Eastern San Joaquin Subbasin

Groundwater Sustainability Workgroup

EASTERN SAN JOAQUIN
GROUNDWATER AUTHORITY

Agenda

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- Meeting Objectives
- Interconnected Surface Water
- Sustainability Indicators (Seawater Intrusion, Storage, Subsidence)
- Monitoring Network
- Announcements

Meeting Objectives

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1. Review and discuss the interconnected surface water sustainability indicator
   - Discussion: Identification of current or historical undesirable results
2. Review approach for establishing sustainable management criteria
   - Presentation and Discussion: Walk through Minimum Thresholds and Measurable Objectives for a subset of sustainability indicators
3. Understand prosed monitoring network
   - Presentation and Discussion: Understand and review the proposed monitoring network

Interconnected Surface Water

Undesirable Results for Depletion of Interconnected Surface Water

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Why is this a concern? What are we trying to avoid?

- Ability to meet minimum flow requirements
- Recreation impacts
- Fisheries impacts/temperature
- Habitat impacts
- GDEs
- Impacts to water supply for reservoirs
- Water rights issues
- Water quality issues

Minimum Threshold Development for Depletion of Interconnected Surface Water

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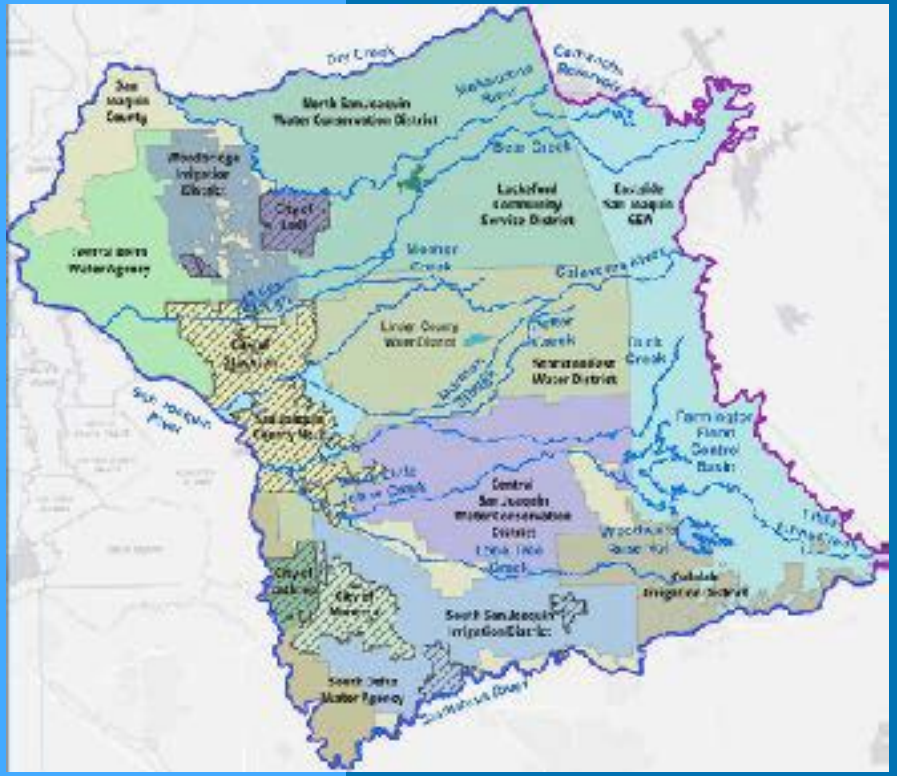

Major river systems in the Subbasin are highly managed.

Instream flow requirements, water quality standards, and water rights govern upstream releases.

DWR Guidance

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Considerations when establishing minimum thresholds for depletions of interconnected surface water may include, but are not limited to:

- What are the historical rates of stream depletion for different water year types?
- What is the uncertainty in streamflow depletion estimates from analytical and numerical tools?
- What is the proximity of pumping to streams?
- Where are groundwater dependent ecosystems in the basin?
- What are the agricultural and municipal surface water needs in the basin?
- What are the applicable State or federally mandated flow requirements?

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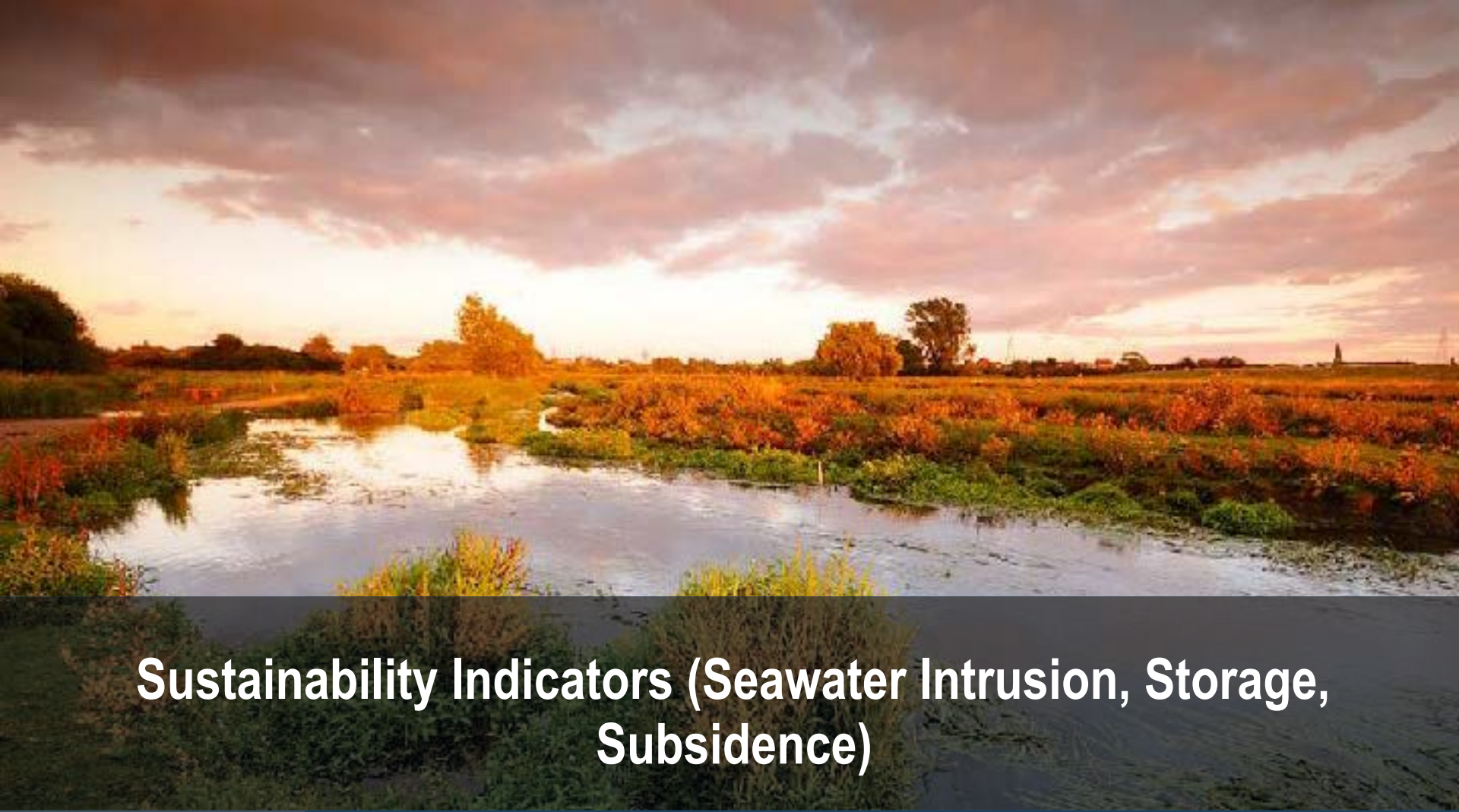
Discussion: **Have current or historical undesirable results been observed in the basin for depletion of interconnected surface water?**



