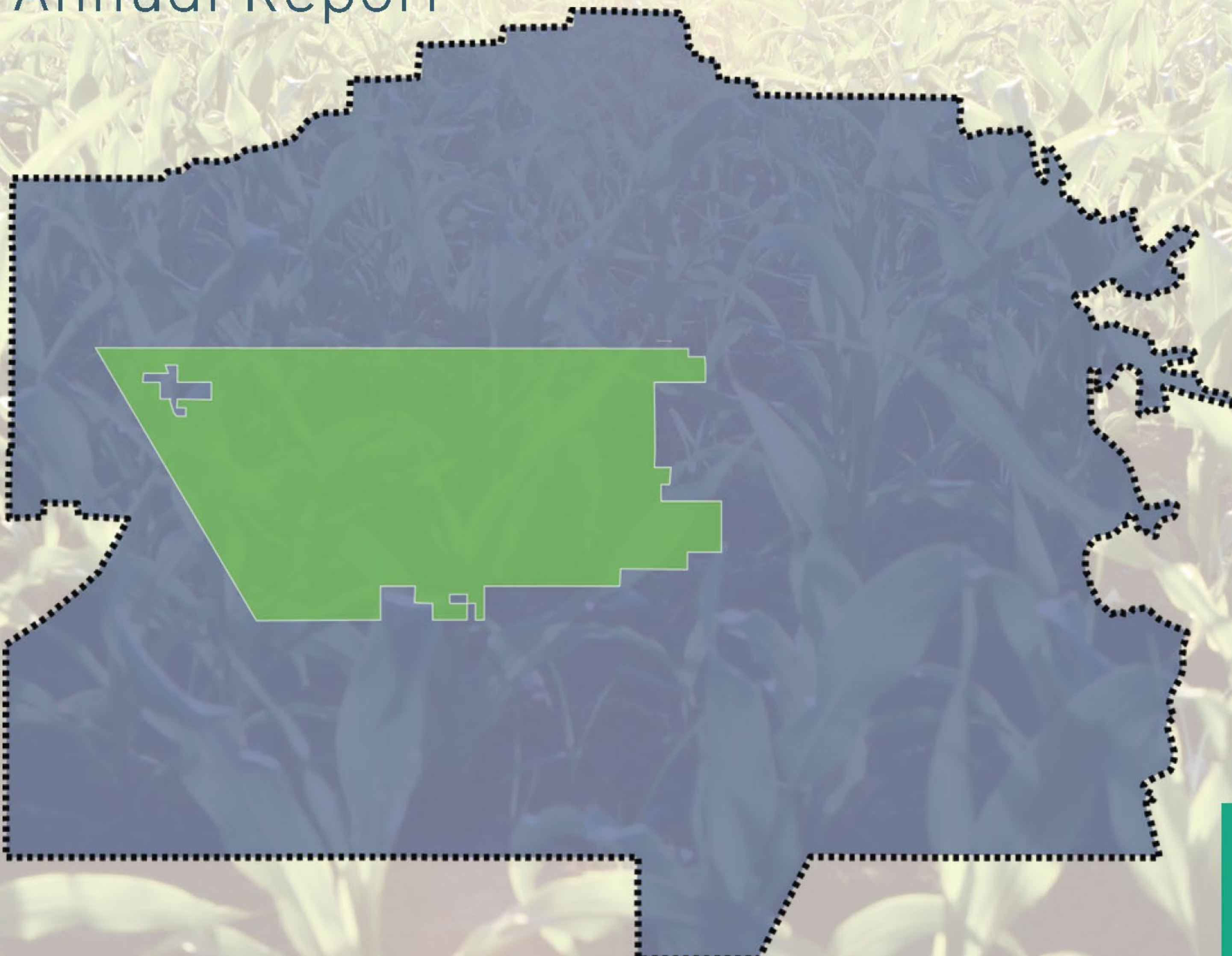
Sustainable Groundwater Management Act

Annual Report



Pixley Irrigation District GSA
Groundwater Sustainablity Agency
Tule Subbasin

October 2022 -September 2023

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ABBREVIATIONS & ACRONYMS

amsl	above mean sea level
CASGEM	California State Groundwater Elevation Monitoring
CDWR	California Department of Water Resources
CEOP	Communication, Engagement and Outreach Plan
CEQA	California Environmental Quality Act
CGQMP	Comprehensive Groundwater Management Plan
CIMIS	California Irrigation Management Information System
CSD	Community Services District
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DCTRA	Deer Creek Tule River Authority
DDW	Division of Drinking Water
DMS	Data Management System
DWR	Department of Water Resources
EC	Electrical Conductivity
ET	Evapotranspiration
EIR	Environmental Impact Report
FKC	Friant-Kern Canal
GAMA	Groundwater Ambient Monitoring and Assessment
GAR	Groundwater Assessment Report
GDEs	Groundwater Dependent Ecosystems
GFM	Groundwater Flow Model
GP	General Plan
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GQTMP	Groundwater Quality Trend Monitoring Program
GQTMW	Groundwater Quality Trend Monitoring Workflow
ILRP	Irrigated Lands Regulatory Program
InSAR	Interferometric Synthetic Aperture Radar
IRWM	Integrated Regional Water Management
IRWMGs	Integrated Regional Water Management Groups
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center

LTRID	Lower Tule River Irrigation District
LUSTs	Leaking Underground Storage Tanks
MOU	Memorandum of Understanding
MCL	Maximum Contaminant Level
NASA	National Aeronautics and Space Administration
NC	Natural Communities
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priority List
NTFGW	net to and from groundwater
PixID	Pixley Irrigation District
PPUD	Pixley Public Utility District
PUD	Public Utility District
RMS	Representative Monitoring Sites
RWQCB	Regional Water Quality Control Board
SAGBI	Soil Agricultural Groundwater Banking Index
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SREP	Success Reservoir Enlargement Project
SWRCB	State Water Resources Control Board
TBWQC	Tule Basin Water Quality Coalition
TCSD	Teviston Community Service District
TSMP	Tule Subbasin Monitoring Plan
UABs	Urban Area Boundaries
UDBs	Urban Development Boundaries
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WDL	Water Data Library

EXECUTIVE SUMMARY [§356.2(A)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(a) *General information, including an executive summary and a location map depicting the basin covered by the report.*

The Pixley Irrigation District Groundwater Sustainability Agency (Pixley GSA) has submitted The Annual Report for Water Year 2023 in compliance with Title 23 of the California Code of Regulations, Division 2, Chapter 1.5, Subchapter 2, Article 7, Section 356.2, as required under the Sustainable Groundwater Management Act (SGMA). This is the fifth annual report submitted by the Pixley GSA for the Tule Subbasin boundary identified by the California Department of Water Resources (CDWR) as No. 5-22-13 of the Tulare Lake Hydrologic Region (**FIGURE 1**). As per Section 356.2 This report summarizes data collection efforts and basin management from the preceding water year, October 1, 2022 through September 30, 2023.

Tule Subbasin's hydrogeologist, Thomas Harder and Company (TH&Co), has prepared an Annual Report summarizing groundwater conditions for the entirety of the Tule Subbasin for water year 2022-2023 (**ATTACHMENT 1**). Appendices A through F of the subbasin-wide Annual Report describe groundwater conditions within each of the eight Groundwater Sustainability Agencies (GSAs) based on Groundwater Sustainability Plans (GSPs) that collectively cover the subbasin. Section 2.1.2 of TH&Co's Annual Report provides a summary of groundwater elevation changes within the Pixley GSA plan area and Appendix B provides data specific to groundwater conditions within the Pixley GSA.

This 2022-2023 Sustainable Groundwater Management Act Annual Report provides results of groundwater monitoring efforts within the Pixley GSA from Representative Monitoring Networks. Representative Monitoring Network selection is based on the four applicable sustainability indicators outlined in section 6.2.2 of the Tule Subbasin Groundwater Sustainability Plan (GSP, 2022).

Key Findings:

Groundwater Levels: Groundwater levels within the Pixley GSA plan area are collected semiannually and varied during the reporting period. Groundwater elevations were measured in the Spring and Fall of 2023. In the Upper Aquifer, groundwater elevations were higher in Spring 2023 than they were in Fall 2023. In the Lower Aquifer, groundwater elevations were higher in Spring 2023 than they were in the Fall 2023. Groundwater Elevations in the Upper and Lower Aquifers were all above their respective Interim Milestones and Measurable Objectives.

Water Quality: Groundwater quality samples are collected annually from agricultural and drinking water wells within the Pixley GSA. Analysis in all drinking water RMS wells determined that water quality standards were upheld and did not exceed the measurable objectives or minimum thresholds. Samples from one RMS agricultural well were analyzed for Chloride, Sodium and Total Dissolved Solids (TDS). Results for Chloride met quality standards and did not exceed the measurable objective or minimum threshold. Results for TDS met quality standards and did not exceed the measurable objective or minimum threshold. Results for sodium exceeded both the measurable objective and minimum threshold.

Using Interferometric Synthetic Aperture Radar (InSar) data from DWR, TH&Co determined that within the Pixley GSA plan area, the total change in aquitard storage for the Upper Aquifer was +24,000 acre-ft. In the Lower Aquifer, total change in aquitard storage was -15,000 acre-ft

Groundwater Storage: During the reporting period, groundwater storage was 40.9330 million acre-ft. This is a 0.0240 million acre-ft increase from the previous water year.

Land Subsidence: 17 RMS benchmarks have been established to measure Land subsidence within the Pixley GSA plan area. In comparison with 2022 measurements, all 17 benchmarks indicated a drop in elevation. 5 RMS benchmarks exceeded the Interim Milestone elevations. 2 RMS benchmarks exceeded both their respective Interim Milestones and Measurable Objectives.

1 INTRODUCTION

1.1 DESCRIPTION OF THE TULE SUBBASIN

The Tule Subbasin is identified by the California Department of Water Resources (CDWR) as No. 5-22-13 of the Tulare Lake Hydrologic Region (see **ATTACHMENT 1**, Figure 1) is completely located within Tulare County and is approximately 744 square miles (475,895 acres). The following eight GSAs are located within Tule Subbasin (see **FIGURE 1**):

1. Eastern Tule Groundwater Sustainability Agency (ETGSA),
2. Tri-County Water Authority Groundwater Sustainability Agency (TCWA GSA),
3. Pixley Irrigation District Groundwater Sustainability Agency (Pixley GSA),
4. Lower Tule River Irrigation District Groundwater Sustainability Agency (LTRID GSA),
5. Delano-Earlimart Irrigation District Groundwater Sustainability Agency (DEID GSA)
6. Alpaugh Groundwater Sustainability Agency (Alpaugh GSA), and
7. Tulare County Groundwater Sustainability Agency (Tulare County GSA)
8. Kern-Tulare Water District Groundwater Sustainability Agency (KTWD GSA)

Six of the eight GSAs within the Tule Subbasin have developed and submitted independent Groundwater Sustainability Plans (GSPs) pursuant to 23 CCR §353.6 to the California DWR. Tulare County GSA has entered into Memoranda of Understanding (MOUs) concerning coverage of territories under adjacent GSPs. As such, their jurisdictional areas are included in the other six GSPs.

Pursuant to 23 Cal. Code Regs. §357.4(a), the six (6) GSPs for the Tule Subbasin have been developed and submitted under a Coordination Agreement to fulfill all statutory and regulatory requirements related to intra-basin coordination agreements pursuant to SGMA.

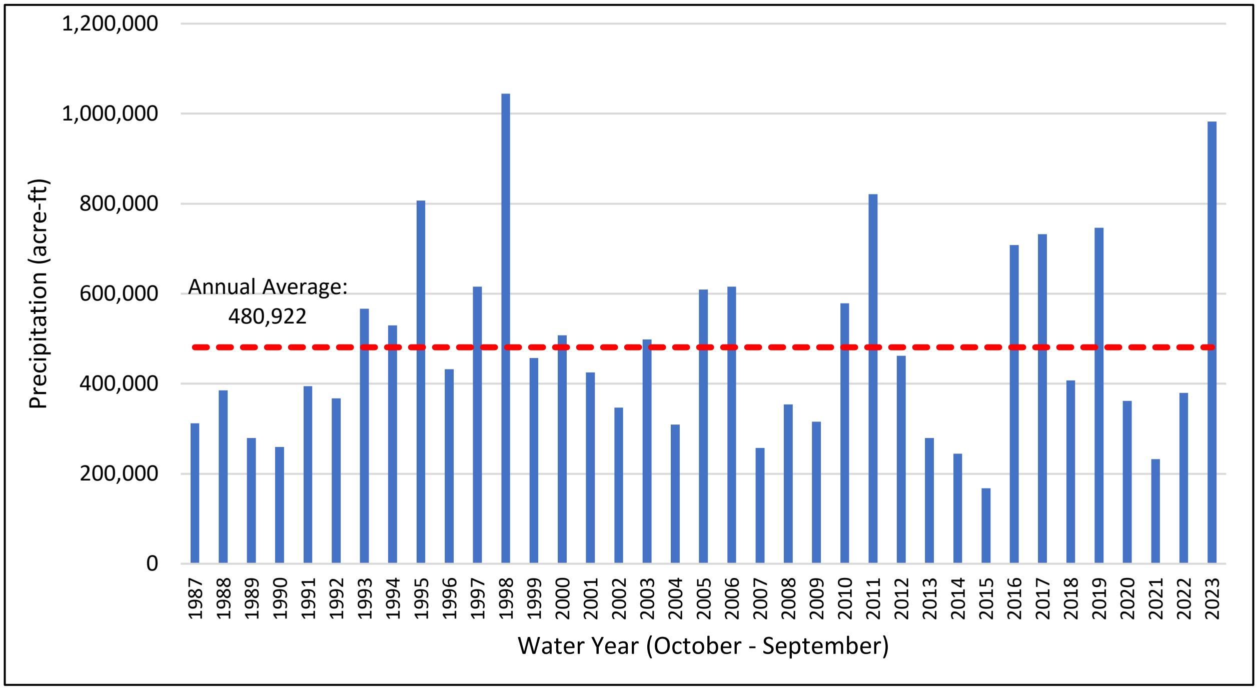
1.2 WATER YEAR CONDITIONS

Heavy precipitation during the reporting period generated an above average amount of runoff into streambeds resulting in above average surface water supplies available for use within the Tule Subbasin. The amount of total surface water for water year 2022/23 was approximately 1,733,730 acre-ft. The volume of water entering the Tule Subbasin as precipitation was estimated based on monthly remote sensing data provided by LandIQ.

1.2.1 PRECIPITATION

The 2022/23 water year experienced above average precipitation and runoff. Total precipitation at the Porterville precipitation station measured was 16.5 inches, which is more than the average precipitation for the area. The total volume of precipitation available for crops in 2022/23 was estimated to be approximately 509,000 acre-ft (**Attachment 1**). Based on data from the California Data Exchange Center (CDEC), the current annual precipitation is estimated at approximately 982,723 acre-feet, which surpasses the annual average of 480,922 acre-feet by 204% (**GRAPH 1-1**).

GRAPH 1-1: TULE SUBBASIN ANNUAL PRECIPITATION



Notes:
Data collected from the California Data Exchange Center (CDEC)

1.2.2 SURFACE WATER STREAM FLOW

Tule River, Deer Creek and White River are surface water features diverted for agricultural use in the Tule Subbasin. Due to the higher rates of precipitation in the 2022-23 water year, the percentage of surface water released from Success Reservoir into the Tule River 1,420% higher than the previous water year and 366% higher than 36-year averages. Surface water flows in Deer Creek and White River were both 439% higher than the 36-year average of 18,499 acre-ft and 6,516 acre-ft respectively, a 1,482% increase from the previous water year. Downstream diversion of surface water during the reporting period was 45,500 acre-ft within the Pixley GSA plan area. For comparison, there were no surface water supplies diverted in the 2021-2022 water year.

Section 3.4.1.1.1 of the Coordination Agreement defines stream inflow in the Tule River as releases from the Lake Success Reservoir. During the reporting period, 512,118 acre-ft of surface water was released from Success Reservoir into the Tule River. In the previous water year 34,389 acre-ft of surface water was released. The 36-year annual average stream flow from Success Reservoir is 127,038 acre-ft (**GRAPH 1-2**).

Section 3.4.1.1.2 of the Coordination Agreement states that streamflow in Deer Creek is measured by the USGS at their gaging station at Fountain Springs. Deer Creek is an uncontrolled stream located south of the Tule River. Flows in Deer Creek gradually dissipate by diversions, channel percolation, and evaporation. Pixley ID, Alpaugh ID, and TCWA GSAs reported 81,499 acre-ft of stream diversions in Deer Creek during the reporting period (**GRAPH 1-3**). Stream diversions were 25,583 acre-ft in the previous water year. Methods to determine flow in White River were performed in accordance to Section 3.4.1.1.3 of the Coordination Agreement. Stream inflow into the Tule Subbasin from the White River has historically been measured at the USGS stream gage near Ducor.

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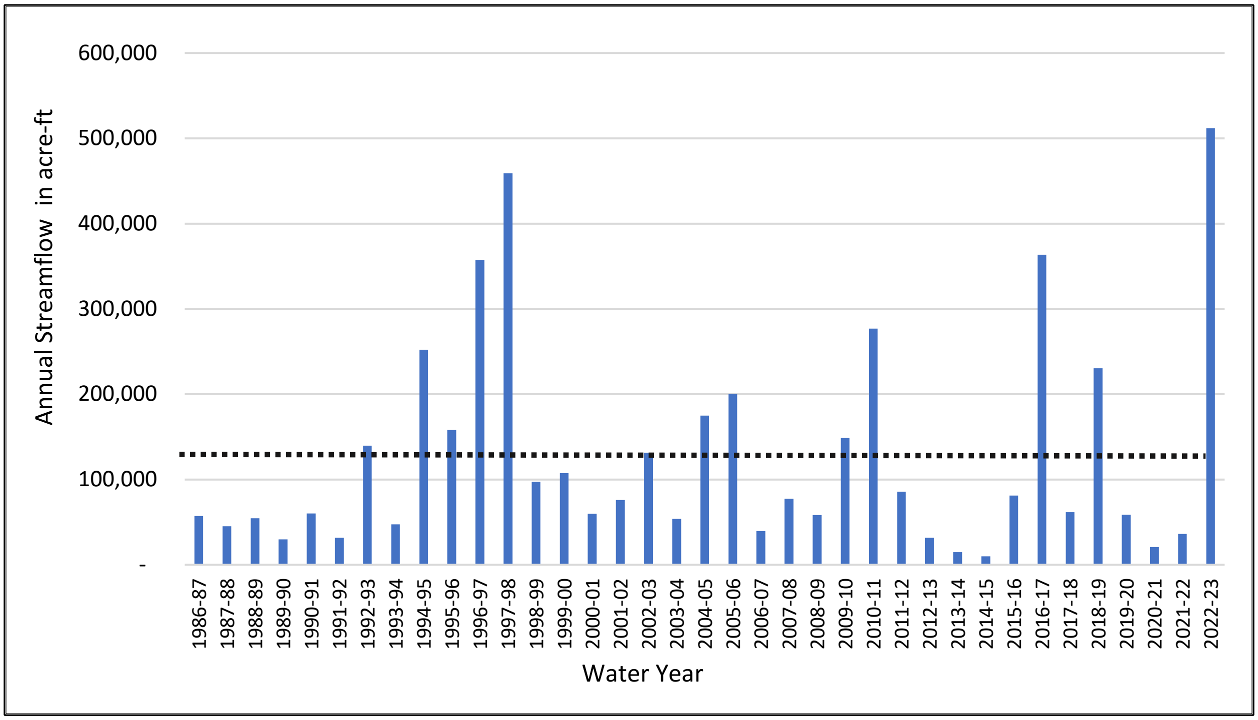
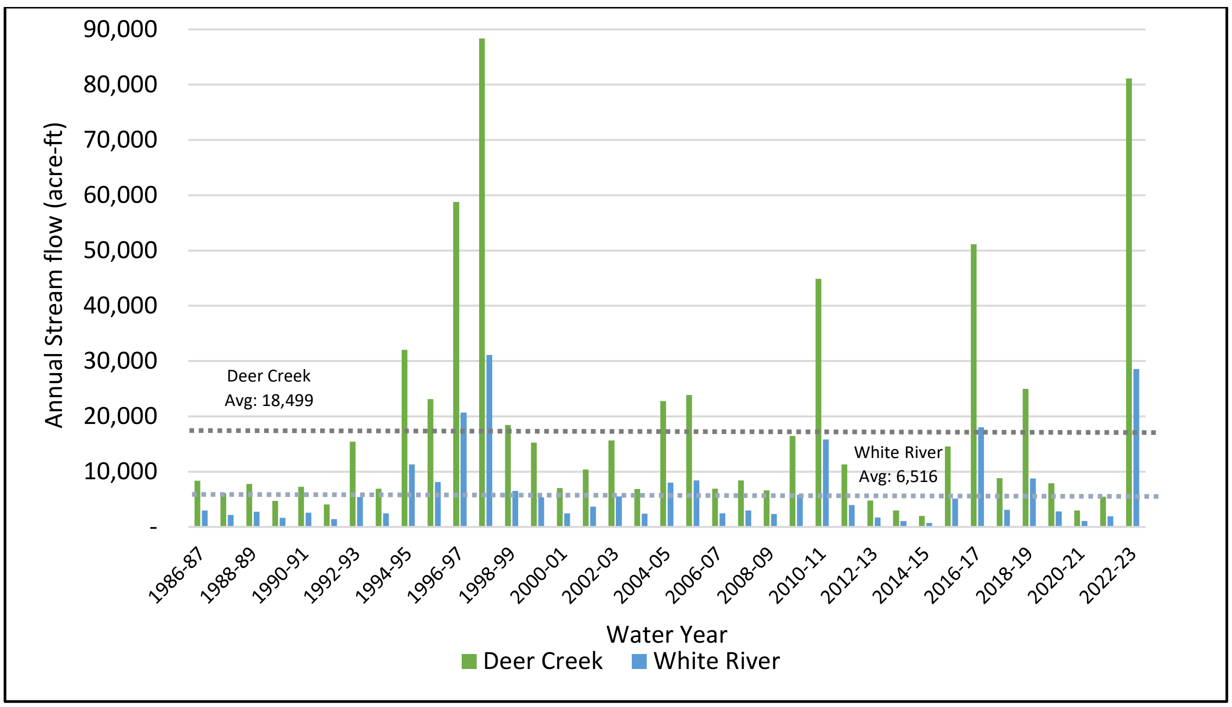
GRAPH 1-2: TULE RIVER ANNUAL STREAMFLOW



GRAPH 1-3: DEER CREEK AND WHITE RIVER ANNUAL STREAMFLOW



Notes

1.Tule River at Success Dam Drainage Area, 388 square miles

2. Computed flow at Success Dam by U.S.C.E.
3. Long-term annual average in in acre-ft based on USGS gaging station data. Deer Creek Gaging station was damaged in the March 2023 storms. 2023 Flow data for Deer Creek and calculated values for White River were provided by Pixley Irrigation District Gaging station

1.3 Description of the Pixley GSA Plan Area

The Pixley GSA is located in the west-central portion of the Tule Subbasin and encompasses 69,928 acres within Tulare County. The GSA Plan area includes lands within the jurisdictional boundaries of Pixley Irrigation District (Pixley ID, District) and the municipalities adjacent to the District, each of which the Agency has entered into agreements providing for the management of groundwater under the Pixley GSA GSP (see **Figure 1**).

Management Areas have been established to corresponded to the jurisdictional status and principal land use of their respective areas for defining different minimum thresholds and operate to different measurable objectives, understanding each management area presents unique circumstances and objectives for managing sustainably. Management areas are described by the following two (2) categories and displayed on **Figure 2**:

1. Pixley ID/ Agricultural Management Area
2. Municipal Management Area
    - Pixley Public Utility District (PUD)
    - Teviston Community Service District (CSD)

1.4 Hydrogeological Setting

The hydrogeological of the Tule subbasin is described in Section 1.2 of the Tule Subbasin 2022-2023 Annual Report (see **Attachment 1**), and a description relating to the Pixley GSA is provided below.

The GSA is located on a series of coalescing alluvial fans that extend toward the center of the San Joaquin Valley from the Sierra Nevada Mountains (see **Attachment 1**, Figure 3). The alluvial fans merge with lacustrine deposits of the Tulare Lakebed in the western portion of the GSA Plan area. Land surface elevations within the GSA range from approximately 400 ft above mean sea level (amsl) along the eastern boundary of the GSA to approximately 200 ft amsl at the western boundary (see **Attachment 1**, Figure 3).

Where saturated in the subsurface, the permeable sand and gravel layers form the principal aquifers in the Plan Area and adjacent areas to the north, south and west. Individual aquifer layers consist of lenticular sand and gravel deposits of varying thickness and lateral extent. The aquifer layers are interbedded with low permeability silt and clay confining layers. There are four (4) aquifer/aquitard units in the subsurface beneath the Plan Area (see **Attachment 1**, Figure 4):

1. Upper Aquifer
2. The Corcoran Clay Confining Unit
3. Lower Aquifer
4. Pliocene Marine Deposits (generally considered an aquitard)

Two primary aquifers have been identified within the Plan Area: an upper unconfined to semi-confined aquifer and a lower semi-confined to confined aquifer. The Upper and Lower Aquifers are separated by the Corcoran Clay confining unit in the western portion of the GSA.

In general, groundwater in the GSA Plan area flows towards a pumping depression located west portion of the GSA Plan area (see **Attachment 1**, Appendix D, Figures 7, 8, 9, and 10).

1.5 Monitoring Features within the Plan Area

The Tule Subbasin Technical Advisory Committee has developed a subbasin-wide monitoring plan, which describes the monitoring network and monitoring methodologies to be used to collect the data to be included in Tule Subbasin GSPs and annual reports. The subbasin-wide monitoring plan is included as Attachment 2 - the Coordination Agreement.

The Tule Subbasin TAC Monitoring Plan has identified representative monitoring sites (RMS) to assess progress with respect to groundwater elevation, groundwater quality, and land subsidence sustainability indicators in the GSA Plan Area.

1.5.1 Groundwater Elevation

Six Representative Monitoring Sites comprise the monitoring network for the Tule Subbasin groundwater elevation data collected from the Upper and Lower Aquifers (see **Figure 3**). Groundwater levels are collected semiannually. The initial sampling event takes place during the spring, while the second event is scheduled for fall to account for seasonal high and low groundwater condition

1.5.2 Groundwater Quality

Five RMS wells have been identified for the purpose of monitoring groundwater quality within the GSA Plan Area (see **Figure 3**). One of the RMS wells is designated as Agricultural use and two are designated as Drinking Use. Where available, groundwater quality data is also provided by Pixley PUD and Teviston CSD.

1.5.3 Land Subsidence

A land surface elevation monitoring network consists of 17 benchmarks installed in 2020 (see **Figure 4**). Each benchmark is a representative monitoring site. RMS Elevations are surveyed annually. Land surface elevation data collecting within the reporting period is provided in Appendix B of **Attachment 1**, along with established measurable objectives and minimum thresholds. Land subsidence measured from InSAR data provided by the DWR from October 2022 to September 2023 is shown on Figure 8 of the attachment.

1.5.4 Interim Milestones and Measurable Objectives

Sustainability indicators identified within Tule Subbasin are compared to the 2025-interim milestone, measurable objectives and minimum thresholds established for each RMS feature in Section 5 of the Pixley GSA GSP (GSP, 2022) to determine the GSA's progress toward successfully implementing its GSP.

The Tule Subbasin Groundwater Flow Model (GFM) projections were used for establishing SMCs for all sustainability indicators. By incorporating historical data, climate change, and the GSA's proposed projects and management actions, the GFM predicted conditions relative to each sustainability indicator as the basis for the established quantifiable interim milestones, measurable objectives, and minimum thresholds. As the GSPs are implemented, refined monitoring and data collection will result in the GFM providing more accurate predictions of groundwater conditions and adjustments will be made to the Sustainable Management Criteria (SMC) to reflect the best available data. These adjustments are expected to be made during the first periodic evaluation of the GSP in 2025.

2 GROUNDWATER MONITORING [§356.2(B)(1)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(b) *A detailed description and graphical representation of the following conditions of the basin managed in the Plan:*

(1) *Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:*

(A) *Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.*

(B) *Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.*

2.1 GROUNDWATER ELEVATIONS

6 Representative Monitoring Sites (**TABLE 2-1**) comprise the monitoring network for the Tule Subbasin groundwater elevation data collected from the Upper, Lower, and Composite Aquifers. Groundwater levels are collected semiannually. The initial sampling event takes place during the spring, while the second event is scheduled for fall to account for seasonal high and low groundwater conditions.

Efforts within the Pixley GSA Plan Area are underway to enhance the monitoring network by introducing additional RMS wells, aiming to address potential data gaps resulting from well removal. During the 2022-2023 water year, one well identified as a Representative Monitoring Site (RMS) and was integrated into the monitoring network specifically for the purpose of recording depth measurements.

TABLE 2-1: WELL COMPLETION INFORMATION

Well	Representative Monitoring Site Wells				
	Total Depth (ft bgs)	Top Perforation (ft bgs)	Bottom Perforation (ft bgs)	GSA	Management Area
Upper Aquifer					
22S/24E-23J01	400	--	--	PIXID	Pixley ID
23S/24E-28J02	500	200	500	PIXID	Pixley ID
22S/25E-25N01	437	--	--	PIXID	Pixley ID
PIDGSA-01 U	1020	400	1005	PIXID	Pixley ID
Lower Aquifer					
TSMW 1L	1010	500	1000	PIXID	Pixley ID
PIDGSA-01 L	840	340	840	PIXID	Pixley ID

2.1.1 WELL SELECTION

The Tule Subbasin TAC Monitoring Plan identified RMS to be relied on for the purpose of assessing progress with respect to the groundwater elevation. The representative monitoring sites are shown on **FIGURE 3.**

2.1.2 Data Collection

Groundwater elevations are measured semiannually during the reporting period. Prior to collection, property owners are notified and attempts are made to schedule sample collection while pumps are not running.

Technicians are dispatched to each of the six representative monitoring sites to collect a depth-to-water measurements in the Spring and Fall of each annual reporting period. Technicians utilize both acoustic and electric sounders to minimize the risk of contamination of domestic and irrigation wells. Sounders are decontaminated prior to each measurement. Field measurements are recorded in GoCanvas, an application utilized for fieldwork (**Appendix B**) Depth to Groundwater measurements are collected from a dedicated reference point referenced to the North American Vertical Datum of 1988.

2.1.3 Data Limitations

Three of the RMS wells in the monitoring network are privately owned and maintained. While significant outreach efforts are made to maintain contact with owners and provide information regarding the GSA and future monitoring plans, sampling is provided at the discretion of the well owner. Separately, to ensure groundwater elevations are accurate, pumps must be shut-off 24 hours prior to sampling to allow proper recharge prior to data collection, which can create conflicts with the agricultural schedules of landowners. Lastly, even with property owner approval, RMS wells are privately maintained, and the GSA cannot guarantee that well heads will be unlocked, that private roads will be accessible by sampling technicians, or that wells are in working order.

Limitations of the Monitoring Network are being addressed by continued investigation efforts to locate privately owned wells in the Pixley GSA Plan Area and in the drilling and installation of dedicated, aquifer-specific monitoring wells. To date PIDGSA-01 U, PIDGSA-01 L, and TSMW 1L have been installed as dedicated monitoring wells within the Pixley GSA Plan Area. These wells provide groundwater elevation data from the Upper and Lower Aquifers as shown in **Table 2-2**.

2.2 Groundwater Elevation Contour Maps [§356.2 (b)(1)(A)]

Groundwater elevation data for the Pixley GSA Monitoring Network is collected and provided to Thomas Harder and Company (TH&Co) to generate groundwater elevation contour maps of the Tule Subbasin. Detailed maps are available in **Attachment 1**. TH&Co uses data compiled from several regulatory monitoring networks including RMS wells in the Tule Subbasin Monitoring Network, wells monitored as part of the Irrigated Lands Regulatory Program (ILRP) and wells primarily monitored by local irrigation districts. RMS and ILRP wells are identified as being perforated in either the Upper Aquifer or Lower Aquifer (**Table 2-1**).

2.2.1 Upper Aquifer

Figures 7 and 8 in Appendix D of TH&Co Tule Subbasin 2022-2023 Annual Report displays groundwater contours for the Upper Aquifer in the GSA plan area for the spring and fall of 2023, respectively (see **Attachment 1**). Groundwater Elevation values are provided in **Table 2-2**.

Groundwater in the Upper Aquifer flows in a southwest direction from the base of the Sierra Nevada's along the east boundary of the GSA towards west boundary of the GSA Plan area. Groundwater elevations range from approximately 155 ft to -20 ft in the Upper Aquifer. All groundwater elevations were above their measurable objectives and minimum thresholds.

Groundwater elevation change within the Upper Aquifer of the GSA from Fall 2022 to Fall 2023 ranged from -10 ft to +30 ft. The northern regions of the Pixley ID Management Areas experienced rising groundwater elevations between 20-30 feet. In comparison, elevation change between Fall 2021 and Fall 2022 was between -5 ft and 0 ft loss of elevation.

2.2.2 LOWER AQUIFER

Figures 8 and 9 of Appendix D in the Tule Subbasin 2022-2023 Annual Report displays groundwater contours maps for the Lower Aquifer in the Pixley GSA plan area for the spring and fall of 2023, respectively (see **ATTACHMENT 1**).

Groundwater in the Lower Aquifer flows east to west and flow is influenced by the pumping depression prevalent in the upper aquifer. Groundwater elevations range from approximately 95 ft to approximately -120 ft. All Groundwater elevations in the lower aquifer were above their measurable Objectives and minimum thresholds.

TABLE 2-2: GROUNDWATER LEVELS AT REPRESENTATIVE MONITORING SITES

RMS Well	Groundwater Elevation (NAVD88[1])[2]				2025 Interim Milestone[3]	Measurable Objective[3]	Minimum Threshold[3]
	Spring 2022	Fall 2022	Spring 2023	Fall 2023			
Upper Aquifer							
22S/24E-23J01	-32.5	-41.2	-29.5	-20.5	-48	-54	-112
23S/24E-28J02	77.5	84.0	82.7	90.0	63	26	15
22S/25E-25N01	16.9	1.6	10.9	13.8	3	-9	-89
PIDGSA-01 U	53.73	48.13	152.6	155	115	109	99
Lower Aquifer							
TSMW 1L	-99.2	-169.7	-73.4	-99.2	-171	-161	-237
PIDGSA-01 L	94.9	64.0	101.8	95.0	61	60	-2

Notes:
1. NAVD88 = North American Vertical Datum of 1988
2. Groundwater elevations are calculated from depth to water measurements taken January 3 - February 9, 2023 and October 3 -17, 2023
3. 2025 Interim Milestones, Measurable Objective and Minimum threshold provided in Pixley Irrigation District Groundwater Sustainability Plan

2.3 GROUNDWATER HYDROGRAPHS [§356.2 (b)(1)(B)]

Groundwater Level hydrograph for Representative Monitoring Site (RMS) wells in the Pixley GSA plan area are provided in Figure 1 through 3 of Appendix D in the Tule Subbasin 2022-2023 Annual Report (see **ATTACHMENT 1**).

The GSA has identified 6 wells to use as Representative Monitoring Sites (RMS), six of which are perforated in the Upper Aquifer, two are perforated in the Lower Aquifer.

Groundwater levels taken from monitoring wells perforated in the Upper Aquifer showed a slight increase in Fall 2023 compared to Spring 2023. All Upper Aquifer groundwater levels are above their respective Interim Milestones and Measurable Objectives.

Of the Lower Aquifer monitoring wells, groundwater levels were within historical averages. Groundwater levels in the lower Aquifer can be highly variable due to the confined nature of the aquifer and may be influenced by nearby pumping. Both Lower Aquifer monitoring wells were above their respective Interim Milestones and Measurable Objectives.

2.4 GROUNDWATER QUALITY [§356.2 (C)]

The Pixley GSA utilizes the RMS monitoring wells and Consumer Confidence Reports (CCRs) as the existing regulatory water quality programs for monitoring water quality and setting baseline standards that are applicable to the overlying land uses and users of the groundwater.

2.4.1 INTERIM MILESTONES AND MEASURABLE OBJECTIVES

There are three (3) water quality RMS wells within the PIXID GSA Plan area. Additionally, the GSA will analyze water quality data from the communities of Pixley and Teviston municipal wells for monitoring water quality conditions throughout the implementation of its GSP. The basis for setting SMC's at each RMS location as described in the PIXID GSA GSP is outlined below:

The interim milestones and measurable objective for the Groundwater Quality Sustainability Indicator have been quantified using the following available data:

- Utilizing historical groundwater quality data from the existing RMS wells which are monitored under separate groundwater quality regulatory programs, such as those wells monitored under the California Regional Water Quality Control Board Irrigated Lands Regulatory Program, CV-Salts Nitrate Control Program, and those associated with Public Water Systems
- Other relevant information is discussed in the Tule Subbasin Setting.

The following three (3) steps detail the process for setting interim milestones and the measurable objective at individual RMS related to Groundwater Quality:

Step 1:
Locate the RMS defined in the Tule Subbasin Monitoring Plan, identify which portion of the aquifer it represents, and the associated Constituents of Concern (COC) to be monitored at the RMS based on beneficial uses and users of groundwater represented by the RMS well (Agricultural, Drinking Water) as described below:

Drinking Water: The RMS well is within an urban MA or 1-mile of a public water system**.**

Agricultural: Greater than 50% of the pumping within the representative area is determined to be agricultural and there are no public water systems within a 1-mile radius.

Agricultural or drinking water constituents of concerns will be evaluated based on the established Maximum Contaminate Level (MCL) or Water Quality Objectives (WQO) by the responsible regulatory agency. In the case of drinking water, the following title 22 constituents will be monitored and for agricultural the following Basin Plan Water Quality Objective (WQO) COC as identified in **TABLE 2-3.**

Step 2:

Establish measurable objectives and interim milestones at each groundwater quality RMS well based on 75% of the regulatory limits set as part of the responsible regulatory programs that are applicable to the identified beneficial uses and users of groundwater represented by the RMS well as shown in **TABLE 2-3**.

Step 3:

Evaluate historical groundwater quality data for instances where SMCs established at RMS wells have been historically exceeded not as a result of implementation of a GSP. In those instances, SMCs will not be set at the MCLs or WQOs, but rather the pre-SGMA implementation concentration. Continued monitoring of RMS wells will be conducted to evaluate if further degradation is occurring at each RMS location.

TABLE 2-3: CONSTITUENTS OF CONCERN BY BENEFICIAL USE

Drinking Water Use[1]	EPA Method[2]
Arsenic	EPA 200.8
Nitrate as N	EPA 300.0
Hexavalent Chromium	EPA 218.7
Dibromochloropropane (DBCP)	EPA 3504.2
1,2,3-Trichloropropane (1.2.3-TCP)	SRL 524M-TCP
Tetrachloroethene (PCE)	EPA 524.2
Chloride	EPA 300.0
Total Dissolved Solids	SM 2540C
Perchlorate	EPA 314.0
Agricultural Use[1]	**EPA Method[2]**
Chloride	EPA 300.0
Sodium	EPA 200.7
Total Dissolved Solids	SM 2540C

Notes:
1. Pixley Irrigation District Groundwater Sustainability Agency (PixID GSA) “Sustainable Groundwater Management Act Groundwater Sustainability Plan Revised 2022”
2. EPA - U.S. Environmental Protection Agency and SM - Standard Method.

2.4.2 MONITORING NETWORK

The water quality monitoring network consists of three (3) water quality RMS wells within the PixID Plan Area (**FIGURE 3**). One RMS well is designated for Drinking Water use, one RMS well is designated for Agricultural Use, and one RMS well is designated for RMS well is designated for mixed use. Constituents of Concern for each designated use are shown in **TABLE 2-3**. Additionally, the GSA analyzes water quality data collected by the communities of Pixley and Teviston from municipal wells for monitoring water quality conditions throughout the implementation of its GSP. In addition, the GSA collects data from public community water systems as part of monitoring efforts. The data provided is averaged. The GSA monitors and coordinates to determine if groundwater pumping activities are contributing to undesirable effects related to degraded water quality. For Municipal management areas, water quality data gathered from Consumer Confidence Reports will be utilized rather than quality readings taken from individual wells.

TABLE 2-4: MINIMUM THRESHOLDS AND MEASURABLE OBJECTIVES FOR GROUNDWATER QUALITY

Constituent	Units[1]	Minimum Thresholds		Interim Milestone & Measurable Objectives[2]	
		Drinking Water Limits	Agricultural Water Quality Objective	75% Drinking Water Limits	75% Agricultural Water Quality Objective
		(MCL/SMCL)	(WQOs)	(MCL/SMCL)	(WQOs)
Arsenic	ppb	10	N/A	7.5	N/A
Nitrate as N	ppm	10	10	7.5	N/A
Hexavalent Chromium	ppb	10	N/A	7.5	N/A
Dibromochloropropane (DBCP)	ppb	0.2	N/A	0.15	N/A
1,2,3-Trichloropropane (1,2,3-TCP)	ppt	5	N/A	3.75	N/A
Tetrachloroethene (PCE)	ppb	5	N/A	3.75	N/A
Chloride	ppm	250	106	375	79.5
Sodium	ppm	N/A	69	N/A	51.75
Total Dissolved Solids	ppm	1,000	450	750	337.5
Perchlorate	ppb	6	N/A	4.5	N/A

Notes:
1. ppt = parts per trillion, ppb = parts per billion, ppm = parts per million, MCL = maximum Contaminant Level, SMCL = Secondary Maximum Contaminant Level
2 Pixley Irrigation District Groundwater Sustainability Agency (PixID GSA) "Sustainable Groundwater Management Act Groundwater Sustainability Plan Revised 2022

2.4.3 DATA COLLECTION

Samples for Constituents of Concern are collected annually, beginning in late May through July. Groundwater wells are sampled by purging the well for a period of time adequate to purge the pump riser pipe or a period of time sufficient for water quality parameter readings for temperature, pH, EC, dissolved oxygen, and turbidity to stabilize within 10 percent. Groundwater parameters are collected using a YSI meter which is calibrated and maintained prior to each sampling event. If the well is pumping upon the technician's arrival, the sample may be taken without purging the well. Water samples can then be collected from the discharge point nearest the well head. In some instances where the pump head has been removed, Hydrasleeves are utilized for sample collection. However, agricultural wells with functional pump heads are only available for collection when landowners are utilizing the well for groundwater pumping. Laboratory-prepared bottles are filled and placed on ice before being transported to BSK laboratories in Fresno, California

2.4.4 DATA LIMITATIONS

The GSA acknowledges a gap in data related to individual domestic well water locations, pertaining to water quality. The GSA will address this gap in coordination with Tulare County and other water quality regulatory programs and agencies that are being coordinated with this GSP, such as the Tule Basin Management Zone. Although the GSA cannot assume responsibility for failure of individual wells, the GSA may consider additional management actions beyond those identified in Section 5 of the revised GSP (GSP, 2022) if a domestic well goes dry due to the chronic lowering of groundwater levels during plan implementation. Any such action would be implemented in coordination with Tulare County and in accordance with existing programs for drought mitigation assistance implemented during the last major drought.

2.4.5 RESULTS

Sampling results for the annual groundwater quality monitoring event are provided in **TABLE 2-5** for Agricultural designated wells and **TABLE 2-6** for Drinking water wells.

TABLE 2-5: RMS WATER QUALITY IN AGRICULTURAL DESIGNATED WELLS

Constituent	Results		
	2023	Measurable Objective	Minimum Threshold
RMS Well: PIDGSA-01U - Agricultural			
Chloride (ppm[1])	21	375	500
Sodium (ppm)	54	51.75	69
TDS (ppm)	280	338	450

Notes:
1. ppm = parts per million

2.4.6 AGRICULTURAL RESULTS

RMS Well PIDGSA-01U is designated for Agricultural use based on geographical distance to public water systems and amount of agricultural pumping with its representative area (GSP, 2022). Constituents of concern for agricultural wells are identified as Chloride, Sodium and Total Dissolved Solids[1]. PIDGSA-01U was sampled June 12, 2023 and results are provided in **TABLE 2-5**. Sampling results exceeded the measurable objective and minimum threshold for Sodium. Results for Chloride and TDS did not exceed the Measurable Objective or Minimum Threshold. Continued monitoring will determine if degradation of groundwater quality by basin use is occurring at this RMS Location.

2.4.7 DRINKING WATER RESULTS

RMS wells 22S/25E-30, Pixley PUD CCR and Teviston CSD CCR are designated for drinking water use based on geographic location to a public water system and within the boundary of an urban Management Area. RMS well 23S25E-08G01 is designated for mixed use.

Due to access issues during the annual sampling event, samples could not be collected from RMS well: 21S/27E-18M01M. Discussions are currently underway to determine if a new RMS well will be selected to replace RMS Well: 21S/27E-18M01M.

RMS Well: 23S/28E-04K01 was sampled June 8, 2023. Results are provided on **Table 2-6**. Constituents of Concern sampled during the annual sampling event did not exceed either Minimum Threshold or Measurable Objectives.

Water quality results for Pixley Public Utility District (PUD) and Teviston Community Service District (CSD) are accessed from the Safe Drinking Water Information System (SDWIS) database. Historical data can be accessed from 2013 to 2023. A 10-year average of historical data is provided in **TABLE 2-6** for all constituents of Concern to summarize the long-term averages of constituents in municipal drinking water.

[1] General Order R5-2013-0120-09, California Regional Water Quality Control Board

TABLE 2-6: RMS GROUNDWATER QUALITY DATA IN DRINKING WATER DESIGNATED WELLS

			Results[2]									
Constituent	Designated Use	Sample date	Arsenic	Nitrate as N	Hexavalent Chromium	Dibromochloropropane	1,2,3-Trichloropropane	Tetrachloroethene	Chloride	Sodium	Total Dissolved Solids	Perchlorate
Units			ppb	mg/L	ppb	ppb	ppt	ppb	ppm	ppm	ppm	ppb
MCL[1]	--	--	10	10	10	0.2	5	5	500	N/A	1000	6
Minimum Threshold	--	--	10	10	10	0.2	5	5	500	N/A	1000	6
Measurable Objective	--	--	7.5	7.5	7.5	0.15	3.75	3.75	375	N/A	750	4.5
RMS Well: 22S/25E-30 (E0259438)	Drinking	6/7/2023	ND	10	1.6	ND	ND	ND	26	47	350	ND
RMS Well: 23S/25E-08G01 (724662)	Mixed	6/12/2023	2.2	2.6	1.3	ND	ND	0.037	9.5	30	140	ND
RMS Well: Pixley PUD CCR	Drinking	2023	14.14	2.78	3.26	ND	0.02	NS	22.68	47.15	158.31	ND
RMS Well: Teviston CSD CCR	Drinking	2023	5.85	3.35	NS	ND	0.02	NS	11.95	44	155	ND

Notes:
1. mg/L = milligrams per liter, ppb = parts per billion, ppm = parts per million, MCL = Maximum Contaminant Level
2. Refer to table 2-3 for EPA methods
3. Data Provided by CCR
4. Not Detected
5. Not Sampled

3 Groundwater Extractions [§356.2(b)(2)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(b) *A detailed description and graphical representation of the following conditions of the basin managed in the Plan:*

(2) *Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.*

Groundwater extractions within the GSA Plan area are categorized as agricultural or municipal. Land use within the GSA plan area is predominantly associated with agriculture, the majority of the groundwater extractions within the GSA plan area are attributed to meeting crop demands that are not met through effective precipitation or diverted surface and imported water supplies.

3.1 Agriculture

The process for determining agricultural groundwater pumping within the Tule Subbasin is described in Section 3.2.1 of the Tule Subbasin 2022-2023 Annual Report (see **Attachment 1**).

Total agricultural water demand is determined through the analysis of data acquired from Landsat satellites for remotely sensed evapotranspiration (ET). This calculation incorporates irrigation efficiencies based on the California Department of Fish and Wildlife (CDFW), Land use map and crop surveys, and also accounts deductions related to surface water deliveries and precipitation.

Volume of groundwater pumped for agricultural use during the reporting period amounted to approximately 80,000 acre-feet within the GSA Plan area.

Table 3-1: Agricultural Groundwater Extraction

Groundwater Extraction (acre-feet)			
2019/20 WY	**2020/21 WY**	**2021/22 WY**	**2022/23 WY**
157,000	**165,500**	**137,000**	**80,000**
Annual Δ in Groundwater Extraction:	(8,500)[1]	28,000[2]	57,000[3]
Average Δ in Groundwater Extraction:	**42,750**		

1) [157,000 acre-feet – 165,500 acre-feet]

2) [165,500 acre-feet – 137,00 acre-feet]

3) [137,00 acre-feet – 90,100 acre-feet]

4) [-8,500 acre-feet + 28,000 acre-feet + 46,900 acre-feet] ÷ 3

3.2 Municipal

Municipal groundwater pumping by Pixley PUD makes up the largest percentage of municipal pumping within the GSA and is based on meter data from Pixley PUD. Municipal groundwater extractions will be reported to the GSA by municipalities and will be available for subsequent annual reports.

Within the Pixley GSA plan area the volume of groundwater pumped for municipal purposes in 2022-2023 water year was provided by the two (2) municipalities and amounted to approximately 660 acre-ft.

3.3 Summary of Total Groundwater Extractions

Combined agricultural and municipal groundwater extraction within the Pixley GSA plan area during water year 2022-2023 reached 80,660 acre-ft (see **Table 3-2**).

Table 3-2: Total Groundwater Extractions

Management Area	Agricultural (AF)	Municipal (AF)	Pumping for Export	Total (AF)
Pixley ID	80,000	0	0	80,000
Pixley PUD	0	560	0	560
Teviston CSD	0	100	0	100
Total	**80,000**	**660**	**0**	**80,660**

Notes:
1. AF = Acre Feet
2. Extraction volumes provided by groundwater reporting agencies listed in section 1.3

4 Surface Water Supply [§356.2(b)(3)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(b) *A detailed description and graphical representation of the following conditions of the basin managed in the Plan:*

(3) *Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.*

Surface water is supplied to lands within the Pixley GSA Plan area through the Pixley Irrigation District (Pixley, District) as diverted stream flow from native Deer Creek, imported Central Valley Project (CVP) contracts, exchanges with other irrigation districts, and effective precipitation. The District delivers the available surface and imported water to meet crop demands for landowners within the District as a first priority of use. During times surface water supplies are available in excess of crop demands, the supplies can be diverted to recharge basins owned by the District for future landowner in-lieu pumping of groundwater. The GSA and District also encourage their landowners to develop on-farm recharge basins to maximize surface water supplies when available in large volumes during short periods of time.

4.1 Diverted Deer Creek Streamflow

The irrigation and water districts with downstream rights to the native Tule River and Deer Creek stream flows, deliver the available surface water to meet crop demands for landowners within their district as a first priority of use. During times surface water supplies are available in excess of crop demands, the supplies can be diverted to recharge basins owned by landowners for future in-lieu pumping of groundwater.

For water year 2022-2023, 45,500 acre-ft of water was diverted into the Pixley ID service area to meet crop demands or as in-lieu pumping of groundwater to recharge basin owned by the District or landowners.

4.2 Imported Water Supplies

Water imported into the PixID GSA plan area is from the Central Valley Project (CVP), as well as, local and imported supplies purchased from neighboring irrigation districts. The District delivers imported supplies from the Friant-Kern Canal (FKC) through Deer Creek to District diversion structures at which point the supplies are introduced into the Districts distribution system consisting of unlined canals for delivery to landowners and recharge basins within the District.

Imported water delivery data for 2022-2023 was obtained from United States Bureau of Reclamation (USBR) Central Valley Operation Annual Reports and totaled 86,300 acre-ft.

4.3 Precipitation

Section 4.6 of the Tule Subbasin 2022-2023 Annual Report describes the methodology used to estimate precipitation within the Tule Subbasin (**Attachment 1**).

The total volume of precipitation available during the reporting period is based on monthly data delivered by LandIQ, estimated to be 71,800 acre-ft.,

4.4 Summary of Total Surface Water Supplies

Total surface water supplied to the Pixley GSA plan area for the 2022-2023 water year was estimated to be 203,600 acre-ft (see **Table 4-1**).

Table 4-1: Total Surface Water Supply

Management Area	Stream Diversions (AF[1])	Imported Water (AF)	Recycled Water (AF)	Precipitation (AF)	Total (AF)
Pixley ID	45,500	86,300	0	71,800	203,600
Pixley PUD	0	0	0	0	0
Teviston CSD	0	0	0	0	0
Total	**45,500**	**86,300**	**0**	**71,800**	**203,600**

1. AF = Acre feet.

5 TOTAL WATER USE [§356.2(b)(4)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(b) *A detailed description and graphical representation of the following conditions of the basin managed in the Plan:*

(4) *Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.*

Total water use within the Pixley GSA Plan area during the water year 2022-2023 consisted of water for meeting agricultural and municipal demand, along with groundwater exports. Agricultural demands were met through a combination of groundwater extractions and surface water deliveries, while municipal demands were met entirely from groundwater extractions. The total water use within the GSA plan area was 284,260 acre-ft (see **TABLE 5-1**).

TABLE 5-1:TOTAL WATER USE BY WATER USE SECTOR

Management Area	Use Sector (AF[1])					Total (AF)
Source:	Agriculture[2]	Municipal	Recharge/Banked[3]	Native Vegetation	Export	
Pixley ID	215,800	0	67,800	0	0	283,600
Pixley PUD	0	560	0	0	0	560
Teviston CSD	0	100	0	0	0	100
Total	**222,900**	**660**	**67,800**	0	0	**284,260**

Notes:
1. AF= Acre Feet
2. Surface water quantities for agriculture include precipitation
3. Recharge/ banked water includes Pixley ID and Pixley PUD recharge/banking water and recycled water

6 GROUNDWATER STORAGE [§356.2(B)(5)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(b) *A detailed description and graphical representation of the following conditions of the basin managed in the Plan:*

(4) *Change in groundwater in storage shall include the following:*

(A) *Change in groundwater in storage maps for each principal aquifer in the basin.*

(B) *A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.*

The change in storage estimate for this annual report is specific to the Upper and Lower Aquifer. The calculations were made using a Geographic Information System (GIS) map of the Tule Subbasin discretized into 600-foot by 600-foot grid cells to allow for spatial representation of aquifer specific yield and groundwater level change. Although the storage change in the Lower Aquifer is expected to be significantly less than the Upper Aquifer due to its confined nature, future annual reports will include storage change from the Lower Aquifer as well.

The areal distribution of specific yield for the Upper Aquifer is based on the values obtained from the updated calibrated groundwater flow model of the Tule Subbasin.

The areal distribution of change in hydraulic head across the Tule Subbasin was estimated by plotting the difference in groundwater level at wells that were measured in both fall 2022 and fall 2023 and then interpolating the subbasin-wide changes in groundwater levels in GIS using a kriging algorithm. Change in hydraulic head (groundwater level) at any given location was assigned to the overlapping grid cell.

The areal distribution of land subsidence between Fall 2022 and Fall 2023 was based on InSAR data (see **ATTACHMENT 1,** Figure 8). Because the InSAR data is not layer-specific but, rather, reflects compression that occurs in all layers in the Tule Subbasin, the change in storage of the Lower Aquifer using these data is possibly an overestimate.

6.1 CHANGE IN UPPER AQUIFER GROUNDWATER STORAGE

Change in groundwater storage in the Upper Aquifer was estimated for each grid cell by multiplying the change in groundwater level by the specific yield and then multiplying by area of the cell. Results of the change in groundwater in storage analysis showed that between Fall 2022 and Fall 2023, groundwater in storage in the Upper Aquifer increased by approximately 24,000 acre-ft (Figure 16, **ATTACHMENT 1**). Recent wet conditions have resulted in more surface water supplies and lower groundwater pumping relative to previous years, which has contributed to the positive groundwater storage change in the 2022-2023 water year.

6.2 CHANGE IN LOWER AQUIFER GROUNDWATER STORAGE

Change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between Fall 2022 and Fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time.

Results of the analysis showed that the volume of water associated with compression of aquitards in all layers between Fall 2022 and Fall 2023 was approximately -15,000 acre-ft.

6.3 Cumulative Change in Tule Subbasin Aquifer Storage

Cumulative change in storage in the Tule Subbasin since water year 1986/87 is provided for both Upper and Lower Aquifers in Figure 18 of **Attachment 1**. Cumulative change in storage in both the Upper and Lower Aquifers from 1986-1987 through 2022-2023 was approximately -7,133,000 acre-ft. Since the 2015-2016 water year, the cumulative change in storage has been approximately +454,000 acre-ft in the Upper Aquifer and approximately -903,000 acre-ft in the Lower Aquifer. Positive changes in aquifer storage are generally associated with above-normal precipitation years when surface water supplies are available and groundwater pumping is lower.

The areal distribution of change in hydraulic head across the Tule Subbasin was estimated by plotting the difference in groundwater levels measured in Fall 2022 and Fall 2023 and interpolating subbasin-wide changes in groundwater levels using a kriging algorithm in GIS. Change in hydraulic head (groundwater level) at any given location was assigned to the overlapping grid cell.

Several other GSAs and irrigation districts maintain individual water accounting systems to track the amount of groundwater banked in their jurisdictions, which is internally calculated from gross groundwater storage volume for the GSA. Banked surface and imported water remain in ownership with the banker and is not considered available groundwater storage. Change in groundwater storage is determined using **Eq.** 6-1 to determine change in groundwater storage based on total water use (ETc, metered) and total non-groundwater supply **Table 6-1** provides a summary of this accounting for the GSA.

$$\Delta\, \boldsymbol{GW\ Storage = Total\ Surface\ Water + Precipitation - Total\ Water\ Use} \qquad \mathbf{Eq.\,3}\text{-}1$$

Table 6-1: GSA Accounting of Groundwater Storage

October 2022 thru September 2023	Volume (AF)			Total (AF)
	Pixley ID	Pixley PUD	Teviston CSD	
Surface Water (streamflow, imported, recycled)	*131,800*	*0*	*0*	*131,800*
Recharged[1]	*67,800*	*234*	*0*	*68,034*
Total Precipitation[2]	*71,800*	*0*	*0*	*71,800*
Total Non-Groundwater Supply	**203,600**	**234**	**0**	**203,934**
ETc (agricultural)	*(140,418)*	*0*	*0*	*(140,418)*
Metered (municipal, exported)	*0*	*(563)*	*(98)*	*(661)*
Total Consumptive Use	**(140,418)**	**(563)**	**(98)**	**(141,079)**
Water Balance	**63,182**	**(329)**	**(98)**	**62,755**

Notes:
1. Recharge volumes include channel losses
2. Total precipitation is used rather than effective precipitation because portion that is not effective is accounted for in ETc

Based on the GSA's accounting of change in groundwater storage from the 2022 to 2023 water year, groundwater in storage increased by 62,755 acre-ft.

6.4 Total Groundwater Storage

Groundwater storage since 2018-2019 WY was estimated according to the equation and methodology described in Section 6 of the Tule Subbasin 2022-2023 Annual Report using available groundwater elevation data (see **Attachment 1**). Based on this estimation, approximately 40.909 million acre-ft of groundwater was stored within the aquifers beneath the Pixley GSA plan area. Applying the increase in groundwater storage of 24,000 acre-ft occurring between 2022 and 2023, the volume of groundwater storage beneath the Pixley GSA Plan area amounts to approximately 40.9330 million acre-ft. While this methodology is useful for understanding total groundwater storage in the Subbasin, it is not intended to account for ownership of water in storage. The volume of groundwater each GSA has access to will differ due to the accumulation of Net Water Balance contributions and extractions by the individual GSA over time.

The interim milestones/measurable objective and minimum threshold for volume of groundwater storage in the aquifers beneath the Pixley GSA Plan area were identified in Tables 3-3 and 3-8, respectively, in Section 3 of the Pixley GSA GSP. **Table 6-2** provides a comparison of the 2022-2023 WY groundwater storage conditions to the 2025 interim milestone, measurable objective, and minimum threshold.

Table 6-2: Groundwater Storage Data

Groundwater Storage (millions AF[1])							
2018/19 WY[1]	2019/20 WY	2020/21 WY	2021/22 WY	2022/23 WY	2025 Interim Milestone[2]	Measurable Objective[2]	Minimum Threshold[2]
41.0430	40.9750	40.9430	40.9090	40.9330	39.7900	39.2000	36.6000
Annual Δ[1] in Storage:	-0.0680[3]	-0.0320[4]	-0.0340[5]	+0.0240[6]	*0.2506[8]*	*0.0921[9]*	*0.2222[10]*
Average Δ in Storage:	**-0.0275[7]**						

Notes:
1. Million A = Millions of Acre Feet, Δ =delta symbology for change WY = Water Year
2. Interim Milestone, Measurable Objective and Minimum Threshold provided by GSP 2022
3. [41.043 million AF – 40.975 million AF]
4. [40.975 million AF – 40.943 million AF]
5. [40.943 million AF – 40.909 million AF]
6. [[40.943 million AF – 40.933 million AF]
7. [41.043 million AF – 40.933 million AF] ÷ 4 years
8. [41.043 million AF – 39.79 million AF] ÷ 5 years
9. [41.043 million AF – 39.20 million AF] ÷ 20 years
10. [41.043 million AF – 36.60 million AF] ÷ 20 years

The volume of groundwater storage in 2023 remains greater than the established 2025 interim milestone, measurable objective and minimum threshold volumes established for the GSA Plan area. The average annual rate of decline in groundwater storage for Pixley GSA Plan area between 2018-2019 WY to 2022-2023 WY amounts to 27,500 acre-feet per year. Whereas the average annual rate of decline for groundwater storage between 2018-2019 WY and the established 2025-interim milestone and minimum threshold in 2040 is 250,600 acre-feet per year and 222,200 acre-feet per year, respectively, putting the experienced annual average rate of decline in groundwater storage less than the rate for achieving the established 2025 interim milestone.

7 PROGRESS TOWARDS PLAN IMPLEMENTATION [§356.2(C)]

23 Cal. Code Regs. § 356.2 Annual Reports. *Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:*

(c) *A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.*

Progress of plan implementation is evaluated by comparing monitoring data to sustainable management criteria (SMC) established in Section 3 of the GSP and the GSA's progress towards implementing projects and management actions compared to the schedules outlined in Section 5 of the GSP (GSP, 2022).

Some of the RMS Subsidence wells shown in have been added since the Tule Subbasin GSPs were finalized in 2020. Most of the added RMS wells are new dedicated monitoring wells that have been drilled and constructed since January 2020. Some existing wells have been identified and added as RMS wells to address data gaps. Finally, some of the previously designated RMS wells were found to be inadequate for collecting reliable data and alternate existing wells were identified as replacements. These changes are consistent with Section 4.1 of the Tule Subbasin Monitoring Plan (TSMP), which states that the plan is *"..both flexible and iterative, allowing for the addition or subtraction of monitoring features, as necessary, and to accommodate changes in monitoring frequency and alternative methodologies, as appropriate."* (TSMP, year)

On-going data collected at new RMS wells allows the Tule Subbasin TAC to address areas of data gaps and improve the accuracy of the subbasin-wide groundwater model, which is relied upon as a tool for establishing SMC. The Tule Subbasin TAC intends to reevaluate SMC established at all existing and new RMS sites during the five-year GSP update in 2025, or sooner as appropriate.

7.1 CURRENT CONDITIONS FOR EACH SUSTAINABILITY INDICATOR

The GSA monitoring network has been established to monitor data four sustainability indicators that may have potential to cause significant and unreasonable effects within the Tule Subbasin:

• Chronic lowering of groundwater levels

• Reduction of groundwater storage

• Degraded water quality

• Land subsidence

The 2022/23 water year experienced above average precipitation and runoff. Total precipitation at the Porterville precipitation station measured was 16.5 inches, which is more than the average precipitation for the area. Precipitation is accounted for as a surface water supply for irrigated agriculture as it offsets some of the evapotranspiration demand of the crops The total volume of precipitation available for crops in 2022/23 was estimated to be approximately 509,000 acre-ft (**ATTACHMENT 1**). This additional precipitation positively impacted the sustainability indicators listed above. Results of monitoring efforts are provided below.

7.1.1 CHRONIC LOWERING OF GROUNDWATER LEVELS

Groundwater levels taken from monitoring well perforated in the Upper Aquifer showed a slight increase in Fall 2023 compared to Spring 2023. All Upper Aquifer groundwater levels are above their respective Interim Milestones and Measurable Objectives.

Of the Lower Aquifer monitoring wells, groundwater levels were inconsistent. Groundwater levels in the lower Aquifer can be highly variable due to the confined nature of the aquifer and may be influenced by nearby pumping. Both Lower Aquifer monitoring wells were above their respective Interim Milestones and Measurable Objectives.

Detailed discussion of groundwater elevation change compared with measurable objectives and minimum thresholds is provided in **SECTION 2** of this report.

7.1.2 REDUCTION OF GROUNDWATER STORAGE

During the reporting period, there was a rise in available groundwater storage in comparison to the previous year due to heavy precipitation. Groundwater storage during 2022-2023 was 40.9330 million acre-ft. This is a 24,000 acre-ft increase from the previous water year.

Using Interferometric Synthetic Aperture Radar (InSar) data from DWR, TH&Co determined that within the Pixley GSA plan area, the total change in aquitard storage was a loss of 15,000 acre-ft from the previous water year. The previous change in aquitard storage from 2021-2022 was a loss of 40,000 acre-ft.

Detailed discussion of groundwater storage change compared with measurable objectives and minimum thresholds is provided in **SECTION 3** of this report.

7.1.3 DEGRADED WATER QUALITY

Groundwater quality samples are collected annually from agricultural and drinking water wells within the Pixley GSA. Analysis in all drinking water RMS wells determined that water quality standards were upheld and did not exceed the measurable objectives or minimum thresholds. Analysis of all agriculture designated wells determined that water quality standards were upheld and did not exceed the measurable objectives or minimum thresholds. The Pixley GSA will continue to expand the RMS Quality network to fill in data gaps. Long-term monitoring will be conducted to determine if land subsidence is contributing to water quality degradation

Detailed discussion of groundwater quality compared with measurable objectives and minimum thresholds is provided in **SECTION 2.4** of this report.

7.1.4 LAND SUBSIDENCE MONITORING

17 subsidence RMS benchmarks were constructed in 2020 within the Pixley ID GSA Plan area. Elevations taken during the summer of 2023 at each of the RMS benchmarks are compared to the established 2025-interim milestones, measurable objectives, and minimum thresholds in **TABLE 7-1**. The rate of subsidence is also shown in **TABLE 7-1** for benchmarks that were measured in both 2020 and 2022**.**

7.1.4.1 Results

During the 2023 Subsidence monitoring event, all 17 benchmarks indicated a drop in elevation. 5 RMS benchmarks exceeded the Interim Milestone elevations. 2 RMS benchmarks exceeded both their respective Interim Milestones and Measurable Objectives.

TABLE 7-1: RMS SUBSIDENCE DATA

RMS Benchmark ID	Baseline Year	Ground Surface Elevation (NAVD88[1])						2025 Interim Milestone	Measurable Objective	Minimum Threshold
		Baseline	2021	2022	2023	Annual Difference (ft/yr)	Rate (ft/year)			
P0007_B_RMS	2020	209.98	209.25	208.34	208.10	-0.09	0.940	207	203	201
P0008_B_RMS	2020	229.07	228.61	227.91	227.53	-0.13	0.770	227	226	224
P0009_B_RMS	2020	205.16	204.47	203.60	203.31	-0.05	0.925	203	198	195
P0010_B_RMS	2020	202.36	201.85	201.12	200.75	-0.09	0.805	202	196	193
P0011_B_RMS	2020	218.49	217.82	216.99	216.75	0.06	0.870	216	212	210
P0025_B_RMS	2020	273.43	273.01	272.37	271.98	-0.08	0.725	272	271	270
P0026_B_RMS	2020	277.23	276.43	275.88	275.35	0.01	0.940	277	276	275
P0027_B_RMS	2020	255.34	254.83	254.47	254.26	0.00	0.540	254	253	252
P0028_B_RMS	2020	278.02	277.45	276.68	276.45	0.04	0.785	278	277	276
P0029_B_RMS	2020	283.52	283.47	282.82	282.45	0.00	0.535	283	282	281
P0036_B_RMS	2020	323.58	323.07	322.71	322.53	-0.03	0.525	323	322	321
P0037_B_RMS	2020	324.56	324.07	323.57	323.45	0.04	0.555	324	323	322
P0090_B_RMS	2020	368.39	368.39	368.06	367.85	-0.13	0.270	N/A	N/A	N/A
P0093_B_RMS	2020	349.96	349.96	349.76	349.51	-0.08	0.225	N/A	N/A	N/A
P0094_B_RMS	2020	310.79	310.79	310.34	309.96	-0.04	0.415	N/A	N/A	N/A
P0095_B_LSMA	2020	360.78	--	360.78	360.59	-0.14	0.095	N/A	N/A	N/A
P0096_B_RMS	2020	336.53	--	336.53	336.28	NM	NM	N/A	N/A	N/A

Notes:
1. NAVD88 = North American Vertical datum of 1988, Ft/year = foot per year
2. 2022 Measurements collected August 16 - September 8, 2023
3. 2023 Measurements collected from June 29- August 3, 2023

7.2 Implementation of Projects or Management Actions

This section describes the GSA's Projects and Management Actions. The PIXID GSA identified seven Projects or Management Actions in Section 5.2. The status of each is described below.

7.2.1 Groundwater Accounting

The PixID GSA Board has adopted and implemented 8 policies that collectively comprise the Groundwater Accounting program of the GSA. They are found in **Attachment 2** to this report and here: gsa-rules-and-operating-policies-pixley-updated-2024.pdf (ltrid.org). Collectively the adoption and implementation of these policies has accomplished the accounting tasks originally identified in Section 5.2.1 of the GSP, and most importantly, resulted in a reduction in groundwater use through landowner incentives.

Identification of groundwater users and groundwater allocations

Status: *Complete as to agricultural groundwater users, ongoing as to other users*

Agricultural Groundwater Users and Allocations: The PixID GSA tracks all agricultural groundwater use by Assessor's parcel number in a database. For each parcel, the GSA allocates credits and computes groundwater use by implementing the rules set forth in the Policies. Additional details regarding the accounting process are described in detail below.

Domestic Groundwater Use: The PixID GSA does not have complete data on individual domestic groundwater users, but has compiled data on domestic wells from available sources including Tulare County, and Department of Water Resources databases. This data has been used to refine the Mitigation Program for domestic groundwater wells that are potentially impacted by overdraft pumping. The GSA has hired a full time Resources Coordinator to provide education and outreach to domestic groundwater users within the GSA and inform those users of the well mitigation program and assist individuals with accessing the mitigation program. The GSA tracks domestic groundwater use for two communities served by public water systems by collecting metered pumping data from the Pixley PUD and Teviston CSD. The GSA Board has also adopted a policy that focuses on surface water deliveries and recharge in the areas around the two communities, even in years where surface water is in short supply.

Accurate accounting of groundwater extractions, water accounting, policy for crediting groundwater recharge and banking activities, and policy for transferring groundwater credits

Status: complete and subject to on-going refinement (Note, in prior annual reports these actions were discussed separately. This report combines the discussion for clarity.)

The GSA has implemented the Policies for accounting since February 2020. The GSA tracks agricultural, groundwater, and surface water use for each APN using a database. Landowners receive monthly reports reflecting the accounting for each parcel and can access this information online through the GSA website. The accounting system is designed to give landowners the ability to view and track annual allocations, monthly water consumption based on remotely sensed ET data, surface water deliveries, and volumes of surface water recharged or banked for future in-lieu use, among other features that give the landowners the tools to successfully manage their operation in a sustainable manner.

The GSA allocates a Sustainable Yield credit and a precipitation credit to each acre for each year. The Groundwater Flow Model (GFM) for the Tule Subbasin established water budgets depicting water uses and users for the past, present, and future. Based on the water budgets, Sustainable Yield allocation of groundwater consumption was determined to be 0.15 acre-feet per acre. Precipitation was recognized as an allocation of groundwater that was available to landowners for consumption, with allocation amounts varying throughout the subbasin. Within the GSA this amounted to 0.70 acre-ft per acre for 2023 based on a 32-year average.

Next, the GSA allocates credits to parcels for GSA recharge and banking activities. In addition, the GSAs policy on Groundwater Banking at the Landowner Level incentivizes landowners to use surface water for recharge and banking when it is available in excess of what's needed for crop demands by crediting the landowners water account with a percentage of the total volume surface water recharged as a groundwater credit. As a result, many landowners have constructed and are operating recharge basins on their farms. From January through December of 2023, the GSA recharged 74,382 acre-ft of groundwater and landowners in the PixID GSA recharged 9,789 acre-ft of groundwater.

Next, the GSA adjusts credits to account for transfers and imported surface water pursuant to the *Water Accounting and Water Transfers* and *Landowner Surface Water Imported* policies. These policies define rules for movement of groundwater credits from one landowner to another within the GSA Plan area and for surface water imported into the GSA by landowners. The policies are attached to this report as Policy 3 and Policy 5, respectively, **ATTACHMENT 2**.

Finally, the GSA assigns a transitional pumping credit to each parcel (Policy 4, **Attachment 2**). For 2020-24 the transitional credit has been 2 af/ac per year. The allocation will be re-evaluated for 2025 after revisions to the GSP are adopted.

After all allocations and credits are assigned, the GSA computes groundwater use per parcel. The GSA obtains and uses remotely sensed crop evapotranspiration (ET) data using satellite imagery (from LandIQ) to compute the ET data for each APN (See Section 3.1 of the Tule Subbasin 2022-2023 Annual Report describing the methodology used to estimate ET for the Tule Subbasin (see **ATTACHMENT 1**)).

The GSA uses its detailed records of surface water deliveries to reduce parcel ET by surface water deliveries to compute the groundwater use for each parcel. All ET is assumed to be met by pumped groundwater if not met by surface water.

The GSA then compares the parcel's groundwater use to the allocated credits for the parcel to determine if the parcel used groundwater in excess of allocated credits and what portion, if any, of the transitional credits have been used by a parcel. Use of the first 50% of transitional credits results in a charge of $90/af and use of the second 50% of the transitional credits results in a charge of $180/af. During 2023 21,545 af of transitional water was used as compared to the 41,994 af annual average since implementation of the program.

<u>Gradually reduce total groundwater consumption</u>

Status: *complete and ongoing*

Total agricultural water use and groundwater consumption has declined in the GSA since 2019.

The following table summarizes ET data for 2019 through 2023:

TABLE 7-2: EVAPOTRANSPIRATION

Evapotranspiration (acre-ft)				
Management Area	**2019/20**	**2020/21**	**2021/22**	**2022/23**
Pixley ID	158,322	149,200	140,418	163,226
Pixley PUD	4,847	4,665	4,480	4,785
Teviston CSD	2,656	1,966	1,940	2,461
TOTAL (acre-feet)	**165,824**	**155,831**	**146,838**	**170,472**
	Annual Δ in ET:	99,931	89,932	23,634
	Average Δ in ET:	1,549		

Notes:
1. [165,824 acre-ft – 155,831 acre-ft]
2. [155,831 acre-ft – 146,838 acre-ft]
3. [146,838 acre-ft – 170,472 acre-ft]
4. [165,824 acre-ft – 146,838 acre-ft] ÷ 3 years

ET was higher than in previous years, this is because there was more rain in 2023, thus more vegetation and more evaporation due to the saturated soils. While ET was higher in 2023, groundwater use was less, because a higher percentage of the ET in 2023 was met through increased surface water deliveries.

The GSA took delivery of more than 130,000 acre-ft of surface water in 2023 compared to the long-term average of 35,000 acre-ft. Groundwater extraction for 2022-2023 was reduced from prior years. Calculated groundwater extractions for 2022-2023 were less than previous years, as shown in the following table.

