

Kinney County Groundwater Conservation District

MONITORING PROGRAM OVERVIEW

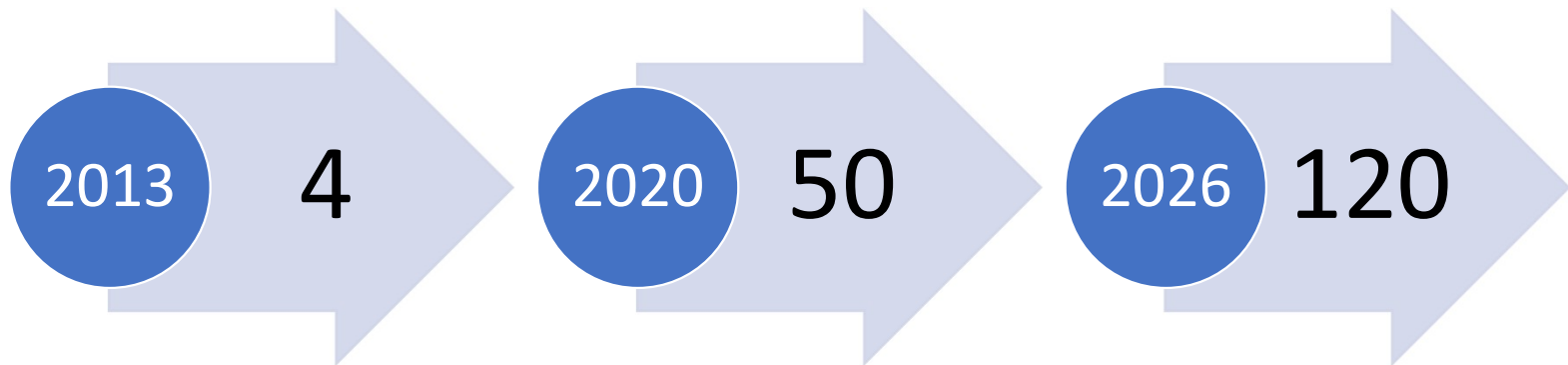
Jim Burton / Carlos Carreon / Martina Payne

March 24, 2026



EcoKai

KCGCD Monitoring Network Locations





Kinney County Groundwater Conservation District

Water Monitoring Network Site Summary

Hourly Measurements (max sample rate) **119** : 91 Wells • 23 Rain Gauges • 5 Springs

Real-Time Telemetry



60 Wells



- ✓ 60 Wells
- ✓ 23 Rain Gauges
- ✓ 4 Creeks

Rain Gauges

23
8 KCGCD
15 TexMesoNet

Creeks

- Las Moras
- Pinto
- Sycamore
- Mud
- West Nueces

Springs



5:

- Las Moras,
- Pinto
- Pinto
- Mud,
- Stricklin★



★ Coordinating Install

Changes in Data Acquisition



Manual Data Downloads
Water Level / Pressure



2013

Initial Automation
Tube w/ Banner Radios



2018

Telemetry Expansion
Wells / Creeks / Precip.



2020

Permitted Wells
WL / Flow / On Off



2024

Cloud API Polling
Tracking EC

MQTT et al →

2026

2013

2018

2020

2026

What We Monitor



Wells (E&P)



Municipal (City)



Springs (L,P,M,S*)



Creeks



Precipitation



Climate Data

* Las Moras, Pinto, Mud, Stricklin



What Type of Data is Collected



Aquifer Pressure



Temperature



Creek Stage



Precipitation



Well Flow Rates / Flow Total



Depth to Water /
Groundwater Elevation



Creek Flow



Drought Severity



Permitted Pumping on/off



Water Quality
GeoChem &
EC Tracking



How We Monitor –



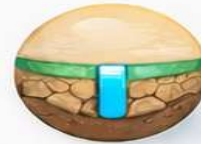
- Hanging Wire
- Direct Read



- Monthly Meter Readings (Permitted Wells)



- Cloud Based Telemetry
 - Water Level / Pressure
 - Well Pump On/Off
 - Well Flow Rates / Ave & Instantaneous
 - Total Volume Produced



Depth to Water /
Groundwater Elevation



Creek Stage / Flow



Well Pump On/Off



Precipitation
(Synoptic / TexMesoNet)





