Tulare Irrigation District Recharge Operations

California Adaption Forum

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Water is scarce in California. But farmers have found ways to store it underground

October 5, 2021 · 4:13 PM ET
Heard on All Things Considered

By Dan Charles

It's basically a big, wide hole in the ground behind the headquarters of the Tulare Irrigation District, in the southern part of California's fertile Central Valley. But "for a water resources nerd like myself, it's a sexy, sexy piece of infrastructure," says Fukuda, the district's general manager.

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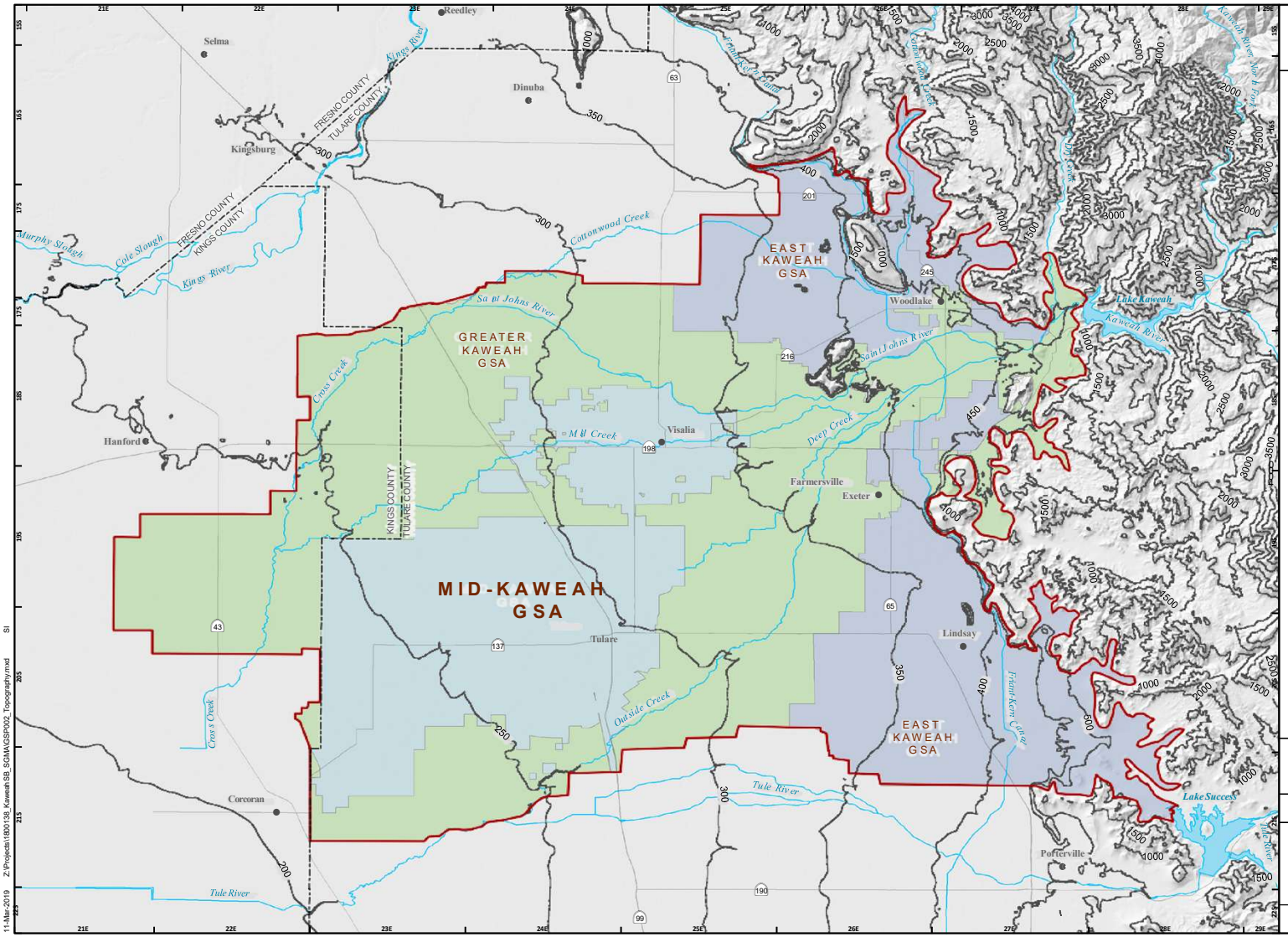


TOPOGRAPHIC MAP

Topographic Elevation Contours

Ground Surface Elevation Contours (500-ft

East Kaweah GSA

Greater Kaweah GSA

Mid-Kaweah GSA

Kaweah Subbasin Boundary

Kaweah Subbasin: 441,000 acres

GKGSA: 220,000 acres
EKGSA: 117,00 acres
MKGSA: 104,000 acres

0 2 4 8
Miles

N

Kaweah Subbasin
Groundwater Sustainability Plan
Tulare County, California

Kaweah Subbasin

GEI Consultants

GSI Water Solutions, Inc.

