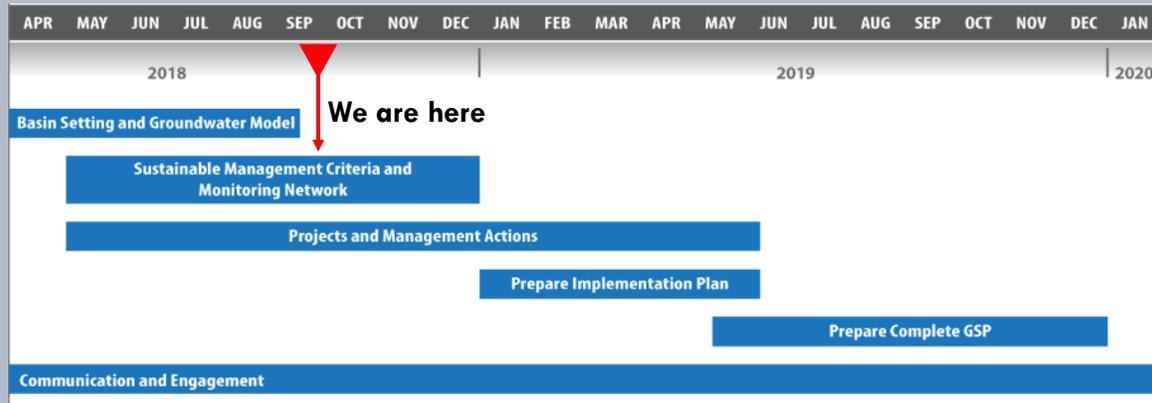
Project Status Update



Presentation Outline

- GSP Schedule and Chapter Delivery
- Groundwater Conditions (GSP Chapter 5)
- Water Budgets (GSP Chapter 6)
- Sustainable Management Criteria (GSP Chapter 7)
- Monitoring Data & De Minimis Extractors

GSP Schedule



GSP Chapters

• CHAPTER 1.	Introduction to Paso Robles Subbasin GSP	Receive/Recommend 7/25
• CHAPTER 2.	Agency Information	Receive/Recommend 7/25
• CHAPTER 3.	Description of Plan Area	Receive/Recommend 7/25
• CHAPTER 4.	Hydrogeologic Conceptual Model	Receive/Recommend 9/12
• CHAPTER 5.	Groundwater Conditions	
• CHAPTER 6.	Water Budgets	
• CHAPTER 7.	Sustainable Management Criteria	
• CHAPTER 8.	Monitoring Networks	
• CHAPTER 9.	Projects and Management Actions	
• CHAPTER 10.	Plan Implementation	
• CHAPTER 11.	Notice and Communications	
• Ch. 11.1	Communications and Engagement Plan	Receive/Recommend 7/25
• CHAPTER 12.	Interagency Agreements	

Groundwater Conditions (GSP Chapter 5)

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Groundwater Conditions

- GSP Regulations §354.16
- Preliminary draft chapter provided to GSA staff for review
- CC recommend GSAs receive & file Chapter 5 at Oct 2018 meeting
- Contents required by regulations align with sustainability indicators:



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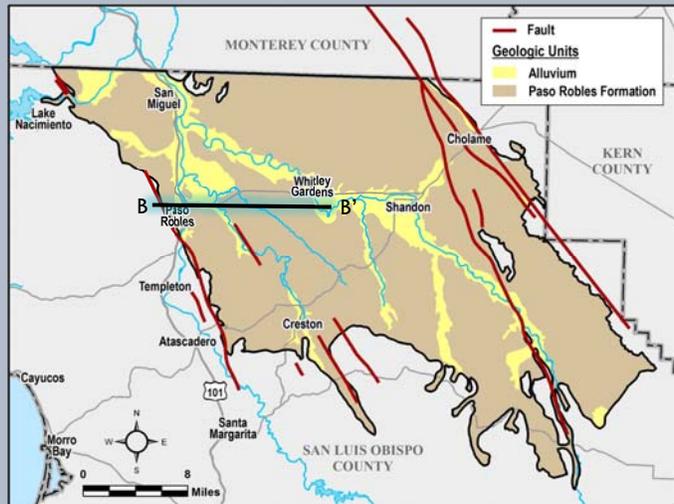
Aquifers in Paso Robles Subbasin

Alluvial Aquifer (yellow areas)

- Coarse-grained sediments along rivers & streams
- Up to about 100 ft thick
- High well yields (some > 1,000 gpm)
- About 5% of basin pumping from alluvium

