



# **AMENDED KERN COUNTY SUBBASIN GROUNDWATER SUSTAINABILITY PLAN(S)**

**MAY 9, 2024**

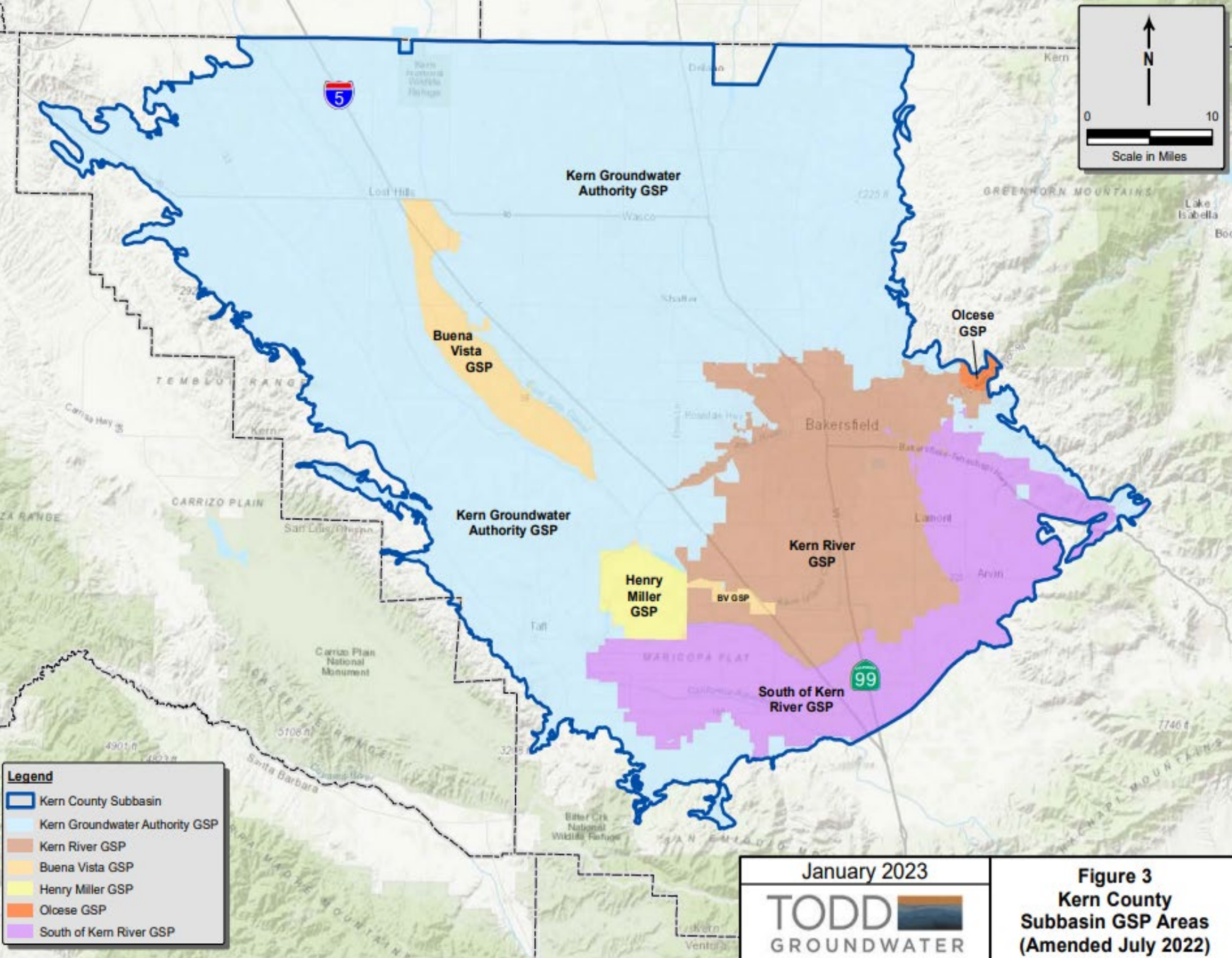
---

# OVERVIEW

## Background & Timeline (2017 – 2025)

### Amended **GSP(s)** Approach

- Sustainable Management Criteria
- Monitoring Network
- Water Budgets
- Projects and Management Actions
- Plan Implementation
- Next Steps



# KERN COUNTY SUBBASIN BACKGROUND

- 2017  
GSAs Formed in Basin
- 2018  
SGMA Initiated in Basin
- 2020  
5 GSPs submitted to DWR
- 2022  
DWR issued Incomplete Letter
- 2022  
6 Revised GSPs submitted to DWR
- 2023  
DWR issued Inadequate Letter

---

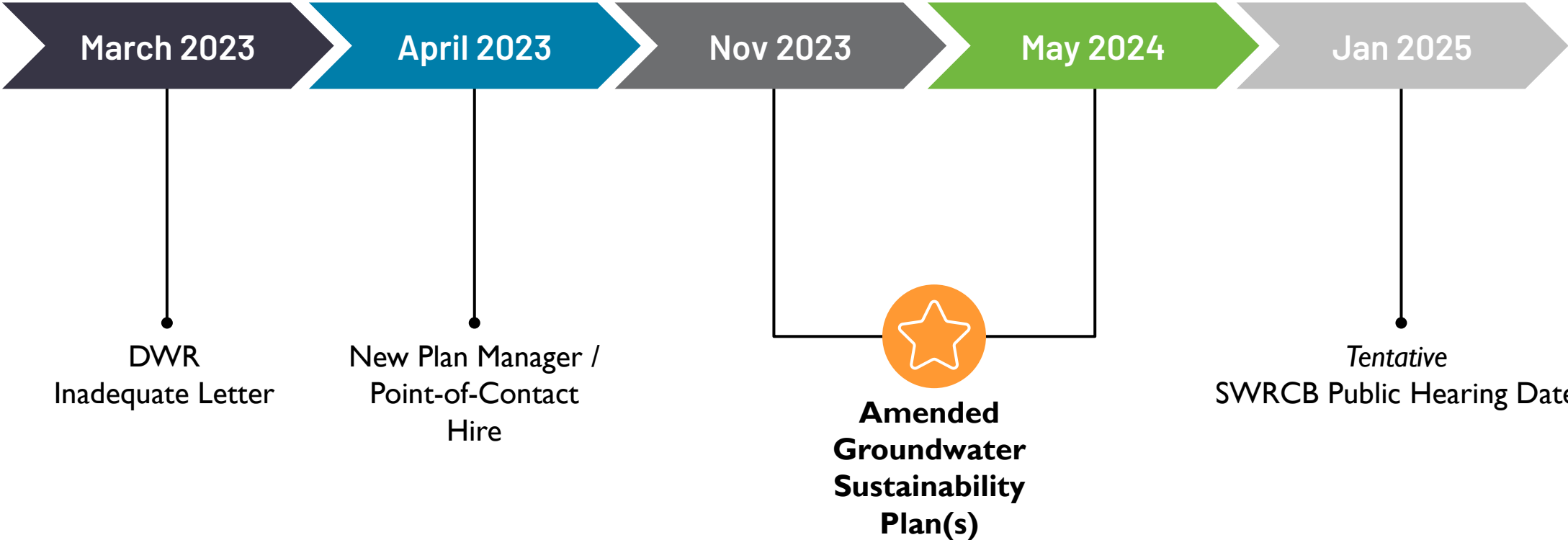
# DWR DEFICIENCIES

## MARCH 2023 INADEQUATE LETTER

1. The GSPs do not establish undesirable results that are consistent for the entire Subbasin.
2. The Subbasin's chronic lowering of groundwater levels SMCs do not satisfy the requirements of SGMA and the GSP Regulations.
3. The Subbasin's land subsidence SMCs do not satisfy the requirements of SGMA and the GSP Regulations.

# SUBBASIN TIMELINE

## SWRCB Consultation Period



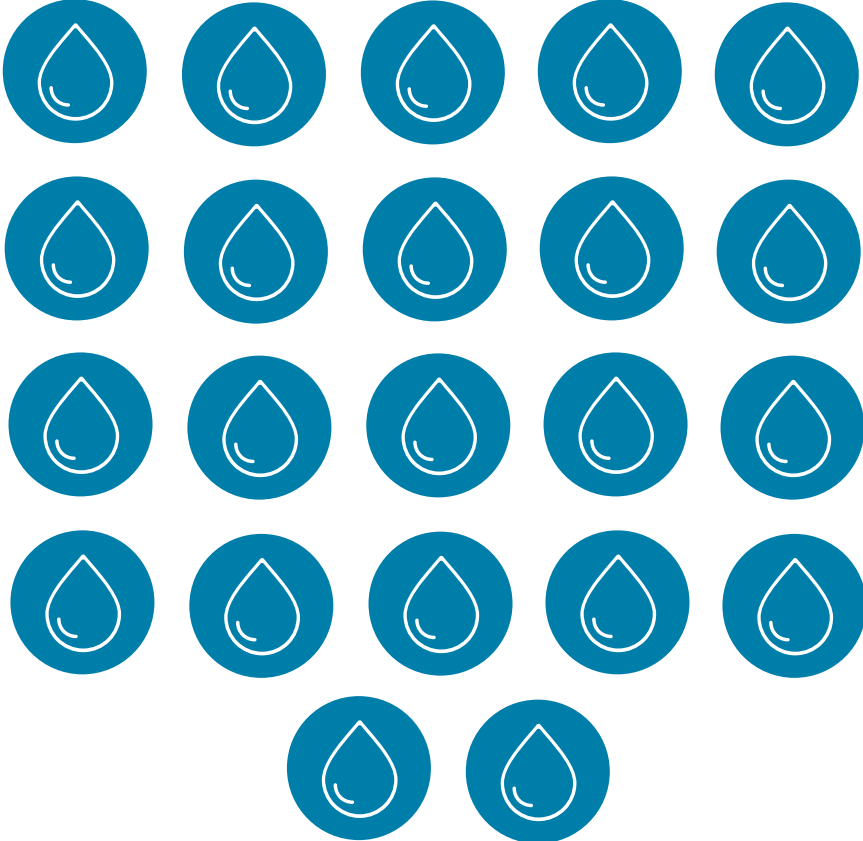
# SUBBASIN AMENDED GSP(S) DEVELOPMENT



Plan Manager /  
Point-of-Contact



Coordination  
Agreement



22 Groundwater Sustainability  
Agencies/Management Areas



15 Technical Working Group Members

# AMENDED GSP(S) DEVELOPMENT

## Participation from all GSAs:

- 146+ Virtual/In-Person Meetings and Workshops
- \$1.3 million project cost
- 6-month timeline