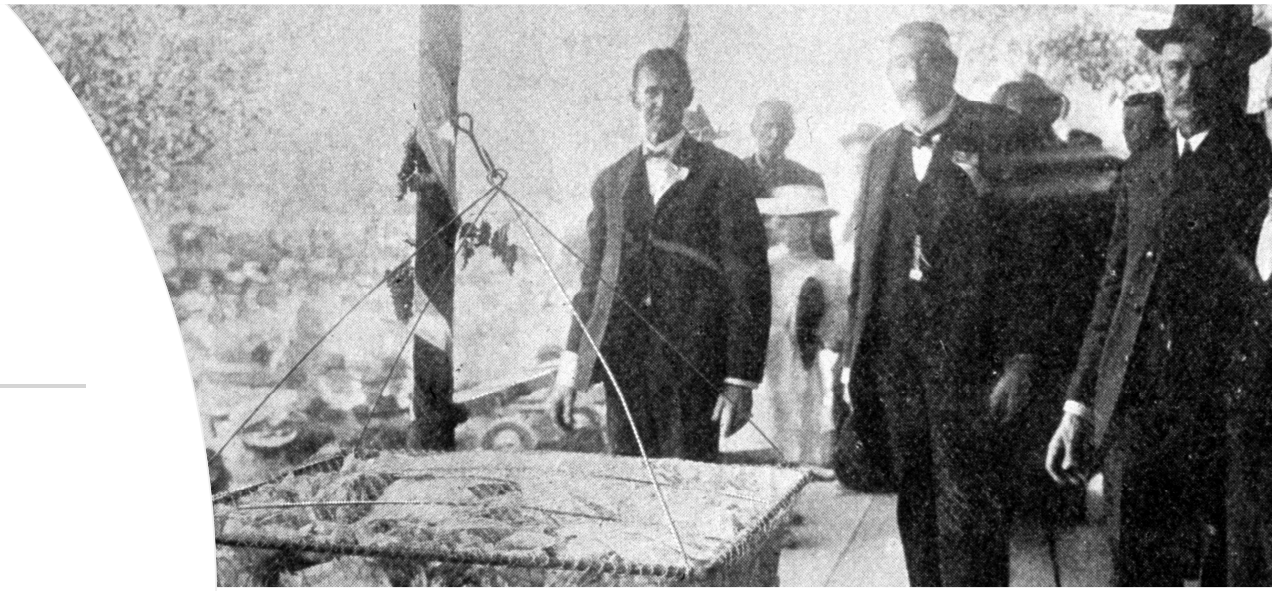
MARCH 2019

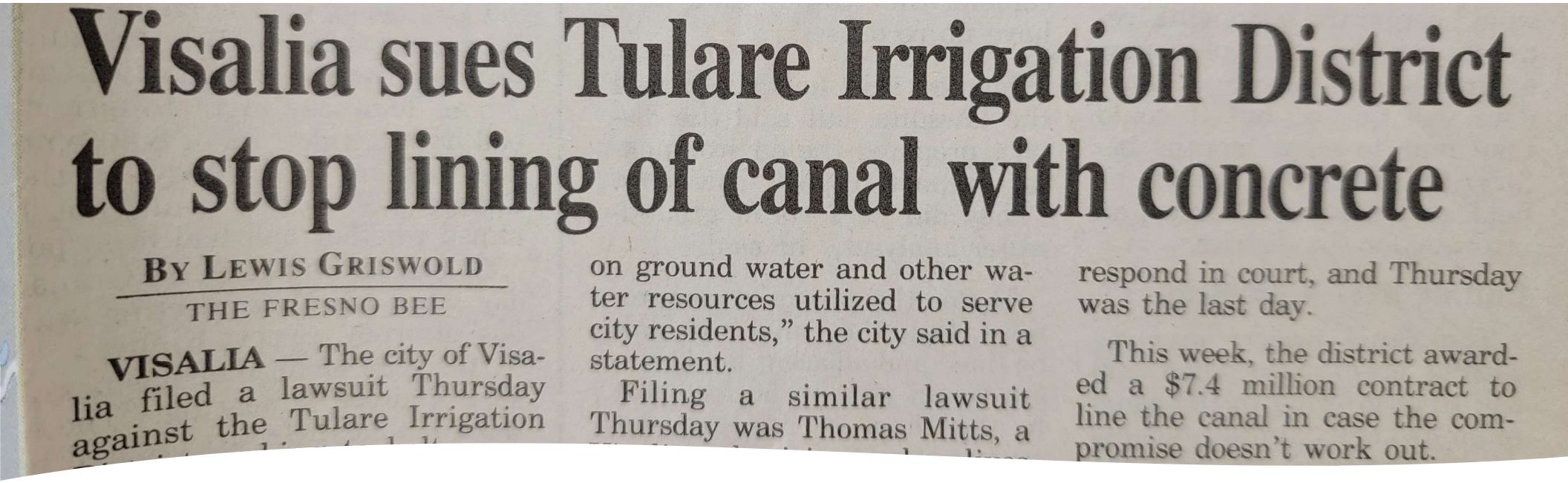
FIGURE 1

11-Mar-2019 Z:\Projects\1800138_Kaweah SB_SGMA\GSP\002_Topography.mxd SI

City of Tulare Partners Since Early 1900's

- Early 1900's City of Tulare Retires TID Bonds – Bond Burning Party
- 1954 Master Agreement – TID manages City of Tulare Stormwater
- 2005 Updated Master Agreement – Tulare Agrees to pay TID Assessment Rate for lands annexed into City
- 35-acre Swall Basin Development Agreement
- 2008 Recharge Agreement – Tulare Reimburses TID for Recharge in basins around Tulare