Groundwater Extraction (acre-feet)			
2019/20 WY	**2020/21 WY**	**2021/22 WY**	**2022/23 WY**
157,000	**165,500**	**137,000**	**80,000**
Annual Δ in Groundwater Extraction:	(8,500)[1]	28,000[2]	57,000[3]
Average Δ in Groundwater Extraction:	**42,750**		

1) [157,000 acre-feet – 165,500 acre-feet]

2) [165,500 acre-feet – 137,00 acre-feet]

3) [137,00 acre-feet – 90,100 acre-feet]

4) [-8,500 acre-feet + 28,000 acre-feet + 46,900 acre-feet] ÷ 3

Adjustment of policies for groundwater allocations and transfers

Status: ongoing - *subject to future consideration*

The GSA has included this component in the Groundwater Accounting Action understanding that all options for transferring and allocating groundwater credits will be based on the best available data. Adjustment of policies for groundwater allocations or transfers are intended to continue granting landowners all opportunities available to manage groundwater resources feasibly and economically to the extent undesirable results are not experienced within the GSA Plan area or the subbasin. As a result, the GSA reserves its right to increase or reduce groundwater allocations and expand or limit transferring of groundwater credits based on the GSA progress toward reaching its sustainability goal.

As the GSP is currently being revised, and measurable objectives and minimum thresholds are re-evaluated, it is likely that the next five year block of Transitional Pumping allocations pursuant to Policy 4 will be reduced going forward.

Create revenue for financing GSA operation, mitigation, monitoring, and projects

Status: *complete, on-going implementation*

The GSA has established a fee structure for consumption of groundwater above sustainable amounts, also known as transitional groundwater consumption. Revenues from the fees collected will be used to mitigate impacts and implement projects and programs to help reach the GSA sustainability goals. A summary of collections and expenditures/reserves from these funds:

TABLE 7-3: COLLECTIONS, EXPENDITURES AND RESERVES

	2021	2022	2023	Total
Fees collected	$4,176,873	$4,361,605	$2,218,437	**$10,756,915**
Interest income	$0	$66	$77,752	**$77,818**
FWA settlement agreement payments and loan payments	($5,550,000)	($649,522)	($649,522)	**($6,849,044)**
Land Fallowing programs	$0	($300,000)	($23,039)	**($323,039)**
Recharge programs	$0	$0	($14,000)	**($14,000)**
12/31/2023 BALANCE				**$3,648,651**
Domestic Well Mitigation Plan Reserve				**1,500,000**
Project and Program reserve				**2,148,651**
				3,648,651

The fee structure for transitional groundwater consumption is included as part of the *Transitional Groundwater Consumption* policy and is attached to this report as Policy 4 in **ATTACHMENT 2**.

Develop policy for enforcement to ensure compliance with rules established to achieve sustainability.

Status: *complete, subject to future refinement*

The governing board to the PixID GSA has adopted the *Implementation and Enforcement of Plan Actions* policy to clearly outlines the process the GSA will use to enforce compliance with the policies adopted in order to achieve sustainability.

The rules for GSP implementation and enforcement are included as part of the Policy 8 within **ATTACHMENT 2** of this report. Enforcement actions include; notices of non-compliance with a period allowed for correction, final determination of non-compliance with penalties for failure to correct, and cease and desist orders issued. To date, the GSA has not had to use any enforcement actions on any landowners.

7.2.2 WATER SUPPLY OPTIMIZATION

Projects for optimization of existing surface supplies is discussed in Section 5.2.2 of the PixID GSA GSP and has been a joint implementation between the Pixley and the landowners within the District.

Modify existing key water control structures

Status: *on-going*

Annually the district performs maintenance on the distribution systems when the system is not in use. This includes routine maintenance to natural water ways and district owned channels. Additionally, the District was awarded grant funding to install meters at all recharge facilities to more accurately track volumes of surface water diverted for recharge activities. This project was completed in 2021. In 2022, the District installed new flow meters at the head of each of the main diversion points into the District's distribution system.

Modify existing District recharge basins

Status: future/*on-going*

As previously mentioned, the District was awarded grant funding to install meters at all recharge facilities to more accurately track volumes of surface water diverted for recharge activities during 2022.

Expand Supervisory Control and Data Acquisition (SCADA) system

Status: *on-going*

As part of the Groundwater Accounting Action, Pixley has expanded its SCADA system for tracking and managing the delivery of surface within its distribution system and to landowners. Upgrades to the system allow the district to utilize real time data to remotely monitor and adjust target flow rates at key bifurcation points. The recharge basin grant funding would give the District the ability to expand its SCADA system.

Expand the District Distribution System to area not currently served

Status: *in-progress*

The District will continue to utilize funding made available to expand the distribution system that do not currently have access to surface water. The District has done the environmental documents and design work to construct a 5.5 mile canal that would serve approximately 5,500 acres of farmland in the North West area of the District that currently does not have access to surface water and relies solely on groundwater. During 2022, the District acquired the required easements for the construction of the canal. In late 2022 and early 2023, the District was awarded grants from the California Department of Water Resources and the United States Bureau of Reclamation, to help pay for the construction of the canal. It is expected that construction will begin in the spring of 2024 and be completed in 2025.

Replace open channel canals with pipeline distribution systems

Status: *in-progress*

The District will continue to utilize funding made available for similar open channel replacement projects to increase efficiency of surface water deliveries to members of its district.

Maintain existing pipeline distribution systems

Status: *on-going*

Maintaining existing pipeline distribution systems in an on-going project the districts perform as part of their annual maintenance activities and in real time as issues arise.

Upgrade on-farm irrigation distribution systems

Status: *on-going*

Upgrading of on-farm irrigation distribution systems are implemented at the landowner level to ensure the most efficient practices for irrigating crops is used to maximum resources available. This is an on-going project and will occur throughout the implementation of the GSP.

7.2.3 Surface Water Development

Surface water development projects are discussed in Section 5.2.3 of the PixID GSA GSP and include additional supplies made available through purchase excess supplies from neighboring irrigation districts, surface water infrastructure development, and delivery of Central Valley Project (CVP) Shasta Division contract. Progress towards implementing these projects is summarized below.

Surface water infrastructure development

Status: *on-going*

A feasibility study and environmental documentation have been completed to expand the distribution system in the North West area of the District. The project alignment has been identified, easements have been obtained, 100% of the construction plans are complete and grant funding has been secured for the project. Construction will begin in spring 2024.

Delivery of CVP Shasta Division Contract

Status: *on-going*

While the District endeavors to find ways to deliver this water directly into the District, during 2018, 2019 and 2020 short term exchange agreements were put in place to exchange this water for water supplies available out of watersheds and reservoirs on the East side of the Valley. During 2022 the District entered into a long term exchange agreement to ensure the delivery of this water into the District when those supplies are available.

7.2.4 Managed Aquifer Recharge and Banking

Managed aquifer recharge and banking projects are discussed in Section 5.2.4 of the PixID GSA GSP and in **Section 7.2.2** of this report and consists of both expansion of the Pixley recharge operations and development of landowner recharge projects. As previously mentioned, the governing board for the GSA has adopted the *Groundwater Banking at the Landowner Level* policy and is attached to this report as Policy 4 in **Attachment 2**.

A summary of progress towards implementing these projects is provided below.

Expansion of District recharge basins

Status: *on-going*

The District purchased approximately 160 acres in 2019 that is being developed into recharge basins to add to the existing 940 acres of recharge basins owned and operated by the District. The District continues to assess potential opportunities for developing additional land to be utilized for recharge basin. During 2021, the District purchased 831 acres, some of which will be developed into recharge basins. As part of a Prop 68 implementation grant awarded to the subbasin, the District will expand the District's recharge capabilities near the Disadvantaged Communities of Pixley and Teviston. Construction for those projects started in fall 2023 and are expected to be complete in 2024.

Development of landowner recharge basins

Status: *on-going*

Since the District adopted the *Groundwater Banking at the Landowner Level* policy, landowners within the district have constructed 450 acres of recharge basins. This is expected to be a continuing trend as landowners adjust to the policies adopted by the GSA for sustainable groundwater management. In addition to dedicated recharge basins, landowners also flooded open fields during 2023 for additional recharge capability.

7.2.5 AGRICULTURE LAND RETIREMENT PROJECTS

Agriculture land retirement projects are discussed in Section 5.2.5 of the PixID GSA GSP and consists of the Pixley purchasing land for permanent retirement, landowners taking a portion of their farm permanently out of production, and landowners taking a portion of their farm annually out of production depending on water supplies available.

To date the GSA has not implemented any agriculture retirement programs. Although, some lands within the district have been converted usage from crop production to manage recharge basins by landowners and the District as noted above, resulting in dual benefit of reduced groundwater consumption and increased managed recharge and banking. This was previously discussed in **SECTION 7.2.4**.

The GSA Board adopted an annual land fallowing policy during 2021, which encourages landowners to fallow land in dry years. The PixID GSA was also a funding contributor and founder of the Tule Basin Land & Water Conservation Trust. The Trust was formed in part as a means of supporting the GSA in the work being done to meet plans and objectives outlined in the GSP. Pixley faces a groundwater deficit that cannot be overcome without long term conversion of farmland away from a water intensive use. The Trust is working with landowners in the GSA to retire and/or fallow active farmland into conservation easements that will have numerous ecosystems and groundwater benefits. The Tule Basin Land & Water Conservation Trust will interface with the Watershed Coordinator described in Section 7.2.6 regarding the plans outlined in the Tule Subbasin GSPs. In 2021, the District purchased 831 acres which will be permanently retired. A portion of the property will be developed into recharge basins. In 2022, 437 acres of the property was sold to the Trust, who will implement and manage a long term upland habitat restoration on the property. In addition to the sale of the property, as part of the transaction, the GSA purchased a groundwater covenant from the Trust, ensuring that the property is taken out of ag production in perpetuity.

During 2021-2022, 2,164 acres of land were fallowed for the entire year, an additional 455 acres were fallowed from October through May and an additional 6,630 acres were fallowed from June – September, under the GSA's land fallowing policy and the Tule Basin Land & Water Conservation Trust pilot land fallowing project. During 2023, 785 acres were fallowed for the entire year, an additional 893 acres from October through May and an additional 1199 acres from June through September.

In 2023 the GSA received a LandFlex grant from the California Department of Water Resources. This is a land fallowing program where the lands enrolled must be fallowed for an entire year. A cover crop can be grown on the property, without the use of groundwater. In addition, the lands enrolled in the program are no longer eligible to receive transitional (overdraft) allocations going forward. The GSA had 617 acres enrolled in the program.

In 2022, the GSA, as the lead agency for the Tule Subbasin applied for and was awarded a $10 million grant from the California Department of Conservation under the Multibenefit Land Repurposing

Program. The Tule Subbasin Multibenefit Land Repurposing Program will facilitate strategic land retirement, development of habitat resources, and protection and enhancement of water resources throughout the Tule Subbasin. The overarching goal of the Program is to support a transition to sustainable groundwater management while meeting economic, environmental, and social needs within the subbasin, in the understanding that these values are intrinsically linked to water resource management. The most recent drought has increased pressure on groundwater resources to support water users in the subbasin, causing declining groundwater levels and drying of small community and domestic wells. Fortunately, stakeholders in the Tule Subbasin were among the first to seriously consider land repurposing as a necessary local strategy for achieving groundwater sustainability and have several existing efforts underway. In 2019, the Lower Deer Creek Watershed Plan, which covers portions of Pixley ID and Tri-County GSAs, was launched to identify sites for strategic land retirement and wildlife-friendly recharge. Based on this planning effort, Pixley ID GSA and its partners demonstrated that early and coordinated efforts to reduce groundwater demand and increase water supplies could reduce needed land retirement by more than 7,000 acres. In 2020, PixID GSA hired a Watershed Coordinator through the Department of Conservation's Watershed Coordinator Grant Program to support and coordinate groundwater sustainability efforts across the Tule Subbasin, including advancing multibenefit land repurposing and completing several pilot projects identified in the 2019 plan. This new Tule Subbasin Multibenefit Land Repurposing Program will allow partners in the Subbasin to expand work beyond pilot efforts. This program will have measurable benefits for disadvantaged communities across the subbasin and measurable, significant benefits for wildlife Through the restoration of upland habitat on retired lands and incorporation of wetland habitat restoration into the wildlife-friendly recharge basin design. Grant activities are continuing from 2023 through 2025. Tasks and projects to be implemented under this grant are as follows:

- Develop a Multibenefit Agriculture Land Repurposing Plan
- Individual project development and permitting of recharge projects focused around Disadvantaged Communities
- Implementation of land repurposing projects
- Partner capacity in support of the projects and goals of the Multibenefit Agriculture Land Repurposing Plan.
- Outreach, education, and training

7.2.6 Municipal Management Area Projects and Management Actions

Municipal management area projects and management actions are described under Section 5.2.6 of the PixID GSA GSP and describes the process by which the CSDs and PUDs that are encompassed within the GSA are able to participate in projects and management actions described within Section of the GSP as well as rules for working cooperatively with the GSA to ensure the GSA meets its sustainability goal. These rules include reporting of community water use and measurable objective and minimum thresholds required by the communities. These rules can be found in *Policy 7 – CSD and PUD Water Use* within the GSA adopted by the GSA governing board and is included as **Attachment 2** to this report. In 2022, the District applied for a grant that will expand the District's recharge capabilities near the Disadvantaged Communities of Pixley and Teviston. Staff is working with local landowners to develop the recharge capabilities in and around these areas.

During 2022 the District developed Surface Water Delivery Operational Guidelines. The document outlines guidelines on handling surface water deliveries based on the amount of surface water supply available. These guidelines will be used, especially in times of limited surface water supply, to direct recharge efforts in the area surrounding the Disadvantaged Communities. The District is also in the process of installing transducers in the municipal wells to further monitor groundwater elevations in these areas.

The PixID GSA continues to believe that the most effective representation of domestic and municipal water users within the planning area is through the existing and longstanding governmental agencies that directly serve domestic water, all which have established governance structures. Post adoption, the PixID GSA has continued working with these agencies.

The Pixley Irrigation District entered into a cooperative Memorandum of Understanding (MOU) with the Pixley Public Utility District (PUD) and the Teviston Community Services District (CSD). Under the MOU, Pixley agreed to cooperate with the PUD and CSD on the development of the Groundwater Sustainability Plans for the region. The PUD and CSD were included in the PixID GSA and were given a seat on the Groundwater Planning Commission formed by the GSA to coordinate and draft the GSP. The intent behind the MOU was to assist the PUD and CSD in the SGMA process using the resources and coordination of the PixID GSA. The PUD and CSD named a representative to the Planning Commission. The PixID GSA considers these MOUs to be the most effective and extensive form of outreach to the domestic water user community possible.

To augment this further, the PixID GSA submitted an application to the Department of Conservation to create a Watershed Coordinator position to further assist in identifying data gaps and to develop strong working connection with local stakeholders and communities throughout the planning area. The GSA was notified in January 2021 that it was awarded the grant for the Watershed Coordinator. A Watershed Coordinator was hired in 2021.

Key Watershed Coordinator tasks and objectives, including those related to DACs are:

1. Develop site-specific projects with benefits to critically underserved communities (DACs) in the Tule Subbasin.
2. Assist underserved communities in the Tule Subbasin to engage and participate in scoping and development of projects that align with community needs and groundwater sustainability goals within the watershed.
3. Ensure continuity with the existing MOUs between Pixley ID GSA and the communities of Pixley PUD and Teviston CSD.
4. Working with Disadvantage Communities to identify projects up-gradient from domestic well-fields to protect water quality
5. Evaluate effects of GSP implementation on Groundwater Dependent Ecosystems (GDE) in collaboration with the California Department of Fish and Wildlife
6. Assist with development of multi-benefit projects with local community, ecosystem, and wildlife habitat benefits.
7. Lead upland habitat restoration efforts with partners (TNC, Audubon, NRCS, US Bureau of Reclamation, US Fish and Wildlife Service the Tule Land and Water Conservation Trust, Pixley ID)
8. Working with willing landowners, identify potential agricultural lands coming out of production to meet groundwater sustainability goal
9. Coordinate on-farm recharge with landowners. Collaborate with Fresno State, UC Davis and Sustainable Conservation on monitoring and evaluation of effects of recharge.

7.2.7 Domestic Well Protection Projects and Management Actions

As part of revisions to the Tule Subbasin Groundwater Sustainability Plans (GSPs) and Coordination Agreement approved by the Groundwater Sustainability Agencies (GSAs) within the Tule Subbasin, the GSAs each agreed to develop mitigation plans to address significant and unreasonable impacts to beneficial uses of groundwater during the sustainability transition period between 2020 and 2040. The revised Tule Subbasin Coordination Agreement submitted in July 2022 included a Mitigation Program Framework as Attachment 7, which outlined the general standards that each GSA would commit to in developing their respective Mitigation Programs. The GSA adopted a mitigation plan with a claims process for domestic and municipal wells in December 31, 2022 and all other aspects of the Mitigation Programs in June 30, 2023. As part of current ongoing GSP revisions in the subbasin, the Tule Subbasin GSAs are developing a subbasin wide mitigation plan.

The GSA adopted a Groundwater Sustainability Plan Impact Mitigation Plan (see **ATTACHMENT 3**) which allows for domestic, industrial, municipal, and certain agricultural well owners adversely affected by groundwater level impacts to file a claim with the GSA in which the well is located. The plan describes the process for filing a claim, assessment and evaluation of filed claims, and potential mitigation measures for accepted claim.

In addition, in 2023, the GSA hired a Resources Coordinator to, among other things, be the GSA point of contact for mitigation program claims.

7.3 FUTURE PROJECTS AND PLANNING

7.3.1 SUBBASIN-WIDE COORDINATION

On March 2, 2023, the California Department of Water Resources Sustainable Groundwater Management Office deemed the Revised 2020 Groundwater Sustainability Plans Submitted for the Tule Subbasin to be inadequate. Tule Subbasin stakeholders, GSA Managers, and consultants stakeholders have engaged in the following efforts since the determination was received:

- Coordination with Self-Help Enterprises on well mitigation
- Coordination with Community Leaders/Representatives
- Quarterly Technical Advisory Committee Meetings
- Bi-monthly GSA manager meetings
- Weekly technical team meetings
- Meetings every 6-weeks with State Water Resources Control Board staff

The objective of the above coordinated efforts is to ensure dialogue amongst the groups that are working on issues related to groundwater sustainability, protection of domestic wells, and interim solutions as the GSP is being revised. The Tule Subbasin GSAs will continue these conversations and GSP revisions until the GSP is determined to be adequate and throughout the period of implementation of SGMA. The subbasin GSAs plan to submit revised GSPs in May 2024.

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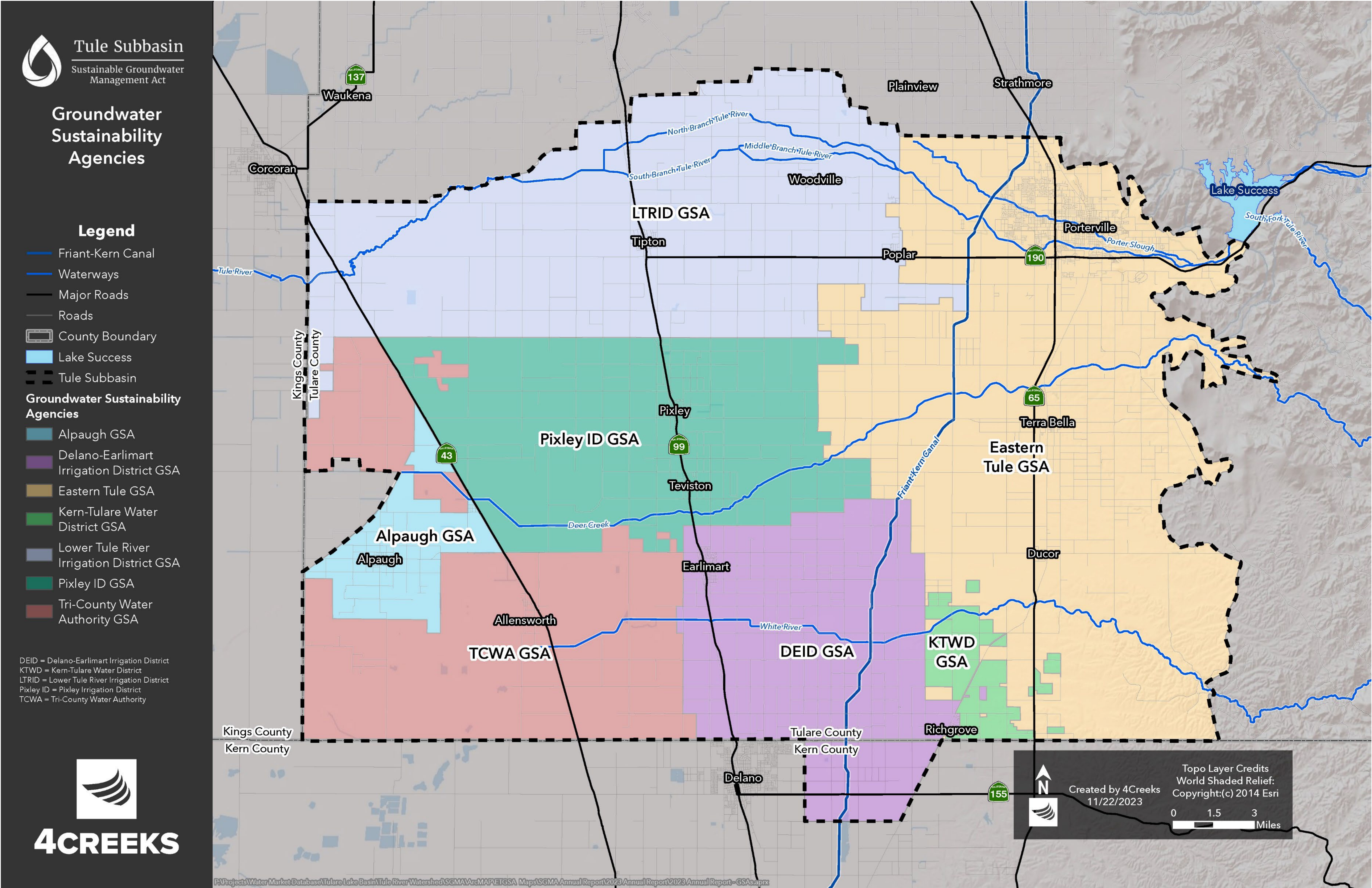
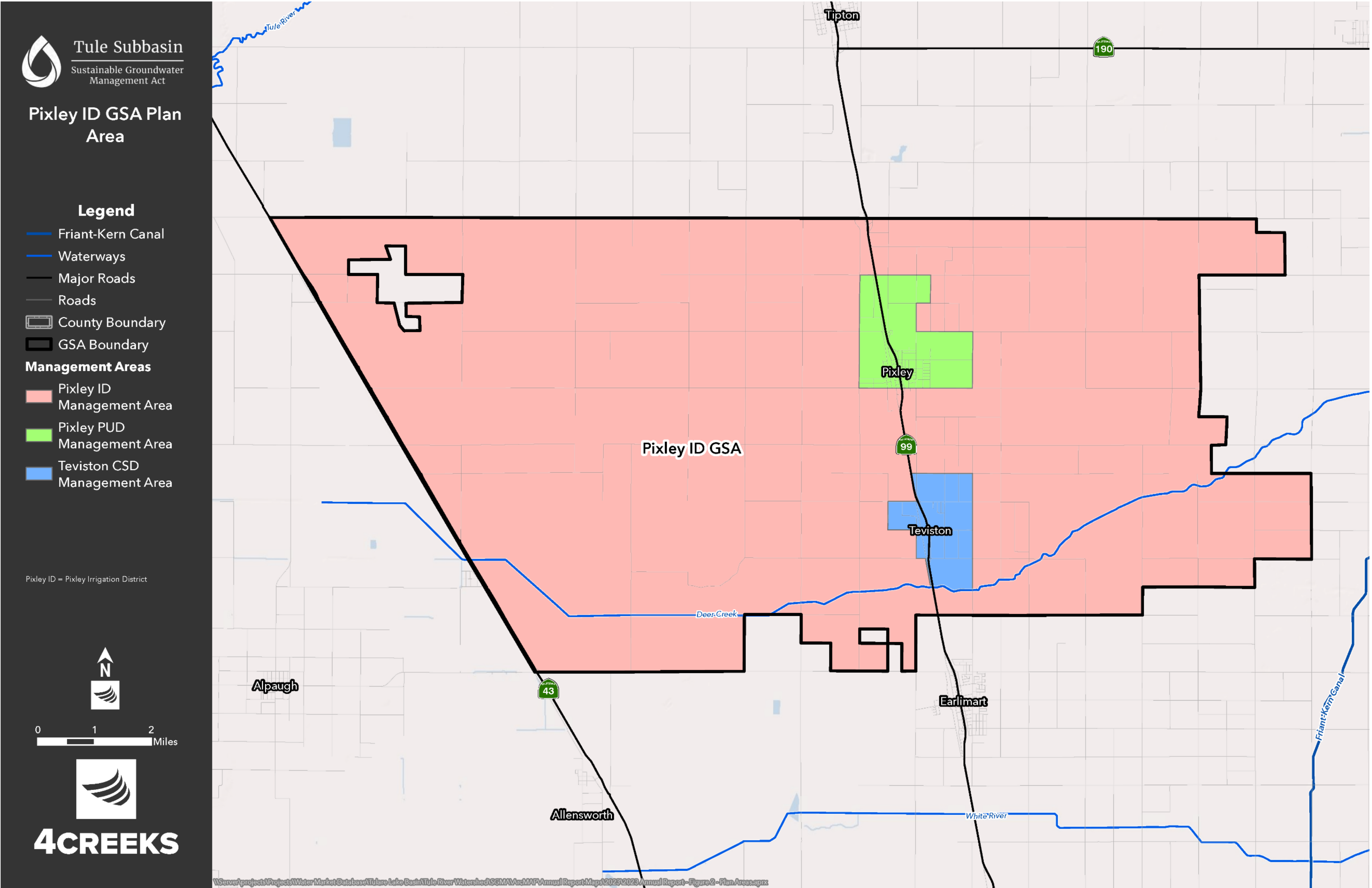
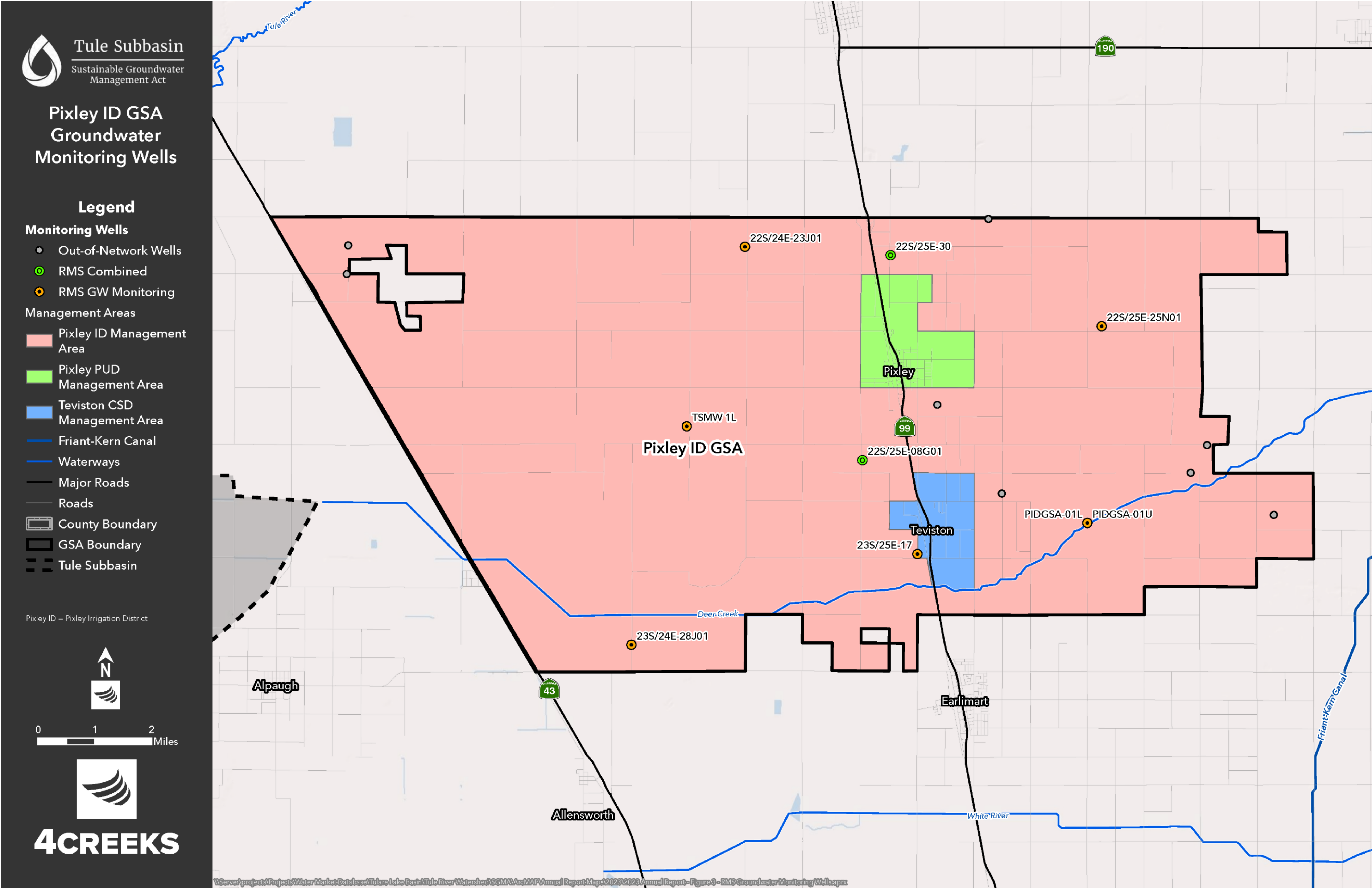
FIGURES



Tule Subbasin
Sustainable Groundwater Management Act
Groundwater Sustainability Agencies
Legend
Friant-Kern Canal
Waterways
Major Roads
Roads
County Boundary
Lake Success
Tule Subbasin
Groundwater Sustainability Agencies
Alpaugh GSA
Delano-Earlimart Irrigation District GSA
Eastern Tule GSA
Kern-Tulare Water District GSA
Lower Tule River Irrigation District GSA
Pixley ID GSA
Tri-County Water Authority GSA
DEID = Delano-Earlimart Irrigation District
KTWD = Kern-Tulare Water District
LTRID = Lower Tule River Irrigation District
Pixley ID = Pixley Irrigation District
TCWA = Tri-County Water Authority
4CREEKS
Waukena
137
Corcoran
Plainview
Strathmore
North Branch Tule River
Middle Branch Tule River
South Branch Tule River
Woodville
LTRID GSA
Tipton
Poplar
190
Porterville
Porter Slough
Lake Success
South Fork Tule River
Tule River
Kings County
Tulare County
Pixley
Pixley ID GSA
99
43
65
Terra Bella
Eastern Tule GSA
Friant-Kern Canal
Teviston
Deer Creek
Alpaugh GSA
Alpaugh
Earlimart
Ducor
Allensworth
White River
TCWA GSA
DEID GSA
KTWD GSA
Kings County
Kern County
Tulare County
Kern County
Richgrove
Delano
155
N
Created by 4Creeks 11/22/2023
Topo Layer Credits World Shaded Relief: Copyright:(c) 2014 Esri
0
1.5
3
Miles


Tule Subbasin
Sustainable Groundwater Management Act
Pixley ID GSA Plan Area
Legend
Friant-Kern Canal
Waterways
Major Roads
Roads
County Boundary
GSA Boundary
Management Areas
Pixley ID Management Area
Pixley PUD Management Area
Teviston CSD Management Area
Pixley ID = Pixley Irrigation District
N
0
1
2
Miles
4CREEKS
Tule River
Tipton
190
Pixley
Pixley ID GSA
99
Teviston
Deer Creek
Alpaugh
43
Earlimart
Friant-Kern Canal
Allensworth
White River



Tule Subbasin
Sustainable Groundwater Management Act
Pixley ID GSA Groundwater Monitoring Wells
Legend
Monitoring Wells
Out-of-Network Wells
RMS Combined
RMS GW Monitoring
Management Areas
Pixley ID Management Area
Pixley PUD Management Area
Teviston CSD Management Area
Friant-Kern Canal
Waterways
Major Roads
Roads
County Boundary
GSA Boundary
Tule Subbasin
Pixley ID = Pixley Irrigation District
N
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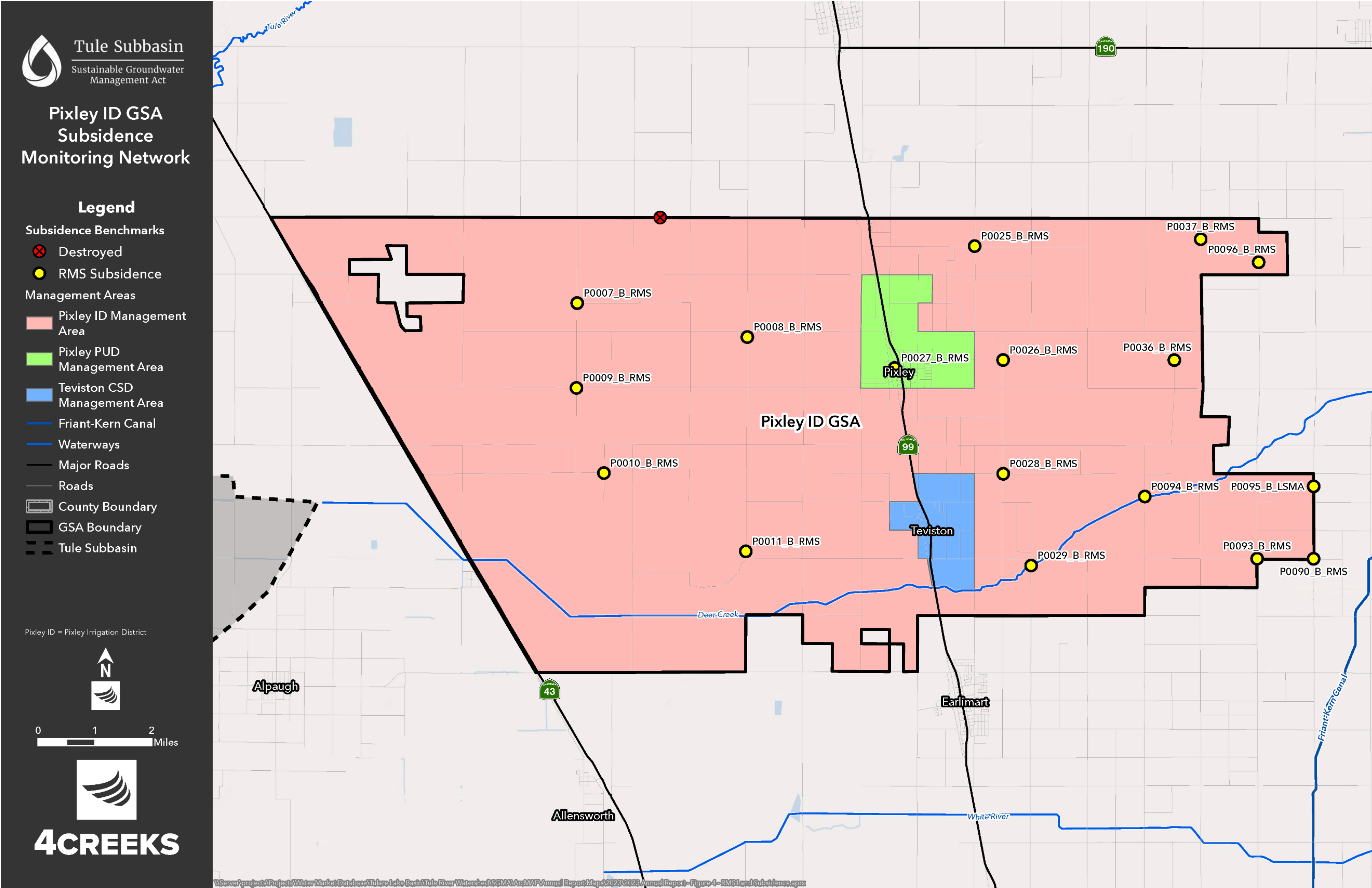
2
Miles
4CREEKS
Tule River
190
22S/24E-23J01
22S/25E-30
22S/25E-25N01
Pixley
TSMW 1L
99
Pixley ID GSA
22S/25E-08G01
PIDGSA-01L
PIDGSA-01U
Teviston
23S/25E-17
Deer Creek
23S/24E-28J01
Alpaugh
43
Earlimart
Friant-Kern Canal
Allensworth
White River
\\Server\projects\Projects\Water Market Database\Tulare Lake Basin\Tule River Watershed\SGMA\ArcMAP\Annual Report Maps\2023\2023 Annual Report - Figure 3 - RMS Groundwater Monitoring Wells.aprx

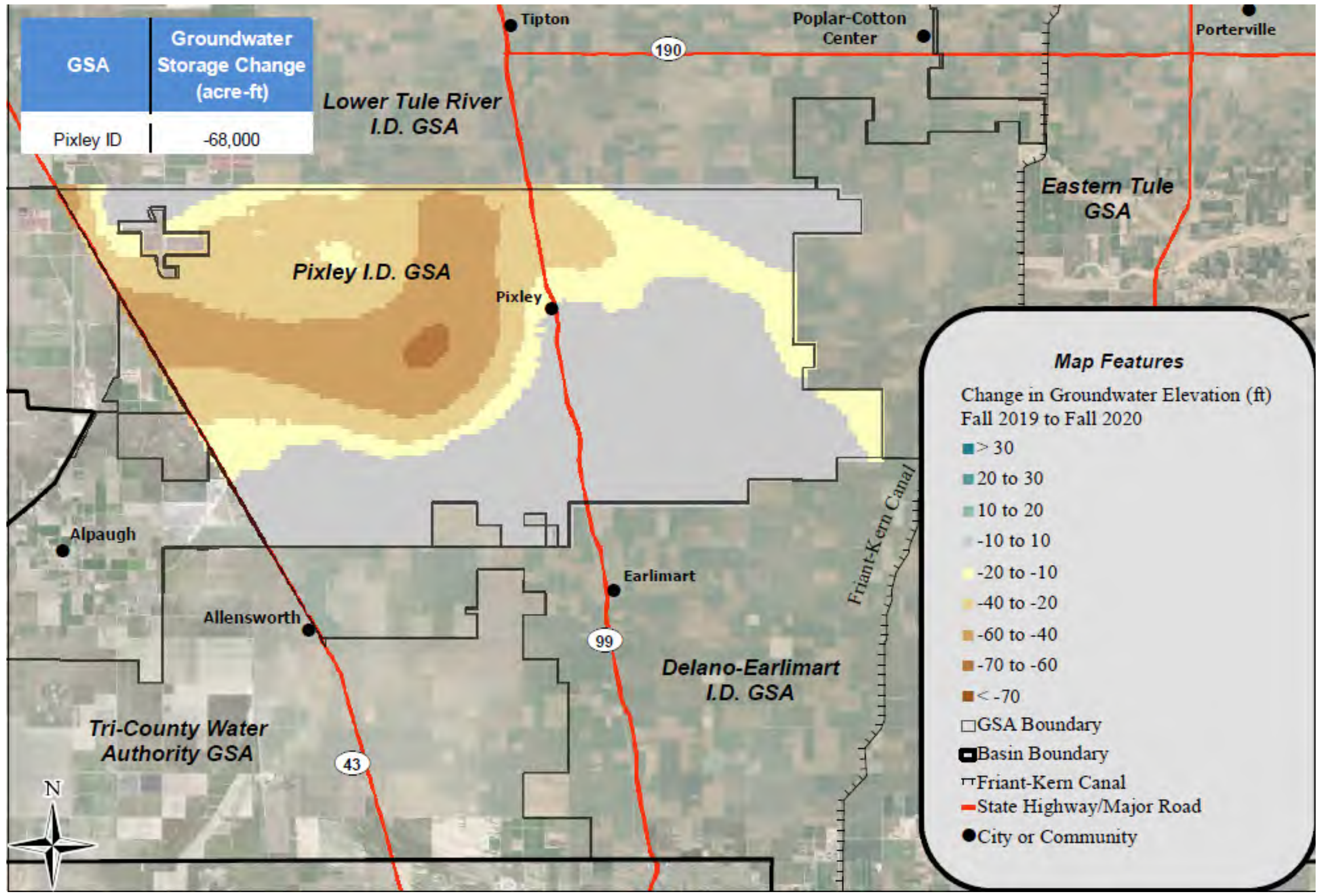


Tule Subbasin
Sustainable Groundwater Management Act
Pixley ID GSA Subsidence Monitoring Network
Legend
Subsidence Benchmarks
Destroyed
RMS Subsidence
Management Areas
Pixley ID Management Area
Pixley PUD Management Area
Teviston CSD Management Area
Friant-Kern Canal
Waterways
Major Roads
Roads
County Boundary
GSA Boundary
Tule Subbasin
Pixley ID = Pixley Irrigation District
N
0
1
2
Miles
4CREEKS
Tule River
190
P0025_B_RMS
P0037_B_RMS
P0096_B_RMS
P0007_B_RMS
P0008_B_RMS
P0027_B_RMS
Pixley
P0026_B_RMS
P0036_B_RMS
P0009_B_RMS
Pixley ID GSA
99
P0010_B_RMS
P0028_B_RMS
P0094_B_RMS
P0095_B_LSMA
Teviston
P0011_B_RMS
P0029_B_RMS
P0093_B_RMS
P0090_B_RMS
Deer Creek
Alpaugh
43
Earlimart
Friant-Kern Canal
Allensworth
White River

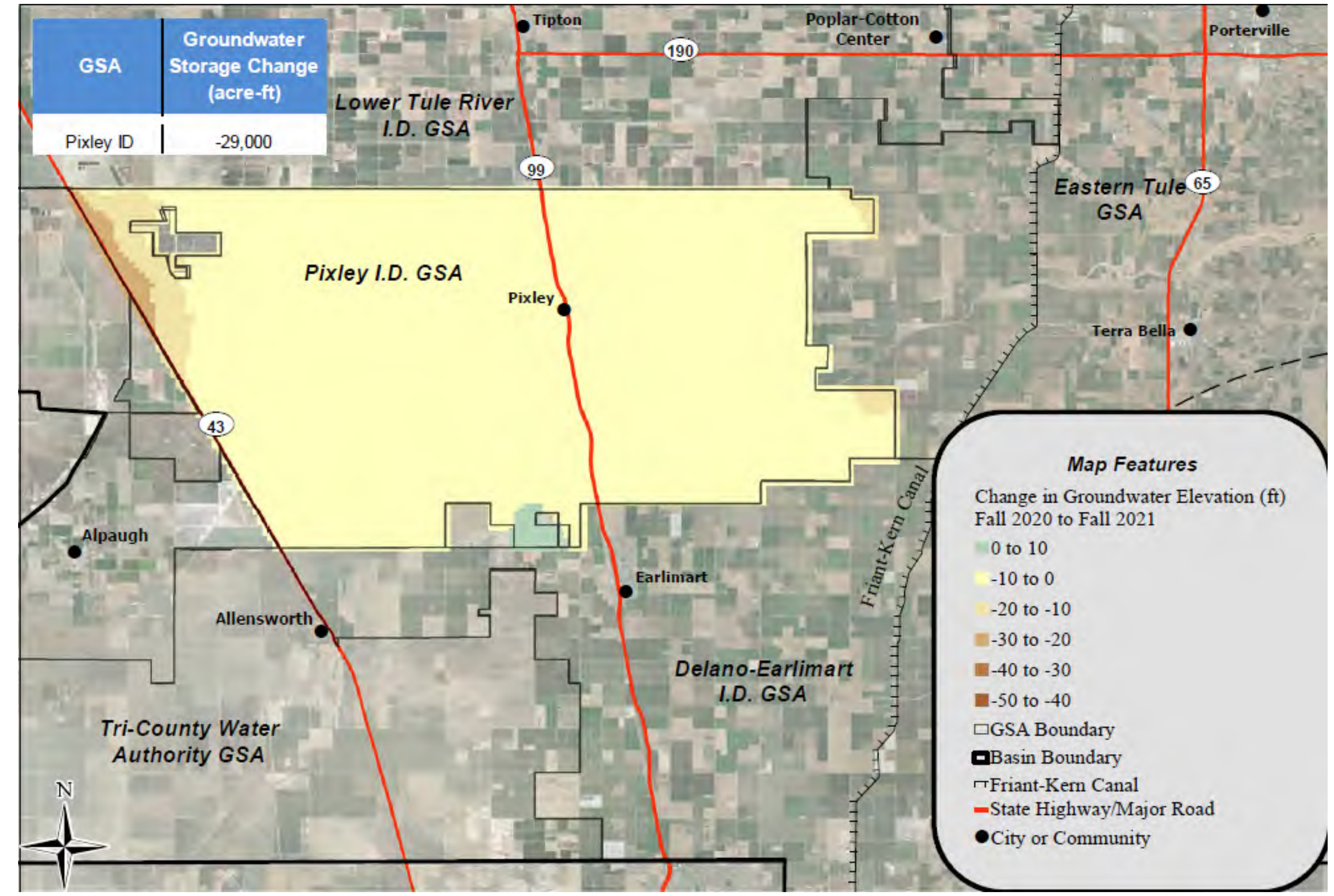
Change in Groundwater Elevation in the Upper Aquifer

Figures courtesy Thomas Harder & Co.

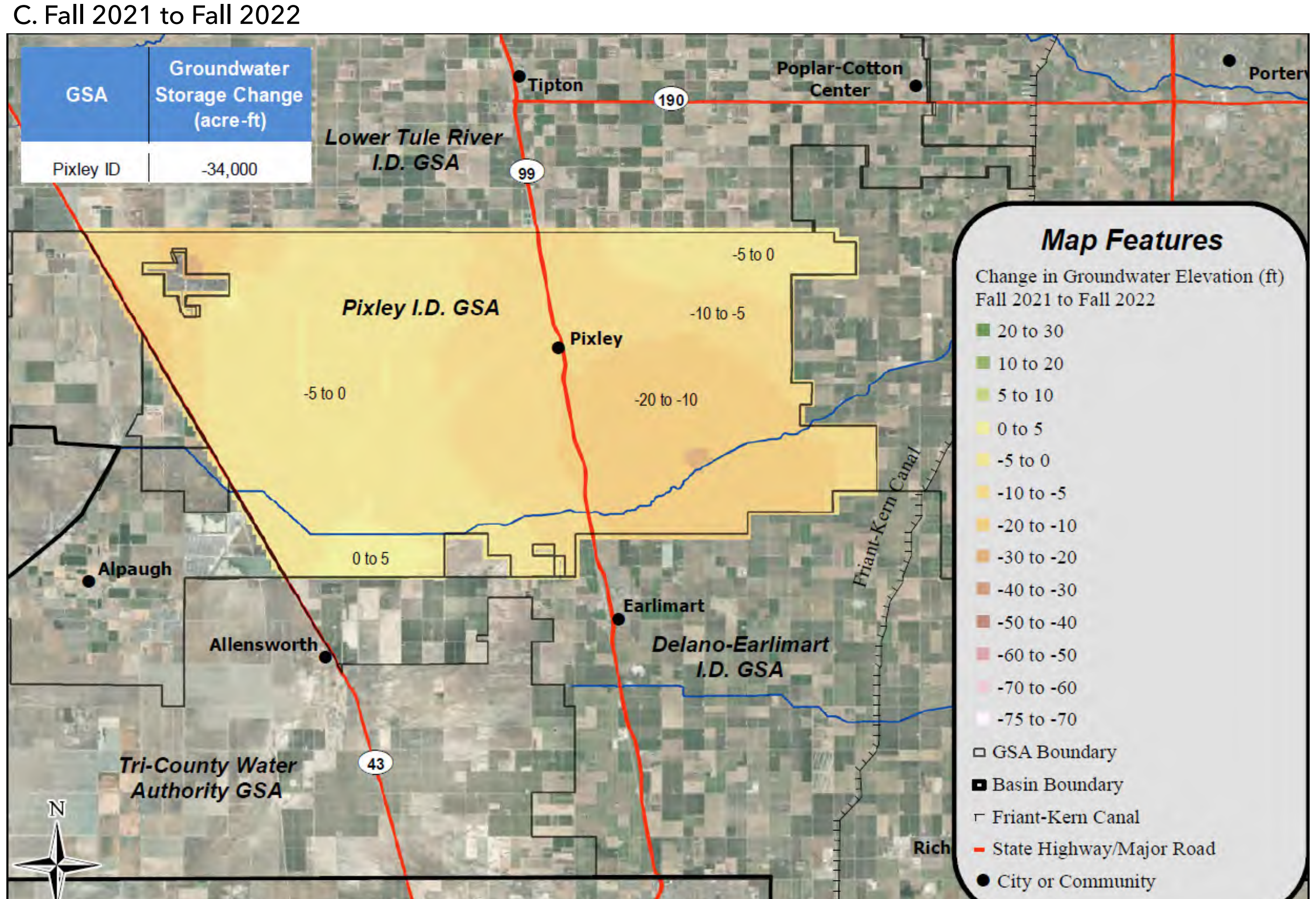
A. Fall 2019 to Fall 2020



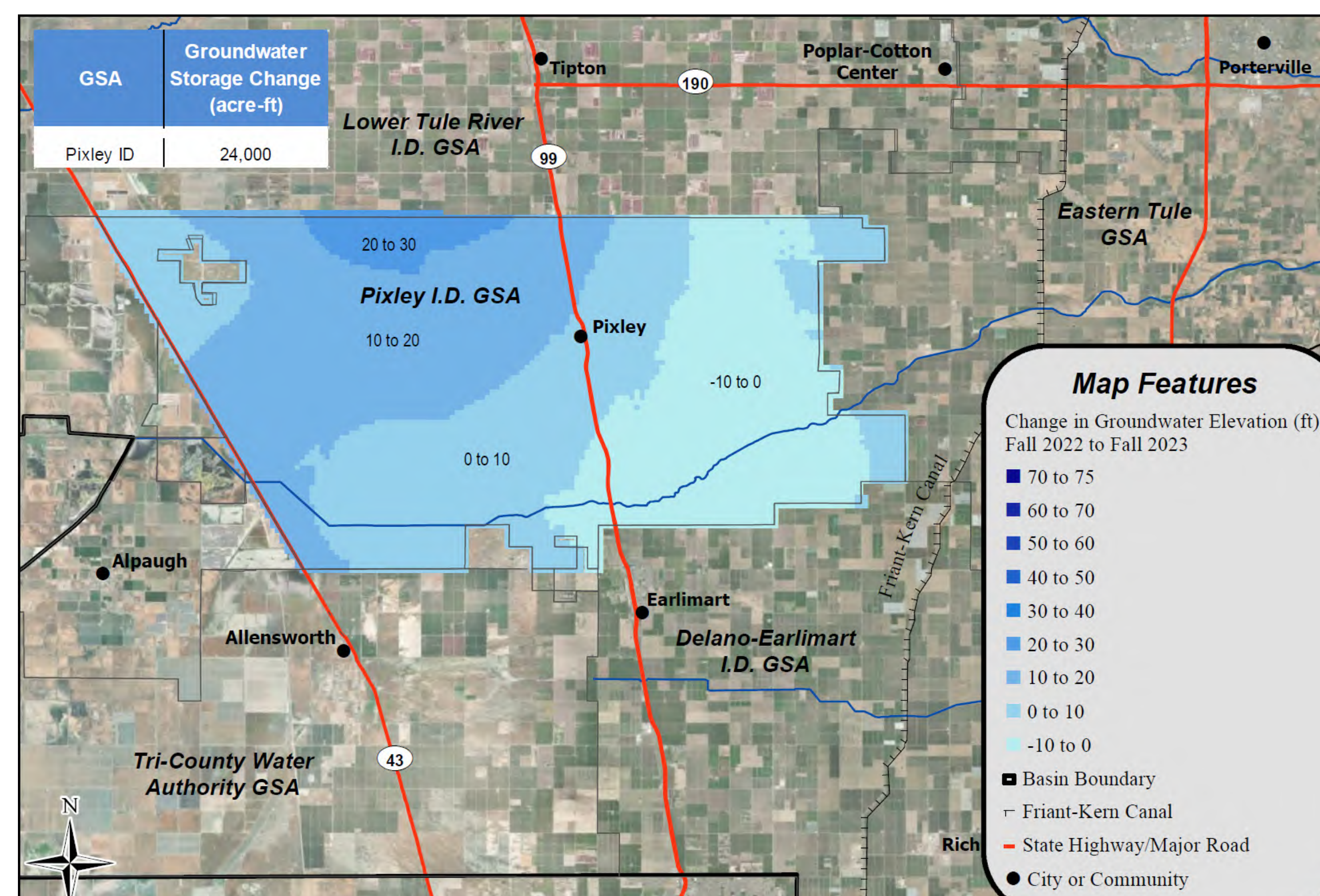
B. Fall 2020 to Fall 2021



C. Fall 2021 to Fall 2022



D. Fall 2022 to Fall 2023



APPENDIX A: ANALYTICAL RESULTS

Historical Analytical Data

			Field Parameters				Chemistry												2023 Expanded Monitoring Program					
Representative Monitoring Site	**Designated Use**	**Sample date**	**EC**	**pH**	**Temp**	**Turbidity**	**Nitrate as Nitrogen**	**Bicarbonate (CaCO3)**	**Carbonate (CaCO3)**	**Carbonate (CO3)**	**Boron**	**Calcium**	**Chloride**	**Magnesium**	**Potassium**	**Sodium**	**Sulfate (SO4)**	**TDS**	**Arsenic**	**Hexavalent Chromium**	**Dibromochloropropane**	**Perchlorate**	**Tetrachloroethene**	**1,2,3-Trichloropropane**
Units[1]	--	--	µS/cm	s.u.	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ppb	mg/L	mg/L	mg/L	mg/L	mg/L
RMS Well: PIDGSA-01U	Agricultural	6/16/2022	694	7.77	24	6.31	12.00	NS[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/8/2023	756	9.30	25.8	3.90	NS	NS	NS	NS	NS	NS	21	NS	NS	54	NS	280	NS	NS	NS	NS	NS	NS
RMS Well: 22S/25E-30 (E0259438)	Drinking	6/10/2020	423	7.72	23.3	7.38	7.50	150	ND[3]	ND	0.12	48.0	26.0	4.5	ND	49	19	310	NS	NS	NS	NS	NS	NS
		6/2/2021	664	7.47	24.8	7.50	14.00	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/9/2022	733	7.65	24.3	8.24	17.00	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/7/2023	520	7.80	20	14.3	10.00	180	ND	ND	ND	51	26	4.3	ND	47	18	350	ND	1.6	ND	ND	ND	ND
RMS Well: 23S/25E-08G01 (724662)	Mixed use	10/25/2018	267	8.27	20.9	6.25	1.70	82	ND	ND	ND	18.0	7	0.5	ND	36	11	150	NS	NS	NS	NS	NS	NS
		6/24/2019	253	8.32	23.2	5.75	1.80	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/8/2020	228	7.95	21.2	7.97	1.70	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/10/2021	242	8.15	21.1	9.32	2.30	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/13/2022	251	8.41	22.8	6.97	2.50	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		6/12/2023	243	8.20	23.6	13	2.60	NS	NS	NS	NS	NS	10	NS	NS	30	NS	140	2.2	1.3	ND	ND	ND	ND

1. ppt = parts per trillion, ppb = parts per billion, ppm = parts per million µS/cm= microsiemens per centimeter, mg/L = milligrams per liter, s.u. = standard units
2. NS = Not Sampled
3. ND =Not Detected

Certificate of Analysis

Sample ID: AGF1697-01
Sampled By: Mike Kenney
Sample Description: 23S25E08G001M // SGMA AG Well

Sample Date - Time: 06/12/2023 - 16:03
Matrix: Ground Water
Sample Type: Grab

Field Data: pH=8.24 Temp=23.6 °C Cond.=242.7 umho D.O. =13.02 mg/L

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Chloride	EPA 300.0	**9.8**	1.0	mg/L	1	AGF1063	06/15/23	06/15/23	
Total Dissolved Solids	SM 2540C	**160**	5.0	mg/L	1	AGF1033	06/15/23	06/15/23	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Sodium	EPA 200.7	**34**	1.0	mg/L	1	AGF1207	06/19/23	06/20/23	

Certificate of Analysis

Sample ID: AGF1182-05
Sampled By: Mike Kenney
Sample Description: IR1023 // AG Well

Sample Date - Time: 06/07/2023 - 12:27
Matrix: Ground Water
Sample Type: Grab

Field Data: pH=7.79 Temp=20.0 ºC Cond.=520.1 umho D.O. =14.30 mg/L

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Chloride	EPA 300.0	**26**	1.0	mg/L	1	AGF0600	06/09/23	06/09/23	
Nitrate as N	EPA 300.0	**10**	0.23	mg/L	1	AGF0600	06/09/23 02:18	06/09/23	
Sulfate as SO4	EPA 300.0	**18**	1.0	mg/L	1	AGF0600	06/09/23	06/09/23	
Total Dissolved Solids	SM 2540C	**360**	5.0	mg/L	1	AGF0654	06/12/23	06/12/23	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Boron	EPA 200.7	ND	100	ug/L	1	AGF0750	06/13/23	06/16/23	
Calcium	EPA 200.7	**51**	0.10	mg/L	1	AGF0750	06/13/23	06/16/23	
Magnesium	EPA 200.7	**4.3**	0.10	mg/L	1	AGF0750	06/13/23	06/16/23	
Potassium	EPA 200.7	ND	2.0	mg/L	1	AGF0750	06/13/23	06/16/23	
Sodium	EPA 200.7	**48**	1.0	mg/L	1	AGF0750	06/13/23	06/16/23	

ASSOCIATES

Certificate of Analysis

Sample ID: AGF1182-05RE1
Sampled By: Mike Kenney
Sample Description: IR1023 // AG Well

Sample Date - Time: 06/07/2023 - 12:27
Matrix: Ground Water
Sample Type: Grab

Field Data: pH=7.79 Temp=20.0 ºC Cond.=520.1 umho D.O. =14.30 mg/L

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Bicarbonate as CaCO3	SM 2320B	**180**	3.0	mg/L	1	AGF0650	06/13/23	06/13/23	B1.3
Carbonate as CaCO3	SM 2320B	ND	3.0	mg/L	1	AGF0650	06/13/23	06/13/23	

Certificate of Analysis

Sample ID: AGF1697-02
Sampled By: Mike Kenney
Sample Description: PIDGSA-01U // SGMA AG Well

Sample Date - Time: 06/12/2023 - 17:34
Matrix: Ground Water
Sample Type: Grab

Field Data: pH=7.70 Temp=20.4 ºC Cond.=469.3 umho D.O. =10.4 mg/L

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Chloride	EPA 300.0	**21**	1.0	mg/L	1	AGF1063	06/16/23	06/16/23	
Total Dissolved Solids	SM 2540C	**280**	5.0	mg/L	1	AGF1033	06/15/23	06/15/23	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Sodium	EPA 200.7	**54**	1.0	mg/L	1	AGF1207	06/19/23	06/20/23	

APPENDIX B: HISTORICAL GROUNDWATER ELEVATION DATA

Historical Groundwater Elevations

RMS Well	Sampling Date	Reference Point Elevation[1]	Depth to Groundwater [1]	Groundwater Elevation[1]
22S/24E-23J01				
	Spring 2020 [3]	239.04	NM[2]	--
	9/30/2020	239.04	276.1	-37.1
	Spring 2021	239.04	NM	--
	10/18/21	239.04	274.3	-35.3
	02/14/22	239.04	267.8	-28.8
	10/10/22	239.04	276.5	-37.5
	02/14/23	239.04	264.8	-25.8
	10/04/23	239.04	259.5	-20.5
23S/24E-28J02				
	2/15/2022	203.72	125	78.7
	10/25/2022	203.72	129.1	74.6
	2/22/2023	203.72	119.8	83.9
22S/25E-25N01				
	03/12/20	306.60	286.7	19.9
	10/01/20	306.60	296.2	10.4
	02/25/21	306.60	288.9	17.7
	10/05/21	306.60	299.2	7.4
	02/04/22	306.60	289.0	17.6
	10/07/22	306.60	304.3	2.3
	02/10/23	306.60	295.0	11.6
	10/06/23	306.60	305.7	0.9
PIDGSA-01 U				
	Spring 2021	298.00	NM	--
	11/05/21	298.00	156.6	141.4
	02/15/22	298.00	151.5	146.5
	10/24/22	298.00	178.4	119.6
	02/17/23	298.00	155.4	142.6
	10/10/23	298.00	143.0	155.0
TSMW 1L				
	Spring 2021	222.00	NM	--
	09/29/21	222.00	369.2	-147.2
	02/04/22	222.00	321.2	-99.2
	10/25/22	222.00	394.0	-172.0
	02/17/23	222.00	309.2	-87.2
	10/04/23	222.00	321.2	-99.2
PIDGSA-01 L				
	2/15/2022	298.00	204.67	93.3
	10/24/22	298.00	233	65.0
	02/17/23	298.00	205.3	92.7
	10/10/23	298.00	203.3	94.7

1. Groundwater elevations are referenced to North American Vertical Datum of 1988 (NAVD88)

2. Not Measured

3. Approximate date ranges where data was provided by Well owner

Depth to Groundwater

No.: 01054
Date: 02/14/2023

WELL INFORMATION

Well ID	22S24E23J001M
GSA	Pixley
Fall 2022 Notes	
Fall 2022 Measurement	276.5
Spring 2022 Measurement	267.8
Fall 2021 Measurement	274.3
Spring 2021 Measurement	NM
Fall 2020 Measurement	276.1
Spring 2020	NM
Fall 2019	NM
Spring 2019	NM
New Date	02/14/2023
New GPS	

Well Photo

Well hasn't been running for the past 24 hrs	✓
Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

No.: 01054

Depth to Groundwater

Date: 02/14/2023

New Time	10:45 AM
Measurement Method 1	Steel Tape
Depth to Groundwater Measurement 1	264.8
Measurement Method 2	Steel Tape
Depth to Groundwater Measurement 2	264.8
Spring 2022	267.8
Last Year Comparison	3.00
Questionable Measurement	
Additional Comments	

4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

Depth to Groundwater

No.: 01122
Date: 02/22/2023

WELL INFORMATION

Well ID	23S24E28J002M
GSA	Pixley
Additional Notes	
Well Photo	
Fall 2022 Notes	
Fall 2022 Measurement	370.5
Spring 2022 Measurement	125
Fall 2021 Measurement	375.3
Spring 2021 Measurement	300.1
Fall 2020 Measurement	370.5
Spring 2020 Measurement	330
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	02/22/2023
New GPS	

Well Photo

Well hasn't been running for the past 24 hrs	✓
Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	11:17 AM
Measurement Method 1	Acoustic Sounder
Depth to Groundwater Measurement 1	119.5
Measurement Method 2	Steel Tape
Depth to Groundwater Measurement 2	119.8
Spring 2022 Measurement	125
Last Year Comparison	5.20
Questionable Measurement	
Additional Comments	

4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

No.: 01030

Depth to Groundwater

Date: 02/10/2023

WELL INFORMATION

Well ID	22S25E25N001M
GSA	Pixley
Fall 2022 Notes	
Fall 2022 Measurement	304.3
Spring 2022 Measurement	289
Fall 2021 Measurement	299.2
Spring 2021 Measurement	288.9
Fall 2020 Measurement	296.2
Spring 2020	286.7
Fall 2019	NM
Spring 2019	NM
New Date	02/10/2023
New GPS	

4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

No.: 01030

Depth to Groundwater

Date: 02/10/2023

Well Photo	
Well hasn't been running for the past 24 hrs	✓
Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	01:24 PM
Measurement Method 1	Acoustic Sounder
Depth to Groundwater Measurement 1	295.1
Measurement Method 2	Electric Sounder
Depth to Groundwater Measurement 2	295.0
Spring 2022	289
Last Year Comparison	-6.10
Questionable Measurement	
Additional Comments	

WELL INFORMATION

Well ID	PIDGSA-01U
GSA	Pixley
Additional Notes	
Well Photo	
Fall 2022 Notes	
Fall 2022 Measurement	178.4
Spring 2022 Measurement	151.5
Fall 2021 Measurement	156.6
Spring 2021 Measurement	NM
Fall 2020 Measurement	178.4
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	02/17/2023
New GPS	

4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

Depth to Groundwater

No.: 01083
Date: 02/17/2023

Well Photo	
Well hasn't been running for the past 24 hrs	✓
Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	08:55 AM
Measurement Method 1	Acoustic Sounder
Depth to Groundwater Measurement 1	155.5
Measurement Method 2	Steel Tape
Depth to Groundwater Measurement 2	155.4
Spring 2022 Measurement	151.5
Last Year Comparison	-3.90
Questionable Measurement	
Additional Comments	

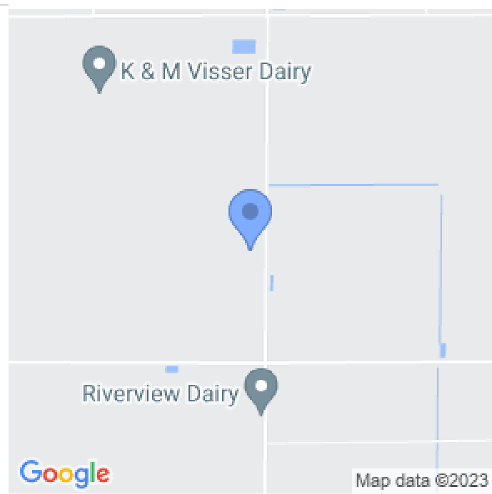
No.: 01087
Depth to Groundwater
Date: 02/17/2023

WELL INFORMATION

Well ID	TSMW 1L
GSA	Pixley
Additional Notes	
Well Photo	
Fall 2022 Notes	

402 is NOT a correct measurement, well is likely dry, Check against well depth. Chain feels like it's hitting bottom exactly at 400' acoustic seems to back this up. Some evidence of water on chain at tip, no hard strike confirmation.

Fall 2022 Measurement	NM
Spring 2022 Measurement	321.2
Fall 2021 Measurement	369.2
Spring 2021 Measurement	NM
Fall 2020 Measurement	NM
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	02/17/2023
New GPS	



Depth to Groundwater

Well Photo	
Well hasn't been running for the past 24 hrs	✓
Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	10:57 AM
Measurement Method 1	Acoustic Sounder
Depth to Groundwater Measurement 1	307.9
Measurement Method 2	Electric Sounder
Depth to Groundwater Measurement 2	309.2
Spring 2022 Measurement	321.2
Last Year Comparison	12.00
Questionable Measurement	
Additional Comments	

4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

Depth to Groundwater

No.: 01084
Date: 02/17/2023

WELL INFORMATION

Well ID	PIDGSA-01L
GSA	Pixley
Additional Notes	
Well Photo	
Fall 2022 Notes	
Fall 2022 Measurement	233
Spring 2022 Measurement	202.1
Fall 2021 Measurement	NM
Spring 2021 Measurement	NM
Fall 2020 Measurement	233
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	02/17/2023
New GPS	

No.: 01084

Depth to Groundwater

Date: 02/17/2023

Well Photo

Well hasn't been running for the past 24 hrs	✓
Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	08:59 AM
Measurement Method 1	Acoustic Sounder
Depth to Groundwater Measurement 1	205.5
Measurement Method 2	Steel Tape
Depth to Groundwater Measurement 2	205.3
Spring 2022 Measurement	202.1
Last Year Comparison	-3.20
Questionable Measurement	
Additional Comments	

4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

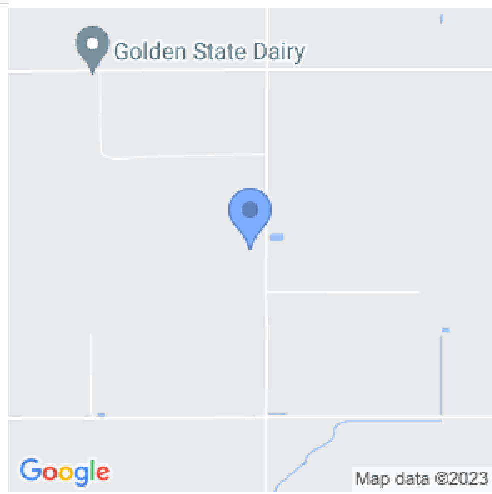
No.: 01252

Depth to Groundwater

Date: 10/04/2023

WELL INFORMATION

Well ID	22S24E23J001M
GSA	Pixley
Spring 2023 Notes	
TAP/CLICK for Well Photo	http://
Spring 2023 Measurement	264.8
Fall 2022 Measurement	276.5
Spring 2022 Measurement	267.8
Fall 2021 Measurement	274.3
Spring 2021 Measurement	NM
Fall 2020 Measurement	276.1
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	10/04/2023
New GPS	



Well Photo

Well hasn't been running for the past 24 hrs ✓

Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	01:29 PM
Measurement Method 1	Steel Tape
Depth to Groundwater Measurement 1	259.5
Measurement Method 2	Steel Tape
Depth to Groundwater Measurement 2	259.5
Spring 2023 Measurement	264.8
Last Year Comparison	5.30
Questionable Measurement	0 - Caved or deepened
Additional Comments	

WELL INFORMATION

Well ID	22S25E25N001M
GSA	Pixley
Spring 2023 Notes	
TAP/CLICK for Well Photo	http://
Spring 2023 Measurement	295
Fall 2022 Measurement	304.3
Spring 2022 Measurement	289
Fall 2021 Measurement	299.2
Spring 2021 Measurement	288.9
Fall 2020 Measurement	296.2
Spring 2020 Measurement	286.7
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	10/06/2023
New GPS	

Well Photo

Well hasn't been running for the past 24 hrs ☐

Surrounding wells are not running (to the best of my knowledge)	☑

MEASUREMENT

New Time	03:10 PM
Measurement Method 1	Acoustic Sounder
Depth to Groundwater Measurement 1	305.7
Measurement Method 2	Acoustic Sounder
Depth to Groundwater Measurement 2	305.7
Spring 2023 Measurement	295
Last Year Comparison	-10.70
Questionable Measurement	
Additional Comments	

WELL INFORMATION

Well ID	PIDGSA-01L
GSA	Pixley
Spring 2023 Notes	
TAP/CLICK for Well Photo	http://
Spring 2023 Measurement	205.3
Fall 2022 Measurement	233
Spring 2022 Measurement	202.1
Fall 2021 Measurement	NM
Spring 2021 Measurement	NM
Fall 2020 Measurement	NM
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	10/10/2023
New GPS	

Well Photo

Well hasn't been running for the past 24 hrs ✓

Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	12:19 PM
Measurement Method 1	Electric Sounder
Depth to Groundwater Measurement 1	203.3
Measurement Method 2	Electric Sounder
Depth to Groundwater Measurement 2	203.3
Spring 2023 Measurement	205.3
Last Year Comparison	2.00
Questionable Measurement	
Additional Comments	

Depth to Groundwater

WELL INFORMATION

Well ID	PIDGSA-01U
GSA	Pixley
Spring 2023 Notes	
TAP/CLICK for Well Photo	http://
Spring 2023 Measurement	155.4
Fall 2022 Measurement	178.4
Spring 2022 Measurement	151.51
Fall 2021 Measurement	156.6
Spring 2021 Measurement	NM
Fall 2020 Measurement	NM
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	10/10/2023
New GPS	

Well Photo

Well hasn't been running for the past 24 hrs ✓

Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	12:11 PM
Measurement Method 1	Electric Sounder
Depth to Groundwater Measurement 1	143.0
Measurement Method 2	Electric Sounder
Depth to Groundwater Measurement 2	143.0
Spring 2023 Measurement	155.4
Last Year Comparison	12.40
Questionable Measurement	
Additional Comments	

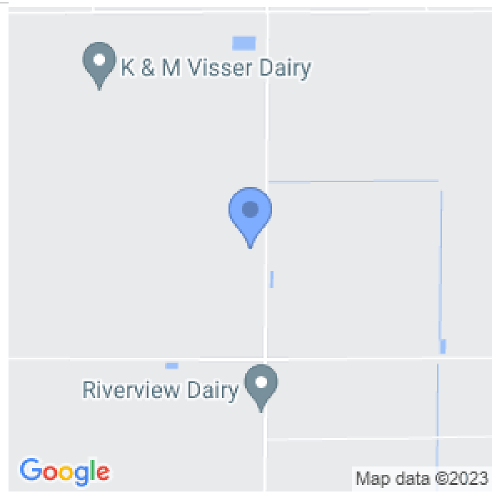
4Creeks
324 S. Santa Fe St. Suite A
Visalia, CA 93291

Depth to Groundwater

No.: 01238
Date: 10/04/2023

WELL INFORMATION

Well ID	TSMW 1L
GSA	Pixley
Spring 2023 Notes	
TAP/CLICK for Well Photo	http://
Spring 2023 Measurement	309.2
Fall 2022 Measurement	NM
Spring 2022 Measurement	321.2
Fall 2021 Measurement	369.2
Spring 2021 Measurement	NM
Fall 2020 Measurement	NM
Spring 2020 Measurement	NM
Fall 2019 Measurement	NM
Spring 2019 Measurement	NM
New Date	10/04/2023
New GPS	



Well Photo

Well hasn't been running for the past 24 hrs ✓

Surrounding wells are not running (to the best of my knowledge)	✓

MEASUREMENT

New Time	07:50 AM
Measurement Method 1	Electric Sounder
Depth to Groundwater Measurement 1	321.2
Measurement Method 2	Electric Sounder
Depth to Groundwater Measurement 2	321.2
Spring 2023 Measurement	309.2
Last Year Comparison	-12.00
Questionable Measurement	
Additional Comments	

ATTACHMENT 1: TULE SUBBASIN 2022/2023 ANNUAL REPORT

Tule Subbasin 2022/23 Annual Report

March 2024

Prepared for

Tule Subbasin Technical Advisory Committee

Prepared by

Thomas Harder

Thomas Harder, P.G., C.HG.
Principal Hydrogeologist

CERTIFIED HYDROGEOLOGIST
THOMAS E. HARDER
No: 588
STATE OF CALIFORNIA

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Executive Summary

This is the fourth annual report of the Tule Subbasin, identified by the California Department of Water Resources (CDWR) as No. 5-22-13 of the Tulare Lake Hydrologic Region (see Figure 1). This report is being submitted in compliance with Title 23 of the California Code of Regulations, Division 2, Chapter 1.5, Subchapter 2, Article 7, Section 356.2, as required under the Sustainable Groundwater Management Act (SGMA). As per Section 356.2, this report addresses data collected for the preceding water year, which covers October 1, 2022, through September 30, 2023.

The Tule Subbasin includes eight Groundwater Sustainability Agencies (GSAs; see Figure 2):

1. Eastern Tule Groundwater Sustainability Agency (ETGSA),
2. Tri-County Water Authority (TCWA),
3. Pixley Irrigation District Groundwater Sustainability Agency (Pixley GSA),
4. Lower Tule River Irrigation District Groundwater Sustainability Agency (LTGSA),
5. Delano-Earlimart Irrigation District Groundwater Sustainability Agency (DEID GSA)
6. Alpaugh Groundwater Sustainability Agency (Alpaugh GSA)
7. Kern-Tulare Water District Groundwater Sustainability Agency (KTWD GSA), and
8. Tulare County Groundwater Sustainability Agency (Tulare County GSA).

Seven of the eight GSAs within the Tule Subbasin have developed and submitted to the CDWR independent Groundwater Sustainability Plans (GSPs) pursuant to 23 CCR §353.6. Tulare County GSA has entered into Memoranda of Understanding (MOUs) concerning coverage of territories under adjacent GSPs. As such, their jurisdictional areas are included in the other seven GSPs.

