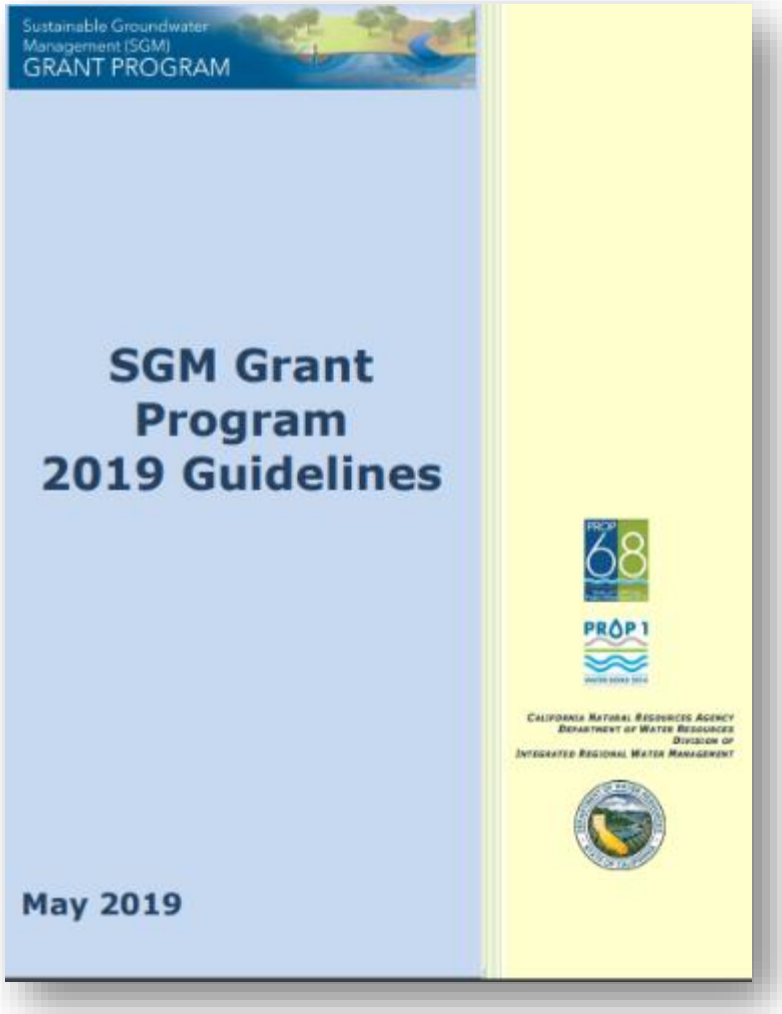
INTRODUCTION TO PROPOSITION 68

- Proposition 68 will provide $46.25 million for planning grant awards to assist GSP development
- Up to $1 million Round 3 funds available for Cosumnes Subbasin:
  - Maximum of $2 million minus the $1 million Prop 1 Grant already awarded
  - Requires 25% cost sharing match



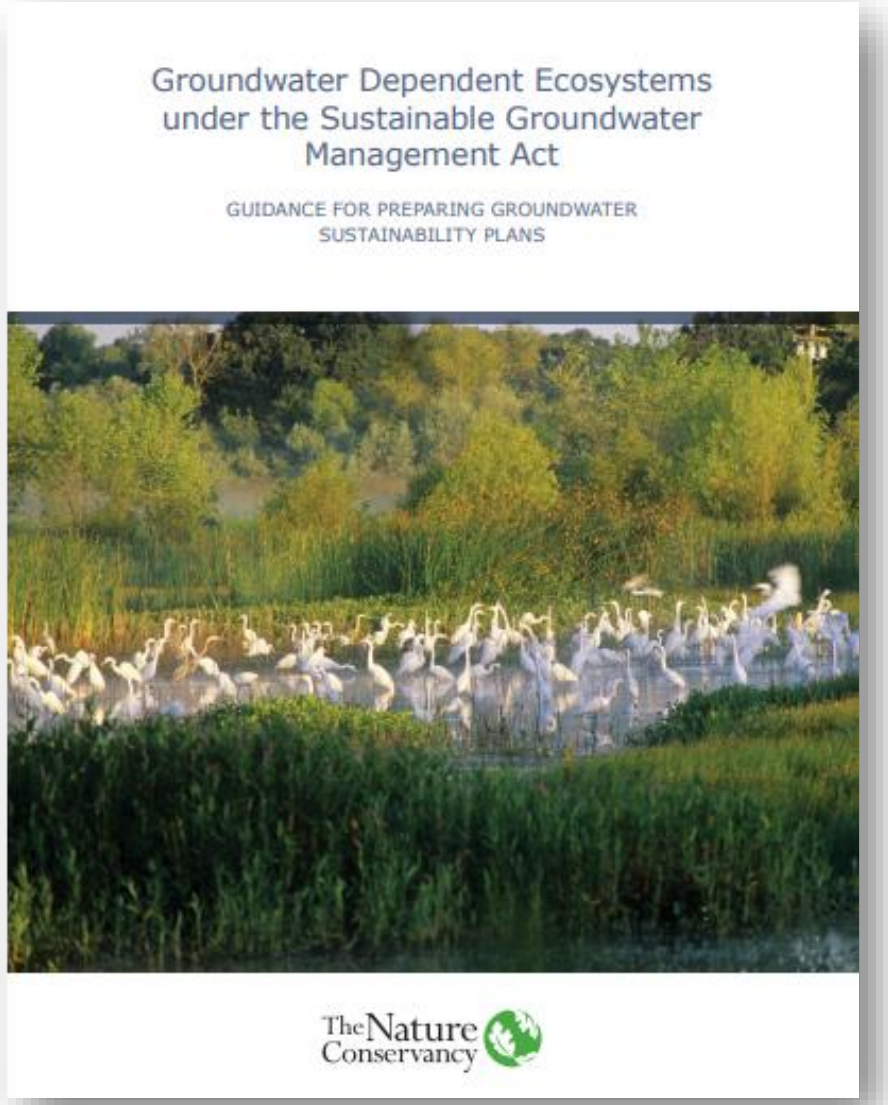
SURFACE WATER IN THE COSUMNES SUBBASIN

- The Cosumnes River is highly visible to stakeholders located within and outside the Cosumnes Subbasin
  - Only river on the western slopes of the Sierra Nevada not regulated by a dam.
  - Chinook Salmon and Steelhead fisheries.
  - Supports natural growth of riparian and floodplain vegetation.
- Surface water can be a key component of the GSP.
  - High run-off events represent opportunity to increase recharge and groundwater storage.
  - Existing infrastructure could transport water from outside subbasin (Folsom South Canal).