Visalia sues Tulare Irrigation District to stop lining of canal with concrete

BY LEWIS GRISWOLD
THE FRESNO BEE

VISALIA — The city of Visalia filed a lawsuit Thursday against the Tulare Irrigation

on ground water and other water resources utilized to serve city residents," the city said in a statement.

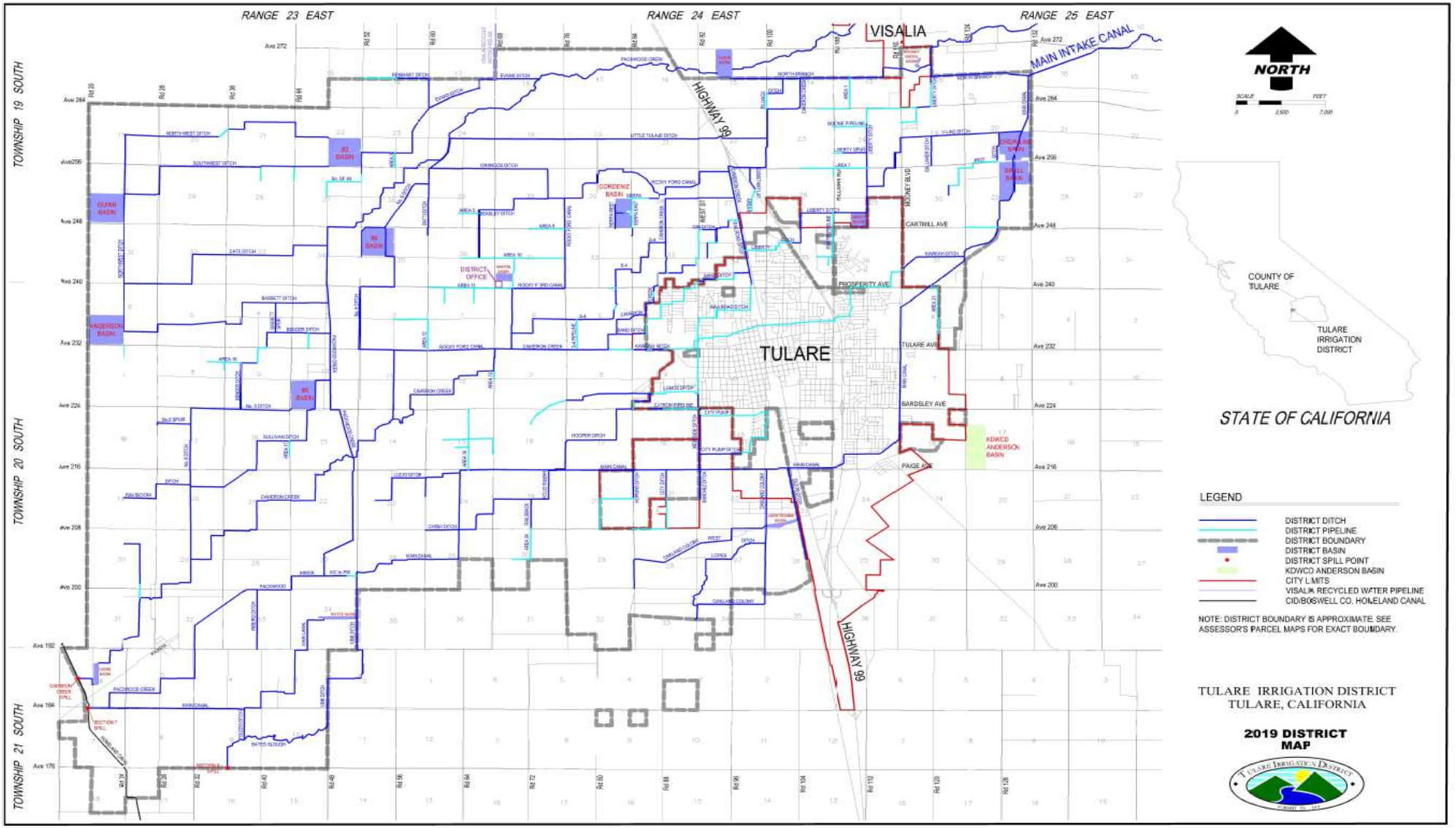
Filing a similar lawsuit Thursday was Thomas Mitts, a

respond in court, and Thursday was the last day.