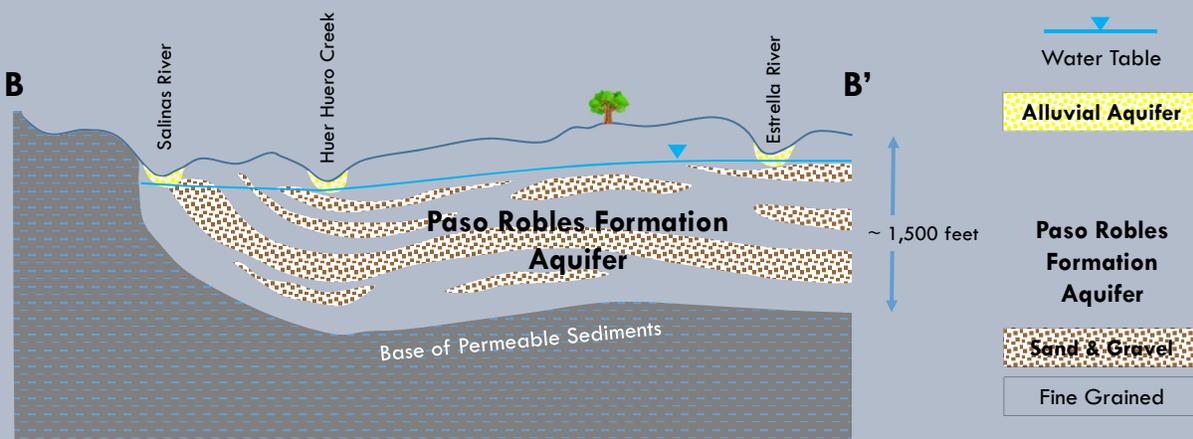
Paso Robles Form. Aquifer (brown areas)

- Mix of sand & gravel zones and silt & clay zones
- Generally 700 to 1,200 feet thick
- Well yields vary from 100s to over 1,000 gpm
- About 95% of basin pumping from PRFm



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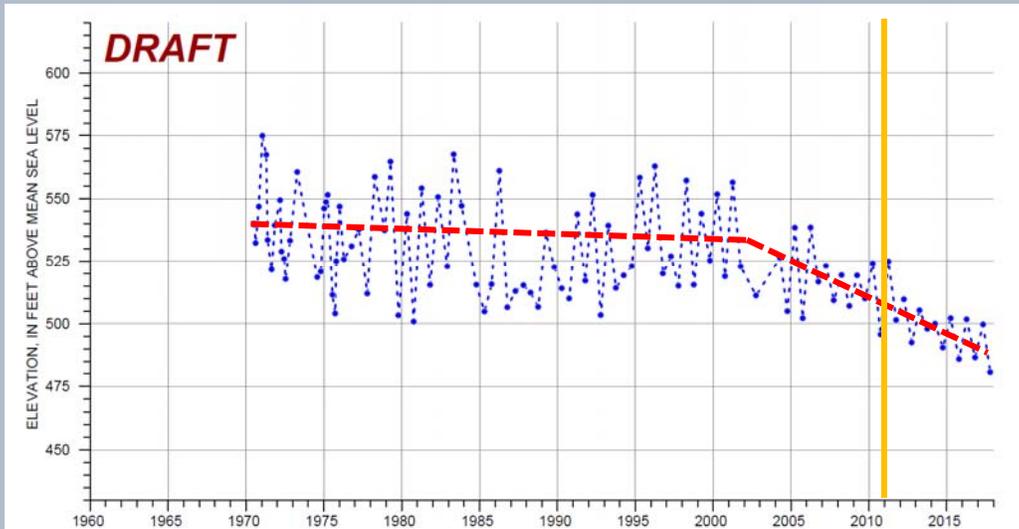
Conceptual Cross-Section of Aquifers



Adapted from Fugro 2002
Not to scale

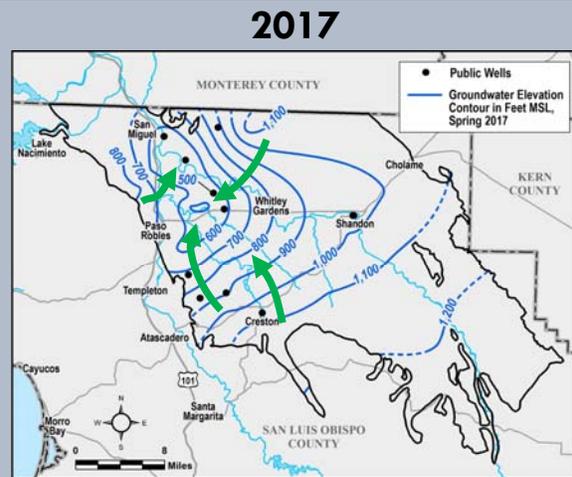
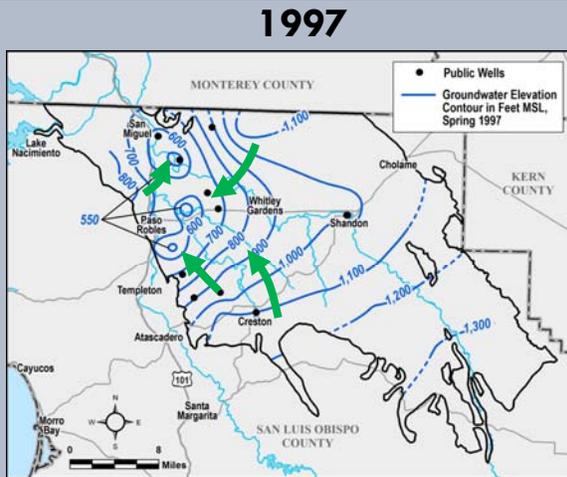
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Example Groundwater Elevation Hydrograph