Groundwater Elevation Data

Two primary aquifers have been identified within the Tule Subbasin: an upper unconfined to semi-confined aquifer (the Upper Aquifer) and a lower semi-confined to confined aquifer (the Lower Aquifer). Groundwater elevation contour maps and hydrographs have been developed for each of these two primary aquifers.

Groundwater in the Upper Aquifer of the Tule Subbasin flows from areas of natural recharge along major streams at the base of the Sierra Nevada Mountains on the eastern boundary towards a groundwater pumping depression in the central portion of the subbasin. Groundwater flow patterns did not change significantly between the spring and fall 2023. In the Upper Aquifer, groundwater generally flows from the northeast to the southwest towards groundwater level depressions in the northwestern and western portions of the subbasin. The same groundwater level conditions and flow patterns were observed from Lower Aquifer contour maps generated from both the spring and fall of 2023.

Groundwater levels in the Tule Subbasin vary seasonally and over longer periods based on precipitation trends and groundwater pumping. Groundwater levels were generally higher across much of the Tule Subbasin for the 2022/23 water year as a result of recent wet conditions and less groundwater pumping relative to previous years.

Groundwater Extractions

Total groundwater extraction from the Tule Subbasin for water year 2022/23 was 396,810 acre-ft, as summarized by water use sector in the following table:

Table ES-1
Tule Subbasin Groundwater Extraction for Water Year 2022/23

Groundwater Sustainability Agency	Management Area	Groundwater Extraction Sector: Agricultural (acre-ft)	Groundwater Extraction Sector: Urban (acre-ft)	Groundwater Extraction Sector: For Export (acre-ft)	Total (acre-ft)
LTRID	Agricultural	49,000	0	2,300	51,300
	Municipal	0	1,220	0	1,220
	Tulare County MOU	1,000	0	0	1,000
	Total	**50,000**	**1,220**	**2,300**	**53,520**
ETGSA	Greater Tule	144,300	0	0	144,300
	Porterville Community	1,500	10,180	0	11,680
	Ducor Community	0	90	0	90
	Terra Bella Community	0	210	0	210
	Total	**145,800**	**10,480**	**0**	**156,280**
DEID	DEID	38,900	0	0	38,900
	Richgrove CSD	0	870	0	870
	Earlimart PUD	0	2,930	0	2,930
	Total	**38,900**	**3,800**	**0**	**42,700**
Pixley ID	Pixley ID	80,000	0	0	80,000
	Pixley PUD	0	560	0	560
	Teviston CSD	0	100	0	100
	Total	**80,000**	**660**	**0**	**80,660**
TCWA	North	1,400	0	2,500	3,900
	Southeast	57,000	100	0	57,100
	Total	**58,400**	**100**	**2,500**	**61,000**
Alpaugh ID	**Total**	**0**	**250**	**0**	**250**
KTWD	**Total**	**2,400**	**0**	**0**	**2,400**
	Grand Total	***375,500***	***16,510***	***4,800***	***396,810***

Surface Water Supplies

Total surface water available for use within the Tule Subbasin for water year 2022/23 was 1,749,430 acre-ft as summarized by water use sector in the following table:

Table ES-2
Tule Subbasin Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Central Valley Project	Managed Local Supplies	Recycled Water	Reused Water	Precip-itation	Total
LTRID	Agricultural	314,500	291,300	0	0	121,200	727,000
	Municipal	0	0	230	0	0	230
	Tulare County MOU	0	0	0	0	900	900
	Total	**314,500**	**291,300**	**230**	**0**	**122,100**	**728,130**
ETGSA	Greater Tule	151,100	36,800	0	0	176,500	364,400
	Porterville Community	0	9,700	5,000	0	3,300	18,000
	Ducor Community	0	0	0	0	0	0
	Terra Bella Community	1,400	0	0	0	0	1,400
	Total	**152,500**	**46,500**	**5,000**	**0**	**179,800**	**383,800**
DEID	DEID	187,400	0	0	0	61,600	249,000
	Richgrove CSD	0	0	0	0	0	0
	Earlimart PUD	0	0	0	0	0	0
	Total	**187,400**	**0**	**0**	**0**	**61,600**	**249,000**
Pixley ID	Pixley ID	86,300	45,500	0	0	71,800	203,600
	Pixley PUD	0	0	0	0	0	0
	Teviston CSD	0	0	0	0	0	0
	Total	**86,300**	**45,500**	**0**	**0**	**71,800**	**203,600**
TCWA	North	0	67,600	0	0	8,300	75,900
	Southeast	0	0	0	0	51,500	51,500
	Total	**0**	**67,600**	**0**	**0**	**59,800**	**127,400**
Alpaugh ID	**Total**	**2,900**	**18,100**	**0**	**0**	**13,800**	**34,800**
KTWD	**Total**	**11,000**	**0**	**0**	**1,200**	**10,500**	**22,700**
	Grand Total	***754,600***	***469,000***	***5,230***	***1,200***	***519,400***	***1,749,430***

Total Water Use

Total water use in the Tule Subbasin for water year 2022/23, including both groundwater extractions, surface water supplies, recycled water, and reused water was 2,146,240 acre-ft as shown in the following table:

Table ES-3

Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
LTRID	Agricultural	51,300	727,000	0	0	778,300
	Municipal	1,220	0	230	0	1,450
	Tulare County MOU	1,000	900	0	0	1,900
	Total	**53,520**	**727,900**	**230**	**0**	**781,650**
ETGSA	Greater Tule	144,300	364,400	0	0	508,700
	Porterville Community	11,680	13,000	5,000	0	29,680
	Ducor Community	90	0	0	0	90
	Terra Bella Community	210	1,400	0	0	1,610
	Total	**156,280**	**378,800**	**5,000**	**0**	**540,080**
DEID	DEID	38,900	249,000	0	0	287,900
	Richgrove CSD	870	0	0	0	870
	Earlimart PUD	2,930	0	0	0	2,930
	Total	**42,700**	**249,000**	**0**	**0**	**291,700**
Pixley ID	Pixley ID	80,000	203,600	0	0	283,600
	Pixley PUD	560	0	0	0	560
	Teviston CSD	100	0	0	0	100
	Total	**80,660**	**203,600**	**0**	**0**	**284,260**
TCWA	North	3,900	75,900	0	0	79,800
	Southeast	57,100	51,500	0	0	108,600
	Total	**61,000**	**127,400**	**0**	**0**	**188,400**
Alpaugh ID	**Total**	**250**	**34,800**	**0**	**0**	**35,050**
KTWD	**Total**	**2,400**	**21,500**	**0**	**1,200**	**25,100**
	Grand Total	***396,810***	***1,743,000***	***5,230***	***1,200***	***2,146,240***

Note: All values are in acre-ft.

Table ES-4

Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
LTRID GSA	Agricultural	408,200	0	367,800	0	2,300	778,300
	Municipal	0	1,220	230	0	0	1,450
	Tulare County MOU	1,900	0	0	0	0	1,900
	Total	**410,100**	**1,220**	**368,030**	**0**	**2,300**	**781,650**
ETGSA	Greater Tule	364,000	0	144,700	0	0	508,700
	Porterville Community	7,600	10,180	11,900	0	0	29,680
	Ducor Community	0	90	0	0	0	90
	Terra Bella Community	0	1,610	0	0	0	1,610
	Total	**371,600**	**11,880**	**156,600**	**0**	**0**	**540,080**
DEID GSA	DEID	191,400	0	41,900	0	54,600	287,900
	Richgrove CSD	0	870	0	0	0	870
	Earlimart PUD	0	2,930	0	0	0	2,930
	Total	**191,400**	**3,800**	**41,900**	**0**	**54,600**	**291,700**
Pixley ID GSA	Pixley ID	215,800	0	67,800	0	0	283,600
	Pixley PUD	0	560	0	0	0	560
	Teviston CSD	0	100	0	0	0	100
	Total	**215,800**	**660**	**67,800**	**0**	**0**	**284,260**
TCWA GSA	North	16,300	0	61,000	0	2,500	79,800
	Southeast	108,500	100	0	0	0	108,600
	Total	**124,800**	**100**	**61,000**	**0**	**2,500**	**188,400**
Alpaugh ID GSA	**Total**	**31,800**	**250**	**3,000**	**0**	**0**	**35,050**
KTWD GSA	**Total**	**25,100**	**0**	**0**	**0**	**0**	**25,100**
	Grand Total	***1,370,600***	***17,910***	***698,330***	***0***	***59,400***	***2,146,240***

Total water use in the Tule Subbasin for water year 2022/23, for the agricultural, urban, managed recharge, native vegetation, and export sectors was 2,146,240 acre-ft as shown on the following table.

Change in Groundwater in Storage

Results of the change in groundwater in storage analysis showed that between fall 2022 and fall 2023, groundwater in storage increased by approximately 568,100 acre-ft in the Upper Aquifer and decreased by approximately 47,050 acre-ft in the Lower Aquifer.

Since 2015/16, the volume of groundwater in storage in the Tule Subbasin Upper Aquifer has increased by approximately 454,000 acre-ft and decreased by approximately 903,000 acre-ft in the Lower Aquifer.

1. Introduction

This is the fourth annual report of the Tule Subbasin, identified by the California Department of Water Resources (CDWR) as No. 5-22-13 of the Tulare Lake Hydrologic Region (see Figure 1). This report is being submitted in compliance with Title 23 of the California Code of Regulations, Division 2, Chapter 1.5, Subchapter 2, Article 7, Section 356.2, as required under the Sustainable Groundwater Management Act (SGMA). As per Section 356.2, this report addresses data collected for the preceding water year, which covers October 1, 2022, through September 30, 2023.

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5. Delano-Earlimart Irrigation District Groundwater Sustainability Agency (DEID GSA)
6. Alpaugh Groundwater Sustainability Agency (Alpaugh GSA)
7. Kern-Tulare Water District Groundwater Sustainability Agency (KTWD GSA), and
8. Tulare County Groundwater Sustainability Agency (Tulare County GSA).

Seven of the eight GSAs within the Tule Subbasin have developed and submitted to the CDWR independent Groundwater Sustainability Plans (GSPs) pursuant to 23 CCR §353.6. Tulare County GSA has entered into Memoranda of Understanding (MOUs) concerning coverage of territories under adjacent GSPs. As such, their jurisdictional areas are included in the other seven GSPs. Also, KTWD GSA was previously a Management Area within the ETGSA and incorporated into its GSPs. KTWD formed its own GSA in 2023 and is in the process of preparing a separate GSP in 2024 for submittal to the CDWR.

The six GSPs for the Tule Subbasin have been developed and submitted under a Coordination Agreement. The purpose of the Coordination Agreement is to fulfill all statutory and regulatory requirements related to intra-basin coordination agreements pursuant to SGMA. The Coordination Agreement includes two attachments: Attachment 1 describes the subbasin-wide monitoring network that all Tule Subbasin GSAs shall utilize for the collection of data to be used in annual reports. Attachment 2 describes the subbasin setting, which represents the coordinated understanding of the physical characteristics of the subbasin.

1.1 Tule Subbasin Description

The Tule Subbasin is in the southern portion of the San Joaquin Valley Groundwater Basin in the Central Valley of California. The area of the Tule Subbasin is defined by the latest version of CDWR Bulletin 118[1] and is approximately 744 square miles (475,895 acres). The lateral

California Department of Water Resources, 2016. Final 2016 Bulletin 118 Groundwater Basin Boundaries shapefile. http://www.water.ca.gov/groundwater/sgm/basin_boundaries.cfm boundaries of the subbasin include both natural and political boundaries (see Figure 2). The eastern boundary of the Tule Subbasin is defined by the surface contact between crystalline rocks of the Sierra Nevada and surficial alluvial sediments that make up the groundwater basin. The northern boundary is defined by the Lower Tule River Irrigation District (LTRID) and Porterville Irrigation District boundaries. The western boundary is defined by the Tulare County/Kings County boundary, except for a portion of the Tulare Lake Basin Water Storage District that extends east across the county boundary and is excluded from the subbasin. The southern boundary is defined by the Tulare County/Kern County boundary except for the portion of the Delano-Earlimart Irrigation District (DEID) that extends south of the county boundary and is included in the subbasin. Communities within the subbasin include Allensworth, Alpaugh, Porterville, Tipton, Woodville, Poplar, Teviston, Pixley, Earlimart, Richgrove, Ducor and Terra Bella. Neighboring DWR Bulletin 118 subbasins include the Kern County Subbasin to the south, the Tulare Lake Subbasin to the west, and the Kaweah Subbasin to the north.

1.2 Hydrogeologic Setting

The Tule Subbasin is located on a series of coalescing alluvial fans that extend toward the center of the San Joaquin Valley from the Sierra Nevada Mountains (see Figure 3). The alluvial fans merge with lacustrine deposits of the Tulare Lakebed in the western portion of the subbasin. Land surface elevations within the Tule Subbasin range from approximately 850 ft above mean sea level (amsl) along the eastern margins of the subbasin to approximately 180 ft amsl at the western boundary (see Figure 3).

Where saturated in the subsurface, the permeable sand and gravel layers form the principal aquifers in the Tule Subbasin and adjacent areas to the north, south and west. Individual aquifer layers consist of lenticular sand and gravel deposits of varying thickness and lateral extent. The aquifer layers are interbedded with low permeability silt and clay confining layers. In general, there are five aquifer/aquitard units in the subsurface beneath the Tule Subbasin (see Figure 4):

1. Upper Aquifer
2. The Corcoran Clay Confining Unit
3. Lower Aquifer
4. Pliocene Marine Deposits (generally considered an aquitard)
5. Santa Margarita Formation and Olcese Formation of the Southeastern Subbasin

Two primary aquifers have been identified within the Tule Subbasin: an upper unconfined to semi-confined aquifer and a lower semi-confined to confined aquifer. The upper and lower aquifers are separated by the Corcoran Clay confining unit in the western portion of the subbasin. Groundwater within the southeastern portion of the subbasin is also produced from the Santa Margarita Formation, which is located stratigraphically below the lower aquifer.

In general, groundwater in the Tule Subbasin flows from areas of natural recharge along major streams at the base of the Sierra Nevada Mountains on the eastern boundary towards the western-central portion of the subbasin.

1.3 Tule Subbasin Monitoring Network

The Tule Subbasin Technical Advisory Committee (TAC) has developed a subbasin-wide monitoring plan, which describes the monitoring network and monitoring methodologies to be used to collect the data to be included in Tule Subbasin GSPs and annual reports. The subbasin-wide monitoring plan is included as Attachment 1 to the Coordination Agreement. The groundwater level monitoring network from the monitoring plan is shown on Figure 5 and includes monitoring features to enable collection of data from the Upper Aquifer, Lower Aquifer and Santa Margarita Formation aquifer. Groundwater levels are collected in the late winter/early spring (February) and in October to account for seasonal high and low groundwater conditions.

A subset of groundwater level monitoring features in the monitoring plan have been identified as representative monitoring sites (RMS) to be relied on for the purpose of assessing progress with respect to groundwater level sustainability in the subbasin. The representative groundwater level monitoring sites are shown on Figure 5.

A land surface elevation monitoring network has also been established and is shown on Figure 6. This monitoring network consists of 132 benchmarks installed by the Tule Subbasin TAC between 2020 and 2022, 58 existing benchmarks installed by the Friant Water Authority, and 74 benchmarks within the network have been designated as a representative monitoring site (RMS). The elevations of the benchmarks are surveyed annually, at a minimum. Land surface change from July 2022 to July 2023 as measured at available benchmarks are shown on Figure 7. The most recent land surface elevation data are provided in Appendices A through G, along with established measurable objectives and minimum thresholds. Land subsidence measured from InSAR data provided by the CDWR from October 2022 to September 2023 is shown on Figure 8.

1.4 Purpose and Scope of this Annual Report

The purpose of this annual report is to document groundwater level conditions, groundwater extractions, surface water supply, and changes in groundwater storage in the Tule Subbasin for the 2022/23 water year, in accordance with CCR §356.2. The annual report also provides a description of progress toward implementing the collective GSPs for the seven GSAs in the subbasin.

2. Groundwater Elevation Data §356.2 (b)(1)

Groundwater elevation contour maps were developed using data compiled from wells that are part of the Tule Subbasin Monitoring Plan (e.g. Representative Monitoring Site Wells), wells monitored as part of the Irrigated Lands Regulatory Program (ILRP), and wells from other monitoring programs, which are primarily monitored by local irrigation districts. Wells from the first two sources were identified as being perforated in either the Upper Aquifer or Lower Aquifer or both the Upper and Lower aquifers (i.e. composite aquifer wells). The perforation depths for most wells from the other monitoring programs are unknown and are therefore not included in the groundwater level monitoring network as shown on Figure 5. Sources of uncertainty in the available data included:

- Lack of representative monitoring well data in some areas.
- Limitations in the number of monitoring wells with known perforation intervals.
- Variations in monitoring frequency, such as due to lack of access, resulting in different spatial and temporal coverage from contour map to contour map.
- Utilization of groundwater level data from private agricultural wells in which the pumping status was unknown or where the length of time between turning the pumps off and obtaining the measurements was unknown.
- New data that was available for the 2023 contour map(s) but was not available at the time the 2022 contour map(s) was developed.

In general, TH&Co used as much of the available data as possible to generate the contour maps presented in this annual report. However, given uncertainties in the data, some professional judgment was involved. The process for generating the contours was as follows:

- For the Upper Aquifer contour maps, the basemaps originally included groundwater level data for Upper Aquifer wells (based on available documentation), wells with perforations in composite aquifers, and wells with unknown perforation intervals.
- Based on available data, the hydraulic head of the Upper Aquifer in the Tule Subbasin is always higher than the hydraulic head of the Lower Aquifer. In areas where multiple groundwater levels were available, the highest elevation was used to constrain the contours.
- Groundwater levels from wells for which documentation showed them to be Upper Aquifer wells were generally given the highest weight in generating the contours. However, in some cases, groundwater levels in designated Upper Aquifer wells were significantly lower than groundwater levels in other area wells whose perforation interval was unknown. In those cases, the contours were constrained to the higher levels.
- Groundwater levels measured in dedicated monitoring wells were always relied on.

- In some instances, additional groundwater levels from wells not formally within the groundwater level monitoring network (see Figure 5) were included, as available, such as from wells with unknown aquifer designations.
- The Upper Aquifer groundwater contour maps shown on Figures 9 and 10 show only the data upon which the contours were developed.
- For the Lower Aquifer, groundwater levels from d wells known to be perforated exclusively in the Lower Aquifer (including dedicated Lower Aquifer monitoring wells) were the primary source of data used to generate the contour maps. Supplement data from wells with composite and unknown aquifer designations was used in some cases and was based on comparison of their groundwater levels to those of nearby wells (see Figures 11 and 12).

Uncertainties in the groundwater level monitoring network are being addressed through the drilling and construction of dedicated, aquifer specific monitoring wells as well as investigations and improvements to the other wells being monitored. As new monitoring wells are constructed, they will replace some of the agricultural wells that are currently relied on. To date, two nested monitoring wells, four cluster monitoring wells, and one single completion monitoring well have been added to the monitoring network. Further, additional monitoring wells may be constructed in the future. As more monitoring features are installed, it is expected that groundwater elevation contour maps from year to year will become more representative.

2.1 Groundwater Elevation Contour Maps §356.2 (b)(1)(A)

Upper Aquifer

Groundwater in the Upper Aquifer of the Tule Subbasin flows from areas of natural recharge along major streams at the base of the Sierra Nevada Mountains on the eastern boundary towards a groundwater pumping depression in the west-central portion of the subbasin (see Figures 9 and 10). The pumping depression is most pronounced between the Tule River and Deer Creek west of Highway 99. The groundwater level depression was observed from data collected in both the spring and fall of 2023. Groundwater flow patterns in the Upper Aquifer did not change significantly between the spring and fall of 2023.

The Upper Aquifer in the southeastern portion of the Tule Subbasin has been largely dewatered since the 1960s.[2]

[2] Lofgren, B.E., and Klausing, R.L., 1969. Land Subsidence Due to Groundwater Withdrawal Tulare-Wasco Area California. United States Geological Survey Professional Paper 437-B.

Lower Aquifer

In the Lower Aquifer, groundwater generally flows from the northeast to the southwest towards groundwater level depressions in the northwestern and western portions of the subbasin (see Figures 11 and 12). Lower Aquifer pumping depressions are observed in the Tri-County GSA and Alpaugh GSA areas. The same groundwater level conditions and flow patterns were observed from Lower Aquifer contour maps generated from both the spring and fall of 2023.

2.2 Groundwater Level Hydrographs §356.2 (b)(1)(B)

Groundwater level hydrographs for Representative Monitoring Site (RMS) wells in each GSA are provided in Appendices A through G. Spring and fall 2023 groundwater levels for the RMS wells are summarized in Tables 1 through 7 of the following sections.

It is noted that some of the RMS wells shown in Tables 1 through 7 have been added since the Tule Subbasin GSPs were finalized in July 2022. Most of the added RMS wells are new dedicated monitoring wells that have been drilled and constructed since January 2020. Some existing wells have been identified and added as RMS wells to address data gaps. Finally, some of the previously designated RMS wells were found to be inadequate for collecting reliable data and alternate existing wells were identified as replacements. These changes are consistent with Section 4.1 of the Tule Basin Monitoring Plan (TSMP),[3] which states that the plan is *"..both flexible and iterative, allowing for the addition or subtraction of monitoring features, as necessary, and to accommodate changes in monitoring frequency and alternative methodologies, as appropriate."*

The newly added RMS wells in Tables 1 through 7 have not yet been assigned Sustainable Management Criteria (SMC; measurable objectives, intermediate milestones, and minimum thresholds). The work to assign the SMC at each RMS is currently underway.

On-going data collected at new RMS wells allows the Tule Subbasin TAC to address areas of data gaps and improve the accuracy of the subbasin-wide groundwater model, which is relied upon as a tool for establishing SMC. The Tule Subbasin TAC is currently reevaluating SMC established at all existing and new RMS sites and the new SMCs will be included in updated GSPs to be published in 2024.

2.1.1. Lower Tule River Irrigation District GSA

There are 13 RMS wells in the LTRID GSA (see Figure 5). Of these wells, six are perforated in the Upper Aquifer, five are perforated in the Lower Aquifer, and two are composite wells perforated in two aquifers. Hydrographs for each of the wells are provided in Appendix A.

[3] Tule Subbasin Coordination Agreement, Attachment 1. January 2020.

Available groundwater level data for LTRID GSA RMS wells from the spring and fall of 2023 are summarized in the following table:

Table 1
Lower Tule River Irrigation District GSA
2022/23 Groundwater Levels at Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Upper Aquifer				
22S/23E-30J01	39.6	63.6	-67	-71
21S/23E-32K01	34.8	155.5	54	13
21S/24E-35A01	104.5	N/A	68	54
21S/26E-32B02	162.1	190.3	113	103
21S/26E-34	230.9	268.2	261	231
LTRID TSS U	179.7	209.8	129	101
Lower Aquifer				
20S/26E-32	139.4	141.3	79	36
21S/25E-36	66.8	96.2	49	1
22S/23E-08	-98.9	N/A[1]	-195	-224
LTRID TSS M	56.7	41.8	62	28
LTRID TSS L	117.0	118	-67	-101
Composite Aquifer				
22S/24E-01Q01	33.9	3.5	-85	-143
22S/26E-03	207.6	194.3	N/A	N/A

[1]N/A = Not Available

For the Upper Aquifer monitoring wells, groundwater levels were generally higher in fall 2023 compared to spring 2023. All measured groundwater levels in the Upper Aquifer monitoring wells were above their respective measurable objectives and minimum thresholds.

For the Lower Aquifer monitoring wells from which groundwater levels could be obtained, groundwater levels were generally higher in fall 2023 compared to spring 2023 with Well LTRID TSS L as the exception. All measured groundwater levels in Lower Aquifer monitoring wells were above their respective measurable objectives and minimum thresholds.

For the Composite Aquifer monitoring wells, groundwater levels were lower in fall 2023 compared to spring 2023. Groundwater levels in 22S/24E-01Q01 were above the measurable objective and minimum threshold for this well.

2.1.2. Eastern Tule GSA

There are 8 RMS wells in the ETGSA (see Figure 5). Of these wells, three are perforated in the Upper Aquifer, one in the Lower Aquifer and the Santa Margarita Formation and three are composite wells perforated in two aquifers. Hydrographs for each of the wells are provided in Appendix B. Available groundwater level data for ETGSA RMS wells from the spring and fall of 2023 are summarized in the following table:

Table 2
Eastern Tule GSA
2022/23 Groundwater Levels at Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Upper Aquifer				
C-1	368.0	377.4	353	314
R-11	314.0	382.7	357	281
22S/26E-13R01	239.8	254.9	228	199
Lower Aquifer				
22S/26E-24	97.3	68.2	46	-18
Santa Margarita Formation				
23S/27E-27	79.8	-5.4	54	-30
Composite Aquifer				
C-16	211.0	193.0	124	61
22S/26E-25J01	N/A[1]	158.9	N/A	N/A
23S/28E-04K01	574.8	580.5	N/A	N/A

[1]N/A = Not Available

For the Upper Aquifer monitoring wells, groundwater levels are higher in fall 2023 relative to spring 2023. All measured groundwater levels in Upper Aquifer monitoring wells were above their respective measurable objectives and minimum thresholds.

For the Lower Aquifer monitoring well, groundwater levels were lower in fall 2023 compared to spring 2023. All measured groundwater levels in the Lower Aquifer monitoring well were above their respective measurable objectives and minimum thresholds.

For the Santa Margarita Formation monitoring well, groundwater levels dropped noticeably between spring and fall 2023 and likely represent seasonal pumping influence in this confined aquifer. Groundwater levels were above the respective measurable objective and minimum threshold in the spring but fell below the measurable objective in the fall

For the Composite Aquifer monitoring wells, groundwater levels in C-16 fell from spring to fall 2023 but rose in well 23S/28E-04K01. Both groundwater levels were above the measurable objective and minimum threshold for Well C-16.

2.1.3. Delano-Earlimart GSA

There are 9 RMS wells in the DEID GSA (see Figure 5). Of these wells, four are perforated in the Upper Aquifer, four are perforated in the Lower Aquifer and one is a composite well perforated in two aquifers. Hydrographs for each of the wells are provided in Appendix C. Available groundwater level data for DEID GSA RMS wells from the spring and fall of 2023 are summarized in the following table:

Table 3
Delano-Earlimart Irrigation District GSA
2022/23 Groundwater Levels at Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Upper Aquifer				
24S/25E-35H01	163.1	160.9	165	149
24S/26E-04P01	99.6	92.6	158	61
M19-U	N/A[1]	188	255	196
24S/26E-11	168.1	164.9	189	106
Lower Aquifer				
25S/26E-9C01	97.6	104.3	84	66
M19 -L	N/A	94	165	92
24S/27E-31	92.5	104.5	166	117
25S/26E-08H	112.5	114.7	N/A	N/A
23S/26E-29D01	67.6	59.0	74	54
Composite Aquifer				
23S/25E-27	1.4	-14.1	102	13

[1]N/A = Not Available

For the Upper Aquifer monitoring wells, groundwater levels were lower in fall 2023 compared to spring 2023. Available spring and fall groundwater levels were below the respective measurable objectives for all Upper Aquifer RMS wells. The fall 2023 groundwater level in Well M19-U was below its respective measurable objective and minimum threshold.

For the Lower Aquifer monitoring wells, groundwater levels were higher in fall 2023 compared to spring 2023. In Well M19-L, the fall 2023 groundwater level dropped below the respective measurable objective. In Well 24S/27E-31, the spring and fall groundwater levels fell below both the measurable objective and minimum threshold. In Well 23S/26E-29D01, groundwater levels were below the measurable objective but above the minimum threshold. Groundwater levels in Well 25S/26E-9C01 remained above the respective measurable objectives and minimum thresholds.

For the Composite Aquifer monitoring well, 23S/25E-27, groundwater levels dropped from spring 2023 to fall 2023. In this well, both groundwater levels were below its measurable objective and minimum threshold.

2.1.4. Pixley Irrigation District GSA

There are 6 RMS wells in the Pixley GSA (see Figure 5). Of these wells, four are perforated in the Upper Aquifer and two are perforated in the Lower Aquifer. Hydrographs for each of the wells are provided in Appendix D. Available groundwater level data for Pixley GSA RMS wells from the spring and fall of 2023 are summarized in the following table:

Table 4
Pixley Irrigation District GSA
2022/23 Groundwater Levels at Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Upper Aquifer				
22S/24E-23J01	-29.5	-20.5	-54	-112
23S/24E-28J02	83.9	90.0	26	15
22S/25E-25N01	10.9	13.8	-9	-51
PIDGSA-01 U	142.6	155.0	109	99
Lower Aquifer				
TSMW 1L	-73.4	-99.2	-161	-237
PIDGSA-01 L	101.8	95.0	60	-2

For the Upper Aquifer monitoring wells, groundwater levels were higher in fall 2023 compared to spring 2023. Groundwater levels in all four Upper Aquifer wells remained above their respective measurable objectives and minimum thresholds.

For the Lower Aquifer monitoring wells, groundwater levels dropped from spring 2023 to fall 2023 and remained above their respective measurable objectives and minimum thresholds.

2.1.5. Tri-County Water Authority

There are 8 RMS wells in the TCWA (see Figure 5). Of these wells, three are perforated in the Upper Aquifer and five are perforated in the Lower Aquifer. Hydrographs for each of the wells are provided in Appendix E. Available groundwater level data for TCWA RMS wells from the spring and fall of 2023 are summarized in the following table:

Table 5
Tri-County Water Authority
2022/23 Groundwater Levels at Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Upper Aquifer				
22S/23E-25C01 (E20)	43.0	44.0	-41	-102
24S/23E-22E01	59.8	55.0	42	19
TSMW 5U	118.2	178.6	95	78
Lower Aquifer				
22S/23E-27F01 (G-13)	-39.0	-90.0	-80	-210
24S/23E-22R02	N/A[1]	N/A	-10	-175
TSMW 5L	-123.3	-169.8	N/A	N/A
24S/23E-15R01	-146.0	-166.6	-15	-150
24S/24E-03A01	100.1	N/A	198	143

[1]N/A = Not Available

For the Upper Aquifer monitoring wells, groundwater levels were generally higher in fall 2023 compared to spring 2023, except for well 24S/23E-22E01. All measured groundwater levels were above their respective measurable objectives and minimum thresholds.

Fall 2023 groundwater levels declined relative to spring 2023 in all Lower Aquifer monitoring wells with available data. Well 24S/23E-15R01's spring and fall 2023 groundwater levels were below its minimum threshold. The spring 2023 groundwater level at 24S/24E-03A01 was below its minimum threshold; the fall 2023 groundwater level at 24S/24E-03A01 is not available. The fall 2023 groundwater level in Well 22S/23E-27F01 (G-13) was above the minimum threshold.

2.1.6. Alpaugh GSA

The Alpaugh GSA has two Lower aquifer RMS wells: Well 23S/23E-25N01 and Well 55 (see Figure 5). The hydrographs for Well 23S/23E-25N01 and Well 55 are provided in Appendix F. Available groundwater level data for Alpaugh GSA RMS wells from the spring and fall of 2023 is summarized in the following table:

Table 6

Alpaugh Irrigation District GSA
2022/23 Groundwater Levels at the Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Lower Aquifer				
23S/23E-25N01	39.7	N/A[1]	-5	-110
Well 55	-141.0	-140.0	-92	-209

[1]N/A = Not Available

For the Lower Aquifer monitoring wells, comparative data for spring and fall 2023 were only available for Well 55. Groundwater levels in Well 55 showed a one foot between spring and fall 2023. The groundwater levels for well 23S/23E-25N01 were above the respective measurable objective and minimum threshold while Well 55 only remained above its respective minimum threshold.

2.1.7. Kern-Tulare WD GSA

There are three RMS wells in the KTWD GSA (see Figure 5). Of these wells, two are perforated in the Lower Aquifer and one is perforated in the Santa Margarita Formation. Hydrographs for each of the wells are provided in Appendix G. Available groundwater level data for KTWD GSA RMS wells from the spring and fall of 2023 are summarized in the following table:

Table 7

Kern-Tulare WD GSA
2022/23 Groundwater Levels at the Representative Monitoring Site Wells

Well	Groundwater Elevation (ft amsl)			
	Spring 2023	Fall 2023	Measurable Objective	Minimum Threshold
Lower Aquifer				
TSMW-6L	210.1	209.0	187	144
Santa Margarita Formation				
24S/27E-32M01	36.8[1]	-16.6	-31	-107
TSMW-6SM	26.9	-24.3	-13	-92

[1]Groundwater level from May 2023

For the Lower Aquifer monitoring well, TSMW-6L, the fall 2023 groundwater level slightly decreased from spring 2023 while both fall and spring remained above the respective measurable objective and minimum threshold.

Of the two Santa Margarita Formation monitoring wells, groundwater levels were lower in fall 2023 than spring 2023. All groundwater levels remained above their respective measurable objectives and minimum thresholds with the exception of Well TSMW-6SM which fell below its measurable objective in fall 2023.

3. Groundwater Extraction §356.2 (b)(2)

3.1 Groundwater Extraction by Sector

Sectors that extract groundwater (i.e. groundwater pumping) in the Tule Subbasin include agriculture, urban, and for exports out of the Subbasin. Total groundwater extraction from the Tule Subbasin for water year 2022/23 was 396,810 acre-ft (see Table 8). The distribution of groundwater production across the subbasin is shown on Figure 13.

Table 8
Tule Subbasin Groundwater Extraction for Water Year 2022/23

Groundwater Sustainability Agency	Management Area	Groundwater Extraction Sector			Total (acre-ft)
		Agricultural (acre-ft)	Urban (acre-ft)	For Export (acre-ft)	
LTRID	Agricultural	49,000	0	2,300	51,300
	Municipal	0	1,220	0	1,220
	Tulare County MOU	1,000	0	0	1,000
	Total	**50,000**	**1,220**	**2,300**	**53,520**
ETGSA	Greater Tule	144,300	0	0	144,300
	Porterville Community	1,500	10,180	0	11,680
	Ducor Community	0	90	0	90
	Terra Bella Community	0	210	0	210
	Total	**145,800**	**10,480**	**0**	**156,280**
DEID	DEID	38,900	0	0	38,900
	Richgrove CSD	0	870	0	870
	Earlimart PUD	0	2,930	0	2,930
	Total	**38,900**	**3,800**	**0**	**42,700**
Pixley ID	Pixley ID	80,000	0	0	80,000
	Pixley PUD	0	560	0	560
	Teviston CSD	0	100	0	100
	Total	**80,000**	**660**	**0**	**80,660**
TCWA	North	1,400	0	2,500	3,900
	Southeast	57,000	100	0	57,100
	Total	**58,400**	**100**	**2,500**	**61,000**
Alpaugh ID	**Total**	**0**	**250**	**0**	**250**
KTWD	**Total**	**2,400**	**0**	**0**	**2,400**
	Grand Total	***375,500***	***16,510***	***4,800***	***396,810***

3.2 Groundwater Extraction Measurement Methods

Groundwater extractions were estimated based on best available data. The following table (Table 9) summarizes measurement methods with more detailed descriptions in the following sections.

Table 9
Tule Subbasin Groundwater Extraction Measurement Methods

Groundwater Sustainability Agency	Management Area	Groundwater Extraction Sector	Measure-ment Type	Method Description	Accuracy	Accuracy Description
LTRID	Agricultural	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
		For Export	Measured	Metered pumping reported by exporter	+/-5%	Assumed accuracy for meters
	Municipal	Urban	Measured	Metered pumping reported by pumper	+/-5%	Assumed accuracy for meters
	Tulare County MOU	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
ETGSA	Greater Tule	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
	Porterville Community	Urban	Measured	Metered pumping reported by pumper	+/-5%	Assumed accuracy for meters
	Ducor Community	Urban	Estimated	Population and per capita water demand	+/-20%	Uncertainty in population and water demand
	Terra Bella Community	Urban	Measured	Metered use reported by owner	+/-5%	Assumed accuracy for meters
DEID	DEID	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
	Richgrove CSD	Urban	Estimated	Population and per capita water demand	+/-20%	Uncertainty in population and water demand
	Earlimart PUD	Urban	Estimated	Population and per capita water demand	+/-20%	Uncertainty in population and water demand
Pixley ID	Pixley ID	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
	Pixley PUD	Urban	Measured	Metered pumping reported by pumper	+/-5%	Assumed accuracy for meters
	Teviston CSD	Urban	Measured	Metered pumping reported by pumper	+/-5%	Assumed accuracy for meters
TCWA	North	Agriculture	Measured	Metered pumping reported by pumper	+/-5%	Assumed accuracy for meters
		For Export	Measured	Metered pumping reported by exporter	+/-5%	Assumed accuracy for meters
	Southeast	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
		Urban	Estimated	Estimated by GSA	+/-20%	Uncertainty in population and water demand
Alpaugh ID	N/A	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.
		Urban	Measured	Reported from water purveyor	+/-5%	Assumed accuracy for meters
KTWD	N/A	Agriculture	Estimated	Remote sensing ET and precip with irr. eff.	+/-20%	Combined uncertainty in ET, precip, and irr. eff.

3.2.1 Agricultural Groundwater Extractions

Agricultural groundwater pumping in the Tule Subbasin is estimated as a function of the total agricultural water demand, surface water deliveries, and precipitation. The total agricultural water demand (i.e. applied water demand) is estimated as follows:

$$W_d = \frac{A_i \, x \, (ET - P_{eff})}{I_{eff}}$$

Where:

W_d = Total Agricultural Water Demand (acre-ft)

A_i = Irrigated Area (acres)

ET = Evapotranspiration (acre-ft/acre)

P_{eff} = Effective Precipitation (acre-ft/acre)

I_{eff} = Irrigation Efficiency (unitless)

Monthly crop evapotranspiration (ET) is estimated using remote sensing (i.e. satellite) data . The satellite data is entered into a model, which is used to estimate the ET rate and ET spatial distribution of an area in any given time period. When appropriately calibrated to land-based ET and/or climate stations and validated with crop surveys, the satellite-based model provides an estimate of crop ET (i.e. consumptive use). For the 2022/23 water year, crop evapotranspiration was provided by data from Land IQ.

Irrigation efficiency (I_{eff}) is estimated for any given area based on the irrigation method for that area (e.g. drip irrigation, flood irrigation, micro sprinkler, etc.). Irrigation methods are correlated with crop types based on either CDWR land use maps or field surveys. The following irrigation efficiencies will be applied to the different irrigation methods based on California Energy Commission (2006):

- Border Strip Irrigation – 77.5 percent
- Micro Sprinkler – 87.5 percent
- Surface Drip Irrigation – 87.5 percent
- Furrow Irrigation – 67.5 percent

Agricultural groundwater extraction is estimated as the total applied water demand (W_d) minus surface water deliveries and effective precipitation. Effective precipitation is the portion of precipitation that becomes evapotranspiration with the remainder of precipitation becoming recharge to the aquifer system.

It is noted that irrigated agricultural lands, and their respective groundwater extractions, within the Porterville Community Management Area are managed pursuant to the rules and regulations of the Greater Tule Management Area and are not associated with the City of Porterville.

Estimated Tule Subbasin 2022/23 agricultural groundwater production for each of the seven GSAs is summarized in Table 8. Total agricultural groundwater production for the Tule Subbasin in 2022/23 was approximately 375,500 acre-ft.

3.2.2 Urban Groundwater Extractions

Groundwater extractions for urban supply is conducted by the City of Porterville and small districts (e.g. Community Services Districts and Public Utility Districts) for the local communities in the Tule Subbasin. The City of Porterville groundwater pumping is metered and reported by the city. Municipal groundwater pumping by the other small communities within the Tule Subbasin are either measured with meters or estimated based on population and per capita water use. Total estimated municipal pumping in the Tule Subbasin for the 2022/23 water year was approximately 16,510 acre-ft (see Table 8).

It is noted that there are some households in the rural portions of the Tule Subbasin that rely on private wells to meet their domestic water supply needs. However, given the low population density of these areas, the volume of pumping from private domestic wells is considered negligible compared to the other pumping sources.

3.2.3 Groundwater Extractions for Export Out of the Tule Subbasin

Some of the groundwater extractions that occurs on the west side of the Tule Subbasin is exported out of the Subbasin for use elsewhere. Angiola Water District and the Boswell/Creighton Ranch have historically exported pumped groundwater out of the Tule Subbasin. Pumping is measured with meters and reported by the exporter. Total groundwater exports out of the Tule Subbasin for the 2022/23 water year was 4,800 acre-ft (see Table 8). This water is accounted for separately because the water is not applied within the Subbasin and there is no associated return flow.

4. Surface Water Supplies §356.2 (b)(3)

4.1 Surface Water Supplies

Surface water sources in the Tule Subbasin include the Central Valley Project, Managed Local Supplies (the Tule River, Deer Creek, and the Tulare Lake), recycled water, reused water (from oil field produced water), and precipitation used for agriculture. Total surface water available for use within the Tule Subbasin for water year 2022/23 was approximately 1,749,430 acre-ft (see Table 10).

Table 10
Tule Subbasin Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Central Valley Project	Managed Local Supplies	Recycled Water	Reused Water	Precip-itation	Total
LTRID	Agricultural	314,500	291,300	0	0	121,200	727,000
	Municipal	0	0	230	0	0	230
	Tulare County MOU	0	0	0	0	900	900
	Total	**314,500**	**291,300**	**230**	**0**	**122,100**	**728,130**
ETGSA	Greater Tule	151,100	36,800	0	0	176,500	364,400
	Porterville Community	0	9,700	5,000	0	3,300	18,000
	Ducor Community	0	0	0	0	0	0
	Terra Bella Community	1,400	0	0	0	0	1,400
	Total	**152,500**	**46,500**	**5,000**	**0**	**179,800**	**383,800**
DEID	DEID	187,400	0	0	0	61,600	249,000
	Richgrove CSD	0	0	0	0	0	0
	Earlimart PUD	0	0	0	0	0	0
	Total	**187,400**	**0**	**0**	**0**	**61,600**	**249,000**
Pixley ID	Pixley ID	86,300	45,500	0	0	71,800	203,600
	Pixley PUD	0	0	0	0	0	0
	Teviston CSD	0	0	0	0	0	0
	Total	**86,300**	**45,500**	**0**	**0**	**71,800**	**203,600**
TCWA	North	0	67,600	0	0	8,300	75,900
	Southeast	0	0	0	0	51,500	51,500
	Total	**0**	**67,600**	**0**	**0**	**59,800**	**127,400**
Alpaugh ID	**Total**	**2,900**	**18,100**	**0**	**0**	**13,800**	**34,800**
KTWD	**Total**	**11,000**	**0**	**0**	**1,200**	**10,500**	**22,700**
	Grand Total	***754,600***	***469,000***	***5,230***	***1,200***	***519,400***	***1,749,430***

4.2 Central Valley Project

Most of the water imported into the Tule Subbasin is from the Central Valley Project (CVP) and delivered via the Friant-Kern Canal (FKC). Angiola Water District also imports water from other various sources including the King's River and State Water Project in certain years. Water from the FKC delivered to farmers and recharge basins via the Tule River and Deer Creek channels, unlined canals, and pipeline distribution systems of Porterville Irrigation District, LTRID, Pixley Irrigation District, Terra Bella Irrigation District, Teapot Dome Water District, DEID, and Saucelito Irrigation District.

Imported water is delivered to eleven water agencies within the Tule Subbasin from the Friant-Kern Canal. Imported water delivery data for 2022/23 was obtained from the respective districts or the United States Bureau of Reclamation (USBR) Central Valley Operation Annual Reports. Imported water deliveries to TCWA were obtained from the Angiola Water District. Imported water deliveries to the Tule Subbasin for 2022/23 totaled 754,600 acre-ft, as summarized in Table 10.

4.3 Managed Local Supplies

The Tule River, Deer Creek, and, in very wet years, the Tulare Lake and White River, are local surface water features that are diverted for agricultural use as managed local supply in the Tule Subbasin. Flow in the Tule River is controlled through releases from Lake Success. Stream flow entering Lake Success is measured and distributed to various water rights holders as allocated at Success Dam in accordance with the Tule River Water Diversion Schedule and Storage Agreement.[4] Releases of water from Lake Success and downstream diversions are documented in Tule River Association (TRA) annual reports. For water year 2022/2023, 512,100 acre-ft of water was released to the Tule River from Success Reservoir. Tule River diversions occur in the ETGSA, LTRID GSA, and TCWA GSA. In water year 2022/23, 198,500 acre-ft of Tule River water flowed out of the Tule Subbasin. Channel infiltration and ET losses account for the balance of Tule River water that was not diverted or did not flow out of the subbasin. Deer Creek diversions reported in Pixley ID GSA, Alpaugh ID GSA, and TCWA were 48,800 acre-ft in 2022/23. Alpaugh ID GSA and TCWA reported using a total of 61,000 acre-ft of Tulare Lake water in 2022/23 with Alpaugh ID GSA reporting an additional 6,600 acre-ft of water pumped from other flooded lands. TCWA reported using a total of 9,900 acre-ft of White River flood water. Total managed local supplies in the Tule Subbasin for 2022/23 totaled 469,000 acre-ft as summarized in Table 10.

4.4 Recycled Water

Recycled water from wastewater treatment plant treated effluent is used for groundwater recharge and agricultural irrigation in the Tule Subbasin. The City of Porterville reported 2,800 acre-ft of recycled water was used for agricultural irrigation and 2,200 acre-ft of recycled water was used for groundwater recharge in 2022/23. In LTRID GSA, Poplar CSD and Woodville PUD reported

[4] TRA, 1966. Tule River Diversion Schedule and Storage Agreement. Dated February 1, 1966; revised June 16, 1966.

a total of 230 acre-ft of recycled water deliveries for recharge. Total recycled water use in the Tule Subbasin was 5,230 acre-ft in 2022/23, as summarized in Table 8.

4.5 Reused Water

The Kern-Tulare Water District receives water generated as a byproduct of oil production but is suitable for agricultural irrigation. The total volume of reused water received for agricultural irrigation in the portion of the Kern-Tulare Water District that is within the Tule Subbasin in 2022/23 was 1,200 acre-ft.

4.6 Precipitation

The volume of water entering the Tule Subbasin as precipitation was estimated based on monthly remote sensing data provided by LandIQ. An isohyetal map showing the estimated 2022/23 precipitation distribution across the subbasin is shown on Figure 14. Total precipitation at the Porterville precipitation station for water year 2022/23 was 16.5 inches, which is more than the average precipitation for the area (see Figure 14). Precipitation is accounted for as a surface water supply for irrigated agriculture as it offsets some of the evapotranspiration demand of the crops (see Section 3.2.1). The total volume of precipitation available for crops in 2022/23 was estimated to be approximately 519,400 acre-ft.

5. Total Water Use §356.2 (b)(4)

5.2 Total Water Use by Source

Total water use in the Tule Subbasin for water year 2022/23, including groundwater extractions, surface water supplies, recycled water, and reused water was 2,146,240 acre-ft (see Table 11).

Table 11
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
LTRID	Agricultural	51,300	727,000	0	0	778,300
	Municipal	1,220	0	230	0	1,450
	Tulare County MOU	1,000	900	0	0	1,900
	Total	**53,520**	**727,900**	**230**	**0**	**781,650**
ETGSA	Greater Tule	144,300	364,400	0	0	508,700
	Porterville Community	11,680	13,000	5,000	0	29,680
	Ducor Community	90	0	0	0	90
	Terra Bella Community	210	1,400	0	0	1,610
	Total	**156,280**	**378,800**	**5,000**	**0**	**540,080**
DEID	DEID	38,900	249,000	0	0	287,900
	Richgrove CSD	870	0	0	0	870
	Earlimart PUD	2,930	0	0	0	2,930
	Total	**42,700**	**249,000**	**0**	**0**	**291,700**
Pixley ID	Pixley ID	80,000	203,600	0	0	283,600
	Pixley PUD	560	0	0	0	560
	Teviston CSD	100	0	0	0	100
	Total	**80,660**	**203,600**	**0**	**0**	**284,260**
TCWA	North	3,900	75,900	0	0	79,800
	Southeast	57,100	51,500	0	0	108,600
	Total	**61,000**	**127,400**	**0**	**0**	**188,400**
Alpaugh ID	**Total**	**250**	**34,800**	**0**	**0**	**35,050**
KTWD	**Total**	**2,400**	**21,500**	**0**	**1,200**	**25,100**
	Grand Total	***396,810***	***1,743,000***	***5,230***	***1,200***	***2,146,240***

Note: All values are in acre-ft.

5.3 Total Water Use by Sector

Total water use in the Tule Subbasin for water year 2022/23, for the agriculture, urban, managed recharge, native vegetation, and export sectors was 2,146,240 acre-ft (see Table 12).

Table 12
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
LTRID GSA	Agricultural	408,200	0	367,800	0	2,300	778,300
	Municipal	0	1,220	230	0	0	1,450
	Tulare County MOU	1,900	0	0	0	0	1,900
	Total	**410,100**	**1,220**	**368,030**	**0**	**2,300**	**781,650**
ETGSA	Greater Tule	364,000	0	144,700	0	0	508,700
	Porterville Community	7,600	10,180	11,900	0	0	29,680
	Ducor Community	0	90	0	0	0	90
	Terra Bella Community	0	1,610	0	0	0	1,610
	Total	**371,600**	**11,880**	**156,600**	**0**	**0**	**540,080**
DEID GSA	DEID	191,400	0	41,900	0	54,600	287,900
	Richgrove CSD	0	870	0	0	0	870
	Earlimart PUD	0	2,930	0	0	0	2,930
	Total	**191,400**	**3,800**	**41,900**	**0**	**54,600**	**291,700**
Pixley ID GSA	Pixley ID	215,800	0	67,800	0	0	283,600
	Pixley PUD	0	560	0	0	0	560
	Teviston CSD	0	100	0	0	0	100
	Total	**215,800**	**660**	**67,800**	**0**	**0**	**284,260**
TCWA GSA	North	16,300	0	61,000	0	2,500	79,800
	Southeast	108,500	100	0	0	0	108,600
	Total	**124,800**	**100**	**61,000**	**0**	**2,500**	**188,400**
Alpaugh ID GSA	**Total**	**31,800**	**250**	**3,000**	**0**	**0**	**35,050**
KTWD GSA	**Total**	**25,100**	**0**	**0**	**0**	**0**	**25,100**
	Grand Total	***1,370,600***	***17,910***	***698,330***	***0***	***59,400***	***2,146,240***

It is noted that at this time the water use of native vegetation is a data gap and therefore the values are zero.

6. Change in Groundwater in Storage §354.16 (b)

6.1 Change in Upper Aquifer Storage

For this annual report, the change in Upper Aquifer groundwater in storage for the Tule Subbasin was estimated for the time period between fall 2022 and fall 2023. The change in storage was estimated based on the following equation:

$$V_w = S_y A \Delta h$$

Where:

V_w	=	the volume of groundwater storage change (acre-ft).
S_y	=	specific yield of aquifer sediments (unitless).
A	=	the surface area of the aquifer within the Tule Subbasin/GSA (acres).
Δh	=	the change in hydraulic head (i.e. groundwater level) (feet).

The change in storage estimate for this annual report is specific to the Upper aquifer. The calculations were made using a Geographic Information System (GIS) map of the Tule Subbasin discretized into 600-foot by 600-foot grid cells to allow for spatial representation of aquifer specific yield and groundwater level change.

The areal distribution of specific yield for the Upper Aquifer is based on the values obtained from the updated calibrated groundwater flow model of the Tule Subbasin.[5]

The areal distribution of change in hydraulic head across the Tule Subbasin was estimated by plotting the difference in groundwater level at wells that were measured in both fall 2022 and fall 2023 and then interpolating the subbasin-wide changes in groundwater levels in GIS using a kriging algorithm. Change in hydraulic head (groundwater level) at any given location was assigned to the overlapping grid cell.

The change in groundwater storage was estimated for each grid cell by multiplying the change in groundwater level by the specific yield and then by the area of the cell.

Results of the Upper Aquifer change in groundwater in storage analysis showed that between fall 2022 and fall 2023, groundwater in storage increased by approximately 568,100 acre-ft (see Figure 16). Recent wet conditions have resulted in more surface water supplies and lower groundwater pumping relative to previous years, which has contributed to the positive groundwater storage change in the 2022/23 water year.

[5] Thomas Harder & Co., 2021. Update to the Groundwater Flow Model of the Tule Subbasin. Prepared for the Tule Subbasin MOU Group. June 2021.

6.2 Change in Lower Aquifer Storage

As the majority of the Lower Aquifer in the Tule Subbasin is under confined conditions, the change in storage associated with groundwater level changes is a function of the compressibility of the sediments and, to a lesser degree, the compressibility of water. The change in storage for a confined aquifer is typically expected to be low compared to changes in storage for an unconfined aquifer assuming similar changes in groundwater elevations. Within a limited range of groundwater level fluctuation, the compressed aquitard can accept water back into its structure when groundwater levels rise resulting in elastic rebound (i.e., which is considered a positive change in storage). However, if groundwater levels are maintained at low elevations for long enough periods of time (e.g., due to groundwater pumping), the compression of aquitards becomes permanent.

In the Tule Subbasin, prolonged lowering of groundwater levels has resulted in notable subsidence at the land surface, which reflects significant compression of low permeability interbeds (hereafter referred to as aquitards) within the Lower Aquifer. This compression, which expels water from these aquitards, is considered a negative change in storage.

For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The change in storage of the Lower Aquifer was estimated based on the following equation:

$$V_w = A\Delta b$$

Where:

V_w	=	the volume of water released from (or taken into) storage (acre-ft).
A	=	the surface area of the aquifer within the Tule Subbasin/GSA (acres).
Δb	=	the change in aquitard thickness (i.e., subsidence) (feet).

The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data (see Figure 8). Because the InSAR data is not layer-specific but, rather, reflects compression that occurs in all layers in the Tule Subbasin, the change in storage of the Lower Aquifer using these data is likely an overestimate. That is, it was assumed that the water released is from the Lower Aquifer and the clay interbeds within the confining layer between the Upper and Lower Aquifers (i.e., the Corcoran Clay; see Figure 4). As there is evidence that some land subsidence occurs from compression of aquitards in the Upper Aquifer, the estimated value using this approach as presented below, is likely high. As more information becomes available regarding the vertical distribution of compaction in the Tule Subbasin, the storage change estimates of the Lower Aquifer will be refined.

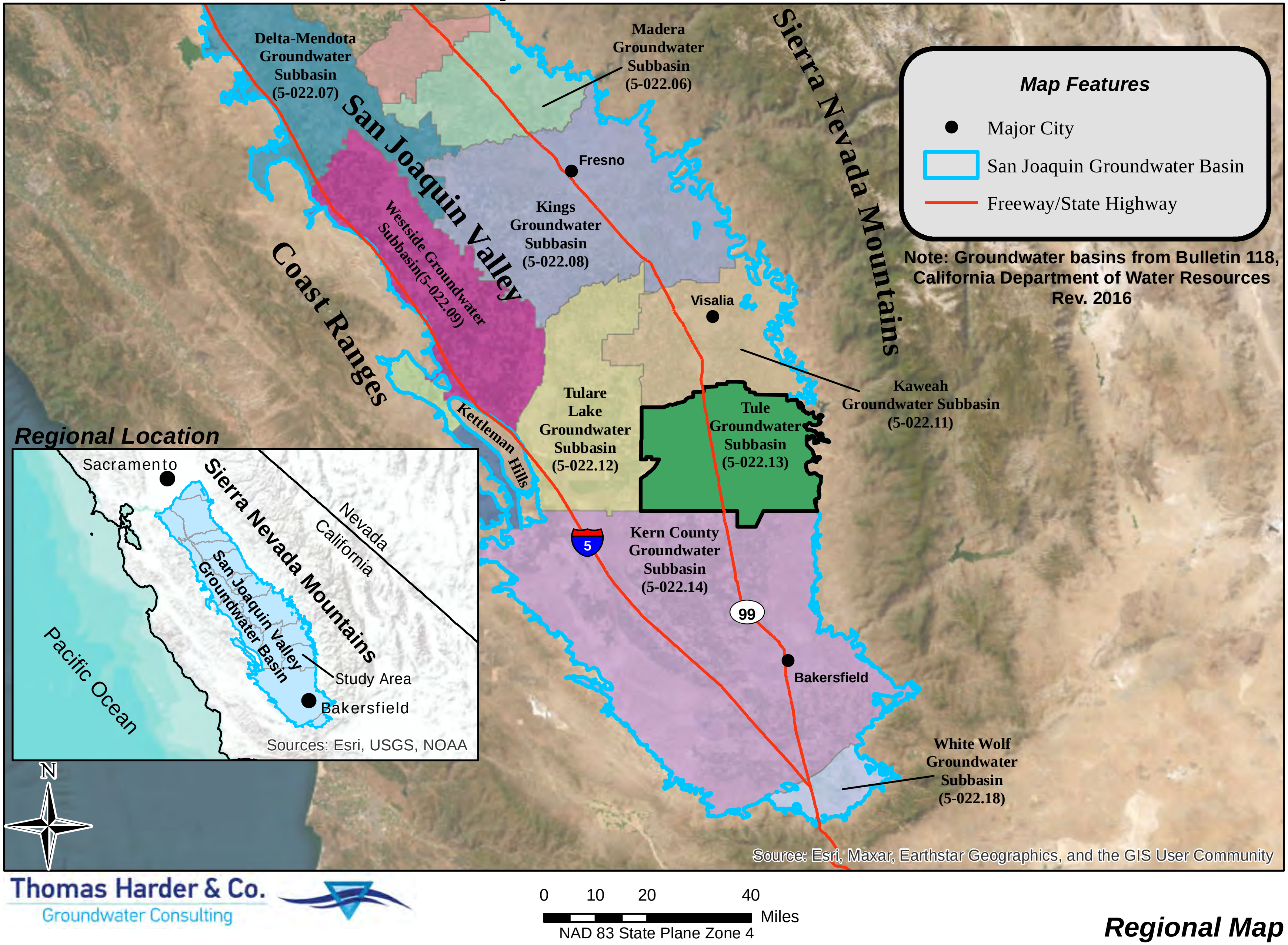
The calculations were made using a Geographic Information System (GIS) map of the Tule Subbasin discretized into 1,000-foot by 1,000-foot grid cells to allow for spatial representation of land subsidence. The change in aquitard storage was estimated for each grid cell by multiplying the InSAR land subsidence by the area of the cell, and the total storage change within each GSA's boundaries was summed (see Figure 17). Results of the analysis showed that the volume of water associated with compression of aquitards in all layers between fall 2022 and fall 2023 was approximately -47,050 acre-ft (see Figure 17). This volume is assumed herein to be the change in storage of the Lower Aquifer.

6.3 Cumulative Change in Tule Subbasin Aquifer Storage

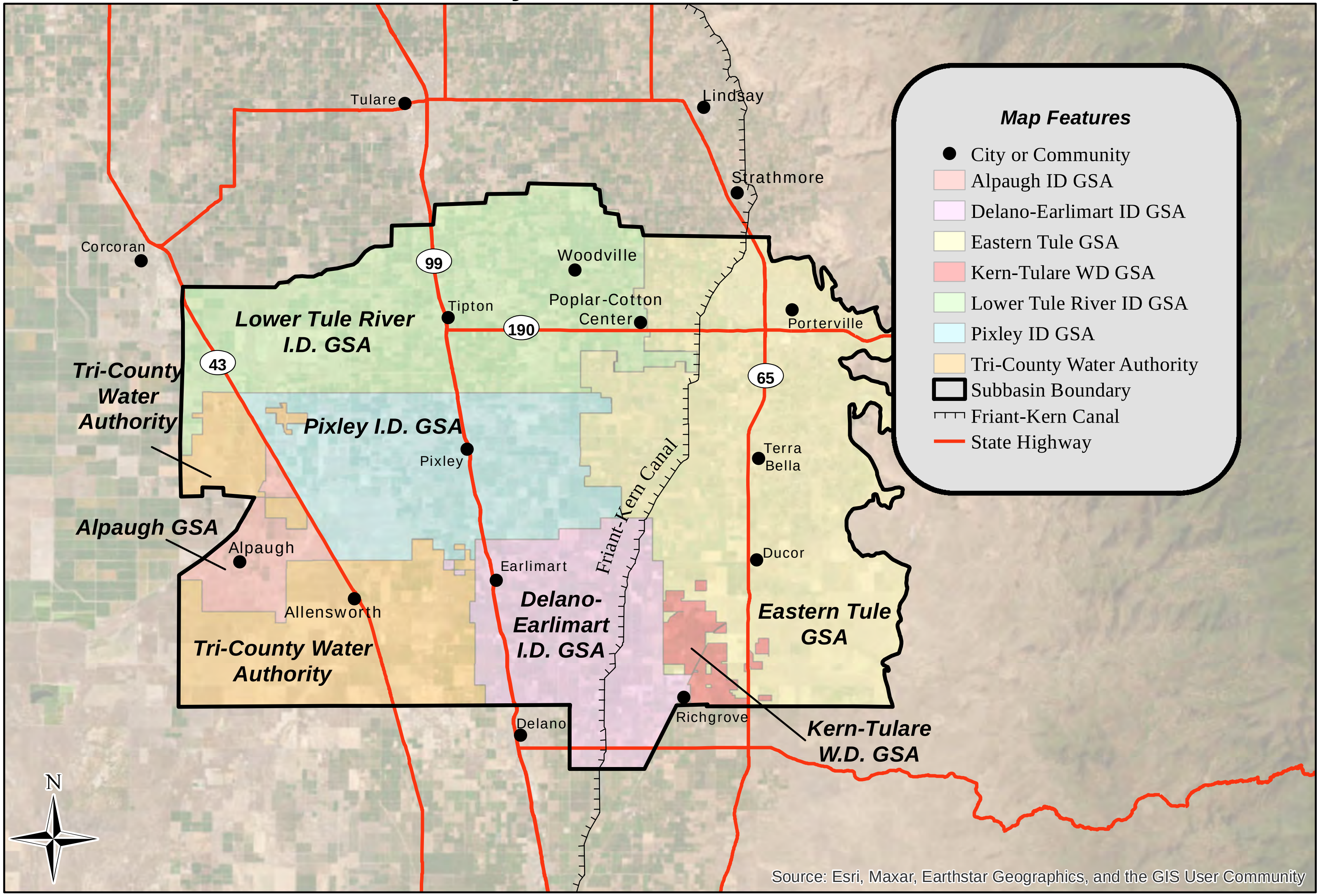
Cumulative change in storage in the Tule Subbasin since water year 1986/87 is shown along with groundwater pumping on Figure 18. The center graph on Figure 18 shows the annual change in aquifer storage by aquifer (Upper and Lower). Aquifer storage change for both Upper and Lower Aquifers prior to water year 2019/20 was estimated using the calibrated groundwater flow model of the Tule Subbasin. Upper and Lower aquifer storage change since 2019/20 was estimated as described in Sections 6.1 and 6.2, respectively.

As shown on Figure 18, cumulative change in storage in both the Upper and Lower Aquifers from 1986/87 through 2022/23 was approximately -7,133,000 acre-ft. Since the 2015/16 water year, the cumulative change in storage has been approximately +454,000 acre-ft in the Upper Aquifer and approximately -903,000 acre-ft in the Lower Aquifer. Positive changes in aquifer storage are generally associated with above-normal precipitation years when surface water supplies are available and groundwater pumping is lower.

Figures



Regional Map
Figure 1



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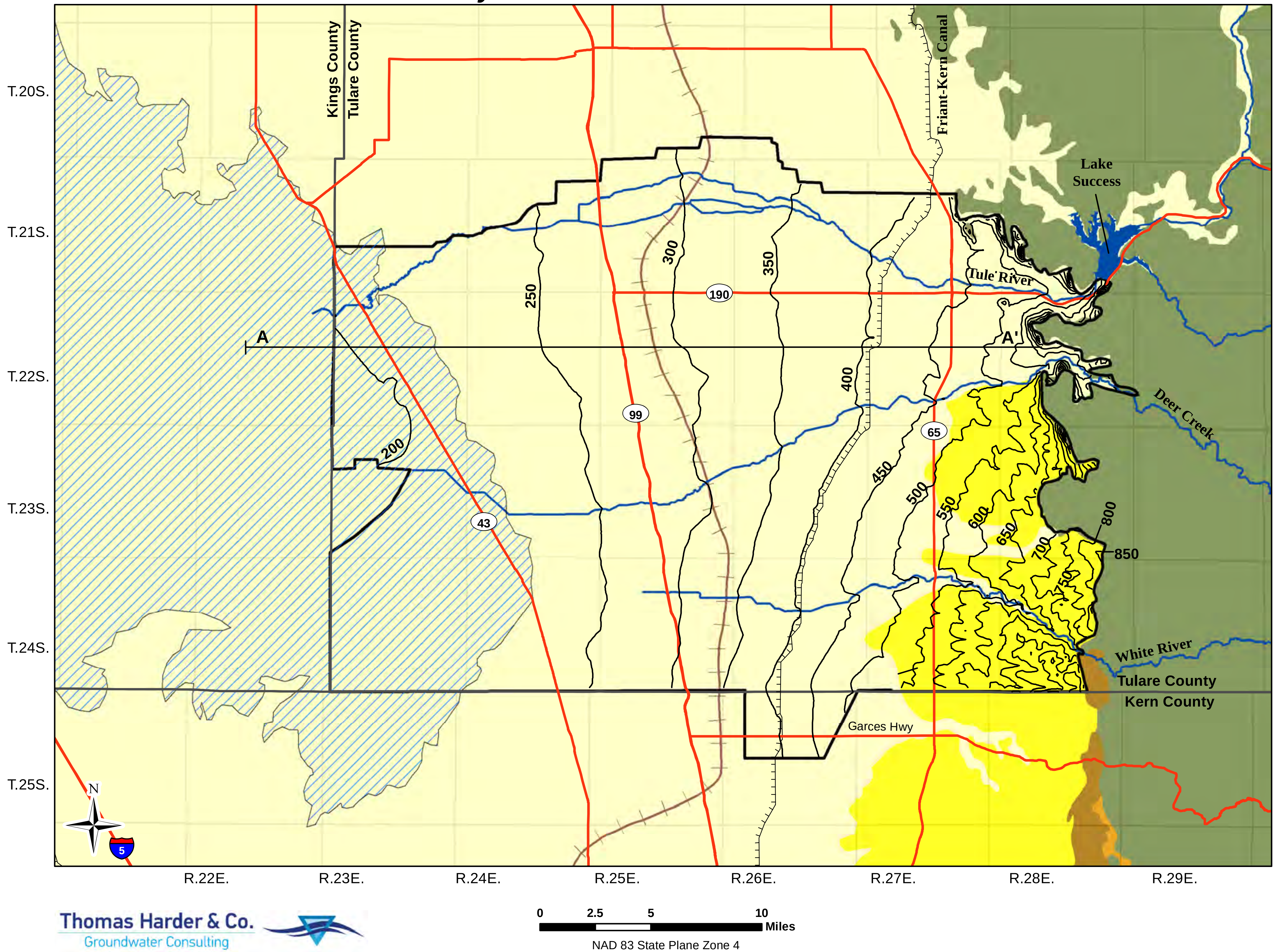
GSA Boundaries
Figure 2

Tule Subbasin Technical Advisory Committee

March 2024

2022/2023 Annual Report



Map Features

- Surficial Deposits
- Tertiary Loosely Consolidated Deposits
- Non-Marine Sedimentary Rocks
- Marine Sedimentary Rocks
- Crystalline Basement
- Approximate Eastern Extent of the Corcoran Clay
- Tulare Lake Surface Deposits
- County Boundary
- Basin Boundary
- Land Surface Elevation Contour (ft amsl)
- Friant-Kern Canal
- Major Hydrologic Feature
- State Highway/Major Road

Corcoran Clay from USGS Professional Paper 1766,
http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

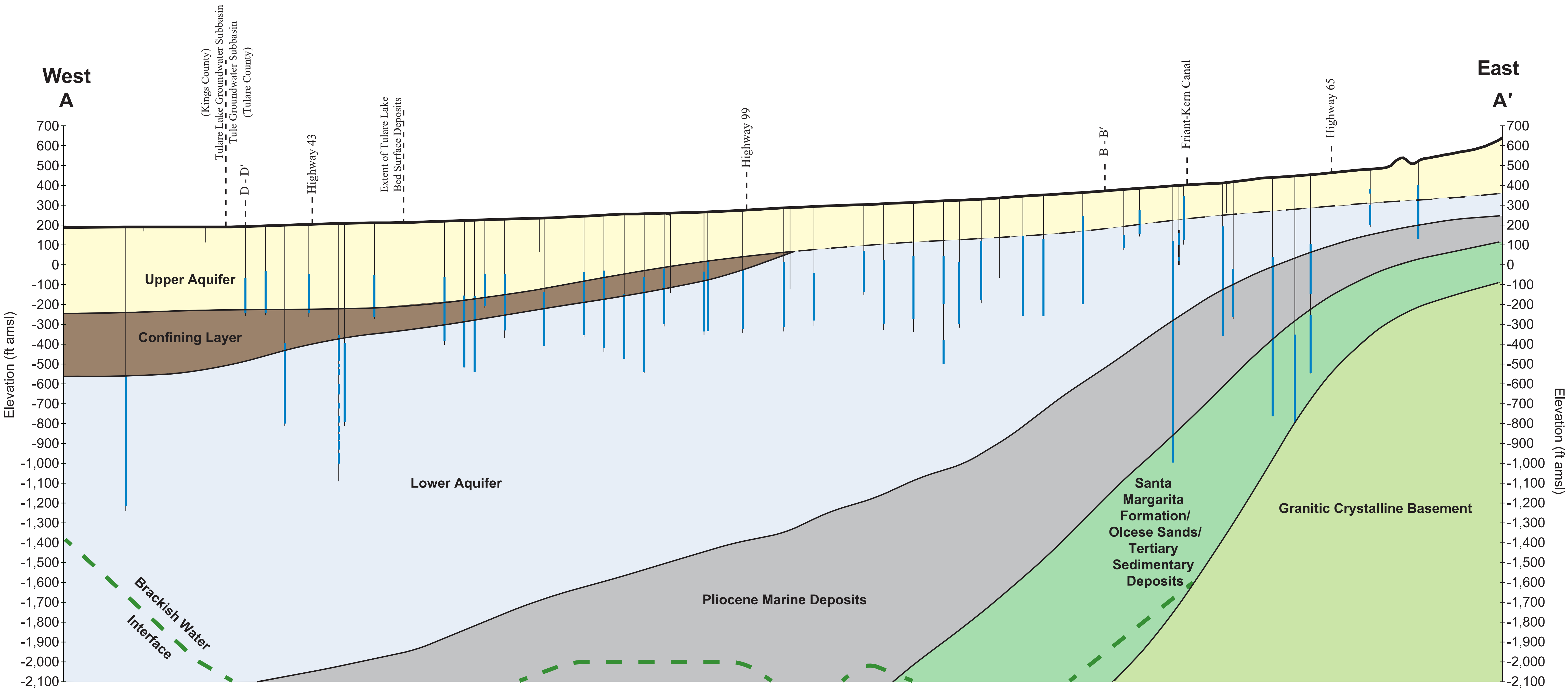
Geologic units modified from USGS Open-File Report 2005-1305

Lake Deposits from California Geological Survey Geologic Atlas of California Map No. 002 1:250,000 scale, Compiled by A.R. Smith, 1964 and Geologic Atlas of California Map No. 005, 1:250,000 scale, Compiled by: R.A. Matthews and J.L. Burnett

Thomas Harder & Co.
Groundwater Consulting

Geology and Cross Section Locations

Figure 3



Vertical Scale

0
100
200
400
Feet

Horizontal Scale

0 1/2 1 2 Miles

***Notes**:* Lithologic data from Department of Water Resources Well Compeletion Reports.
Wells within one half mile from cross section line unless otherwise noted by " * ".
Corcoran Clay from USGS Professional Paper 1766,
http://water.usgs.gov/GIS/dsdl/pp1766_CorcoranClay.zip

Brackish Water Interface based on Planert and Williams, 1995 and Page, 1973 USGS Atlas HA-489

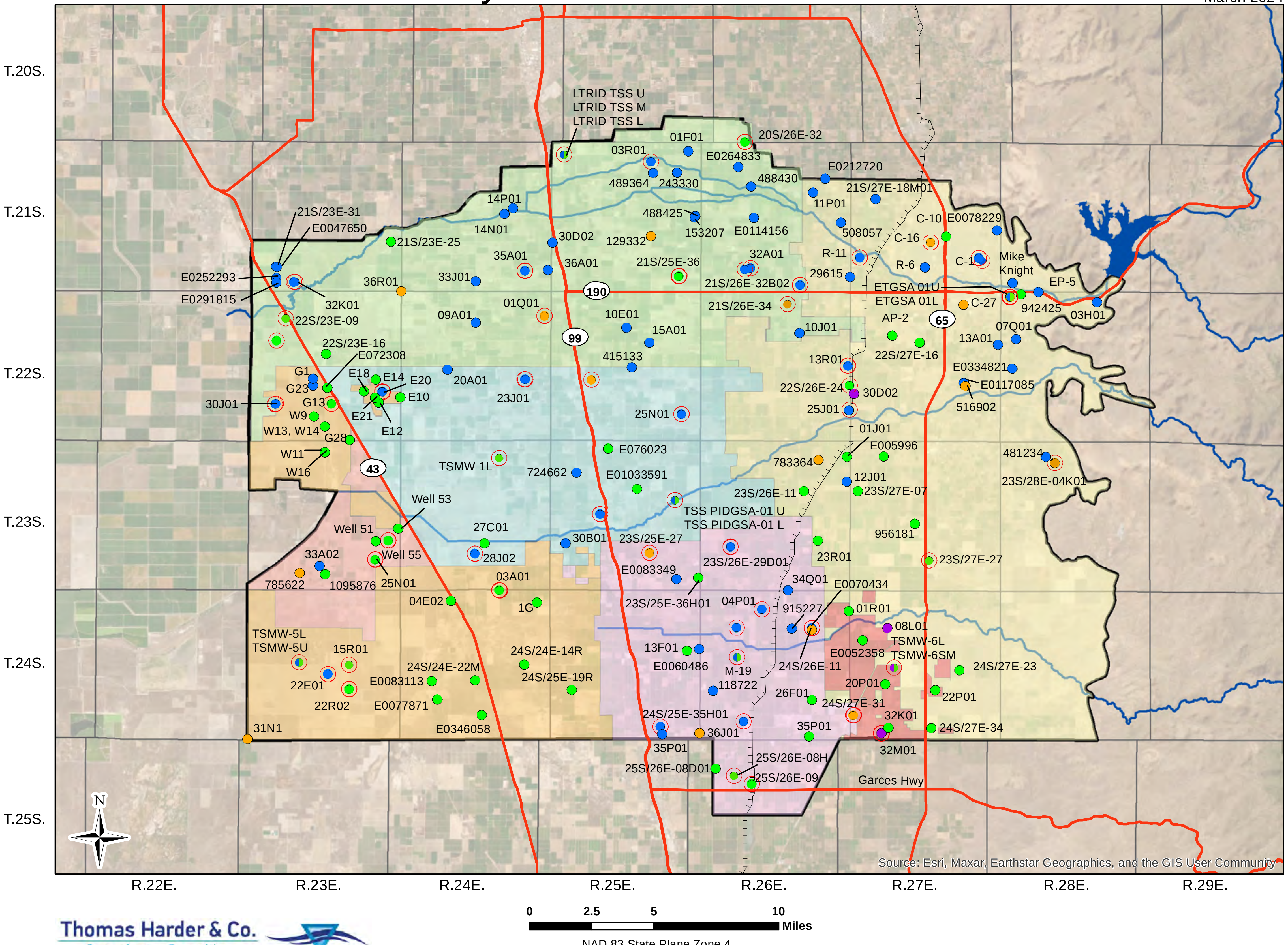
= Indicates well perforation interval

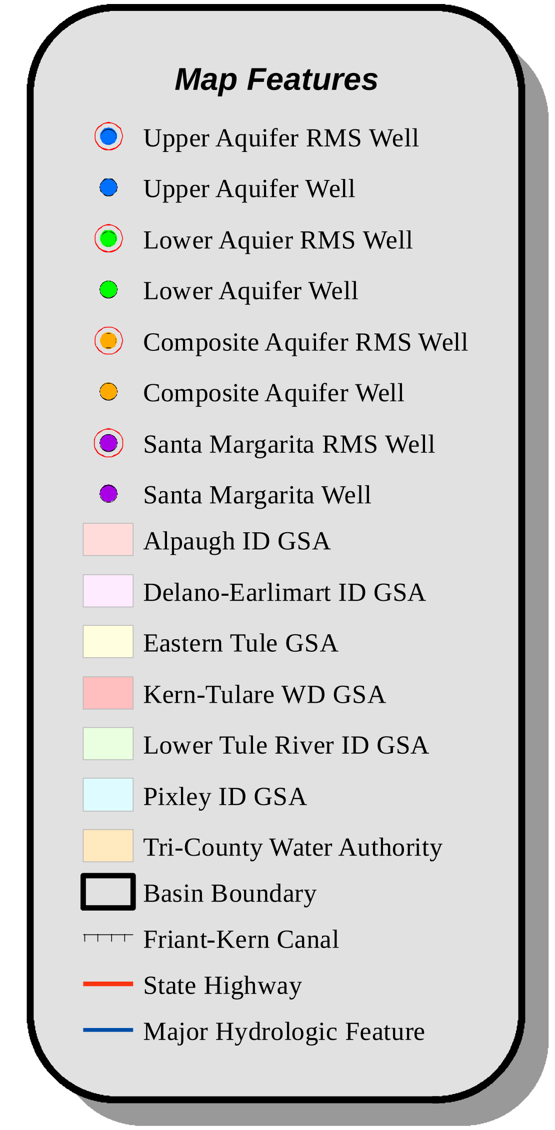
Hydrogeologic Cross Section A-A′
Tule Groundwater Subbasin
Figure 4

Tule Subbasin Technical Advisory Committee

March 2024

2022/2023 Annual Report





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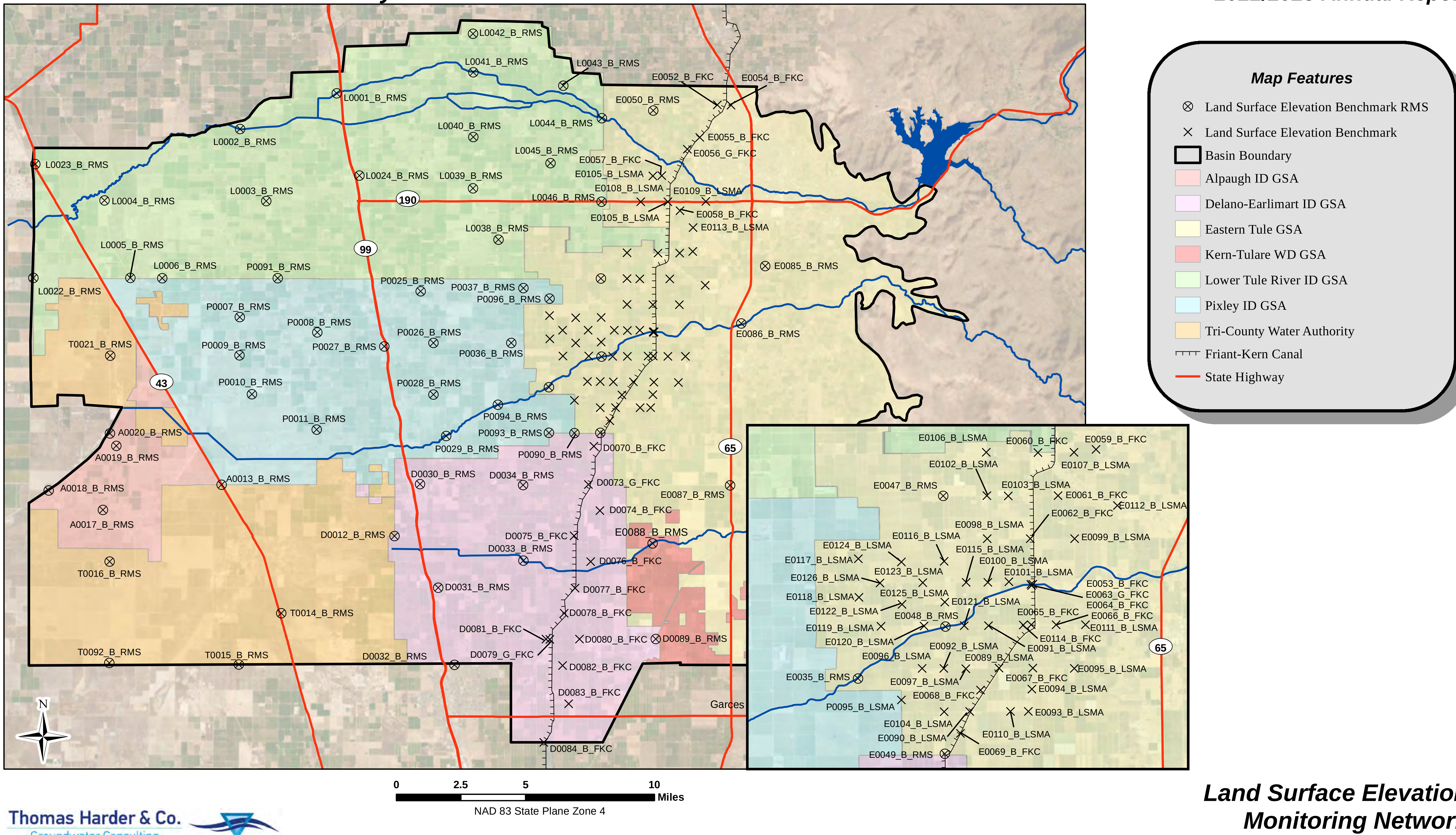
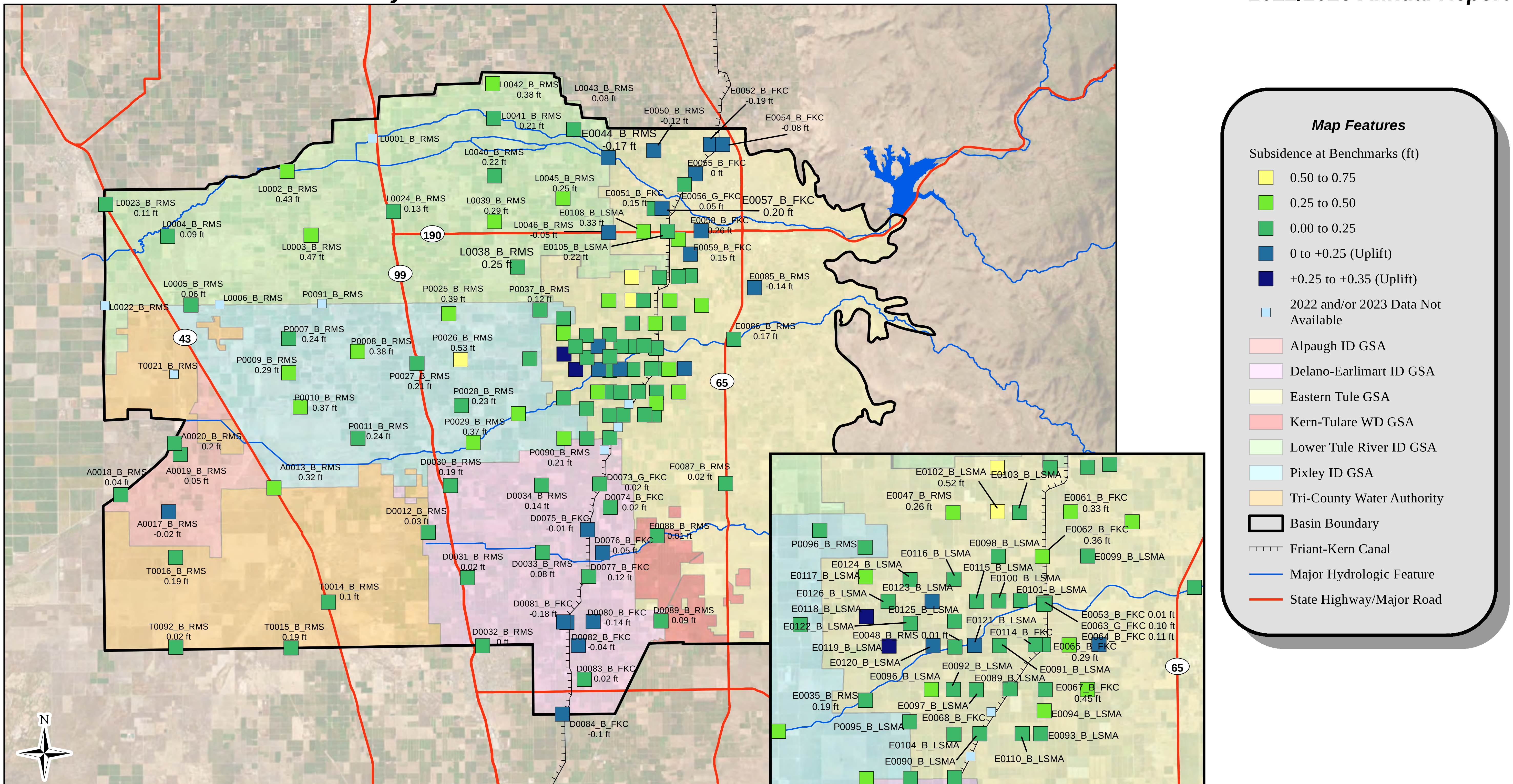
Groundwater Level Monitoring Network

Figure 5



Land Surface Elevation Monitoring Network

Figure 6



0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

Data from Tule Subbasin Monitoring Network. Fall 2023 data was used if Summer 2023 data was not available.