This week, the district awarded a $7.4 million contract to line the canal in case the compromise doesn't work out.

City of Visalia – Litigation to Partners

- Late 1990's TID proposed to line their Main Intake Canal
  - City of Visalia sued to stop the project – protect canal losses (groundwater recharge)
  - Settlement – partnership of projects
- 2014 – Cooperative Exchange Agreement (negotiations started around 2011)
  - City of Visalia invested in WWTP upgrade to tertiary water – included a 2-mile pipeline to Tulare ID
  - Tulare ID provides 2:1 exchange – City gives 1 acre-foot to TID and TID provides ½ acre-foot of water in Visalia Recharge projects



TULARE IRRIGATION DISTRICT
TULARE, CALIFORNIA

2019 DISTRICT MAP

What is the Tulare Irrigation District

- Formed in 1889
- Acreage: Approx. 65,000 Acres
- *300 miles of earthen canals*
- 30 miles of pipelines
- *1,300 Acres of Recharge Basins*
- *Average Annual Surface Water Supply of 150,000 AF*
- Kaweah River Pre-1914 Water Rights
- CVP Friant Supplies
  - Class 1: 30,000 AF
  - *Class 2: 141,000 AF*
- Approx. 200 Growers
- Main Crops
  - Corn
  - Wheat
  - Alfalfa
  - Walnuts
  - Almonds
  - Pistachios

MKGSA Projects and Management Actions

Projects

- Visalia Tertiary Treatment Plant Upgrade – Exchange Agreement with Tulare ID – water used for irrigation Demand (Completed)
- City of Visalia Packwood Creek Linear Recharge Project (Completed)
- Tulare ID/City of Tulare 150-Acre Recharge Complex (Completed)
- Tulare ID 60-Acre Recharge Basin (Completed)
- Okieville Basin Recharge Project (Construction WY 2023)
- City of Visalia Cameron Creek Linear Recharge Project (In Design)
- City of Tulare Catron Basin Stormwater Capture and Recharge Basin (Grant Application Pending)
- Tulare ID Seaborn Reservoir – Reclamation of Mining operation for surface water storage and habitat restoration project (Pending Funding)
- Purchase and implementation of TowTEM Unit (Completed)

Management Actions

- 2022 MKGSA Emergency Ordinance – Groundwater Allocation & Cutback

SGMA Compliance on the Ground in 2022

We are here to help;

We are going to allocate;

We are going to restrict; and

We are going to charge

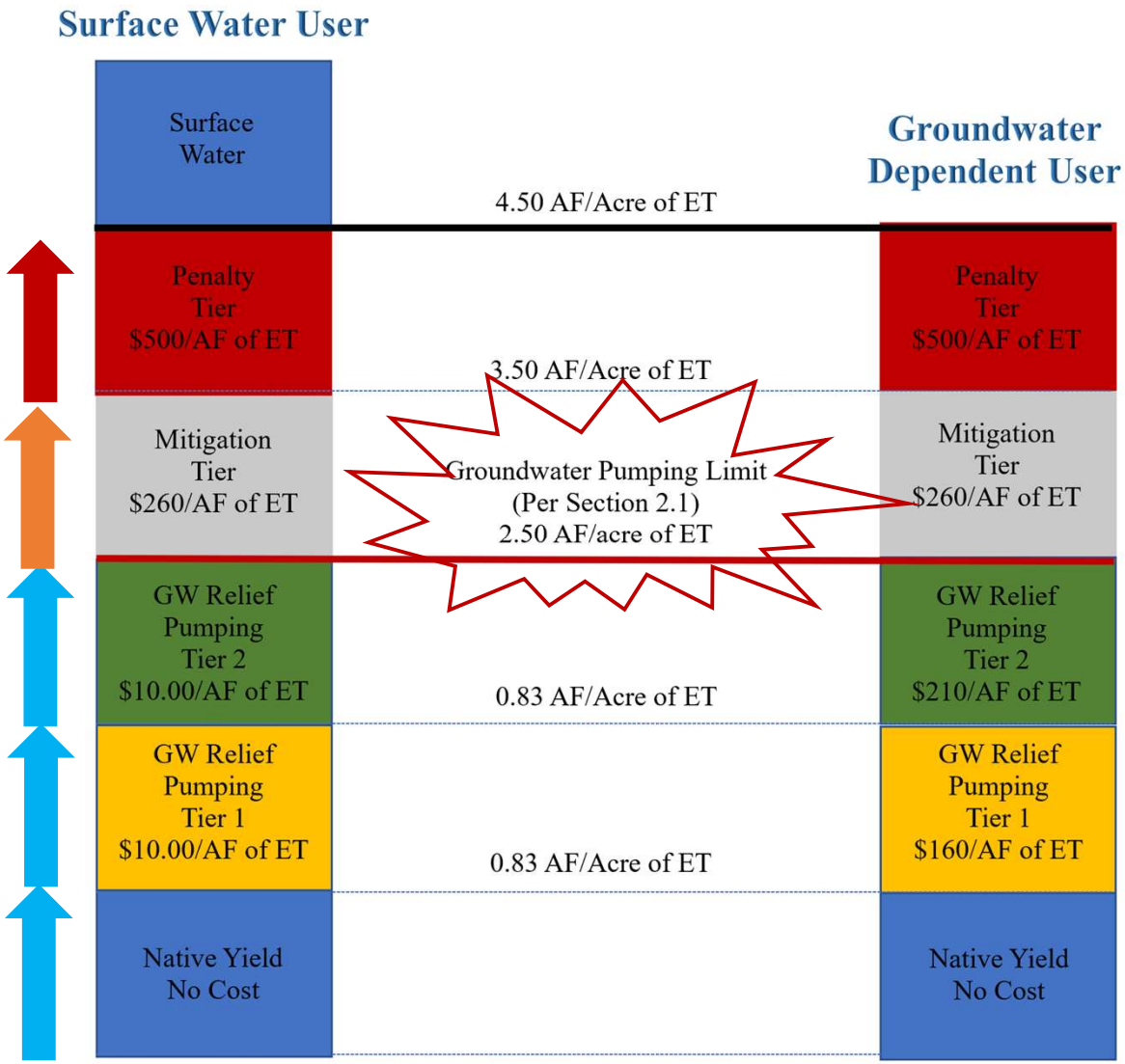
You for GROUNDWATER.