Sustainability Indicators (Seawater Intrusion, Storage, Subsidence)

Review – Let's Talk Terminology

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Why are terms important?

- Established by regulation
- Used by regulators during GSP review
- Consistency of terms assists SGMA discussion

Important to understand the relationship between:

- Sustainability Indicators
- Sustainable Management Criteria (Built off Each Sustainability Indicator)
  - Sustainability Goal
  - Undesirable Results
  - Minimum Thresholds
  - Measurable Objectives
    a. Interim Milestones
    b. Margin of Operational Flexibility
- Monitoring Network

Reaching Sustainability by 2040

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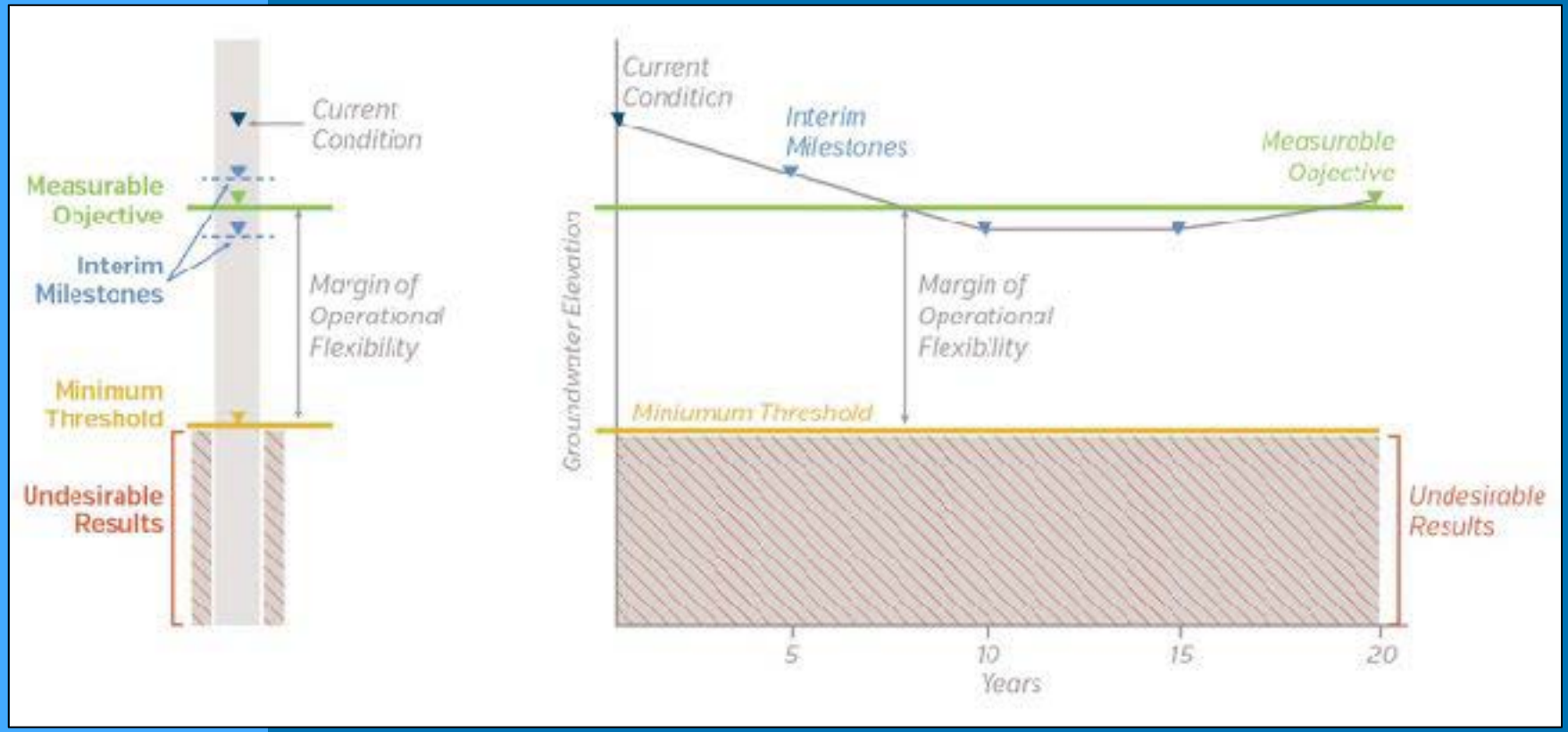