Picture from: USGS 11335000 Cosumnes R A Michigan Bar CA site.
https://waterdata.usgs.gov/nwisweb/local/state/ca/text/11335000_1.jpg

SURFACE WATER IN THE COSUMNES SUBBASIN

- Current GSP scope anticipated a preliminary assessment of:
  - Groundwater dependent ecosystems (GDEs)
  - Surface water / groundwater interaction
  - Potential projects related to groundwater augmentation
  - Identification of substantial data gaps.
- Pre-dated GDE Guidance & DWR review of Alternatives

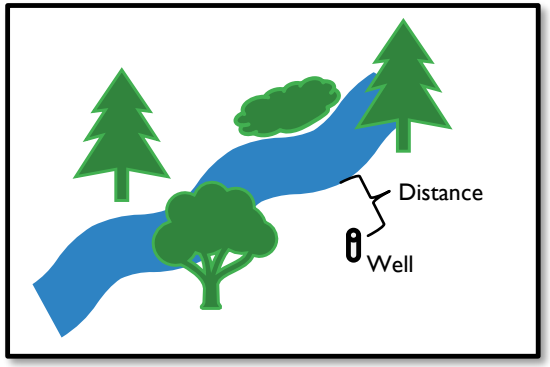


INTERCONNECTED SW/GW WILL BE HIGHLY SCRUTINIZED

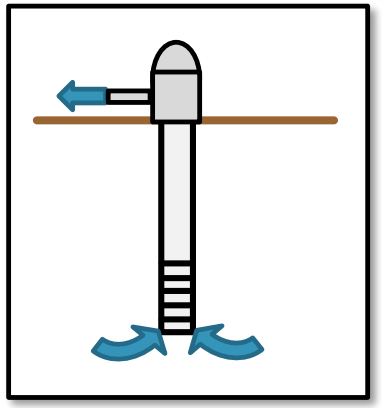
- DWR did not approve the South American Alternative (July 17, 2019).
- Central to the outcome was a lack of information to determine the relationship between subbasin yield and surface water depletion.
- DWR requested evidence for the following.
  - *The negotiated sustainable yield **avoids surface water depletions** that have unreasonable adverse impacts on beneficial uses of the surface waters.*
  - *Operating to the sustainable yield will **avoid surface water depletions** that have unreasonable adverse impacts on beneficial uses of the surface waters.*
  - *That the selected management criteria **avoid depletions to surface waters** that have significant and unreasonable adverse impacts.*
  - *That **losses of river water** to groundwater were monitored.*

FACTORS INFLUENCING SURFACE WATER DEPLETIONS

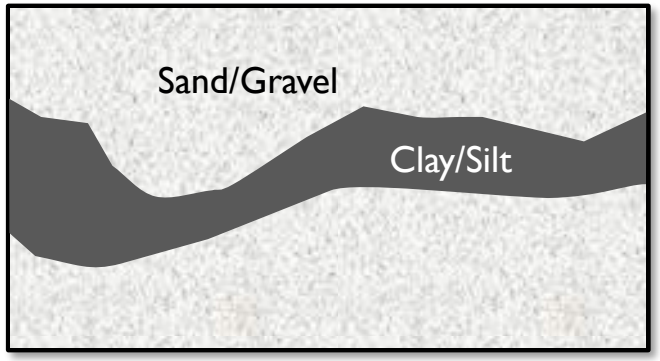
- Well location (geometry).



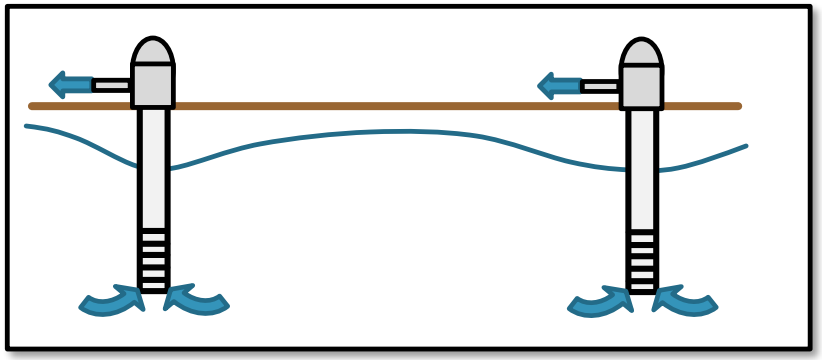
- Well extraction rate (past and current).



- Water storage and transmitting properties.



- Cumulative effects from multiple wells.