28  
Managers

70  
TWG

38  
Subbasin

10  
SWRCB

# COORDINATED APPROACH TO ADDRESS DEFICIENCIES IN AMENDED GSP(S)

- ✓ Sustainable Management Criteria
- ✓ Monitoring Network
- ✓ Water Budget
- ✓ Projects and Management Actions
- ✓ Plan Implementation

Activity	October 2023				November 2023				December 2023				January 2024				February 2024				March 2024				April 2024				May 2024				August 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Decisions Needed																																				
GSP format					●																															
<b>Manager Policy Development</b>																																				
Exceedance Policy (P/IMA team)									☛	☛			☛				☛	☛			☛				☛											
Well Mitigation Program																																				
<b>GSP Preliminary and Draft GSP Chapters</b>																																				
1-4: Purpose, Sustainability Goal, Agency Information, GSP Organization									■	■			■	■																						
5: Plan Area, Introduce Organizing Themes, Land Use Elements, Communications									■	■			■	■			■	■			■	■			■	■										
6-8: Basin Setting, Hydrogeological Conceptual Model, Groundwater Conditions									■	■			■	■			■	■			■	■			■	■										
9: Water Budget									■	■			■	■			■	■			■	■			■	■										
10: Management Areas																																				
11-15: SMCs									☛				☛				☛				☛				☛											
16: Monitoring Network																																				
17: PIMAs																																				
18: Plan Implementation																																				
Executive Summary																																				
Final Draft																																				
<b>State Board Meetings</b>																																				
Follow up to GWL SMCs																																				
Subsidence SMCs	●	▲			●				▲	★																										
Water Quality SMCs													●	▲	★																					
Well Inventory & Well Mitigation Program, Monitoring Network																	●	▲	★																	
Water Budgets & Banking Programs																																				
Projects & Management Actions																																				
Overview of the Final GSP																																				



# SWRCB COORDINATION DURING SUBBASIN AMENDED GSP(S) DEVELOPMENT



# AMENDED GSP(S)/ SUBBASIN MANAGEMENT STRUCTURE

**6 almost identical GSPs +  
1 Coordination Agreement  
make up the Amended GSP(s)**

GSP Name	Area (acres)	Percentage of Subbasin Area	GSA	GSP Content
Kern Subbasin GSP	1,430,127	80.2%	Arvin GSA Cawelo Water District GSA Kern Groundwater Authority GSA Kern River GSA Kern Water Bank GSA Greenfield County Water Districts GSA North Kern WSD GSA Pioneer GSA Rosedale-Rio Bravo WSD GSA Semitropic Water Storage District GSA Shafter-Wasco ID GSA Southern San Joaquin MUD GSA Tejon-Castac Water District GSA West Kern Water District GSA Wheeler Ridge-Maricopa GSA	Kern Subbasin GSP
Buena Vista WSD GSA GSP	51,052	2.9%	Buena Vista WSD GSA	Kern Subbasin GSP; Supplemental GSA information on blue pages identified in Executive Summary.
Henry Miller GSA GSP	26,053	1.5%	Henry Miller GSA	Kern Subbasin GSP; Supplemental GSA information on blue pages identified in Executive Summary.
Kern-Tulare Water District GSA GSP	11,307	0.6%	Kern-Tulare Water District GSA	Kern Subbasin GSP; Supplemental GSA information on blue pages identified in Executive Summary.
Olcese Water District GSA GSP	3,206	0.2%	Olcese Water District GSA	Kern Subbasin GSP; Supplemental GSA information on blue pages identified in Executive Summary.
Westside District Water Authority GSA GSP	260,061	14.6%	Westside District Water Authority GSA	Kern Subbasin GSP; Supplemental GSA information on blue pages identified in Executive Summary.

# RESPONSE TO DWR DEFICIENCY #1

*“The GSPs do not establish undesirable results that are consistent for the entire Subbasin.”*

*“While the Coordination Agreement presents Subbasin-wide undesirable results, the Subbasin’s fragmented approach towards establishing management criteria that define undesirable conditions in various parts of the Subbasin does not satisfy SGMA’s requirement to use same data and methodologies.”*

- ✓ **Subbasin GSAs established consistent, Subbasin-wide definitions and criteria for undesirable results for each applicable Sustainability Indicator.**
- ✓ **Subbasin GSAs conducted a thorough identification of beneficial users included a comprehensive well inventory and critical infrastructure assessment.**
- ✓ **Subbasin Data Management System (DMS) was updated to notify all GSAs when an MT exceedance is uploaded.**

# REVISED UNDESIRABLE RESULTS CRITERIA



## Chronic Lowering of GW Levels

- More than 15 drinking water wells reported as dry in any given year and no more than 255 drinking water wells impacted by 2040, or
- The MTs for groundwater levels are exceeded in at least 25% of the representative monitoring sites (184 RMWs) over a single year (two consecutive seasonal measurements).



## Reduction of GW Storage

- 4% reduction in usable groundwater storage in the primary principal aquifer relative to the baseline (WY 2015) total usable groundwater storage volume.
- Measured using groundwater levels as proxy.



## Seawater Intrusion

- Not present or likely to occur.
- Unchanged from 2022 GSPs.
- Not applicable, so no SMCs established.



## Degraded Water Quality

- MTs for the same groundwater quality COC are exceeded in 3 representative monitoring sites within an HCM area based on confirmed semi-annual samples and can be attributed based on a technical analysis to either groundwater extraction, managed recharge operations, and/or groundwater level changes.



## Land Subsidence

- MT extent of land subsidence is exceeded at any RMS-LS or as measured using InSAR data published annually by DWR averaged across an HCM area.



## Depletions of Interconnected Surface Waters

- Not present or likely to occur.
- Unchanged from 2022 GSPs.
- No SMCs established; Subbasin GSAs will re-assess after full DWR guidance on ISWs is released later this year.

# RESPONSE TO DWR DEFICIENCY #2

*“The Subbasin’s chronic lowering of groundwater levels sustainable management criteria do not satisfy the requirements of SGMA and the GSP regulations.”*

*“The GSPs do not consistently and sufficiently document the effects of their selected minimum thresholds on beneficial uses and users in the Subbasin, nor explain how the minimum thresholds and measurable objectives that are set below historical lows will impact other applicable sustainability indicators...”*

- ✓ **Subbasin GSAs coordinated to use consistent methodology to establish SMCs through an iterative process.**
- ✓ **Subbasin GSAs performed a robust well impacts analysis and “depletion of supply” calculation to better quantify potential impacts and demonstrate no significant and unreasonable impacts on beneficial users.**
- ✓ **Revised Plan includes clear descriptions of how MTs affect beneficial uses and users, as well as the relationship between Sustainability Indicators.**
- ✓ **Subbasin GSAs established two key policies:**
  - ✓ **Subbasin-wide MT Exceedance Policy to trigger immediate GSA action in the event of a single MT exceedance.**
  - ✓ **Framework for a Subbasin-wide locally funded Well Mitigation Program to address impacts on domestic and small community users, in partnership with Self-Help Enterprises, to be operational by January 2025.**

# RESPONSE TO DWR DEFICIENCY #3

*“The Subbasin’s land subsidence sustainable management criteria do not satisfy the requirements of SGMA.”*

*“The Plan lacks a Subbasin-wide, coordinated approach to establishing land subsidence sustainable management criteria.”*

- ✓ **Subbasin GSAs have developed a Subbasin-wide approach to address Land Subsidence.**
  - ✓ **Subbasin GSAs coordinated to use consistent methodology to establish SMCs through decision tree and risk-based matrix approach along Critical Infrastructure, and established subbasin-wide SMCs by HCM Area.**
  - ✓ **Use of updated InSAR data and methodologies (e.g., InSAR time series) to differentiate between causes of subsidence within and outside of the GSAs’ authority to manage.**
  - ✓ **Coordinated definition and mapping of Subbasin-wide critical infrastructure.**
  - ✓ **Coordinated with key beneficial users of Regional Critical Infrastructure, including the Friant Water Authority and State Water Project California Aqueduct Subsidence Program (CASP).**

# REVISED MO AND MT BY SUSTAINABILITY INDICATOR



## Chronic Lowering of GW Levels

- MO = 2015 low groundwater elevation
- MT = the lower of:
  - Groundwater level in 2030 if the regional trend is extended from the 2015 low (the MO), or
  - Groundwater level that allows for operational flexibility below the 2015 low, based on an RMW-WL-specific record of groundwater level fluctuations.



## Land Subsidence

- MO = 50% of the MT rate and MT extent
- MT =
  - Established along critical infrastructure as a rate and extent based on specific impacts to critical infrastructure or as an observed or allowable rate of subsidence, as determined by the Subbasin's risk-based approach, and
  - Set for the Subbasin as the average historical rate of subsidence in each HCM area from 2015-2023.



## Seawater Intrusion

- Not applicable.



## Degraded Water Quality

- MO = The greater concentration of:
  - The applicable health-based screening standard, or
  - The median pre-2015 baseline concentration at each RMW-WQ.
- MT = The greater concentration of:
  - The applicable health-based screening standard, or
  - The maximum pre-2015 baseline concentration at each RMW-WQ.



## Reduction of GW Storage

- Chronic Lowering of Groundwater Levels used as a proxy.



## Depletions of Interconnected Surface Waters

- Not applicable.

# KRGSA KEY SMC CHANGES BY SUSTAINABILITY INDICATOR



## Chronic Lowering of GW Levels

- Revised SMCs definition
  - MOs set to 2015 low water levels.
  - MTs lowered by 34 ft on average.
- Initiation of a well mitigation program by 2025.



## Land Subsidence

- Basin-wide SMCs definition
  - Site-specific SMCs established along Critical Infrastructure.
  - SMCs established across the entire Subbasin, based on an average across the HCM Area.



## Seawater Intrusion

- Unchanged from 2022 GSP.