Reminder: Consequence of Violating Minimum Thresholds

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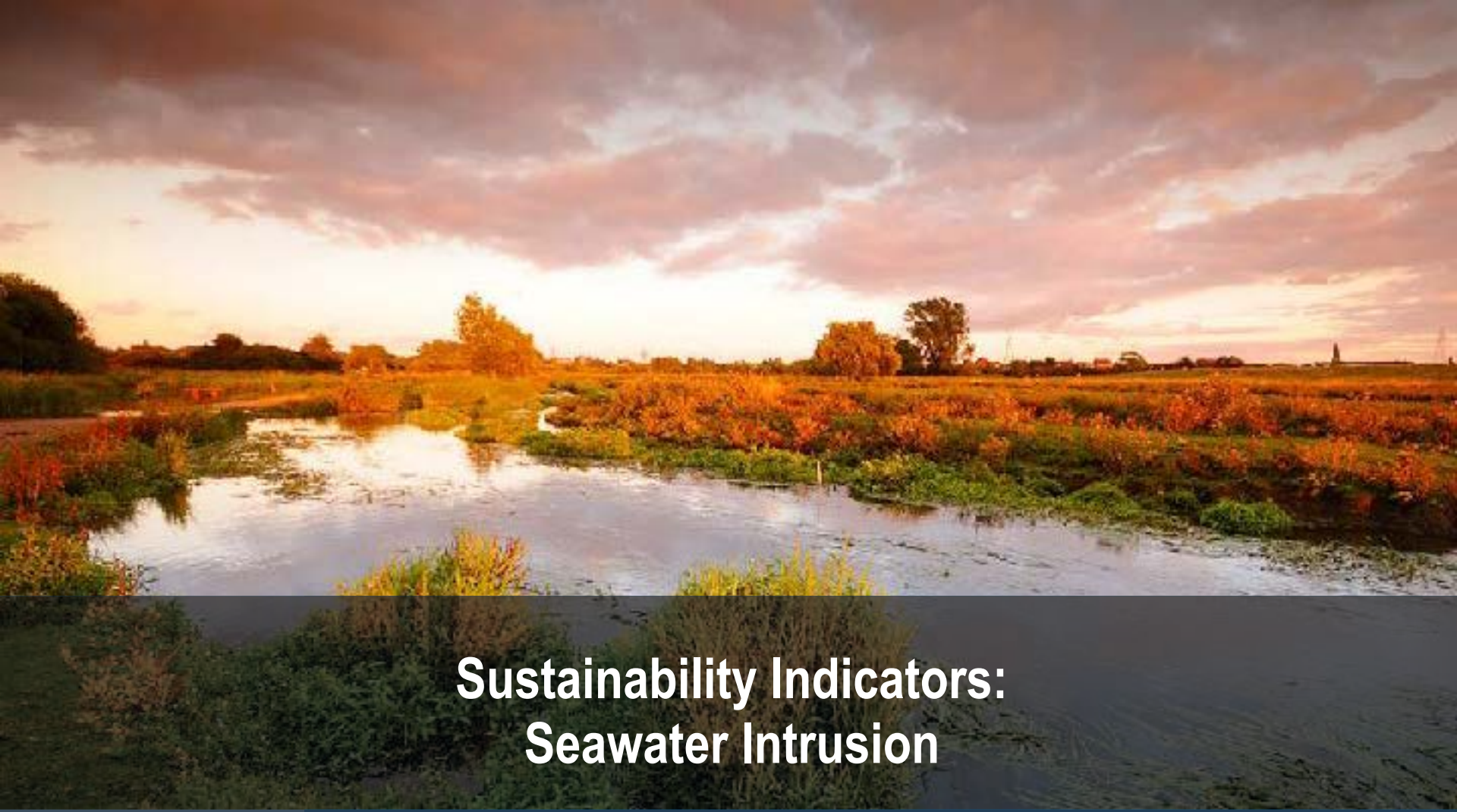
Undesirables results are defined by minimum thresholds, and the State Board can intervene if minimum thresholds are violated for any of the sustainability indicators.



Sustainability Indicators: Seawater Intrusion

Seawater Intrusion: Current Conditions

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- Recent USGS study (O'Leary, Izbicki, and Metzger, 2015) looked at sources of high-chloride waters throughout the ESJ Subbasin to characterize source.
- Assessing high-chloride water sources involved determining water type from major-ions, and evaluating stable isotope concentrations. The ratio of chloride to iodide is also used to differentiate high-chloride water sources besides seawater.
- Within the Subbasin, the research shows that there are three primary sources of salinity:

1. San Joaquin Delta Sediments
2. Deep Deposits
3. Irrigation Return Water

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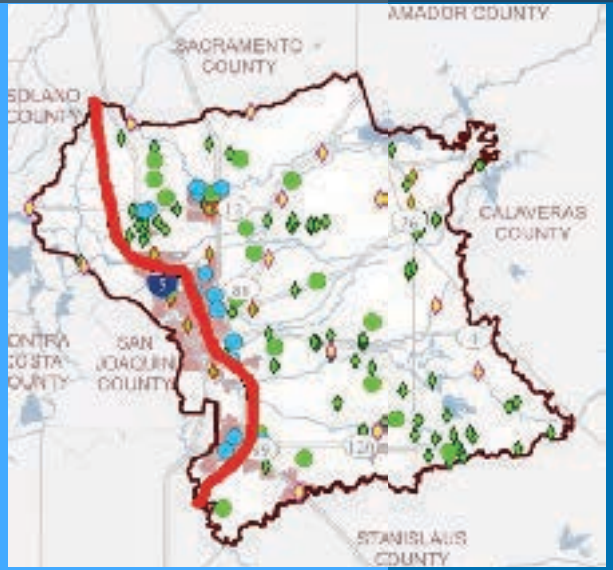
Seawater Intrusion: Developing an Isocontour Line



- The proposed contour would be between the westernmost monitoring points and the next most-westerly points, to serve as a sentinels.
- Alternately, it could be placed along I-5 for simplicity.