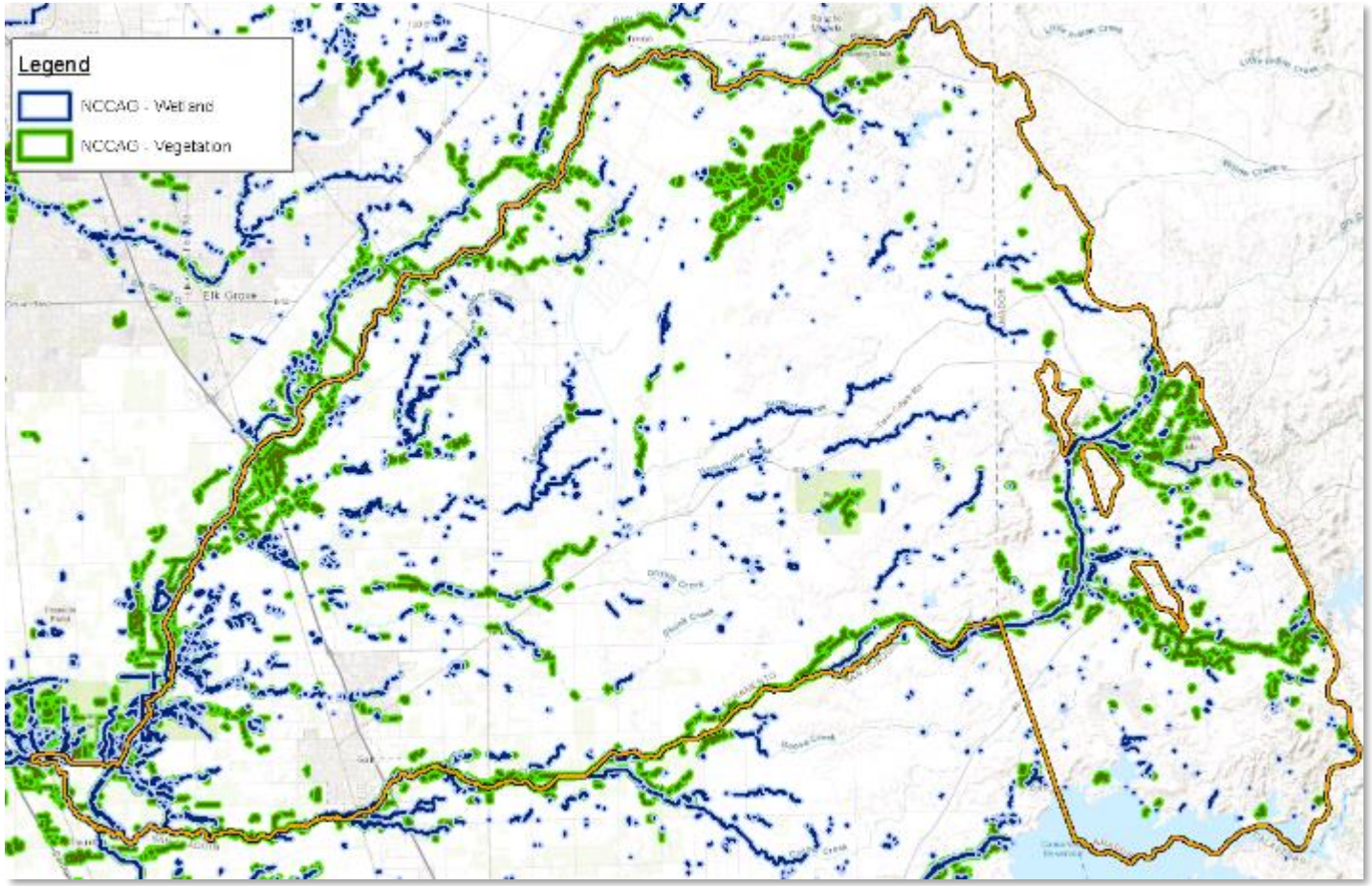


PROP 68 FUNDS COULD SUPPORT PROACTIVE FILLING OF INTERCONNECTED SW/GW DATA GAPS

1. Field verified distribution and composition of GDEs.
2. Mapped areal and depth distribution of water transmitting and storage properties.
3. Measured relationships between well extractions/recharge, water table changes, and groundwater storage changes.
4. Reliable data on groundwater extractions (metered values).
5. Mapped distribution of recharge sources (Cosumnes River, Local Rainfall and Runoff, Groundwater Return Flows).
6. Improve tools (models) to more precisely project water table and surface water changes in response to climate, land and water use, and recharge/pumping conditions.

1. GDEs IDENTIFICATION AND VERIFICATION

- Field Verification
  - Map areas of ecological interest
  - Determine shallow groundwater areas
  - Identify GW monitoring needs
- Improve HCM and GWC reliability
- Support sustainability criteria development
- Surface Water Work Group
  - GSAs, EDF, TNC, etc.
  - Prioritize focus species for management

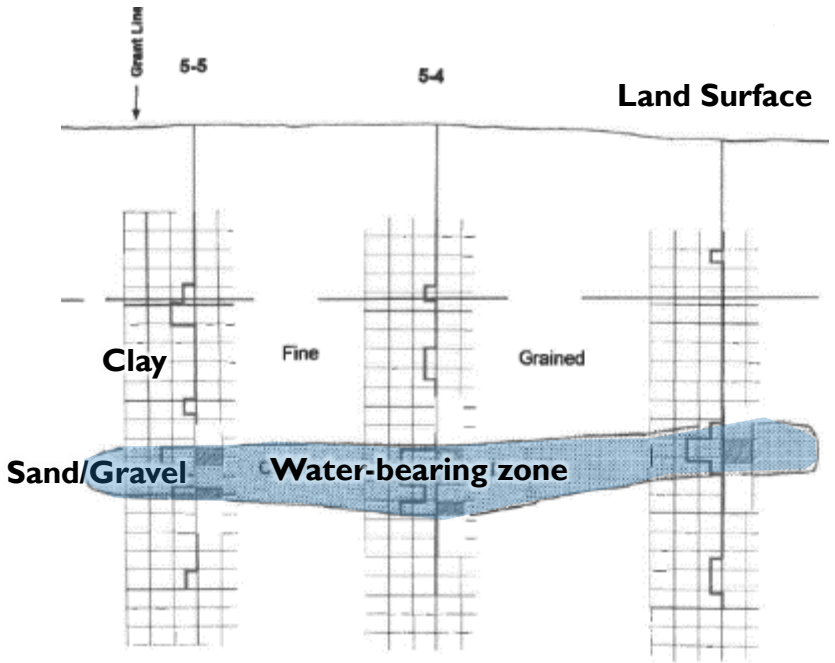


Natural Communities Commonly Associated with Groundwater (NCCAG)