Hanging Wire Installation with Rugged Troll Transducer



Direct Read Cable Installation – Exempt Well



Non-operational Permitted Well – No Meter



Fort Clark MUD Production Well



Cloud Based Telemetry



Permitted Well w/ Rain Gauge



Permitted Well – Signal Fire Telemetry / Water Level



Permitted Well Flow Meter - McCrometer Pulse Transmitter



Cloud Deployed Current Switch



Current Switch Installation

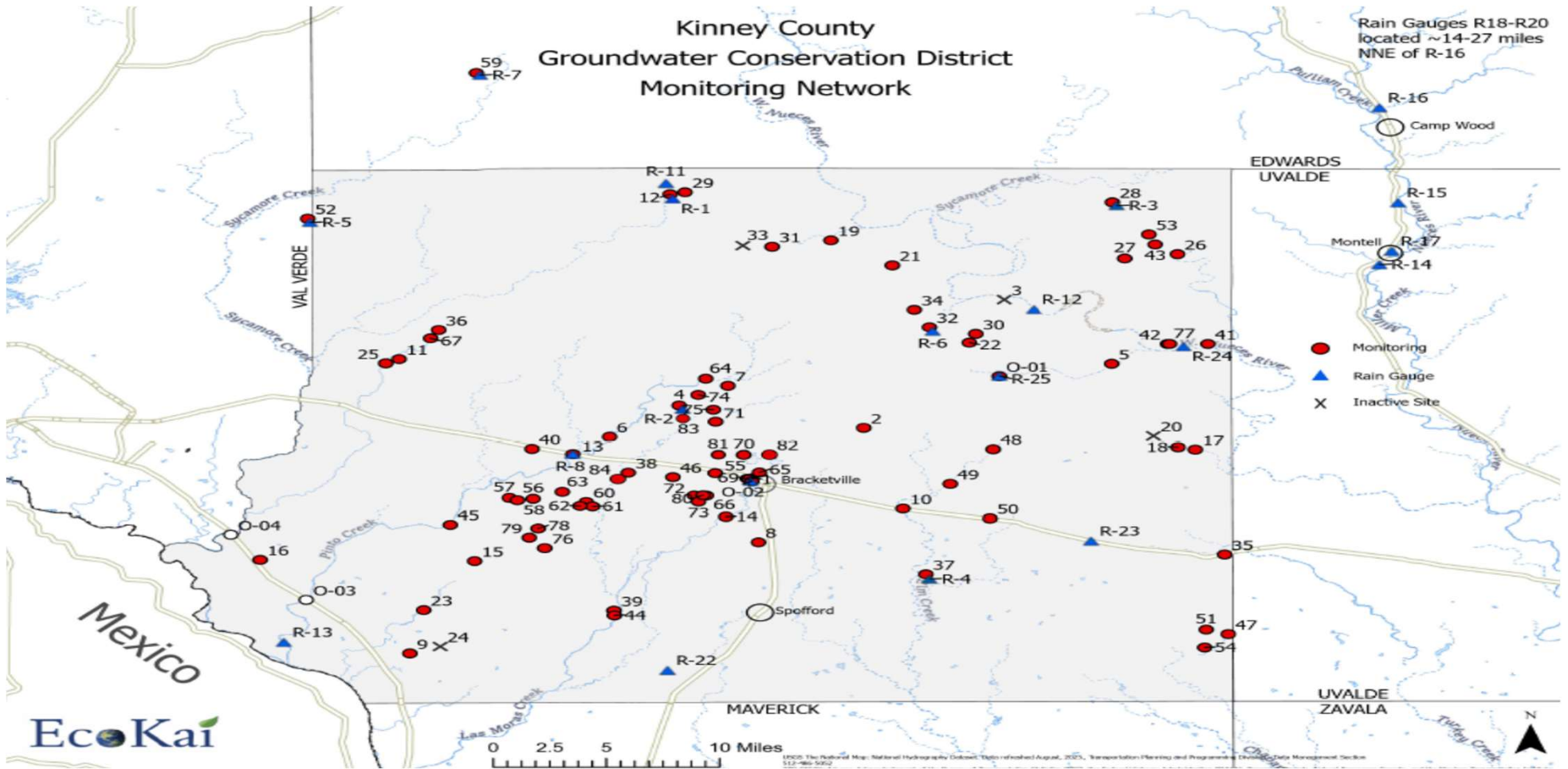


Exempt Well - Depth Indicator Measurements

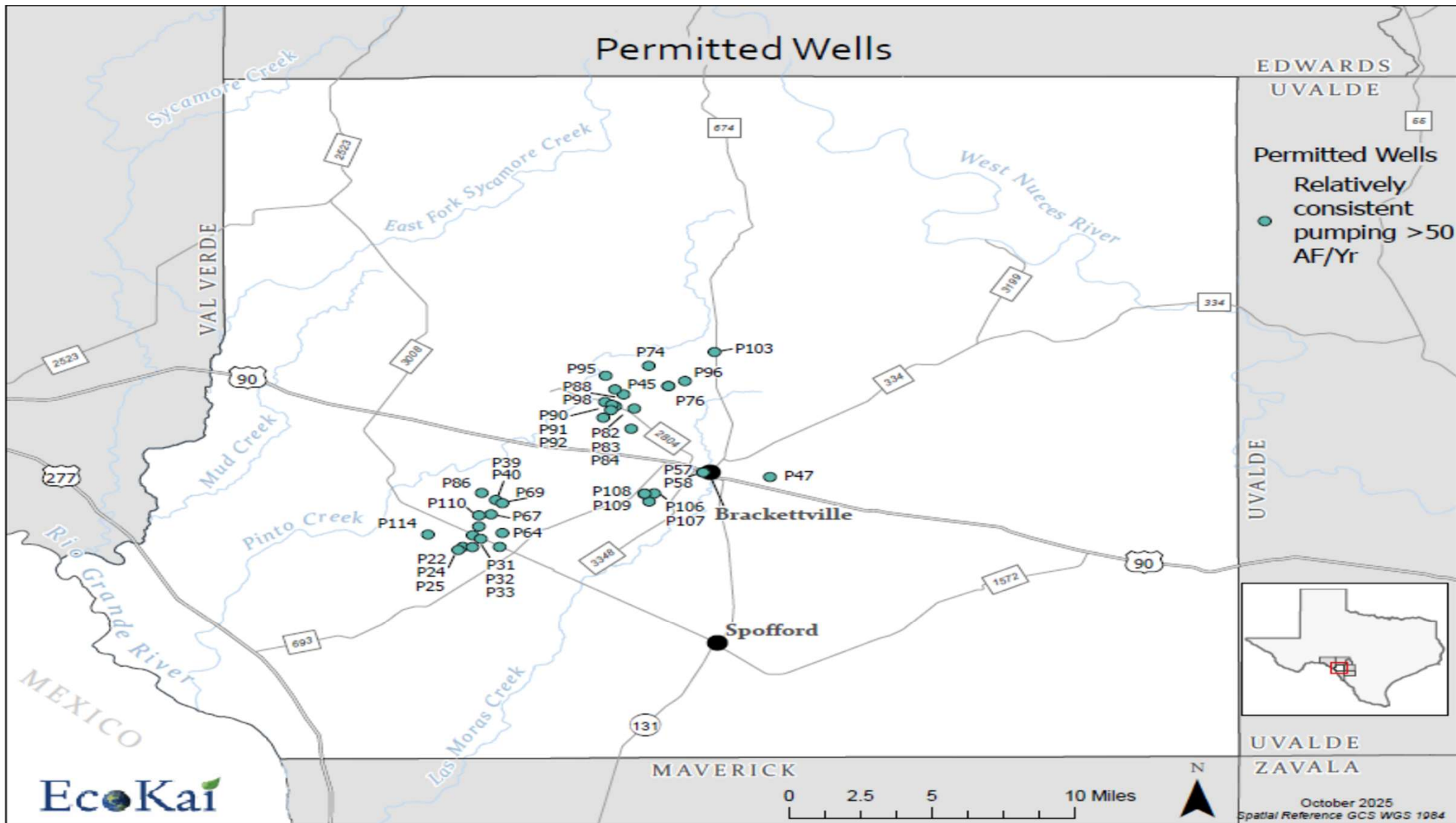


Permitted Well - Monthly Meter Reading

Where We Monitor -

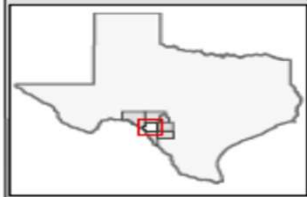


Permitted Wells



EDWARDS
UVALDE

Permitted Wells
Relatively
consistent
pumping >50
AF/Yr



UVALDE
ZAVALA

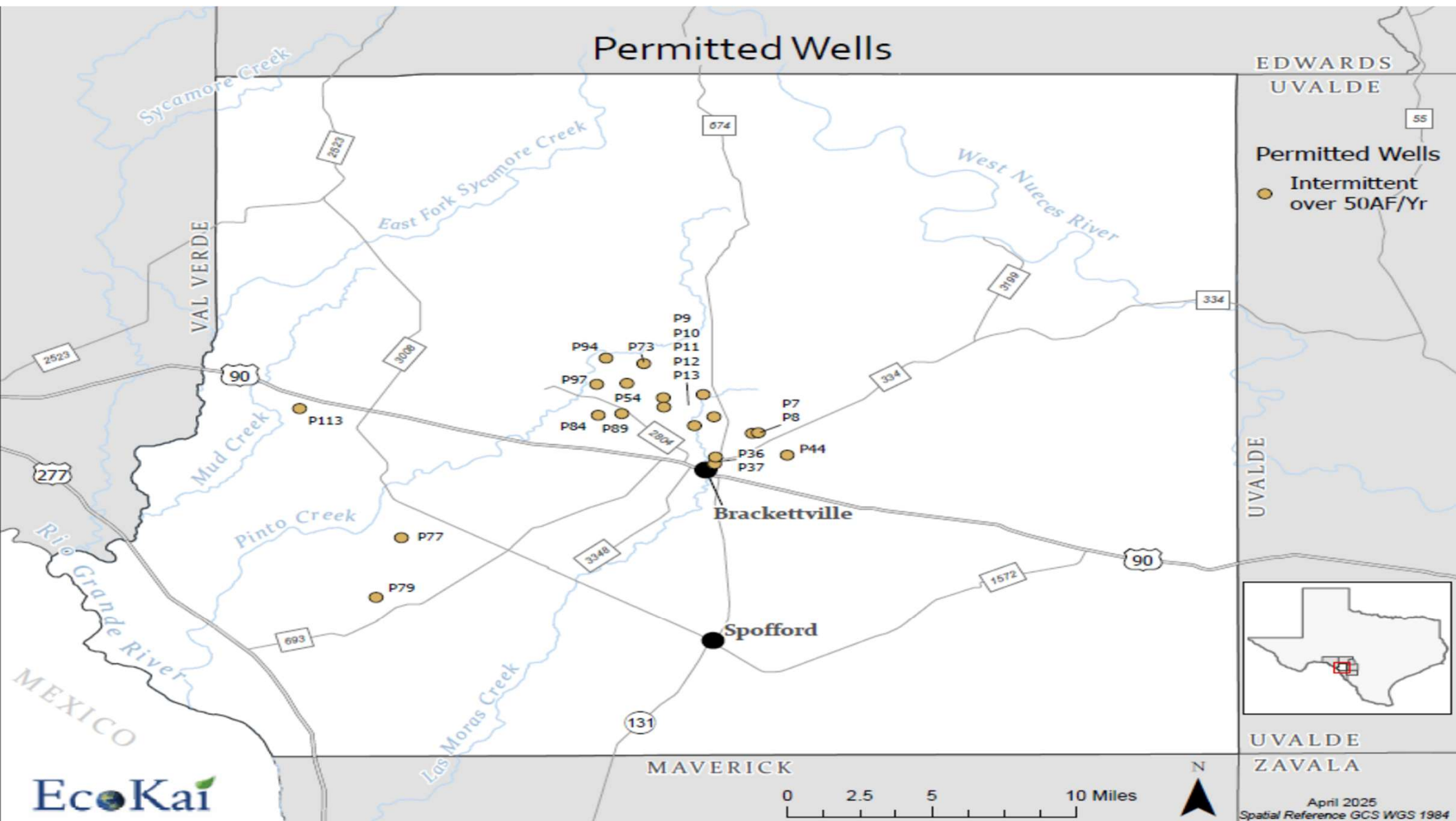
October 2025
Spatial Reference GCS WGS 1984



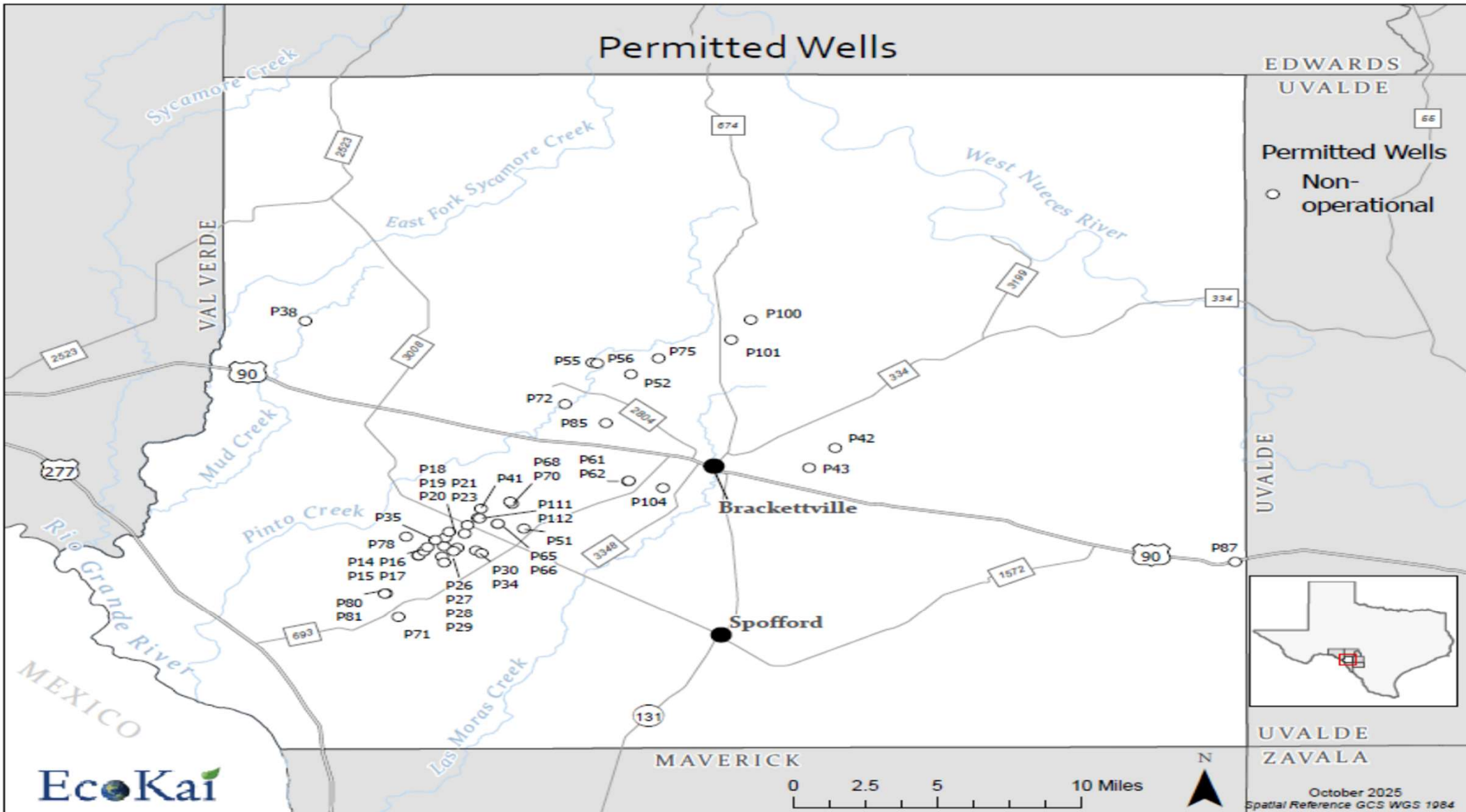
0 2.5 5 10 Miles



Permitted Wells



Permitted Wells



Coalescing Data



Manual Data Downloads (site visit)

◆ In-Situ (HydroVu)



Signal Fire Cloud

◆ USGS (Las Moras)



TexMesoNet (Climate)

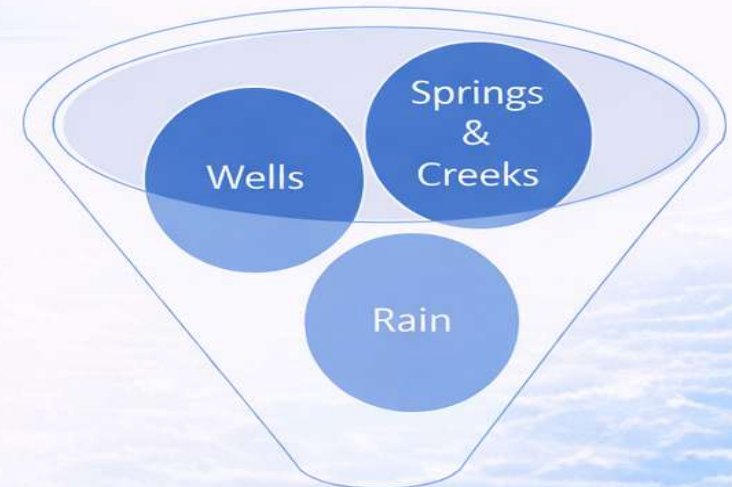
◆ Synoptic (Precipitation)



TWDB (State Data Partner)



API Polling / MQTT et al.