Thomas Harder & Co. Groundwater Consulting

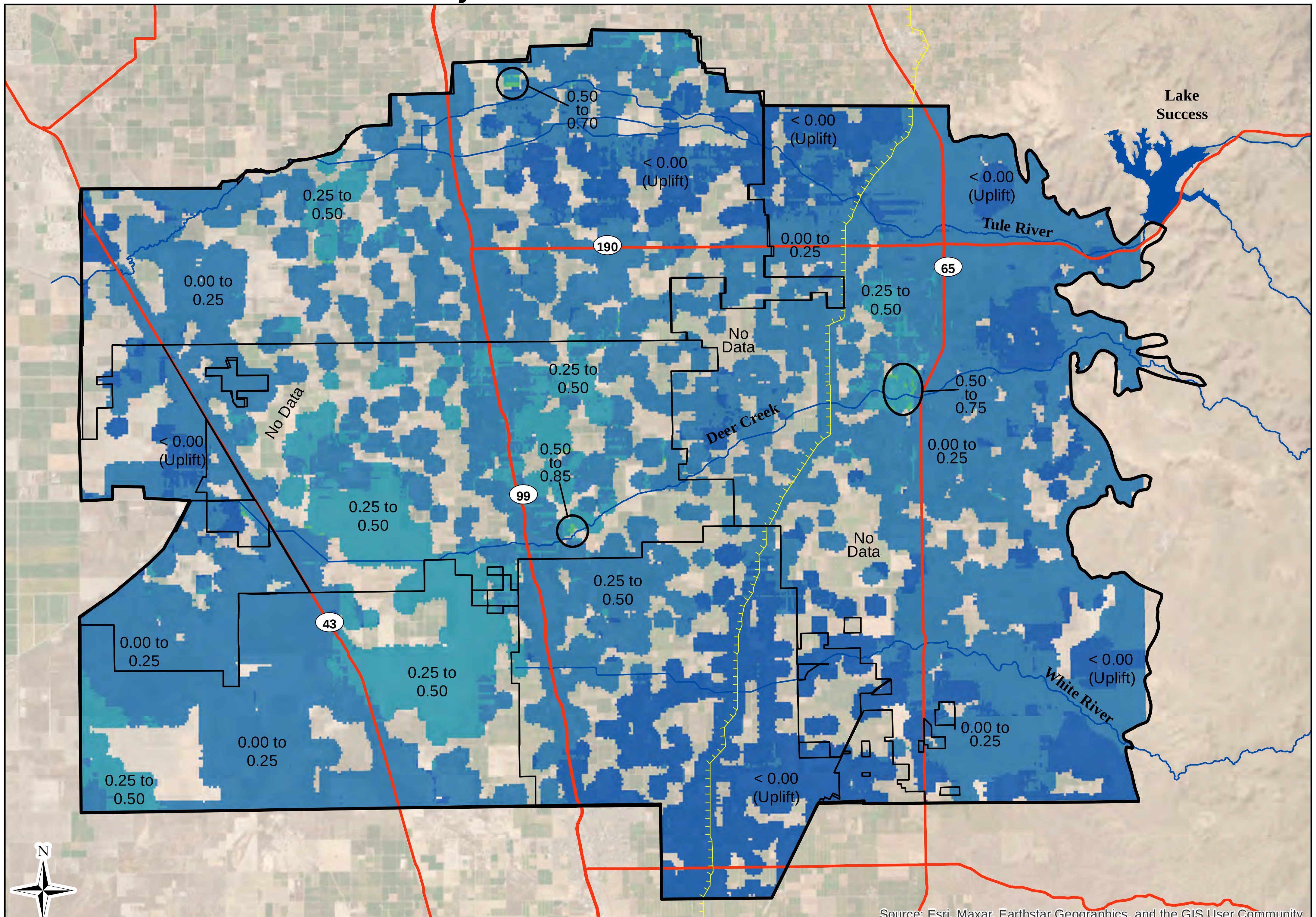
July 2022 to July 2023
Benchmarks Land Subsidence

Figure 7

Tule Subbasin Technical Advisory Committee

March 2024

2022/2023 Annual Report



Map Features

InSAR Subsidence from October 2022 to September 2023 (ft)

- > 0.50
- 0.25 to 0.50
- 0 to 0.25
- < 0.00 (Uplift)
- Basin_Boundary
- GSA Boundary
- Friant-Kern Canal
- Major Hydrologic Feature
- State Highway/Major Road

0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

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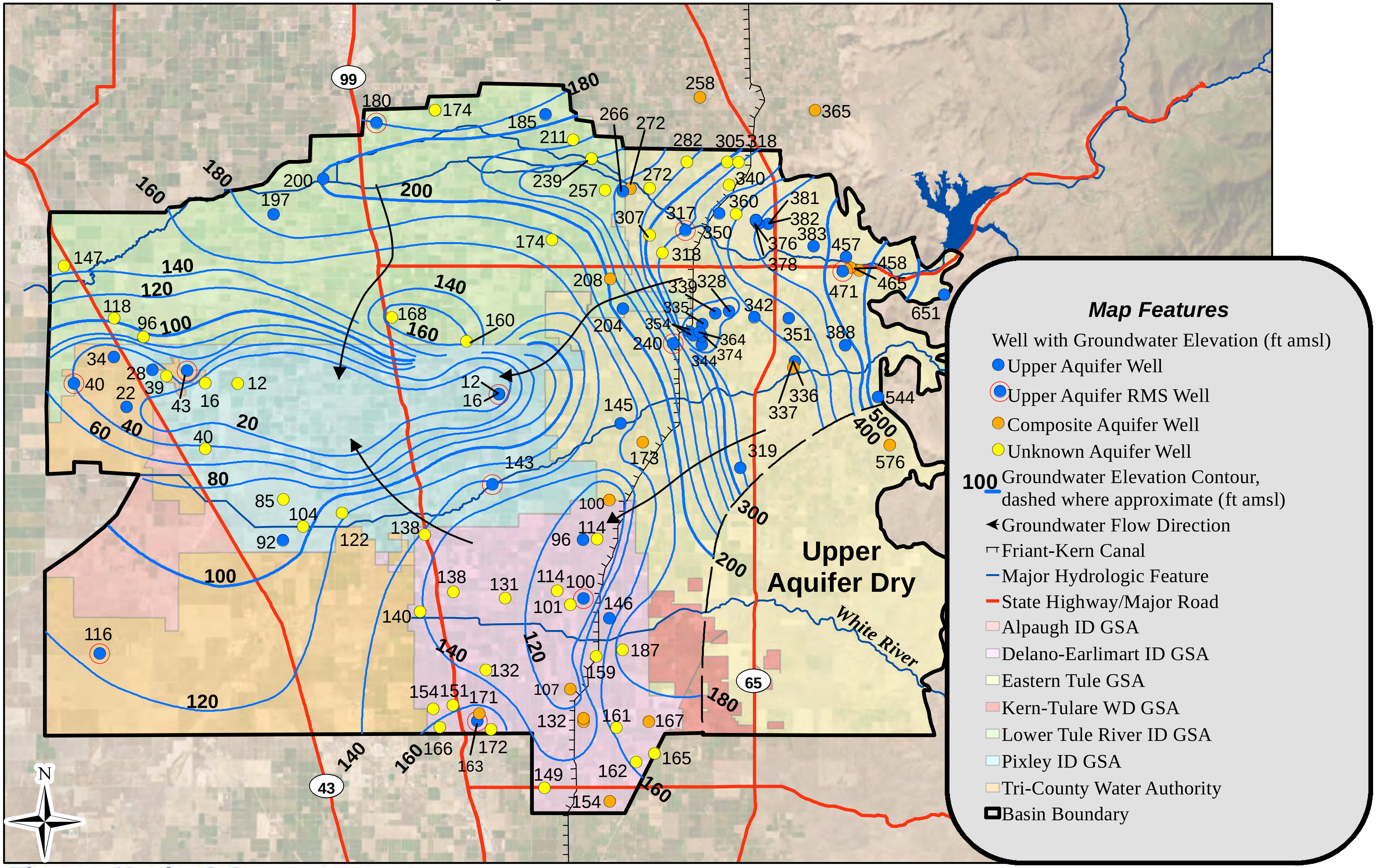
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

October 2022 to September 2023 InSAR Land Subsidence

Figure 8

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

0 2.5 5 10 Miles

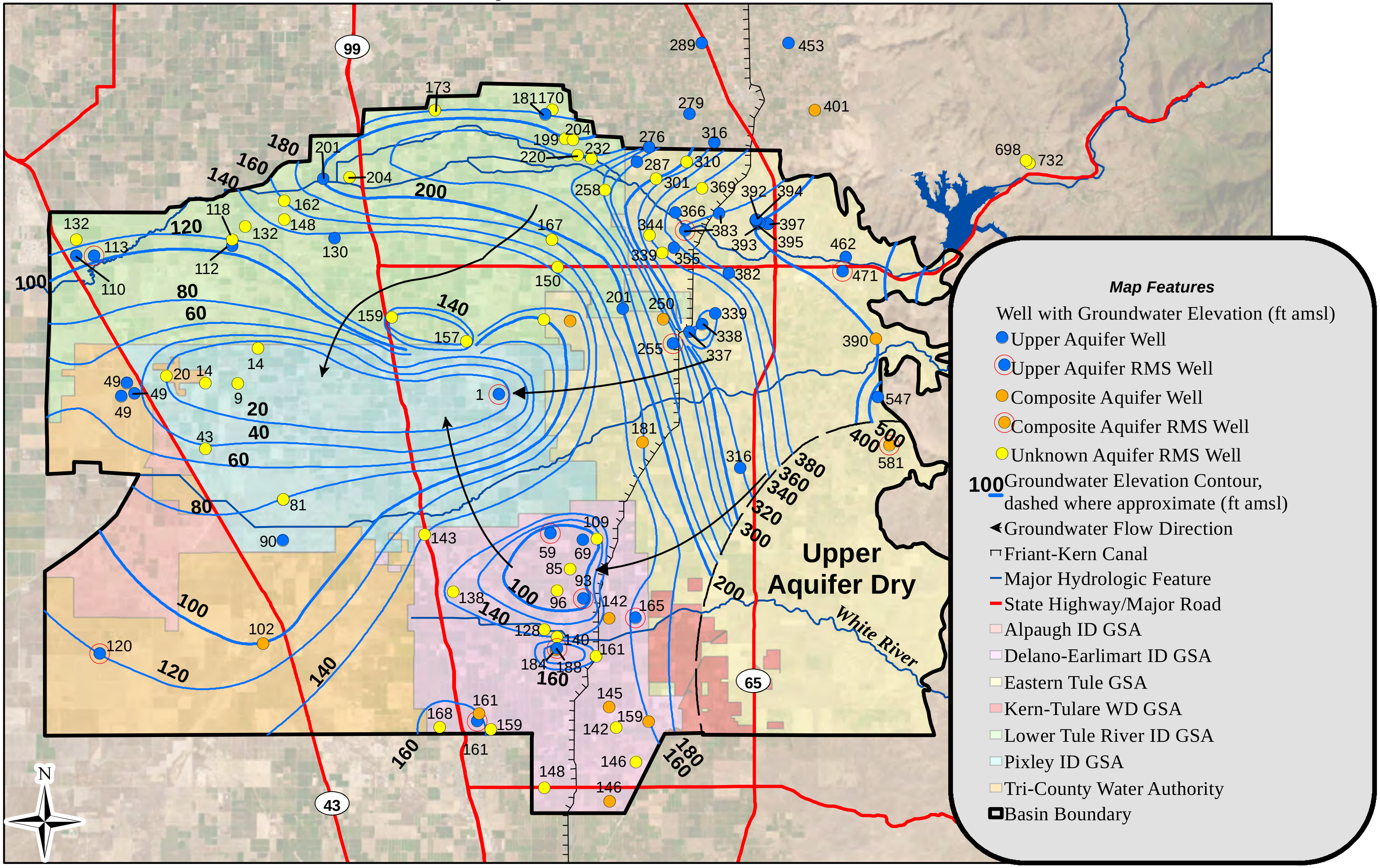
NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Upper Aquifer Groundwater Elevation Contours

Figure 9

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

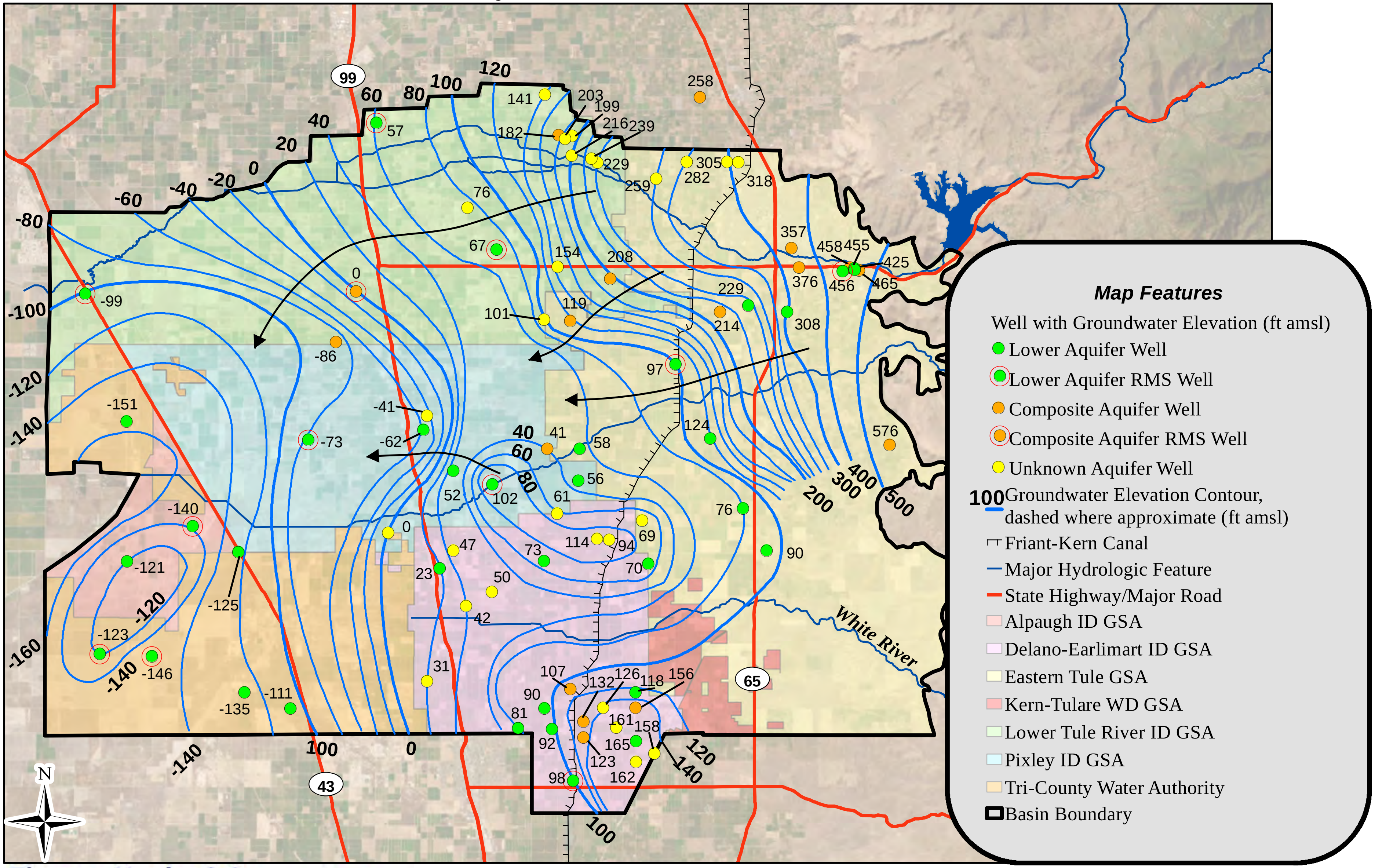
0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer Groundwater Elevation Contours

Figure 10



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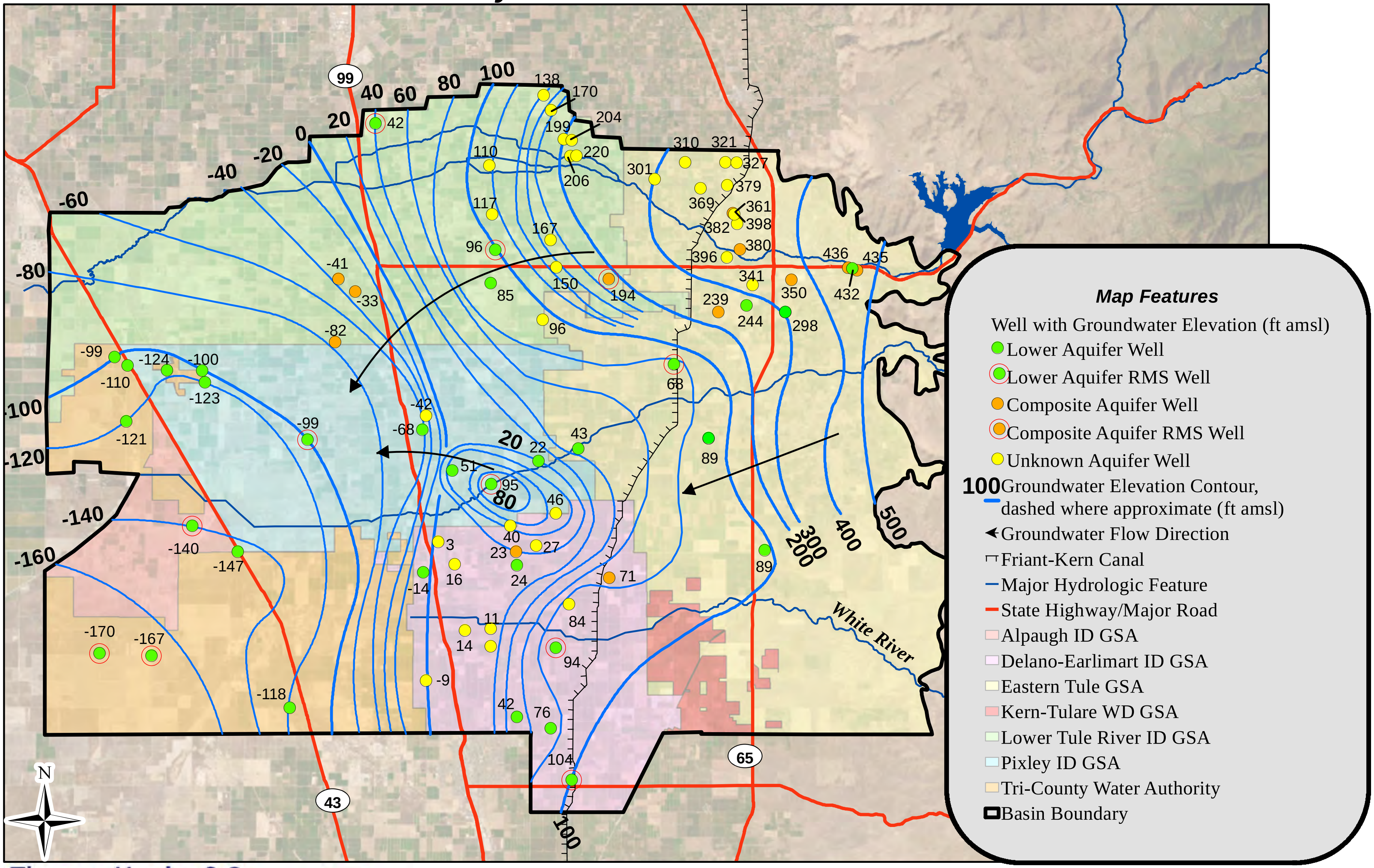
NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer Groundwater Elevation Contours
Figure 11

Tule Subbasin Technical Advisory Committee



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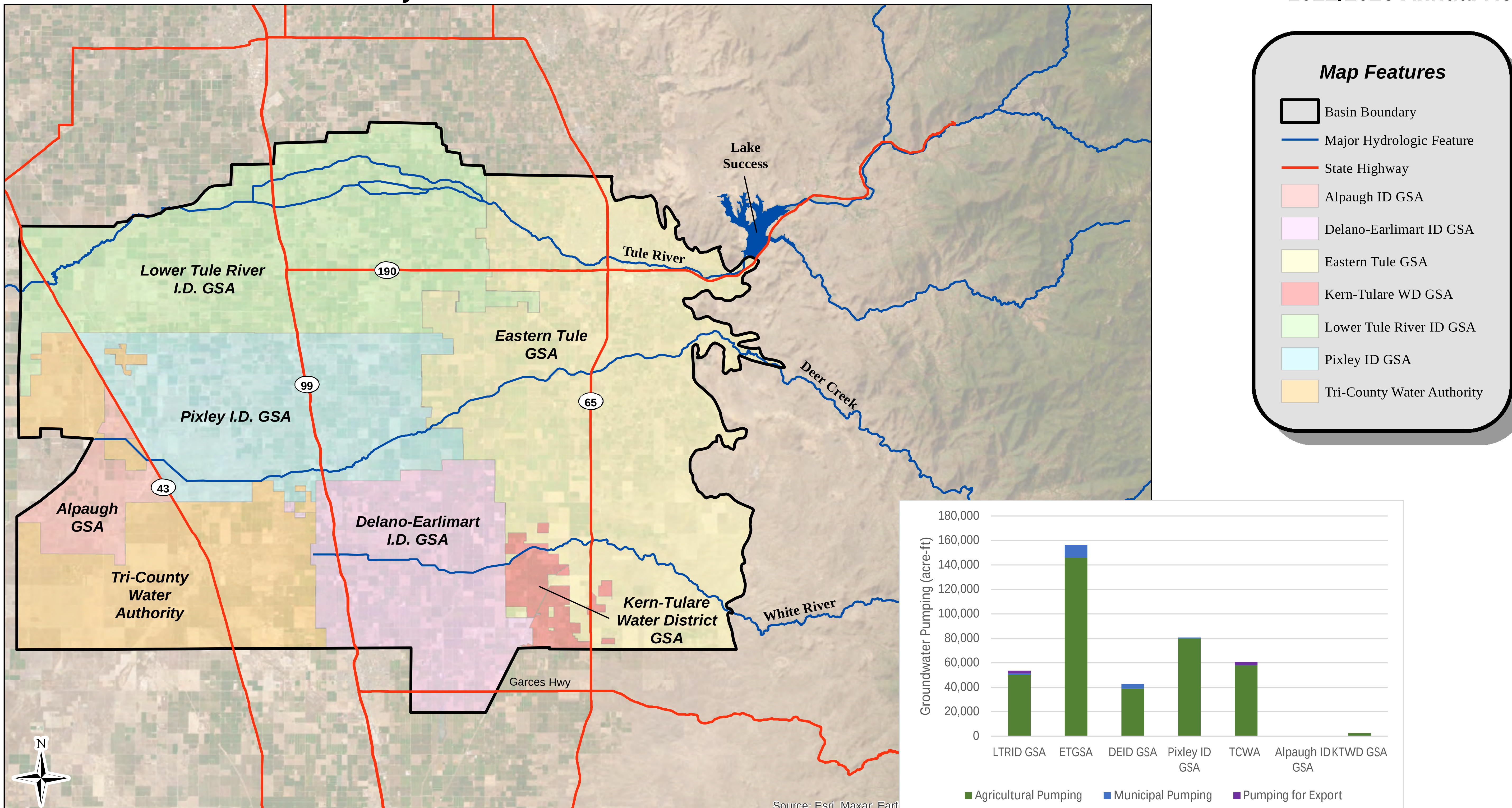
NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer Groundwater Elevation Contours

Figure 12



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0 2.5 5 10 Miles

NAD 83 State Plane Zone 4

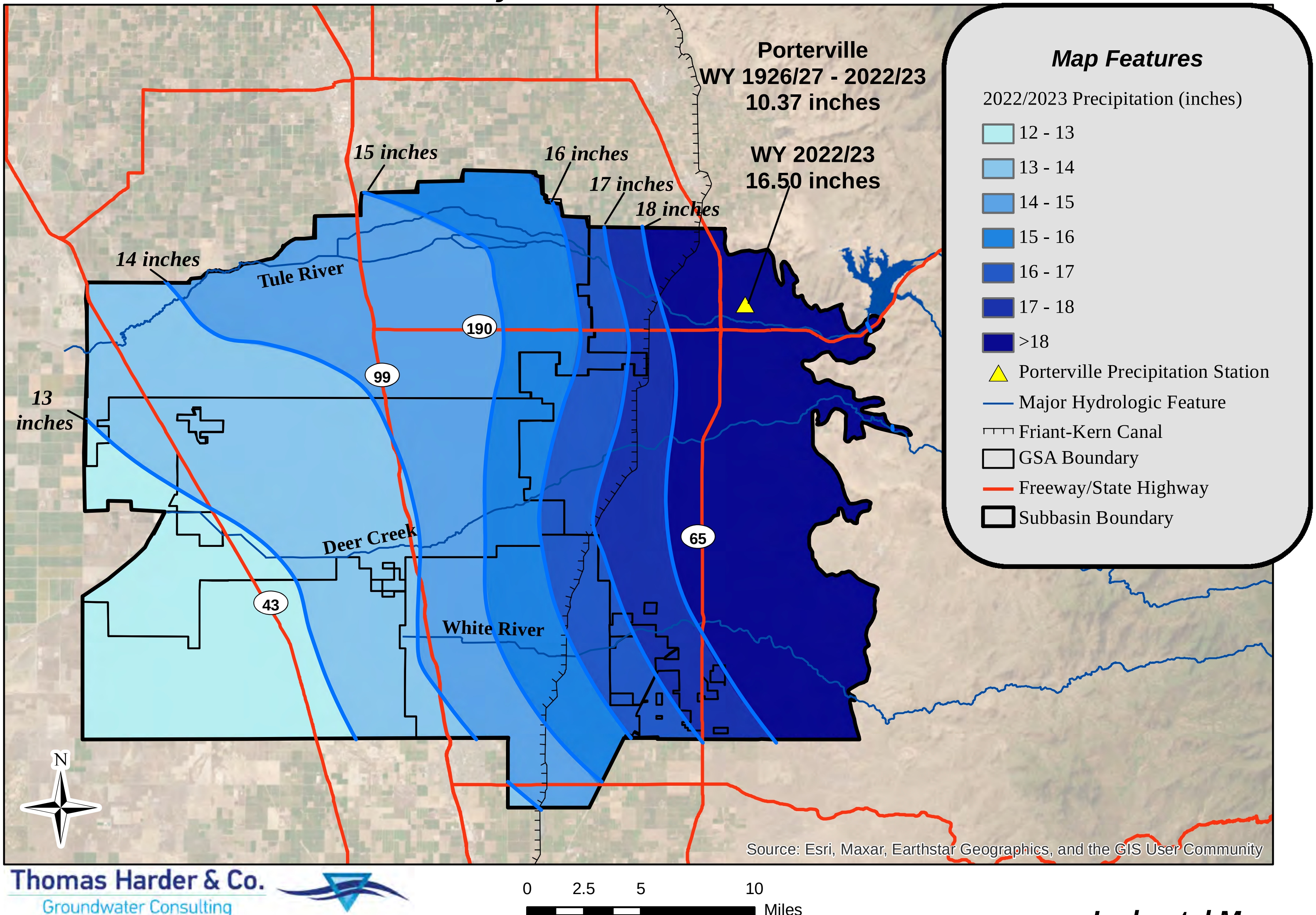
Groundwater Pumping

Figure 13

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report

March 2024



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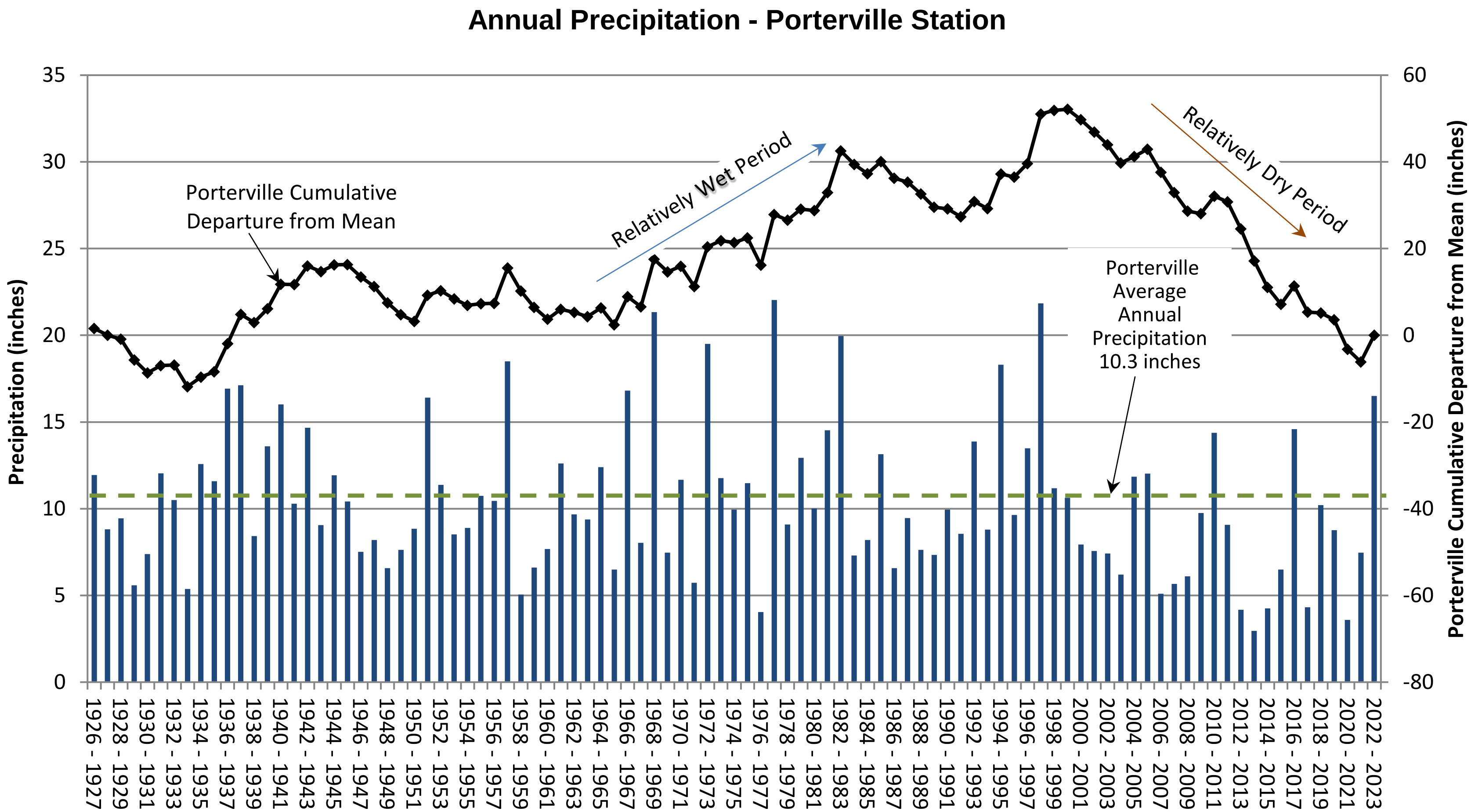
Note: Isohyetal data from LandIQ.
Porterville Precipitation Station Data
from WRCC, CIMIS and LandIQ (see Figure 15).

Isohyetal Map
Figure 14

Figure 15

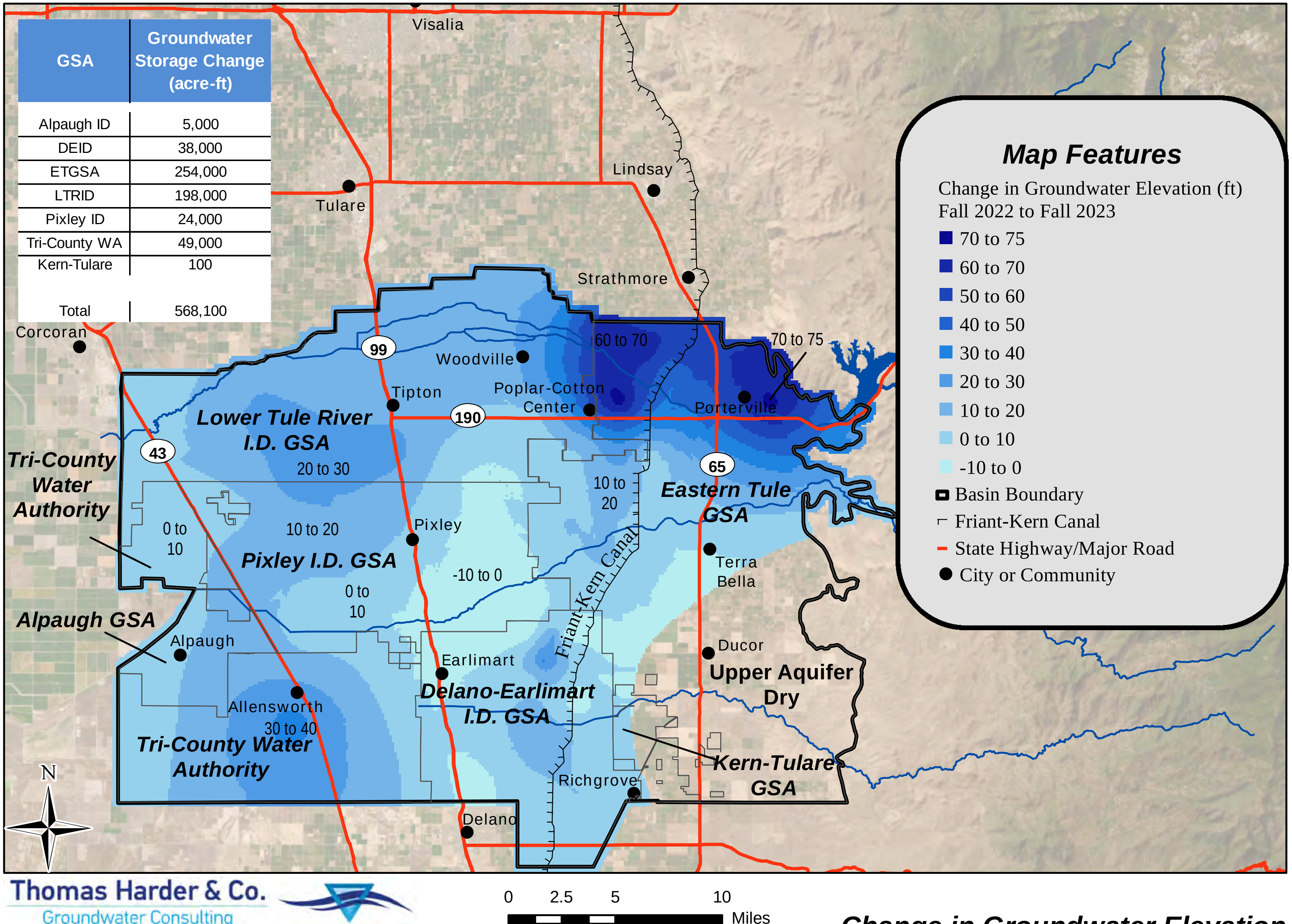


Notes:

Data in water years (October 1 to September 30).

Data from Western Regional Climate Center (1926-2001), California Irrigation Management Information System (2002-March 2023) and Land IQ (April 2023-September 2023).

Tule Subbasin Technical Advisory Committee

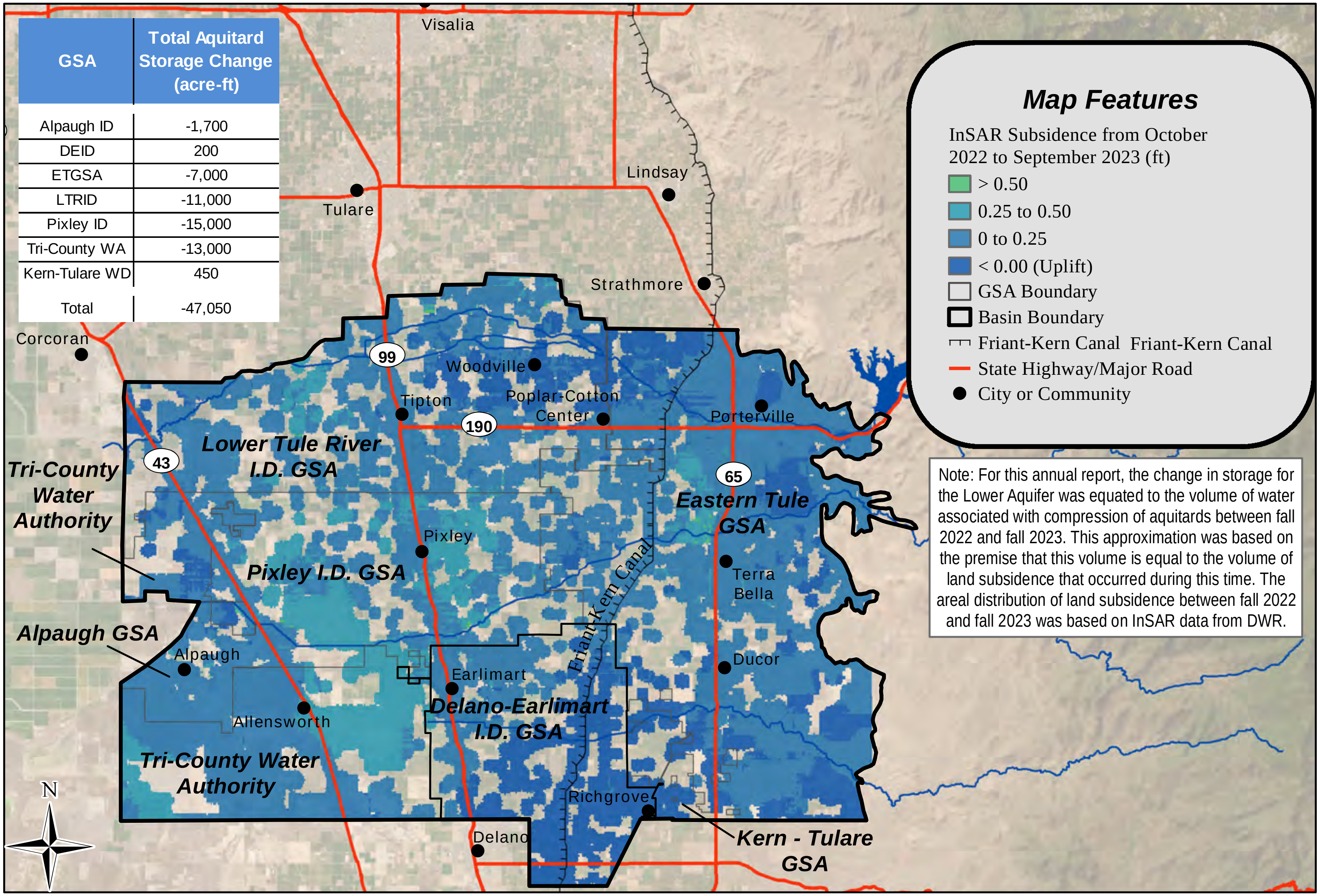


GSA	Groundwater Storage Change (acre-ft)
Alpaugh ID	5,000
DEID	38,000
ETGSA	254,000
LTRID	198,000
Pixley ID	24,000
Tri-County WA	49,000
Kern-Tulare	100
Total	568,100

Change in Groundwater Elevation
Upper Aquifer - Fall 2022 to Fall 2023
Figure 16

Tule Subbasin Technical Advisory Committee

GSA	Total Aquitard Storage Change (acre-ft)
Alpaugh ID	-1,700
DEID	200
ETGSA	-7,000
LTRID	-11,000
Pixley ID	-15,000
Tri-County WA	-13,000
Kern-Tulare WD	450
Total	-47,050



Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.

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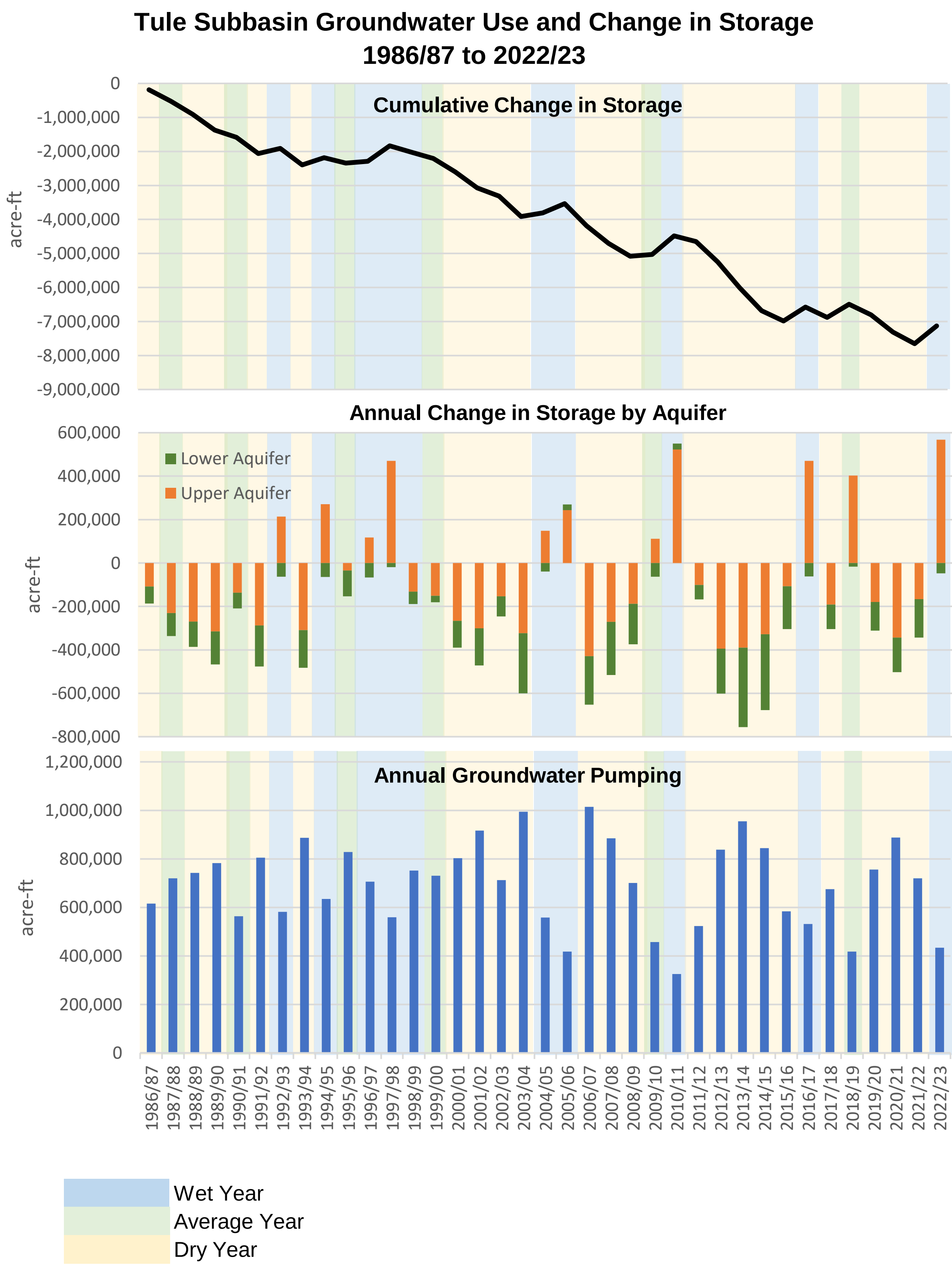
InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage As Estimated from Land Subsidence Fall 2022 to Fall 2023
Figure 17


Tule Subbasin Groundwater Use and Change in Storage
1986/87 to 2022/23
Cumulative Change in Storage
acre-ft
0
-1,000,000
-2,000,000
-3,000,000
-4,000,000
-5,000,000
-6,000,000
-7,000,000
-8,000,000
-9,000,000
Annual Change in Storage by Aquifer
Lower Aquifer
Upper Aquifer
600,000
400,000
200,000
-200,000
-400,000
-600,000
-800,000
Annual Groundwater Pumping
1,200,000
1,000,000
800,000
600,000
400,000
200,000
1986/87
1987/88
1988/89
1989/90
1990/91
1991/92
1992/93
1993/94
1994/95
1995/96
1996/97
1997/98
1998/99
1999/00
2000/01
2001/02
2002/03
2003/04
2004/05
2005/06
2006/07
2007/08
2008/09
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
Wet Year
Average Year
Dry Year

Appendix A

Lower Tule River Irrigation District GSA 2022/23 Annual Data

Lower Tule River Irrigation District GSA
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
LTRID GSA	Agricultural	49,000	0	2,300	51,300
	Municipal	0	1,220	0	1,220
	Tulare County MOU	1,000	0	0	1,000
	Total	***50,000***	***1,220***	***2,300***	***53,520***

Lower Tule River Irrigation District GSA
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
LTRID GSA	Agricultural	291,300	314,500	0	0	121,200	727,000
	Municipal	0	0	230	0	0	230
	Tulare County MOU	0	0	0	0	900	900
	Total	***291,300***	***314,500***	***230***	***0***	***122,100***	***728,130***

Lower Tule River Irrigation District GSA
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
LTRID GSA	Agricultural	51,300	727,000	0	0	778,300
	Municipal	1,220	0	230	0	1,450
	Tulare County MOU	1,000	900	0	0	1,900
	Total	***53,520***	***727,900***	***230***	***0***	***781,650***

Lower Tule River Irrigation District GSA
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
LTRID GSA	Agricultural	408,200	0	367,800	0	2,300	778,300
	Municipal	0	1,220	230	0	0	1,450
	Tulare County MOU	1,900	0	0	0	0	1,900
	Total	***410,100***	***1,220***	***368,030***	***0***	***2,300***	***781,650***

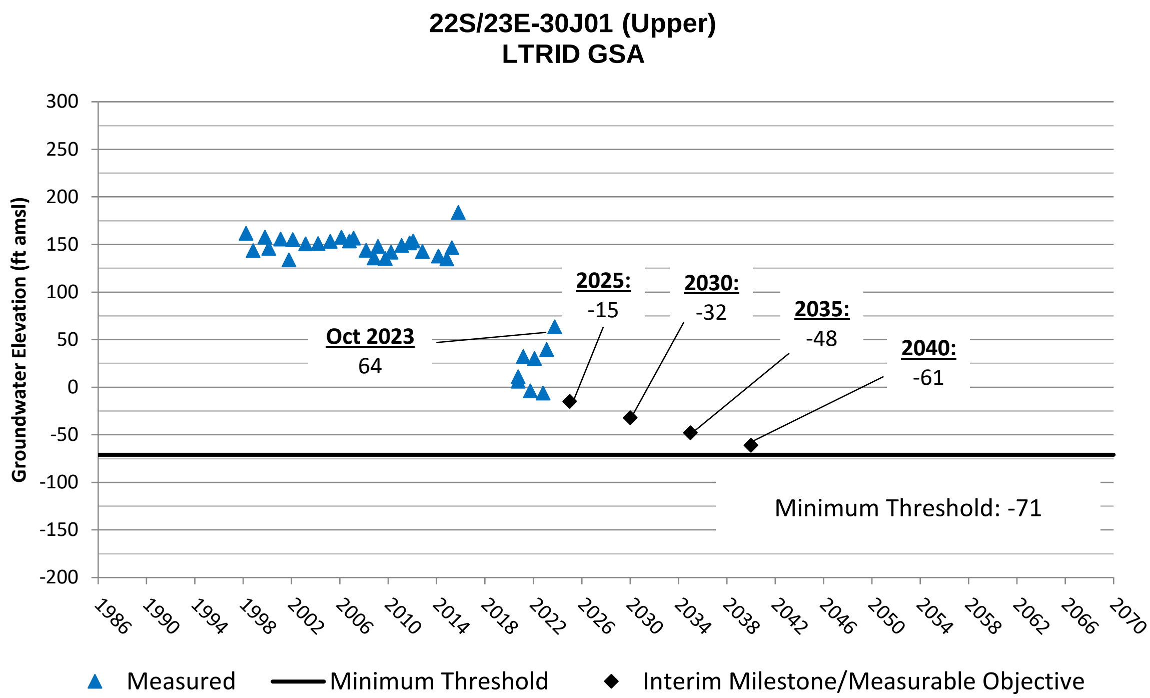
Lower Tule River Irrigation District GSA
Land Surface Elevations at Representative Monitoring Sites

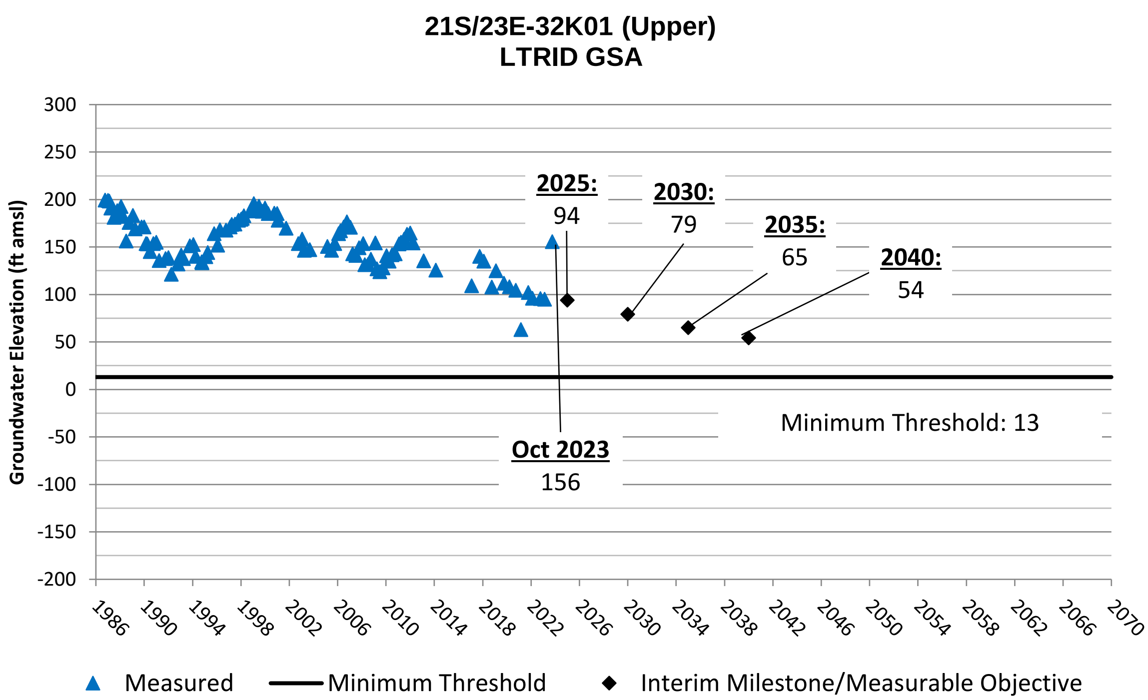
Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
L0001_B_RMS	253.0	DESTROYED	238.7	237.8
L0002_B_RMS	228.9	226.4	222.2	220.8
L0003_B_RMS	228.7	226.3	223.5	221.5
L0004_B_RMS	197.3	195.7	193.1	192.1
L0005_B_RMS	190.2	188.4	182.5	181.5
L0006_B_RMS	192.3	DESTROYED	184.5	183.5
L0022_B_RMS	180.0	UNDER WATER	170.3	169.3
L0023_B_RMS	190.8	189.3	185.1	184.1
L0024_B_RMS	254.9	253.3	249.8	248.8
L0038_B_RMS	321.6	320.3	319.5	318.1
L0039_B_RMS	307.5	305.7	304.4	303.3
L0040_B_RMS	309.0	307.7	304.4	303.4
L0041_B_RMS	307.3	306.0	302.8	301.8
L0042_B_RMS	306.5	304.7	301.6	300.6
L0043_B_RMS	348.6	348.4	346.4	345.4
L0044_B_RMS	370.6	370.4	370.1	368.9
L0045_B_RMS	346.3	345.1	343.7	342.6
L0046_B_RMS	371.0	370.1	370.0	369.0

Note:

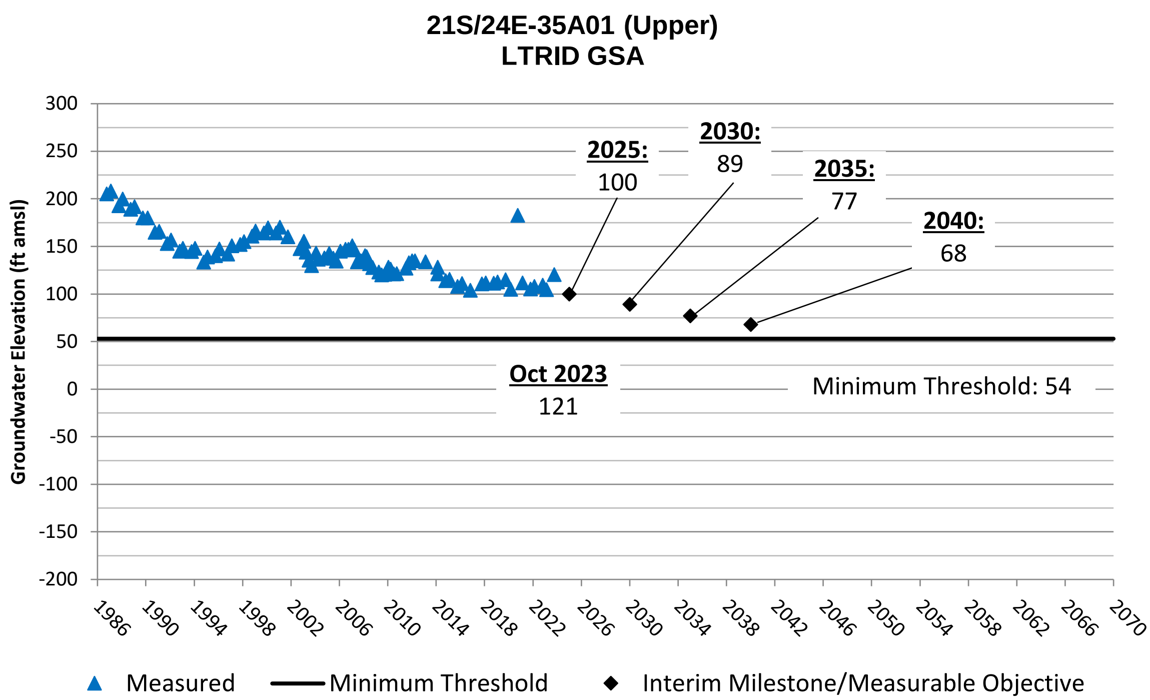
[1] Benchmarks surveyed in July and August of each year.

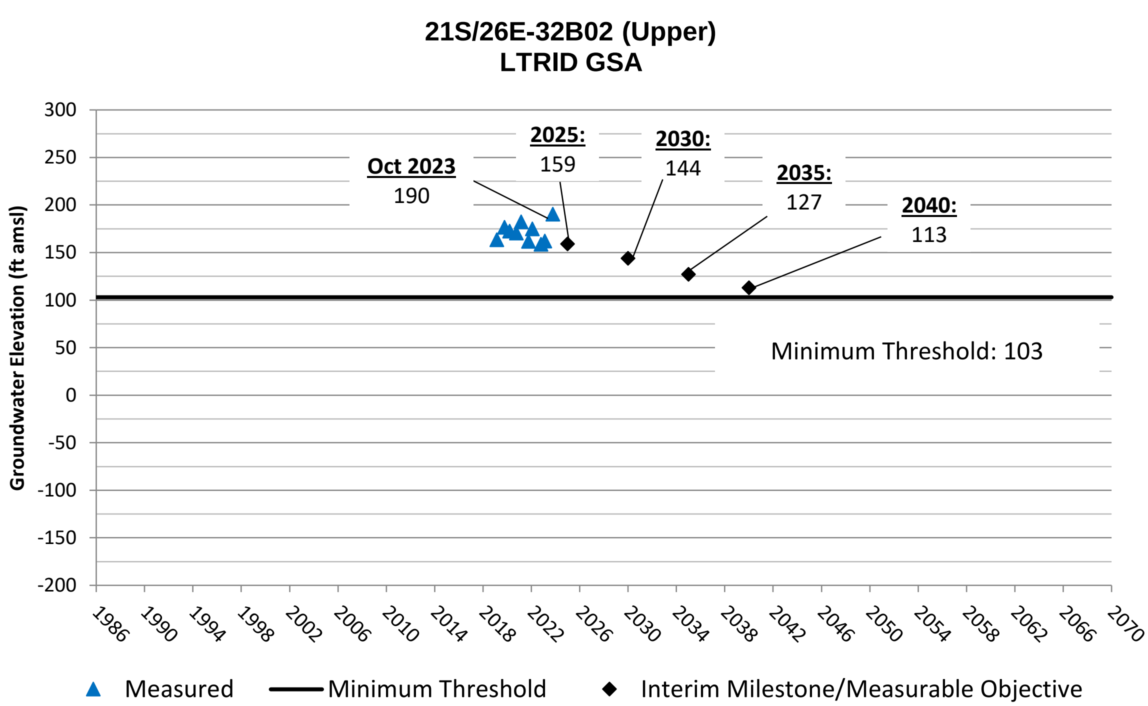
Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs



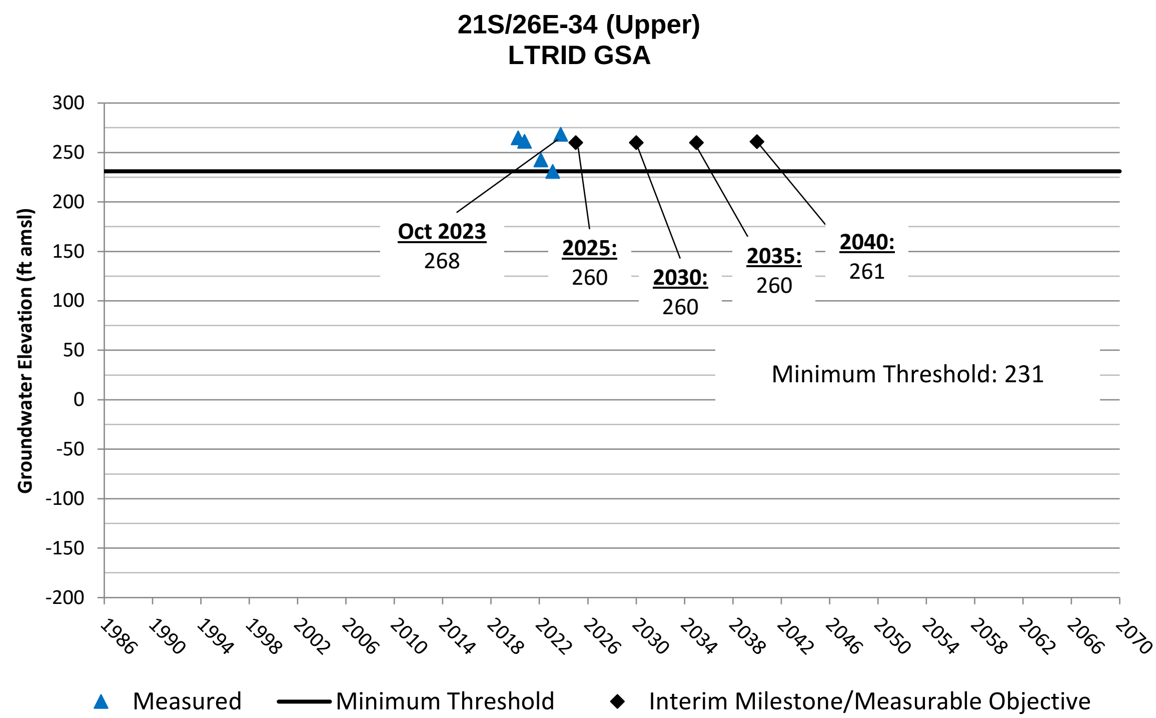


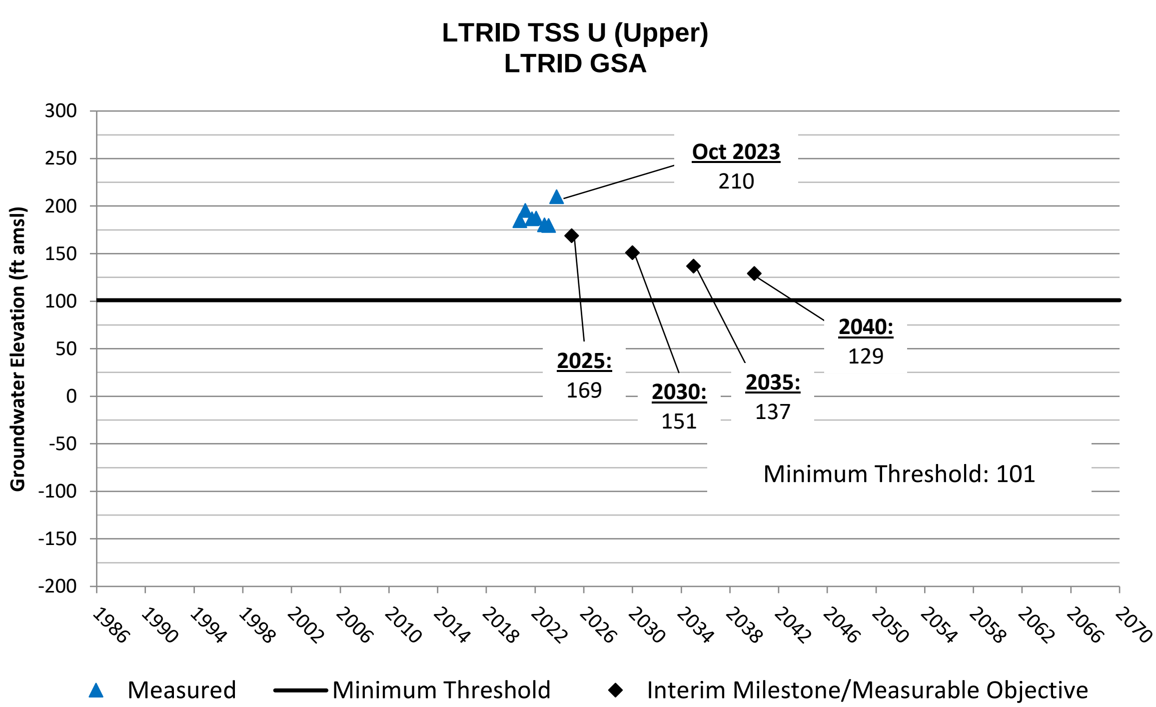
Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs



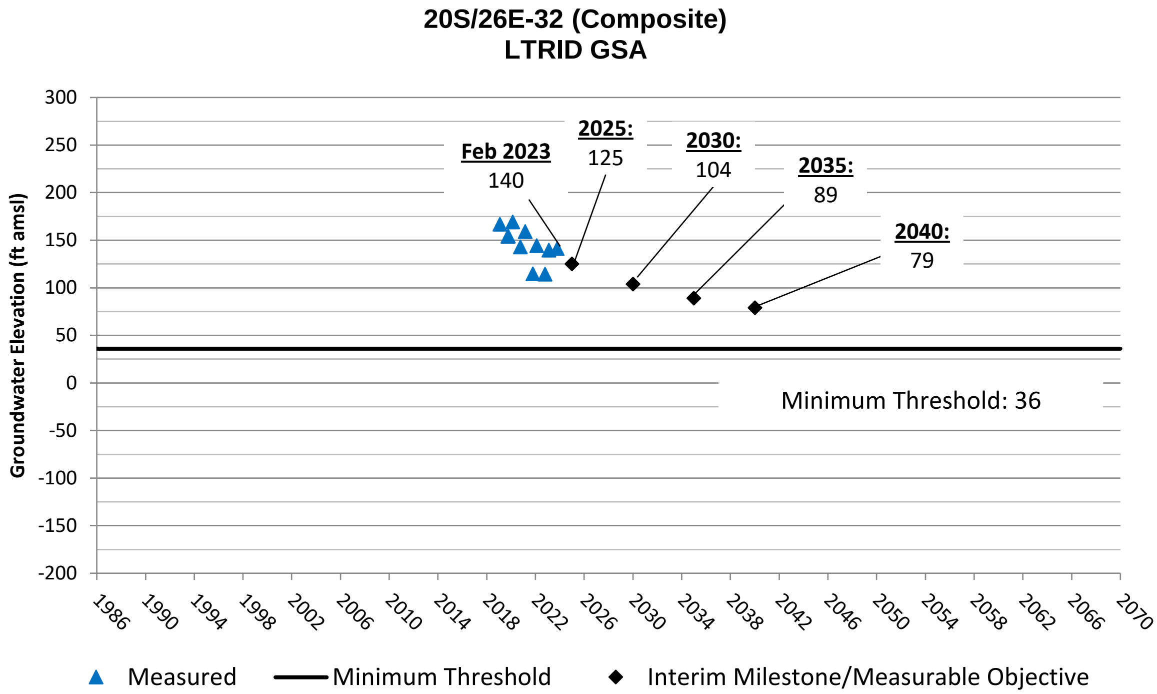


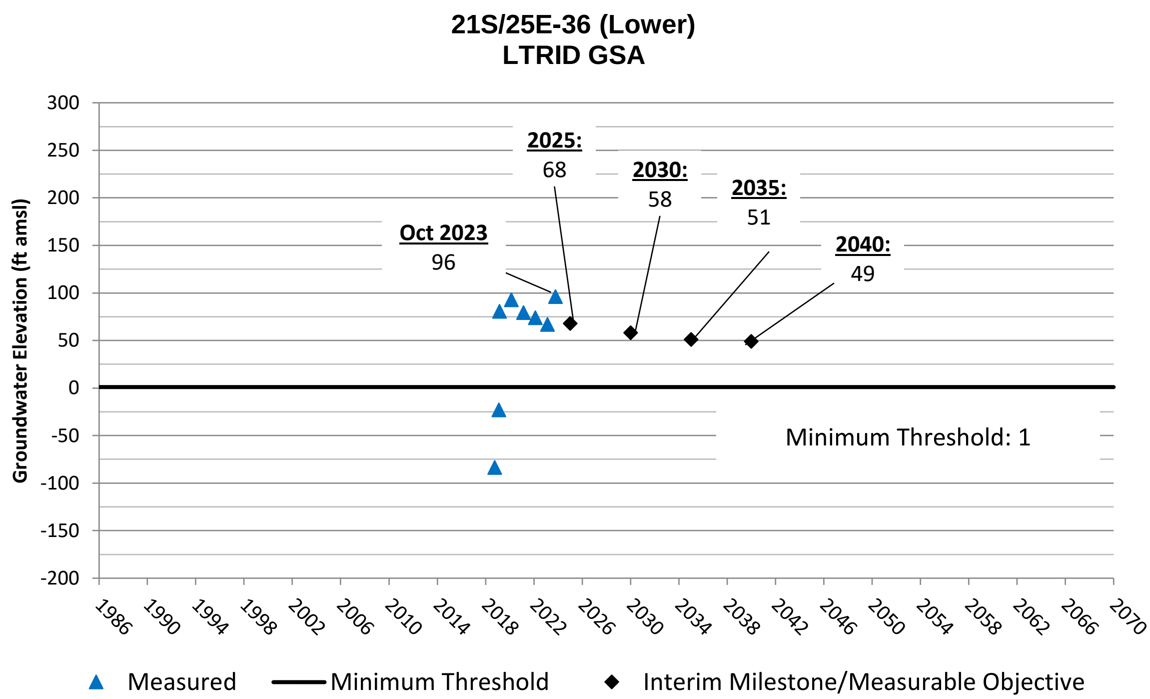
Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs



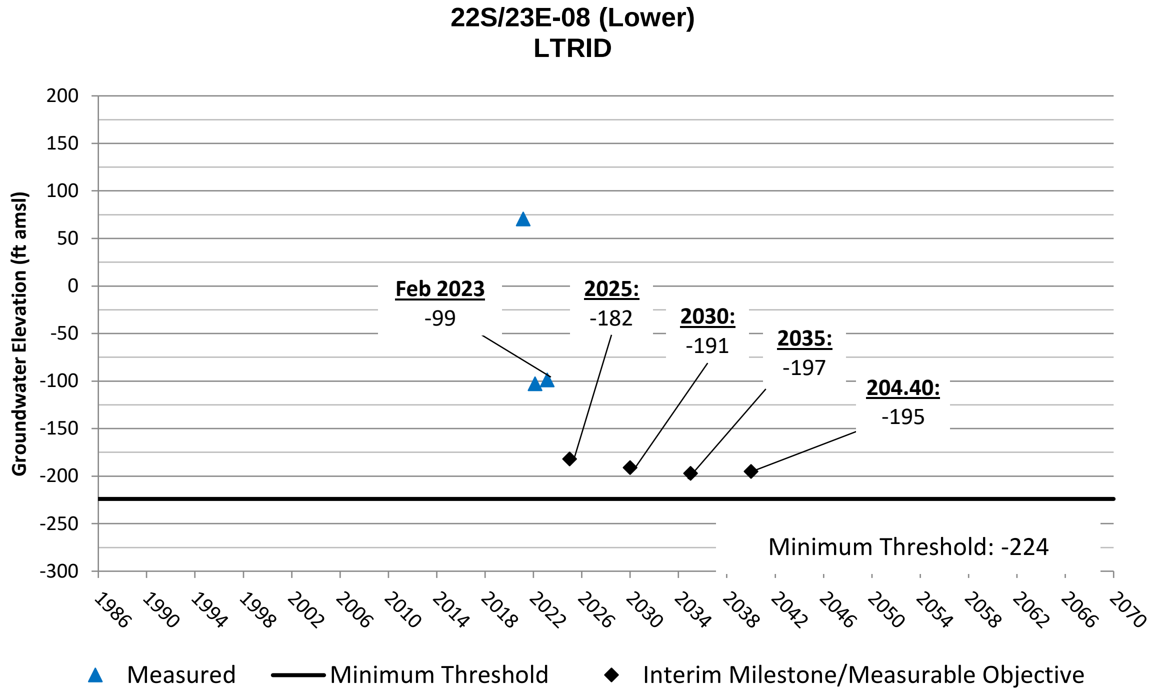


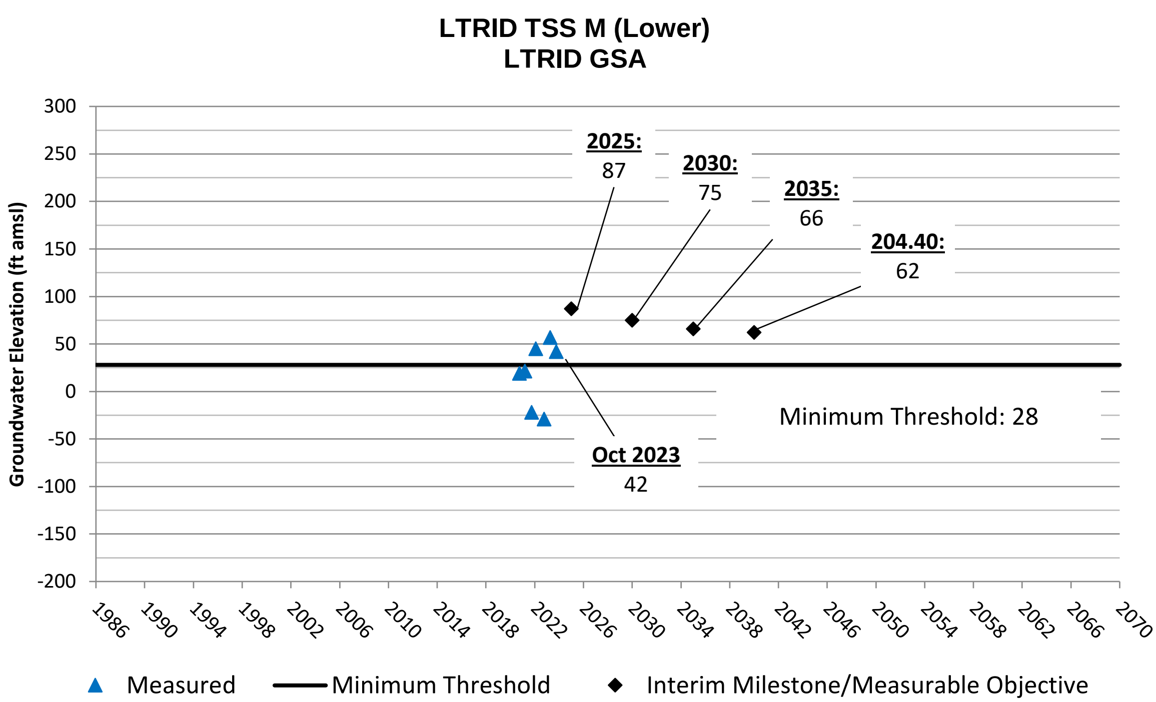
Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs



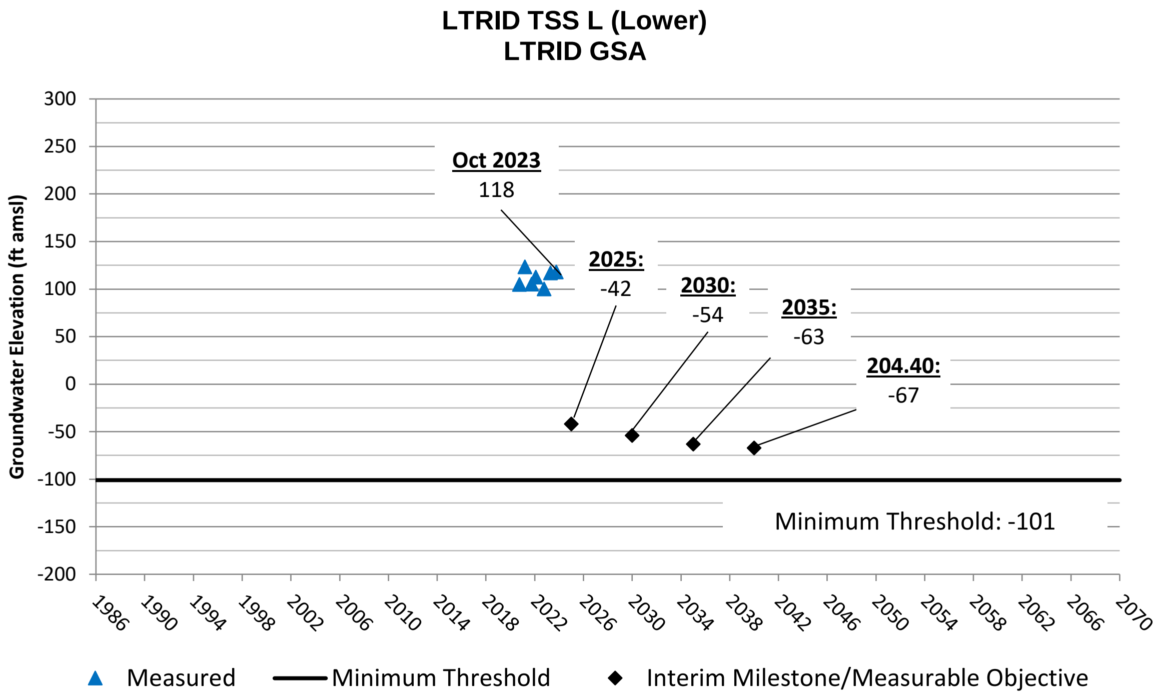


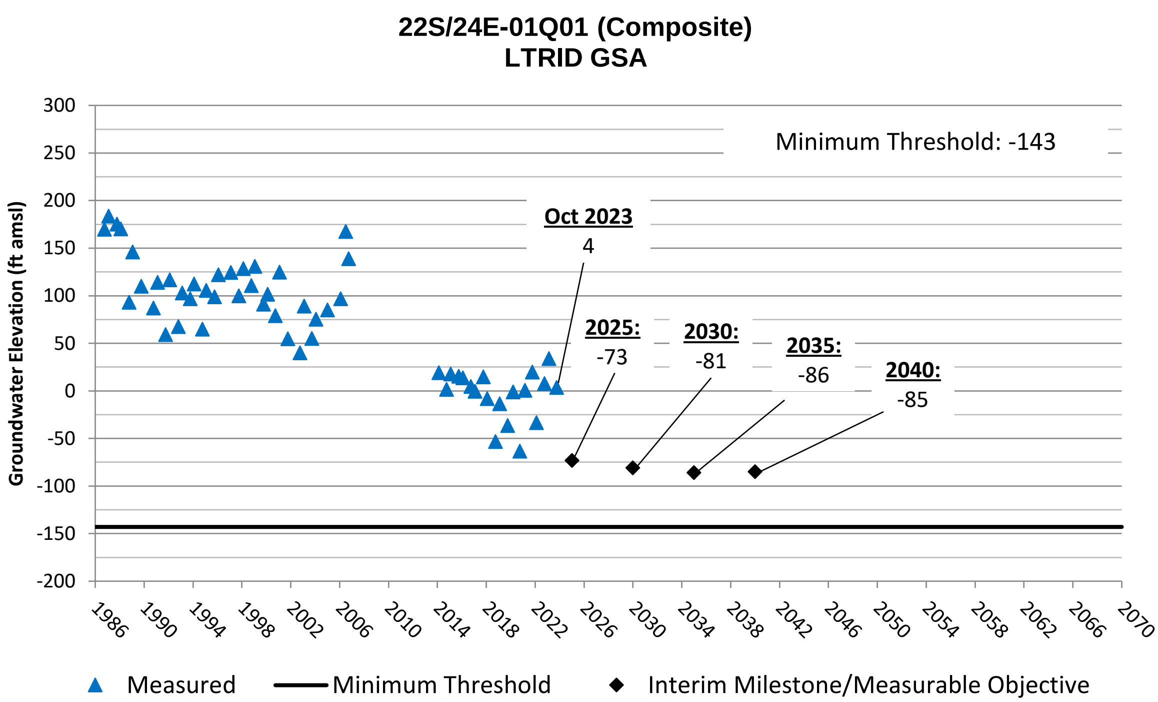
Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs



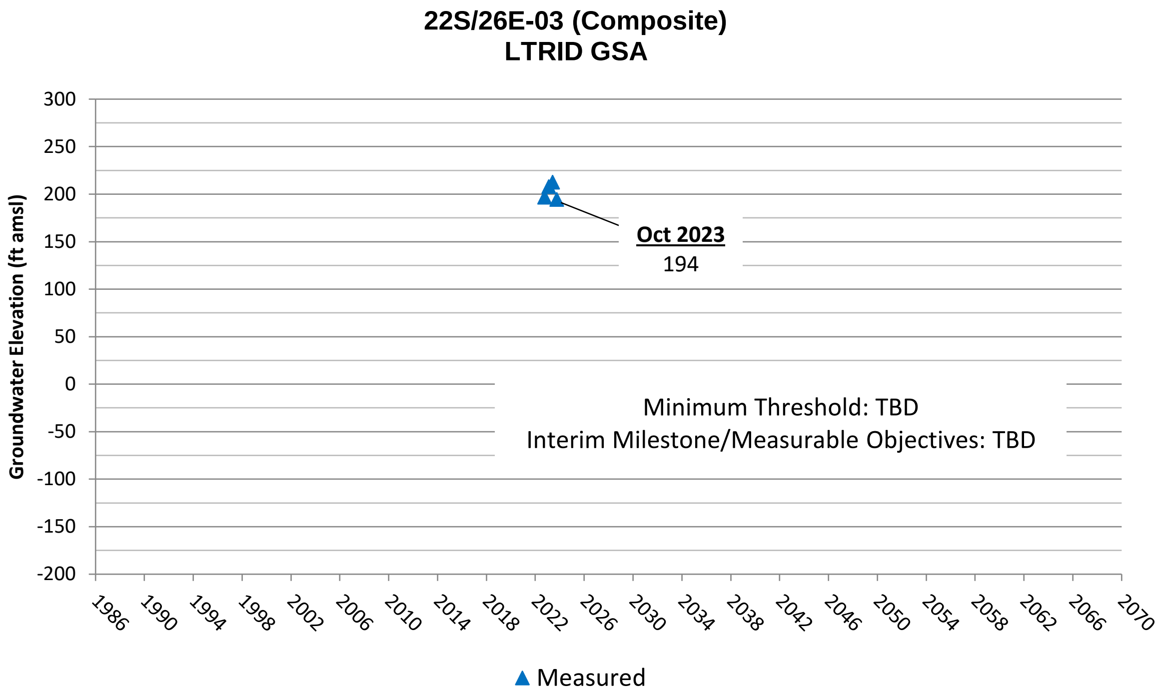


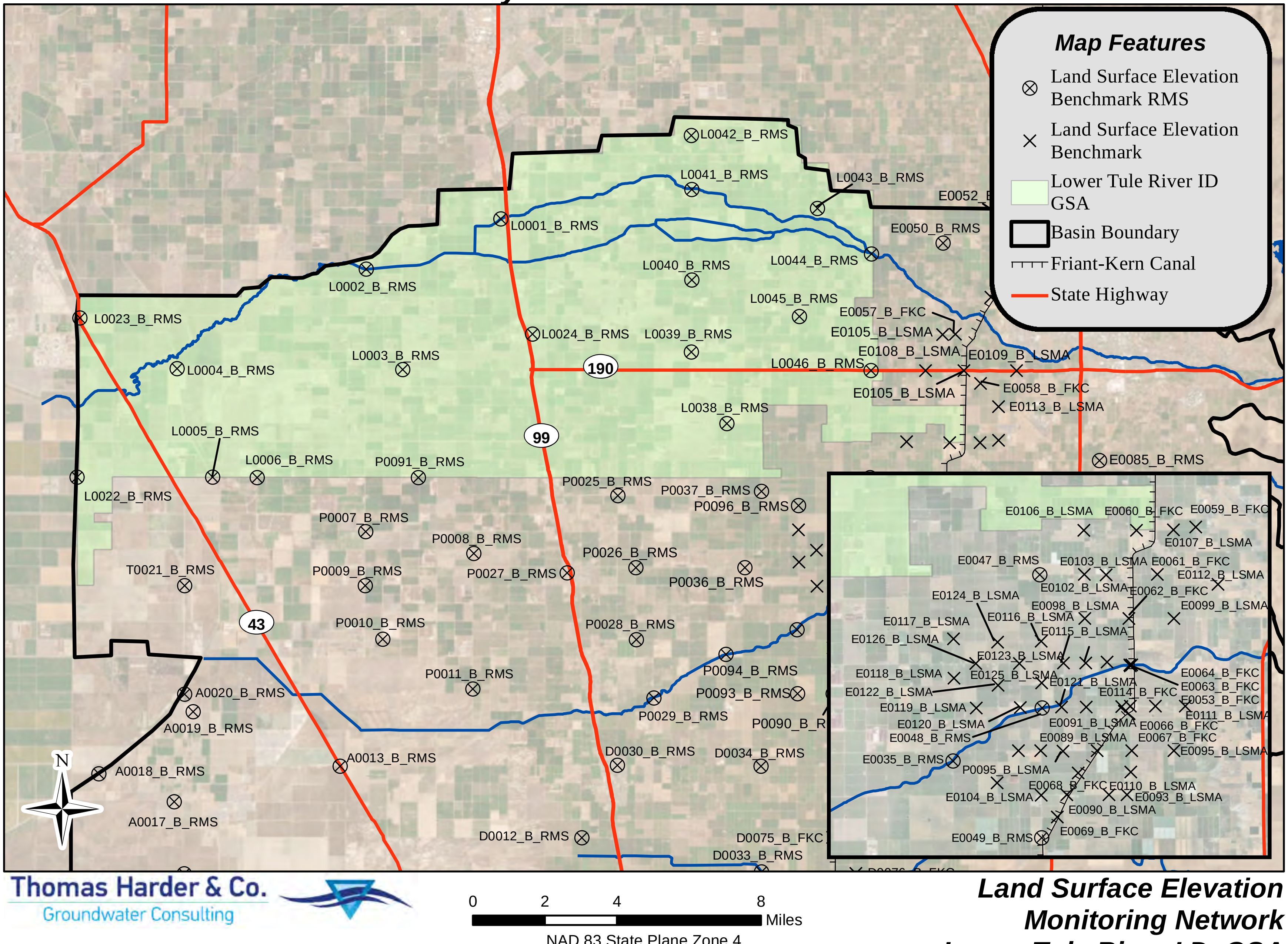
Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs





Lower Tule River Irrigation District GSA
RMS Groundwater Elevation Hydrographs





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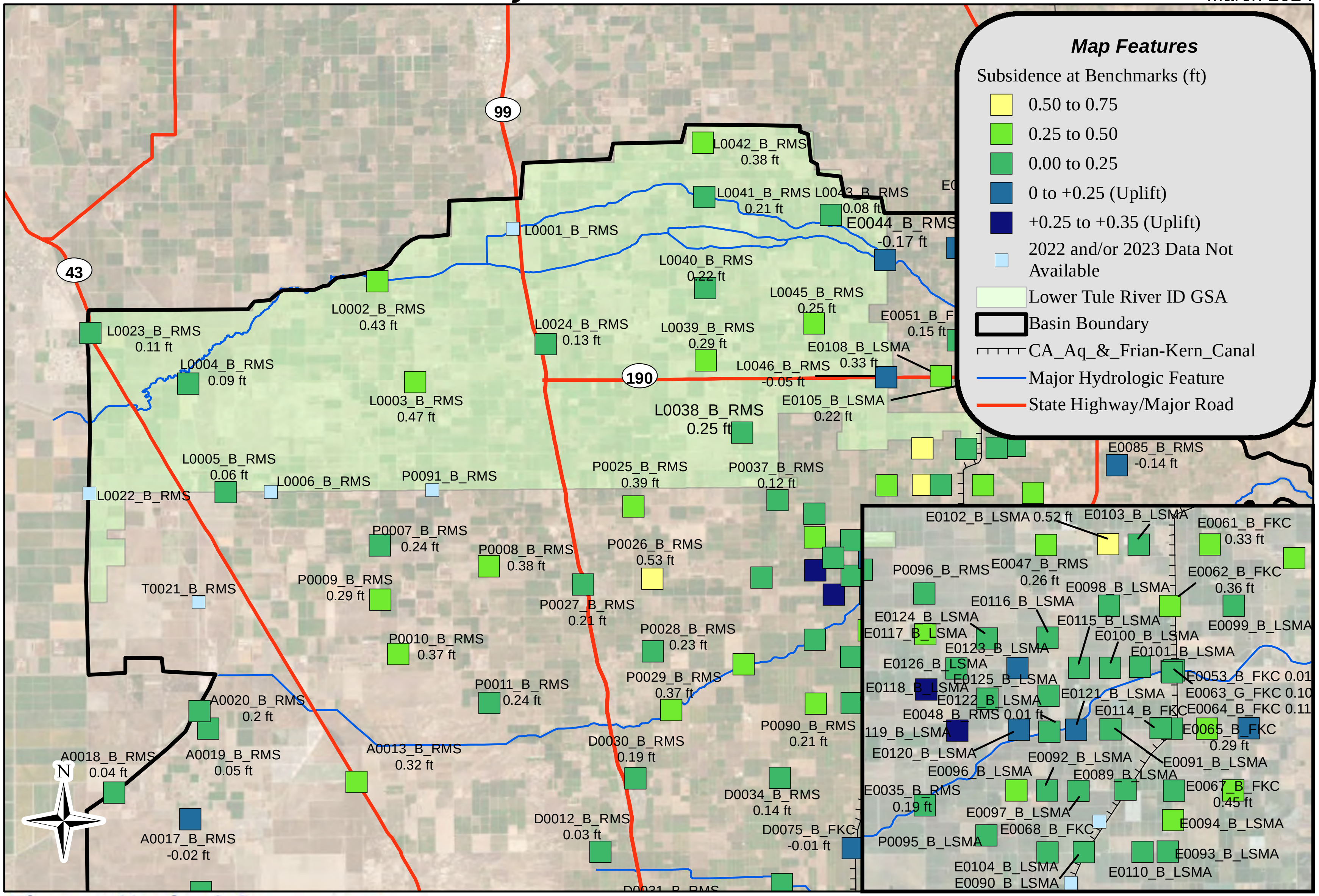
Land Surface Elevation Monitoring Network
Lower Tule River I.D. GSA

Appendix A
Figure 8

2022/2023 Annual Report
March 2024

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
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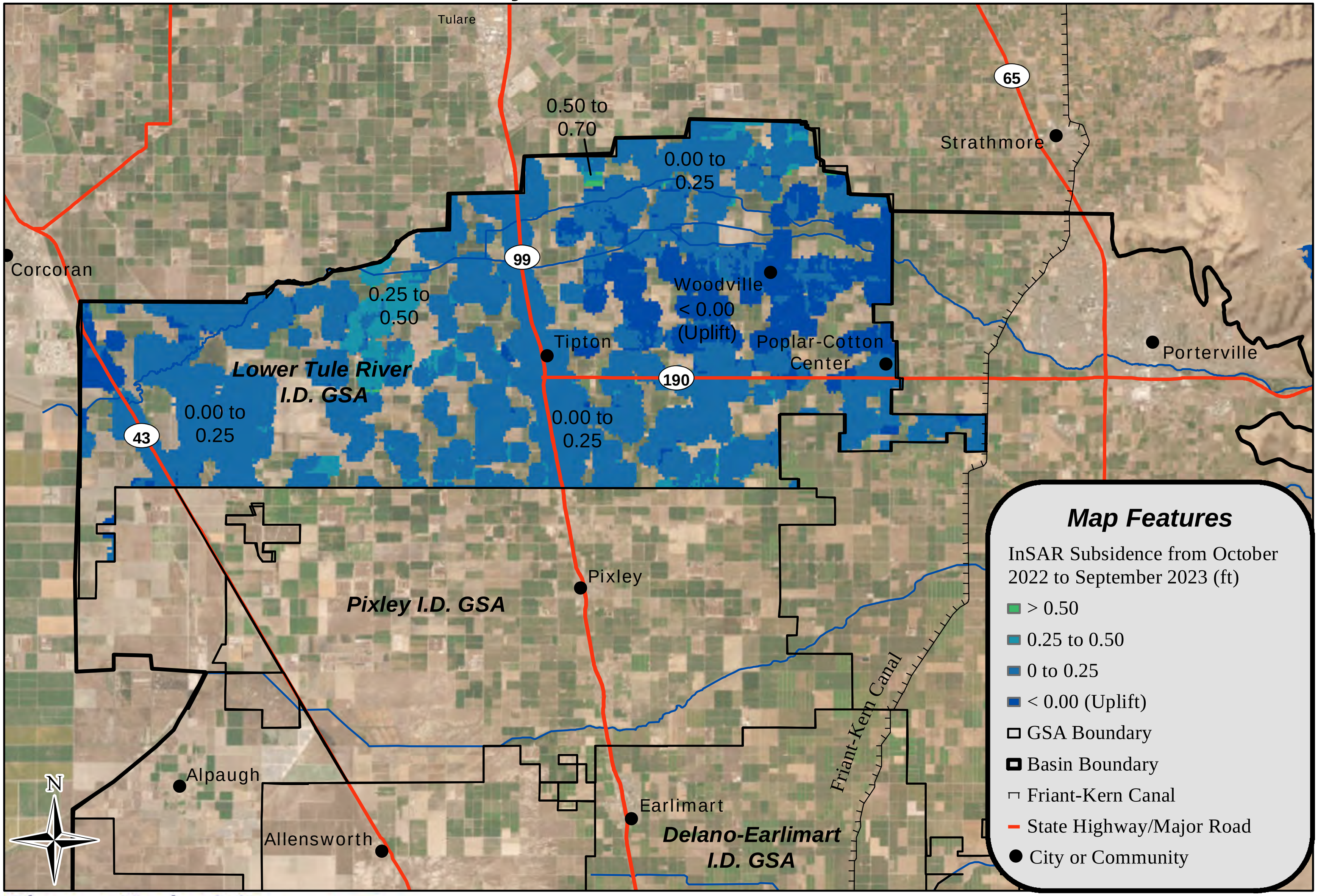
Data from Tule Subbasin Monitoring Network.
Fall 2023 data was used if Summer 2023 data was not available.

Land Subsidence - July 2022 to July 2023 Lower Tule River I.D. GSA

Appendix A
Figure 9

2022/2023 Annual Report
March 2024

Tule Subbasin Technical Advisory Committee



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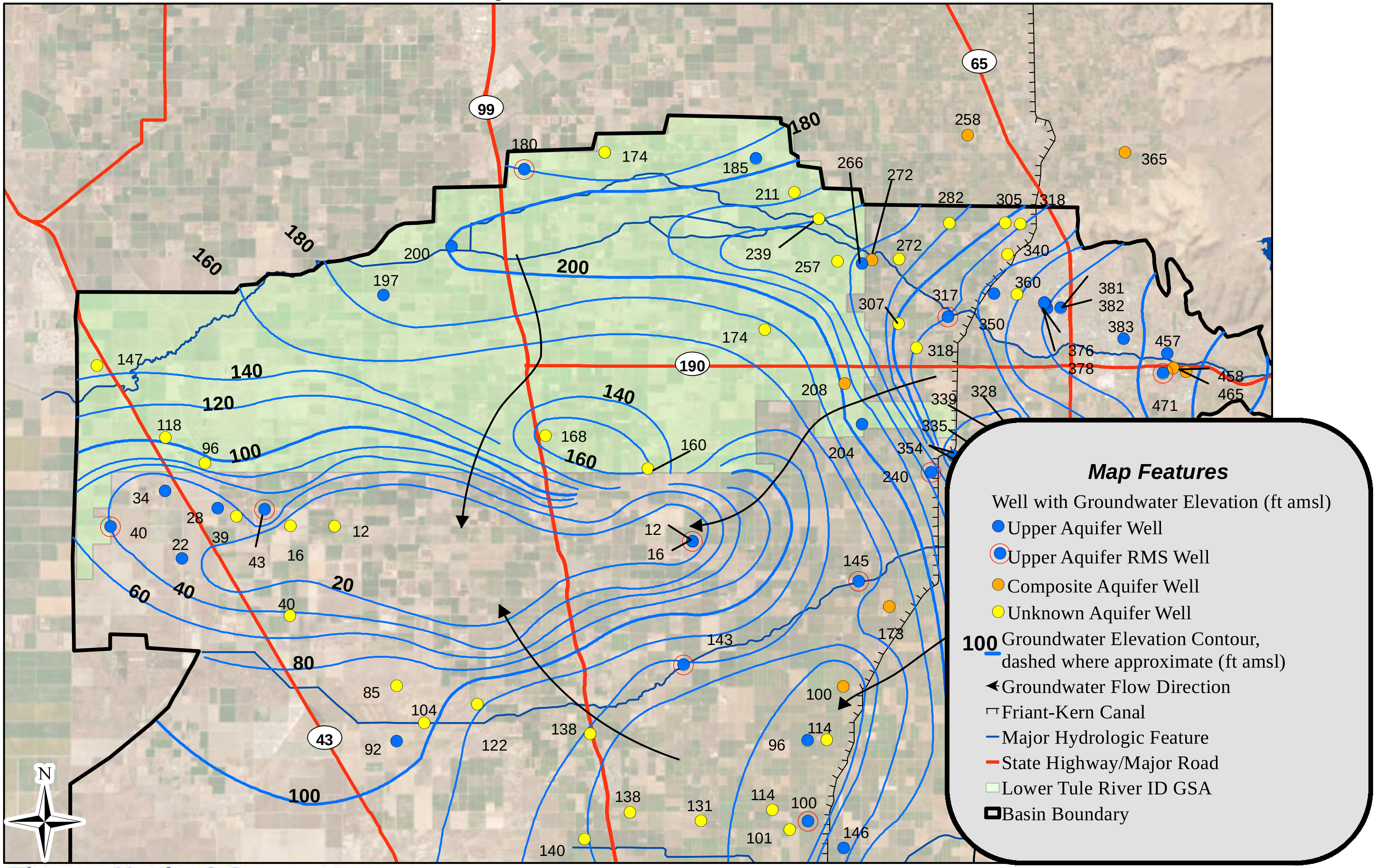
Land Subsidence - Fall 2022 to Fall 2023 Lower Tule River I.D. GSA

Appendix A
Figure 10

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

0 2 4 8 Miles

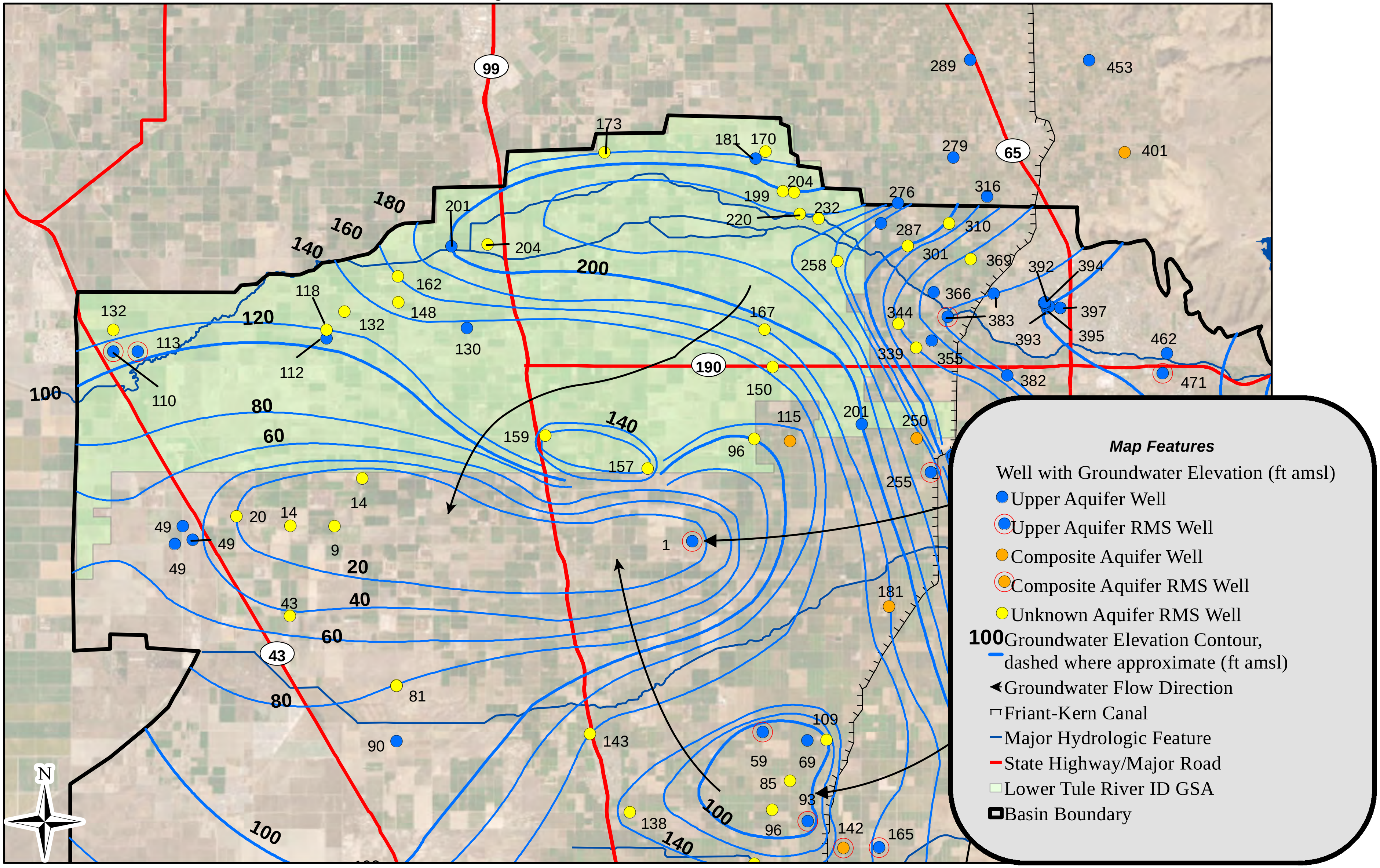
NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Upper Aquifer
Lower Tule River I.D. GSA
Appendix A
Figure 11

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



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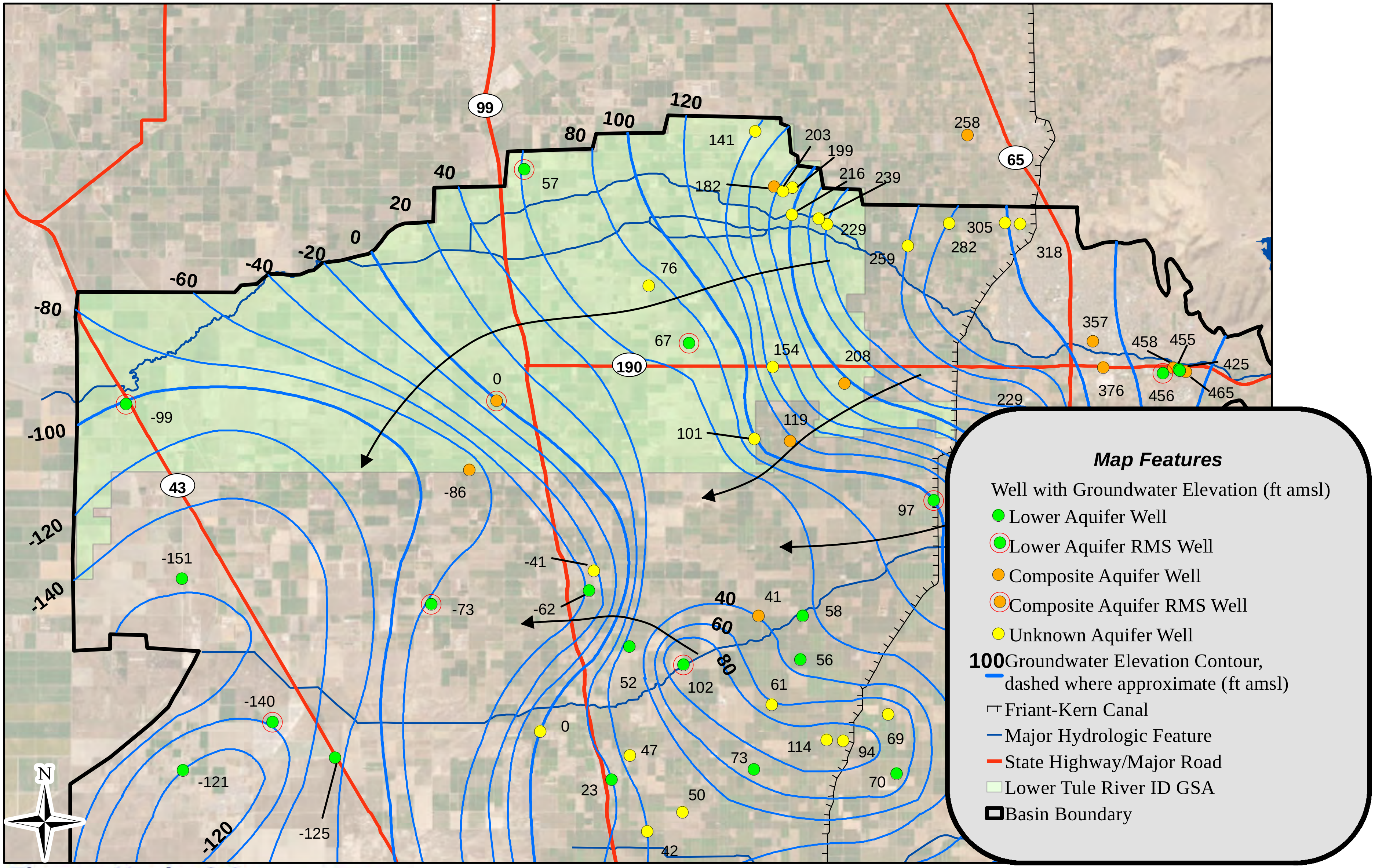
Groundwater Consulting

0 2 4 8 Miles

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer
Lower Tule River I.D. GSA
Appendix A
Figure 12



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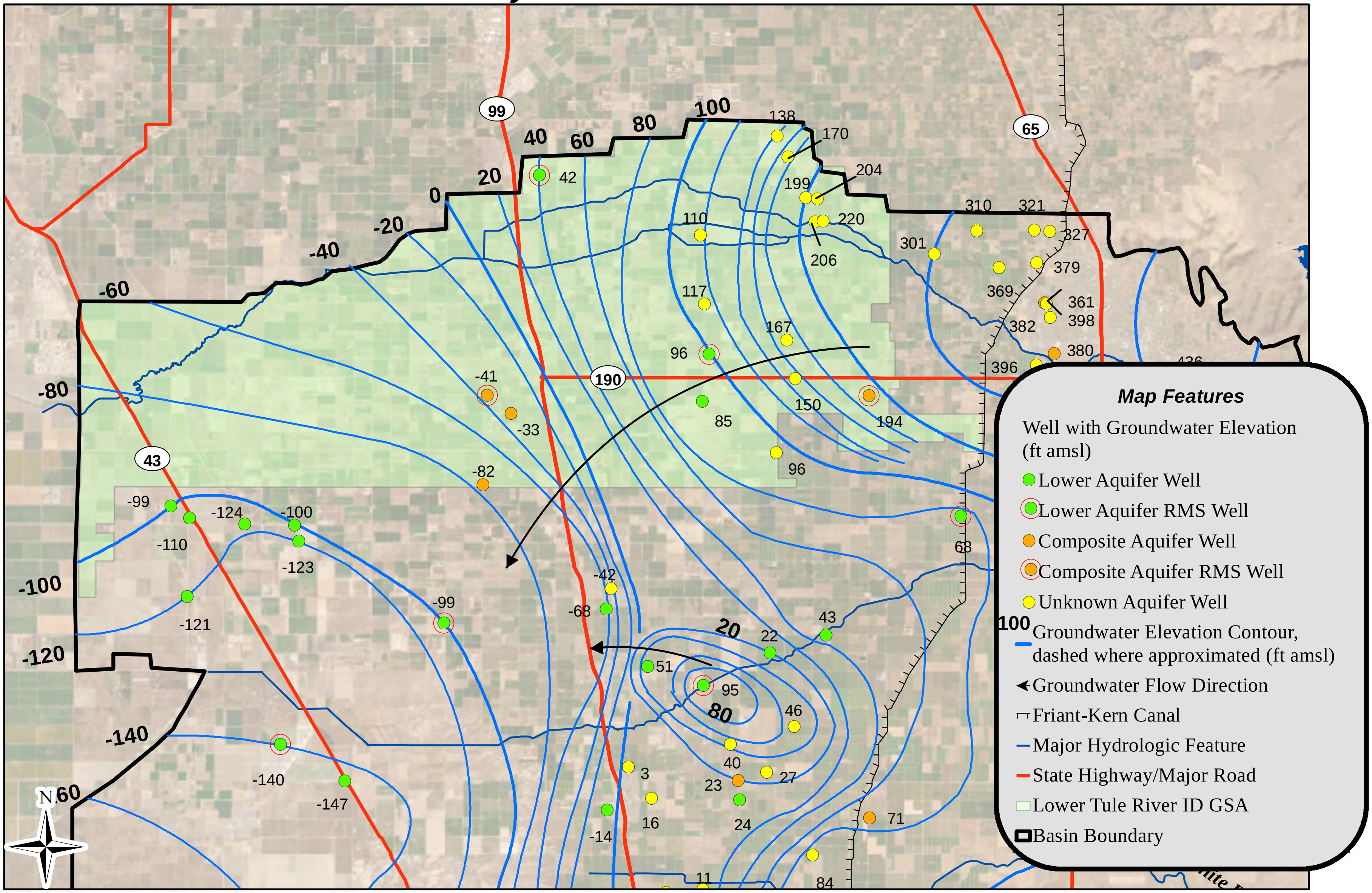
NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer
Lower Tuler River I.D. GSA
Appendix A
Figure 13

Tule Subbasin Technical Advisory Committee



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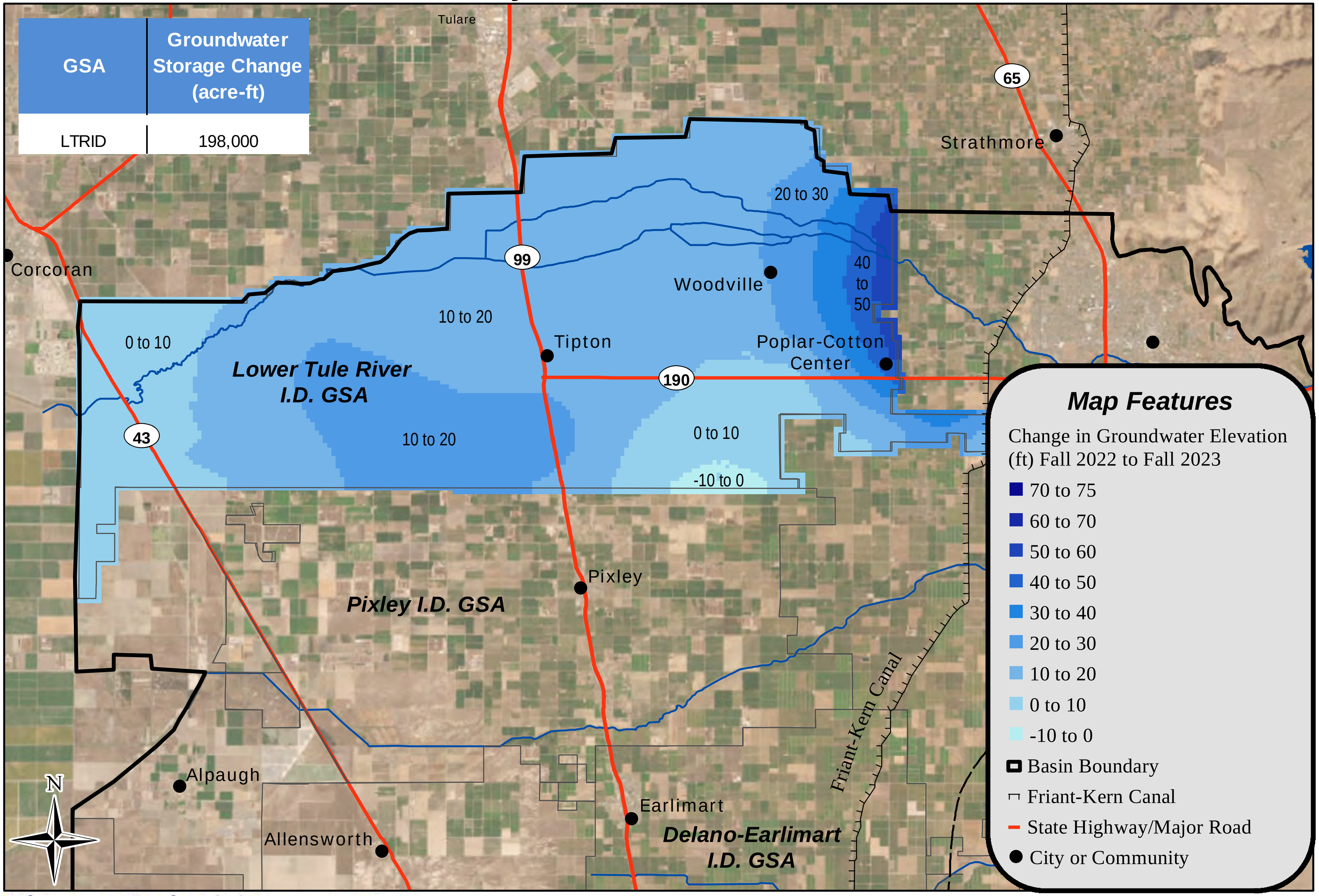
NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
Lower Tule River I.D. GSA
Appendix A
Figure 14

GSA	Groundwater Storage Change (acre-ft)
LTRID	198,000



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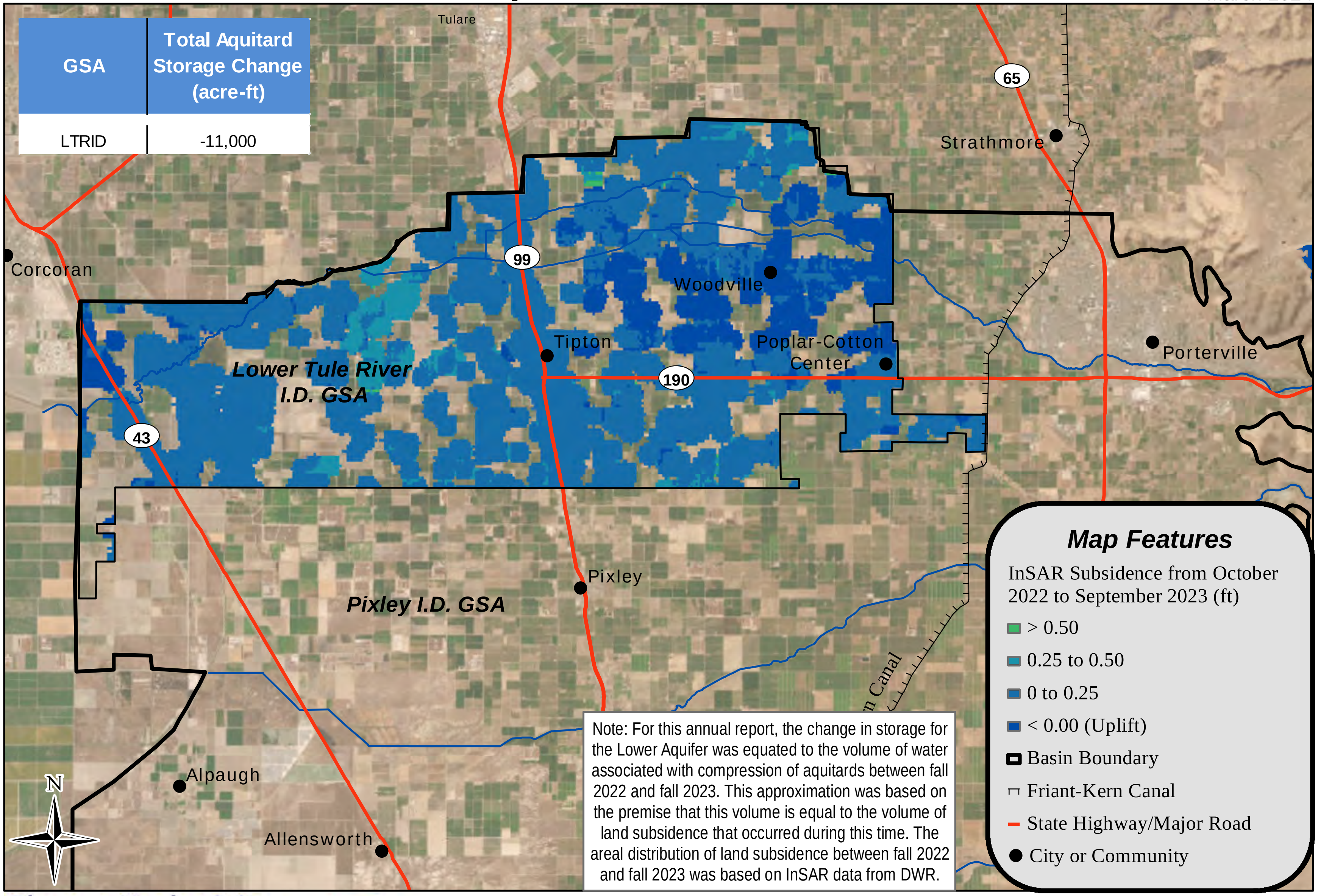
Change in Groundwater Elevation Fall 2022 to Fall 2023 - Upper Aquifer Lower Tule River I.D. GSA

Appendix A
Figure 15

Tule Subbasin Technical Advisory Committee

GSA	Total Aquitard Storage Change (acre-ft)
LTRID	-11,000



Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.

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InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage as Estimated from Land Subsidence - Fall 2022 to Fall 2023
Lower Tule River I.D. GSA

Appendix A
Figure 16

Appendix B

Eastern Tule GSA
2022/23 Annual Data

Eastern Tule GSA
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
ETGSA	Greater Tule	144,300	0	0	144,300
	Porterville Community	1,500	10,180	0	11,680
	Ducor Community	0	90	0	90
	Terra Bella Community	0	210	0	210
	Total	***145,800***	***10,480***	***0***	***156,280***

Eastern Tule GSA
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
ETGSA	Greater Tule	36,800	151,100	0	0	176,500	364,400
	Porterville Community	9,700	0	5,000	0	3,300	18,000
	Ducor Community	0	0	0	0	0	0
	Terra Bella Community	0	1,400	0	0	0	1,400
	Total	***46,500***	***152,500***	***5,000***	***0***	***179,800***	***383,800***

Eastern Tule GSA
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
ETGSA	Greater Tule	144,300	364,400	0	0	508,700
	Porterville Community	11,680	13,000	5,000	0	29,680
	Ducor Community	90	0	0	0	90
	Terra Bella Community	210	1,400	0	0	1,610
	Total	***156,280***	***378,800***	***5,000***	***0***	***540,080***

Eastern Tule GSA
Land Surface Elevations at Representative Monitoring Sites

Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
E0035_B_RMS	342.1	340.8	340.5	339.5
E0047_B_RMS	366.2	365.3	365.2	363.4
E0048_B_RMS	370.5	369.1	369.5	366.5
E0049_B_RMS	403.2	401.8	402.7	401.8
E0050_B_RMS	386.6	386.6	386.5	385.5
E0051_B_FKC	397.3	396.7	397.3	396.3
E0052_B_FKC	405.7	405.8	405.7	404.7
E0053_B_FKC	399.8	399.1	399.7	398.3
E0054_B_FKC	412.5	412.4	412.4	411.0
E0055_B_FKC	409.1	409.2	409.0	408.0
E0056_G_FKC	406.7	406.7	406.7	405.7
E0057_B_FKC	399.3	398.7	399.3	398.3
E0058_B_FKC	407.8	407.2	407.1	406.0
E0059_B_FKC	418.0	417.0	416.9	415.9
E0060_B_FKC	393.6	392.6	392.8	391.7
E0061_B_FKC	403.8	403.0	402.7	401.7
E0062_B_FKC	403.6	403.0	402.9	401.9
E0063_G_FKC	403.2	402.3	403.2	402.1
E0064_B_FKC	400.8	400.1	400.7	399.4
E0065_B_FKC	393.7	399.3	392.6	389.9
E0066_B_FKC	411.9	411.1	410.2	409.1
E0067_B_FKC	408.0	406.9	407.0	404.7
E0068_B_FKC	391.2	NOT FOUND	390.9	389.0
E0069_B_FKC	397.4	GONE	397.4	396.4
E0085_B_RMS	480.6	480.5	480.6	479.6
E0086_B_RMS	447.7	446.9	447.7	446.2
E0087_B_RMS	531.1	530.6	531.2	530.2
E0114_B_FKC	N/A	392.6	N/A	N/A

Notes:

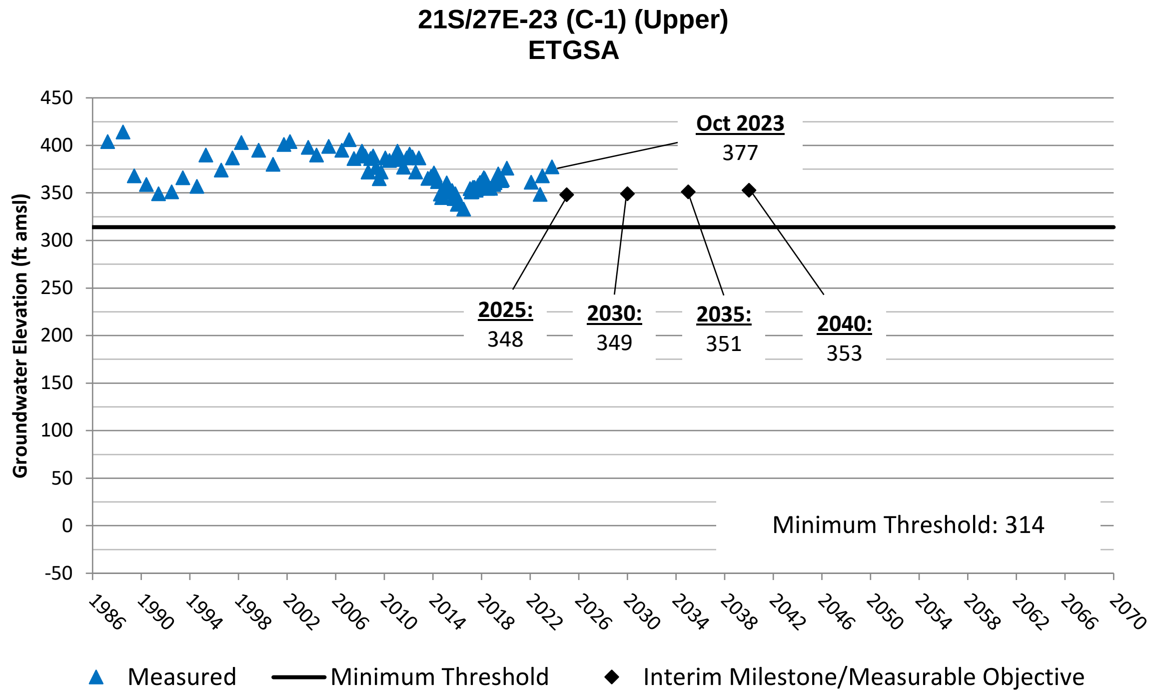
N/A = Not available

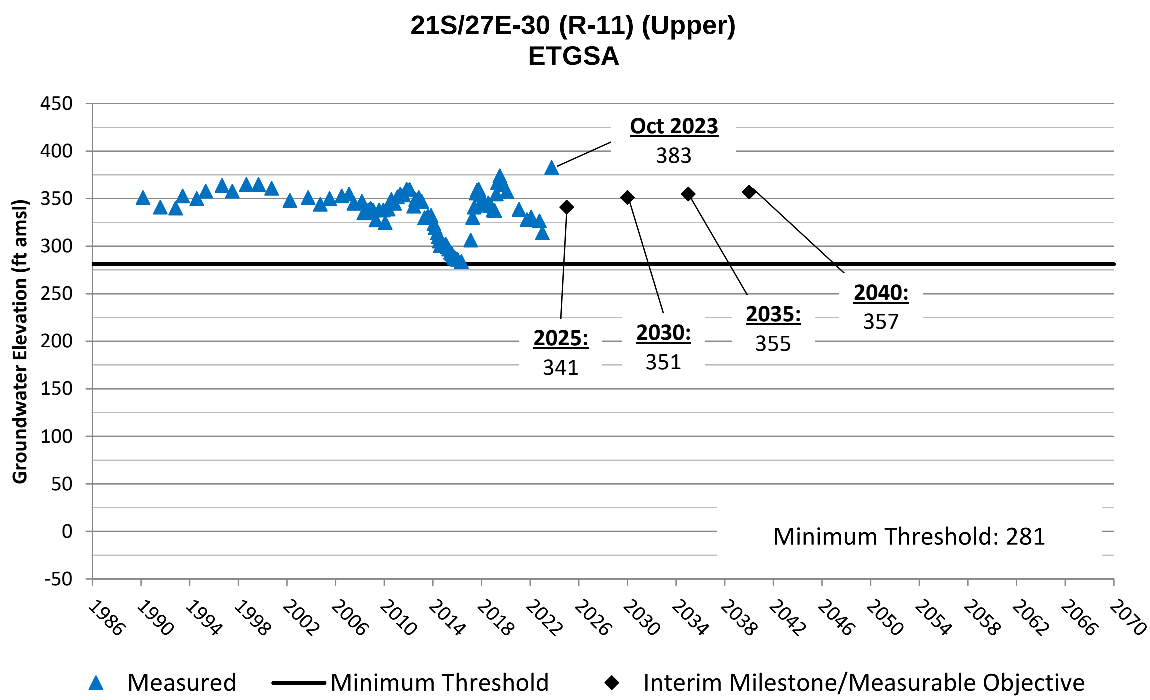
[1] Benchmarks surveyed in July and August of each year.

Eastern Tule GSA
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
ETGSA	Greater Tule	364,000	0	144,700	0	0	508,700
	Porterville Community	7,600	10,180	11,900	0	0	29,680
	Ducor Community	0	90	0	0	0	90
	Terra Bella Community	0	1,610	0	0	0	1,610
	Total	***371,600***	***11,880***	***156,600***	***0***	***0***	***540,080***

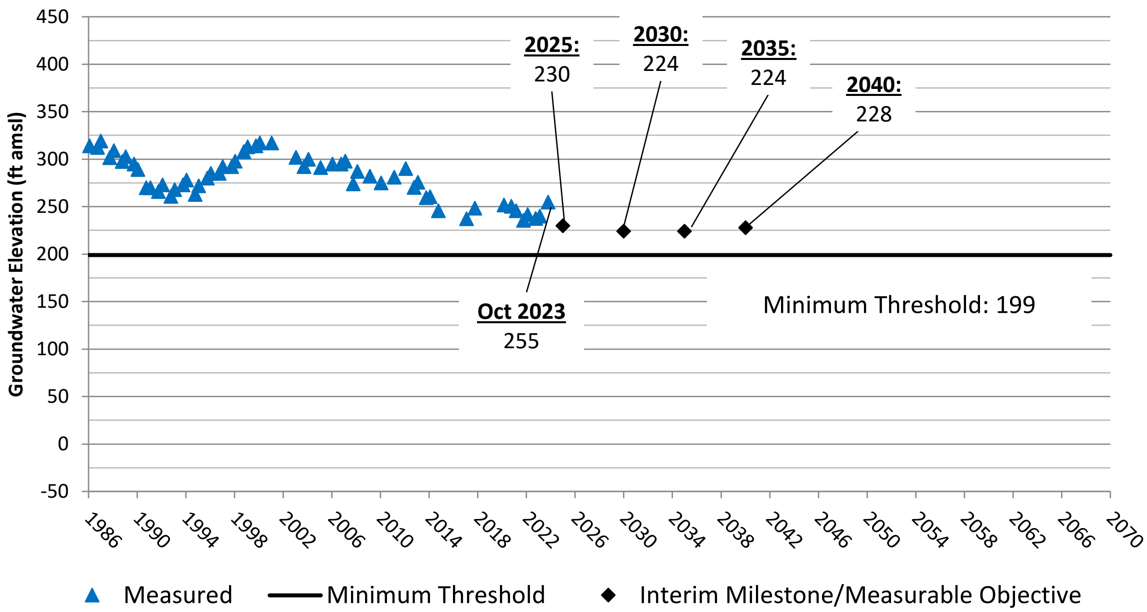
Eastern Tule GSA
RMS Groundwater Elevation Hydrographs



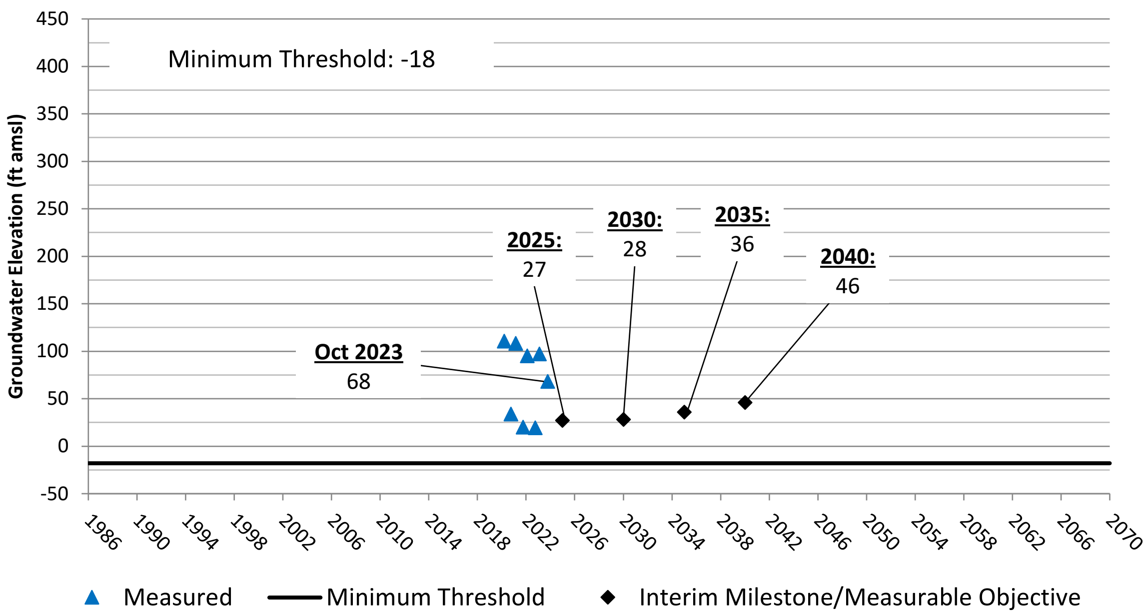


Eastern Tule GSA
RMS Groundwater Elevation Hydrographs

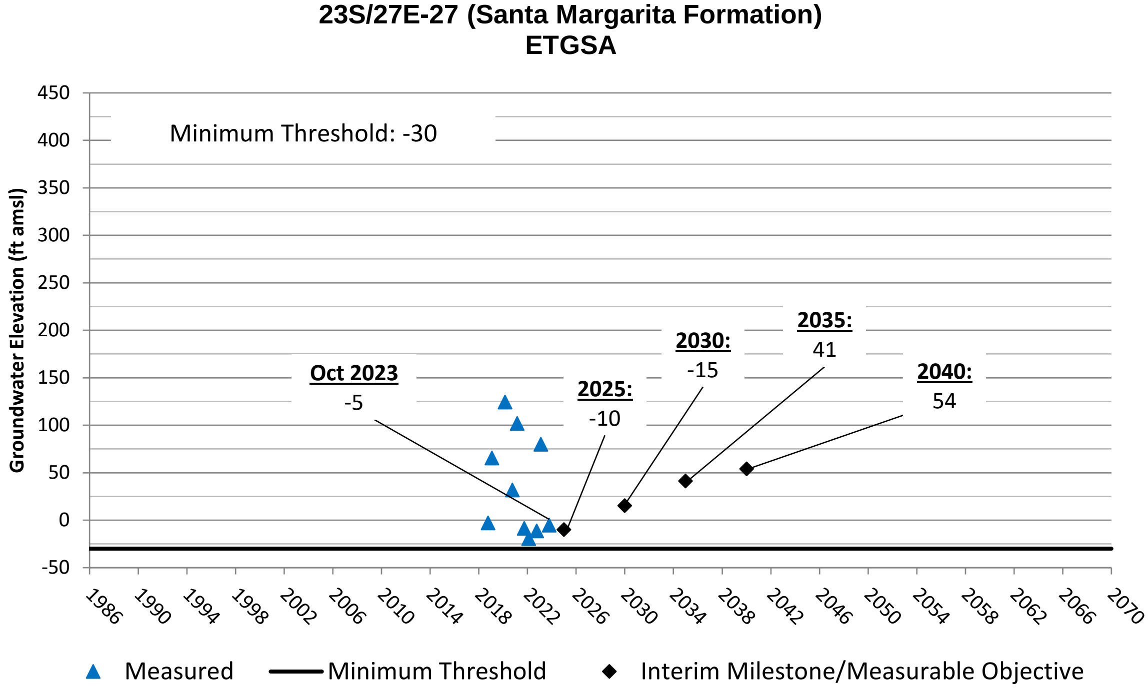
22S/26E-13R01 (Upper)
ETGSA

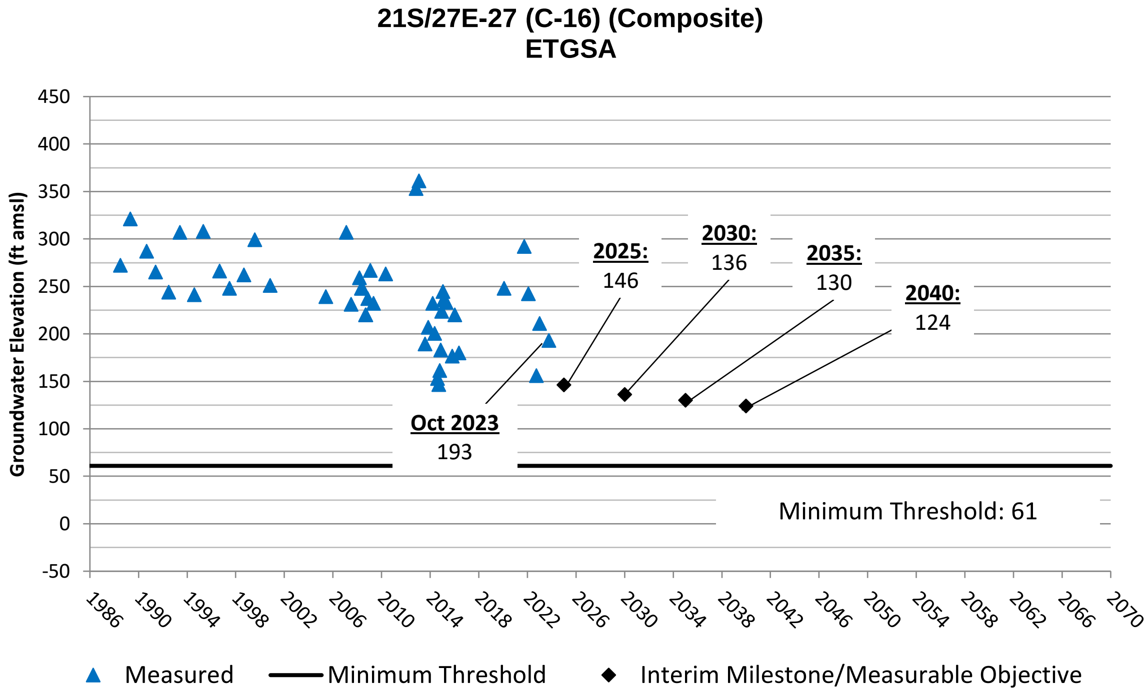


22S/26E-24 (Lower)
ETGSA

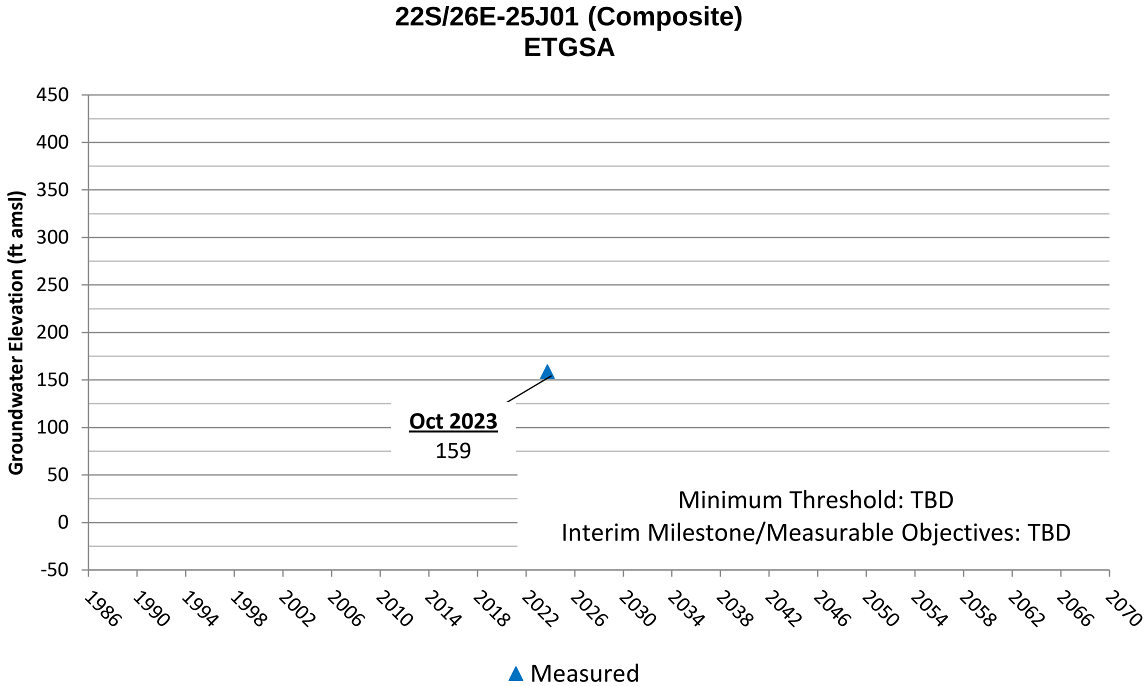


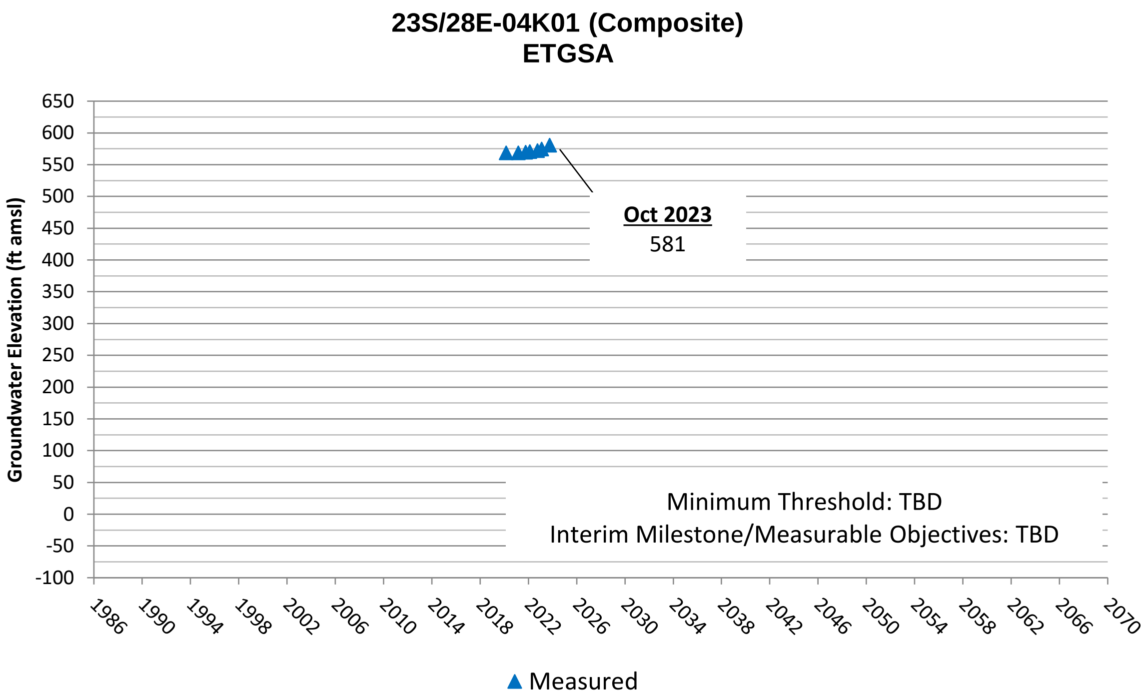
Eastern Tule GSA
RMS Groundwater Elevation Hydrographs

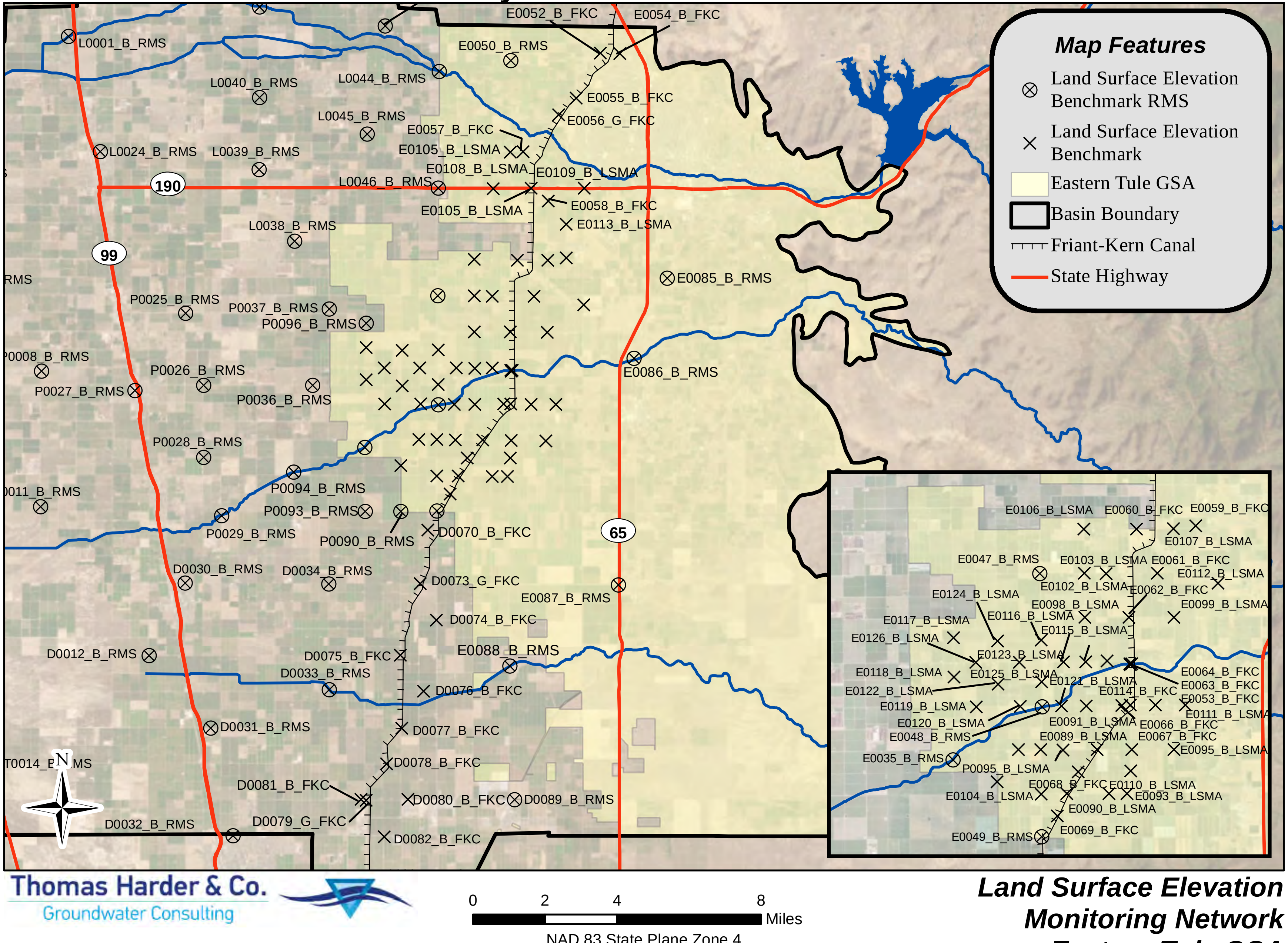




Eastern Tule GSA
RMS Groundwater Elevation Hydrographs







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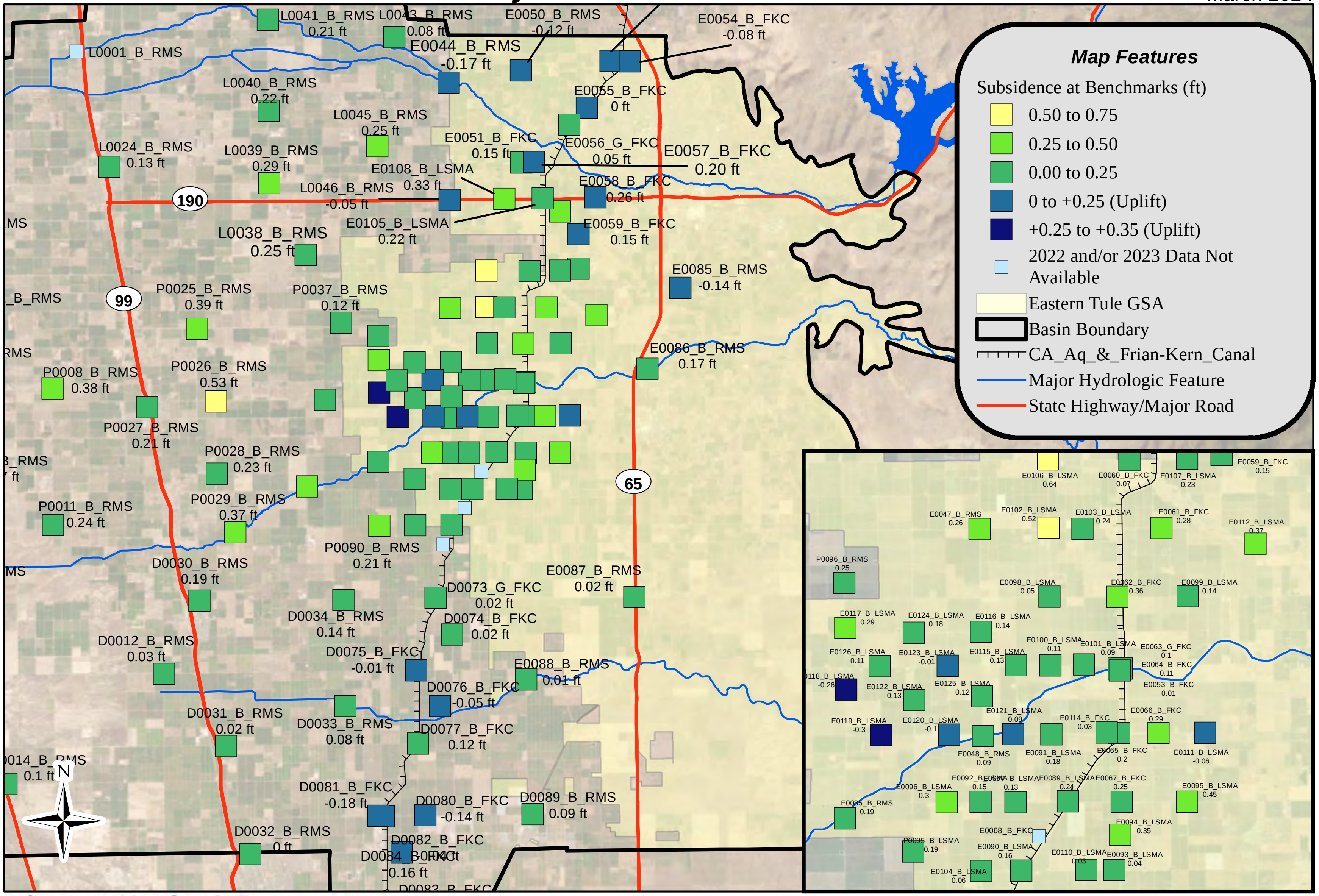
Land Surface Elevation Monitoring Network Eastern Tule GSA

Appendix B
Figure 5

Tule Subbasin Technical Advisory Committee



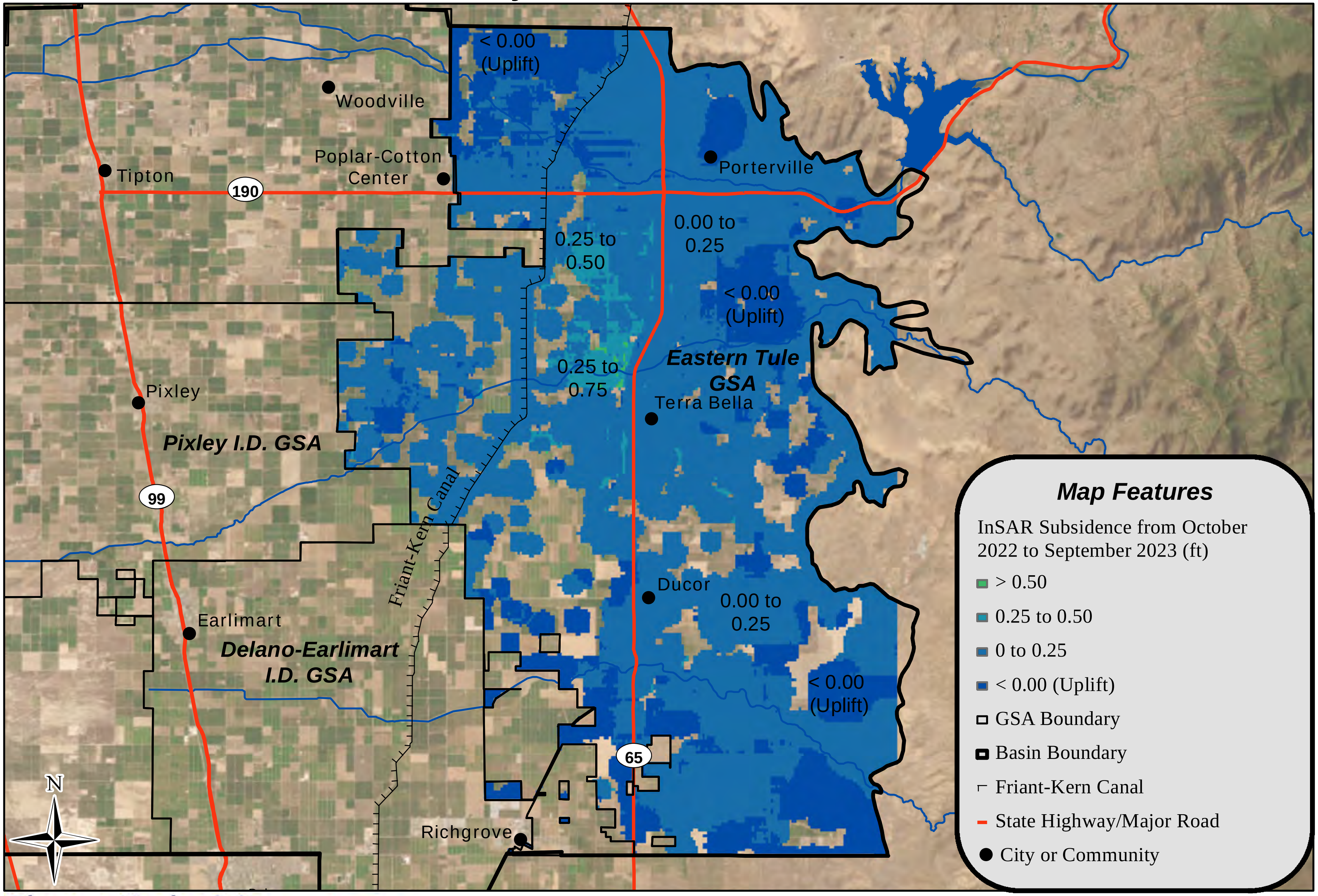
Thomas Harder & Co.
Groundwater Consulting

0 2 4 8 Miles
NAD 83 State Plane Zone 4

Data from Tule Subbasin Monitoring Network.
Fall 2023 data was used if Summer 2023 data was not available.