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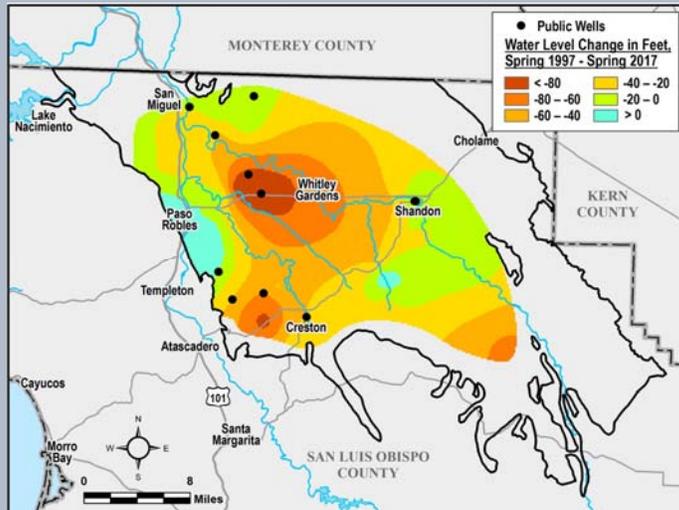
Groundwater Elevation Contour Maps Paso Robles Formation Aquifer



→ Inferred Groundwater Flow Direction

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Change in Spring Groundwater Elevations 1997 to 2017 – Paso Robles Formation Aquifer



Observations:

- Decline in GW elevation over most of subbasin
- Areas of largest decline in Estrella and Creston areas
- Declines in groundwater elevations result in depletion of groundwater in storage

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Summary of Groundwater Conditions

- Chapter 5 of GSP (draft in progress)
 - CC recommends GSAs receive and file at October CC meeting
- GSP addresses two aquifers:
 - Alluvial Aquifer
 - Paso Robles Formation Aquifer
- Groundwater elevations
 - Generally declined from 1997 to 2017
 - Amount of decline varies over Subbasin

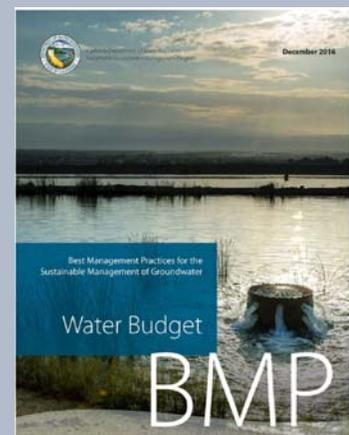
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Water Budgets (GSP Chapter 6)

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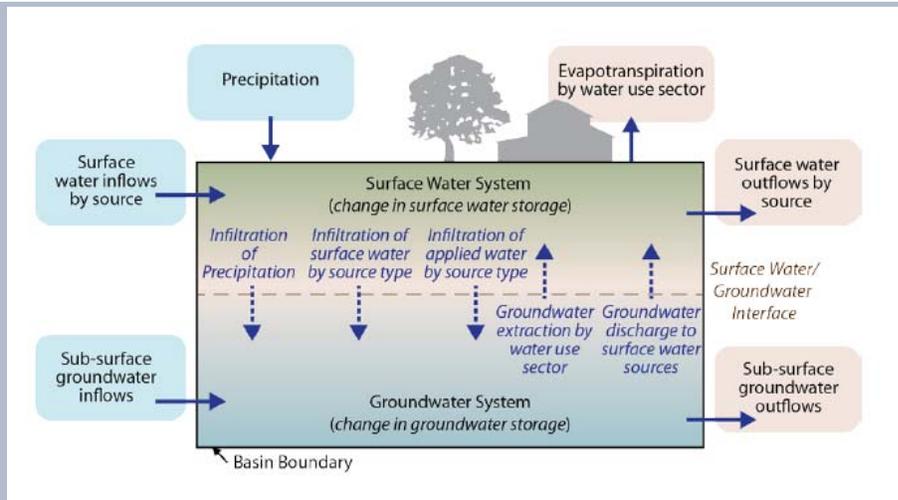
Basics of Water Budgets