## Degraded Water Quality

- Direct SMCs at WQ wells.
- Constituents of concern
  - Arsenic, nitrate, nitrite, nitrate+nitrite, total dissolved solids (TDS), 1,2,3-TCP, uranium.
- Revised SMCs definition.
- Revised RMWs (pending finalization).



## Reduction of GW Storage

- Unchanged from 2022 GSP



## Depletions of Interconnected Surface Waters

- Unchanged from 2022 GSP.



# SUBBASIN MT EXCEEDANCE POLICY

## Step 1: Identification of Initial Exceedance and Investigation of RMW Area

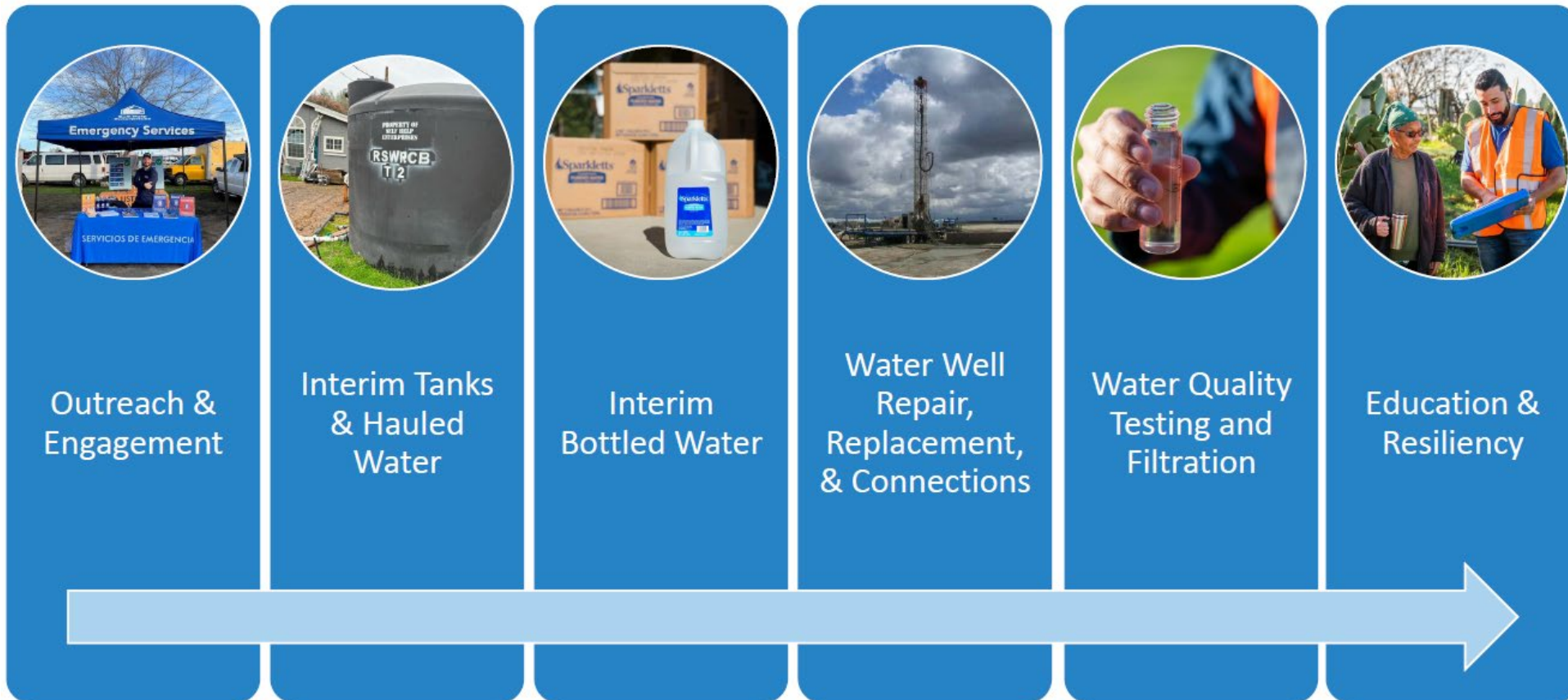
- Investigate RMW area to determine if exceedance is isolated or systemic to a larger area.
- Assess cause of exceedance (e.g., drought, activities within or outside of GSA authorities, operations in adjacent GSAs or basins).
- Provide copy of exceedance report to Subbasin GSAs.

## Step 2: Confer with Subbasin GSAs

- GSAs will consider implementing P/MAs or other response actions to prevent continued exceedance.

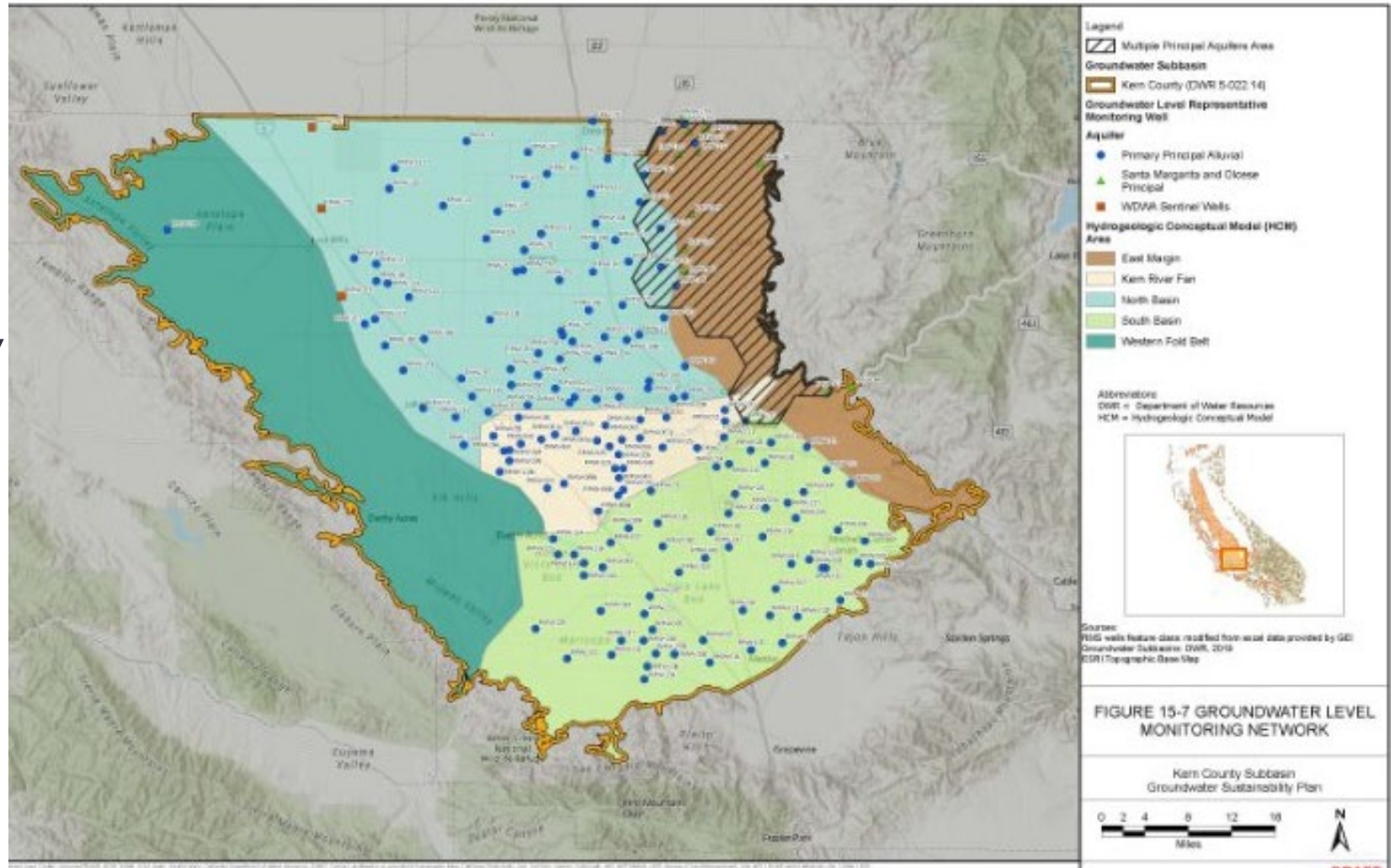
# SUBBASIN WELL MITIGATION PROGRAM

- Subbasin intends to contract with Self-Help Enterprises (SHE) for implementation of a Subbasin-wide locally funded Well Mitigation Program.
- Implementation by January 2025.