MKGSA Emergency Ordinance

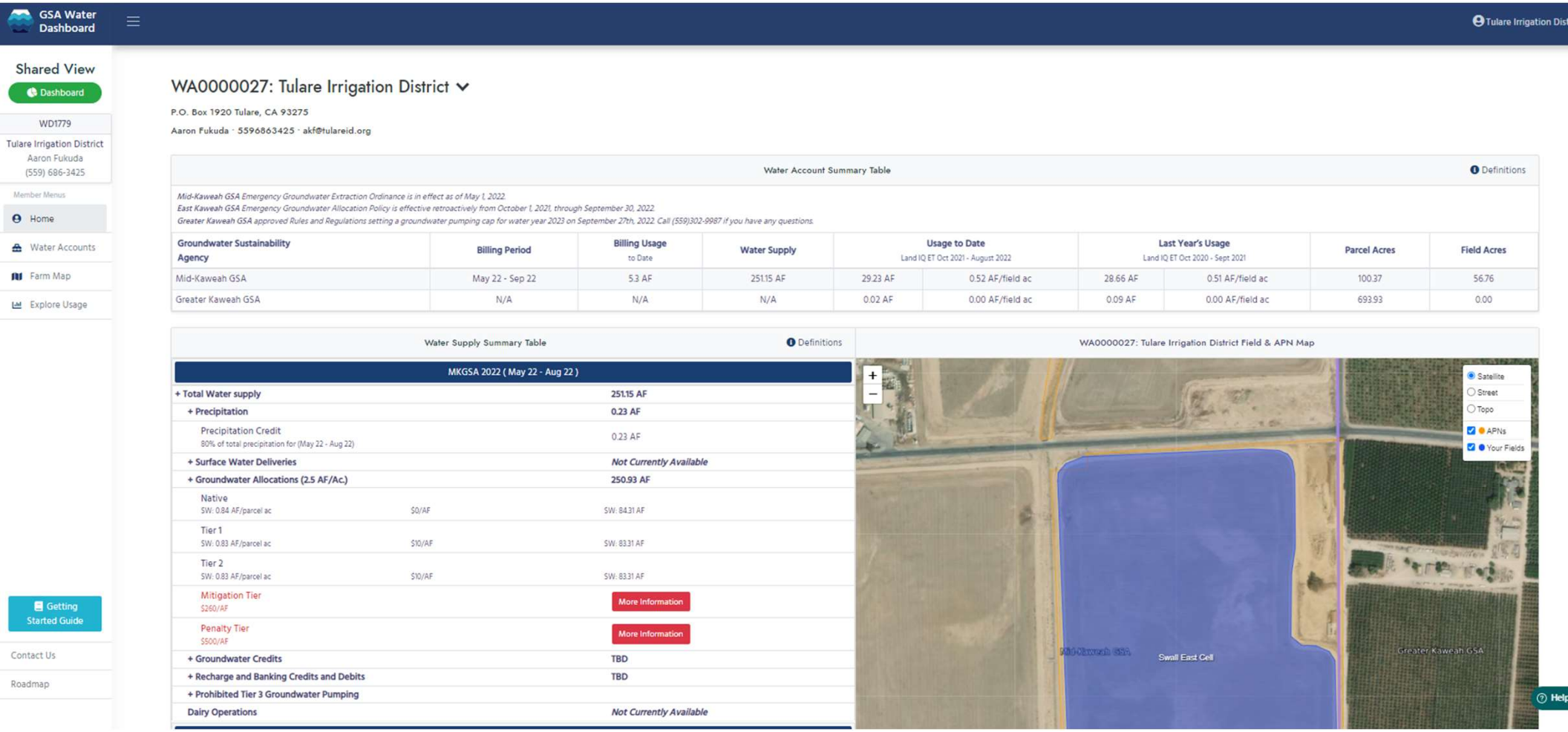
Policy + Data + Grower Interface = Emergency Ordinance