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Advisory Committee Recommendation – Seawater Intrusion

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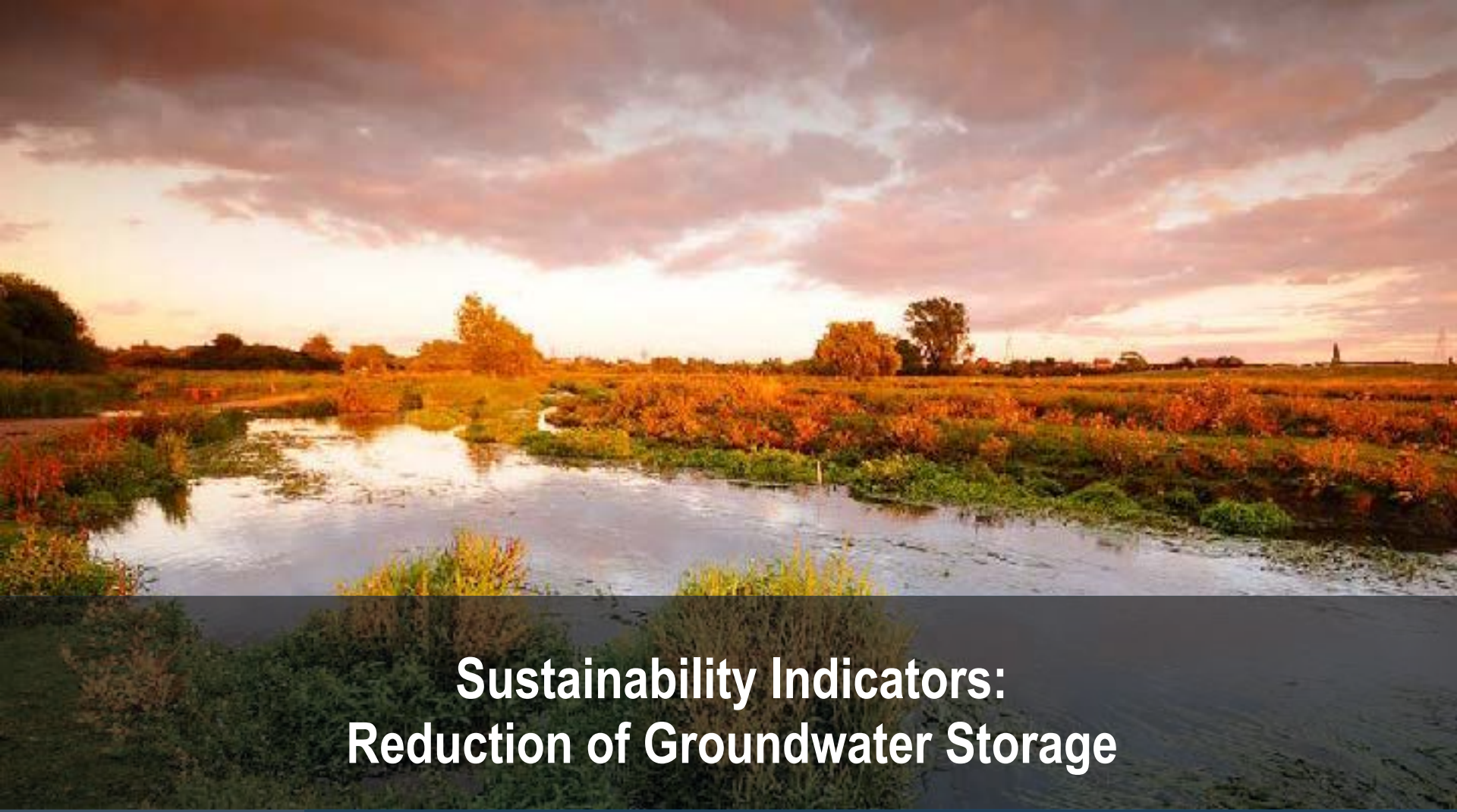
Policy decision will go to the Board in May.

Sustainable Management Criteria Summary – Seawater Intrusion	
Criteria	**Narrative Description**
Proposed Minimum Threshold	2,000 mg/L chloride isocontour line
Proposed Measurable Objective	The current condition (2015-2018 average)
Proposed Interim Milestone	5-year milestones along a linear trend between current condition and the measurable objective
Definition of Violation	Undesirable results are considered to occur during GSP implementation when 2,000 mg/L chloride reaches an established isocontour line and where these concentrations are caused by intrusion of a seawater source. The proposed contour would be between the westernmost monitoring points and the next most-westerly points, to serve as a sentinels. Alternately, it could be placed along I-5 for simplicity.
Trigger and Action Plan	Put action plan in place at to trigger additional monitoring and analysis to confirm seawater source at lower concentrations (proposed at 1,000 mg/L chloride)