Land Subsidence - July 2022 to July 2023
Eastern Tule GSA
Appendix B
Figure 6

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

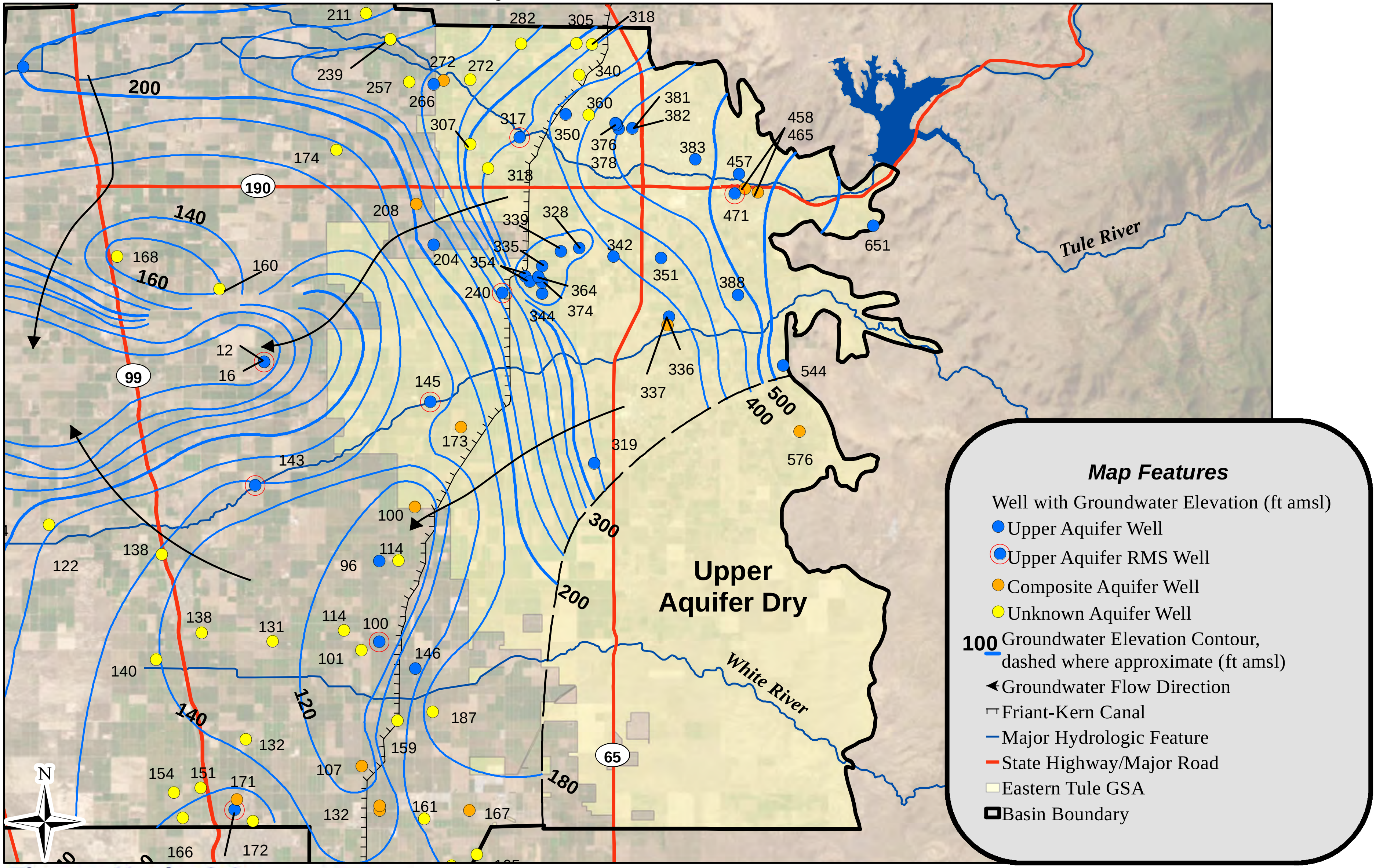
0 2 4 8
Miles
NAD 83 State Plane Zone 4

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Land Subsidence - Fall 2022 to Fall 2023 Eastern Tule GSA

Appendix B
Figure 7

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co. Groundwater Consulting

NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

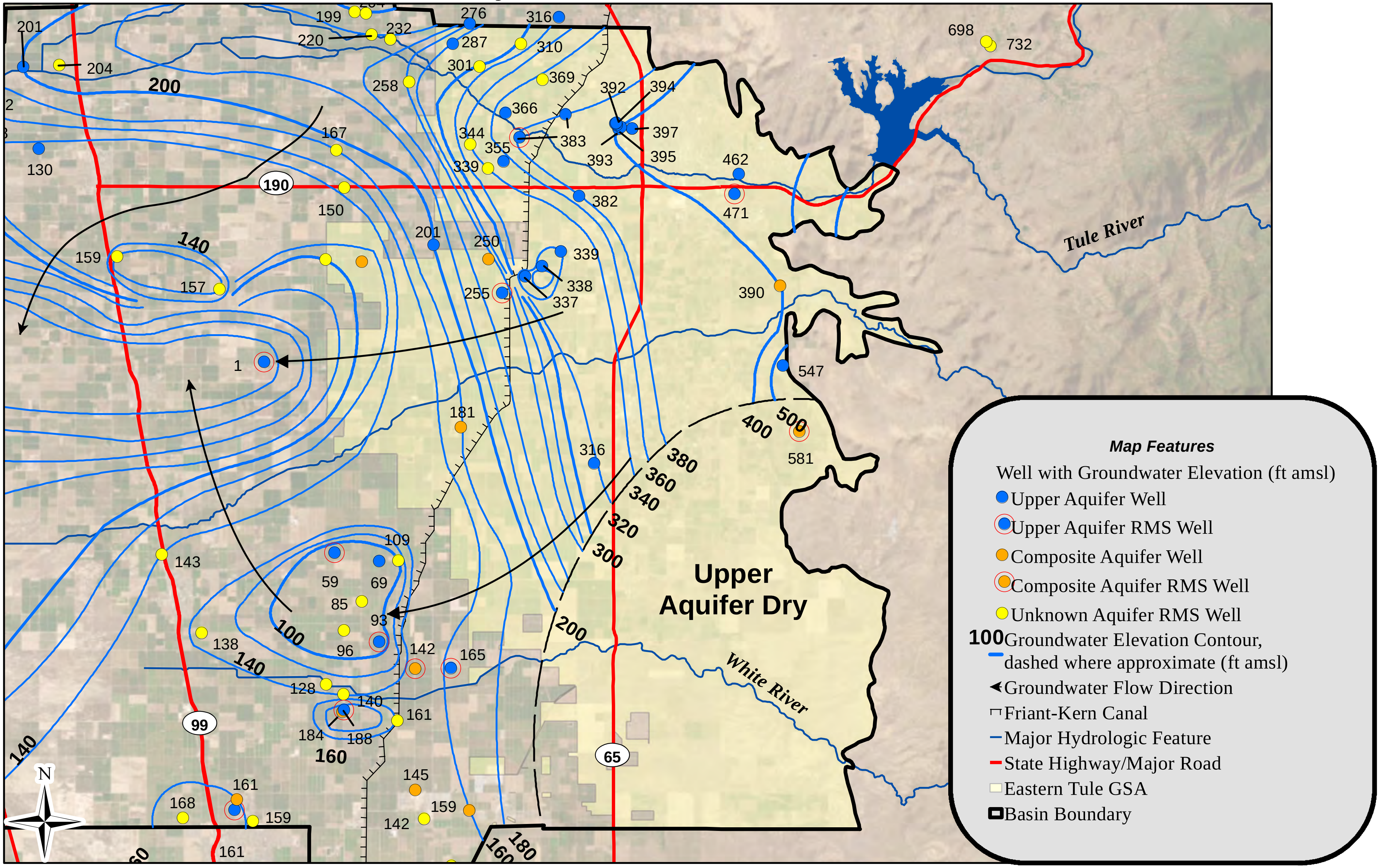
Spring 2023 Upper Aquifer Eastern Tule GSA

Appendix B

Figure 8

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



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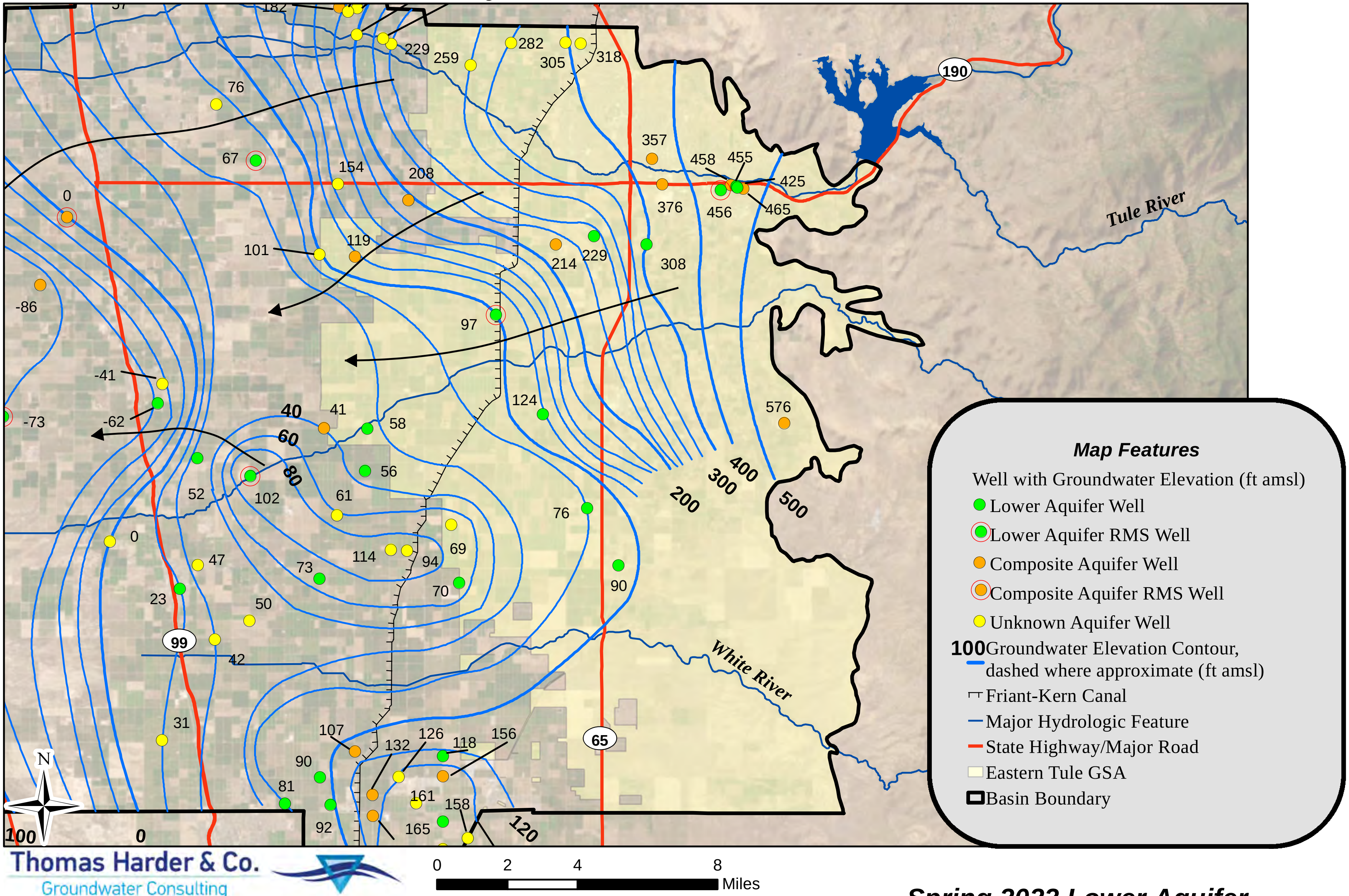
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer
Eastern Tule GSA
Appendix B
Figure 9

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



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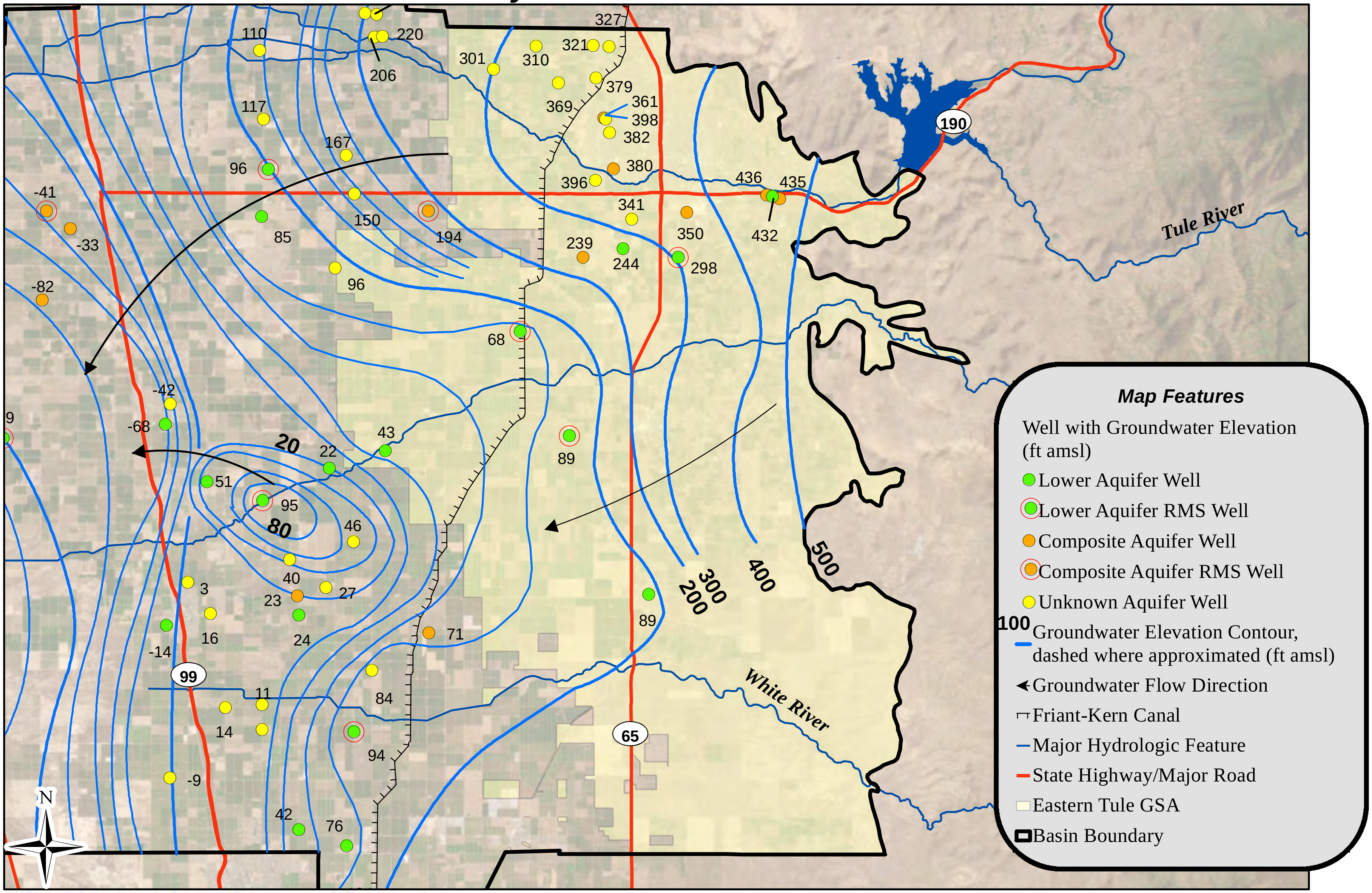
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer Eastern Tule GSA
Appendix B
Figure 10

Tule Subbasin Technical Advisory Committee



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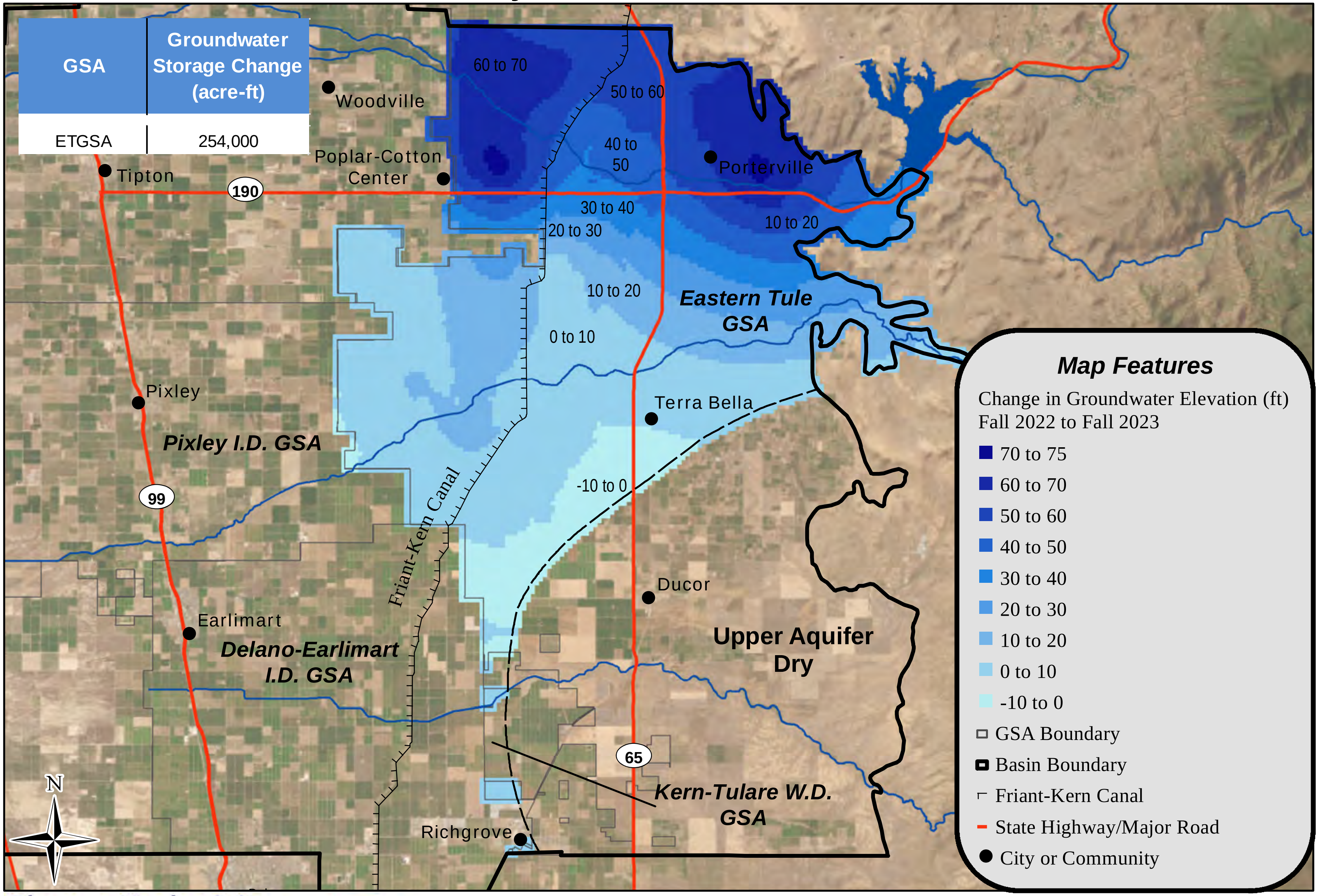
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
Eastern Tule GSA
Appendix B
Figure 11

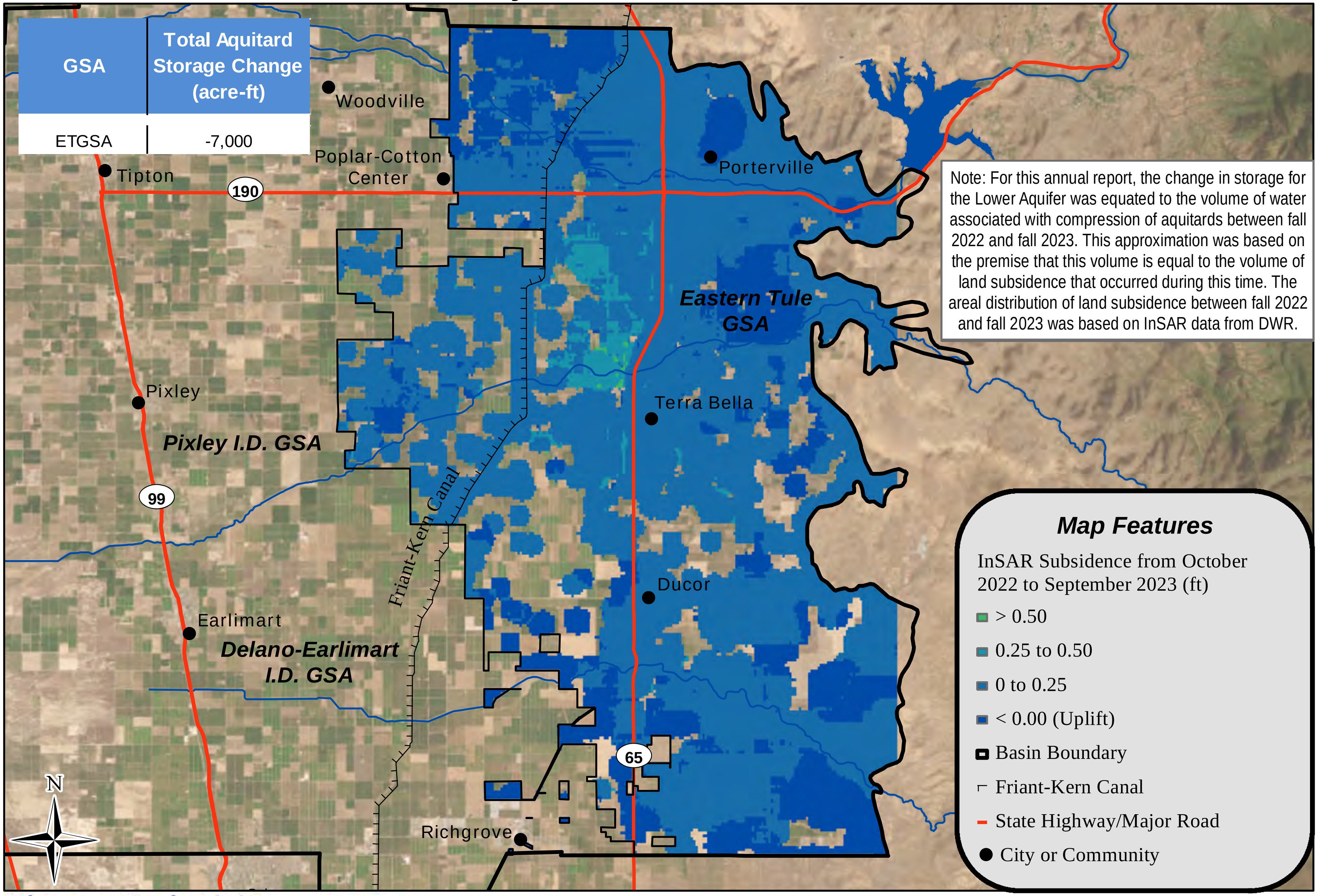
GSA	Groundwater Storage Change (acre-ft)
ETGSA	254,000



Thomas Harder & Co.
Groundwater Consulting

Change in Groundwater Elevation Fall 2022 to Fall 2023 - Upper Aquifer Eastern Tule GSA

Appendix B
Figure 12



Thomas Harder & Co.
Groundwater Consulting

0 1.5 3 6 Miles
NAD 83 State Plane Zone 4

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage As Estimated from Land Subsidence - Fall 2022 to Fall 2023
Eastern Tule GSA

Appendix B
Figure 13

Appendix C

Delano-Earlimart Irrigation District GSA 2022/23 Annual Data

Delano-Earlimart Irrigation District GSA
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
DEID GSA	DEID	38,900	0	0	38,900
	Richgrove CSD	0	870	0	870
	Earlimart PUD	0	2,930	0	2,930
	Total	***38,900***	***3,800***	***0***	***42,700***

Delano-Earlimart Irrigation District GSA
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
DEID GSA	DEID	0	187,400	0	0	61,600	249,000
	Richgrove CSD	0	0	0	0	0	0
	Earlimart PUD	0	0	0	0	0	0
	Total	***0***	***187,400***	***0***	***0***	***61,600***	***249,000***

Delano-Earlimart Irrigation District GSA
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
DEID GSA	DEID	38,900	249,000	0	0	287,900
	Richgrove CSD	870	0	0	0	870
	Earlimart PUD	2,930	0	0	0	2,930
	Total	***42,700***	***249,000***	***0***	***0***	***291,700***

Delano-Earlimart Irrigation District GSA
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
DEID GSA	DEID	191,400	0	41,900	0	54,600	287,900
	Richgrove CSD	0	870	0	0	0	870
	Earlimart PUD	0	2,930	0	0	0	2,930
	Total	***191,400***	***3,800***	***41,900***	***0***	***54,600***	***291,700***

Delano-Earlimart Irrigation District GSA
Land Surface Elevations at Representative Monitoring Sites

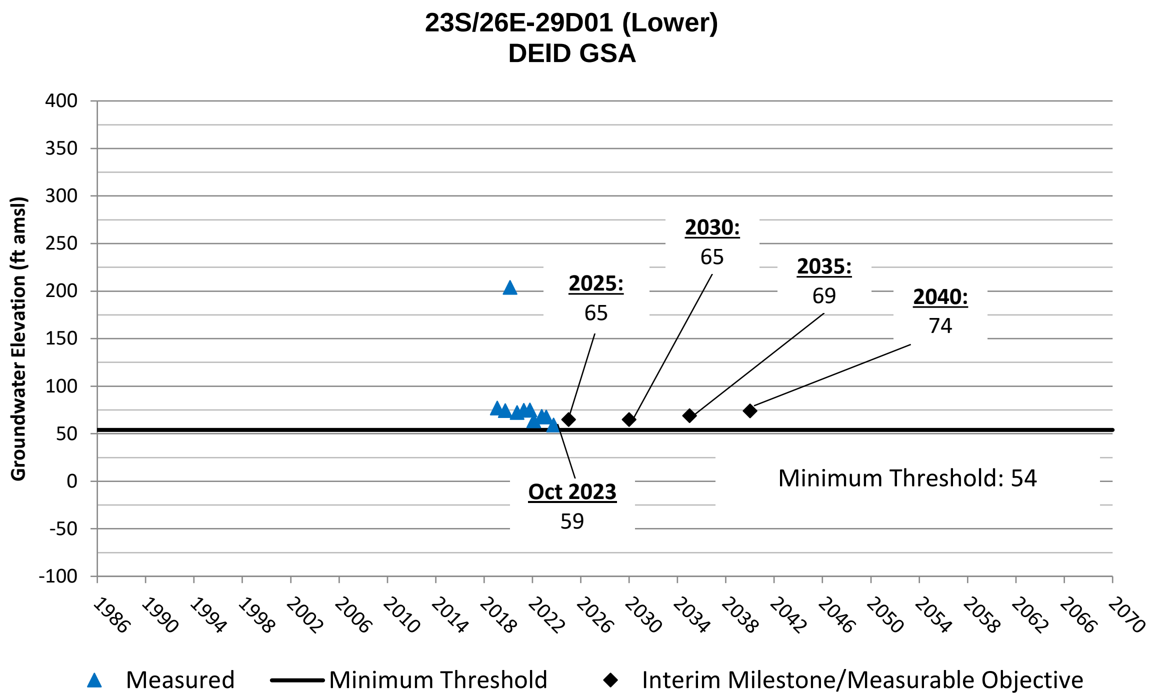
Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
D0012_B_RMS	267.1	266.1	263.3	262.1
D0030_B_RMS	272.8	271.9	270.3	269.2
D0031_B_RMS	296.7	295.9	294.9	293.9
D0032_B_RMS	316.7	316.4	316.7	315.7
D0033_B_RMS	366.1	365.7	365.1	364.0
D0034_B_RMS	340.8	339.6	338.8	337.8
D0070_B_FKC	389.4	DESTROYED	389.2	388.2
D0071_B_FKC	N/A	NOT FOUND	N/A	N/A
D0072_B_FKC	N/A	NOT FOUND	N/A	N/A
D0073_G_FKC	406.2	405.6	405.0	404.0
D0074_B_FKC	415.5	415.1	413.8	412.8
D0075_B_FKC	403.2	402.7	401.7	400.7
D0076_B_FKC	408.9	408.2	408.4	407.4
D0077_B_FKC	401.9	401.5	401.4	400.4
D0078_B_FKC	406.1	405.9	405.6	404.6
D0079_G_FKC	407.1	407.0	406.9	405.9
D0080_B_FKC	433.1	432.9	432.5	431.5
D0081_B_FKC	399.5	399.4	399.3	398.3
D0082_B_FKC	423.4	423.4	423.1	422.1
D0083_B_FKC	419.5	419.5	418.8	417.8
D0084_B_FKC	407.3	406.9	405.9	404.9
D0089_B_RMS	498.2	498.2	497.3	496.3

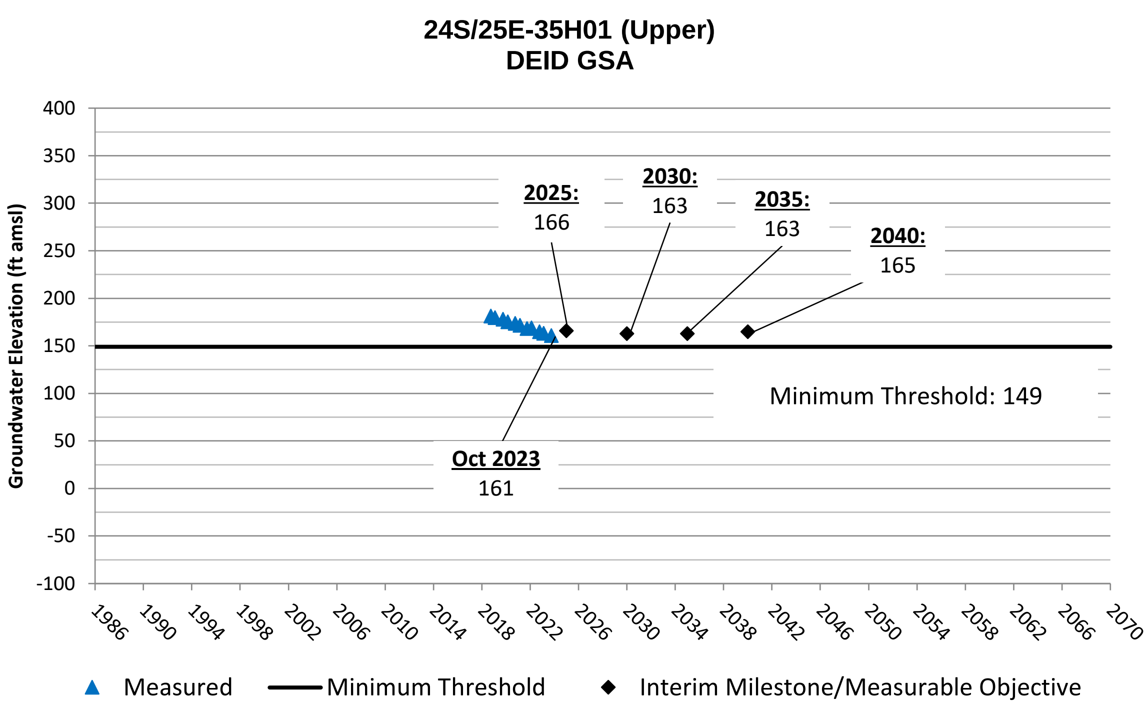
Notes:

N/A = Not available

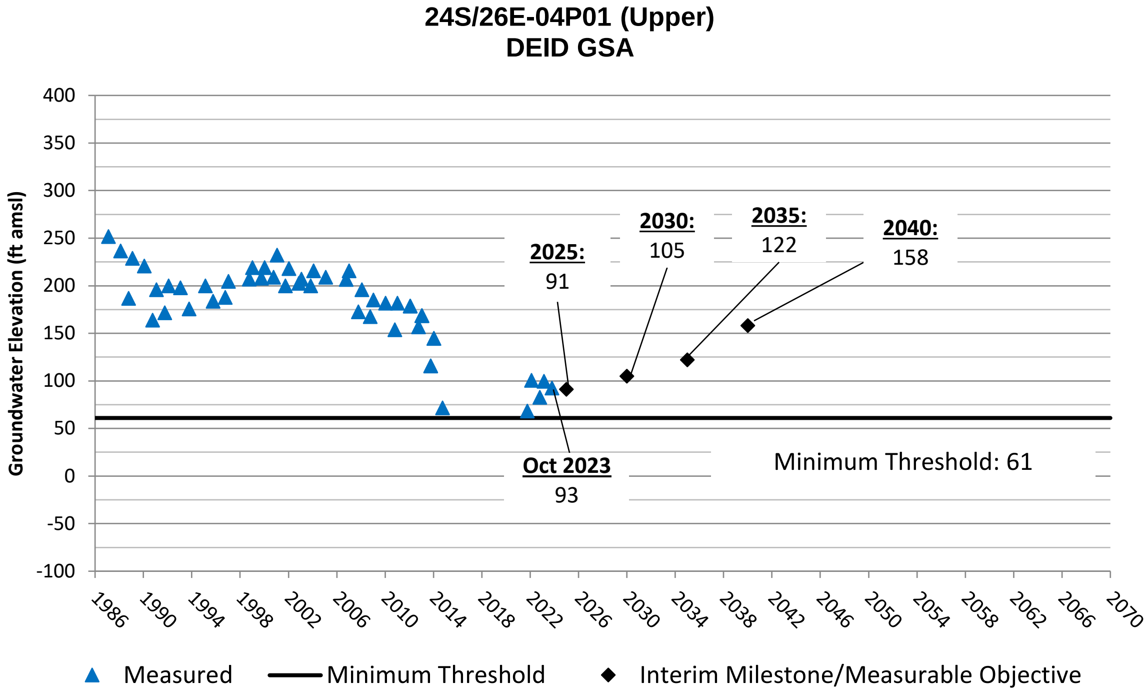
[1] Benchmarks surveyed in July and August of each year.

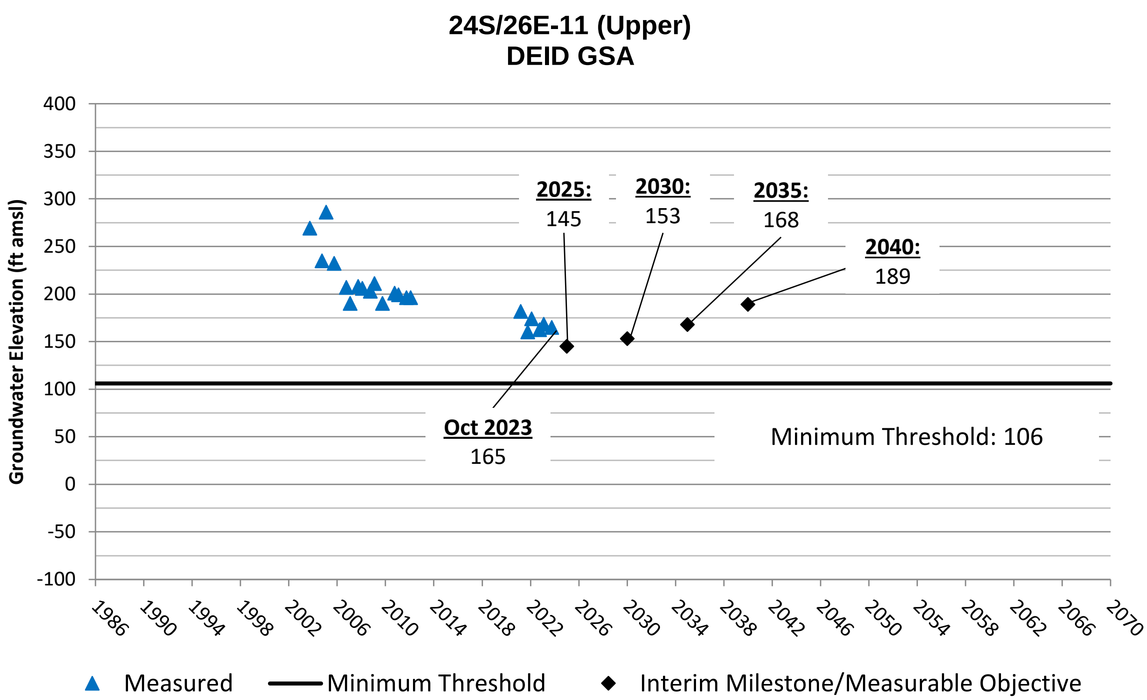
Delano-Earlimart Irrigation District GSA
RMS Groundwater Elevation Hydrographs



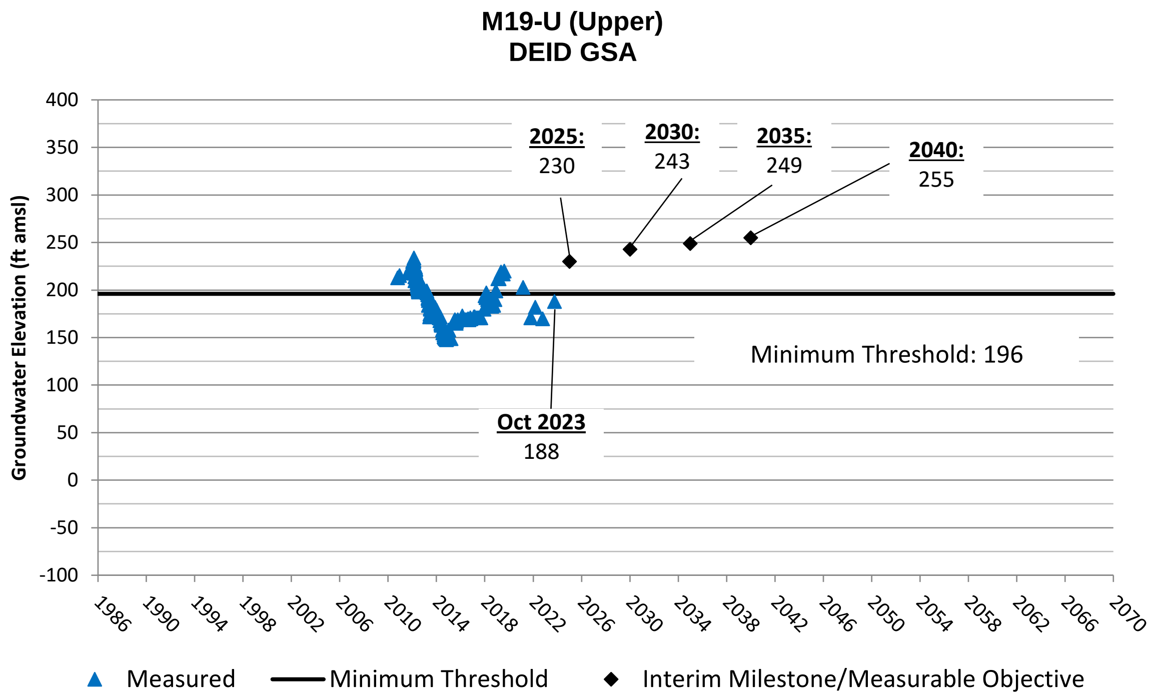


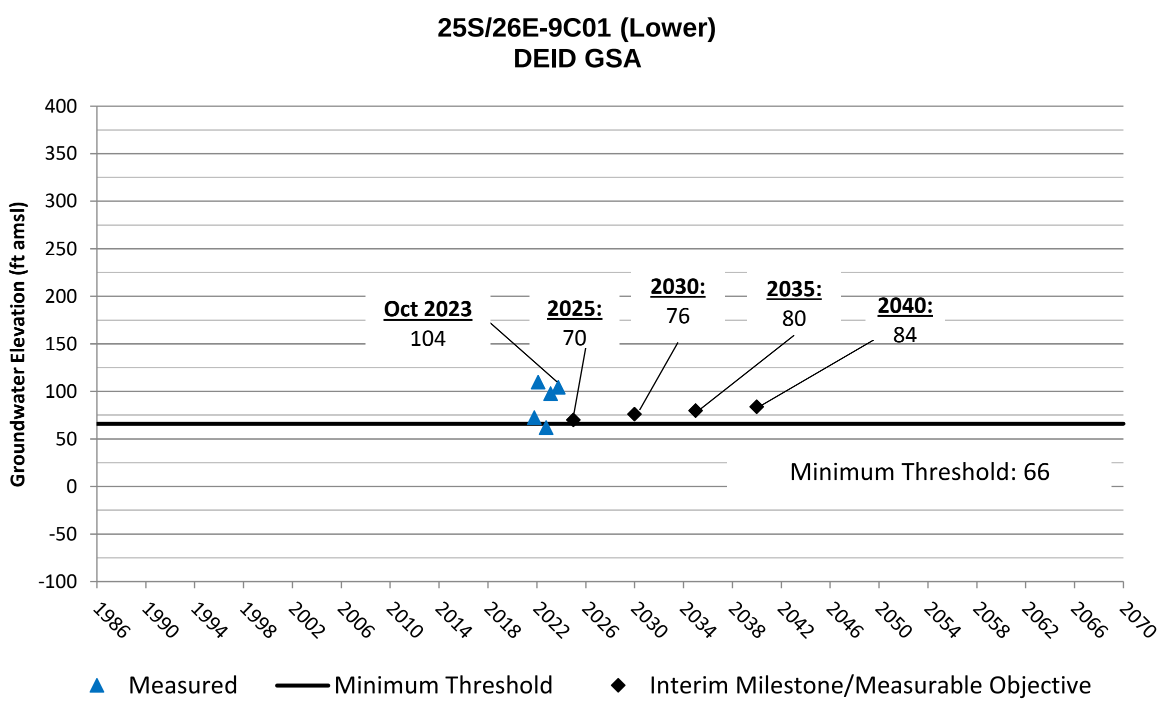
Delano-Earlimart Irrigation District GSA
RMS Groundwater Elevation Hydrographs





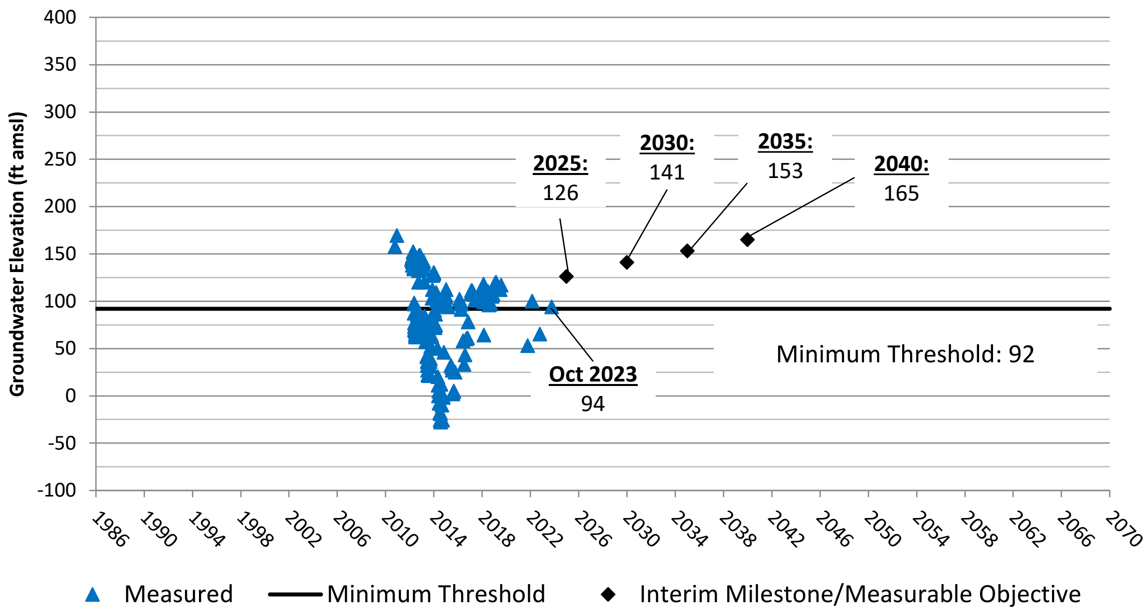
Delano-Earlimart Irrigation District GSA
RMS Groundwater Elevation Hydrographs



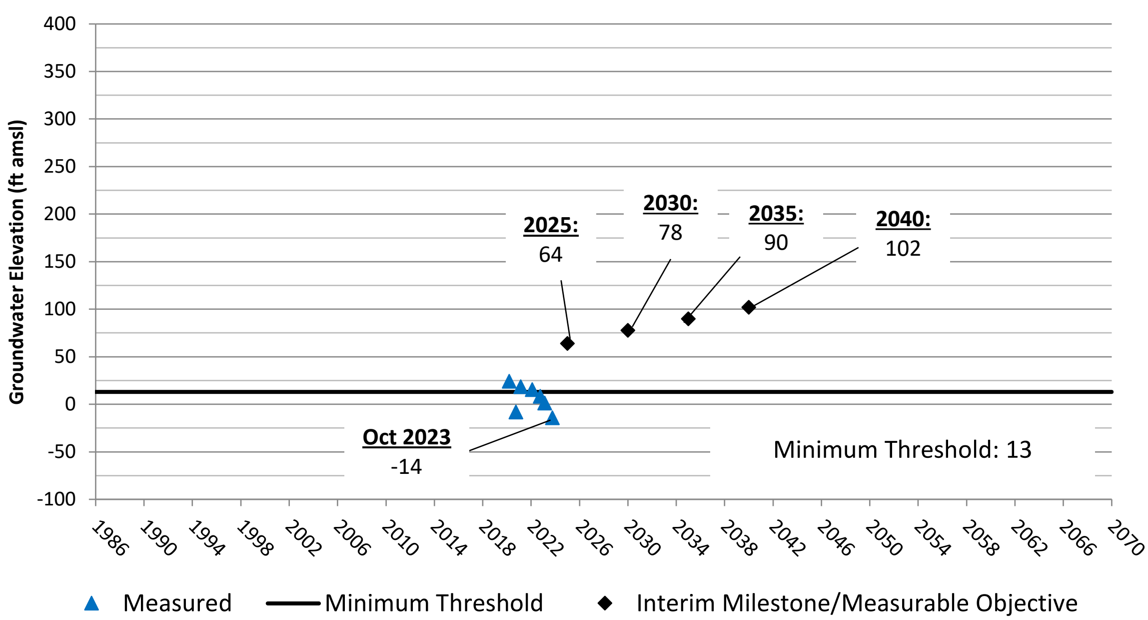


Delano-Earlimart Irrigation District GSA
RMS Groundwater Elevation Hydrographs

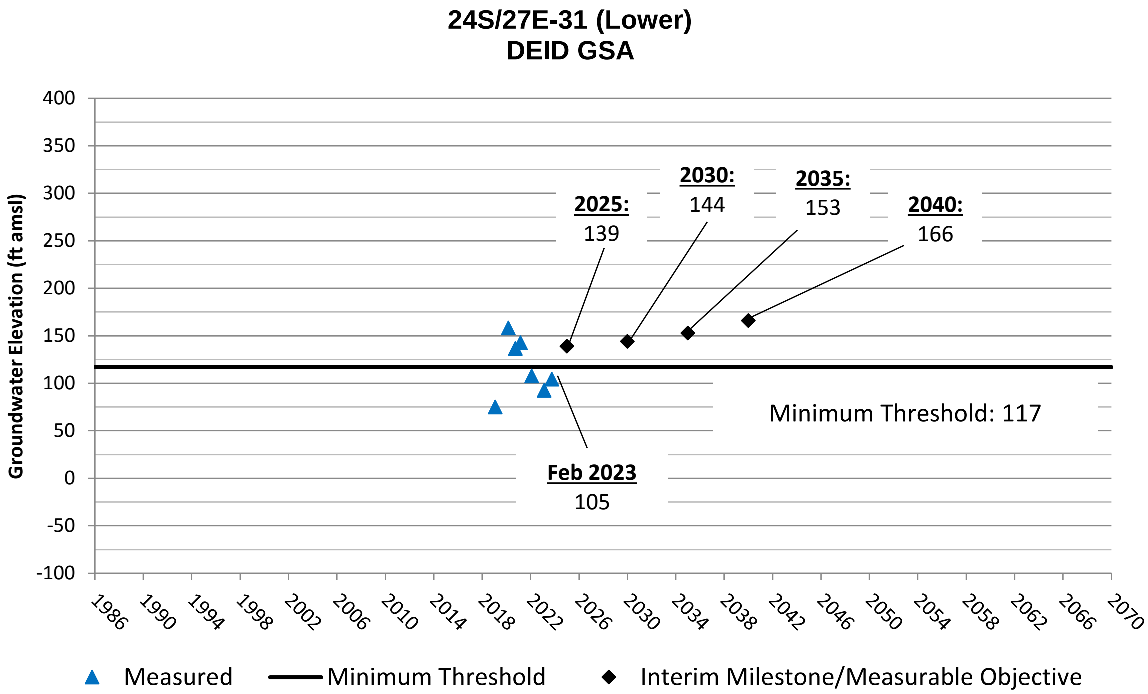
M19-L (Lower)
DEID GSA

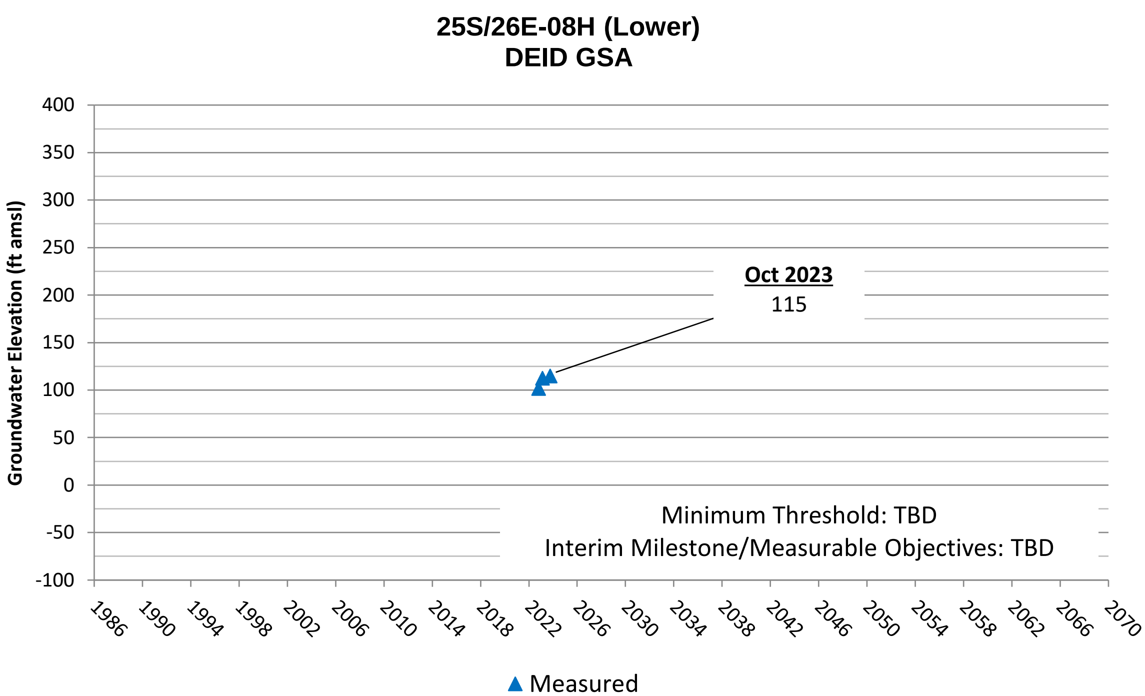


23S/25E-27 (Composite)
DEID GSA

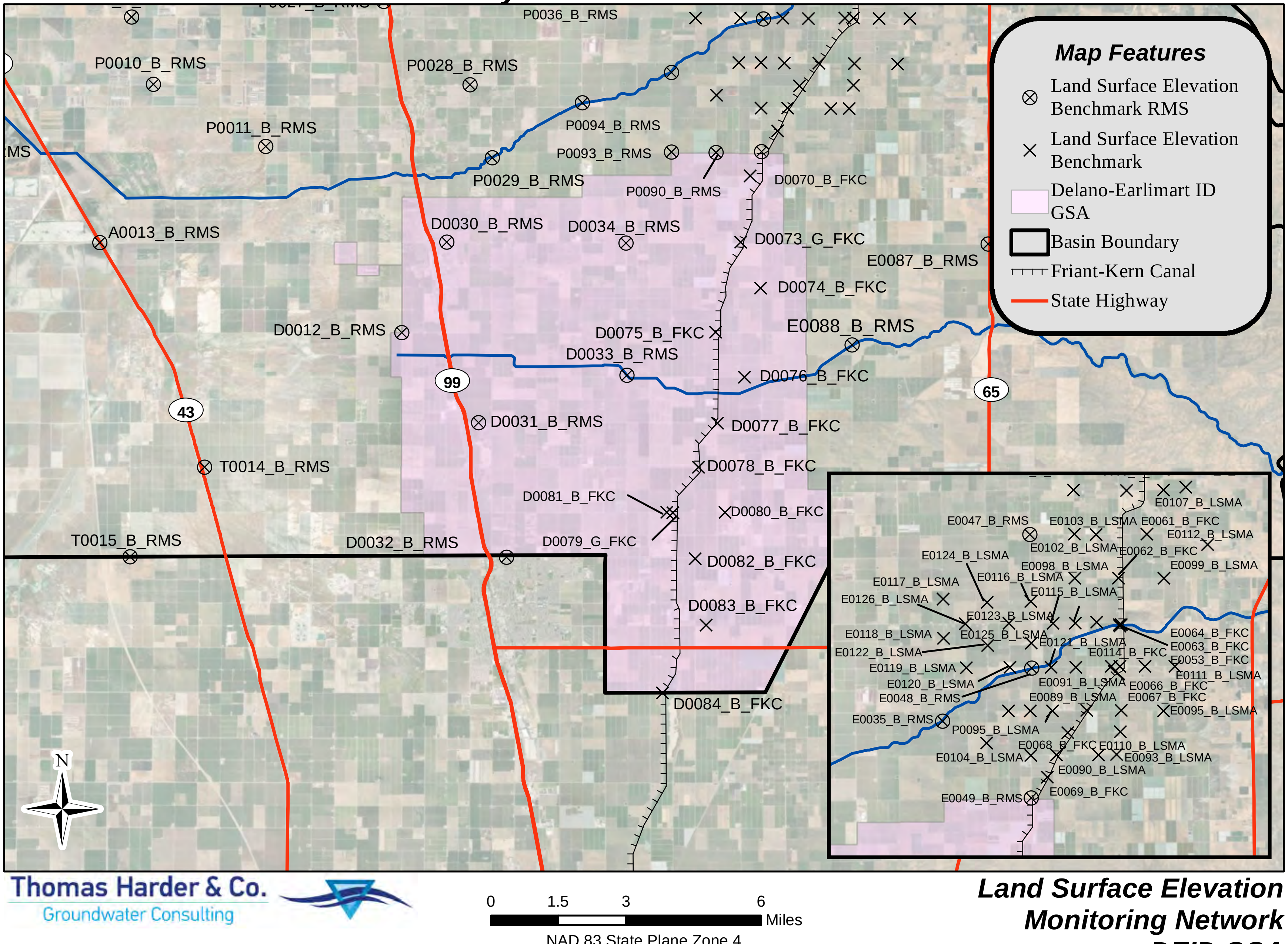


Delano-Earlimart Irrigation District GSA
RMS Groundwater Elevation Hydrographs





Tule Subbasin Technical Advisory Committee

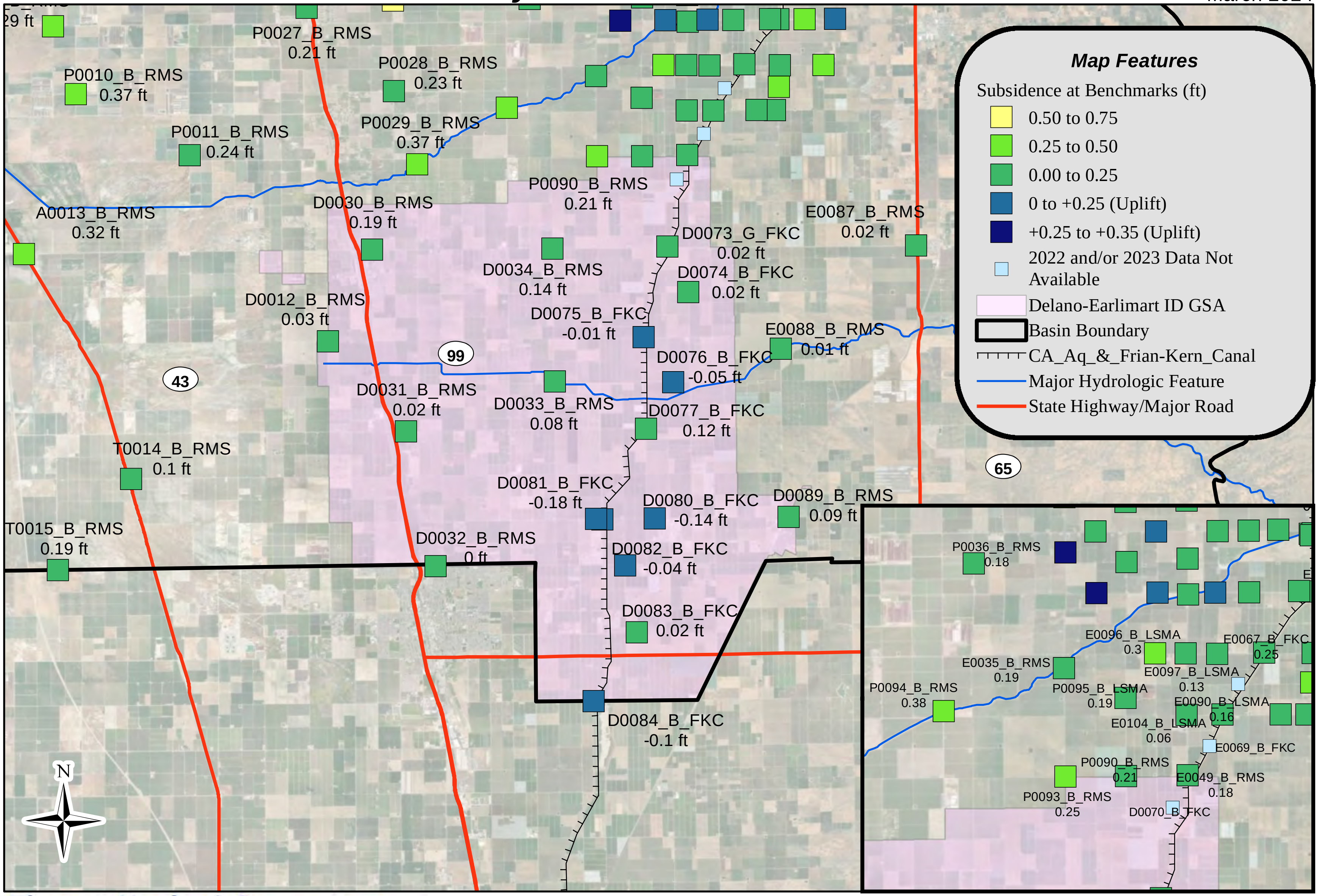


Thomas Harder & Co.
Groundwater Consulting

Land Surface Elevation Monitoring Network DEID GSA

Appendix C
Figure 6

Tule Subbasin Technical Advisory Committee

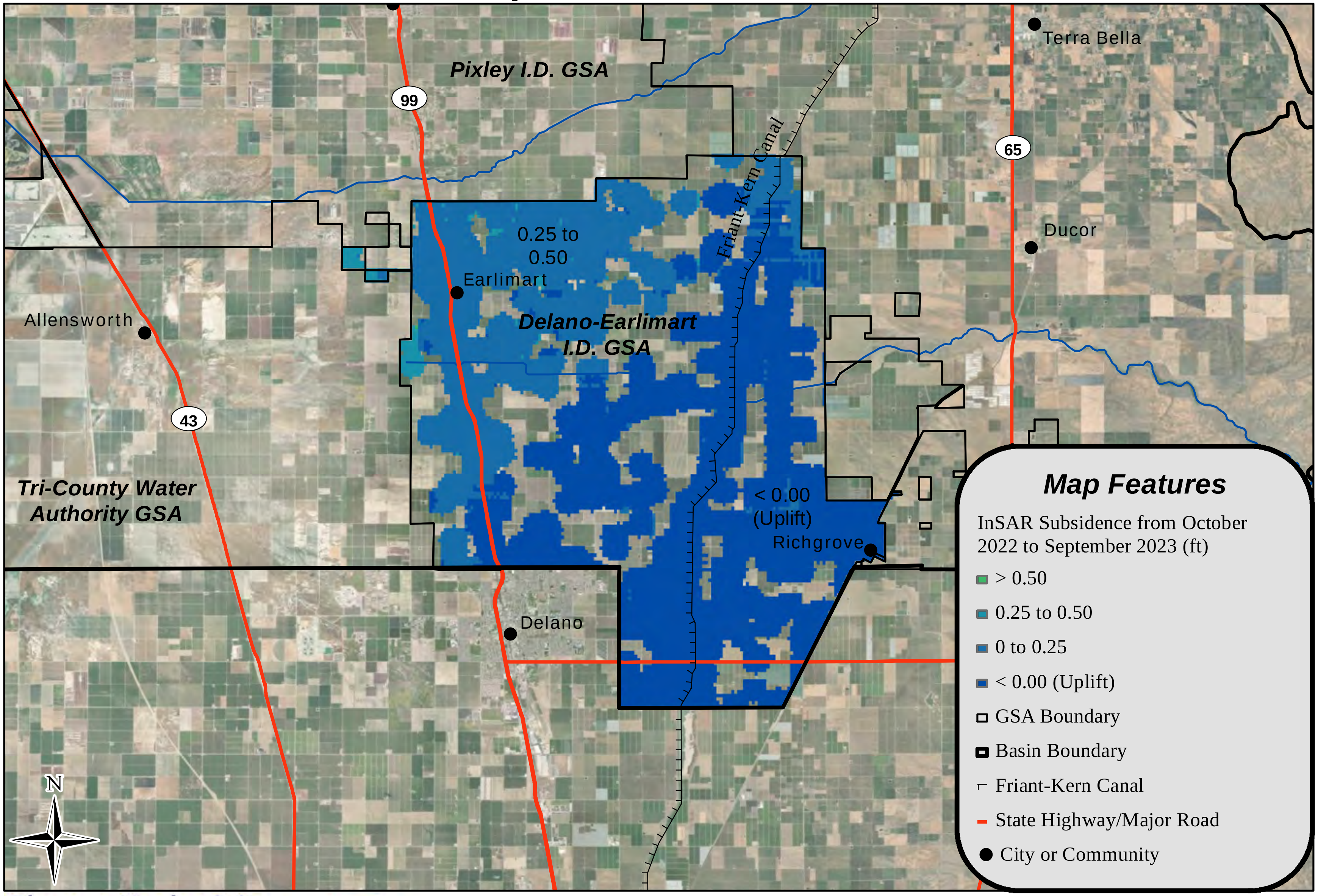


Thomas Harder & Co.
Groundwater Consulting

0 1.5 3 6 Miles
NAD 83 State Plane Zone 4

Data from Tule Subbasin Monitoring Network.
Fall 2023 data was used if Summer 2023 data
was not available.

Land Subsidence -
July 2022 to July 2023
DEID GSA
Appendix C
Figure 7

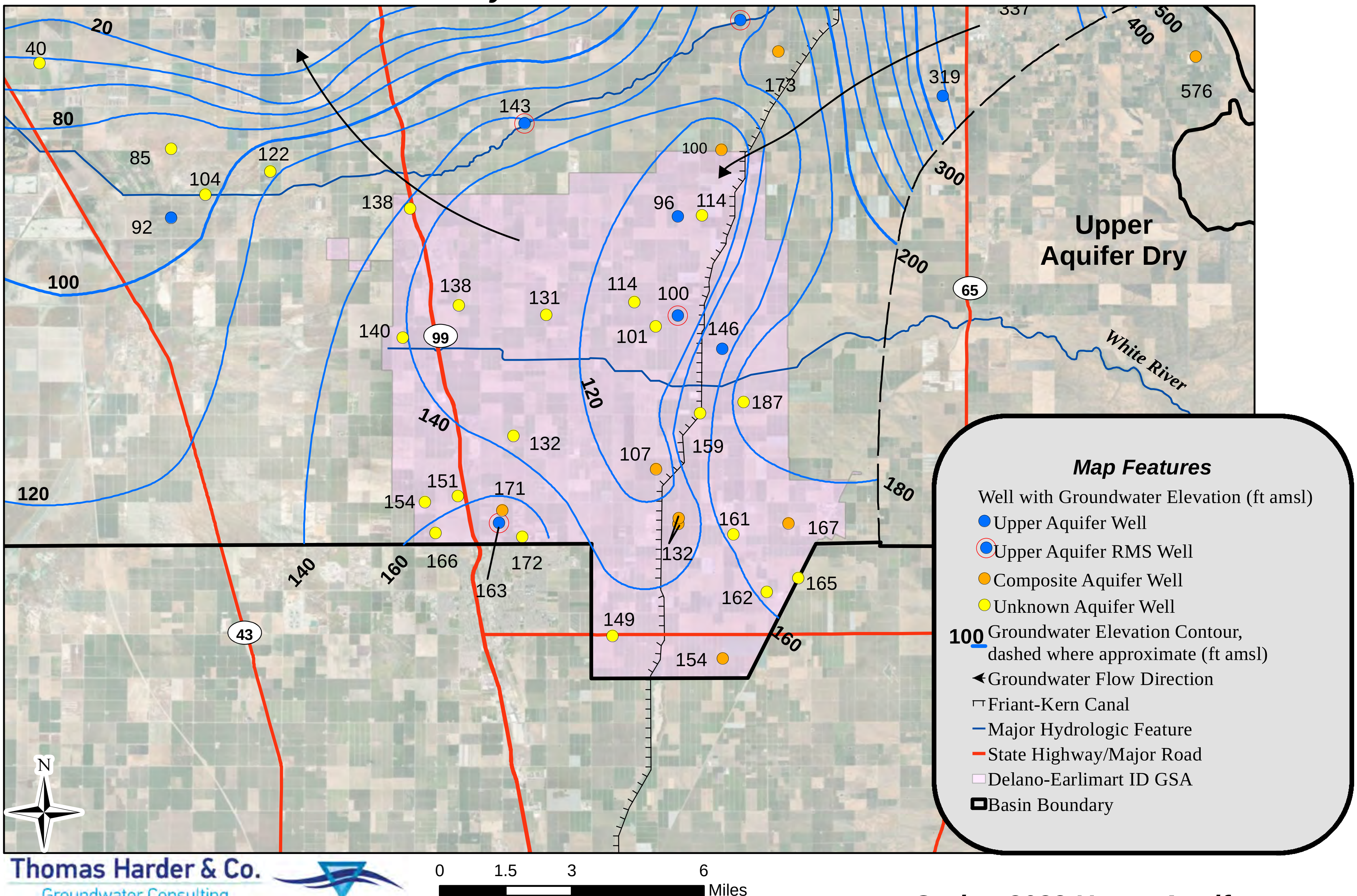


Thomas Harder & Co.
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Land Subsidence - Fall 2022 to Fall 2023 DEID GSA

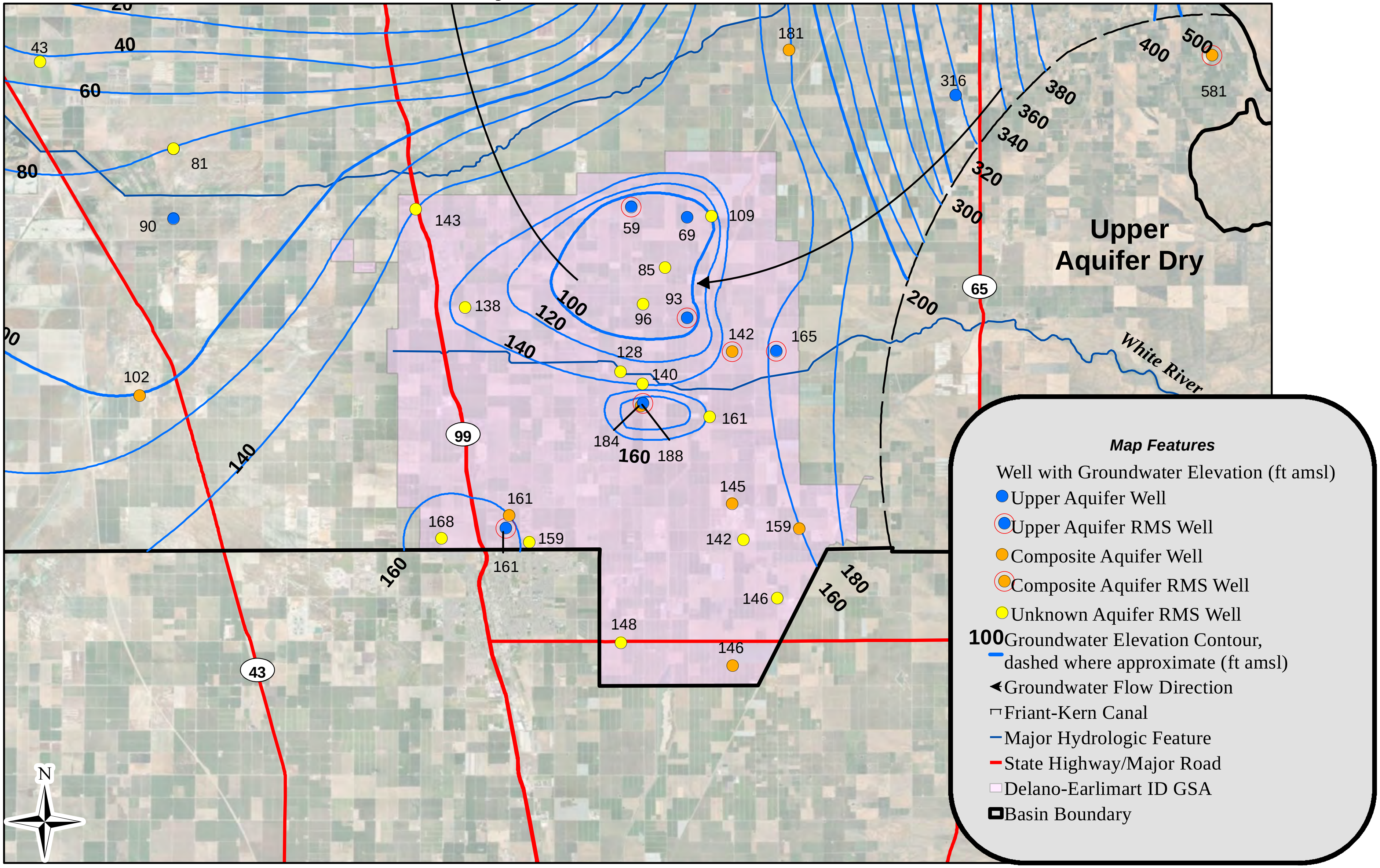
Appendix C
Figure 8



Note: All groundwater elevations are in feet above mean sea level.