- CA CCR §354.18 & Best Management Practices document
- Three water budgets for GSP:
 1. Historic (1981-2011)
 2. Current (2012-2016)
 3. Future (2020-2070)
- Water budget must include:
 - Inventory all inflows (supply) and outflows (demand)
 - Evaluate changes in groundwater storage
 - Estimate groundwater overdraft
 - Estimate sustainable yield



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Water Budget Diagram

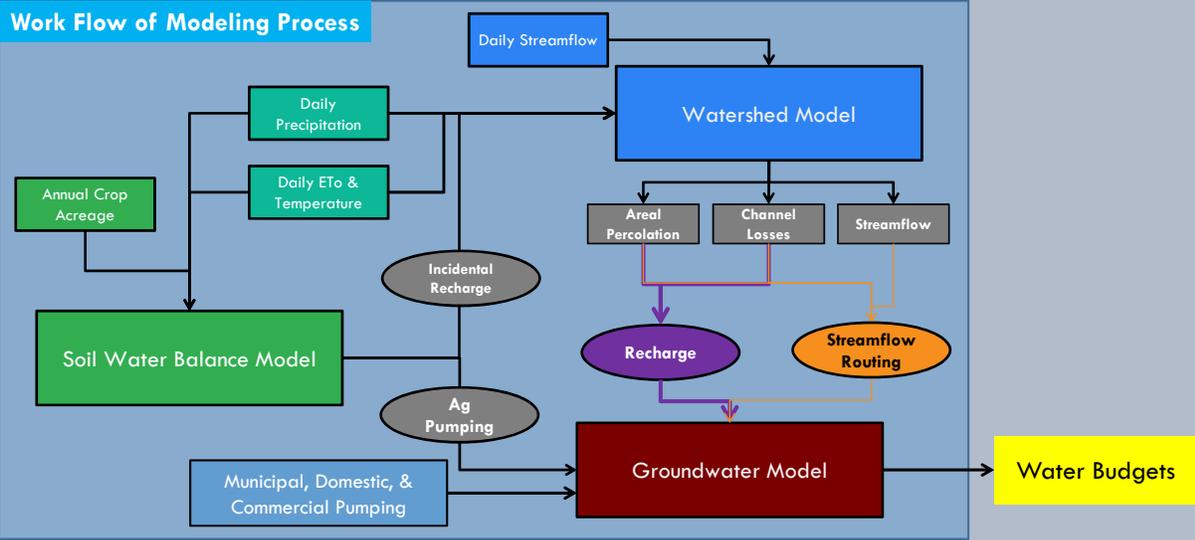


California Department of Water Resources, 2016

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Use Models to Develop Water Budgets