Sustainability Indicators: Reduction of Groundwater Storage

Historical Modeled Change in Groundwater Storage

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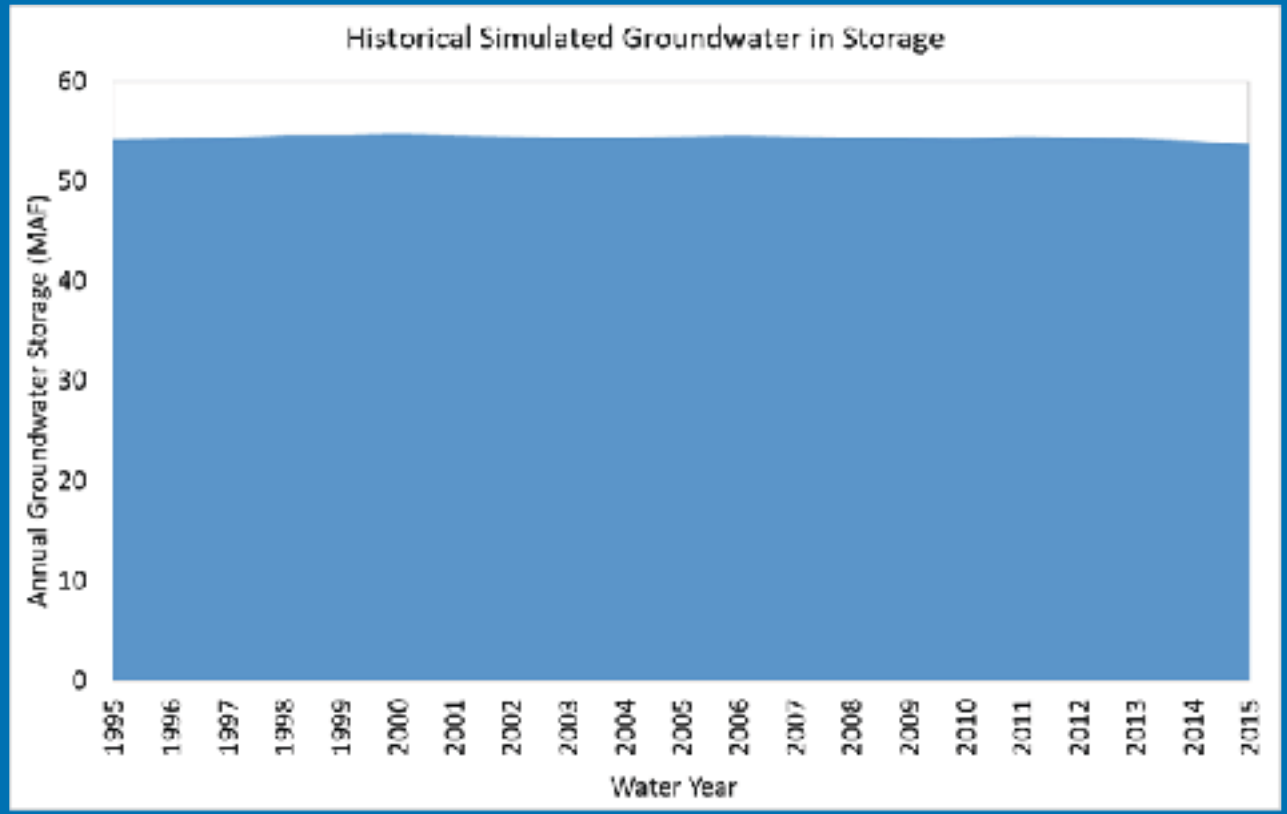
- 53.0 Million AF freshwater in storage (2015)
- Cumulative change of -0.05 MAF per year (-.09%)



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Using GW Elevations as Proxy

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GSP regulations allow GSAs to use groundwater level can be used as a proxy metric for any sustainability indicator, provided the GSP demonstrates that there is a significant correlation between groundwater levels and the other metrics. One possible approach for this is:

1) Demonstrate that the minimum thresholds and measurable objectives for chronic declines of groundwater levels are sufficiently protective to ensure significant and unreasonable occurrences of other sustainability indicators will be prevented. In other words, demonstrate that setting a groundwater level minimum threshold satisfies the minimum threshold requirements for not only chronic lowering of groundwater levels but other sustainability indicators at a given site.

2) Identify representative groundwater elevation monitoring sites where minimum thresholds and measurable objectives based on groundwater levels are developed for a specific sustainability indicator. In other words, the use of a groundwater level minimum threshold is not intended to satisfy the minimum threshold requirements for chronic lowering of groundwater but is intended solely for establishing a threshold for another sustainability indicator.

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Two Approaches

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Approach 1 – Using Groundwater Levels as a Proxy
Use groundwater levels as a proxy (with justification that the groundwater levels minimum thresholds will be protective)

Approach 2 – Establish a threshold for groundwater storage based on the general zone of GW management

Set a threshold at a point at which undesirable results would occur based on volume at which groundwater is being accessed

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Approach 1: Using GW levels as Proxy

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- Sustainability in the ESJ Subbasin related to groundwater volume is driven by the groundwater level indicator, which relates to the ability of infrastructure to economically access groundwater and the sustainability of groundwater dependent ecosystems, to the extent connected to the aquifer accessed for water supplies.
- Groundwater elevation levels will be protective of significant and unreasonable depletion of groundwater storage.

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Approach 2: Setting a Threshold at Zone of Groundwater Management

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There is a greater understanding of the top management area of the aquifer with regard to water quality and other parameters. Uncertainty increases with depth, and having storage drop below that point is considered undesirable.

Groundwater is currently pumped from Layers 1 and 2 of the model

- Total volume at which groundwater is pumped: **24.3 MAF**

53.0 MAF Total Storage – 24.3 MAF in the general zone of GW Management

= 28.7 MAF as Proposed Threshold (Round to 30 MAF)

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Advisory Committee Recommendation: Reduction in Groundwater Storage