Emergency Ordinance - Groundwater Pumping Limit

- Pumping Limit ("Cap"): 2.5 AF/acre as ET
  - Native Yield – 10"
  - Relief Pumping Tier 1 – 10"
  - Relief Pumping Tier 2 – 10"
  - Costs: Service Fees and Replacement Fees
- Mitigation Tier – 1 AF/Acre
  - Allows for buffer as we begin the program
  - Pricing based upon cost to replace water
- Penalty Tier – 1 AF/Acre
  - High Penalty Fees
  - Loss of future water allocation on a 1:1 ratio



Water Dashboard – Online Allocation/Usage Tool (Interface)



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WEATHER

Why California Is Being Deluged by Atmospheric Rivers

California has been hit by repeated storms fueled by torrents of moisture called atmospheric rivers that will only intensify in a warming climate

By Robin Meadows on January 11, 2023

In an aerial view, cars are submerged in floodwater after heavy rain moved through the area on January 9, 2023, in Windsor, Calif. The San Francisco Bay Area was drenched by powerful atmospheric river

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Winter 2023 Recharge Operations

- Mid-January: After atmospheric river activity
  - Opened up for irrigation deliveries and immediately went to 80+ turnouts on and approximately 750 cubic feet per second (1,500 AF per day)
  - Where is the water going:
    - Field irrigation (majority of irrigation going to groundwater)
    - Canal system losses (filling entire system)
    - Recharge Basin (1,300 acres of recharge basin)

Observations

- 2017 – 400,000 AF & 2019 325,000 AF
  - 2023 storms and runoff are different so recharge totals are unknown
- Water is going out to all crops
- Greatest use
  - Open Ground (cotton, beans, fallow)
  - Pistachios – very hearty tree that can take a lot and a little amount of water
  - Walnut industry is declining – ET reduction and additional recharge
  - Ill prepared for winter storms – fields not ready
- Irrigation in winter with ongoing storms presents logistic issues
  - Field access issues
  - Irrigation in rain has potential for flooding
- All water across the state was very dirty and looking at long-term O&M issues

Results of Early Recharge Efforts

	January					
	1998	2006	2011	2017	2019	2023
Water Delivered to Turnouts	932	6,613	2,320	6,786	90	9,766
District Groundwater Recharge	8,545	15,611	18,092	24,016	2,815	26,462
Subtotal	9,477	22,224	20,412	30,802	2,905	36,228
Total Annual to Turnouts	133,394	137,478	164,700	178,414	148,359	
Total Groundwater Recharge	171,448	148,997	169,772	190,208	167,393	
Total Annual Water Into TID	304,842	286,475	334,472	368,622	315,752	

Avg. Pre SGMA – 17,100 AF 111% Increase

	March					
	1998	2006	2011	2017	2019	2023
Water Delivered to Turnouts	5,894	2,147	11,396	18,082	15,126	8,531
District Groundwater Recharge	15,039	14,802	14,520	26,234	26,285	18,344
Subtotal	20,933	16,949	25,916	44,316	41,411	26,875
Total Annual to Turnouts	133,394	137,478	164,700	178,414	148,359	
Total Groundwater Recharge	171,448	148,997	169,772	190,208	167,393	
Total Annual Water Into TID	304,842	286,475	334,472	368,622	315,752	

	February					
	1998	2006	2011	2017	2019	2023
Water Delivered to Turnouts	8,361	12,738	6,822	8,018	10,236	17,346
District Groundwater Recharge	16,848	15,463	14,123	24,016	18,335	16,211
Subtotal	25,209	28,201	20,945	32,034	28,571	33,557
Total Annual to Turnouts	133,394	137,478	164,700	178,414	148,359	
Total Groundwater Recharge	171,448	148,997	169,772	190,208	167,393	
Total Annual Water Into TID	304,842	286,475	334,472	368,622	315,752	

Avg. Pre SGMA – 27,000 AF 25% Increase

Avg. Pre SGMA (pro rata for 21 days) – 20,300 AF
33% Increase

Avg Inc. 56%

Water Totals to Date

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TO DATE
WATER DELIVERED TO FARM TURNOUTS	9,763	17,346	8,531	17,550	22,738	29,296							105,224
ON-FARM RECHARGE TO TURNOUTS	3	0	0	0	0	0							3
DISTRICT GROUND WATER RECHARGE	26,462	16,211	18,344	25,070	25,919	24,045							136,051
% OF DIVERSION TO FARM TURNOUTS	27%	51%	27%	38%	44%	52%							41%
% OF DIVERSION SPILLED	0.5%	1%	16%	7%	4%	3%							5%
% OF DIVERSION DELIVERED TO OTHER DISTRICTS	0%	1%	0%	0%	1%	3%							1%
% RECHARGED IN DISTRICT BASINS													
% RECHARGED IN DISTRICT CANALS													
% RECHARGED IN RIVERS FROM CVP	0%	0%	0%	0%	0%	0%							0%