Work Flow of Modeling Process

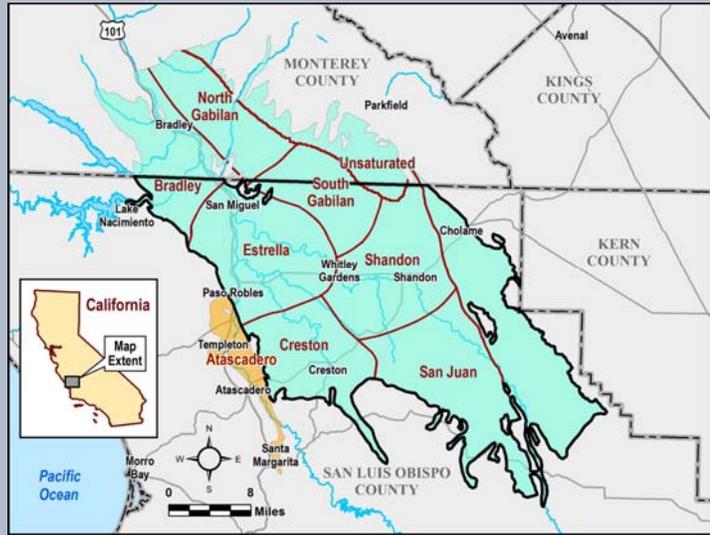


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GSP Water Budgets

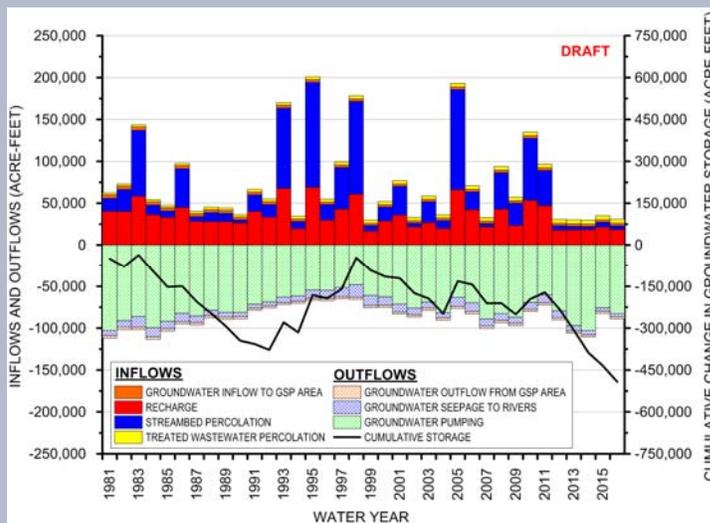
- Previous water budgets:
 - Entire Paso Robles Subbasin
 - Included Atascadero Subbasin
- GSP water budgets:
 - GSP area* (outlined in black)
 - Informal subareas

* Paso Robles Subbasin within County of SLO



Water Budget for GSP Area

(updated 9/19/18)



Observations

- Streambed percolation important for recharging Subbasin
- Groundwater pumping dominant outflow
- Loss of groundwater in storage
 - 1981 to 2011 about 170,000 AF
 - 1981 to 2016 about 490,000 AF

Estimated Groundwater Overdraft (GSP Area)

- Hydrogeologic definition of overdraft: *long-term condition of total outflow (including pumping) exceeding total inflow*
- Overdraft causes a loss of groundwater in storage
- Estimated overdraft conditions:
 - 1981 – 2011 (pre-drought): 5,500 AFY
 - 1981 – 2016 (includes drought): 13,700 AFY
- Provides basis for developing projects & management actions

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Groundwater Overdraft (Subareas)

Subarea	1981 to 2011 Average Overdraft (AFY)	1981 to 2016 Average Overdraft (AFY)
Estrella	- 6,100	- 8,400
San Juan	- 2,800	- 4,100
Creston	300	- 1,900
Shandon	700	- 700
Bradley	-	- 200
North Gabilan	100	100
South Gabilan	2,200	1,500

AFY = acre feet per year

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Estimated Sustainable Yield for GSP Area

- Definition: *maximum quantity of water, calculated over a base period representative of long-term conditions in the basin, and including temporary surplus that can be pumped annually from groundwater supply without causing an undesirable result* (DWR, 2016)
- 1981 to 2011 *
 - Total estimated groundwater pumping: 74,000 AFY
 - Estimated overdraft: **5,500** AFY
 - Estimated sustainable yield: 68,500 AFY
- 1981 to 2016 *
 - Total estimated groundwater pumping: 76,000 AFY
 - Estimated overdraft: **13,700** AFY
 - Estimated sustainable yield: 62,300 AFY

* All values are annual averages

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Future Water Budgets

- In progress
- Purpose is to project overdraft if existing land uses continued
- Conceptual approach:
 - Use average historical precipitation, evapotranspiration, streamflow data
 - Use existing agricultural and rural residential demands
 - Include effects of future changes in urban water demand
 - Include effects of climate change based on DWR data
- Supports evaluation of sustainability projects and management actions

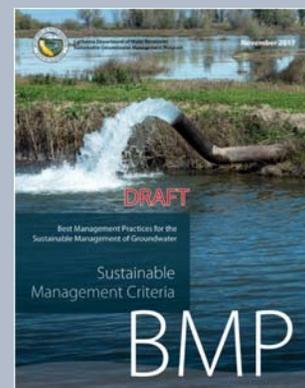
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Summary of Water Budgets

- Three water budgets: historic, current, and future
- Water budgets for GSP area
- Overdraft for GSP Area
 - Through 2011 (pre-drought): 5,500 AFY
 - Through 2016 (with drought): 13,700 AFY
- Sustainable yield in GSP area:
 - Through 2011 (pre-drought): 68,500 AFY
 - Through 2016 (with drought): 62,300 AFY
- Overdraft varies by subarea

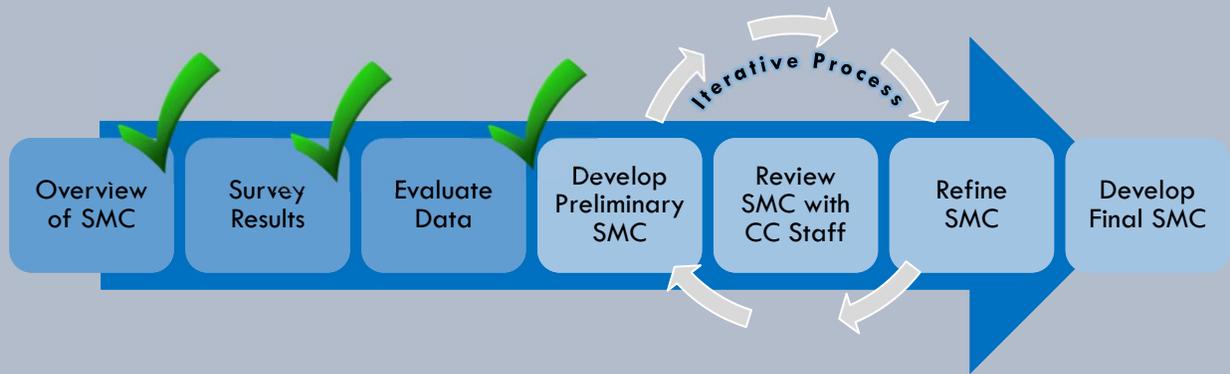
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Sustainable Management Criteria (SMC) (GSP Chapter 7)