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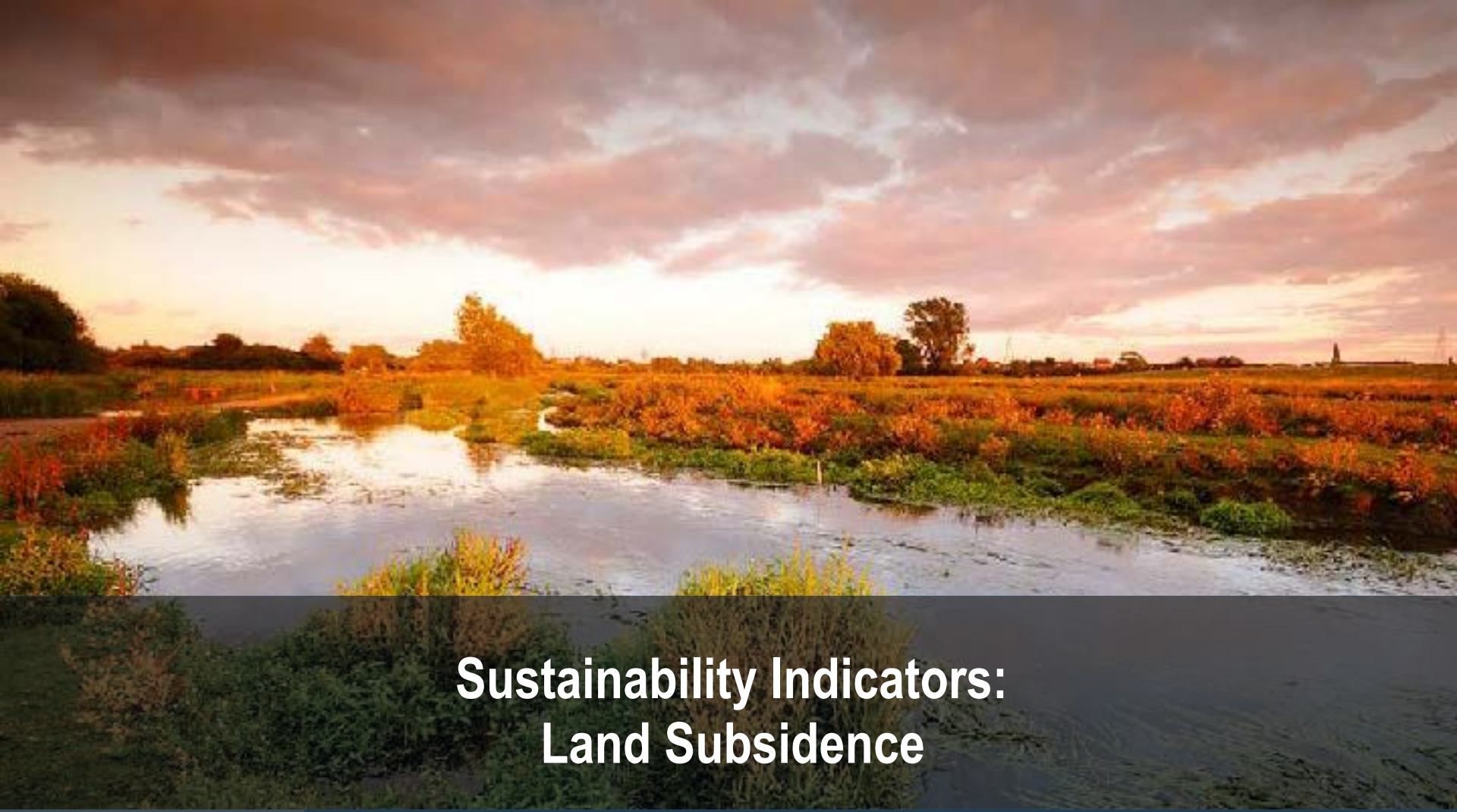
Policy decision will go to the Board in May.

Sustainable Management Criteria Summary – Reduction in Groundwater Storage		
Criteria	Narrative Description – Approach 1 (GW Levels as Proxy)	Narrative Description – Approach 2 (Establish New Threshold)
Proposed Minimum Threshold	Consistent with groundwater levels minimum thresholds	30 MAF
Proposed Measurable Objective	Consistent with groundwater levels measurable objectives	Historical drought low (1992 or 2015-16)
Proposed Interim Milestone	Consistent with groundwater levels interim milestones	To be developed
Proposed Definition of Violation	Consistent with groundwater levels definition of violation	Undesirable results are considered to occur when the 5-year average estimated storage for the Sustainable Simulation exceed the minimum threshold



Sustainability Indicators: Land Subsidence

Subsidence has not been Observed Historically in the Subbasin

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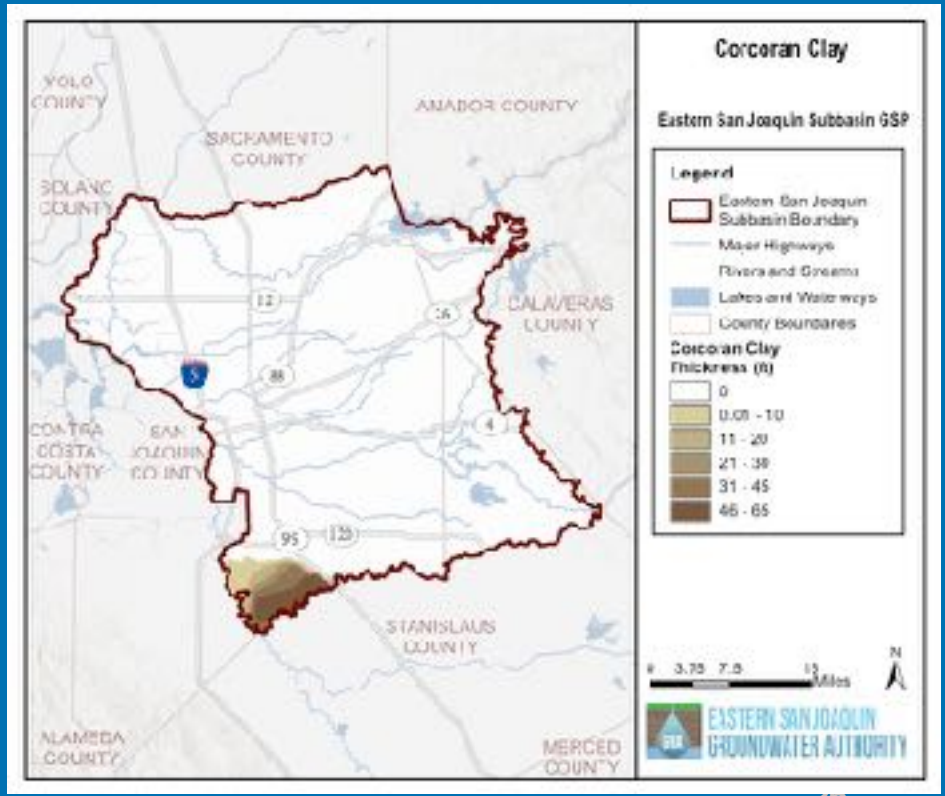
Monitoring Stations (USGS)



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Using GW Levels as a Proxy

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- The use of groundwater levels as a proxy metric for this sustainability indicator is justified by the significant correlation between groundwater levels and land subsidence and is necessary given the lack of extensive monitoring for land subsidence.