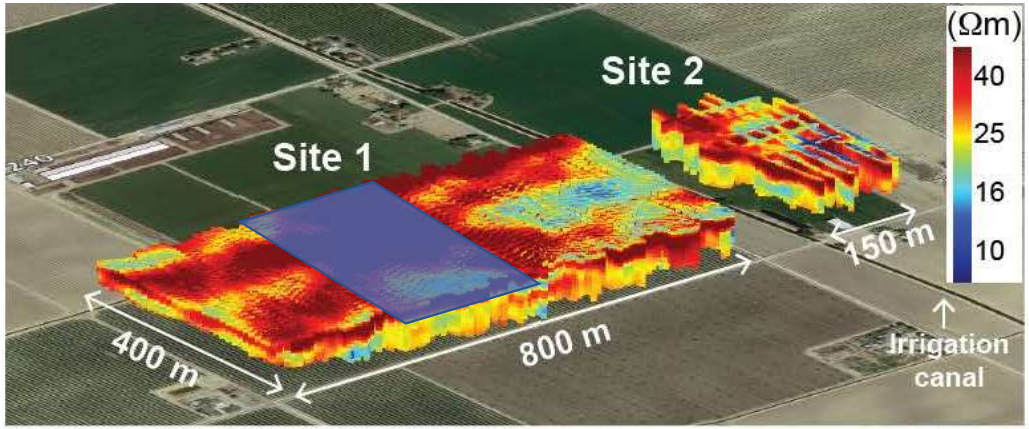
Technology of Groundwater

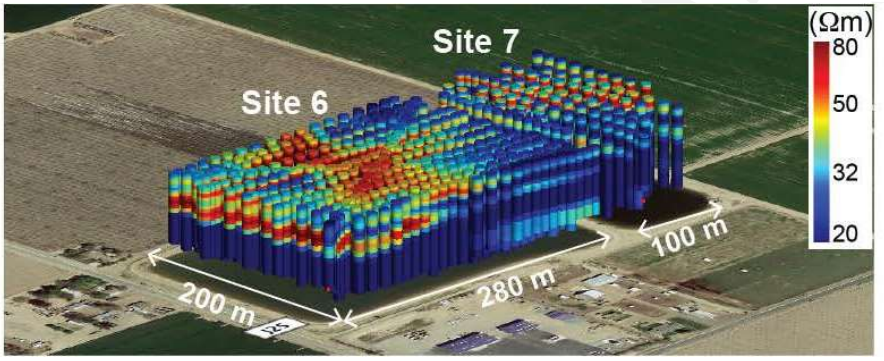
Using AEM for Groundwater Recharge

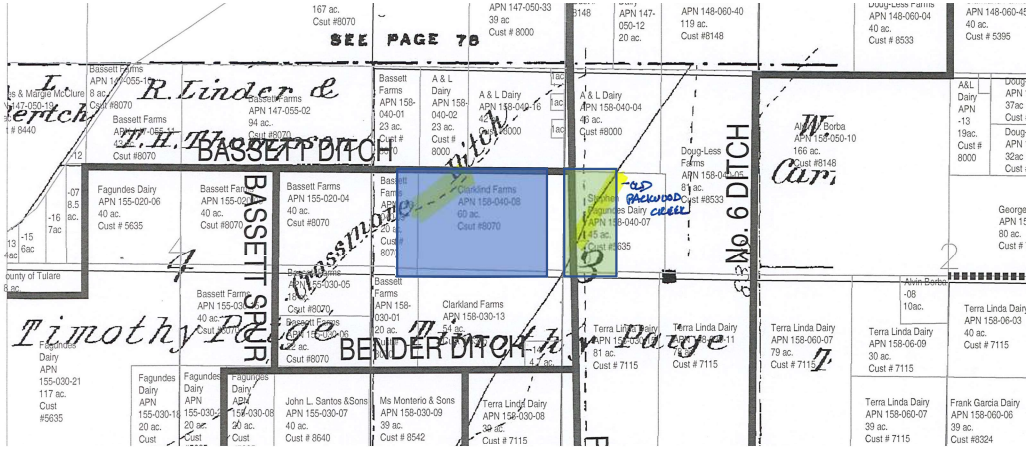
Groundwater Knowledge

- Kaweah Sub Basin in partnership with Stanford University completed a SkyTEM data acquisition for the entire subbasin IN 2019
  - Data has been incorporated into an updated MODFLOW model of the subbasin
- MKGSA is working with Stanford and has acquired a TowTEM unit
  - Will be used to evaluate District recharge opportunities
  - Grower requests to evaluate future use of land
  - Assist local subbasin recharge efforts
- Continue to collect data to increase subsurface knowledge and to calibrate TEM data collected within the sub basin

TowTEM Unit







How do we use the information:

1. Confirmation
2. Inform site specific testing program
3. Assist with due diligence during lease/purchase agreements
4. Increase efficiency of on-farm recharge program
5. Increase existing recharge basin sinking capacity
6. Provide textural input to our groundwater models
7. Assist in citing new groundwater monitoring wells