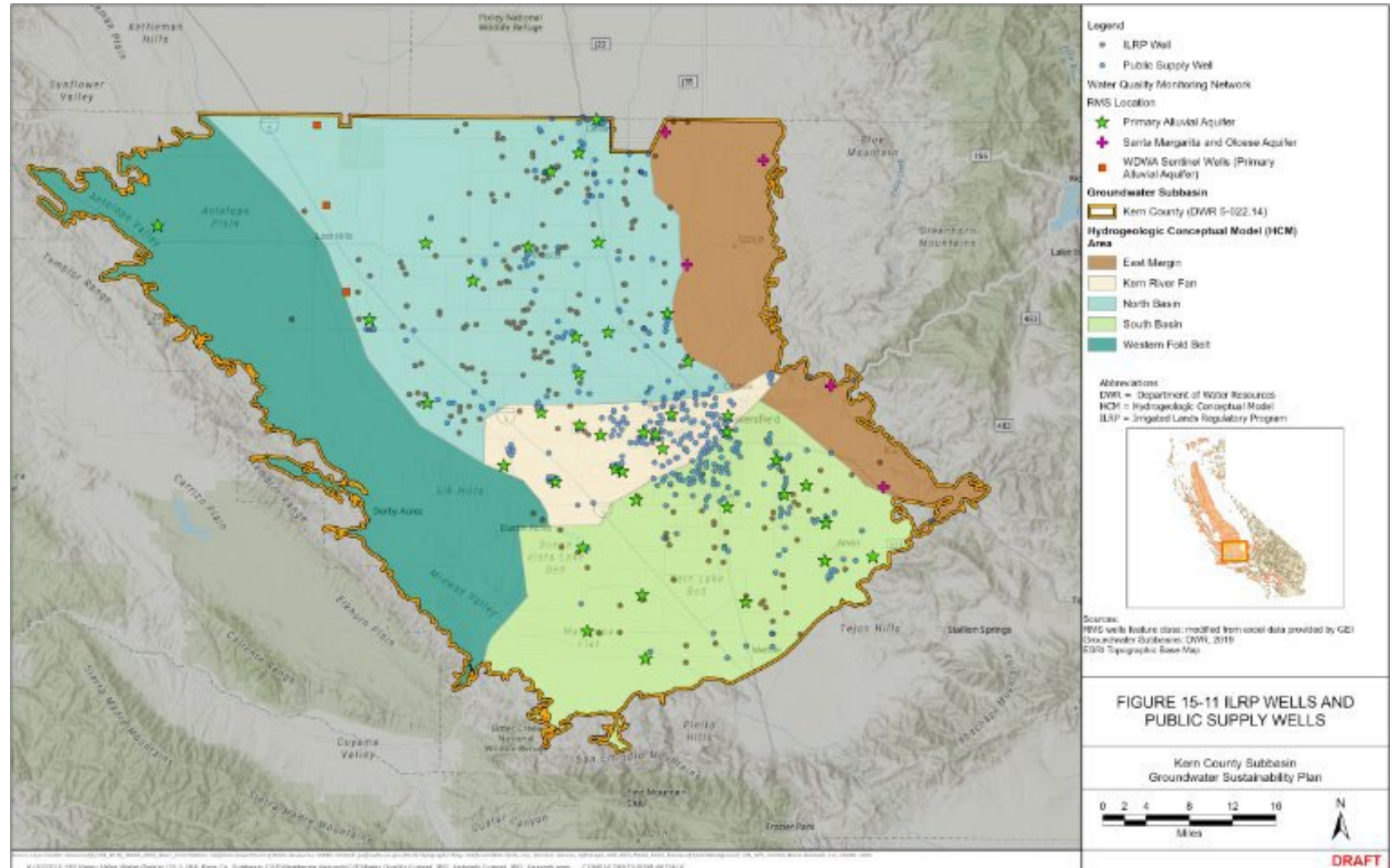
# AMENDED GSP(S) APPROACH: MONITORING NETWORK - GWL

Chronic Lowering of Groundwater Level Monitoring Network totals **184 wells**, representing the Primary Principal Alluvial and Santa Margarita and Olcese Principal aquifers



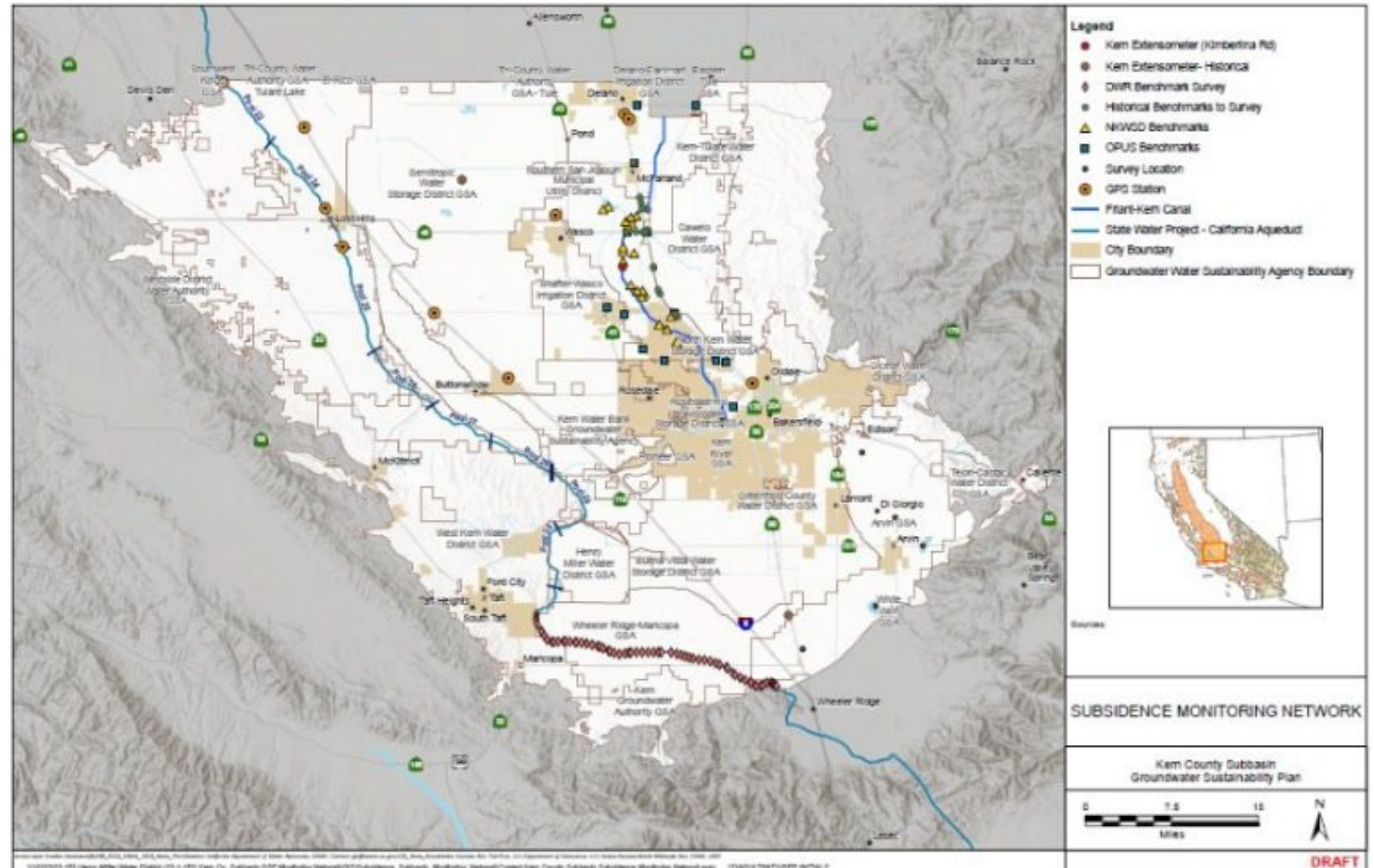
# AMENDED GSP(S) APPROACH: MONITORING NETWORK - GWQ

- Groundwater Quality Monitoring Network totals **50 wells**
- Continue to evaluate publicly collected data
  - ILRP Monitoring Wells
  - Public Supply Wells

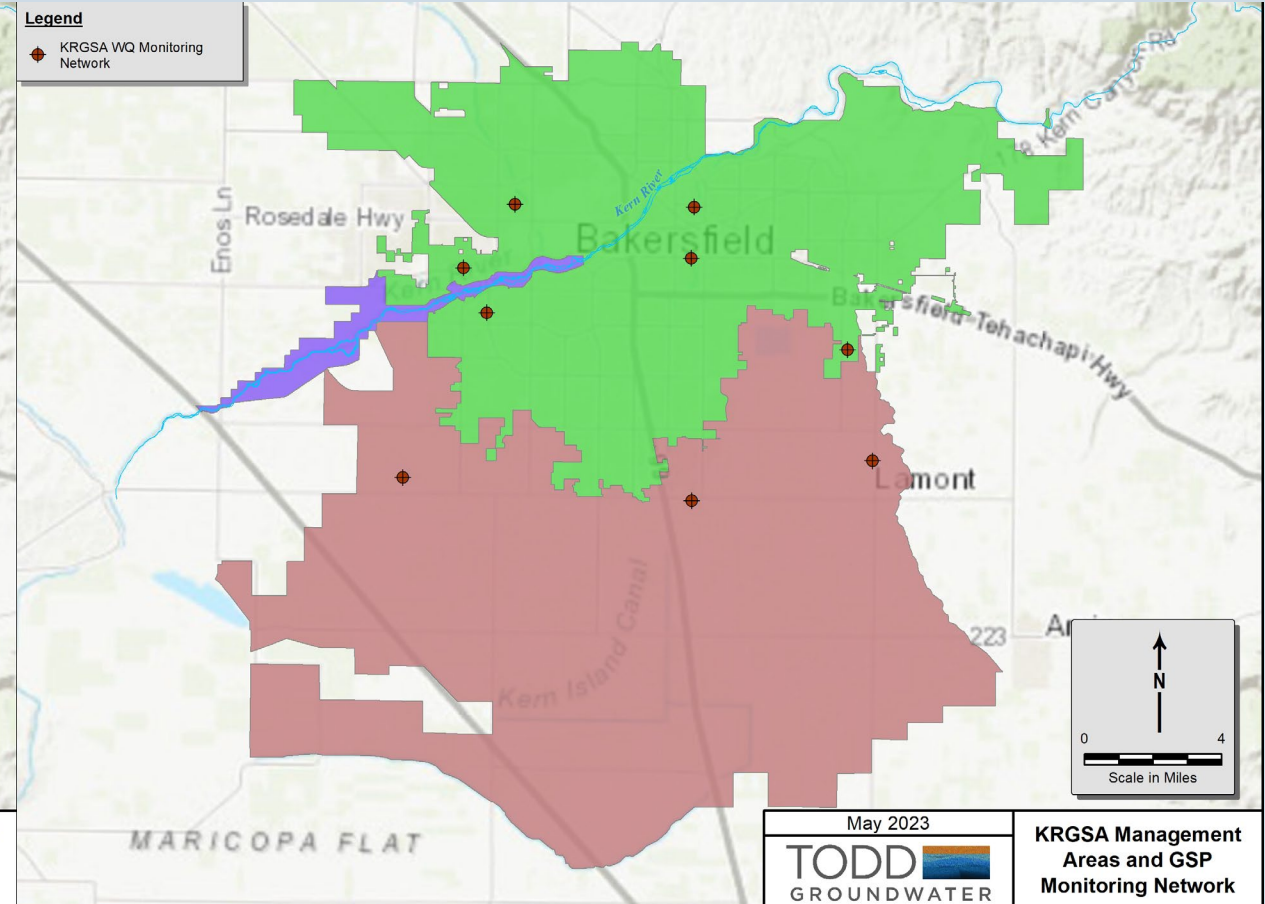
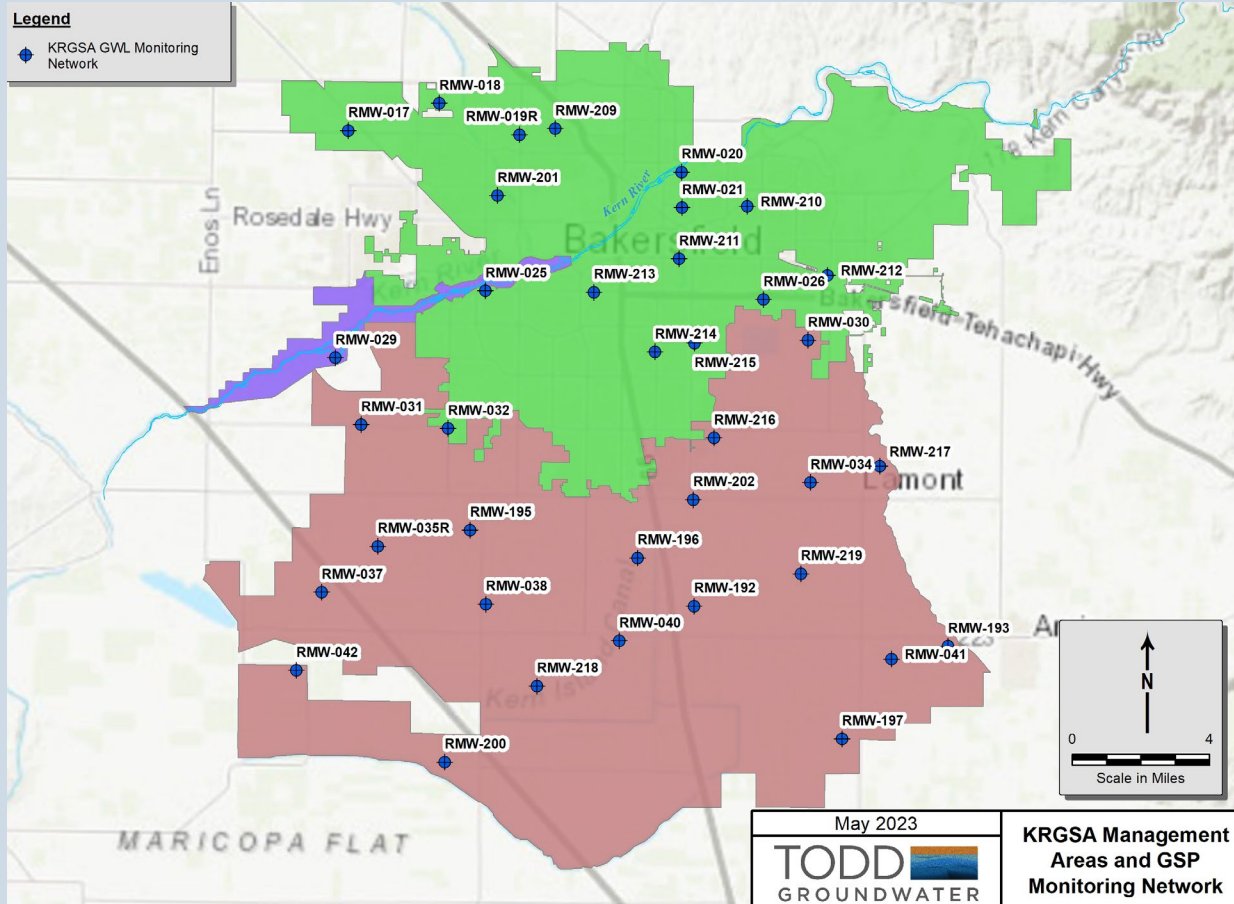