Conceptual Hydrologic Understanding



Existing Server Architecture



Language – Go (Golang)

- ◆ Receive, Store, Process, Serve Data



Database – TimescaleDB & PostgreSQL

- ◆ Time-series optimized storage and querying



Frontend – React & TypeScript

- ◆ User interface and data visualization



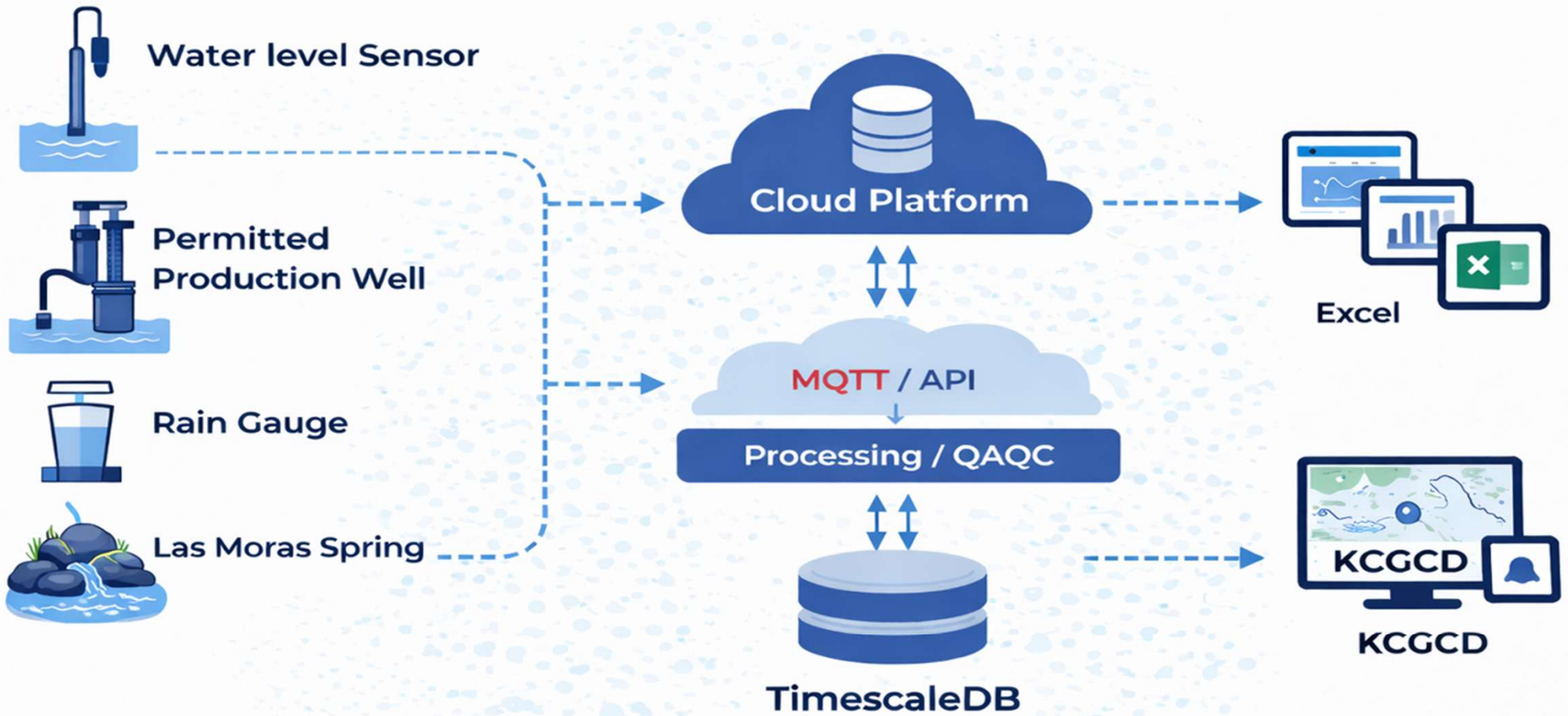
Infrastructure – Docker, AWS

- ◆ Containerized deployment and scalable cloud hosting



KCGCD App – Internal Production Tracking

- ◆ Centralized platform for monitoring and reporting



Data Management Platform Screenshots —

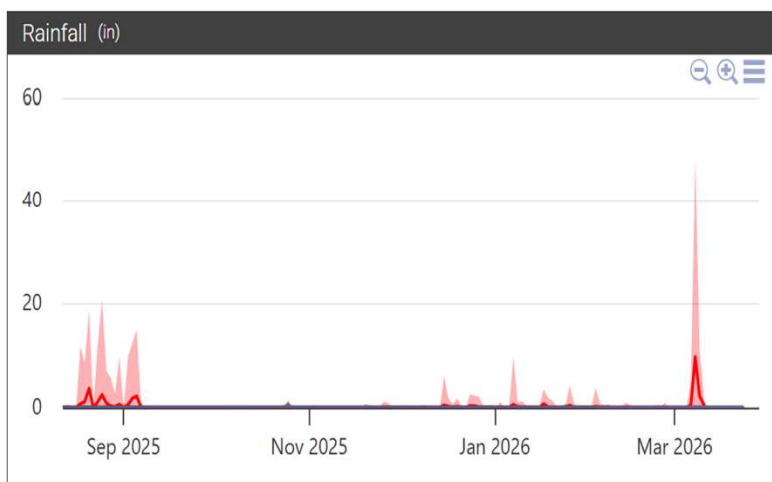
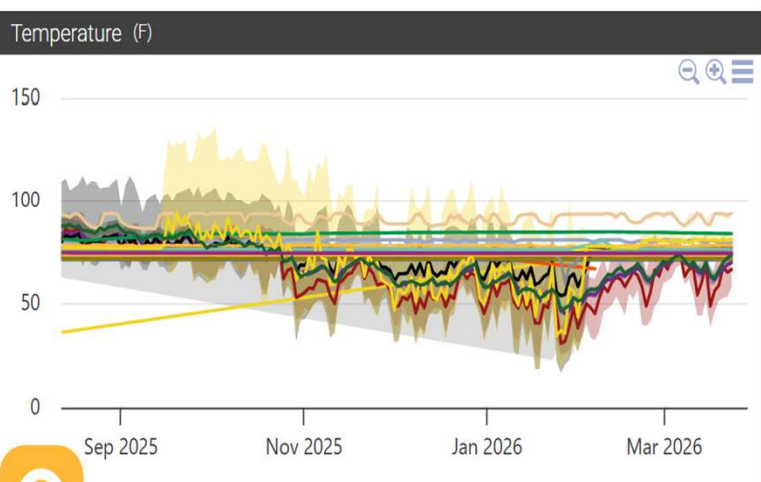
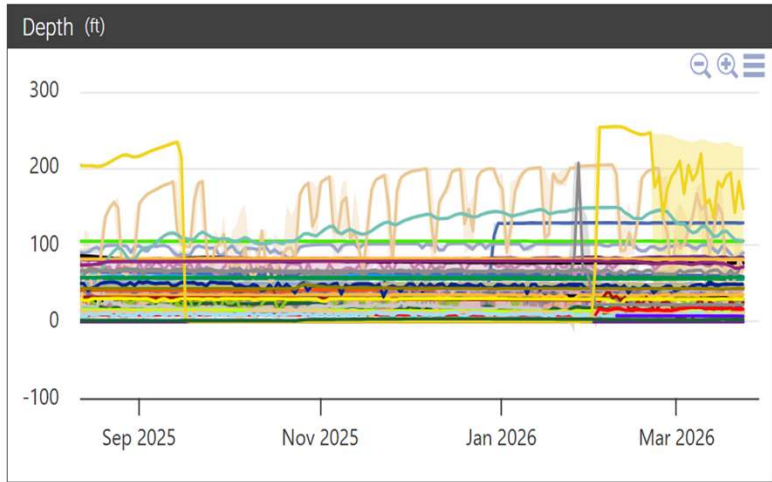
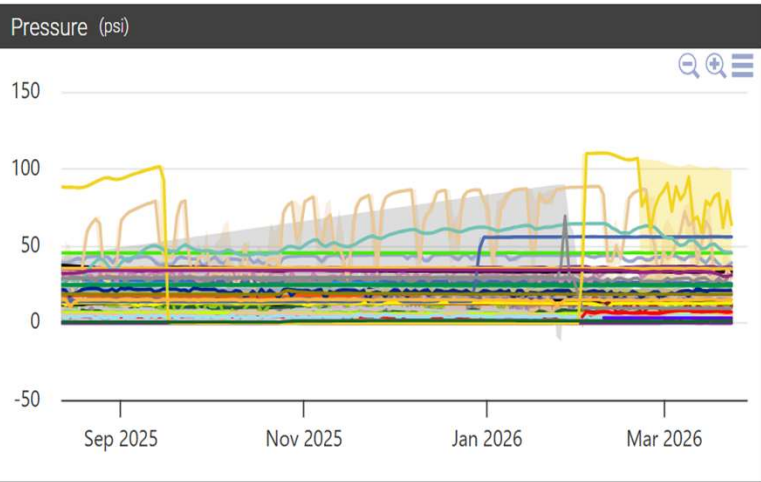
- HydroVu (In-Situ) – Monitoring
- Signal Fire – Production Wells
- ESRI Online GIS Viewer – *Data Population*
- KCGCD Graphing Migration – **Website**
- KCGCD APP - Permitted Production Tracking



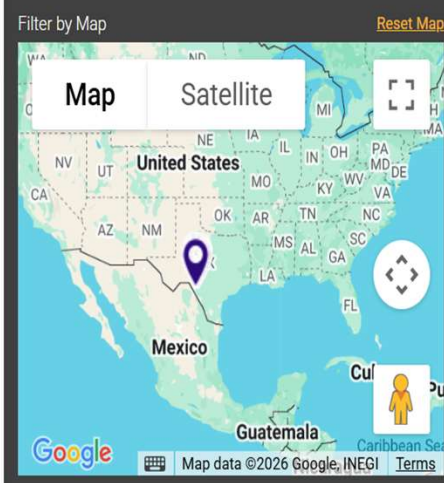


America/Chicago Show Last 7 Days Show Last 30 Days Show Last 365 Days Show All Refresh Data

Graph All Parameters Battery Level Baro Pressure Temperature Depth Battery Voltage Rainfall