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Approach for Developing SMC



Focus on groundwater levels because they drive most SMC

Complete survey results on www.pasogcp.com

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Sustainability Indicators



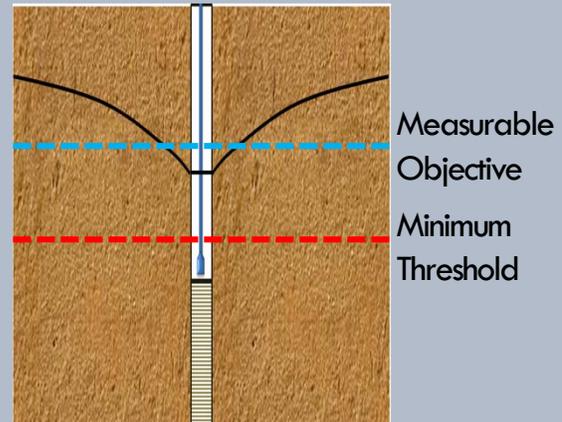
- Establish three SMC for applicable sustainability indicators
 - Measurable Objectives
 - Minimum Thresholds
 - Undesirable Results
- Today's presentation focuses on
 - Chronic lowering of GW levels
 - Measurable Objectives and Minimum Thresholds

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Measurable Objectives and Minimum Thresholds

Chronic Lowering of Groundwater Levels

- Measurable Objectives
 - Average water levels in wells in 2040
 - Include operational flexibility (e.g., account for droughts)
- Minimum Thresholds
 - Minimum water levels in wells
 - Exceedance may lead to undesirable result (e.g., wells going dry)



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Information Used for Paso Robles GSP Measurable Objectives and Minimum Thresholds

- Groundwater levels at wells
 - “Measurable Objectives shall be based on quantitative values”
- Preferences of basin stakeholders from survey
- Check to avoid undesirable conditions
 - Undesirable conditions are adverse impacts to beneficial groundwater uses and users
 - Rural residential, agriculture, & municipalities need access to the groundwater resource

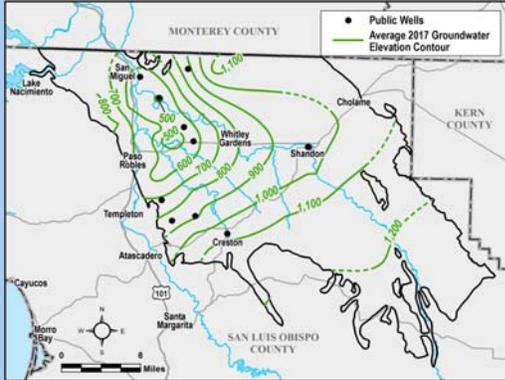
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Process for Establishing Measurable Objectives

Chronic Lowering of Groundwater Elevations

2017 Average Groundwater Levels

SMC Survey Results

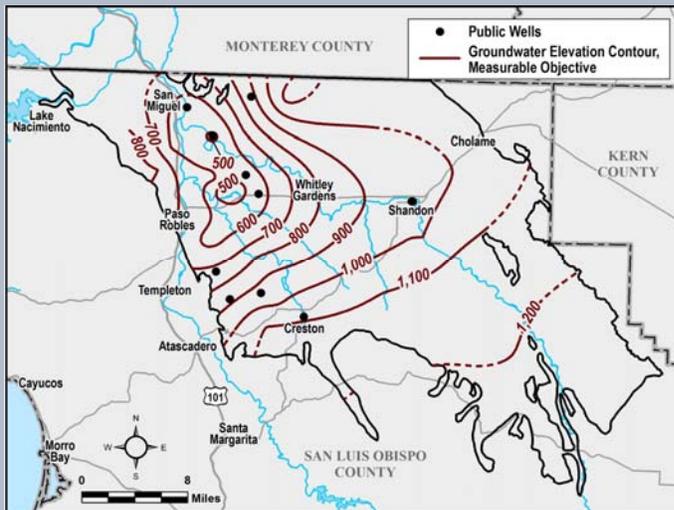


- Estrella – majority prefer current WLs
- Creston – majority prefer higher WLs similar to 10 years ago
- Shandon – majority prefer current WLs