# AMENDED GSP(S) APPROACH: MONITORING NETWORK - SUBSIDENCE

Subsidence  
Monitoring Network  
totals **144** sites and  
**InSAR** data



# KRGSA MONITORING NETWORK DETAILS



# AMENDED GSP APPROACH: WATER BUDGETS

- **Checkbook Water Budget 2010-2019**
- **Adjusted for Climate Change**
- **Entities with Zero are Surplus**
- **For P/MA Planning Purposes**
- **Basin Study to Inform Next Iteration**

GSA Name	Minimum Target P/MA	Planned P/MA
Arvin GSA	34,770	60,760
Buena Vista Water Storage District GSA	0	39,610
Cawelo Water District GSA	0	35,110
Eastside Water Management Area	3,940	7,020
Henry Miller Water District GSA	1,330	3,850
Kern River GSA	0	150,433
Kern Water Bank Groundwater Sustainability Agency	0	21,762
Kern-Tulare Water District GSA	970	7,720
North Kern Water Storage District GSA	0	32,620
Olcese Water District GSA	0	0
Pioneer GSA	0	0
Rosedale-Rio Bravo Water Storage District GSA	0	18,360
Semitropic Water Storage District GSA	136,040	223,600
Kern National Wildlife Refuge	0	0
Shafter-Wasco Irrigation District GSA	22,560	29,292
7th Standard	12,260	23,153
Southern San Joaquin Municipal Utility District	33,610	33,610
Tejon-Castac Water District GSA	0	1,800
West Kern Water District GSA	0	191
Westside District Water Authority GSA	0	50,000
Wheeler Ridge-Maricopa GSA	18,910	36,330
Whitelands	20,410	20,410
Subbasin Adjustment (subbasin outflow and data uncertainty)	87,320	
<b>Subbasin Total</b>	<b>372,120</b>	<b>795,631</b>



# KRGSA

## WATER BUDGET DETAILS

**DRAFT**

Table 7. Check Book Summary for Kern River GSA (All values in AF)

Kern River Natural Flow, First Point of Measurement, Water Year % of Current Average	San Joaquin Valley Water Year Hydrologic Classification Index	WY	Total Surface Water Supply	Effective Precipitation (ETpr)	Native Yield for Total Developed Area <sup>1</sup>	Total Demand <sup>2</sup>	Historical Net GW Deficit (Demand - Supply) <sup>3</sup>
113%	AN	2010	397,534	39,317	48,520	419,696	-65,676
203%	W	2011	568,554	51,121	48,610	401,298	-266,986
53%	D	2012	402,881	47,222	48,518	467,398	-31,223
30%	C	2013	252,195	32,530	49,593	481,389	147,071
25%	C	2014	188,847	22,022	49,382	455,609	195,358
18%	C	2015	171,074	31,437	49,517	409,889	157,860
51%	D	2016	266,478	42,008	49,579	381,947	23,882
275%	W	2017	533,805	51,622	49,787	396,297	-238,917
60%	BN	2018	370,853	37,034	49,762	395,325	-62,324
177%	W	2019	508,363	53,925	49,863	393,107	-219,044
55%	D	2020	371,958	54,034	49,783	351,428	-124,347
22%	C	2021	179,463	38,200	49,816	405,079	137,601
29%	C	2022	195,153	32,778	49,576	379,462	101,955
320%	W	2023	294,353	71,180	49,870	274,299	-141,104
<b>Average (2010-2019)</b>			<b>366,058</b>	<b>40,824</b>	<b>49,313</b>	<b>420,196</b>	<b>-36,000</b>
<b>Wet (W, AN)</b>			<b>502,064</b>	<b>48,996</b>	<b>49,195</b>	<b>402,599</b>	<b>-197,656</b>
<b>Dry (C, D, BN)</b>			<b>275,388</b>	<b>35,375</b>	<b>49,392</b>	<b>431,926</b>	<b>71,771</b>
<b>Percent of Supply</b>			<b>80%</b>	<b>9%</b>	<b>11%</b>	<b>92%</b>	<b>-8%</b>