Location Filters



Filter by Project Clear

Filter by Label Clear

Search by Keyword Clear

Select Locations 47 showing, 47 selected

<input checked="" type="checkbox"/>	Location		
<input checked="" type="checkbox"/>	3-D Cattle Shearing Barn	Blue square	Up arrow
<input checked="" type="checkbox"/>	3D Cattle - HWY Solar	Yellow square	Slider
<input checked="" type="checkbox"/>	3D Cattle - North Mill	Red square	
<input checked="" type="checkbox"/>	Bader Irrigation	Green square	
<input checked="" type="checkbox"/>	Boerschig House Pasture	Orange square	
<input checked="" type="checkbox"/>	Boiling Springs #10 Lower	Blue square	

Feb 21, 2026 12:00 AM

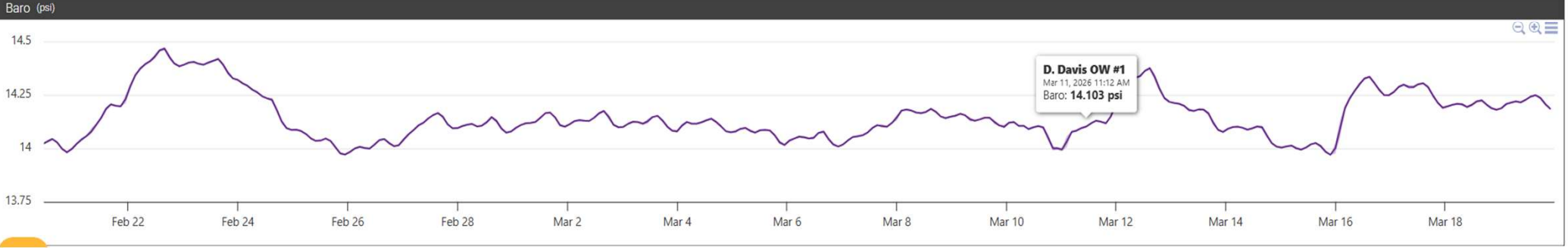
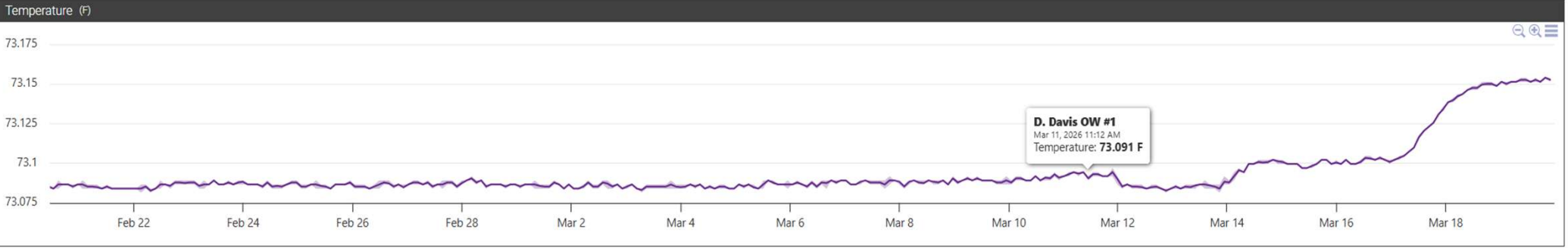
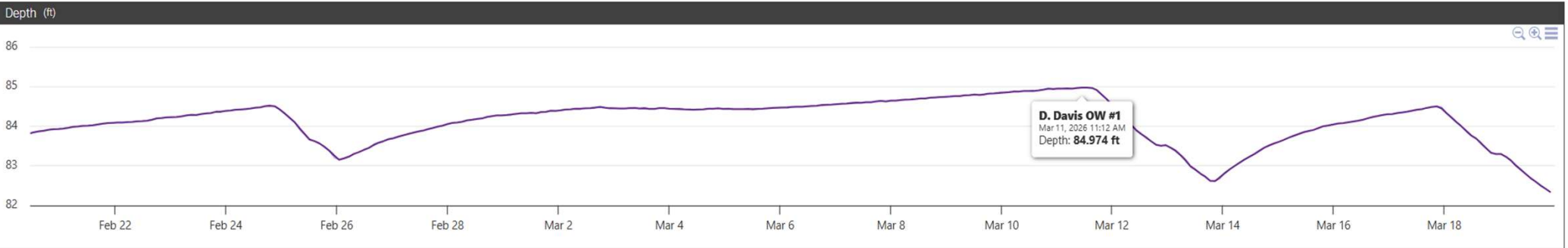
Mar 19, 2026 11:00 AM

America/Chicago

Show Last 7 Days Show Last 30 Days Show Last 365 Days Show All


Refresh Data

Graph All Parameters Battery Level Baro Pressure Temperature Depth



NODE STATUS

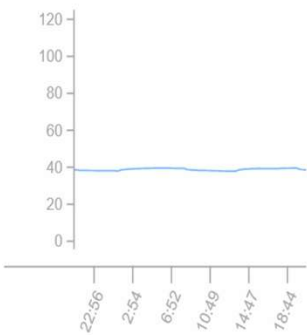
ONLINE


-86 dBm
Reports every 15 minutes

WATER ABOVE SENSOR (-50FT) (FT. H2O)

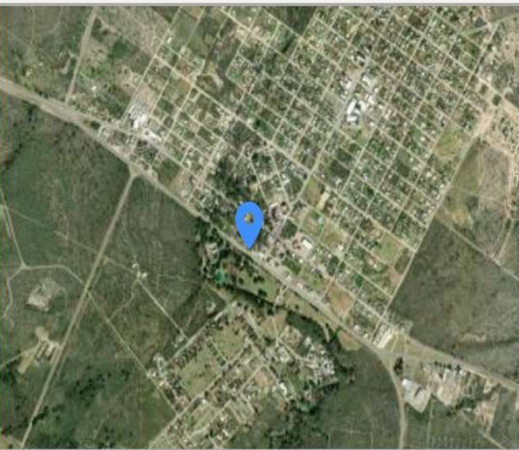
38.09

past 24 hr. auto-scale



GPS

Location at 2023-12-18 06:20:40 Satellite



City Well No. 1

Battery	3.636 V	Temp.	72 °F
Uptime	4 hours 3 minutes 42 seconds		
Last Report	2026-03-23 08:55:29 PM		
Online Since	2026-03-23 04:55:05 PM		
Carrier Info	VzW (8C09)	SW Ver.	v0.1.44-v2
Expiration	2026-11-12 (232 days)		

Reading	38.09 ft. h2O		
Raw	9.281 mA	Scale	0-115.4 ft. h2O
Low Alarm	< 0 ft. h2O (Disabled)		
High Alarm	> 0 ft. h2O (Disabled)		


Coordinates	29° 18' 39" N 100° 25' 10" W	UPDATE
Auto Trigger	Manual	

SET AS DEFAULT ✓

CLEAR ALL ≡

- ft. h2O
- AIN2
- AIN3
- FLOW1 Total
- FLOW1 Avg Flow

Graph
Table



HIDE CONTROLS

REFRESH

EXPORT

Select Date Range

From:

March 13th 2026 17:36

To:

March 22nd 2026 22:03

NODE STATUS

ONLINE

CONFIGURE NODE

FAST REPORTING

HIDE / SHOW TILES

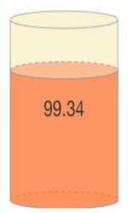
FORCE REPORT

Fort Clark Mud Wells

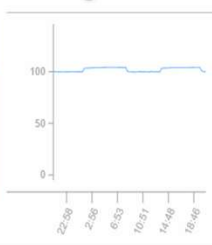
Battery	3.646 V	Temp.	75 °F
Uptime	3 days 21 hours 15 minutes 12 seconds		
Last Report	2026-03-23 08:52:19 PM		
Online Since	2026-03-19 11:44:49 PM		
Carrier Info	VzW (BC09)	SW Ver.	v0.1.44-v2
Expiration	2026-11-12 (232 days)		

WATER ABOVE SENSOR (-113) (FT. H2O)

past 24 hr. auto-scale

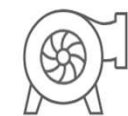


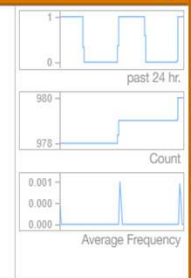
99.34



Reading	99.34 Big ft. h2O		
Raw	15.478 mA	Scale	0-138.48 Big ft. h
Low Alarm	< 0 Big ft. h2O (Disabled)		
High Alarm	> 0 Big ft. h2O (Disabled)		

BIG PUMP ON/OFF (BIG ON/OFF)

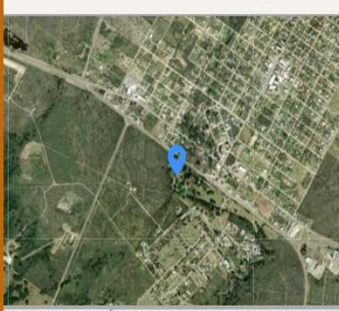
 **CLOSED**



Count	980		
Avg. Freq.	0 Hz	Inst.	0 Hz
State Alarm	Alarm on CLOSED (Disabled)		
Debounce	0 ms	Report On Change	Enabled

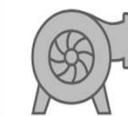
GPS


Location at 2023-12-14 18:04:55 Satellite



Coordinates	29° 18' 38" N 100° 25' 18" W	UPDATE
Auto Trigger	Manual	

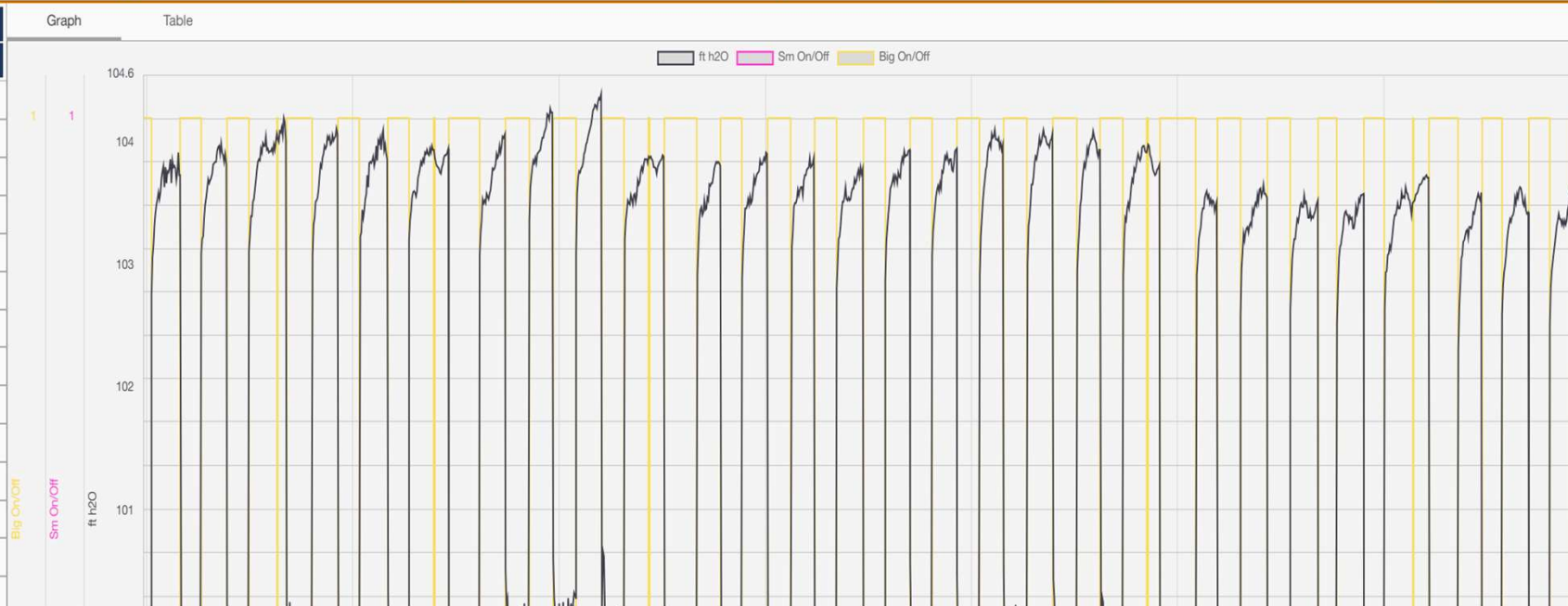
SMALL PUMP ON/OFF (SM. ON/OFF)