Map of Measurable Objectives

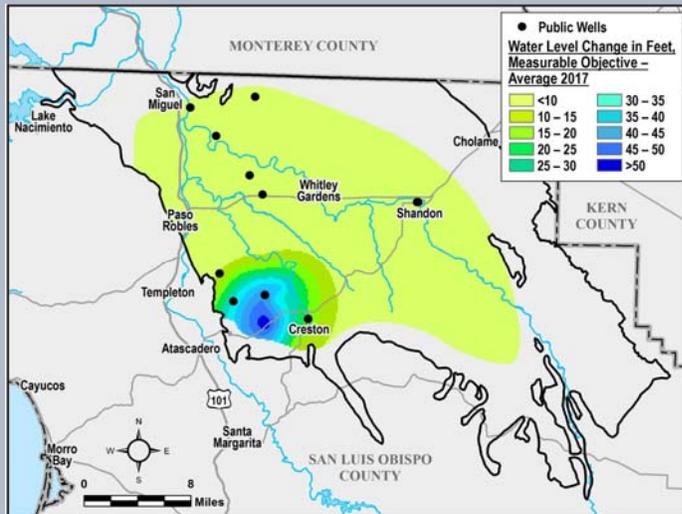
Preliminary Measurable Objectives Map

Chronic Lowering of Groundwater Elevations



Map shows conceptual groundwater elevations in 2040

Conceptual Change in 2040 Groundwater Elevations

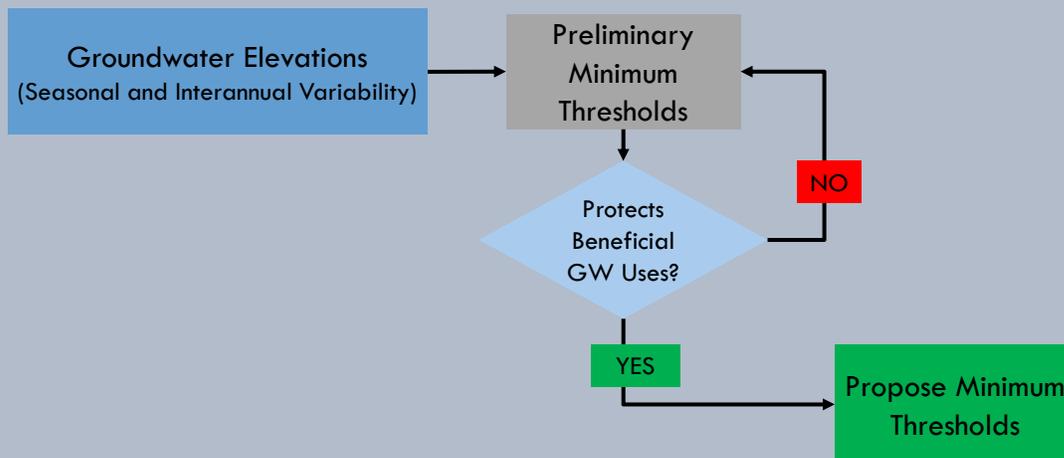


Map reflects:

- Higher water levels in Creston area as noted in survey results
- Water levels similar to 2017 in other areas in light green area
- Measurable Objectives will change based on sustainability projects & management actions selected to stabilize or raise water levels

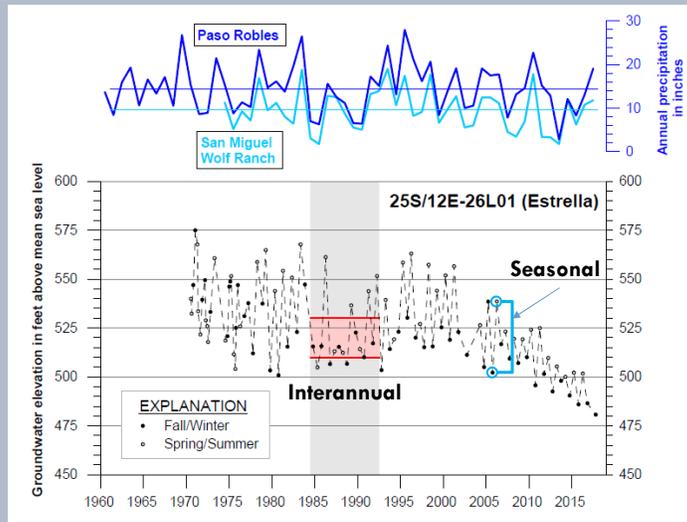
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Process for Establishing Minimum Thresholds Chronic Lowering of Groundwater Elevations