Sk

Hydrogeologic Framework of Selected Areas of the Kaweah Subbasin Region

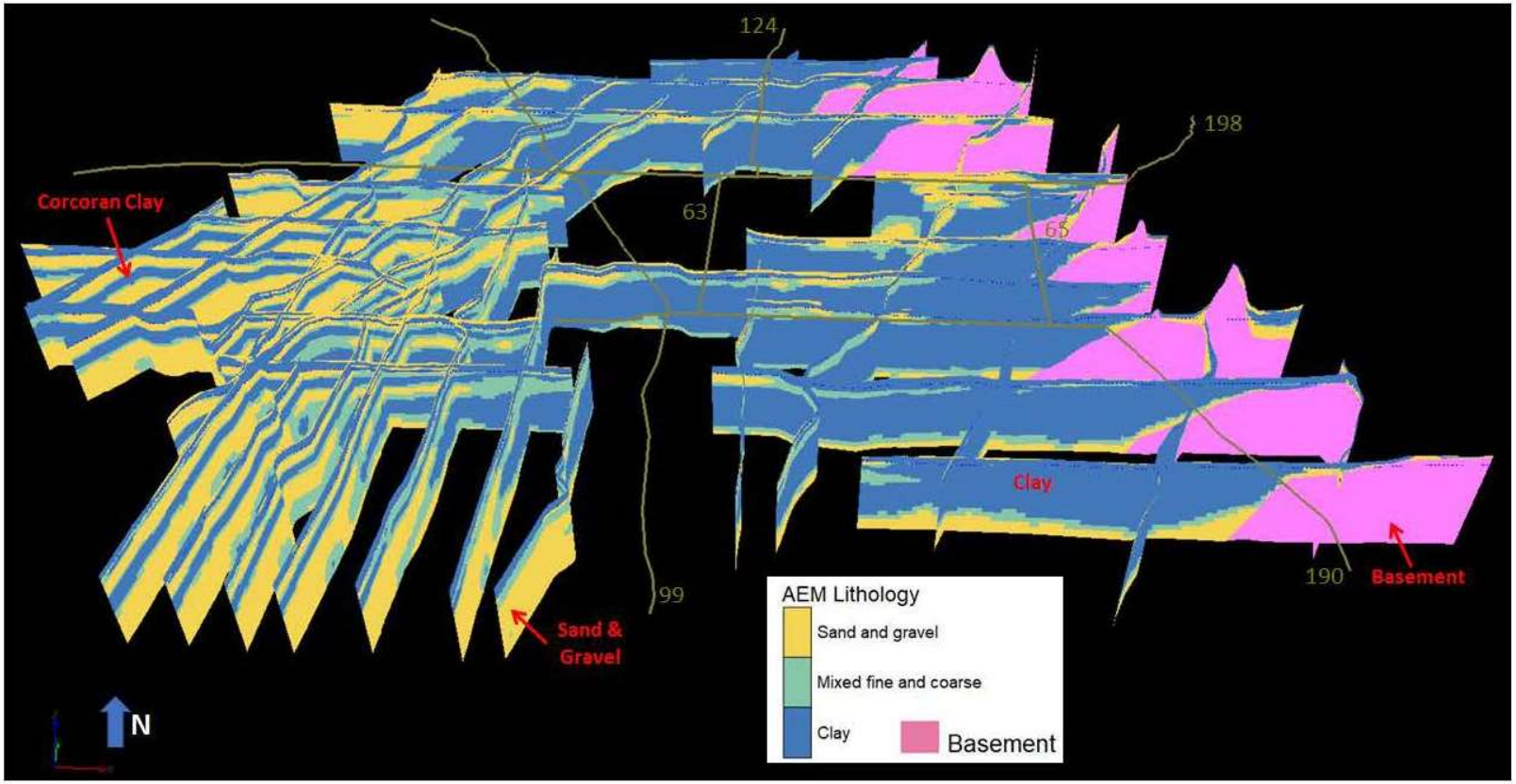


Figure 5-33. 3D lithologic interpretative fence diagram of the Kaweah Subbasin AEM inverted earth models, looking north. Greenish lines are local highways. Examples of the different lithologies are marked including the Corcoran Clay, undifferentiated Clay material, Sand and Gravel, and Basement materials.

Closing Thoughts

- Water management strengthens partnerships and partnerships strengthen water management
- Conjunctive Use Irrigation District – history of recharge, but can drastically improve
- Allocation and limits, while not welcomed, are valuable tools and incentives
  - Growers can use these tools to ensure a good business plan
  - Not advocating – if alternatives are available
- Staff has to be committed to the success of your programs – this takes more time and energy than what a 40-hour work week takes (TID, Visalia, Tulare)
- Make decisions **BEFORE** you **HAVE** to make decisions.
- We have 4 years to solve SGMA, I think we have 2 (maybe 3) left.
- SGMA is a 2-track program: GSP and Implementation

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Thank You