2. GEOPHYSICAL STUDIES (1 OF 3)

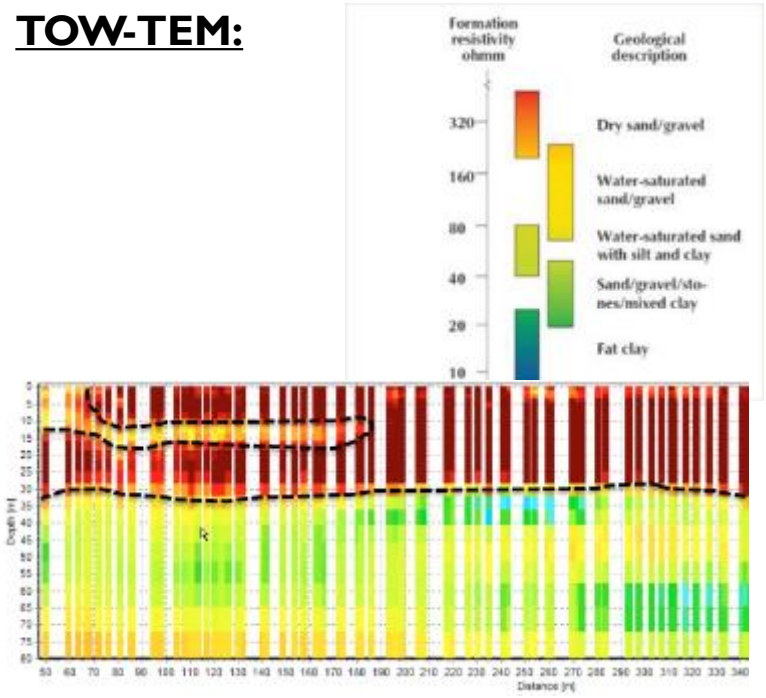
- Characterize areal and depth distribution of water-bearing and non-water bearing zones near and below water table.
- Improve HCM and capability to quantify hydraulic connection between surface water and groundwater.
- Inform selection of new well sites.
- Inform selection of possible recharge sites.

Electrotelluric Surveys:



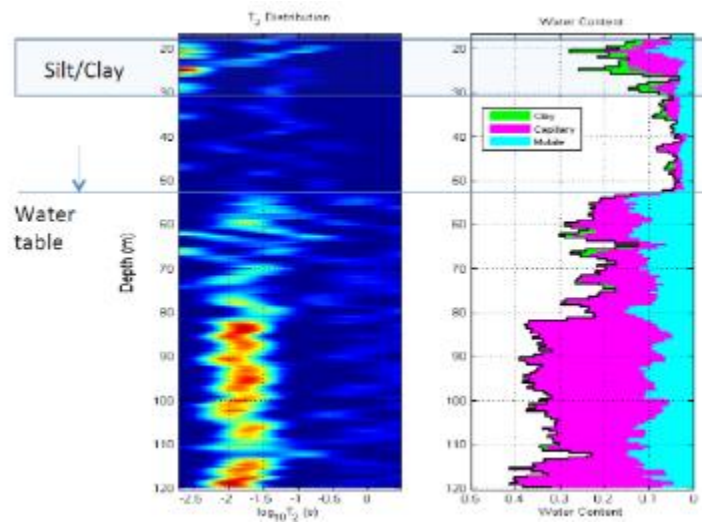
Wire JC, Geoconsultants, Inc., 2019, Geophysical Workshop for Cosumnes Groundwater Subbasin Electrotelluric Surveys for Hydrogeologic Studies

TOW-TEM:



Gailey RM, Behroozmand Aa, 2019 Potential Application of Geophysical Surveys in the Cosumnes Groundwater Sub-Basin

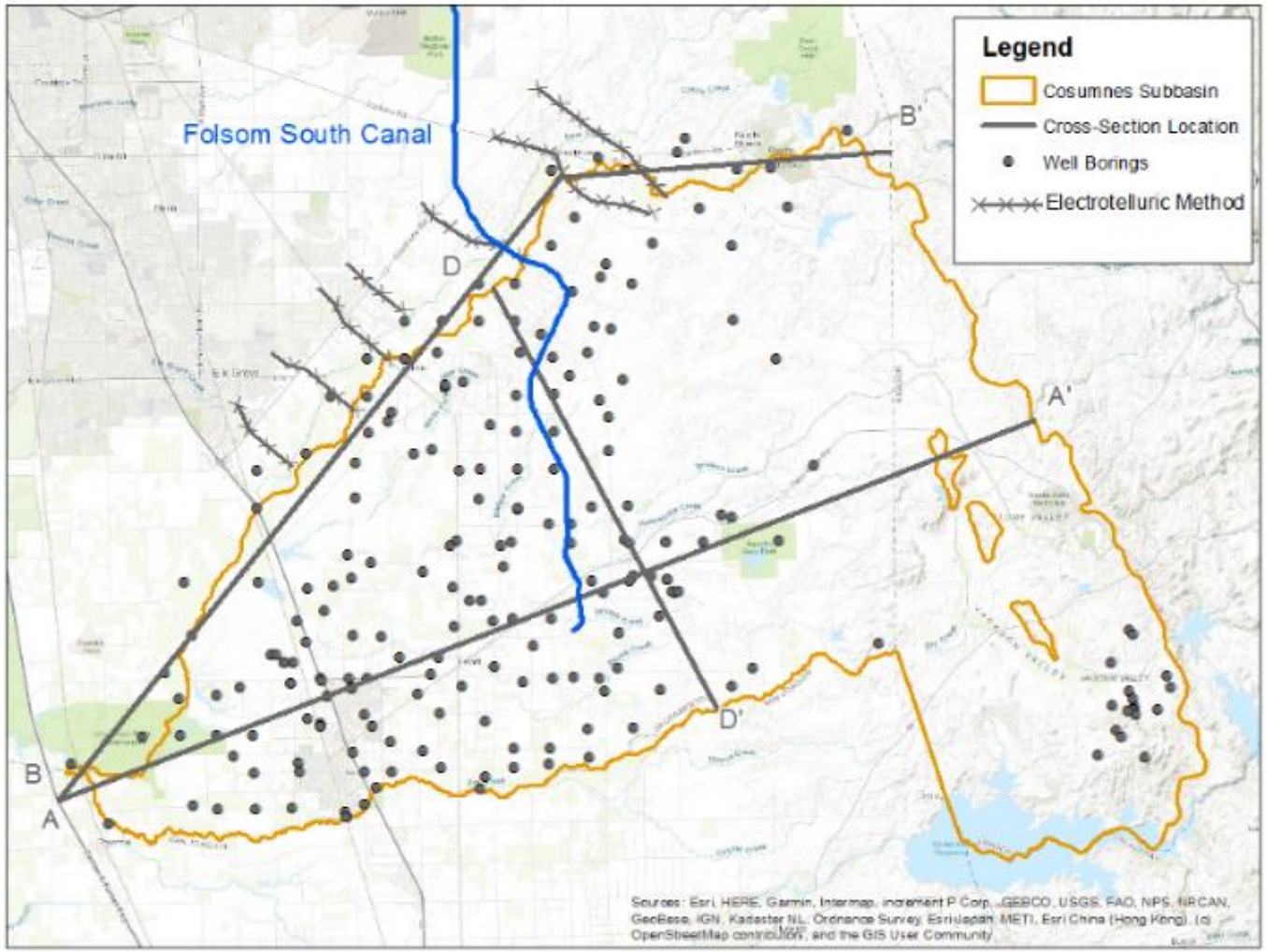
NMR:



Walsh D, 2016, NMR Geophysics for Groundwater Investigations

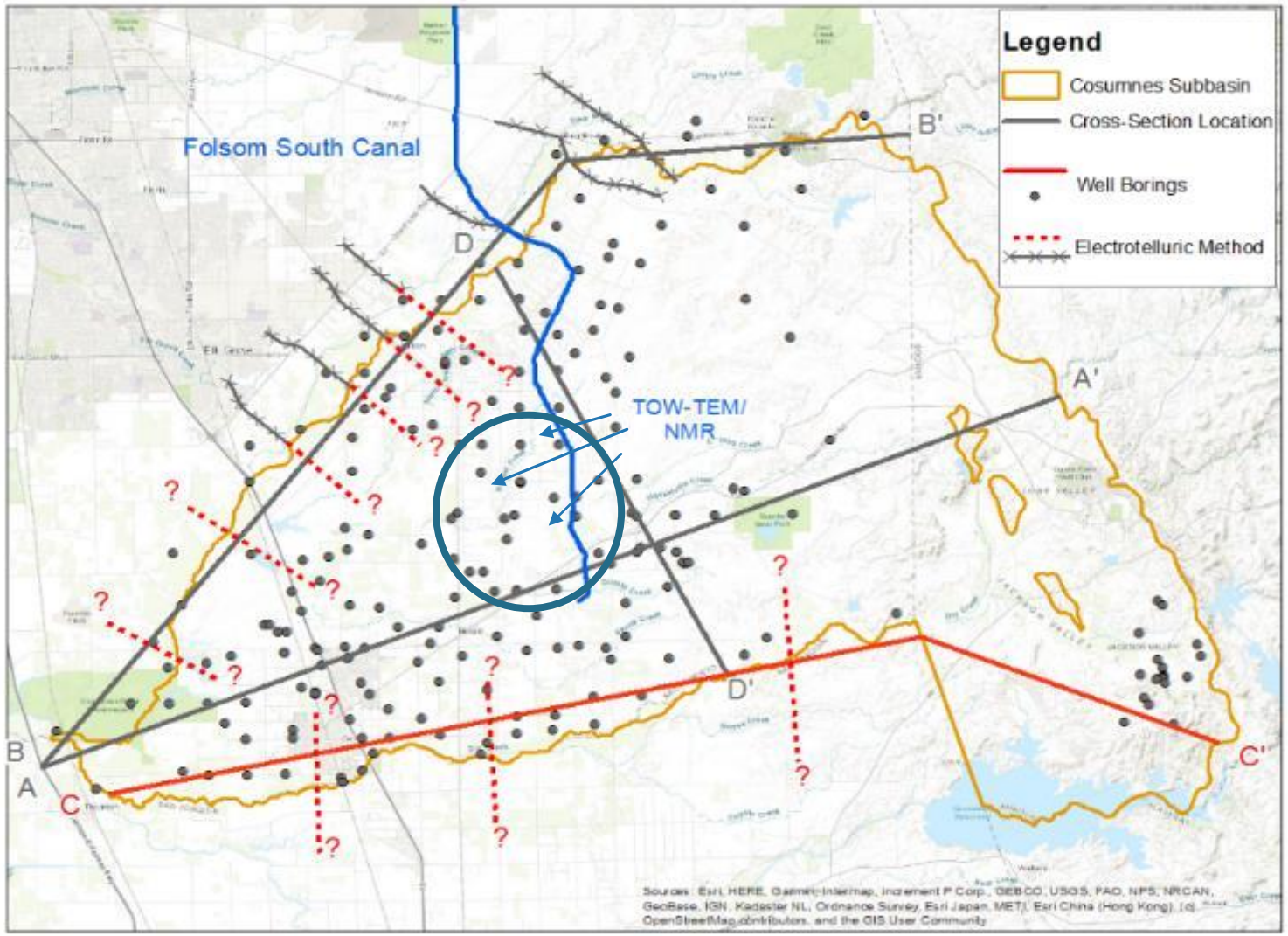
2. GEOPHYSICAL STUDIES (2 OF 3)

- Existing data:
  - Borehole information in DMS.
  - Previous geophysical surveys.