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Justification for Using Levels as a Proxy

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- Land subsidence requires two conditions – dewatering of subsurface materials and that those dewatered subsurface materials be compressible.
- Historical declines in groundwater levels are not known to result in subsidence.
- If the basin were to operate within the margin of operational flexibility proposed for GW levels, future dewatering would take place in similar geologic units to those currently dewatered.
- It is therefore anticipated that additional declines in groundwater levels are unlikely to cause subsidence, as dewatered materials are expected to behave consistently with historical dewatering, which resulted in no known subsidence. Thus, the groundwater level minimum thresholds are protective against additional subsidence.

B-B' Cross-Section

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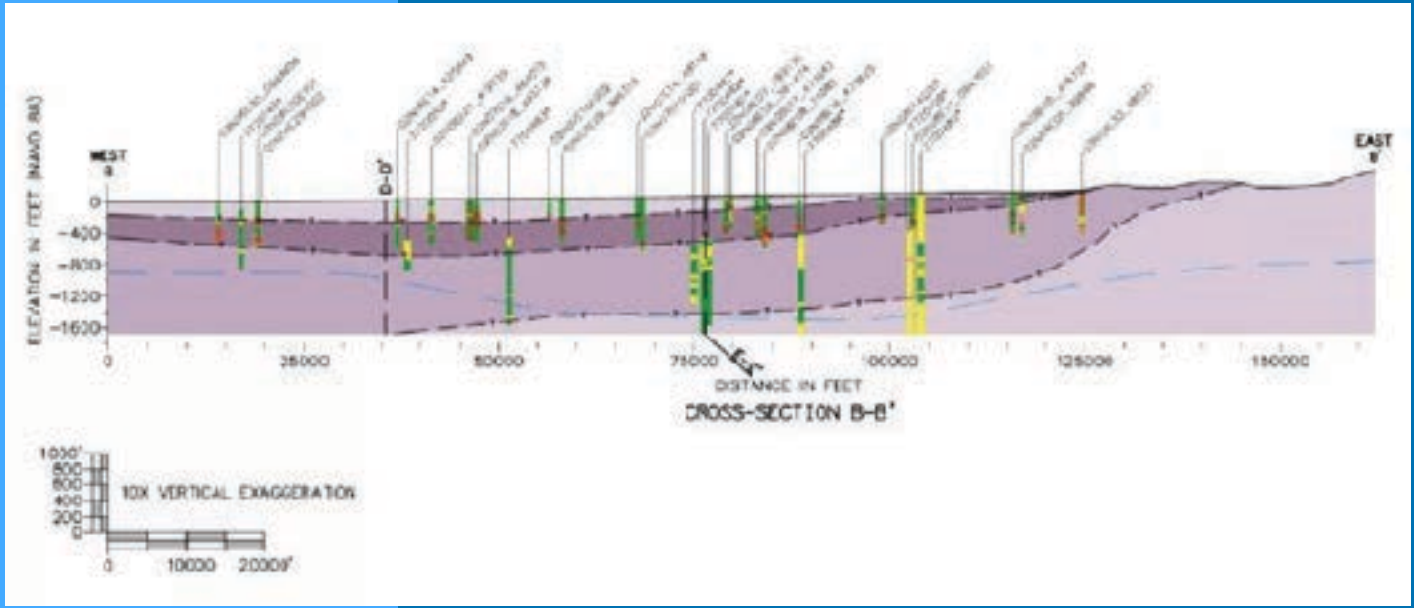

Pumping is primarily from within the Modesto/ Riverbank Formation both under current conditions and at the MT condition for GW levels.

Legend

- Eastern San Joaquin Subbasin Boundary

Formations

- Modesto/Riverbank
- Turlock Lake/Laguna
- Mehrten
- Valley Springs/Ione
- Bedrock
- Base of Fresh Water
- Screens
- Cross-Section Intercepts
- Inferred Formation Contacts

Well Strata

- Clays and Silts
- Sands and Gravels
- Sedimentary Rock
- Igneous/Metamorphic Rocks
- Other

Oil and Gas Wells are Indicated by

Advisory Committee Recommendation – Land Subsidence

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Policy decision will go to the Board in May.

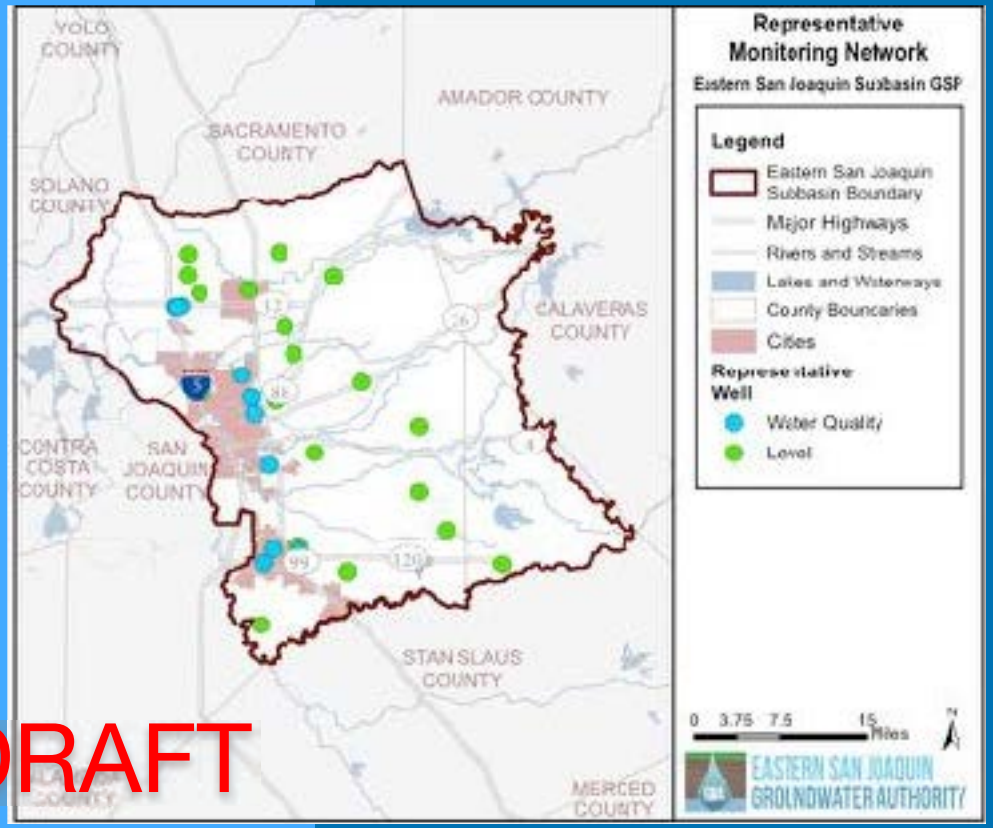
Sustainable Management Criteria Summary – Land Subsidence	
Criteria	Narrative Description
Minimum Threshold	Consistent with groundwater levels minimum thresholds
Measurable Objective	Consistent with groundwater levels measurable objectives
Interim Milestone	Consistent with groundwater levels interim milestones
Definition of Violation	Consistent with groundwater levels definition of violation