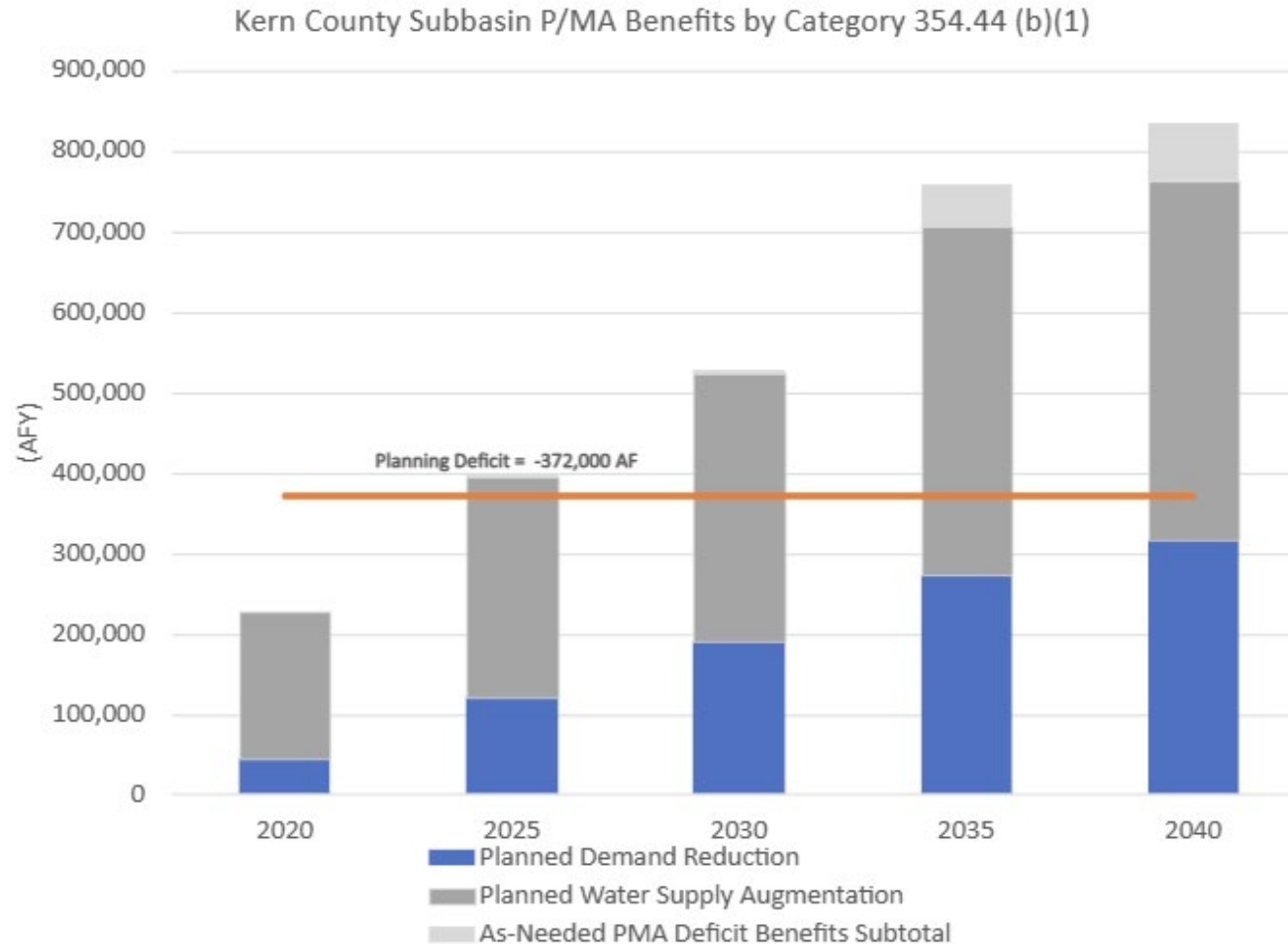


# AMENDED GSP APPROACH: WATER BUDGETS

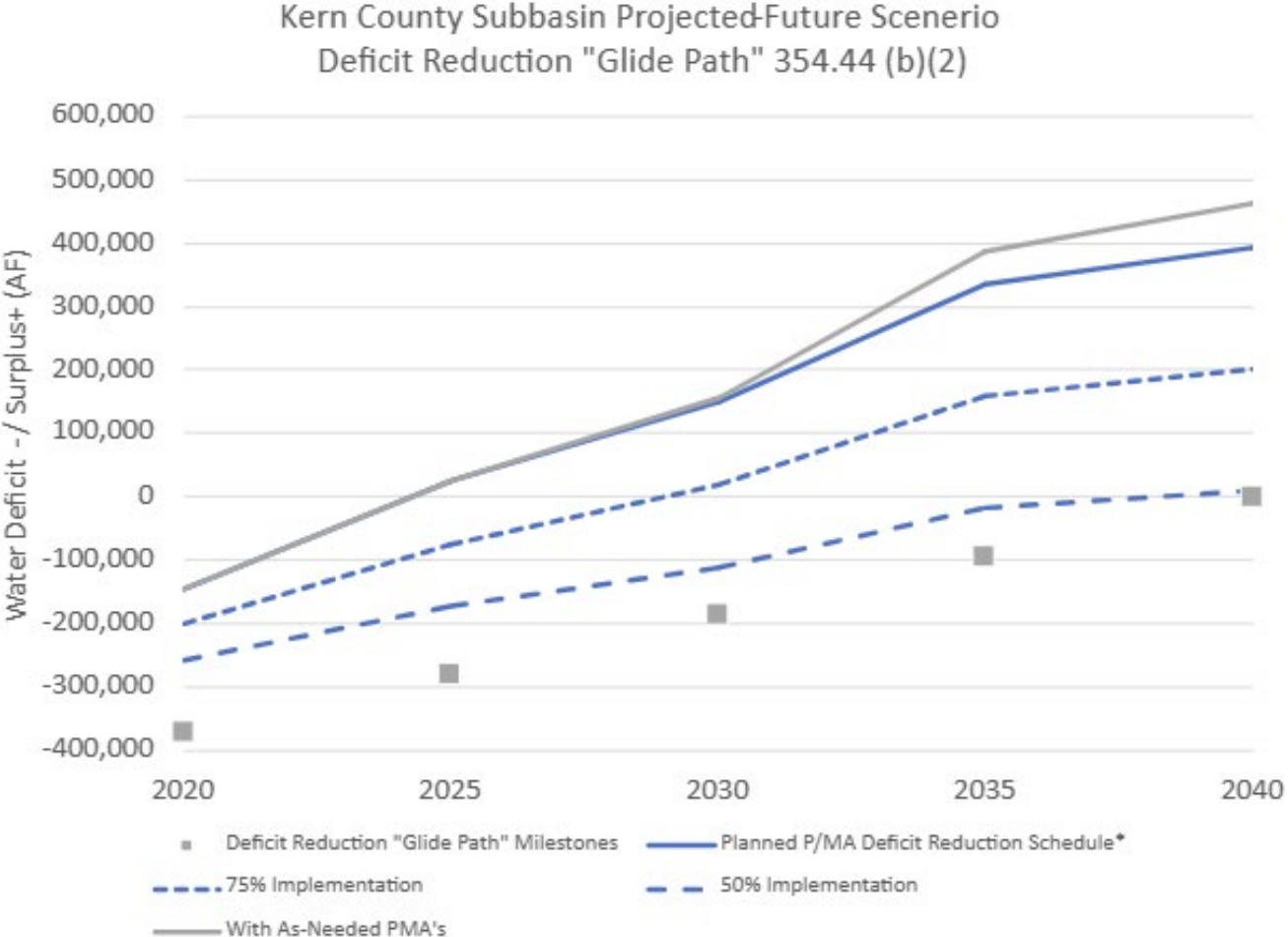
**Table 3. Check Book Summary for Kern Subbasin**

GSA Name	Wt Factor <sup>3</sup>		Deficit Due to Climate Change
	<sup>3</sup> 63%	37%	
<b>DRAFT</b>	<sup>5</sup>		
	Percent of Total Surface Water Supply in Subbasin	Percent of Total Crop ET (Irrigated Agriculture)	
Arvin GSA	8%	9%	12,153
Buena Vista Water Storage District GSA	5%	4%	7,105
Cawelo Water District GSA	3%	5%	4,990
Eastside Water Management Area	0%	0%	160
Henry Miller Water District GSA	1%	1%	1,619
Kern River GSA	17%	13%	21,656
Kern Water Bank Groundwater Sustainability Agency	8%	0%	6,787
Kern-Tulare Water District GSA	1%	1%	1,573
North Kern Water Storage District GSA	9%	8%	12,528
Oloese Water District GSA	0%	0%	59
Pioneer GSA	3%	0%	3,064
Rosedale-Rio Bravo Water Storage District GSA	5%	4%	7,011
Semitropic Water Storage District GSA	9%	18%	16,924
Kern National Wildlife Refuge	1%	1%	1,130
Shafter-Wasco Irrigation District GSA	3%	5%	4,733
7th Standard	0%	1%	606
Southern San Joaquin Municipal Utility District	4%	7%	7,287
Tejon-Castac Water District GSA	0%	0%	1
West Kern Water District GSA	1%	0%	1,257
Westside District Water Authority GSA	16%	13%	20,840
Wheeler Ridge-Maricopa GSA	6%	8%	9,799
Whitelands	0%	1%	447
<b>Subbasin Total</b>	<b>100%</b>	<b>100%</b>	<b>141,731</b>

# AMENDED GSP APPROACH: SUBBASIN PROJECTS AND MANAGEMENT ACTIONS



# AMENDED GSP APPROACH: SUBBASIN PROJECTS AND MANAGEMENT ACTIONS



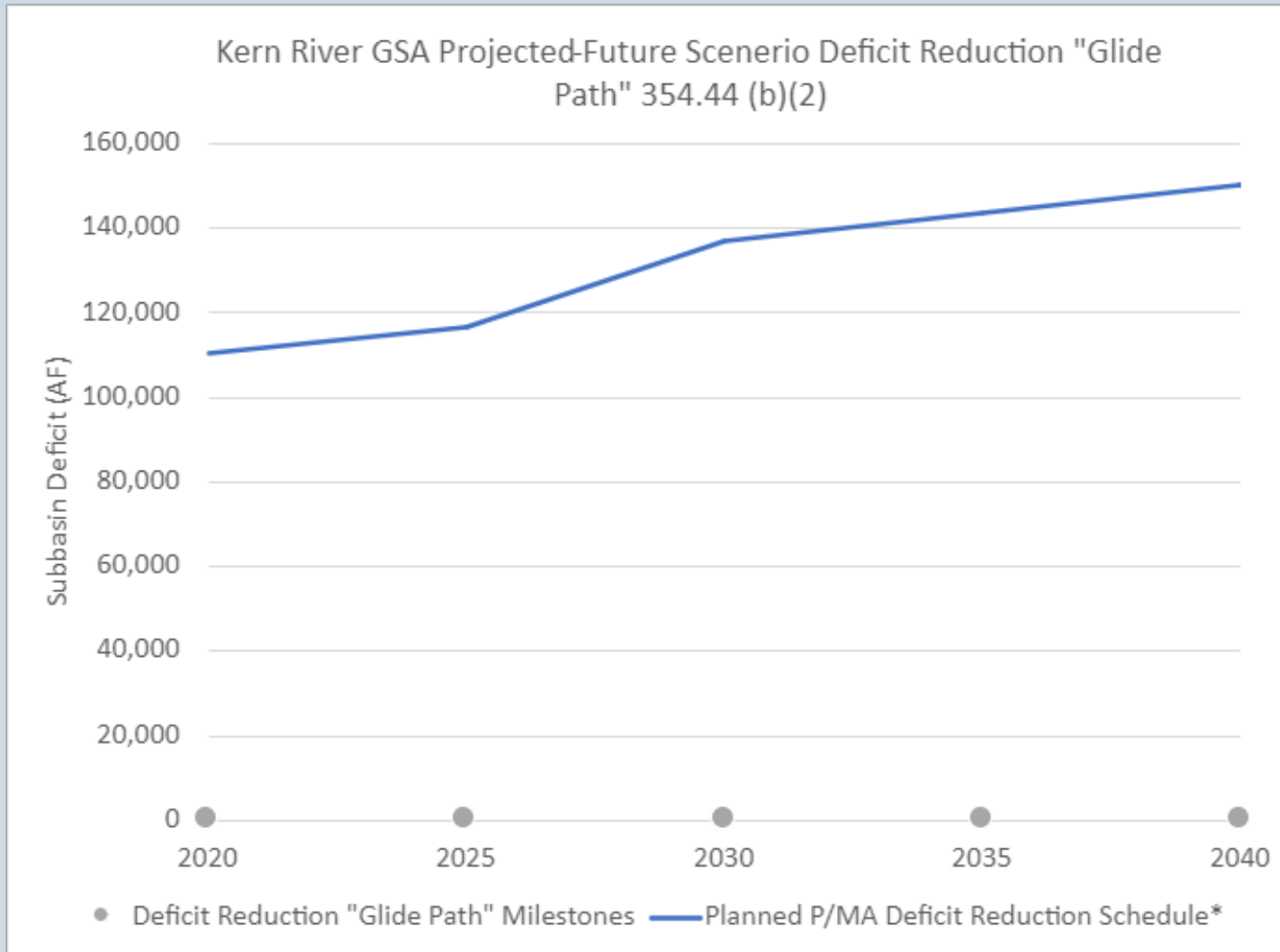
# KRGSA PROJECTS AND MANAGEMENT ACTIONS DETAILS