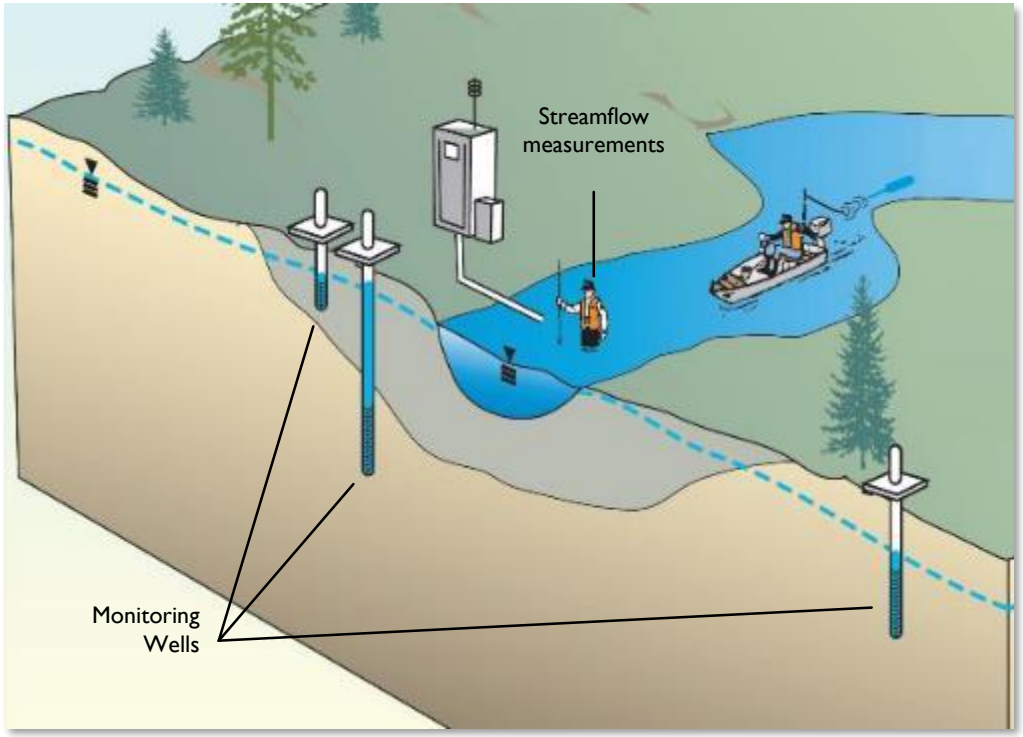
2. GEOPHYSICAL STUDIES (3 OF 3)

- Construct new and/or extended sections using:
  - Borehole data.
  - Geophysical data.
- Site characterization based on geophysical data.



3. INSTALL MONITORING WELLS AT KEY LOCATIONS

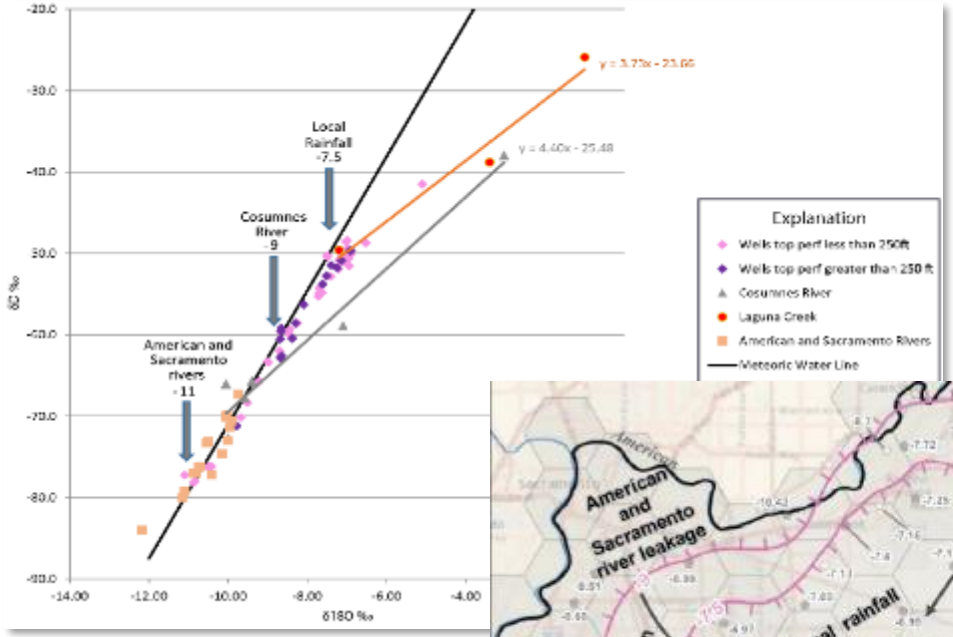
- Quantify hydraulic relationships between surface water and groundwater.
  - SGMA compliant monitoring wells.
  - Measured relationships between surface water flow, shallow groundwater levels, and deeper groundwater levels.
- Locations to reliably use groundwater levels as proxy for monitoring surface water depletions.
- Potential representative monitoring sites for specified sustainability criteria.
- Enhanced accuracy of the HCM, GWC and WB.

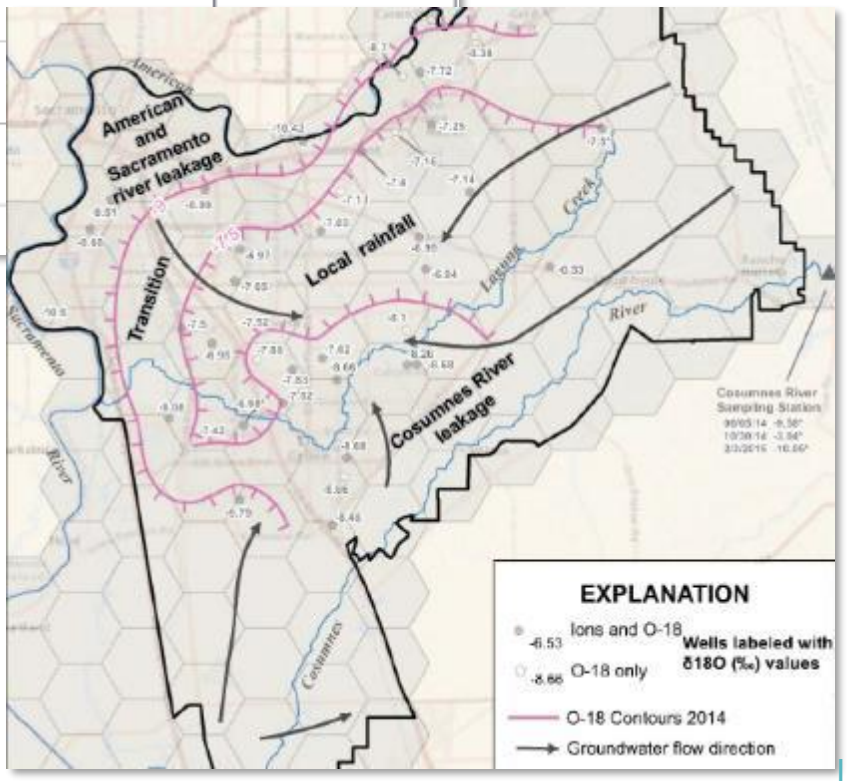


Rosenberry and LaBaugh, 2008, USGS Techniques and Methods 4-D2

4. RECHARGE CHARACTERIZATION STUDY

- Field sampling to characterize surface water, groundwater, and rainfall isotopic compositions.
- Characterize spatial distribution of recharge sources.
- Improved understanding of surface water and groundwater interactions.
  - Map areas influenced primarily by local rainfall.
  - Map areas influenced by river leakage.
- Enhance the HCM and WB.