Monitoring Network

Monitoring Network

- Is used to monitor for conditions that would cause undesirable results
- Must address the six sustainability indicators
- Adequate spatial and temporal coverage for each primary aquifer
- Need minimum thresholds and measurable objectives for each “representative” monitoring point, but there can be a broader network without thresholds assigned

Representative Monitoring Network Wells



Includes:

Dedicated Threshold Wells for GW Levels (19)
Dedicated Threshold Wells for GW Quality (10)

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Broad Monitoring Network

- Representative monitoring and additional broader network

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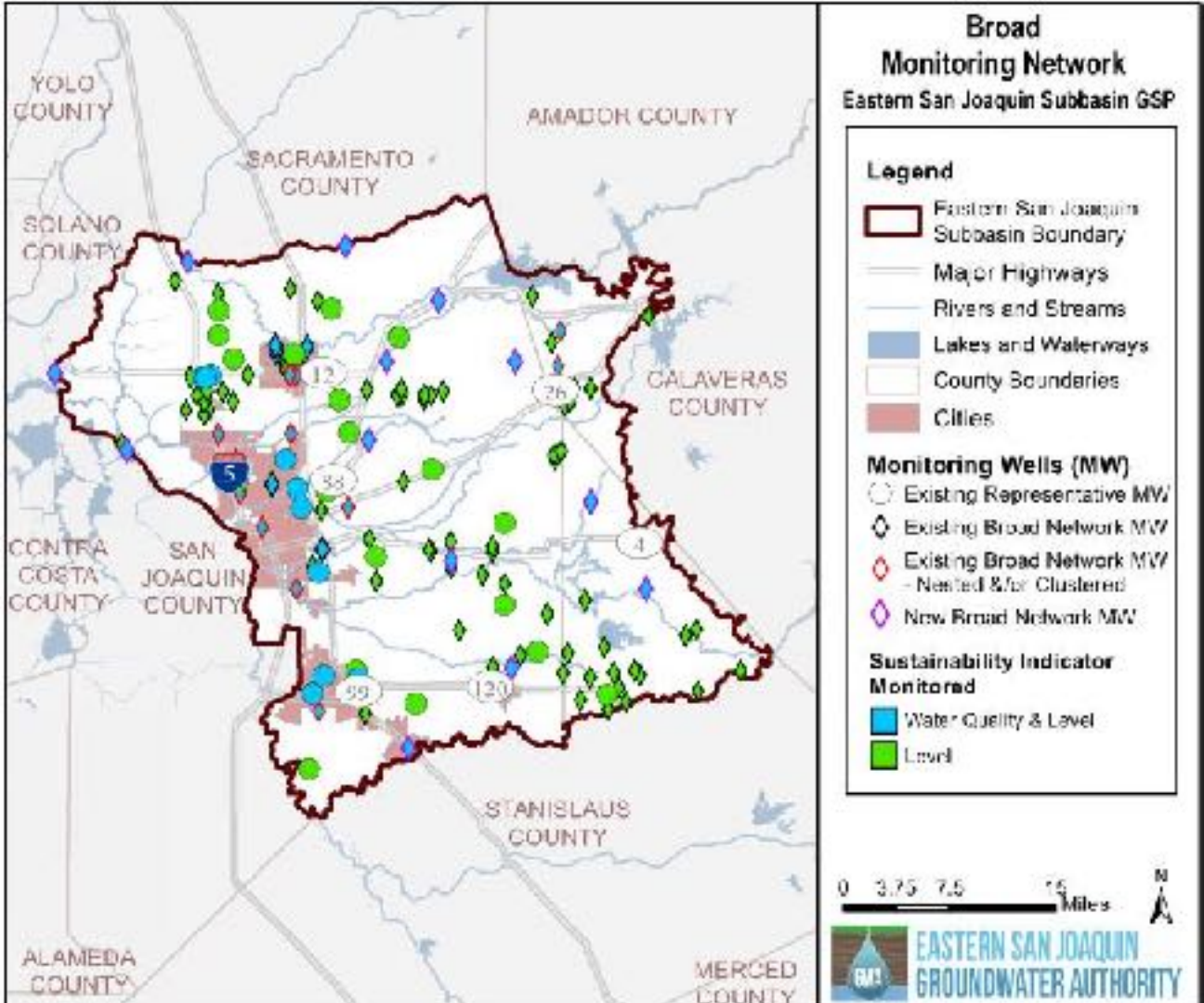

Monitoring Network Summary

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Well Type	#	Monitoring Network	Constituent Monitored		Proposed Frequency
			Elevation	Water Quality	
Dedicated level Threshold	19	Representative Monitoring	X		Quarterly
Dedicated Groundwater Quality Threshold	10	Representative Monitoring	X	X	Quarterly
CASGEM Wells (Official)	76	Broad	X		Semi-Annually
Nested &/or Clustered Wells	21	Broad	X	X	Semi-Annually
TSS Wells + 10 New Wells (Planned)	13	Broad	X	X	Semi-Annually
Additional local wells in water quality network	5	Broad	X	X	Semi-Annually

Announcements

Chapter Deliverable Release

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- The Administrative Information and HCM chapters will be posted to the website on May 1, in advance of the May Board meeting.

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