 **OPEN**



Count	0		
Avg. Freq.	0 Hz	Inst.	0 Hz
State Alarm	Alarm on CLOSED (Disabled)		
Debounce	0 ms	Report On Change	Enabled

- SET AS DEFAULT** ✓
- CLEAR ALL** ≡
- ft. h2O
 - AIN2
 - AIN3
 - Sm. On/Off
 - Sm. On/Off Count
 - Sm. On/Off Avg Hz
 - Sm. On/Off Inst Hz
 - Big On/Off
 - Big On/Off Count
 - Big On/Off Avg Hz
 - Big On/Off Inst Hz
 - DIN3
 - DIN3 Count
 - DIN3 Avg Hz



✓ **HIDE CONTROLS**

↻ **REFRESH**

📄 **EXPORT**

Select Date Range

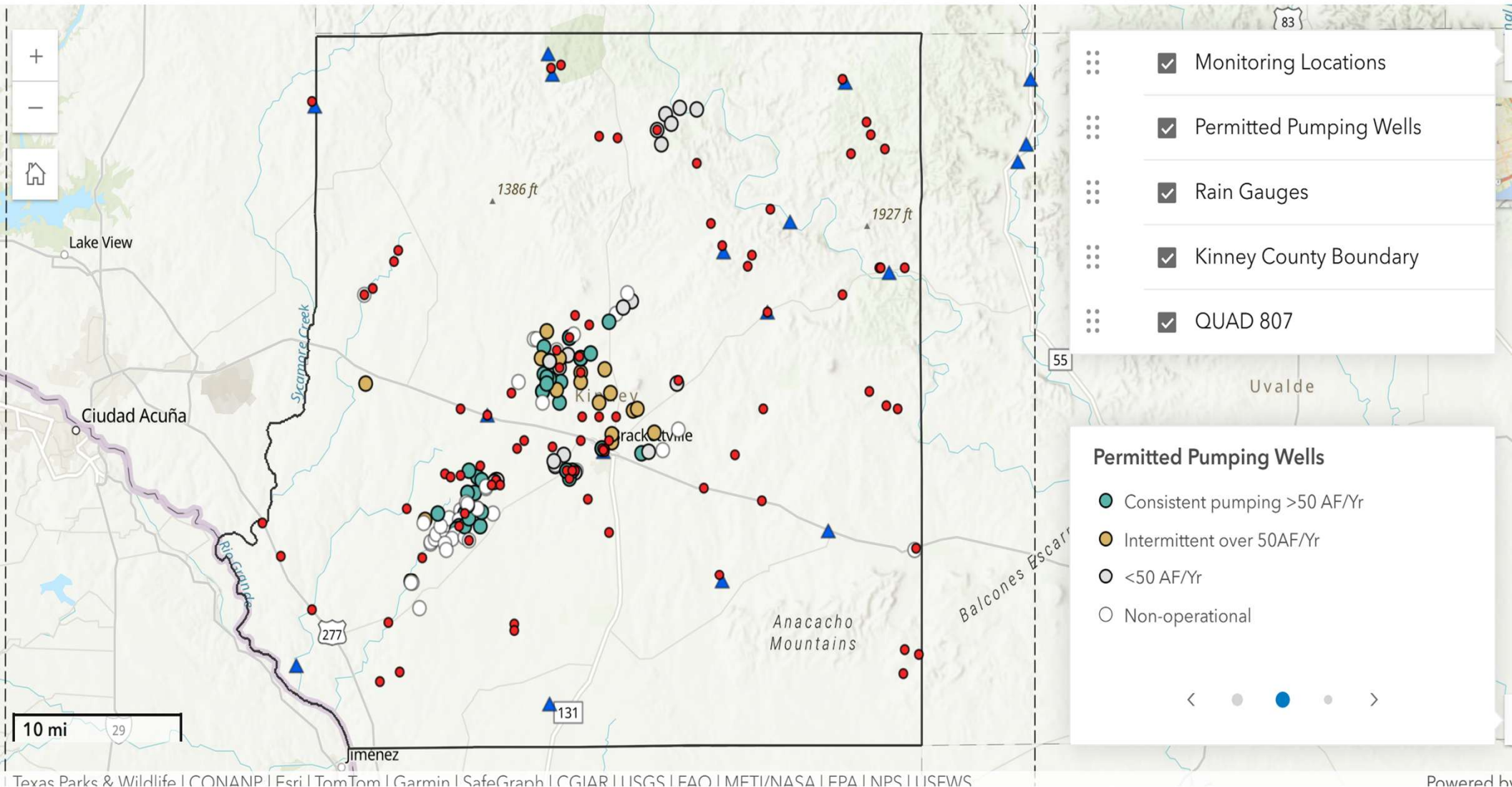
From:

To:

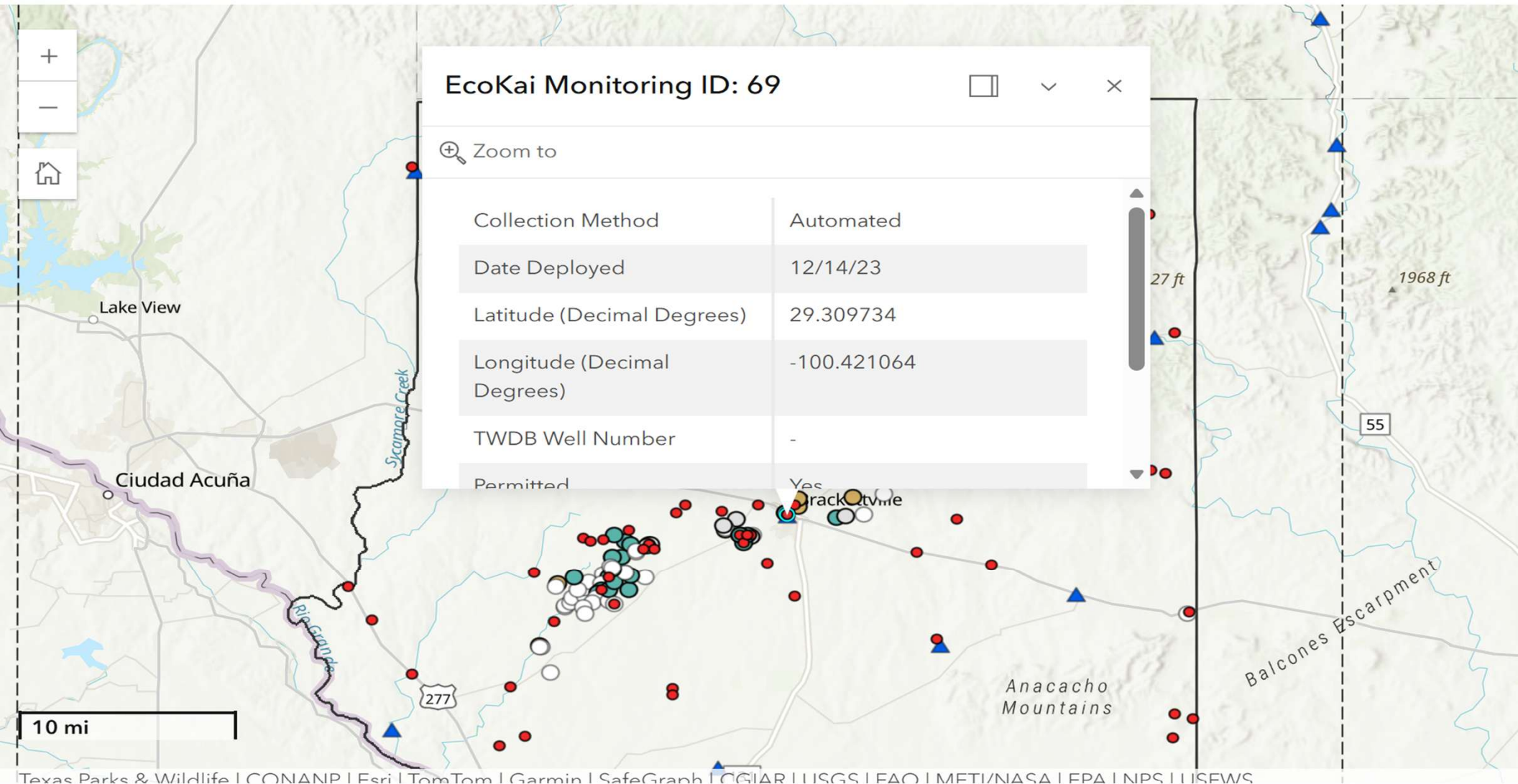
SET RANGE

Timestamps are in UTC-5

Kinney County Groundwater Conservation District Well and Rain Gauge Network

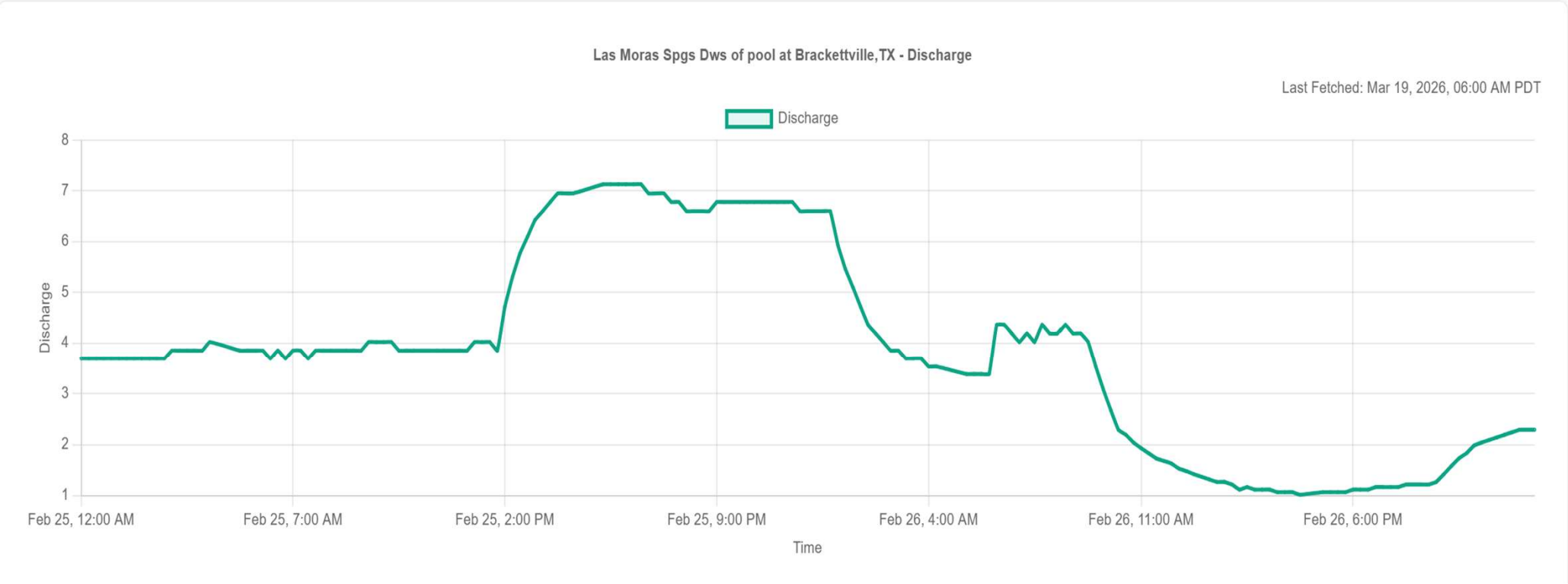


Kinney County Groundwater Conservation District Well and Rain Gauge Network



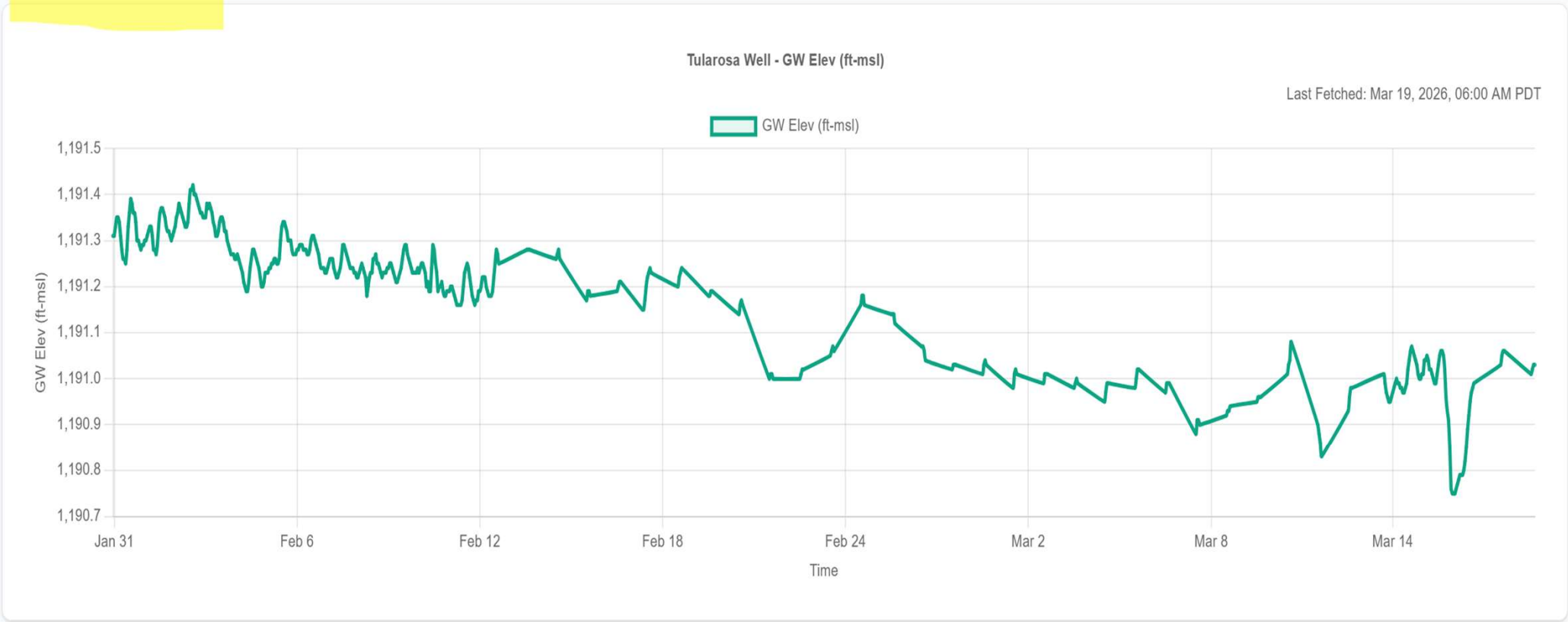
KCGCD Graph

Data Source: USGS
Location: Las Moras Spgs Dws of pool at Brackettville, TX (USGS)
Parameter: Discharge
Timezone: Local
Time Range: Custom
Start Date: 02/25/2026
End Date: 02/27/2026



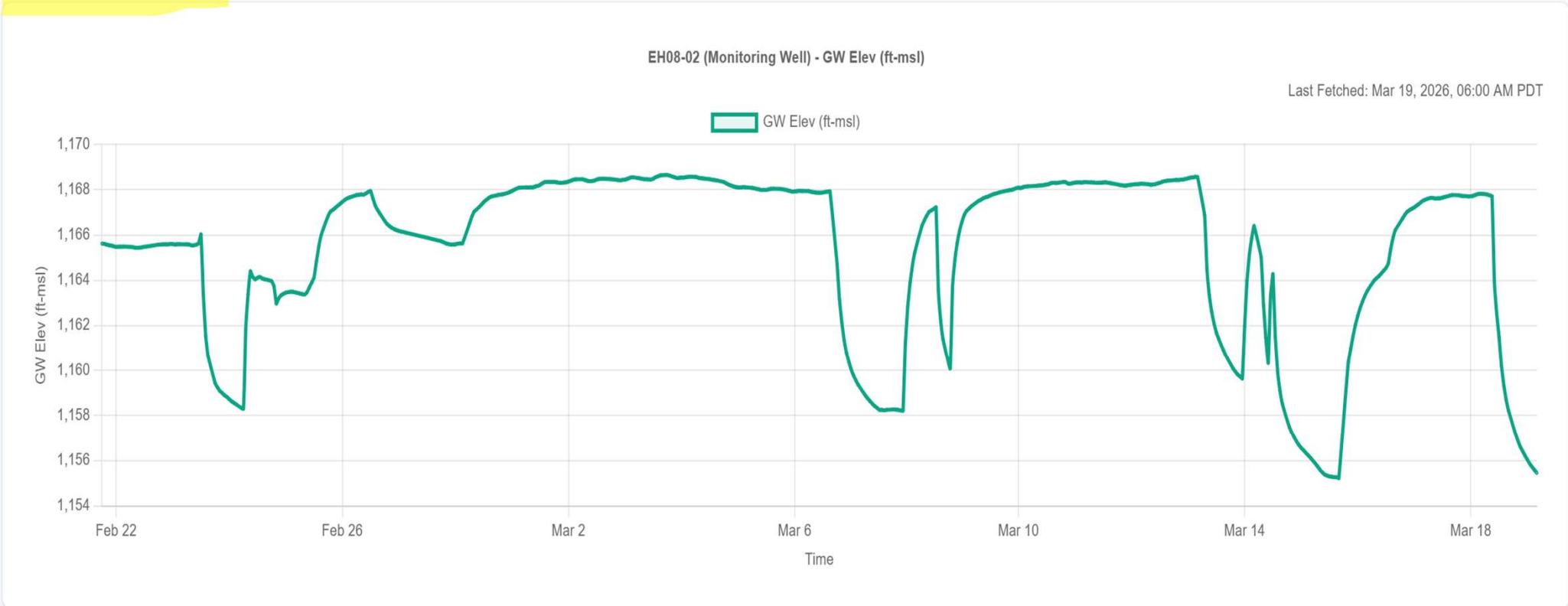
KCGCD Graph

Data Source: waterDataForTexas
Location: Tularosa Well (waterDataForTexas)
Parameter: Depth
Timezone: Local
Time Range: Default
Display Mode: **Groundwater Elevation**



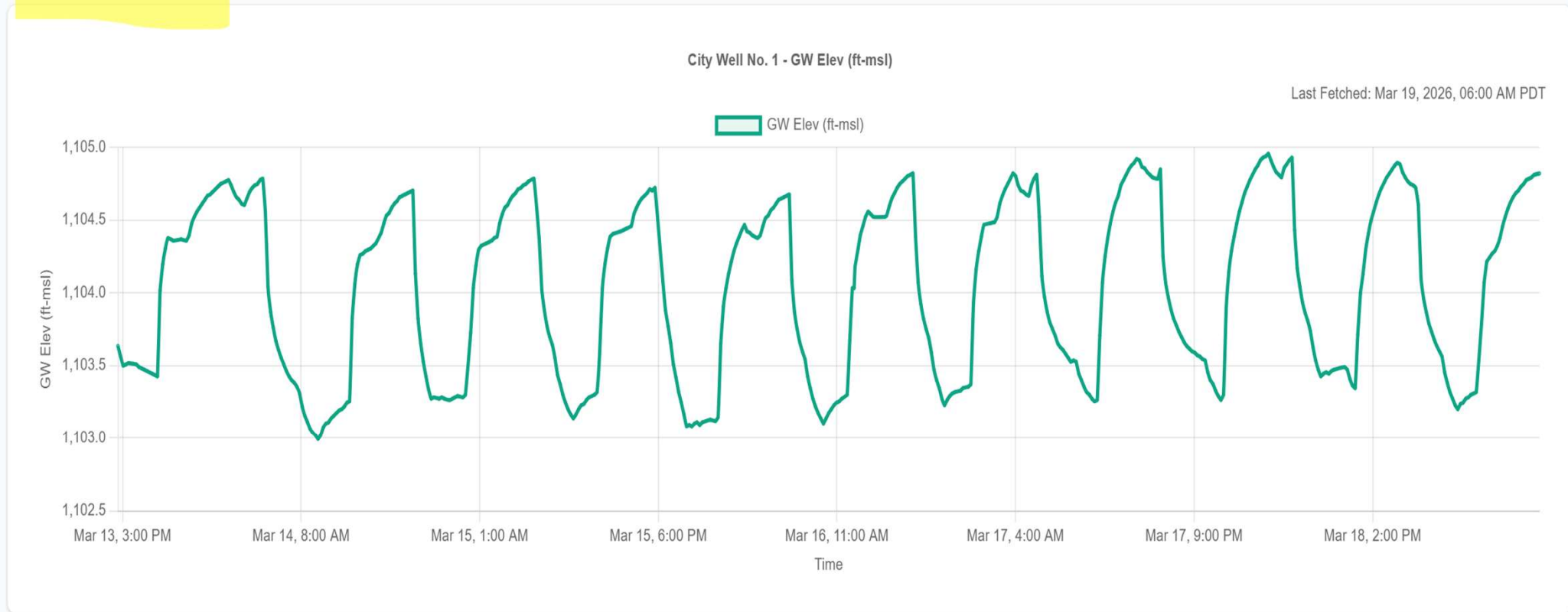
KCGCD Graph

Data Source: hydrovu
Location: EH08-02 (Monitoring Well) (hydrovu)
Parameter: Depth
Timezone: Local
Time Range: Default
Display Mode: Groundwater Elevation