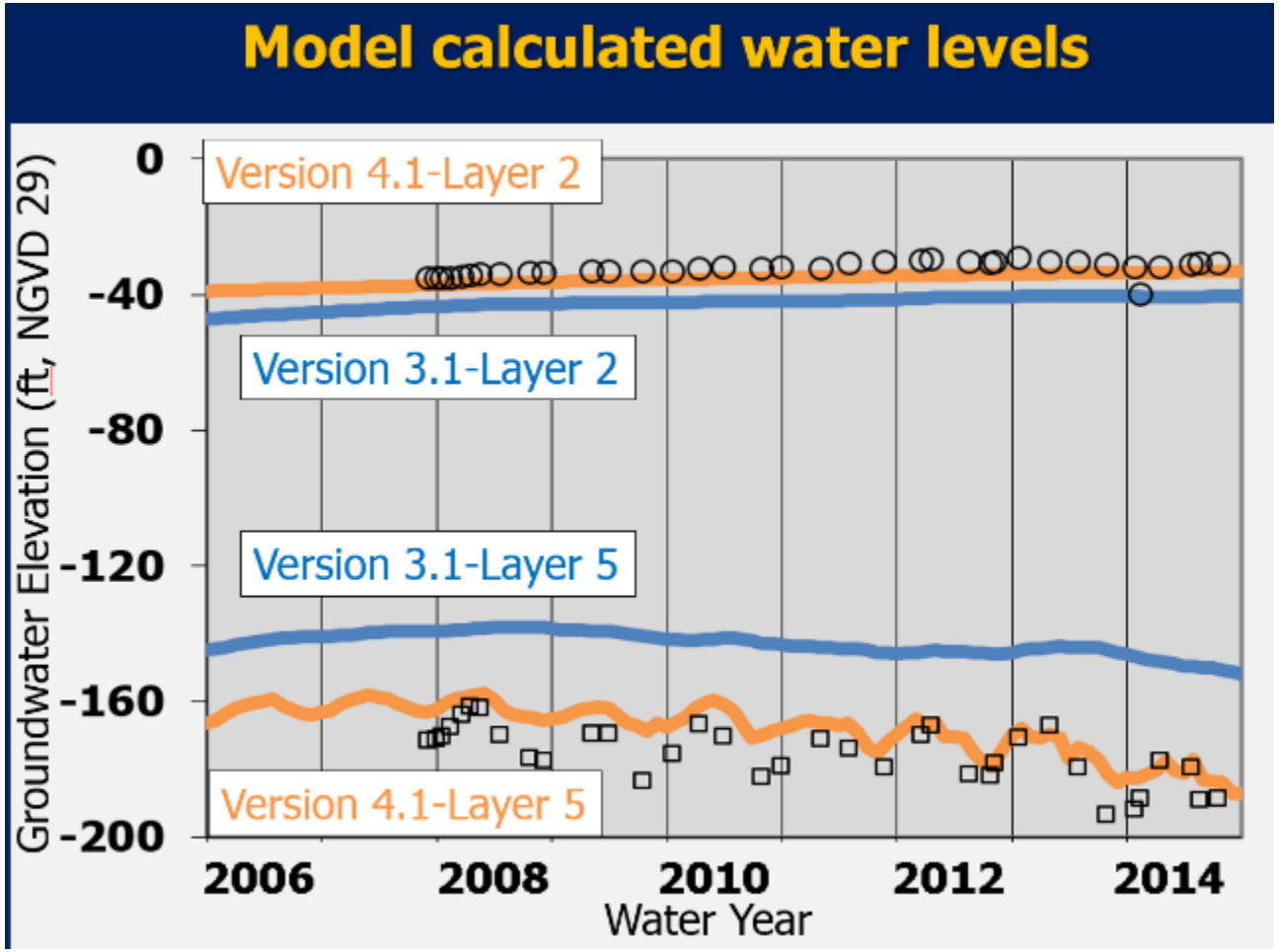


5. MEASURE GROUNDWATER EXTRACTIONS

- Basin specific estimate of agricultural-residential water use.
- Improved WB reliability and estimated SW depletions.
  - *Well locations (geometry).*
  - *Past and current well extractions.*
  - *Cumulative effects of multiple extraction wells.*