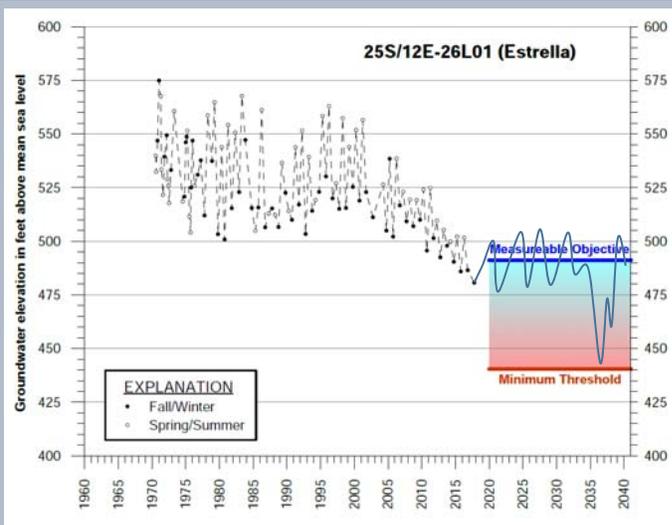
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Variability in Groundwater Elevation



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Measurable Objective and Minimum Threshold at Example Estrella Well



Survey indicated current groundwater elevations in Estrella are preferred

Measurable Objective

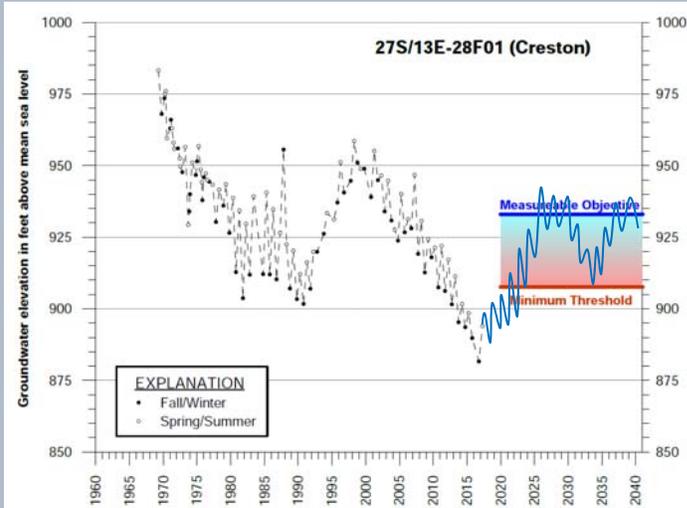
- Average 2017 groundwater elevation (~490 ft MSL)

Minimum Threshold

- 50 feet lower than Measurable Objective to account for groundwater level variability

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Measurable Objective and Minimum Threshold at Example Creston Well



Survey indicated higher groundwater elevations in Creston are preferred (about 2007)

Measurable Objective

- Average 2007 groundwater elevation (~933 ft MSL)

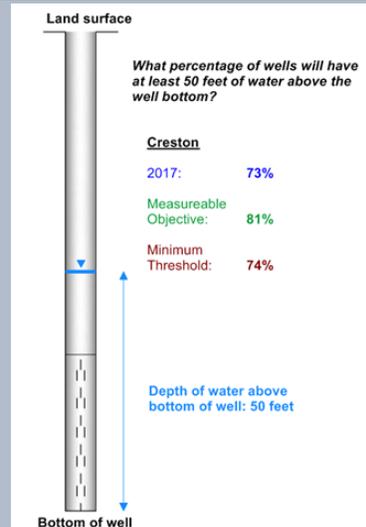
Minimum Threshold

- 26 feet lower than Measurable Objective to account for groundwater level variability

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Undesirable Conditions

- Consider all beneficial groundwater users
- Conceptual example: domestic wells
 - Shallow wells vulnerable
 - Maintain at least 50 feet of water in wells
 - Measurable Objectives and Minimum Thresholds established to maintain operability of most (not all) wells



Summary of SMC Development

- Establish for all sustainability indicators except seawater intrusion
- Effort to date focuses on chronic lowering of groundwater levels
- Preliminary Measurable Objectives and Minimum Thresholds are being developed at representative monitoring wells
- Next step is to schedule workshops to review and get feedback
- Refine SMC based on feedback

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Presentation Summary

- Groundwater conditions (Chapter 5)
 - Preliminary draft chapter provided to GSA staff for review
- Water budgets (Chapter 6)
 - Historic & current WB complete
 - Future water budget work in progress
 - Subbasin in overdraft; overdraft varies by subarea
- Sustainable management criteria (Chapter 7)
 - Preliminary Measurable Objectives and Minimum Thresholds for chronic lowering of groundwater levels are being developed
 - Beginning process of reviewing and refining based on stakeholder feedback

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Monitoring Data & De Minimis Extractors

Monitoring Data