Project and Management Action Implementation Schedule (AFY)						
Kern River GSA Projected-Future Scenario "Glide Path" 354.44 (b)(2)	Deficit Reduction	2020	2025	2030	2035	2040
		Projected Deficit		0		
Target Deficit Reduction (%)		0	25%	50%	75%	100%
<b>Target Deficit Reduction</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Deficit Reduction "Glide Path" Milestones</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Project and Management Action, by Type (AFY)						
Planned Demand Reduction	Land Retirement					
	Demand Reduction					
	Ag to Urban Conversion	389	6,750	13,500	20,250	27,000
	Water Conservation-Efficiency	21,299	21,299	21,299	21,299	21,299
<b>Subtotal</b>		<b>21,688</b>	<b>28,049</b>	<b>34,799</b>	<b>41,549</b>	<b>48,299</b>
Planned Water Supply Augmentation	Supplemental Water Recharge					
	Supplemental Water Use					
	Third-Party Banking					
	New Local Supply			13,407	13,407	13,407
	Exercise of Rights	88,727	88,727	88,727	88,727	88,727
<b>Subtotal</b>		<b>88,727</b>	<b>88,727</b>	<b>102,134</b>	<b>102,134</b>	<b>102,134</b>
<b>P/MA Implementation Schedule*</b>		<b>110,415</b>	<b>116,776</b>	<b>136,933</b>	<b>143,683</b>	<b>150,433</b>
<i>Total As-Needed P/MA Deficit Benefits</i>		<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
<b>Planned P/MA Deficit Reduction Schedule*</b>		<b>110,415</b>	<b>116,776</b>	<b>136,933</b>	<b>143,683</b>	<b>150,433</b>

\* Implementation Date includes estimated time to start accruing benefits

Target = 0

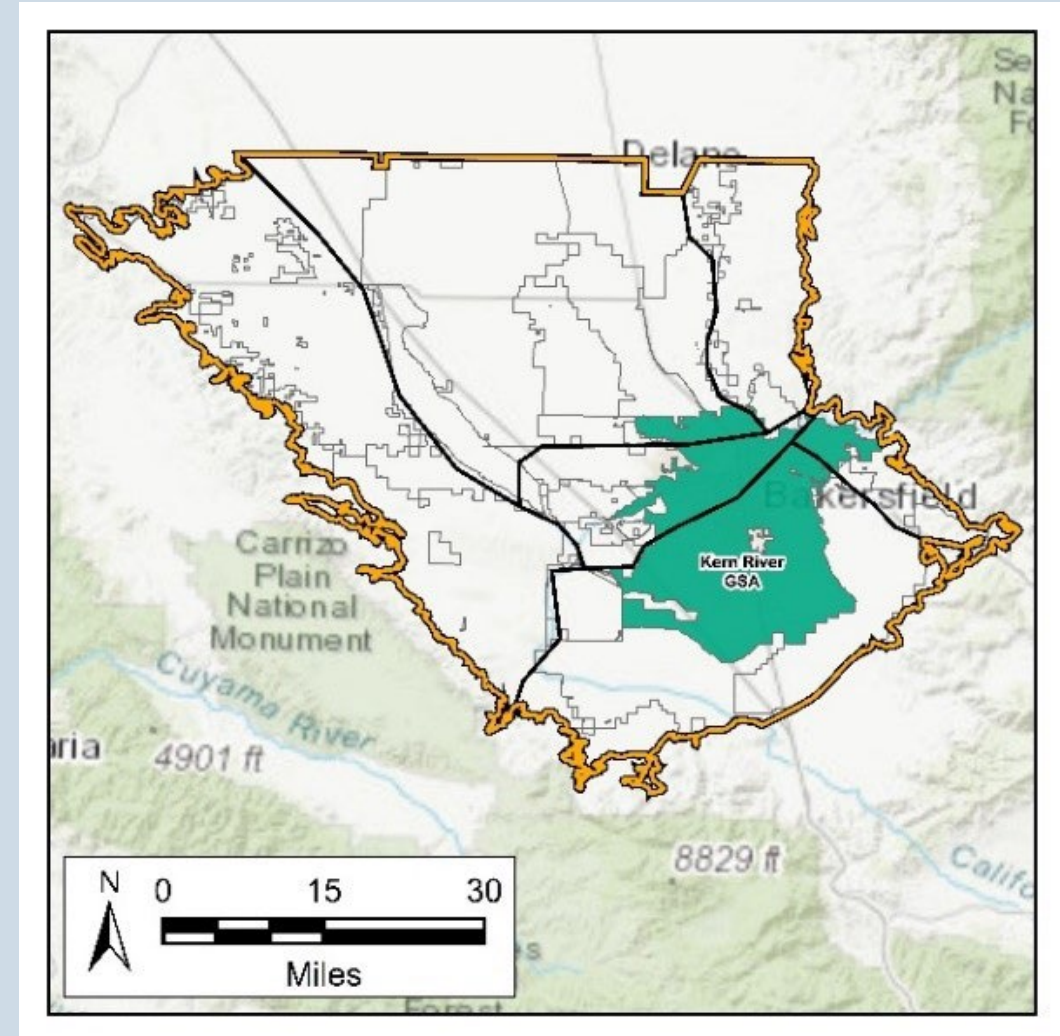
# KRGSA GLIDE SLOPE PROJECTS AND MANAGEMENT ACTIONS DETAILS



# KRGSA

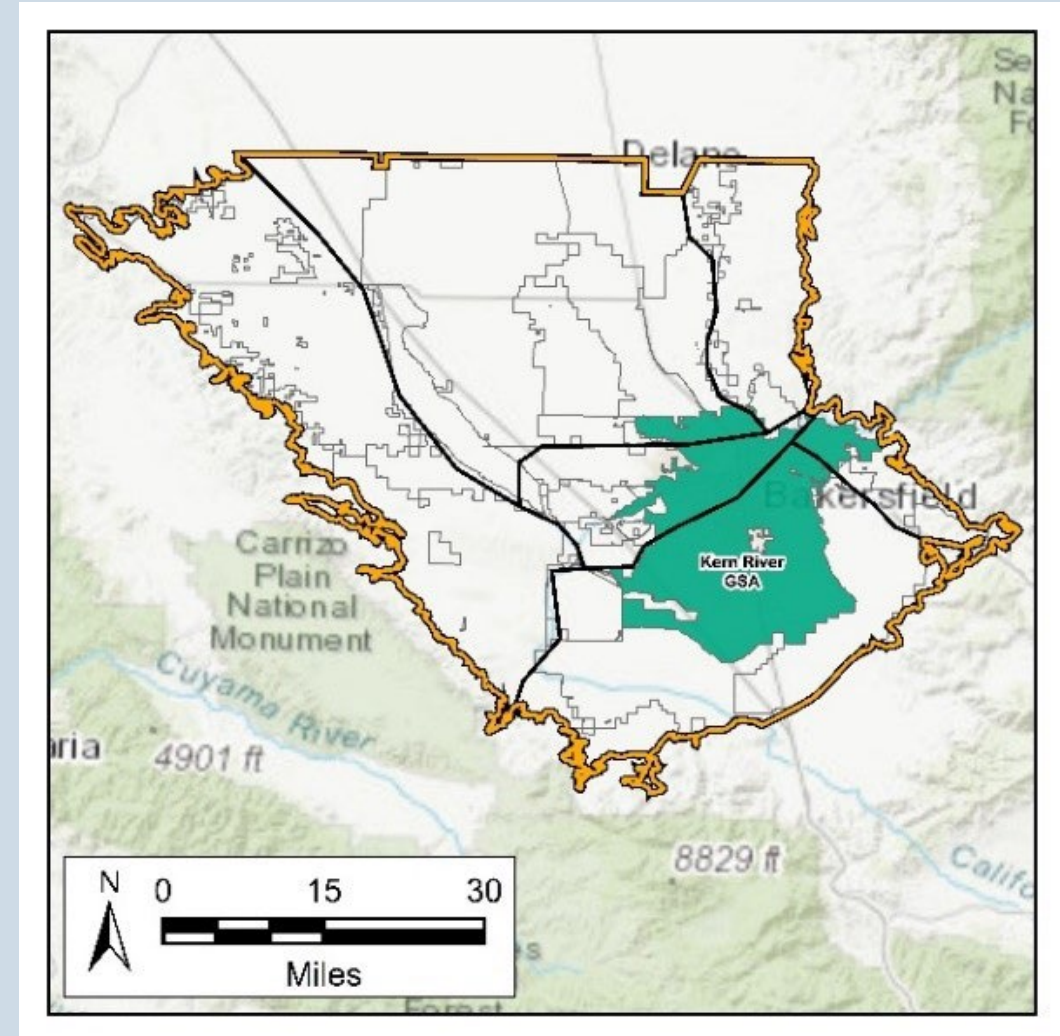
## PROJECT AND MANAGEMENT ACTIONS

- **KRGSA-1 Kern Delta Water District Water Allocation Plan (WAP)**
- **KRGSA-2 Kern River Optimized Conjunctive Use**
- **KRGSA-3 Expand Recycled Water Use**
- **KRGSA-4 Conversion of Agricultural Lands to Urban Use**
- **KRGSA-5 Urban Conservation**
- **Others include water system consolidation, improved monitoring, and community outreach**