Thomas Harder & Co.
Groundwater Consulting

Spring 2023 Upper Aquifer
DEID GSA
Appendix C
Figure 9



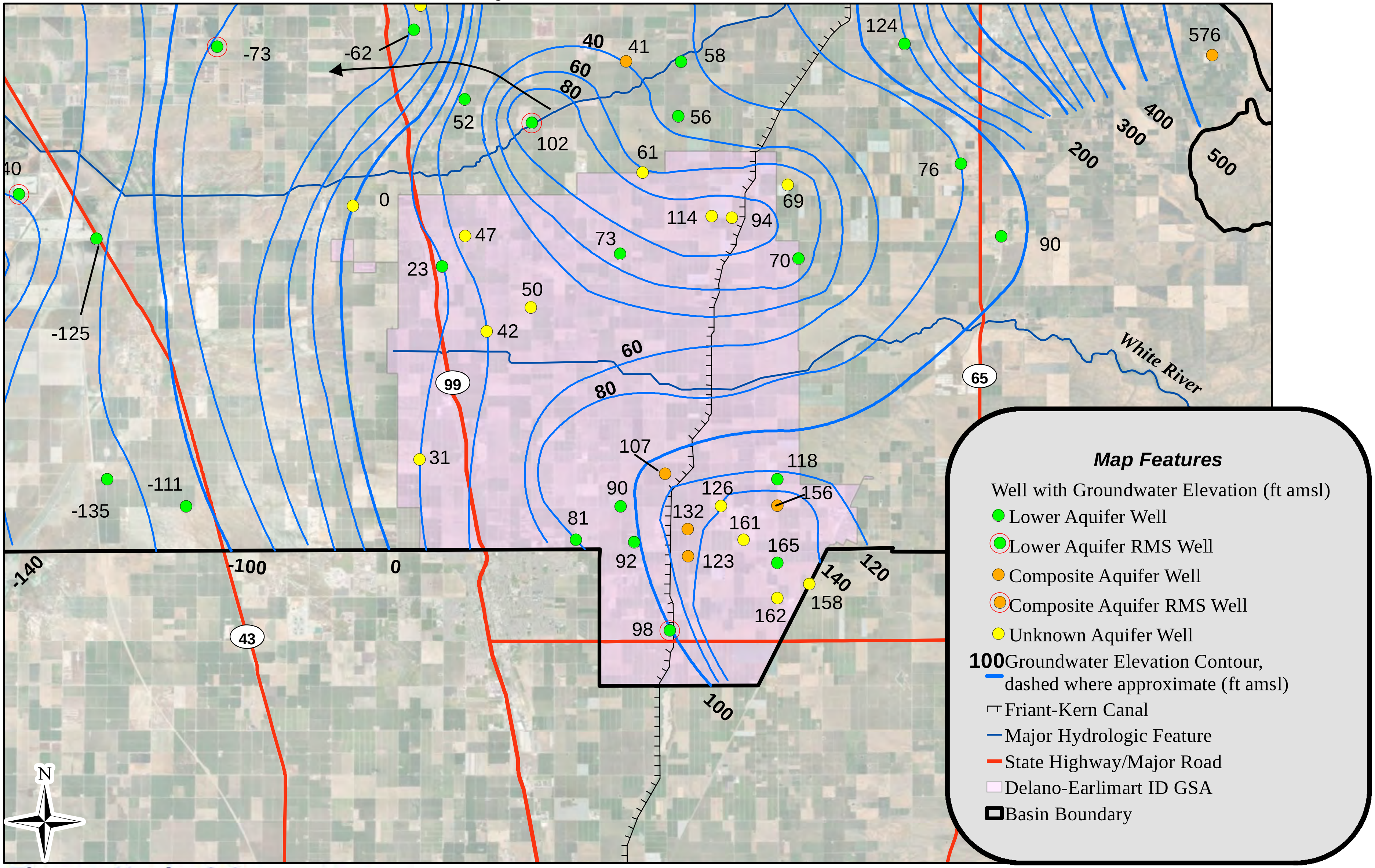
Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer
DIED GSA
Appendix C
Figure 10

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



Thomas Harder & Co.
Groundwater Consulting

0 1.5 3 6 Miles

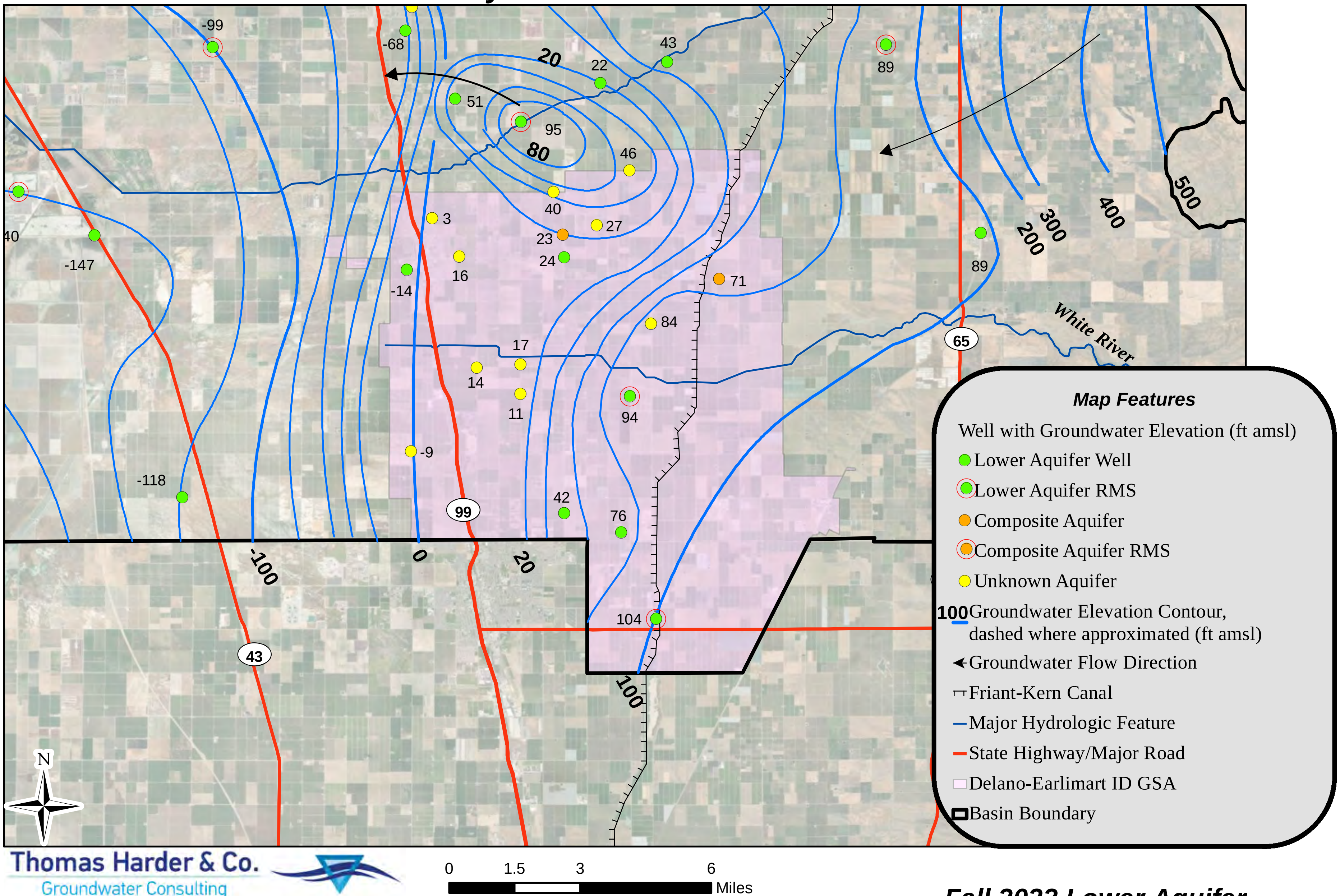
NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer
DEID GSA
Appendix C
Figure 11

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024

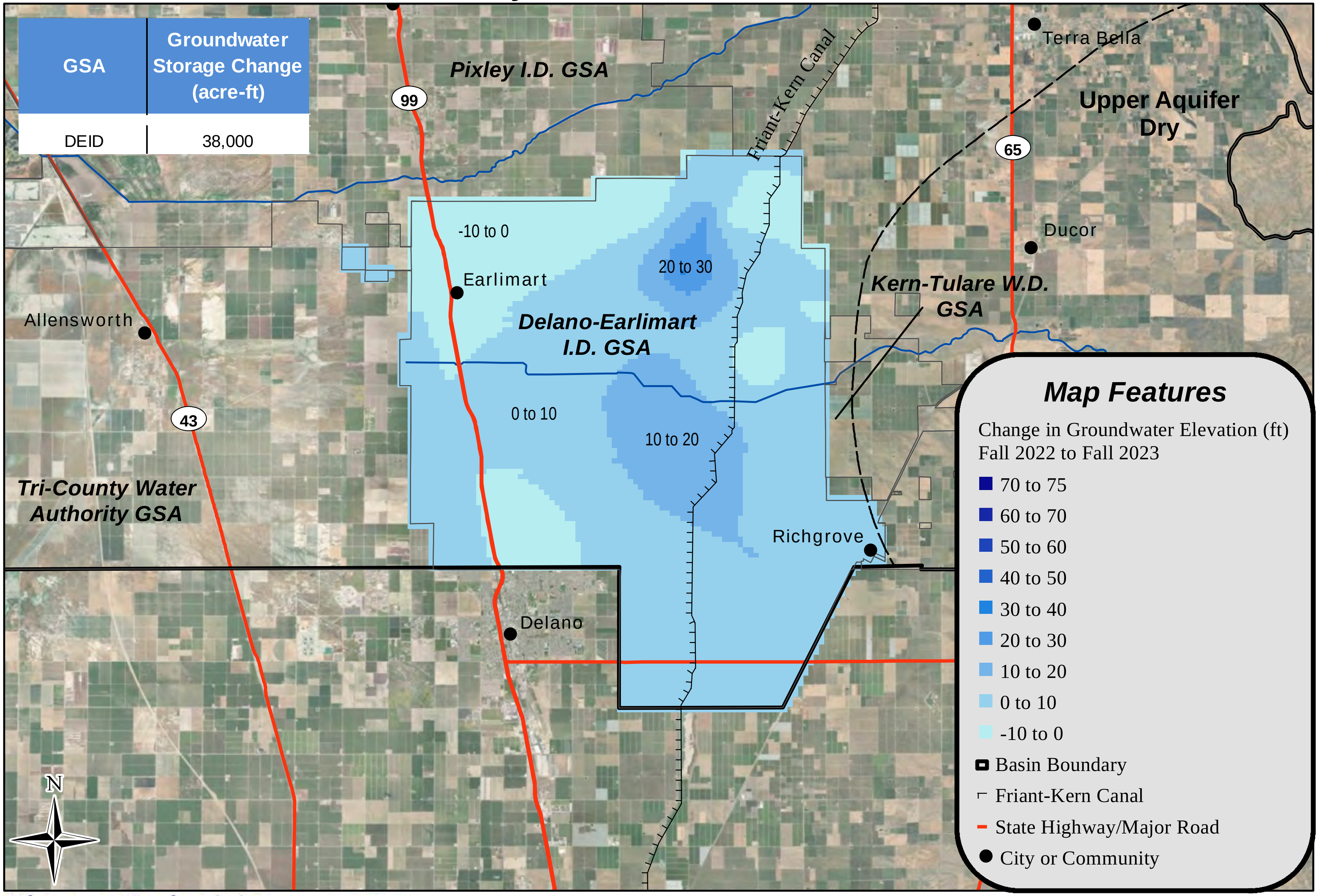


Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
DEID GSA
Appendix C
Figure 12

GSA	Groundwater Storage Change (acre-ft)
DEID	38,000



Thomas Harder & Co.
Groundwater Consulting

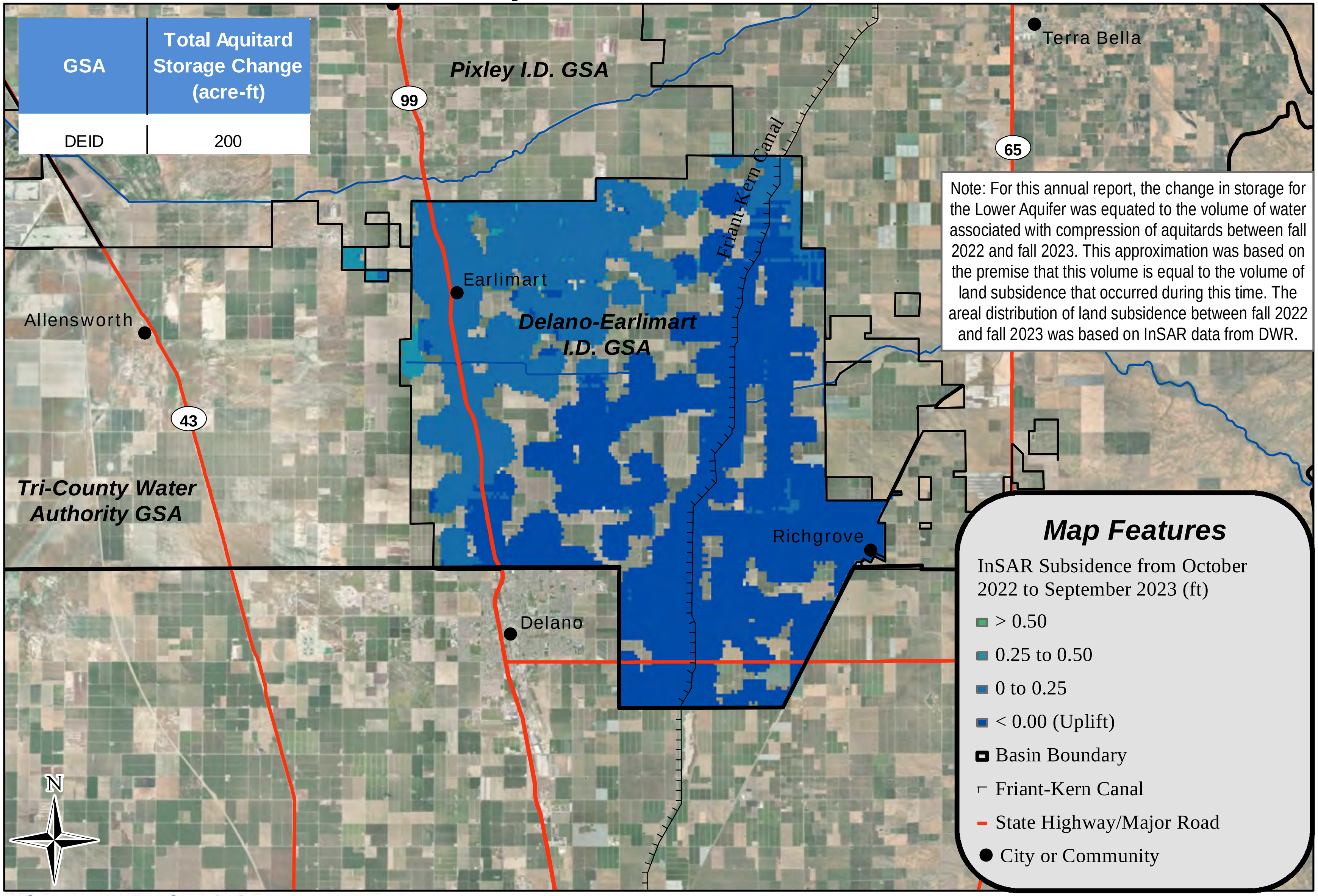
0 1 2 4 Miles
NAD 83 State Plane Zone 4

Change in Groundwater Elevation Fall 2022 to Fall 2023 - Upper Aquifer DEID GSA

Appendix C
Figure 13

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



GSA	Total Aquitard Storage Change (acre-ft)
DEID	200

Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.

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InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage as Estimated from Land Subsidence - Fall 2022 to Fall 2023
DEID GSA
Appendix C
Figure 14

Appendix D

Pixley Irrigation District GSA 2022/23 Annual Data

Pixley Irrigation District GSA
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
Pixley ID GSA	Pixley ID	80,000	0	0	80,000
	Pixley PUD	0	560	0	560
	Teviston CSD	0	100	0	100
	Total	***80,000***	***660***	***0***	***80,660***

Pixley Irrigation District GSA
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
Pixley ID GSA	Pixley ID	45,500	86,300	0	0	71,800	203,600
	Pixley PUD	0	0	0	0	0	0
	Teviston CSD	0	0	0	0	0	0
	Total	***45,500***	***86,300***	***0***	***0***	***71,800***	***203,600***

Pixley Irrigation District GSA
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
Pixley ID GSA	Pixley ID	80,000	203,600	0	0	283,600
	Pixley PUD	560	0	0	0	560
	Teviston CSD	100	0	0	0	100
	Total	***80,660***	***203,600***	***0***	***0***	***284,260***

Pixley Irrigation District GSA
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
Pixley ID GSA	Pixley ID	215,800	0	67,800	0	0	283,600
	Pixley PUD	0	560	0	0	0	560
	Teviston CSD	0	100	0	0	0	100
	Total	***215,800***	***660***	***67,800***	***0***	***0***	***284,260***

Pixley Irrigation District GSA
Land Surface Elevations at Representative Monitoring Sites

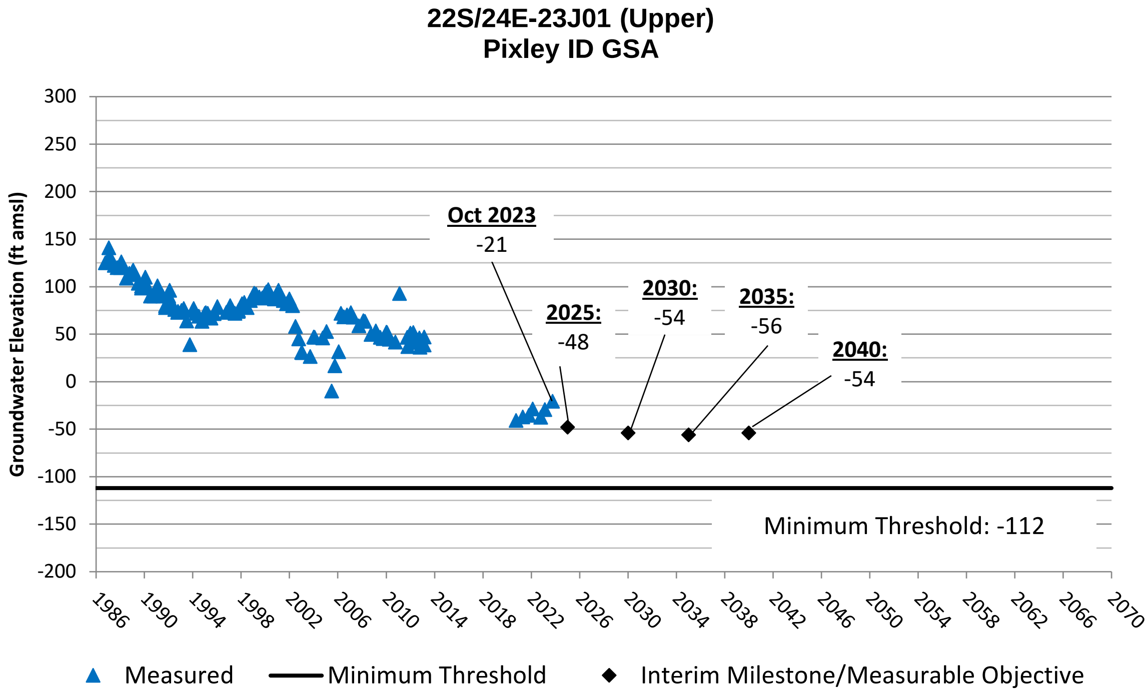
Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
P0007_B_RMS	210.0	208.1	203.4	200.6
P0008_B_RMS	229.1	227.5	225.8	223.7
P0009_B_RMS	205.2	203.3	197.8	195.2
P0010_B_RMS	202.4	200.8	195.9	192.8
P0011_B_RMS	218.5	216.8	212.4	210.0
P0025_B_RMS	273.4	272.0	270.6	269.6
P0026_B_RMS	277.2	275.4	276.0	274.9
P0027_B_RMS	255.3	254.3	253.1	252.1
P0028_B_RMS	278.0	276.5	276.9	275.9
P0029_B_RMS	283.5	282.5	282.2	280.9
P0036_B_RMS	323.6	322.5	322.1	321.1
P0037_B_RMS	324.6	323.5	323.0	322.0
P0090_B_RMS	N/A	N/A	N/A	N/A
P0091_B_RMS	N/A	N/A	N/A	N/A
P0093_B_RMS	N/A	349.5	N/A	N/A
P0094_B_RMS	N/A	310.0	N/A	N/A

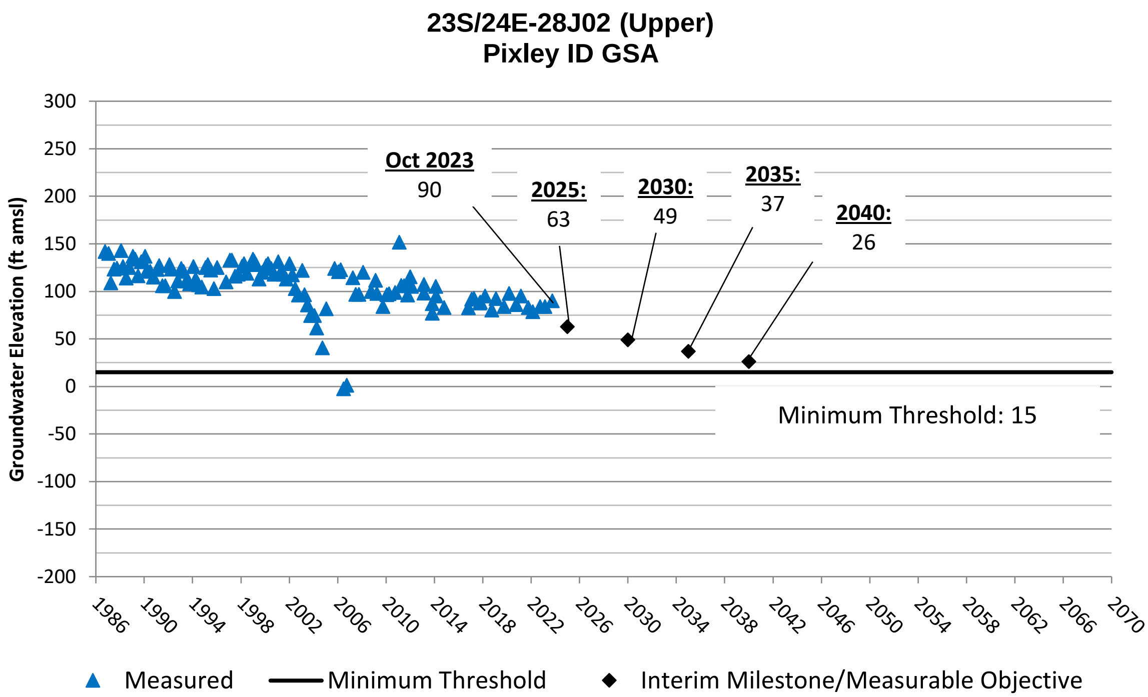
Note:

N/A = Not available

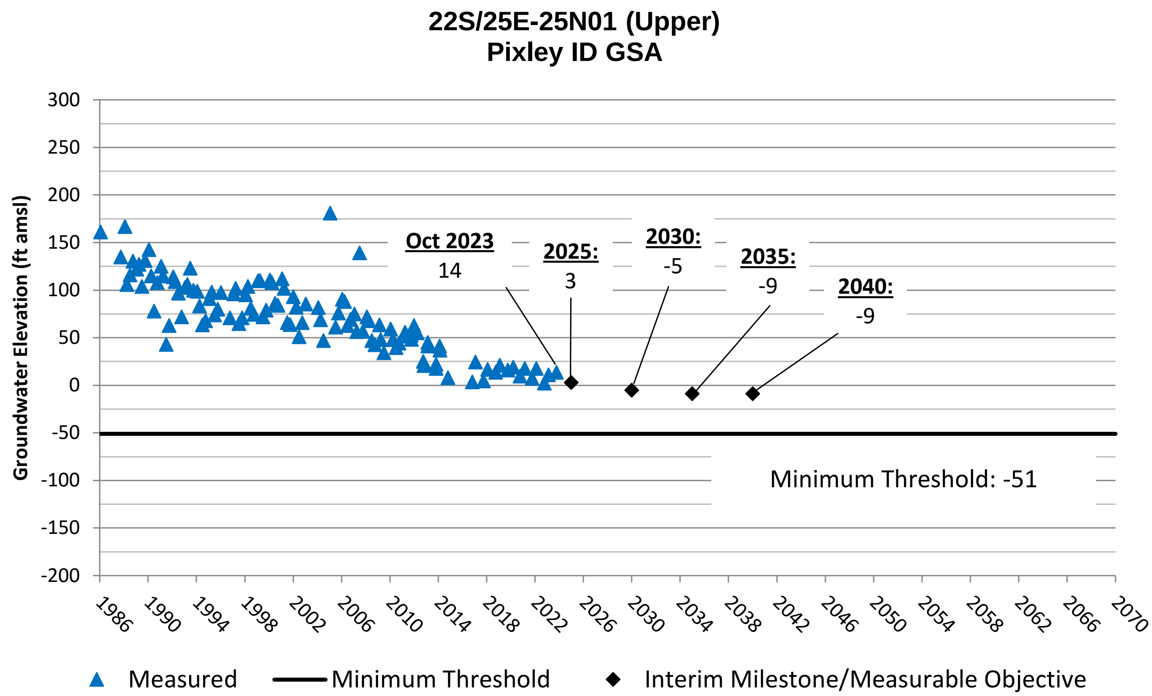
[1] Benchmarks surveyed in July and August of each year.

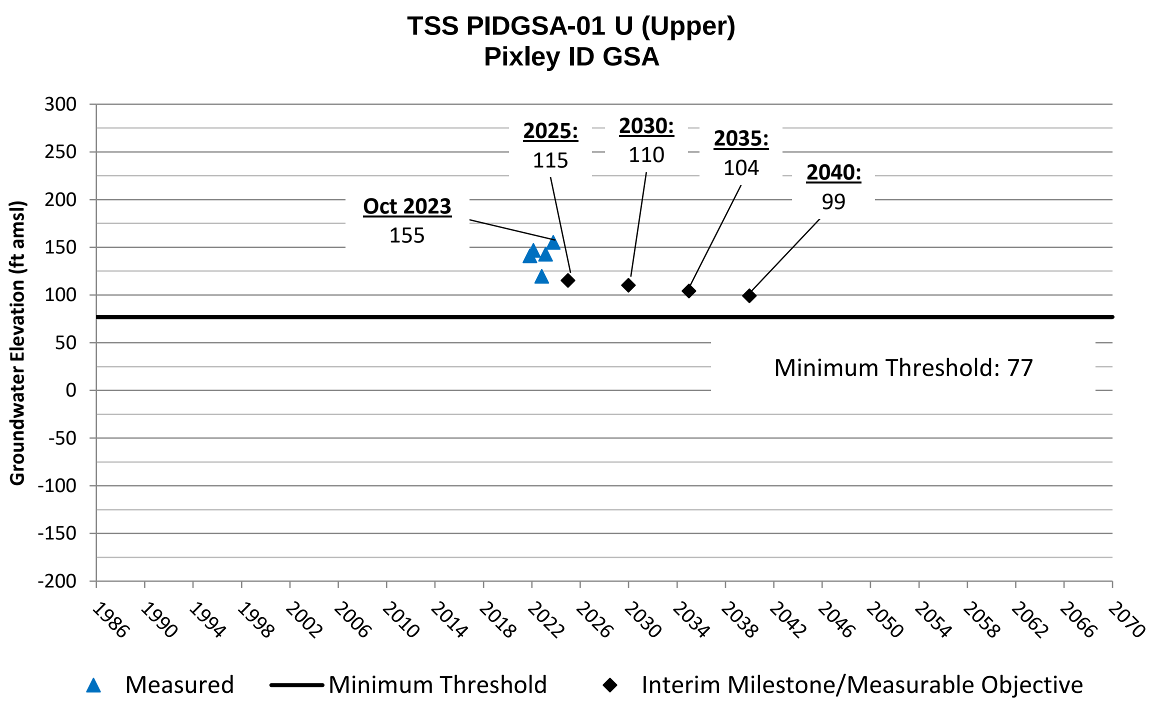
Pixley Irrigation District GSA
RMS Groundwater Elevation Hydrographs



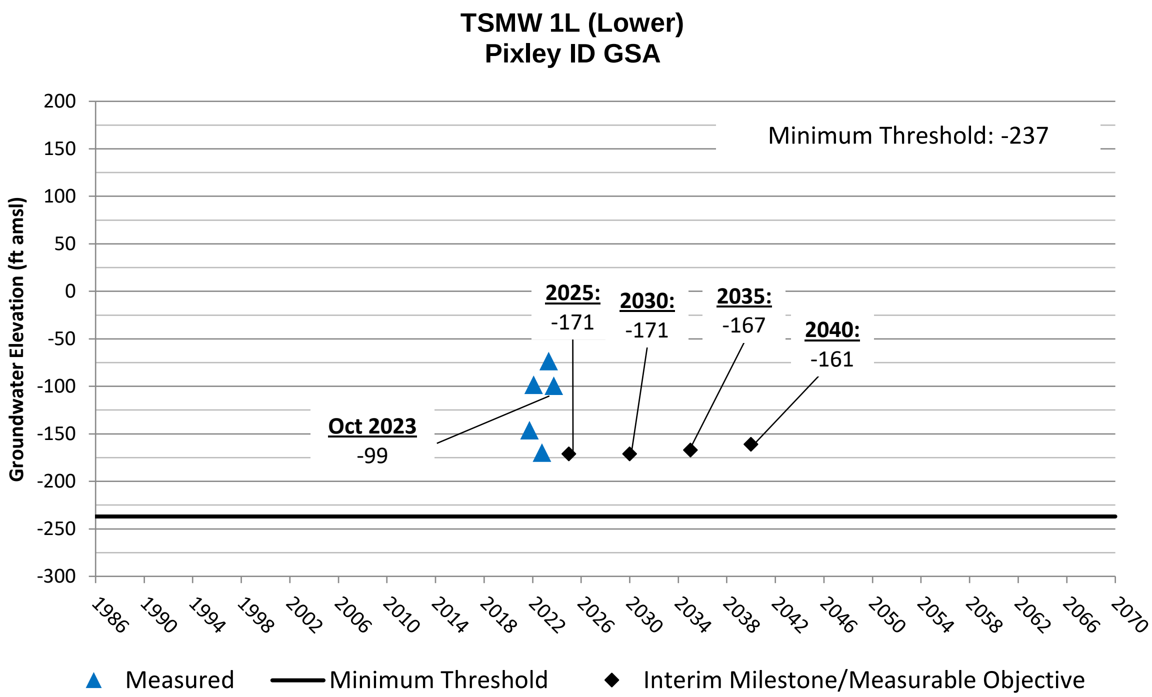


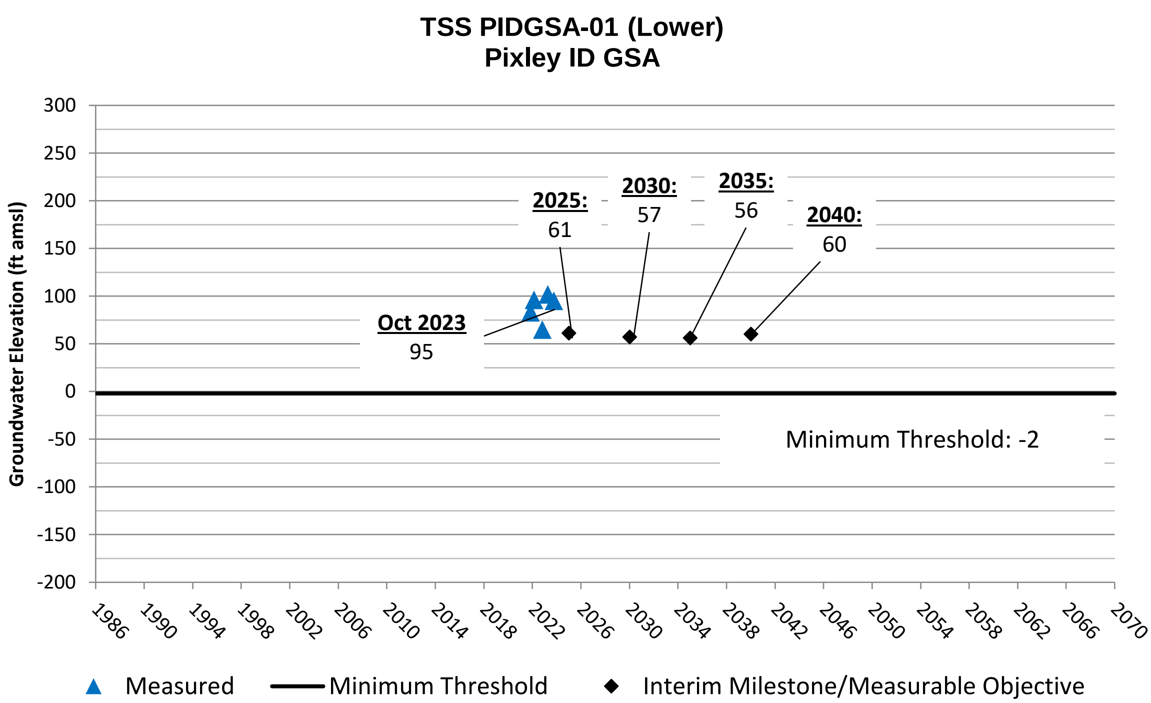
Pixley Irrigation District GSA
RMS Groundwater Elevation Hydrographs



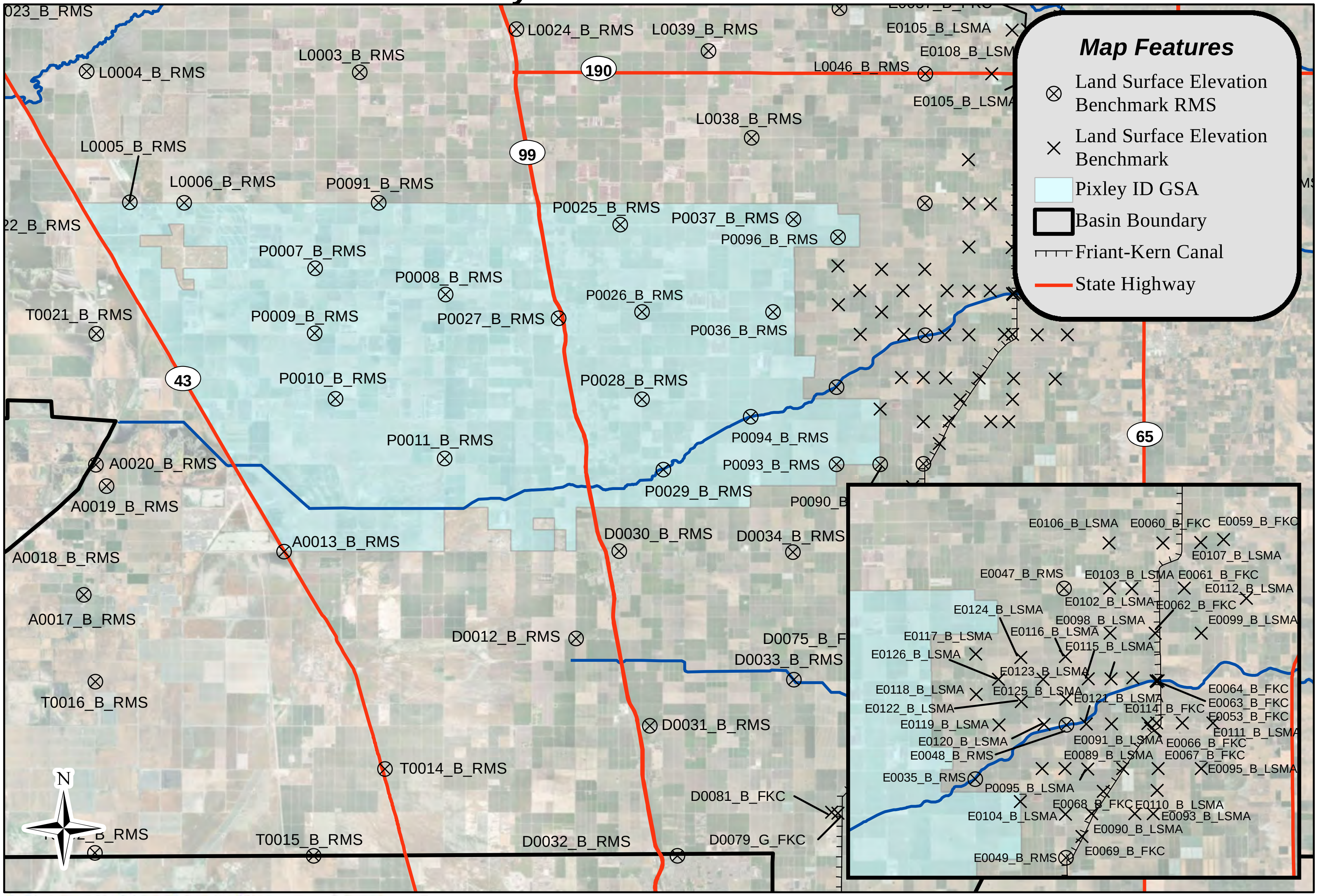


Pixley Irrigation District GSA
RMS Groundwater Elevation Hydrographs





Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

0 1.5 3 6 Miles
NAD 83 State Plane Zone 4

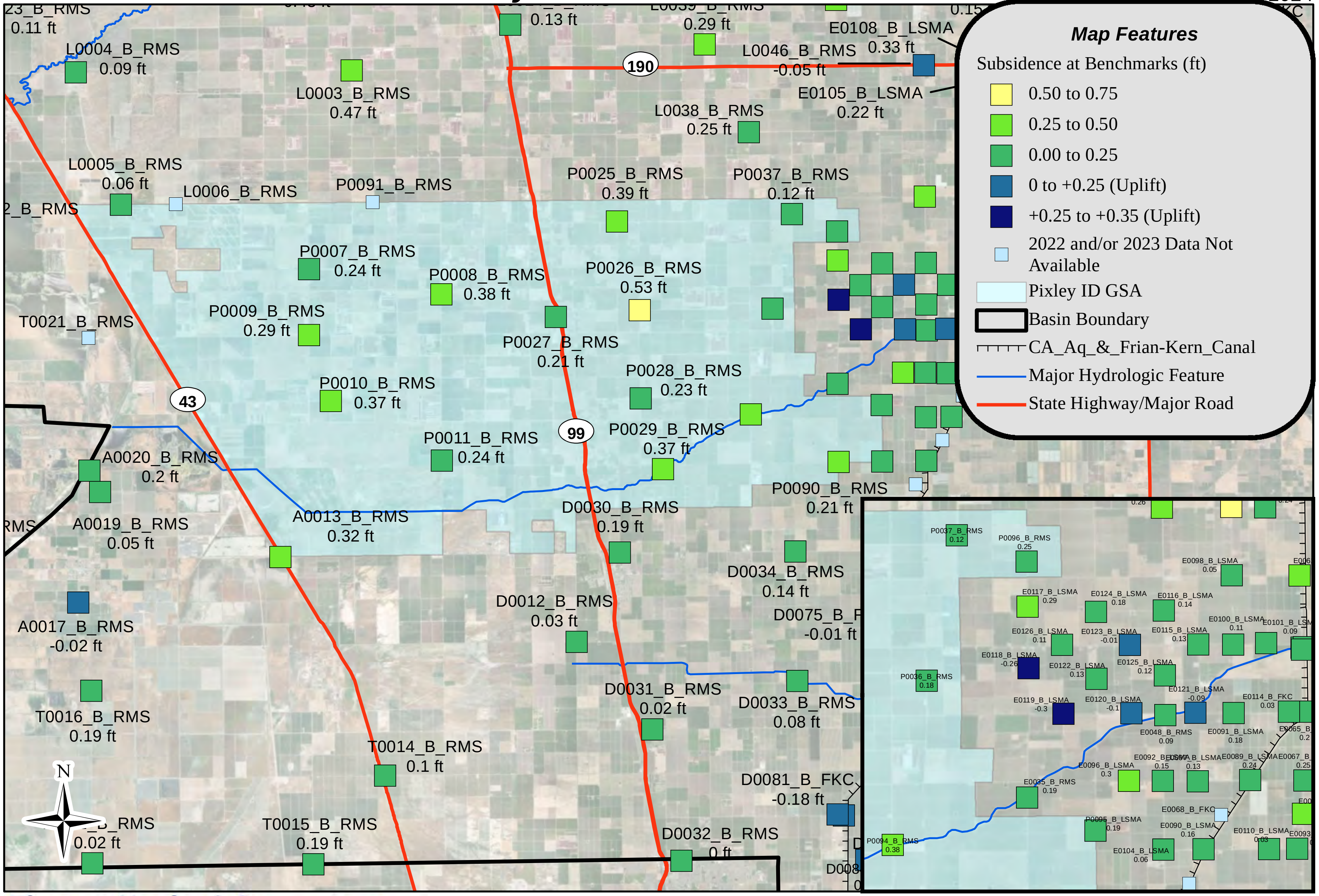
Land Surface Elevation Monitoring Network Pixley I.D. GSA

Appendix D
Figure 4

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report

March 2024

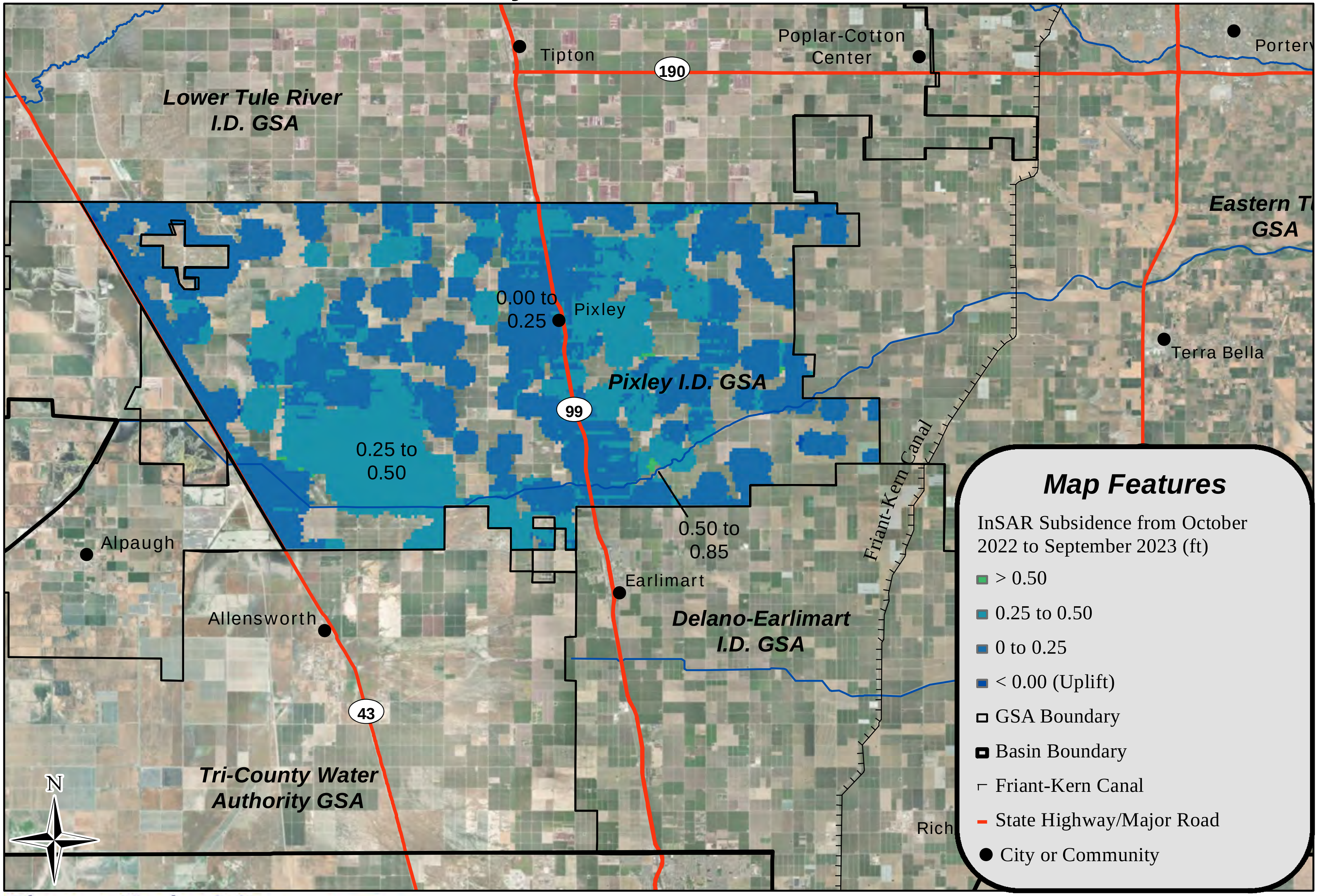


Data from Tule Subbasin Monitoring Network.
Fall 2023 data was used if Summer 2023 data was not available.

Land Subsidence -
July 2022 to July 2023
Pixley I.D. GSA

Appendix D
Figure 5

Tule Subbasin Technical Advisory Committee



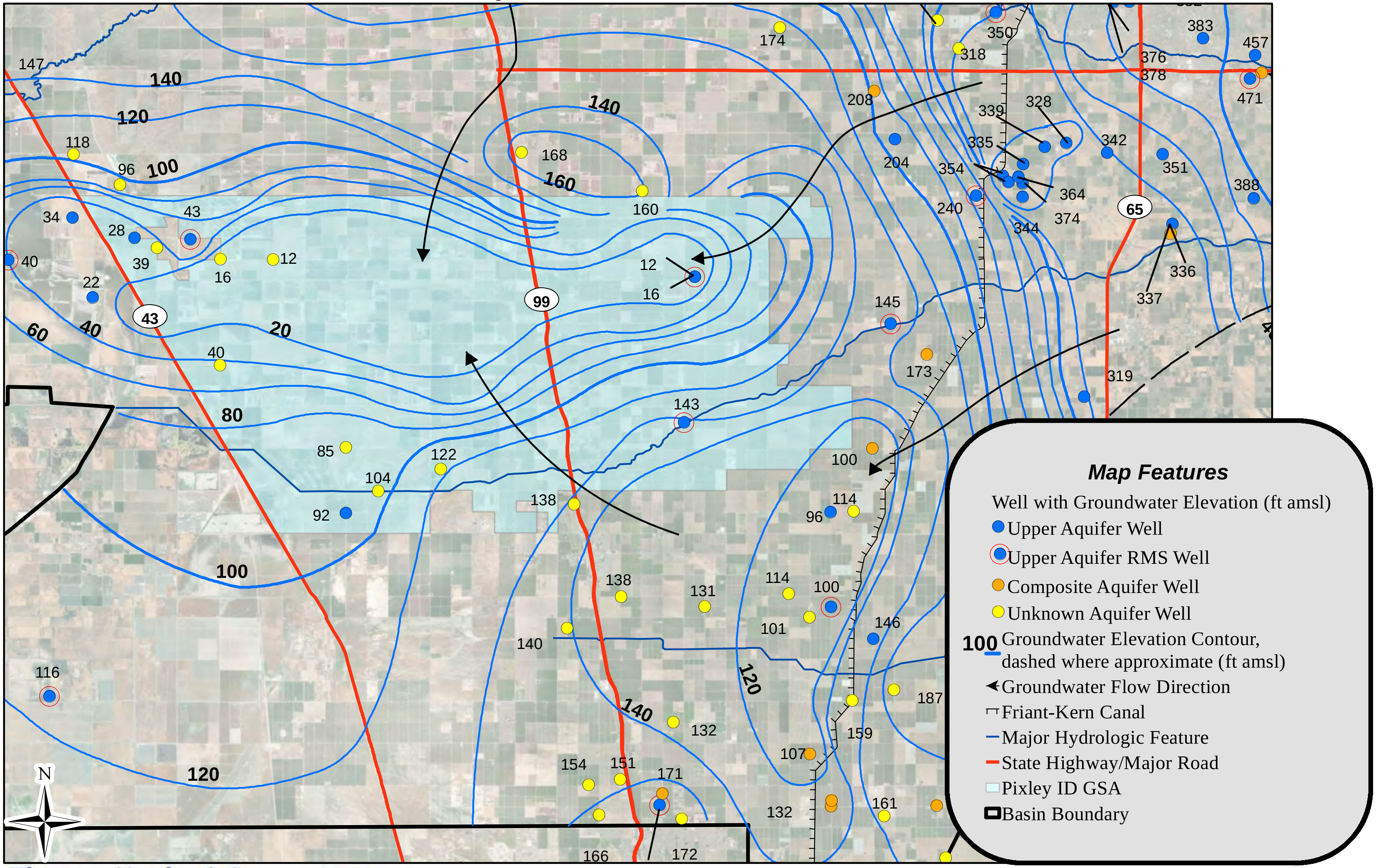
Thomas Harder & Co.
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Land Subsidence - Fall 2022 to Fall 2023
Pixley I.D. GSA

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



Thomas Harder & Co.
Groundwater Consulting

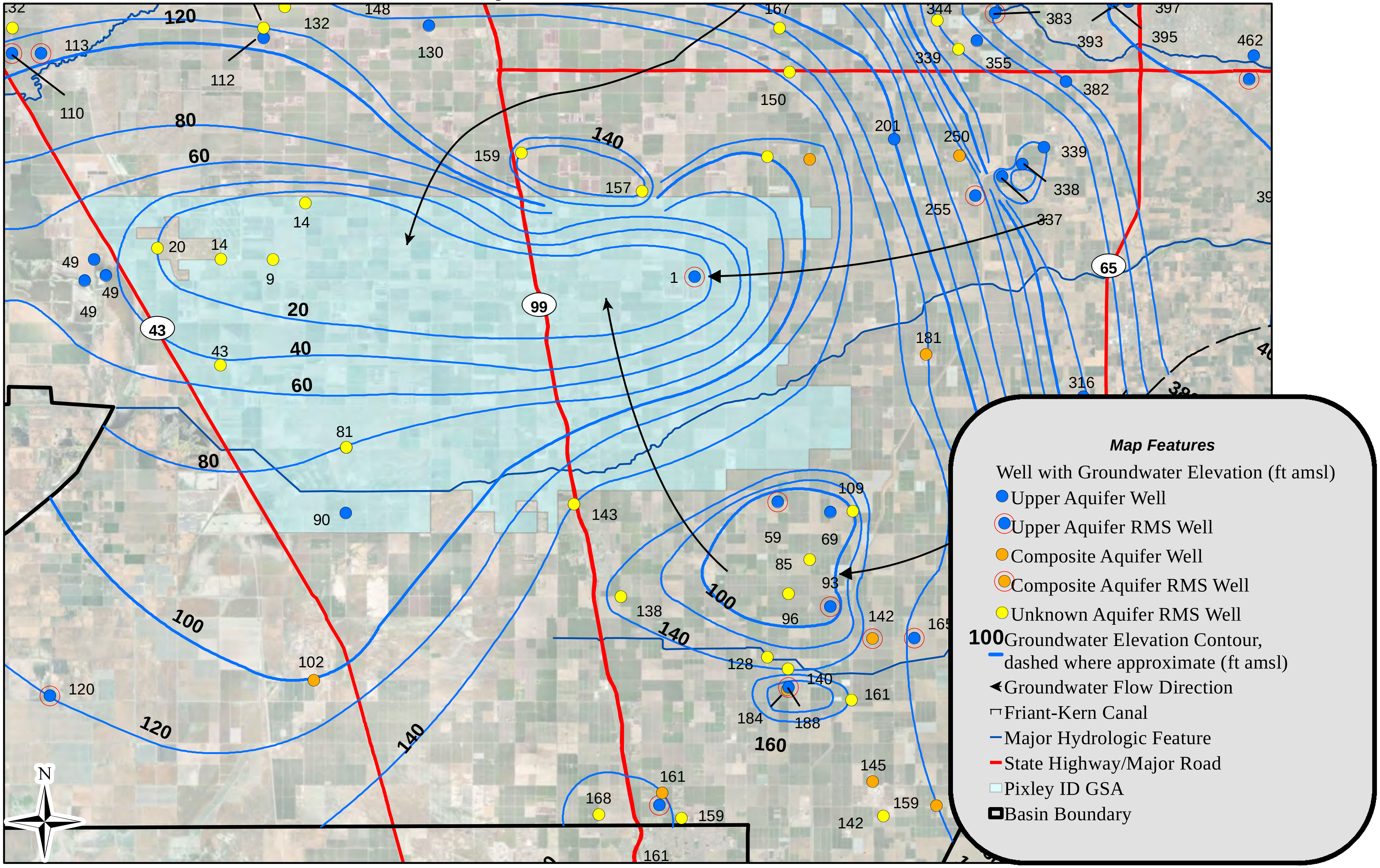
0 1.5 3 6 Miles

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Upper Aquifer
Pixley I.D. GSA
Appendix D
Figure 7

2022/2023 Annual Report
March 2024

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

0 1.5 3 6 Miles

NAD 83 State Plane Zone 4

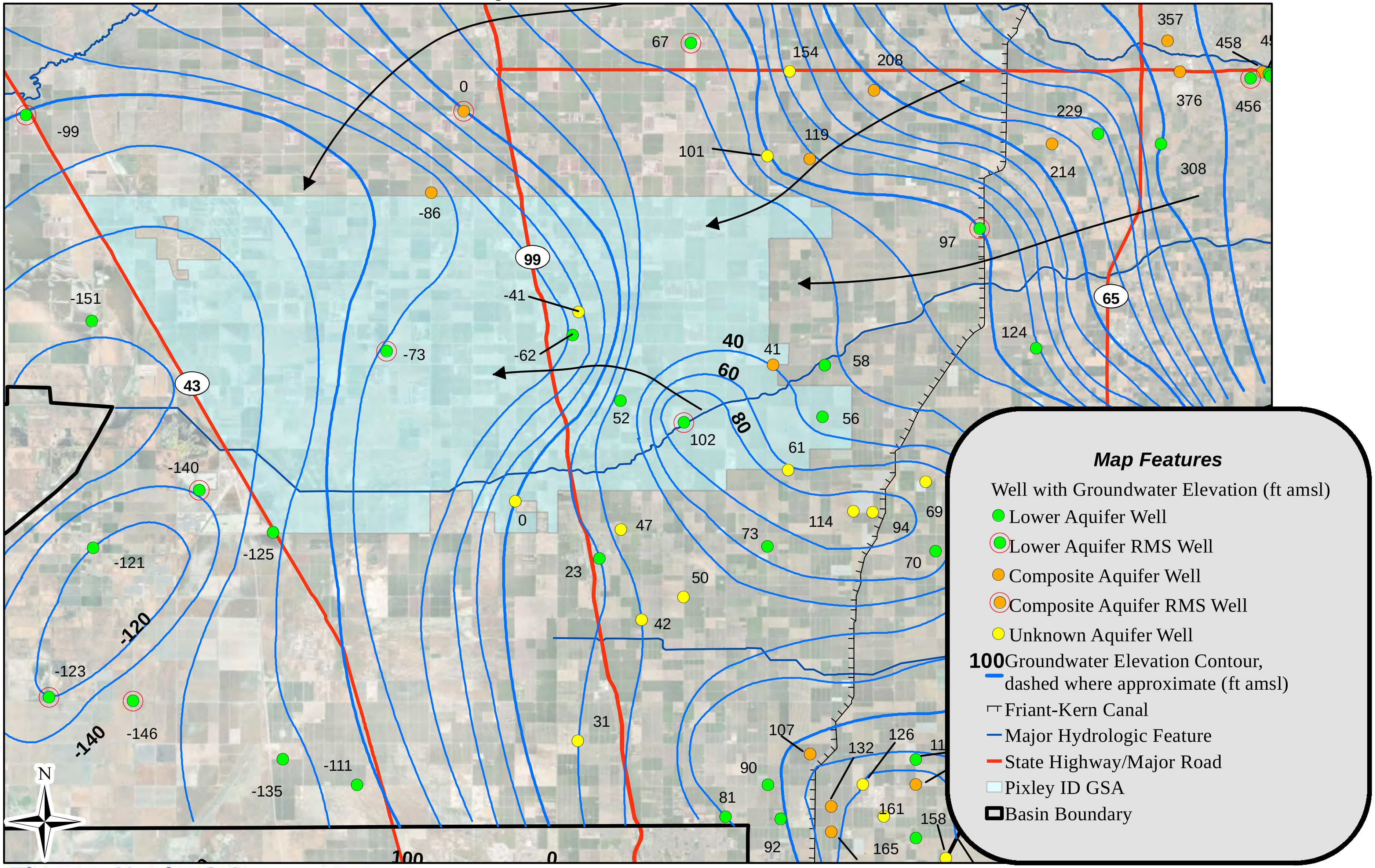
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer
Pixley I.D. GSA
Appendix D
Figure 8

2022/2023 Annual Report

March 2024

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

0 1.5 3 6 Miles

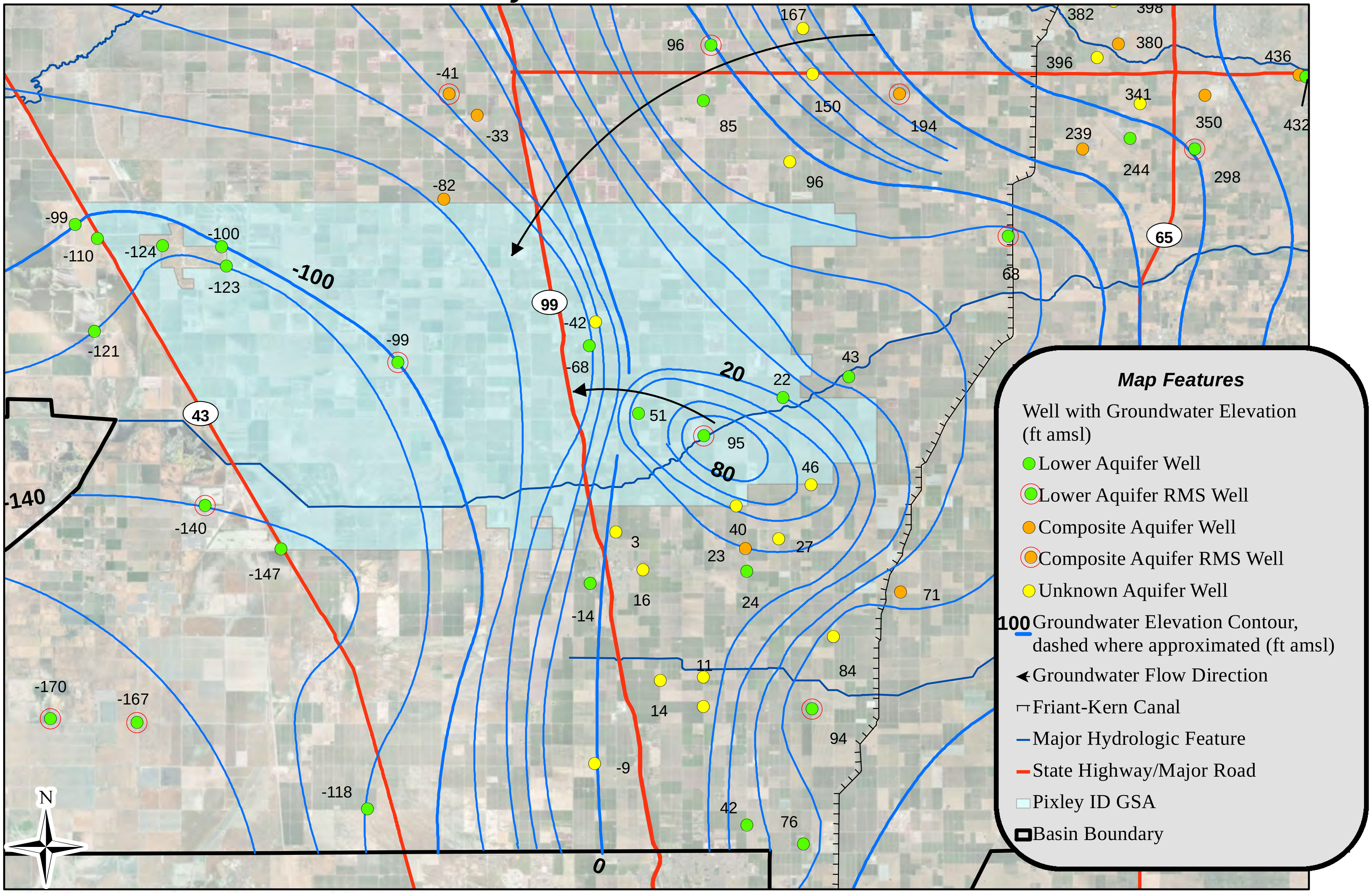
NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer
Pixley I.D. GSA

Appendix D

Figure 9

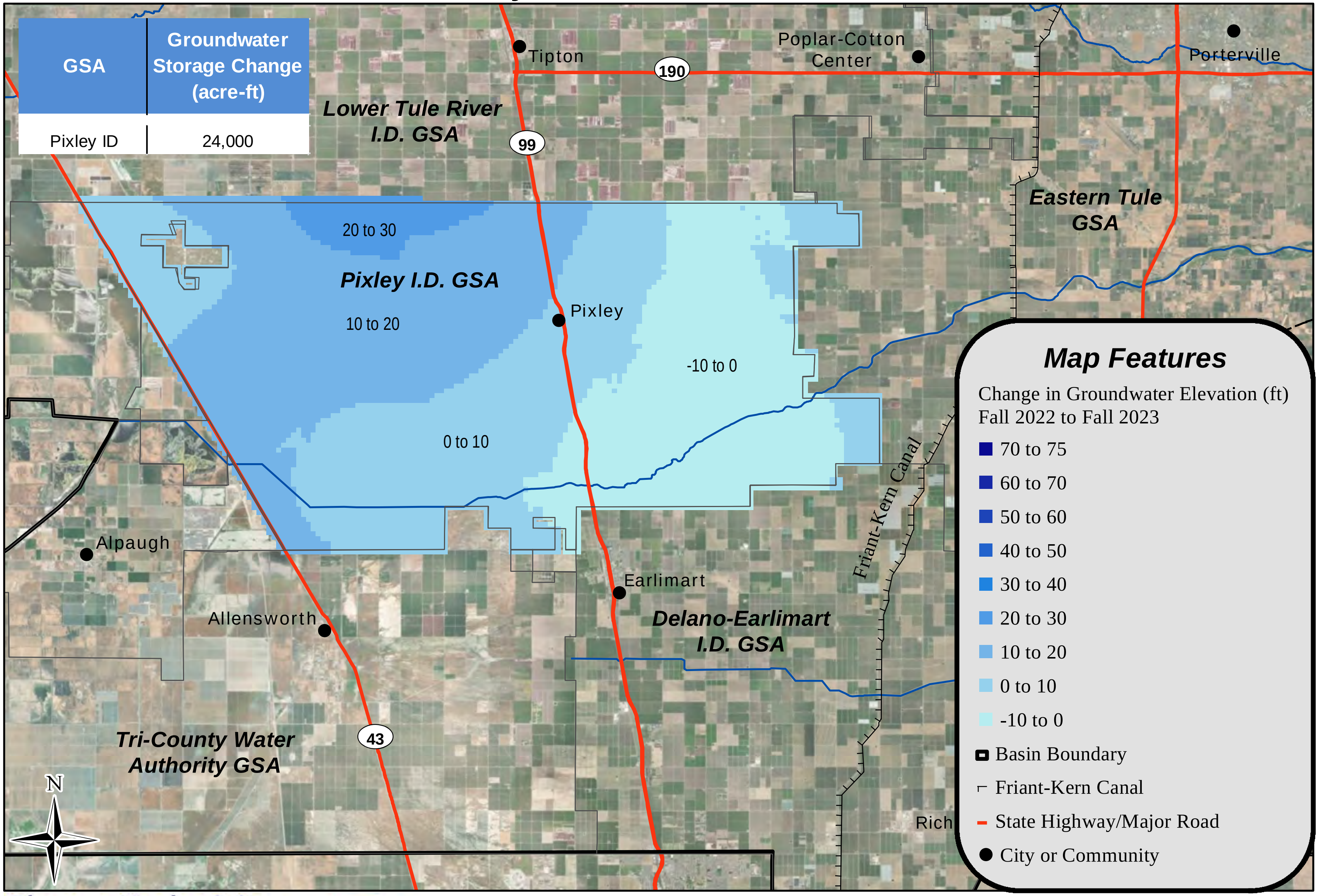


Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
Pixley I.D. GSA
Appendix D
Figure 10

GSA	Groundwater Storage Change (acre-ft)
Pixley ID	24,000



Thomas Harder & Co.
Groundwater Consulting

0 1 2 4 Miles
NAD 83 State Plane Zone 4

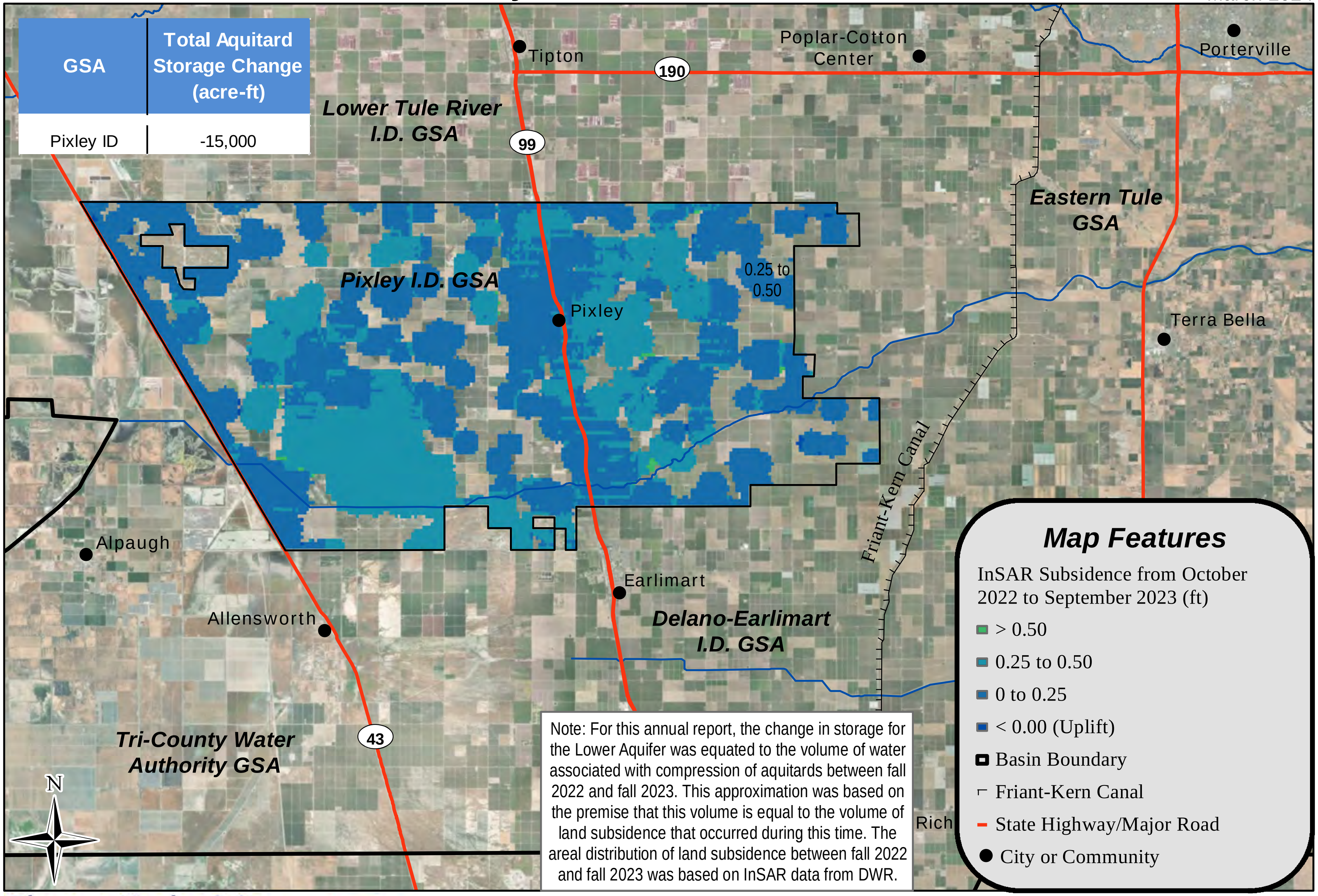
Change in Groundwater Elevation
Fall 2022 to Fall 2023 - Upper Aquifer
Pixley I.D. GSA

Appendix D
Figure 11

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024

GSA	Total Aquitard Storage Change (acre-ft)
Pixley ID	-15,000



Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.