KCGCD Graph

Data Source: signalFire
Location: City Well No. 1 (signalFire)
Parameter: Depth
Timezone: Local
Time Range: Default
Display Mode: Depth Groundwater Elevation



GO BACK

Groundwater Pumping Report

Permit ID

Well ID

Select groundwater pumping report type (fill in ONLY the information you need):

Select Submittal Year & Months

Submission Year

- Check here to report no water usage for this well
- Submit volume without meter reading (this submission is for the entire year)
- Use Meter Reading Mode (default is Monthly Volume)

Monthly Volumes

MONTH	MONTHLY VOLUME (ACRE-FEET)
January	<input type="text" value="0"/>

GO BACK

Reports

Submission

Outstanding submissions

Extracted Volume

Permittees Info

Permits Info

Well Info

Export Data

Permit ID

Well ID

Management Zone

GMA

Start Year

End Year

SEARCH

Comparing Groundwater Monitoring Programs in Texas



MPGCD
Middle Pecos GCD

137 Monitor Wells

110 Monthly (manual) e-line measurements

27 Real-Time Telemetry

BSEACD
Barton Springs Edwards Aquifer CD

78 Monitor Wells

72 Monthly (manual) e-line measurements

6 Real-Time Telemetry

“The investment and decisions made by KCGCD have laid a solid foundation for all future science and management actions. The longer these data points are active and collecting information, the more powerful this dataset becomes. Now as we begin infilling key areas, we continue building one of the most robust water level datasets in the state. This work is extremely impressive and is something that KCGCD should be very proud of.”



Vince Clause
Hydrogeologist, KCGCD



Where We Are Today & Looking Ahead

Where We Are Today



Existing Equipment Deployments



Cloud Based API Polling



Monthly Meter Readings



Increase *Real Time* Permitted Well Flow Monitoring

Increase Real Time Permitted Well Flow Monitoring

Looking Ahead



• Introduce Web Site Migration Graphing



• Introduce Additional AT 200's (*Specific Conductivity*)



• USGS Gauge Analysis - Grant

• Geophysical Logging - Grant

• Goal: Improve Conceptual Hydrogeologic Understanding

👁️ **MQTT** - *Implement as feasible*

Specific Conductance as an Indicator Path and Residence Time



Fast / Low EC

Rapid Response + Little EC Change

- Highly Conductive Conduits (karst, fractures)
- Shorter Residence Time

Low Specific Conductance



Slow / Elevated EC

Delayed Response + Elevated EC

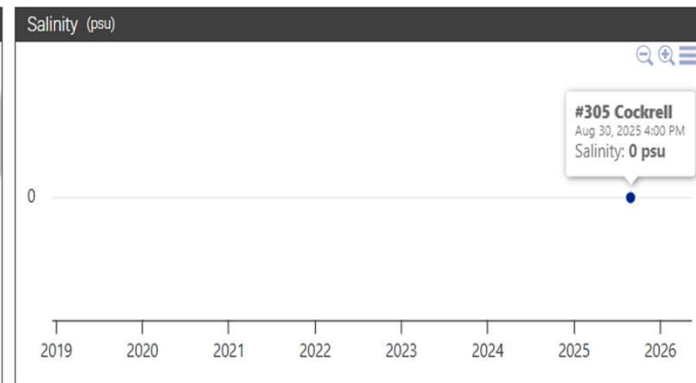
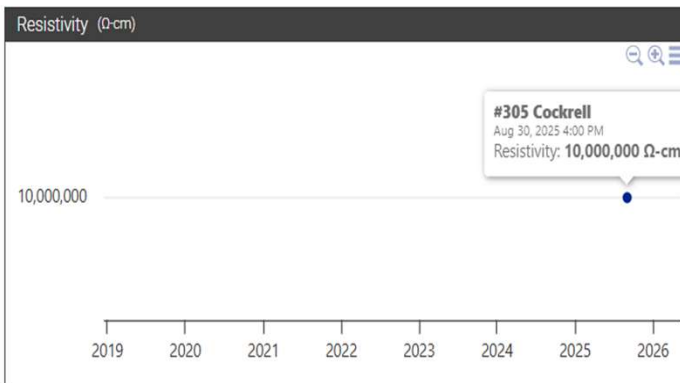
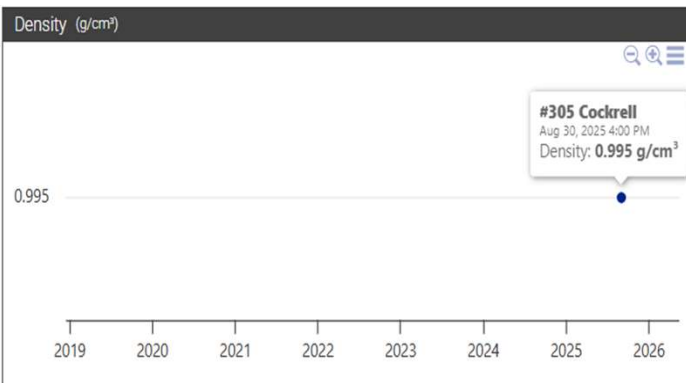
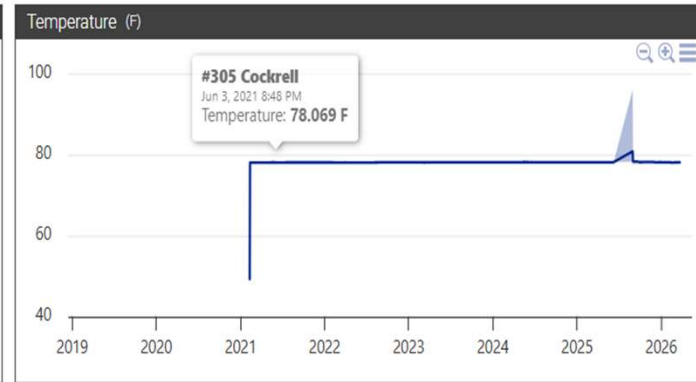
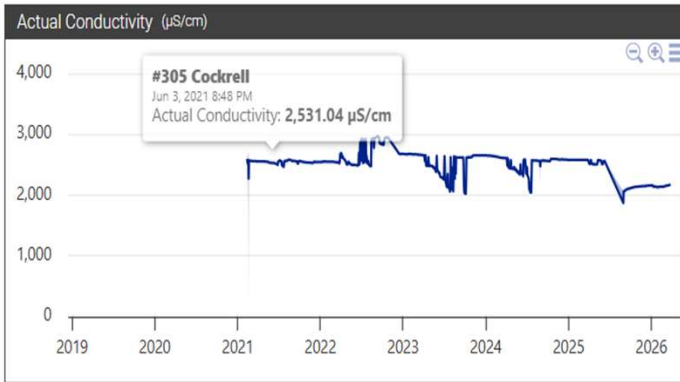
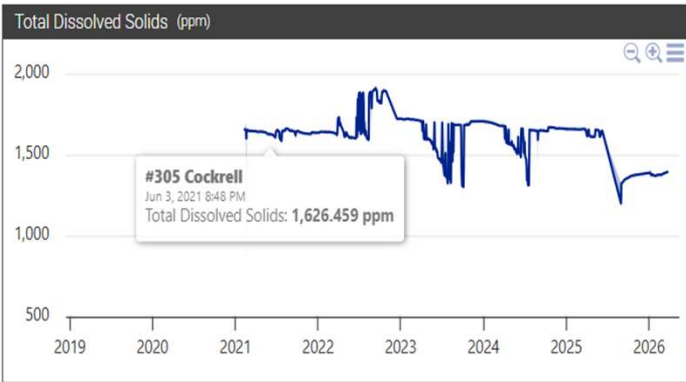
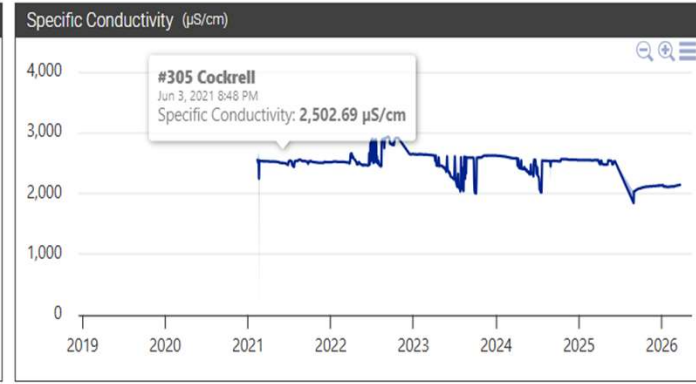
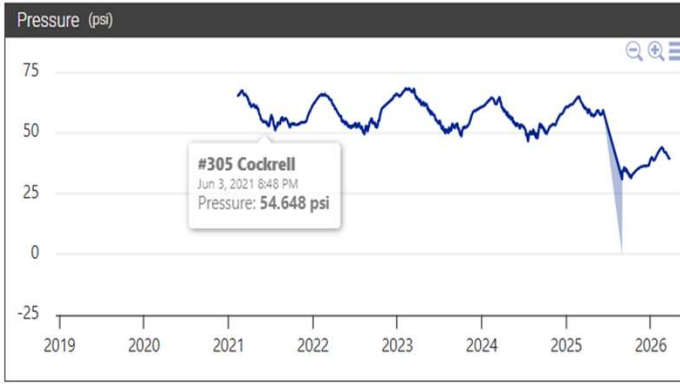
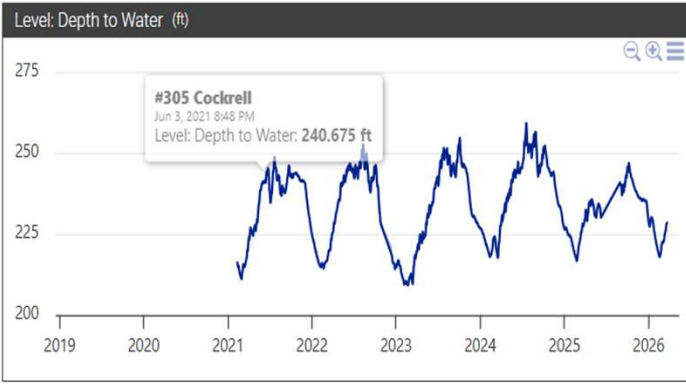
- Matrix Storage (slow movement)
- Longer Residence Time