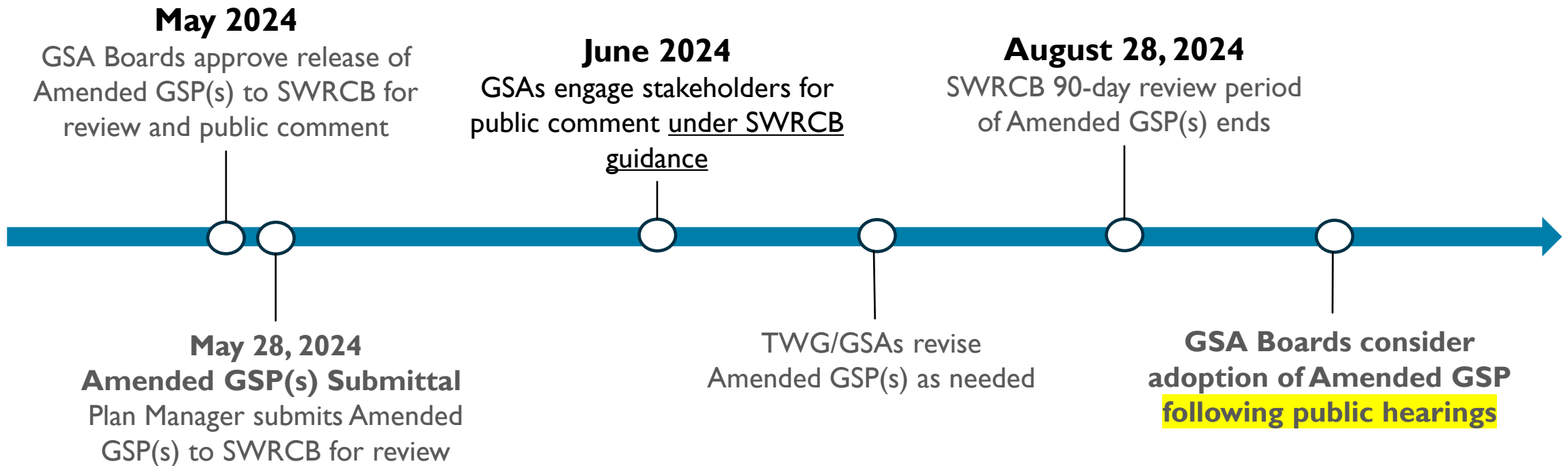


# BASIN WIDE PMAS PLAN IMPLEMENTATION DETAILS

- **KSB-1 - Friant-Kern Canal Capacity Mitigation**
- **KSB-2 - Coordination with Groundwater Regulatory Programs**
- **KSB-3 - SMC Exceedance Policy**
- **KSB-4 - Coordination with Basin Study**
- **KSB-5 - Domestic Well Mitigation**
- **KSB-6 - White Land Demand Management**
- **KSB-7 - Well Registry**
- **KSB-8 - Consumptive-Use Study**



# PROPOSED SCHEDULE LEADING TO GSP(S) ADOPTION





# AMENDED GSP APPROACH

## SUBBASIN NEXT STEPS

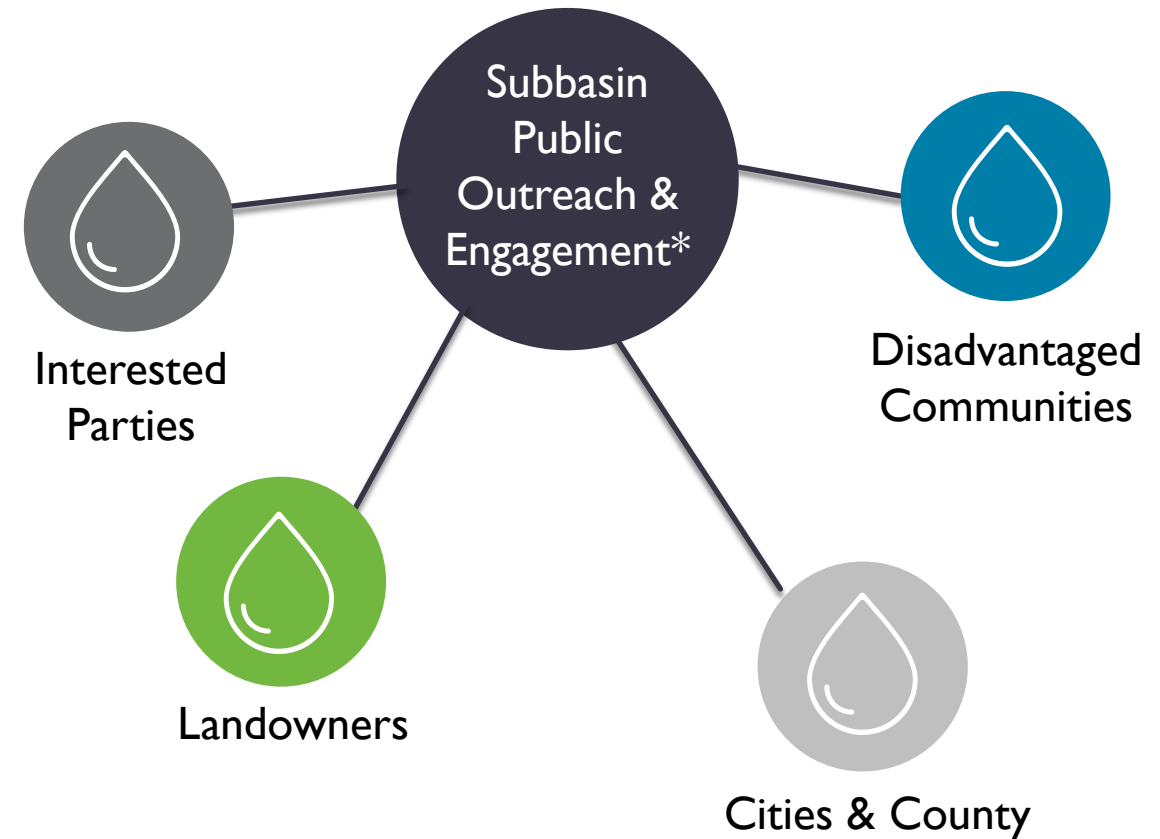
Prior to a scheduled SWRCB Public Hearing:

**Additional SWRCB Meetings**

**Public Outreach & Engagement\***

**Establish Partnerships**

- Kern County Environmental Health
- Self-Help Enterprises
- Kern Water Collaborative
- Friant Water Authority
- Water Association of Kern County
- Municipalities & Purveyors

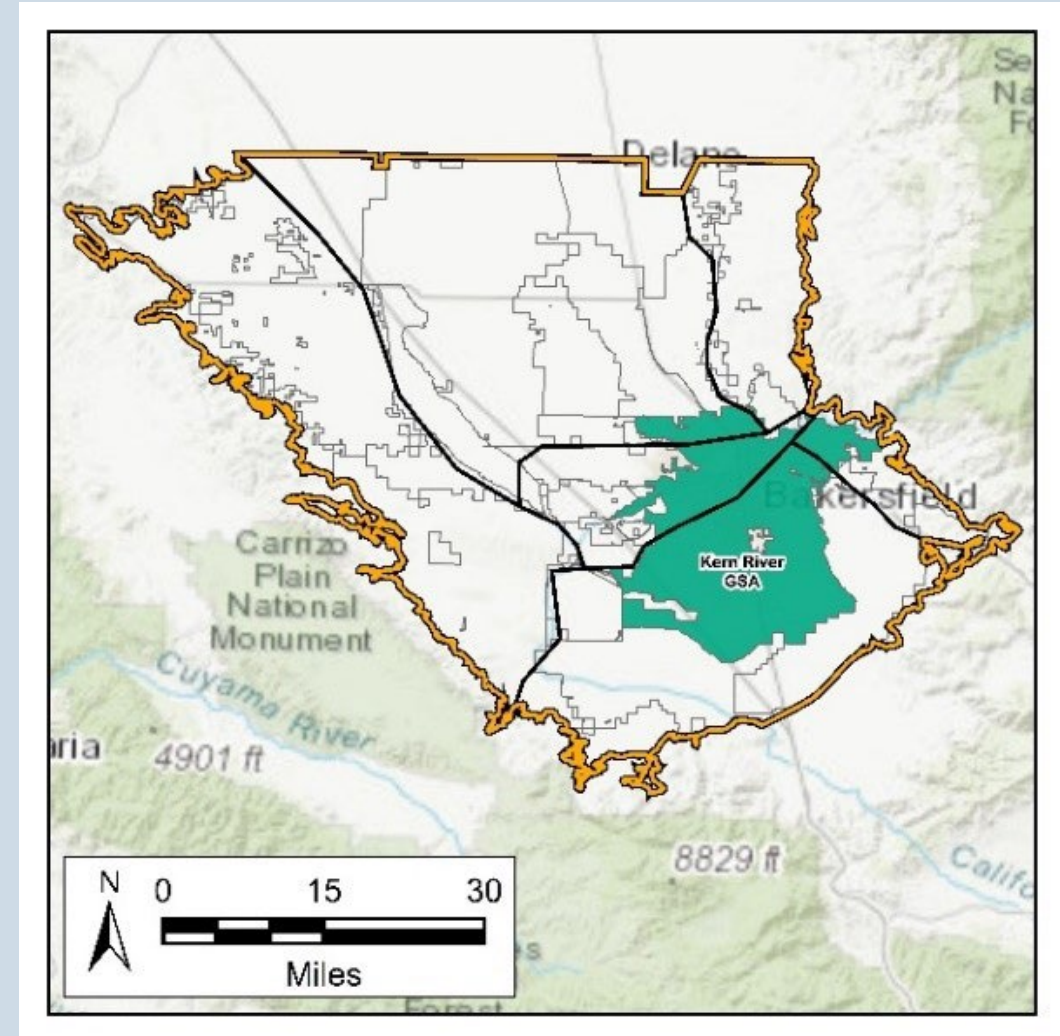


\*SWRCB Guidance

# CLOSING REMARKS

**KRGSA Board support of the Public Draft Amended GSP submittal to SWRCB staff ultimately supports the Kern County Subbasin's commitment to SGMA implementation.**

- Coordinated approach to revised GSPs
- Coordination with State
- Coordination with partners and interested parties



# THANK YOU