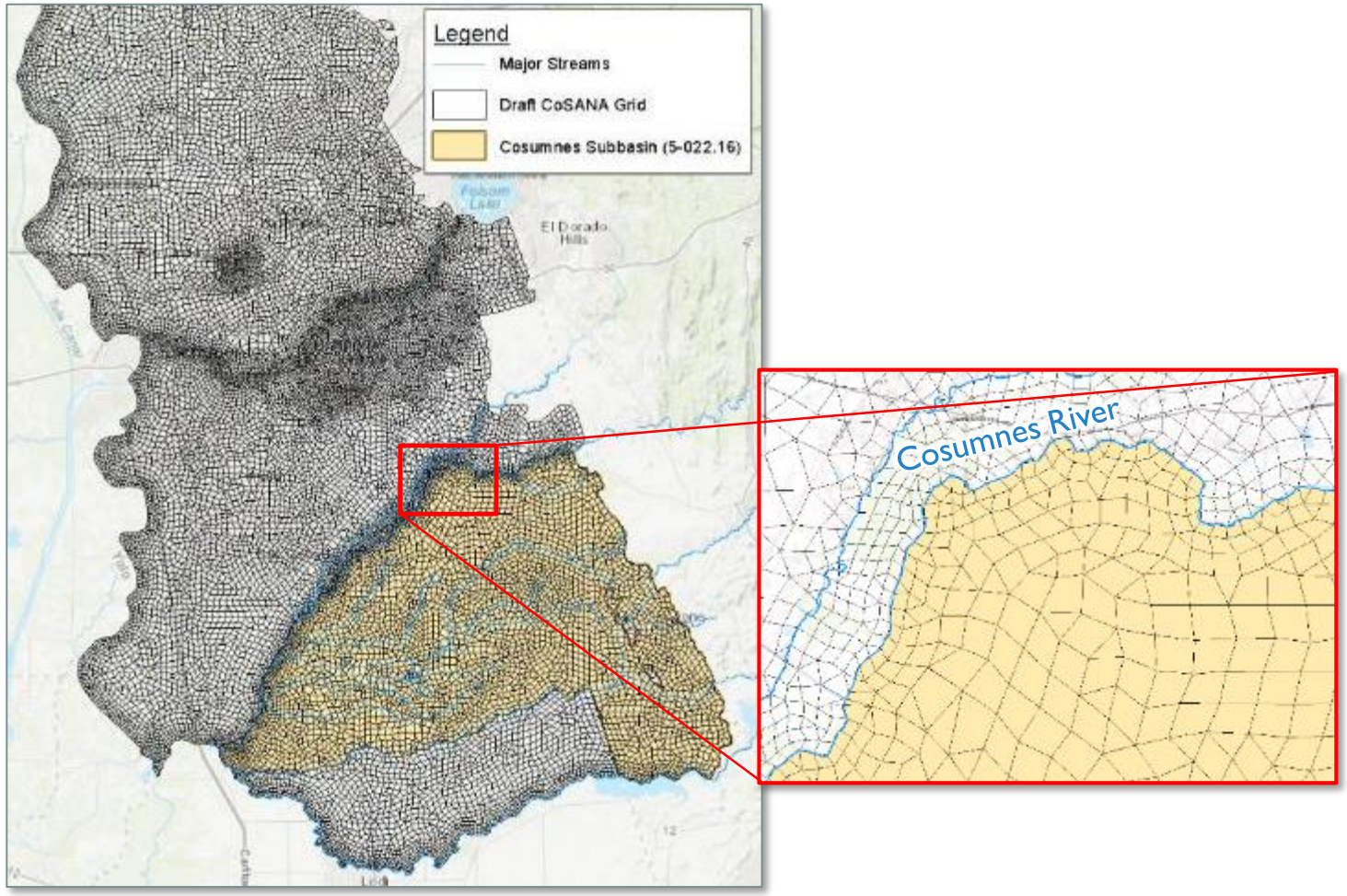
6. INCREASE SW/GW MODELING CAPABILITIES (1 OF 2)

- Greater model reliability from:
  - Aquifer properties informed by geophysical studies.
  - Improved water table characterization.
  - High quality calibration points located near surface water features (monitoring wells).
  - Improved modeled recharge distribution.
  - Reliable water budget (measured extractions).



6. INCREASE SW/GW MODELING CAPABILITIES (2 OF 2)

- Modeled calculations to quantify:
  - Relationships between extractions and river depletions.
  - Projected movement and fate of intentional recharge.
  - Effectiveness of conjunctive use projects (e.g. Flood-MAR).



PROP 68 - PROPOSED TASKS (DETAILED)

Task/Project	Outcome	Benefit	Relative Cost
1. GDEs Identification/Verification • Surface Water Workgroup: GSAs, EDF, TNC, etc. • Aerial photo analysis • Field verification	Field verified distribution and composition of GDEs that considers input from stakeholders from within and outside the Basin	• Confirm shallow groundwater areas • Map areas of ecological interest • Identify GW monitoring needs • Improved HCM and GC reliability • More reliable management objectives and thresholds.	$50,000 - $100,000
2. Geophysical studies • Map additional transects, adjacent to rivers, creeks and Folsom South Canal Service area • Validate using borehole information from DMS	Areal and depth distribution of water bearing zones	• Increase HCM reliability by better characterization of water-bearing and non-water bearing zones • Improved quantification of interconnected surface water and groundwater • Inform selection of new well sites	$75,000- $200,000
3. Install monitoring wells • Key Distances and depths from the Cosumnes River	Measured relationships between well extractions, water table changes, changes in surface water depletions, and changes in groundwater storage.	• Potential SGMA compliant monitoring wells • Reliable use of groundwater levels as proxy for depletion of interconnected surface water • Enhanced accuracy of the HCM, GC and WB • High quality data for sustainability indicators (Lowering GW Levels, Degraded Quality, etc.)	$200,000
4. Isotopic Recharge Study • Analyze select surface water samples • Analyze select well water samples • Analyze rainfall samples	Characterize spatial distribution of recharge primarily from river and creeks, rainfall infiltration, and possibly return flows from applied well water	• Delineate recharge areas and primary recharge sources • Improved understanding of surface water and groundwater interactions and fate of intentional recharge • Enhance the HCM and WB	$75,000- $100,000
5. Install and monitor meters on agricultural and residential water wells (agricultural and domestic use)	Measured groundwater extractions	• Basin specific estimate of agricultural-residential water use. • Improved WB reliability and estimated SW depletions	$50,000 – $100,000
6. Model Refinements • Utilize new geohydrologic and water budget data to refine model • Improve reliability of simulated interconnected surface water and groundwater	Improved modeling capabilities through: • Aquifer properties informed by geophysical data • Improved water table characterization and measured relationships between SW and GW conditions. • Calibration targets based on wells near river • Refined recharge representation • Greater WB reliability	Increased model reliability for evaluating: • Pumping impacts on Cosumnes River flows • Movement and fate of intentional recharge • Effectiveness of conjunctive use projects (e.g. Flood-MAR)	$100,000 - $300,000
			Total $550,000-$1,000,000

PROP 68 - PROPOSED TASKS (SUMMARY)

Task/Project	Relative Cost
1. GDEs Identification/Verification	$50,000-$100,000
2. Geophysical studies	$75,000-$200,000
3. Install monitoring wells	$200,000
4. Isotopic Recharge Study	$75,000-$100,000
5. Install and monitor meters on agricultural and residential water wells	$50,000-$100,000
6. Model Refinements	$100,000-$300,000
Total	$550,000-$1,000,000

Estimated costs need to be refined.