High Specific Conductance



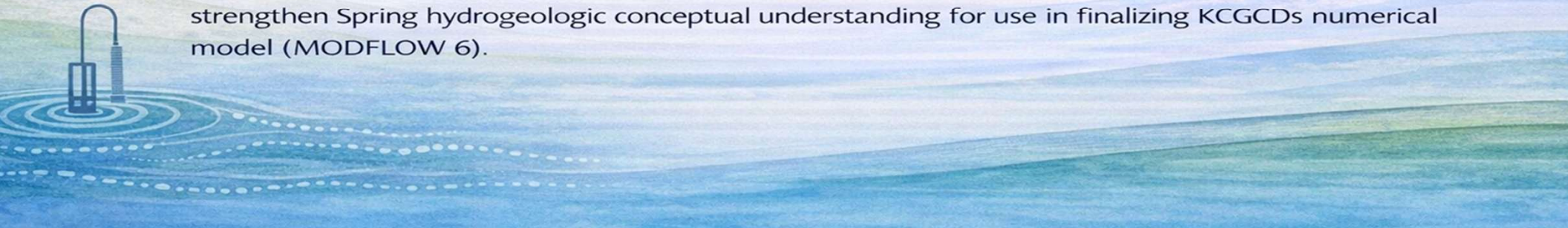
Specific Conductance Monitoring

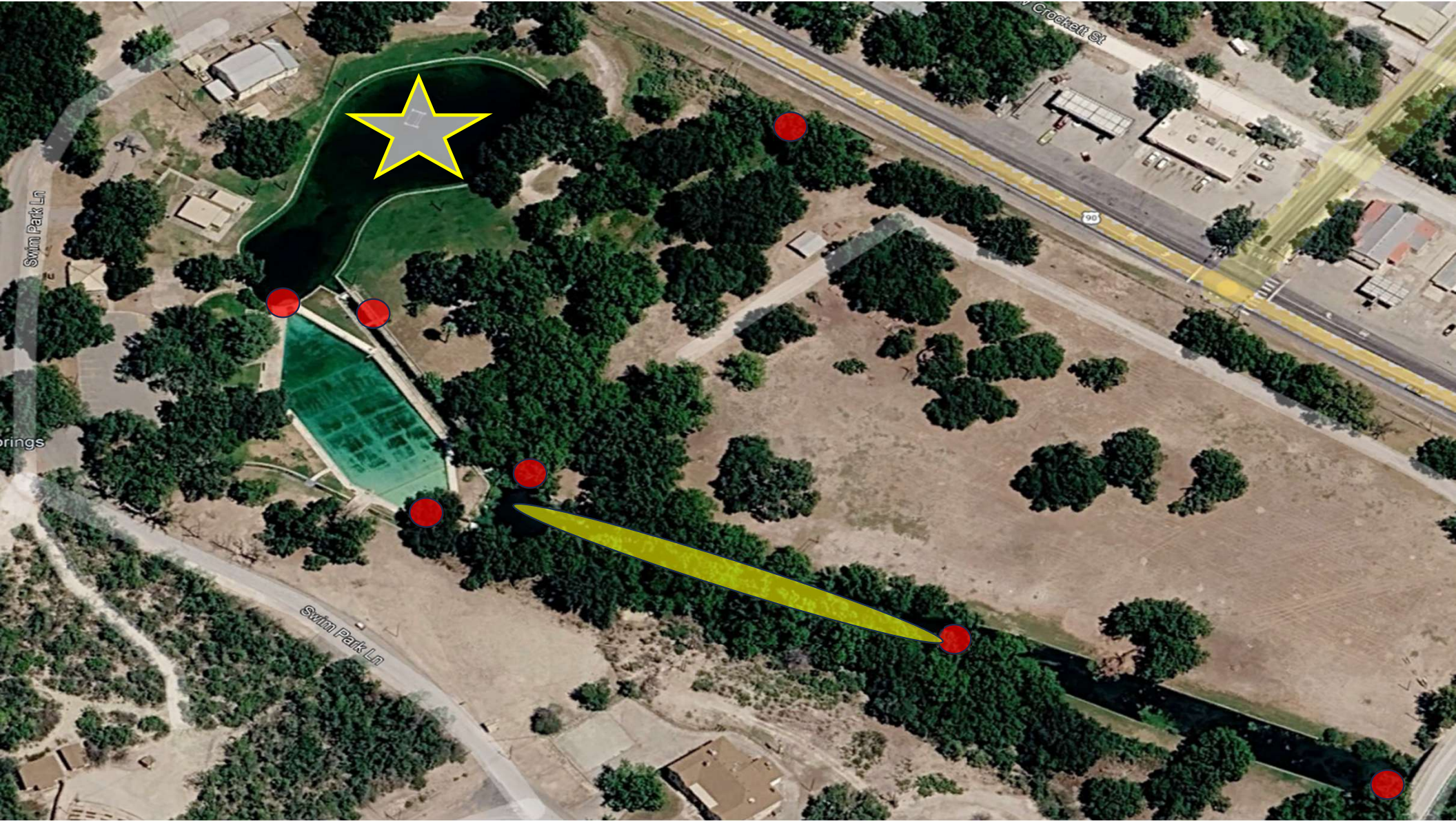




TWDB GRANT APPLICATION

- **Task 1 Objective (Discharge Attribution and Monitoring Defensibility):**
 - Quantify and defensibly allocate USGS gage 08456310 flow into component sources and gauge value influences. These include but not limited to Fort Clark Springs recreational pool operation, Gain / Loss segment of Creek before gauge, vegetation impediments causing downstream dam control, gauge sensor not at bottom of creek, rainfall influence, unmanaged / unknown discharge volume, upstream creek inflow, and other runoff / infiltration considerations.
- **Task 2 Objective (Proxy Water-Level Development):**
 - Compile and evaluate groundwater-water level data and evaluate statistical relationships between aquifer pressure and spring flow to identify one or more “proxy” wells that may provide an early warning and management relevant indicator of future spring discharge conditions. Understanding GMA 7 vs GMA 10 influences / TWDB’s Tularosa Monitoring Well.
- **Task 3 Objective (Subsurface Data for Zoning and Future Modeling):**
 - Complete geophysical well logs improve lithologic characterization of aquifer strata to strengthen Spring hydrogeologic conceptual understanding for use in finalizing KCGCDs numerical model (MODFLOW 6).

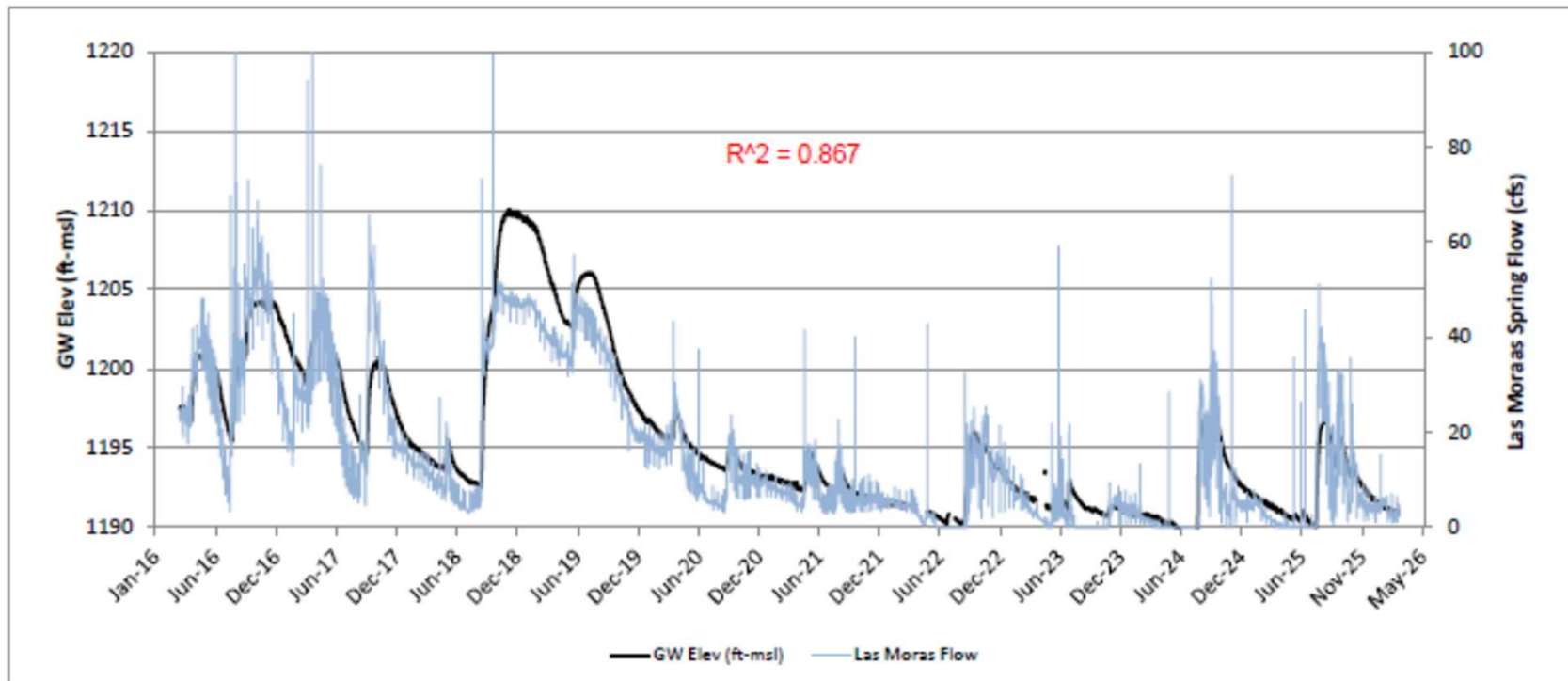




Tularosa Well (GMA 10)

TD = 775 ft, RP = 1382 ft-msl, Edwards BFZ, TWDB No. 7038902

Groundwater Elevation (ft-msl)*





QUESTIONS / ACKNOWLEDGEMENTS

This Program would not be possible without the unprecedented cooperation of Land Owners and their Managers in Kinney County and the historical dedication of our KCGCD Board of Directors who put science ahead of politics. For this I am truly grateful. Jim Burton