Map Features

InSAR Subsidence from October 2022 to September 2023 (ft)

- > 0.50
- 0.25 to 0.50
- 0 to 0.25
- < 0.00 (Uplift)
- Basin Boundary
- Friant-Kern Canal
- State Highway/Major Road
- City or Community

Thomas Harder & Co.
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage as Estimated from Land Subsidence - Fall 2022 to Fall 2023
Pixley I.D. GSA

Appendix D
Figure 12

Appendix E

Tri-County Groundwater Authority 2022/23 Annual Data

Tri-County Water Authority
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
TCWA	North	1,400	0	2,500	3,900
	Southeast	56,600	100	0	56,700
	Total	***58,000***	***100***	***2,500***	***60,600***

Tri-County Water Authority
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
TCWA	North	57,000	0	0	0	8,300	65,300
	Southeast	9,900	0	0	0	51,500	61,400
	Total	***66,900***	***0***	***0***	***0***	***59,800***	***126,700***

Tri-County Water Authority
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
TCWA	North	3,900	65,300	0	0	69,200
	Southeast	56,700	61,400	0	0	118,100
	Total	***60,600***	***126,700***	***0***	***0***	***187,300***

Tri-County Water Authority
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
TCWA	North	15,600	0	51,100	0	2,500	69,200
	Southeast	108,100	100	9,900	0	0	118,100
	Total	***123,700***	***100***	***61,000***	***0***	***2,500***	***187,300***

Tri-County Water Authority
Land Surface Elevations at Representative Monitoring Sites

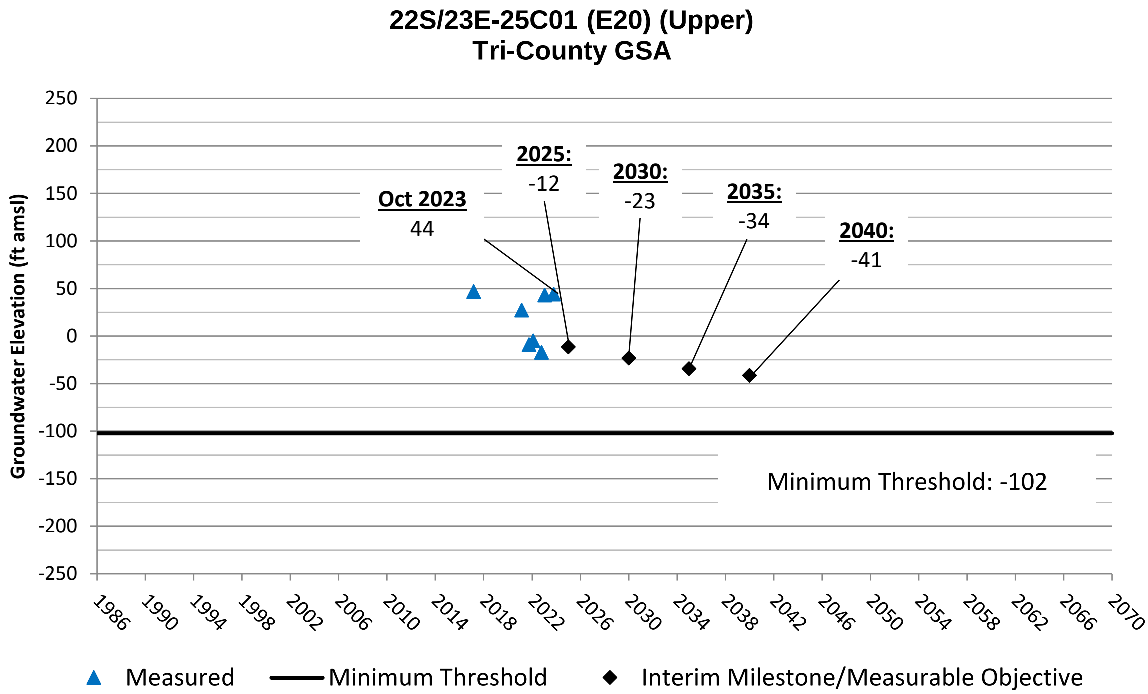
Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
T0014_B_RMS	219.4	218.2	212.6	211.6
T0015_B_RMS	217.1	216.2	211.3	210.3
T0016_B_RMS	201.3	200.6	195.4	194.4
T0021_B_RMS	183.0	181.4	175.1	174.1
T0092_B_RMS	N/A	200.0	N/A	N/A

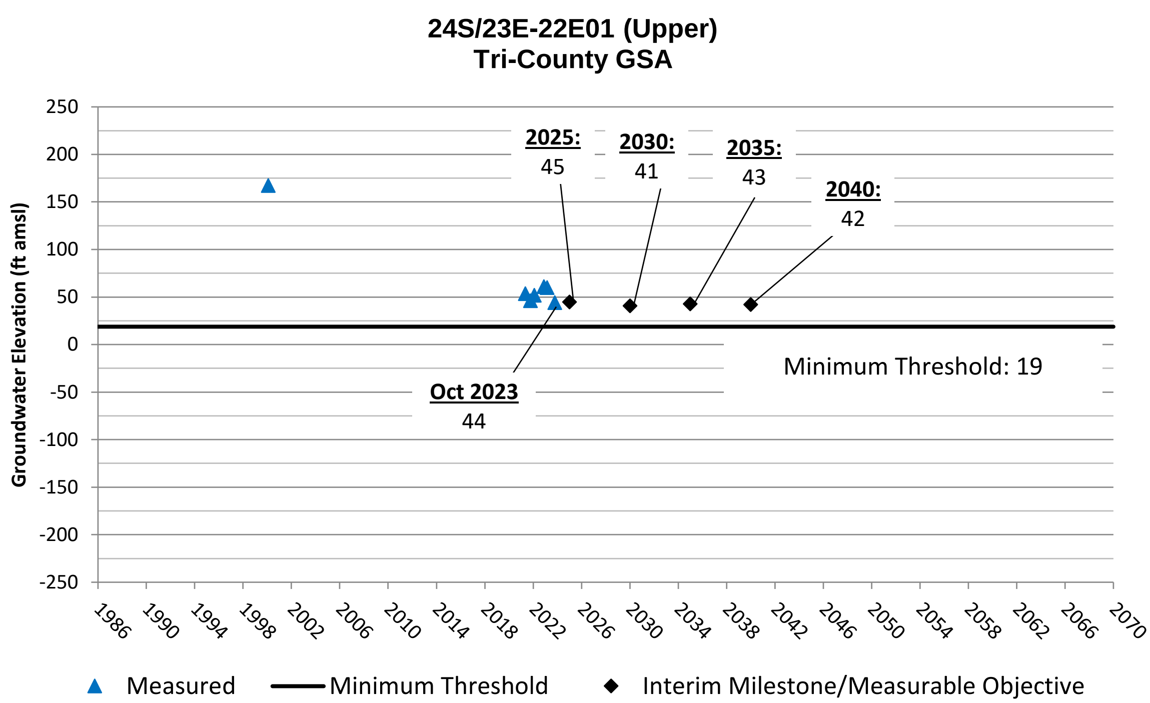
Note:

N/A = Not available

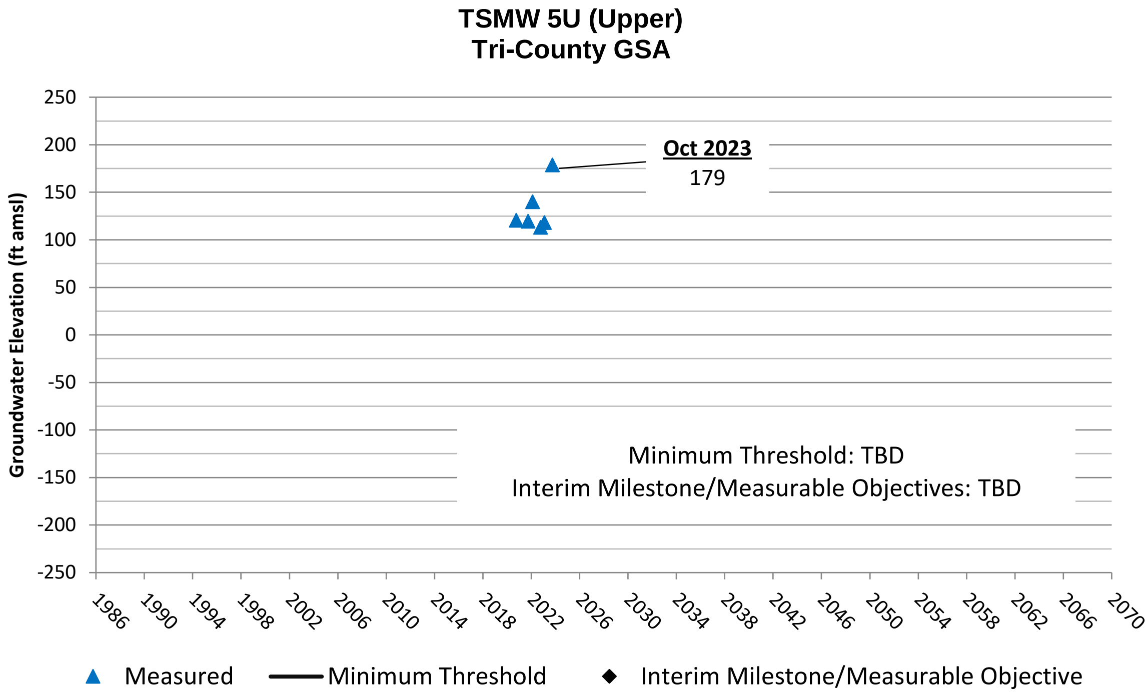
[1] Benchmarks surveyed in July and August of each year.

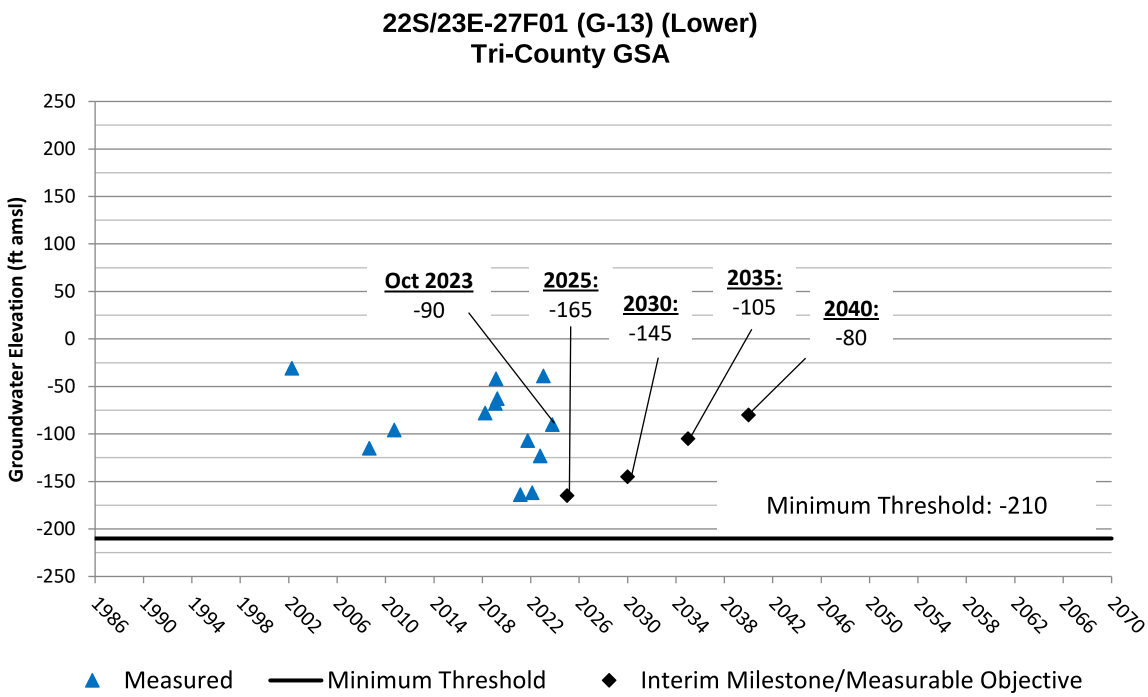
Tri-County Water Authority GSA
RMS Groundwater Elevation Hydrographs



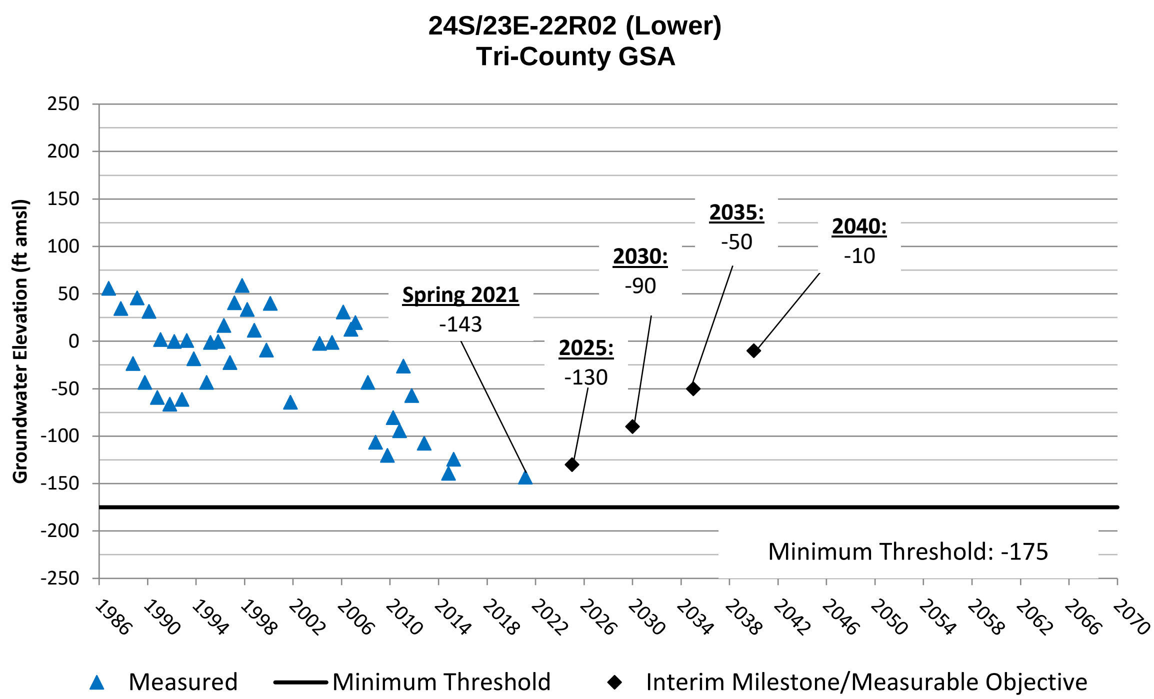


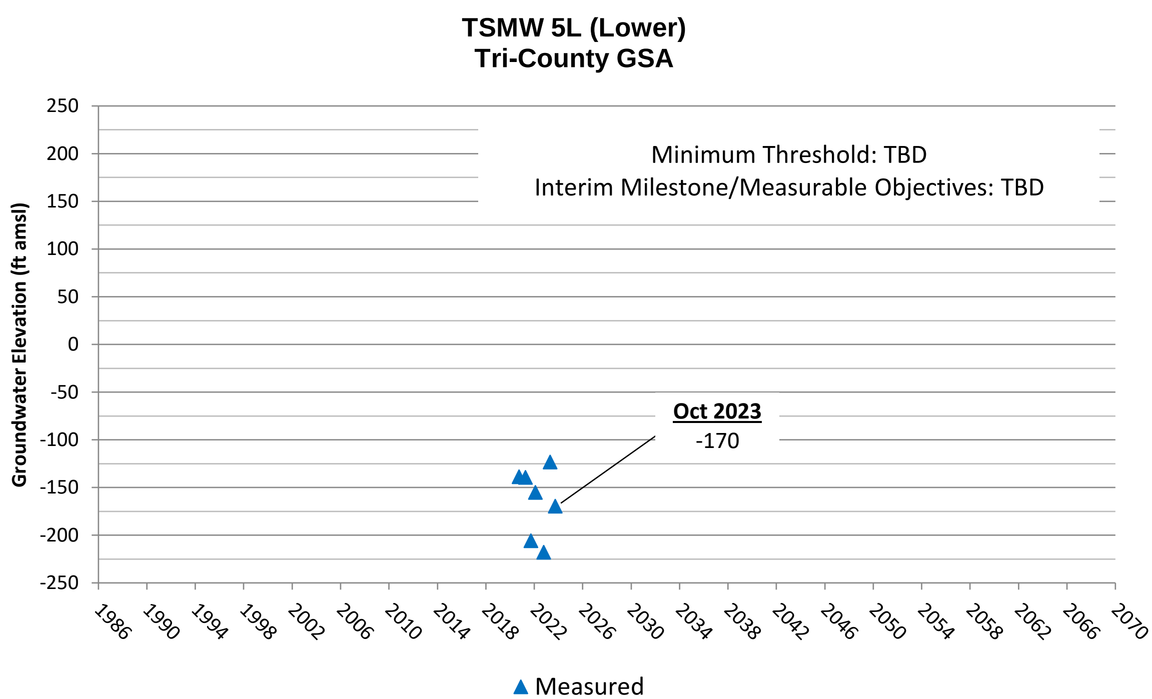
Tri-County Water Authority GSA
RMS Groundwater Elevation Hydrographs





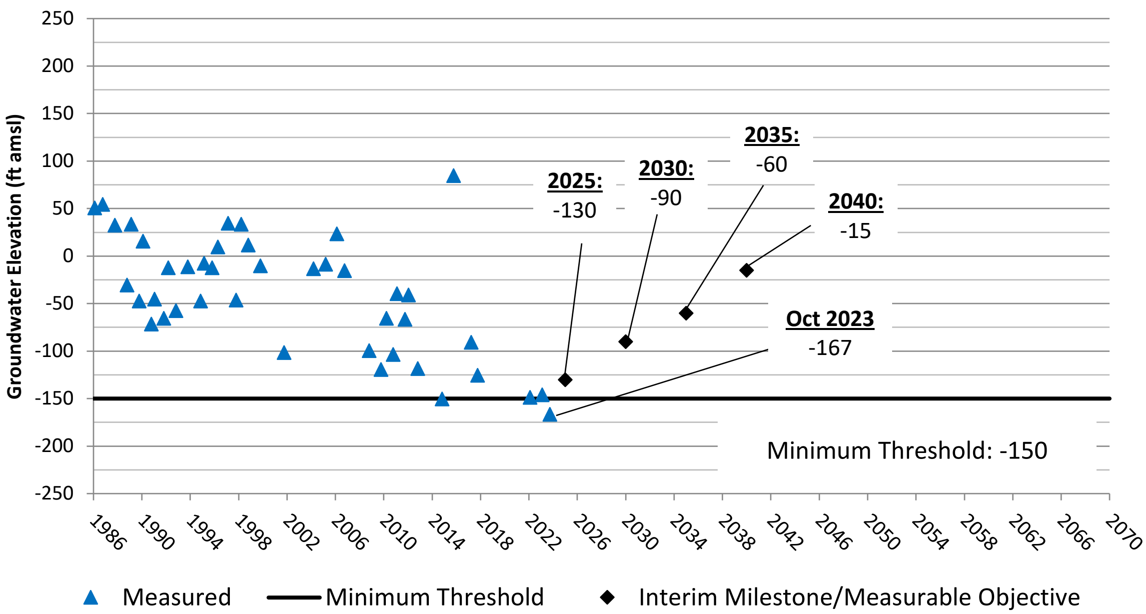
Tri-County Water Authority GSA
RMS Groundwater Elevation Hydrographs



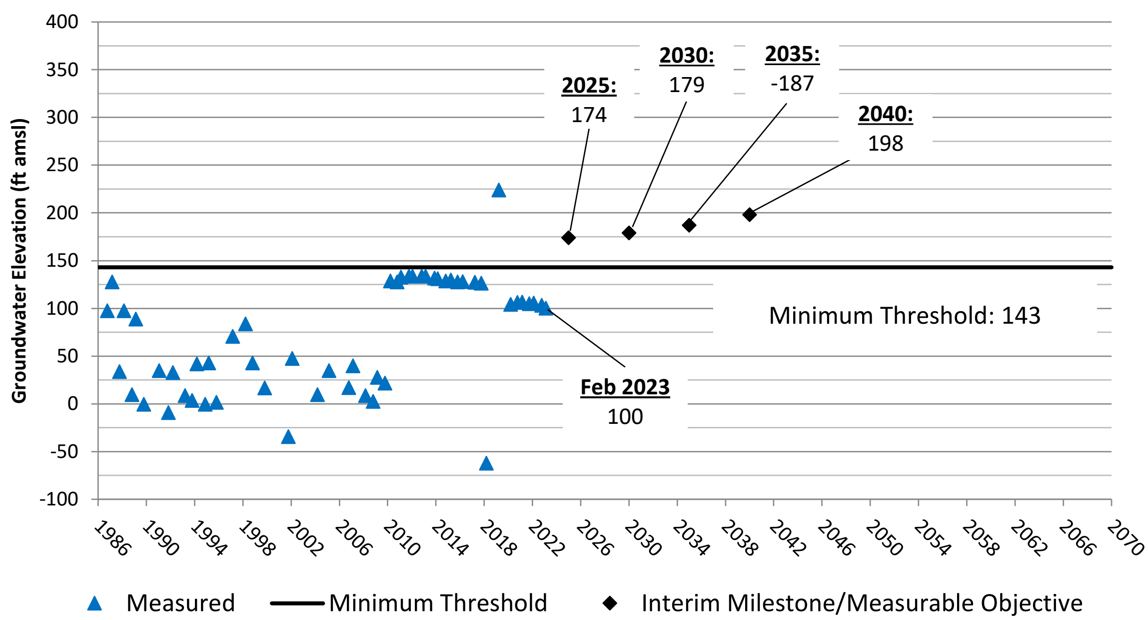


Tri-County Water Authority GSA
RMS Groundwater Elevation Hydrographs

24S/23E-15R01 (Lower)
Tri-County GSA

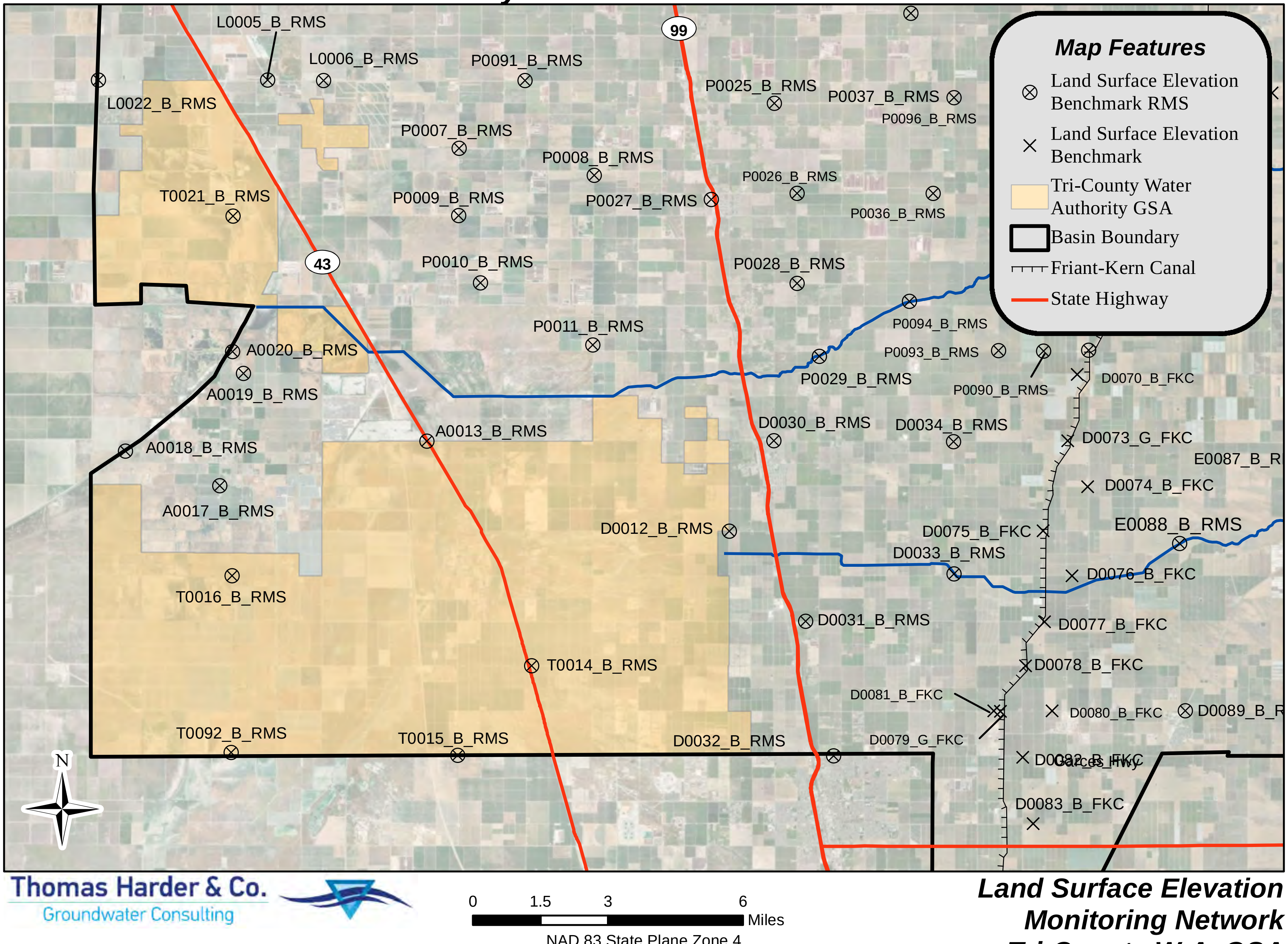


24S/24E-03A01 (Lower)
Tri-County GSA



Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report
March 2024



Thomas Harder & Co.
Groundwater Consulting

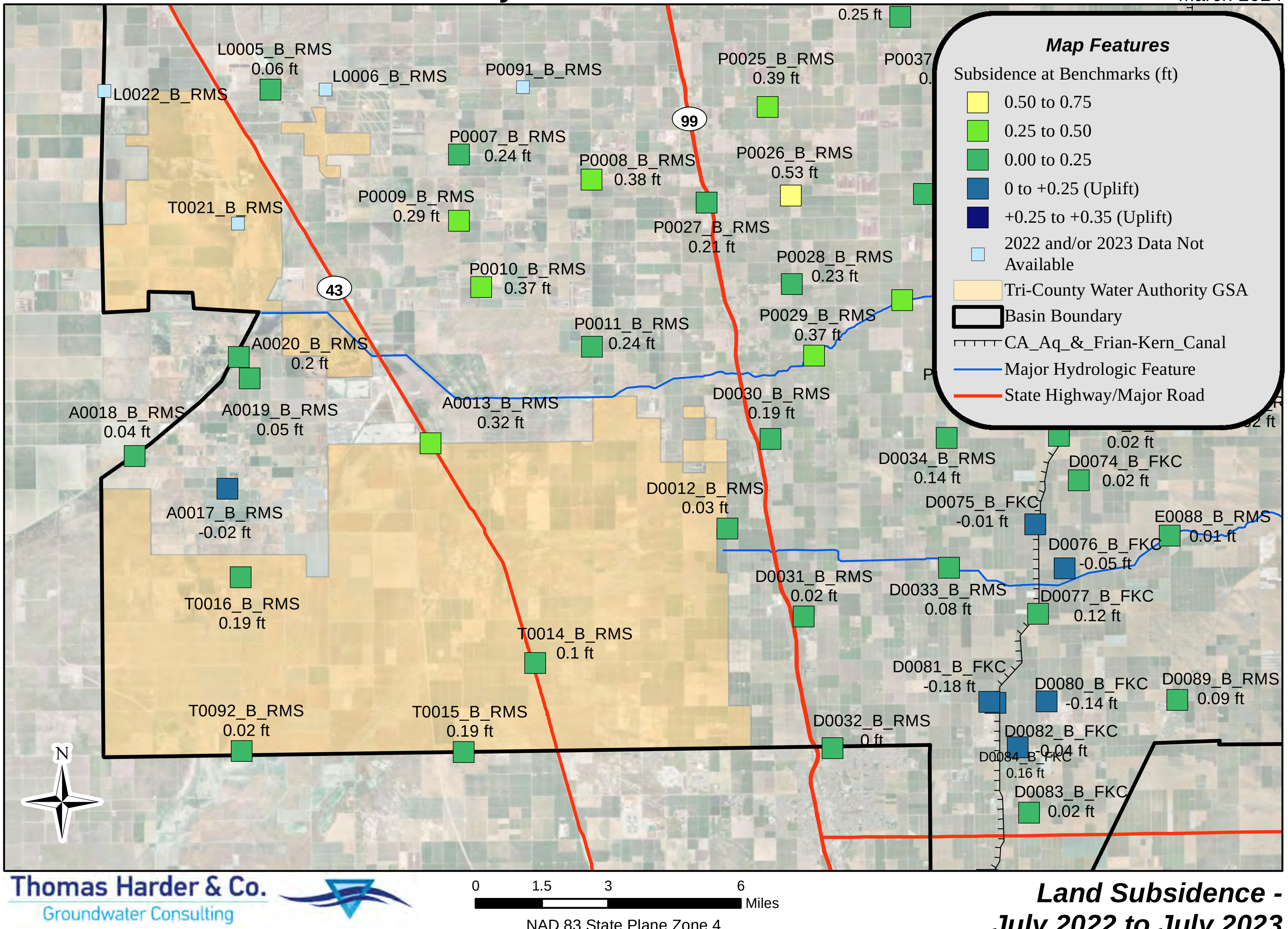
Land Surface Elevation Monitoring Network
Tri-County W.A. GSA

Appendix E
Figure 5

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report

March 2024



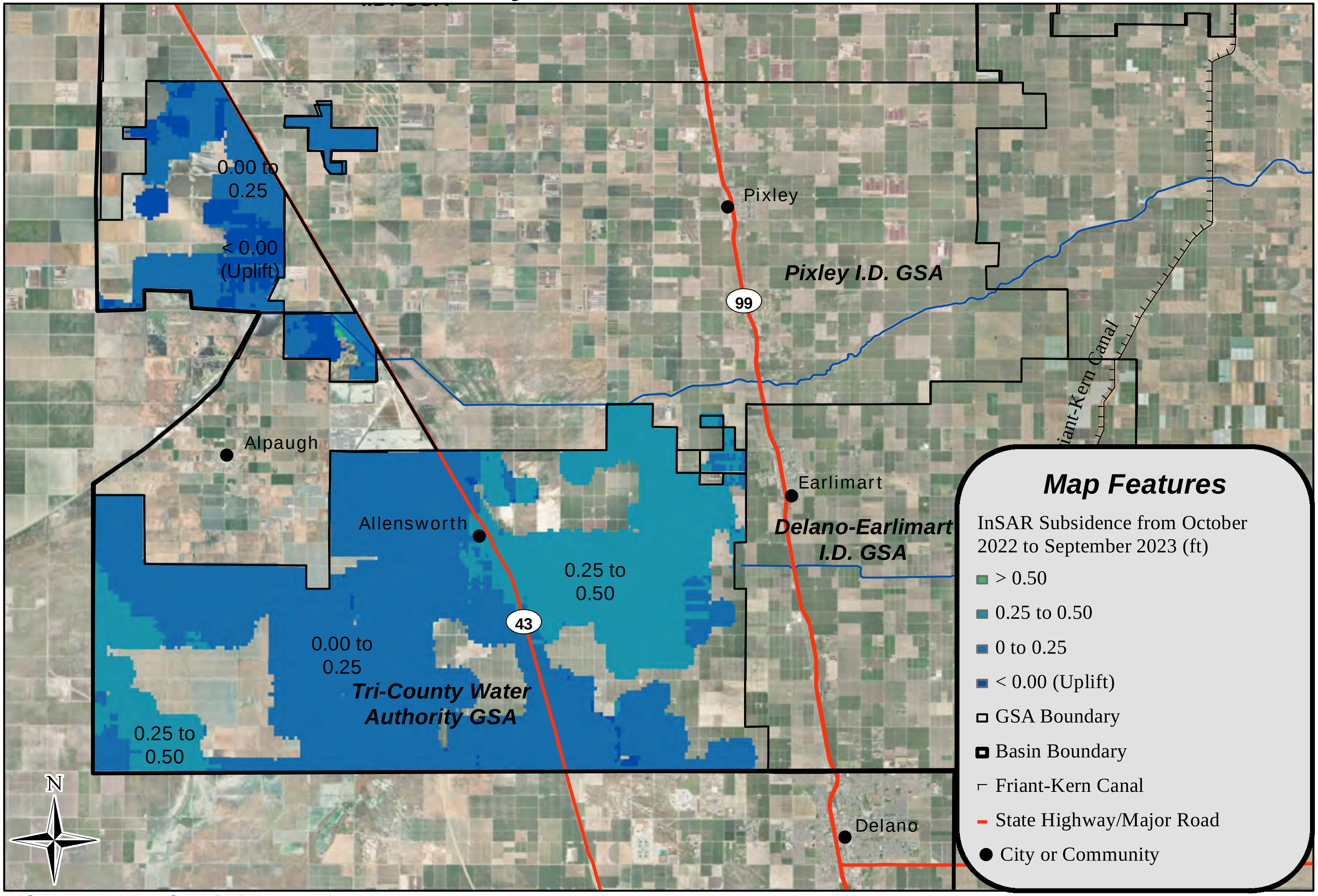
Thomas Harder & Co.
Groundwater Consulting

Data from Tule Subbasin Monitoring Network. Fall 2023 data was used if Summer 2023 data was not available.

Land Subsidence - July 2022 to July 2023 Tri-County W.A. GSA

Appendix E

Figure 6



Thomas Harder & Co.
Groundwater Consulting

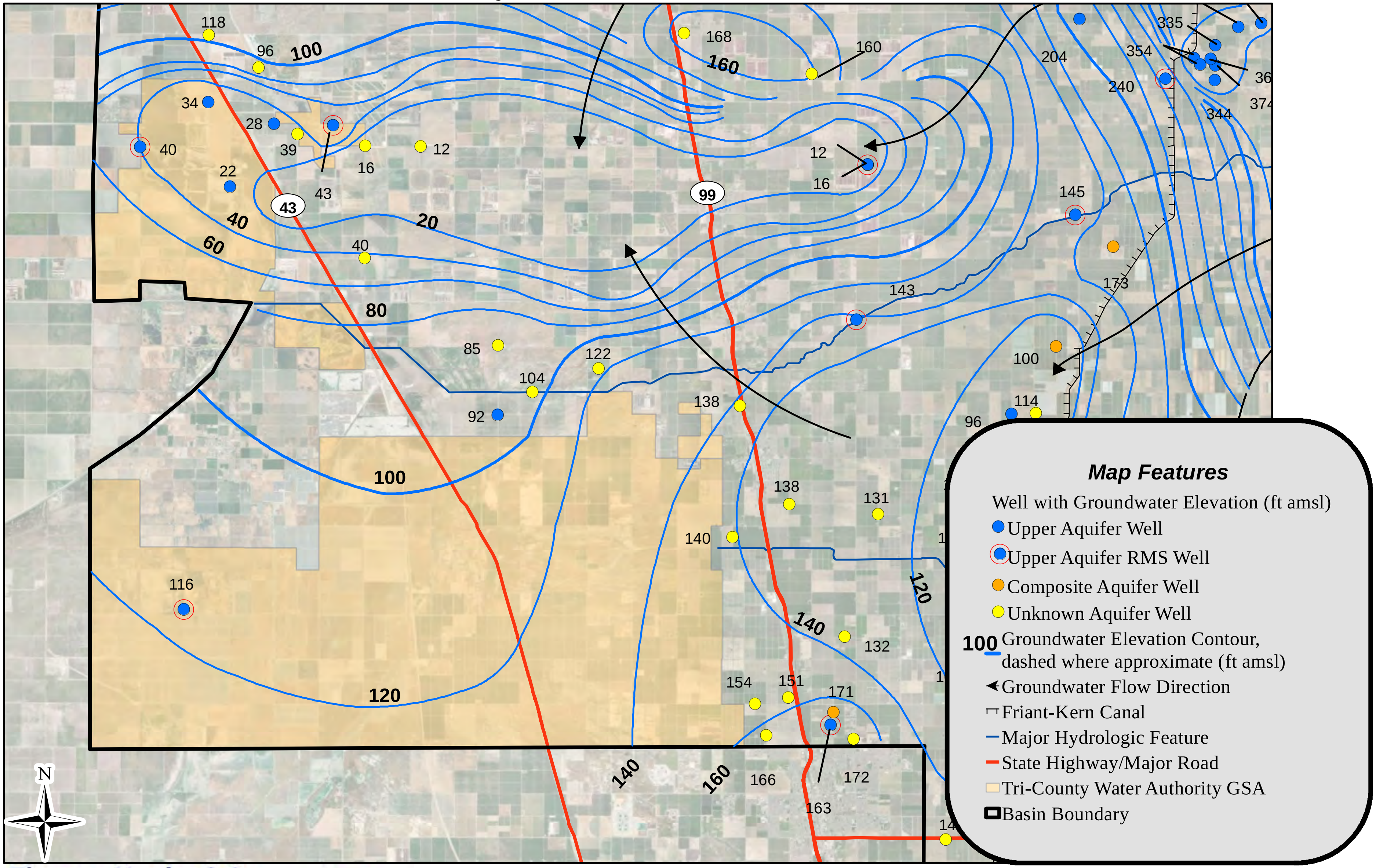
InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Land Subsidence - Fall 2022 to Fall 2023 Tri-County W.A. GSA

Appendix E
Figure 7

Tule Subbasin Technical Advisory Committee

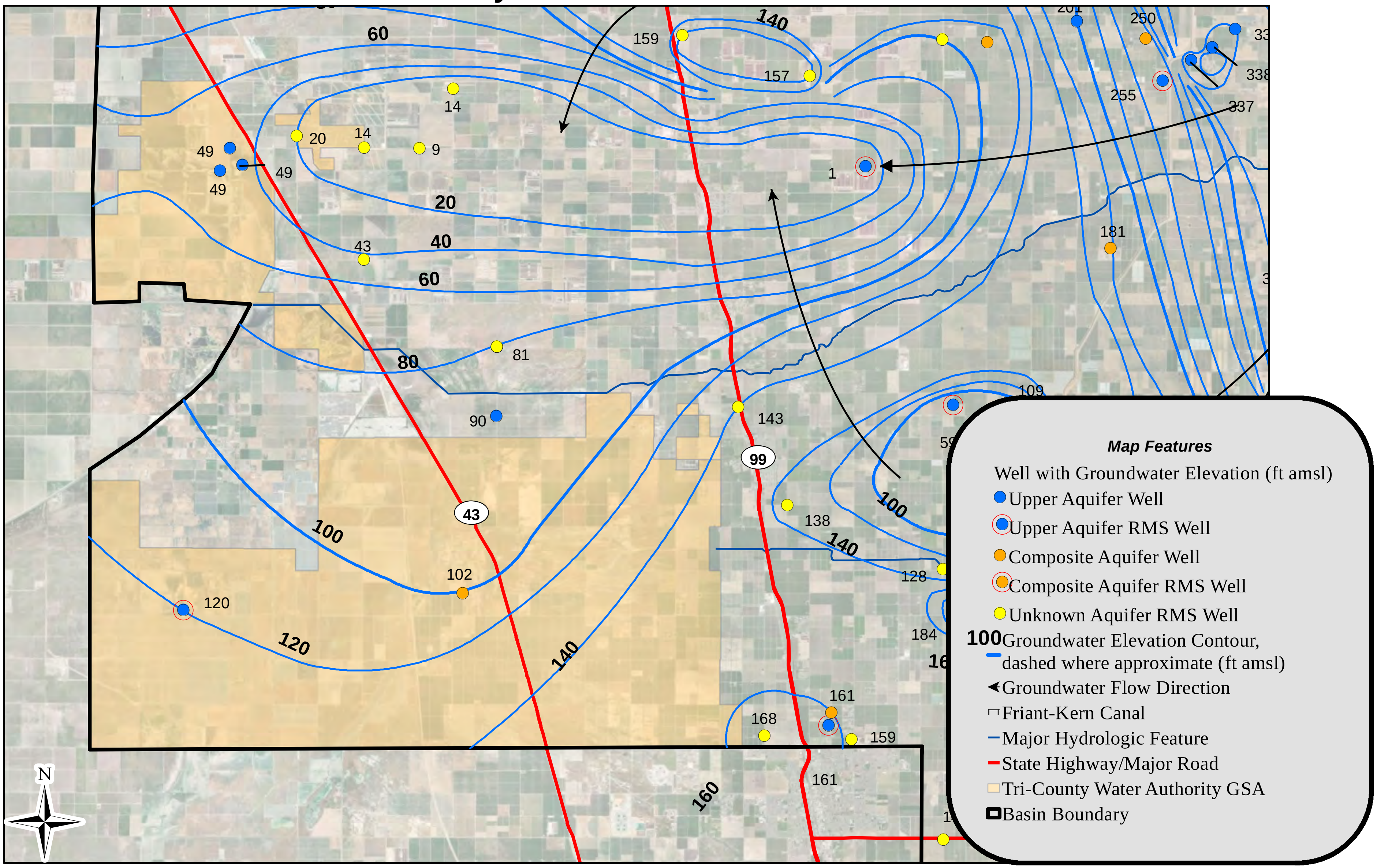
2022/2023 Annual Report
March 2024



Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Upper Aquifer
Tri-County Water Authority GSA
Appendix E
Figure 8

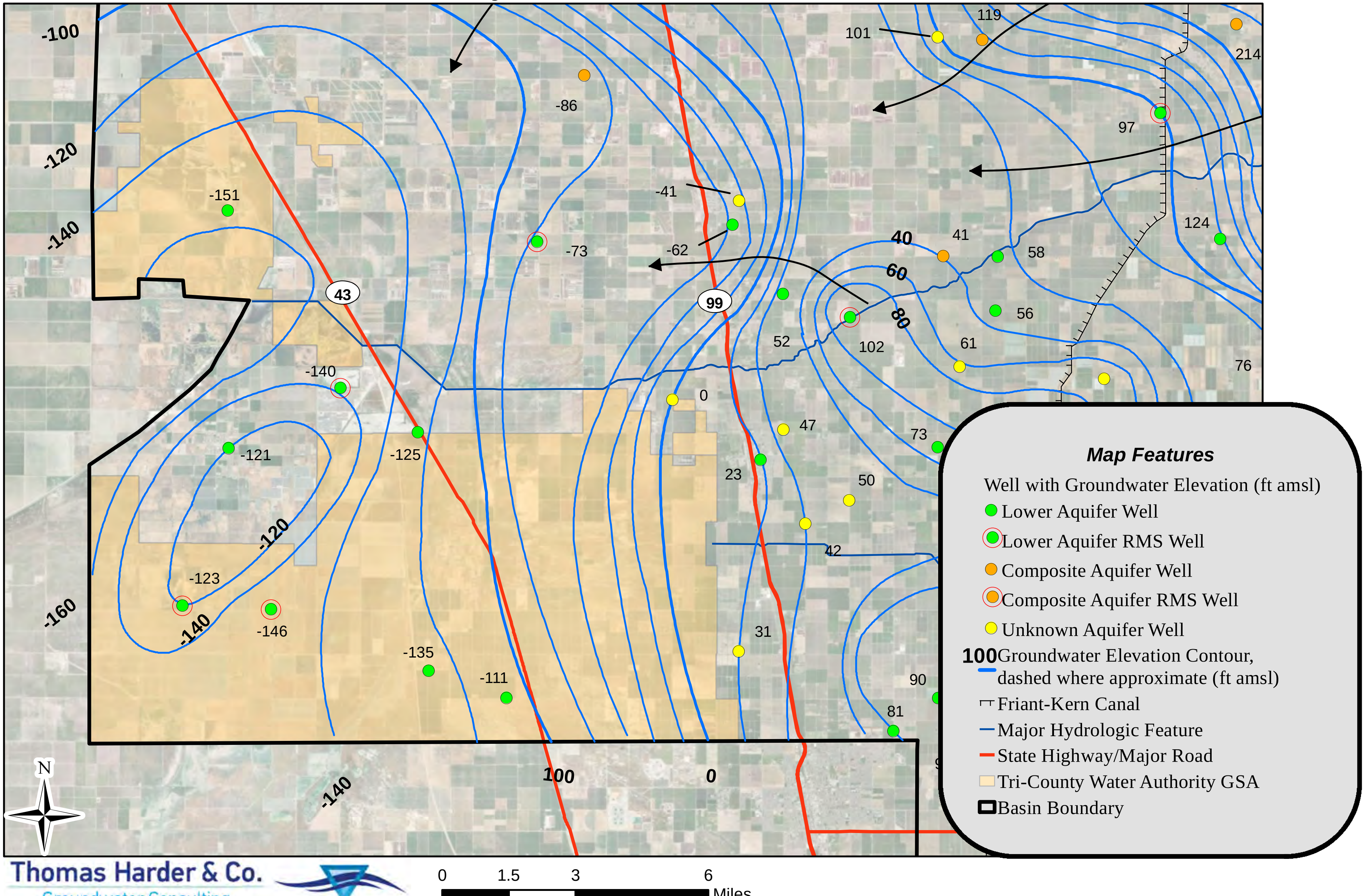


Thomas Harder & Co.
Groundwater Consulting

Fall 2023 Upper Aquifer
Tri-County Water Authority GSA
Appendix E
Figure 9

Tule Subbasin Technical Advisory Committee

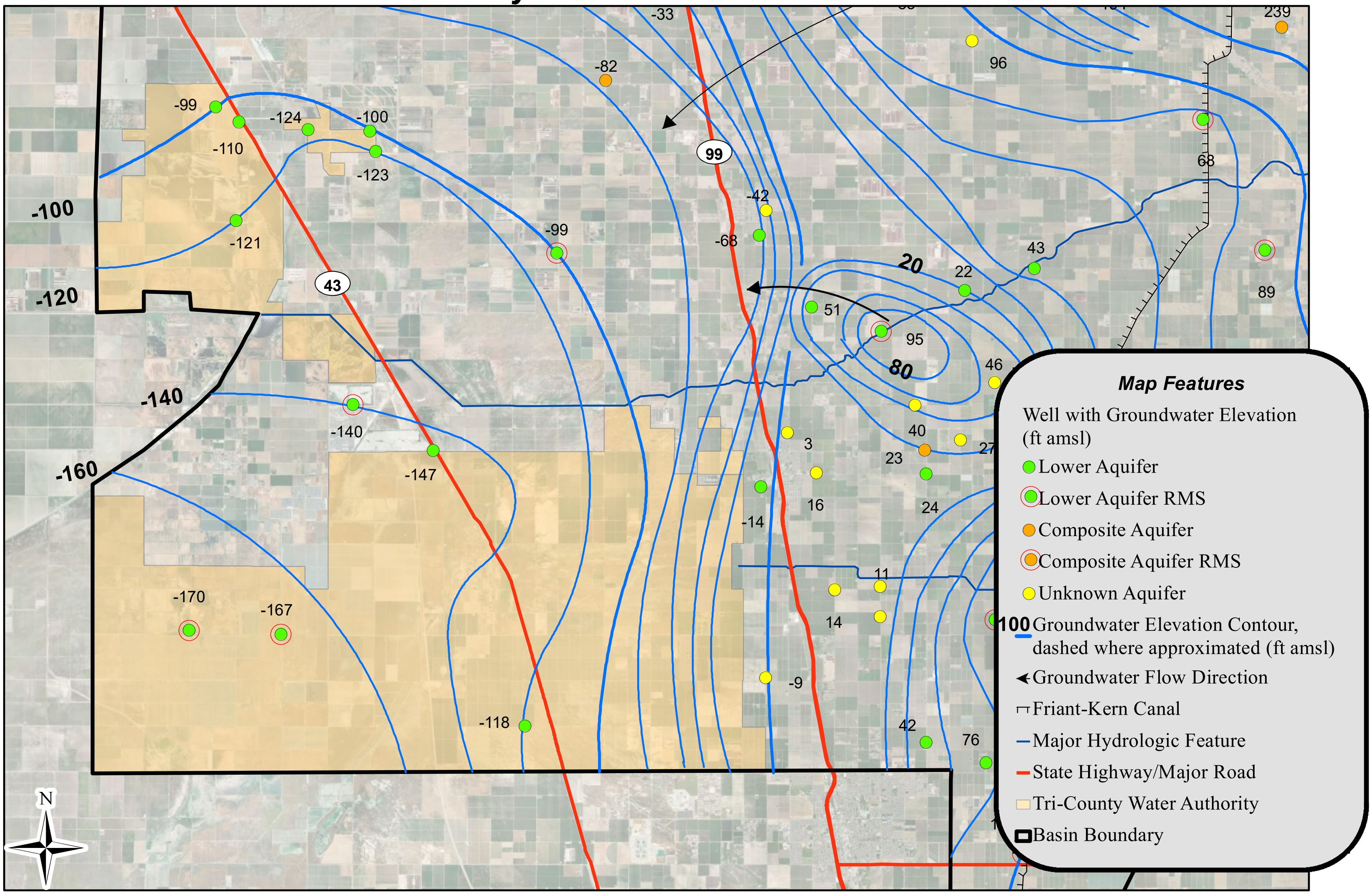
2022/2023 Annual Report
March 2024



Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer
Tie-County Water Authority GSA
Appendix E
Figure 10

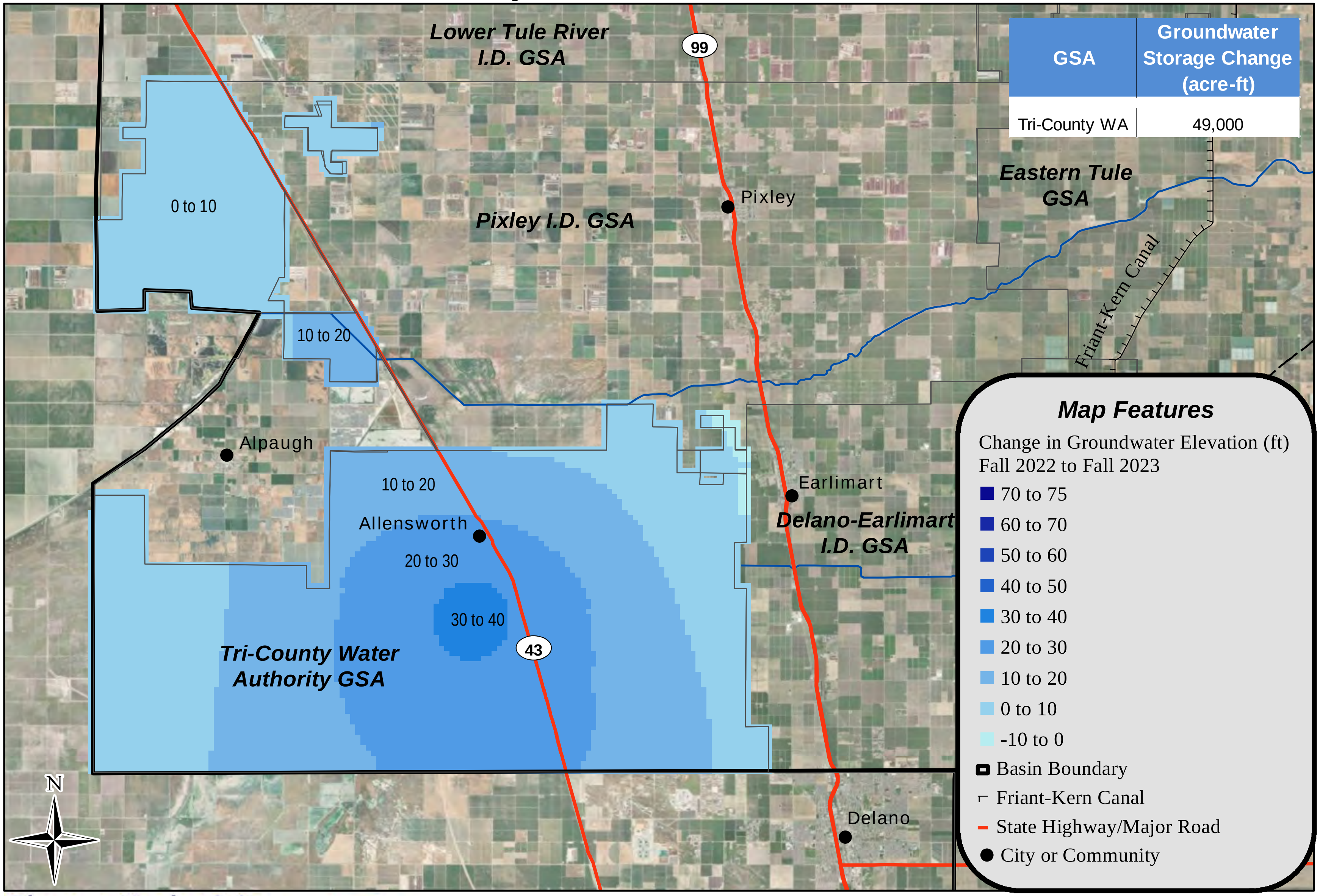


Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
Tri-County Water Authority GSA
Appendix E
Figure 11

GSA	Groundwater Storage Change (acre-ft)
Tri-County WA	49,000



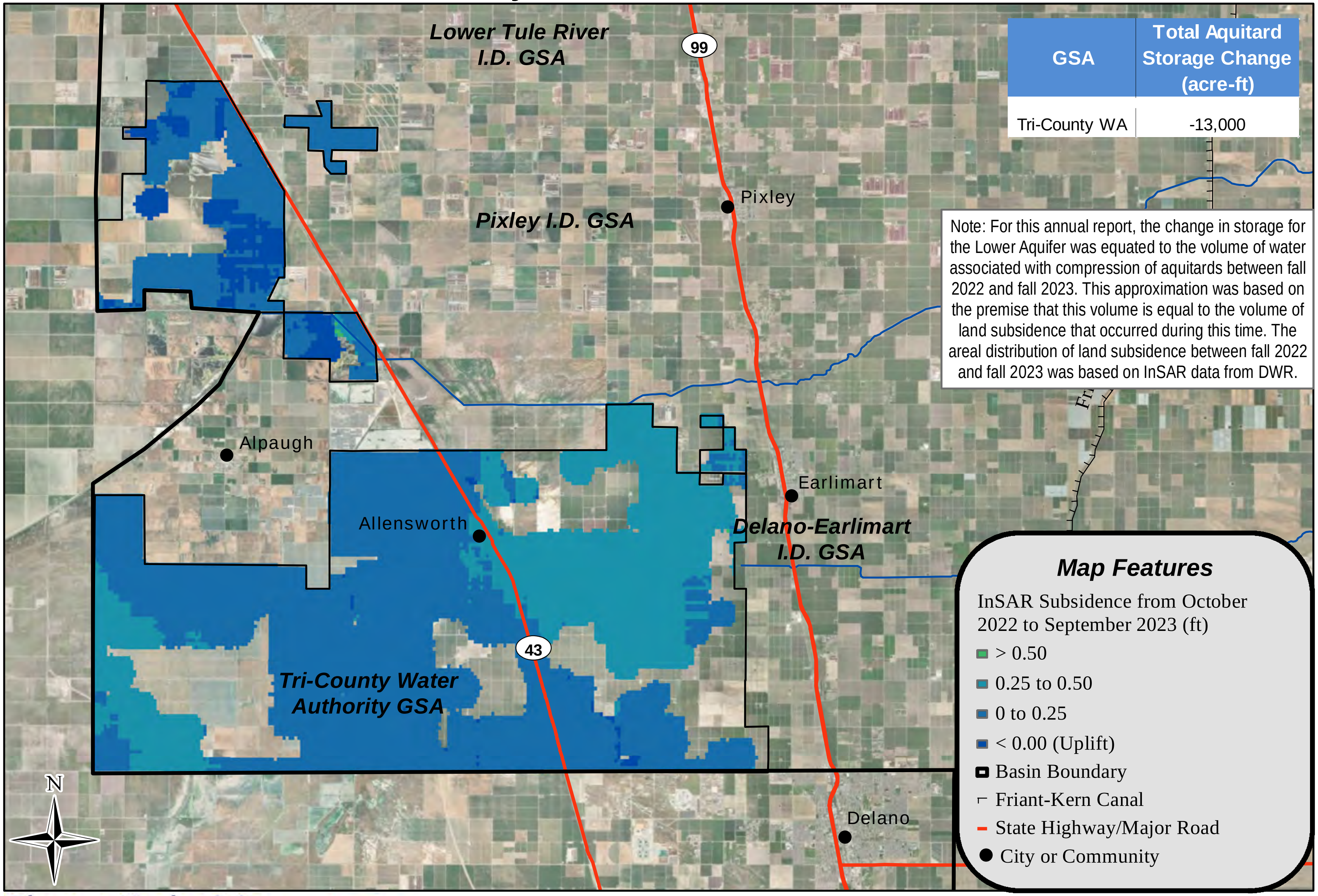
Thomas Harder & Co.
Groundwater Consulting

Change in Groundwater Elevation Fall 2022 to Fall 2023 - Upper Aquifer Tri-County Water Authority GSA

Appendix E
Figure 12

GSA	Total Aquitard Storage Change (acre-ft)
Tri-County WA	-13,000

Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.



Thomas Harder & Co.
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage as Estimated from Land Subsidence - Fall 2022 to Fall 2023
Tri-County Water Authority GSA

Appendix E
Figure 13

Appendix F

Alpaugh Irrigation District GSA 2022/23 Annual Data

Alpaugh Irrigation District GSA
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
Alpaugh ID GSA	***Total***	***0***	***250***	***0***	***250***

Alpaugh Irrigation District GSA
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
Alpaugh ID GSA	***Total***	***18,400***	***2,900***	***0***	***0***	***13,800***	***35,100***

Alpaugh Irrigation District GSA
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
Alpaugh ID GSA	***Total***	***250***	***35,100***	***0***	***0***	***35,350***

Alpaugh Irrigation District GSA
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
Alpaugh ID GSA	*Total*	*31,800*	*250*	*3,000*	*0*	*300*	*35,350*

Alpaugh Irrigation District GSA
Land Surface Elevations at Representative Monitoring Sites

Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
A0013_B_RMS	196.8	195.5	189.6	187.9
A0017_B_RMS	204.4	203.8	199.1	198.0
A0018_B_RMS	196.1	195.7	192.2	191.2
A0019_B_RMS	192.3	191.3	186.9	185.9
A0020_B_RMS	195.1	190.4	189.5	188.5

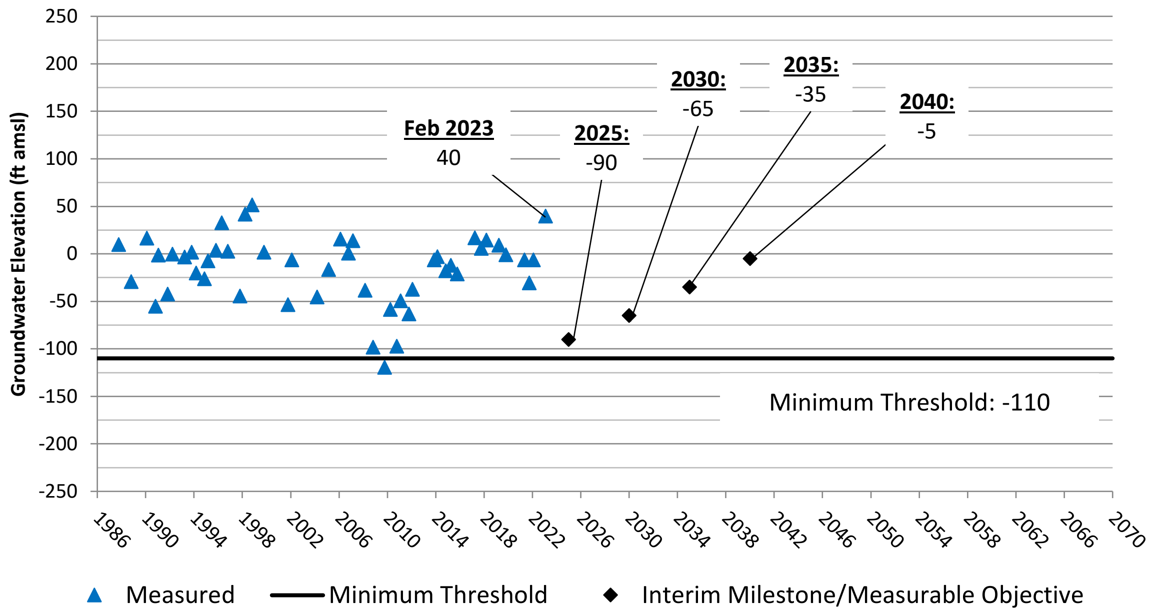
Notes:

N/A = Not available

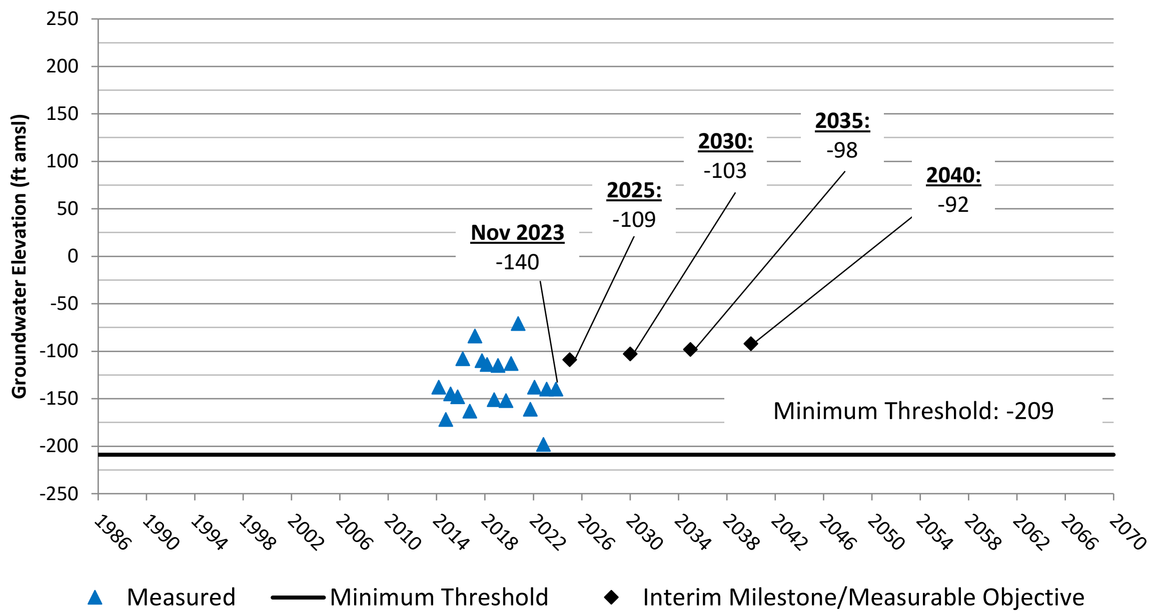
[1] Benchmarks surveyed in July and August of each year.

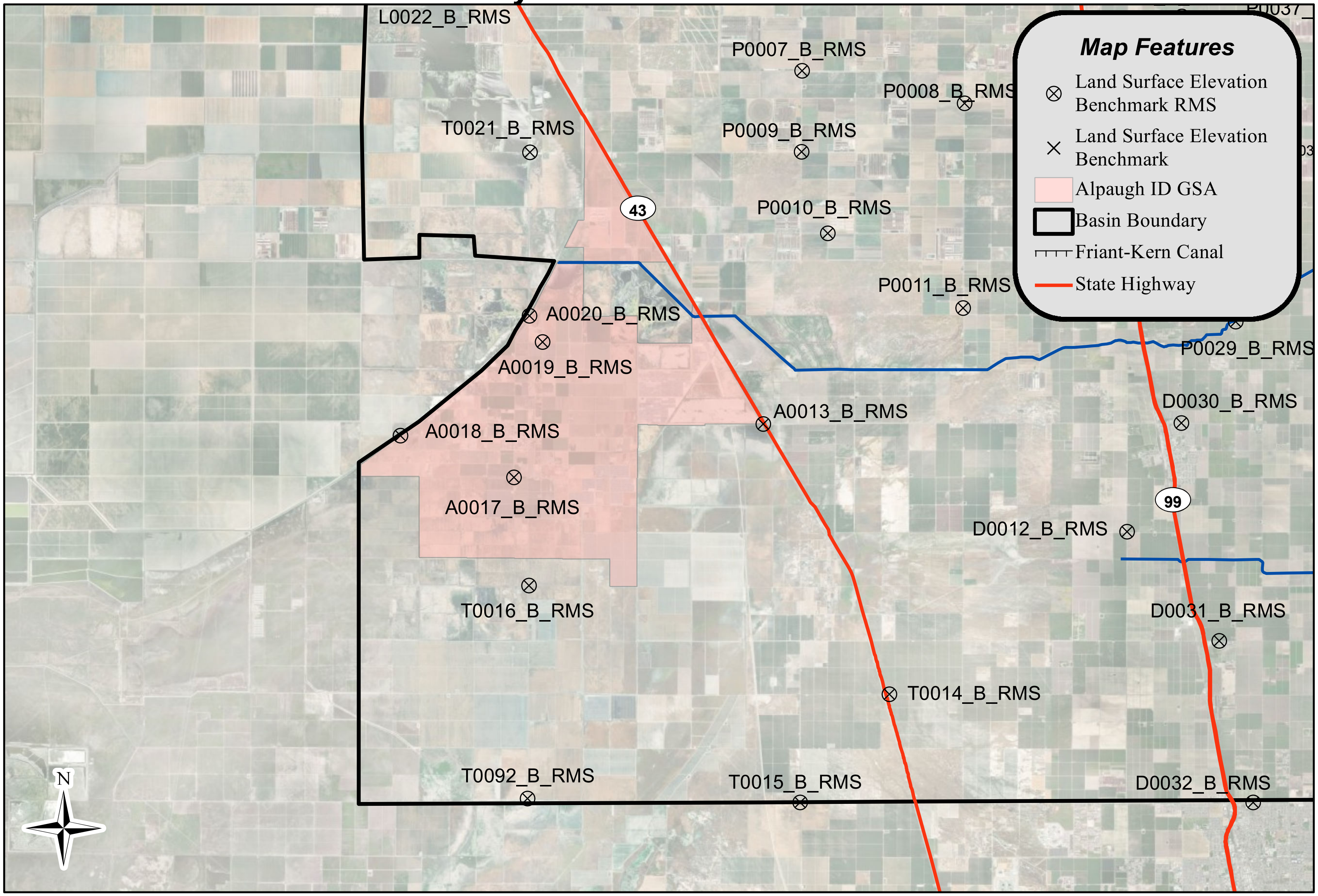
Alpaugh Irrigation District GSA
RMS Groundwater Elevation Hydrographs

23S/23E-25N01 (Lower)
Alpaugh GSA



Well 55 (Lower)
Alpaugh GSA



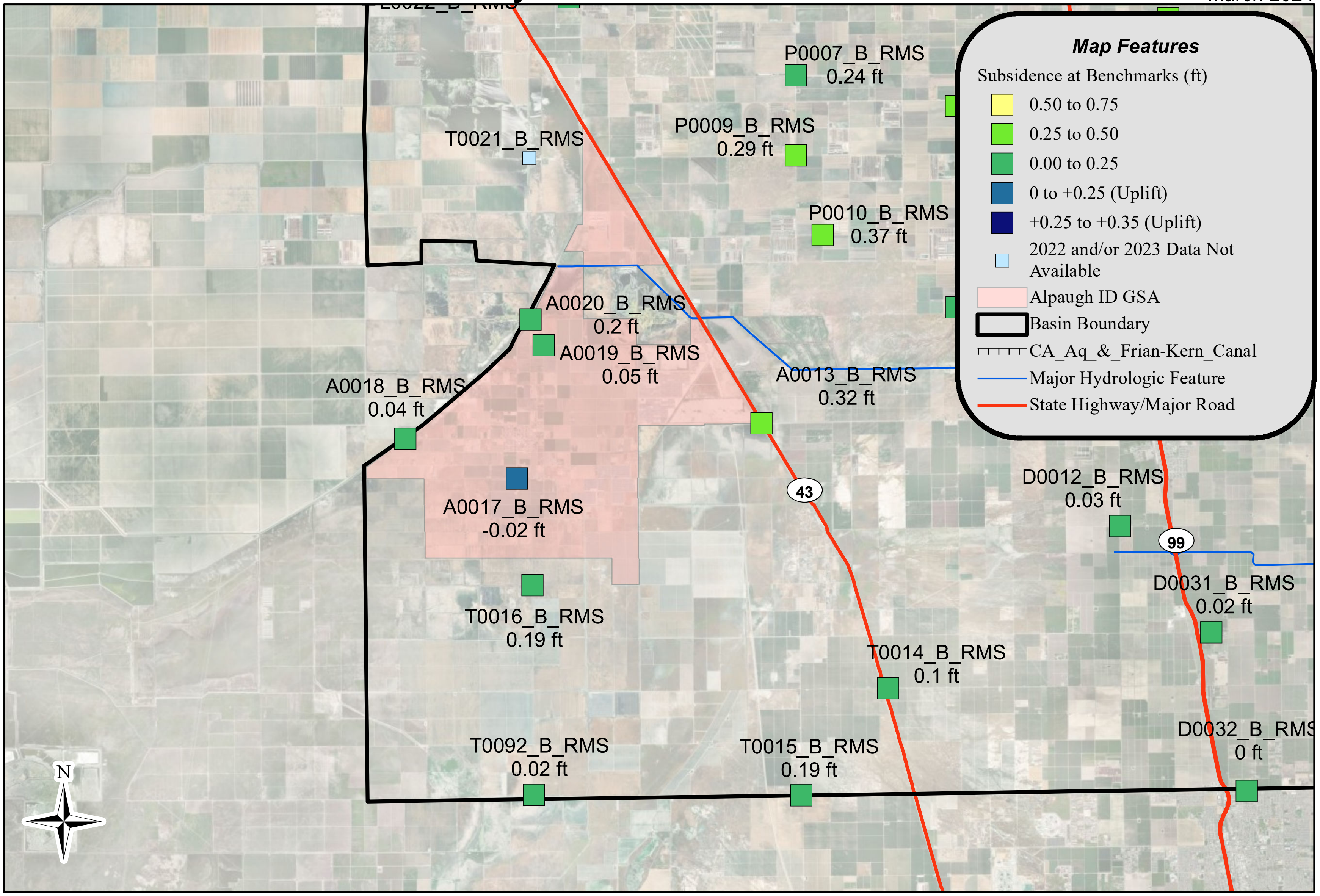


Thomas Harder & Co.
Groundwater Consulting

0 1 2 4 Miles
NAD 83 State Plane Zone 4

Land Surface Elevation Monitoring Network Alpaugh I.D. GSA GSA

Appendix F
Figure 2



Thomas Harder & Co.
Groundwater Consulting

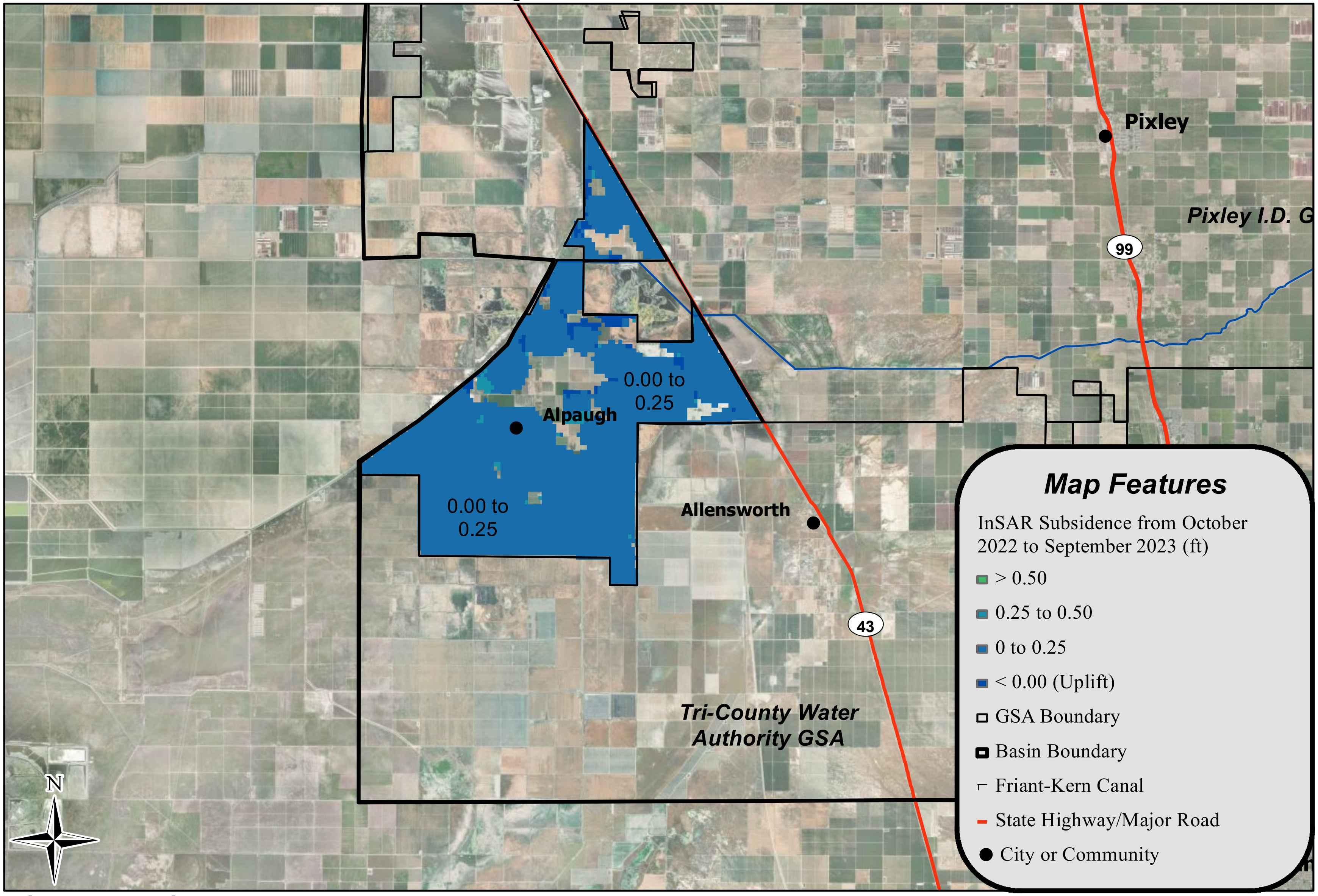
Data from Tule Subbasin Monitoring Network. Fall 2023 data was used if Summer 2023 data was not available.

0 1 2 4 Miles
NAD 83 State Plane Zone 4

Land Subsidence - July 2022 to July 2023 Alpaugh I.D. GSA

Appendix F
Figure 3

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

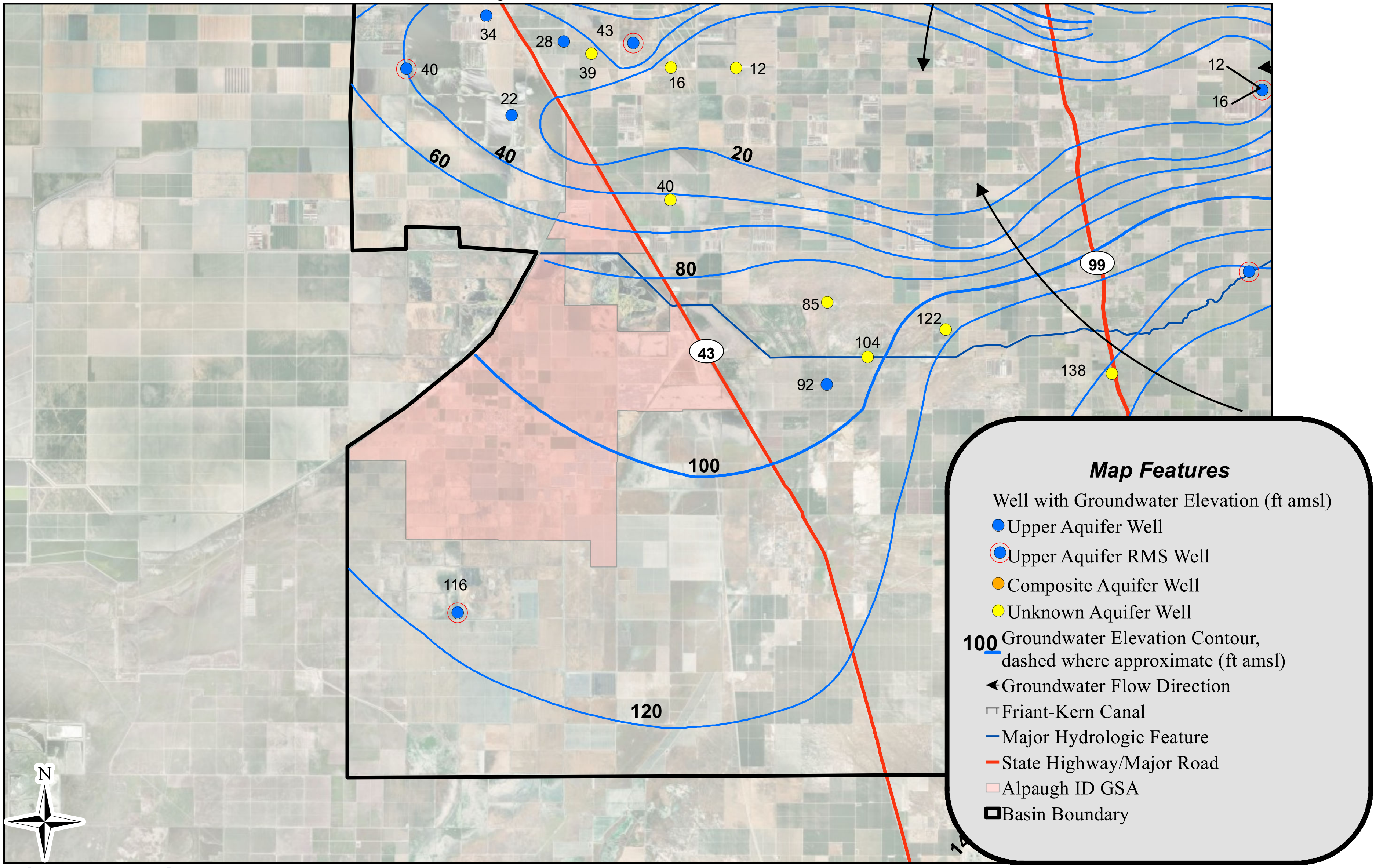
InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Land Subsidence - Fall 2022 to Fall 2023 Alpaugh I.D. GSA

Appendix F
Figure 4

2022/2023 Annual Report
March 2024

Tule Subbasin Technical Advisory Committee

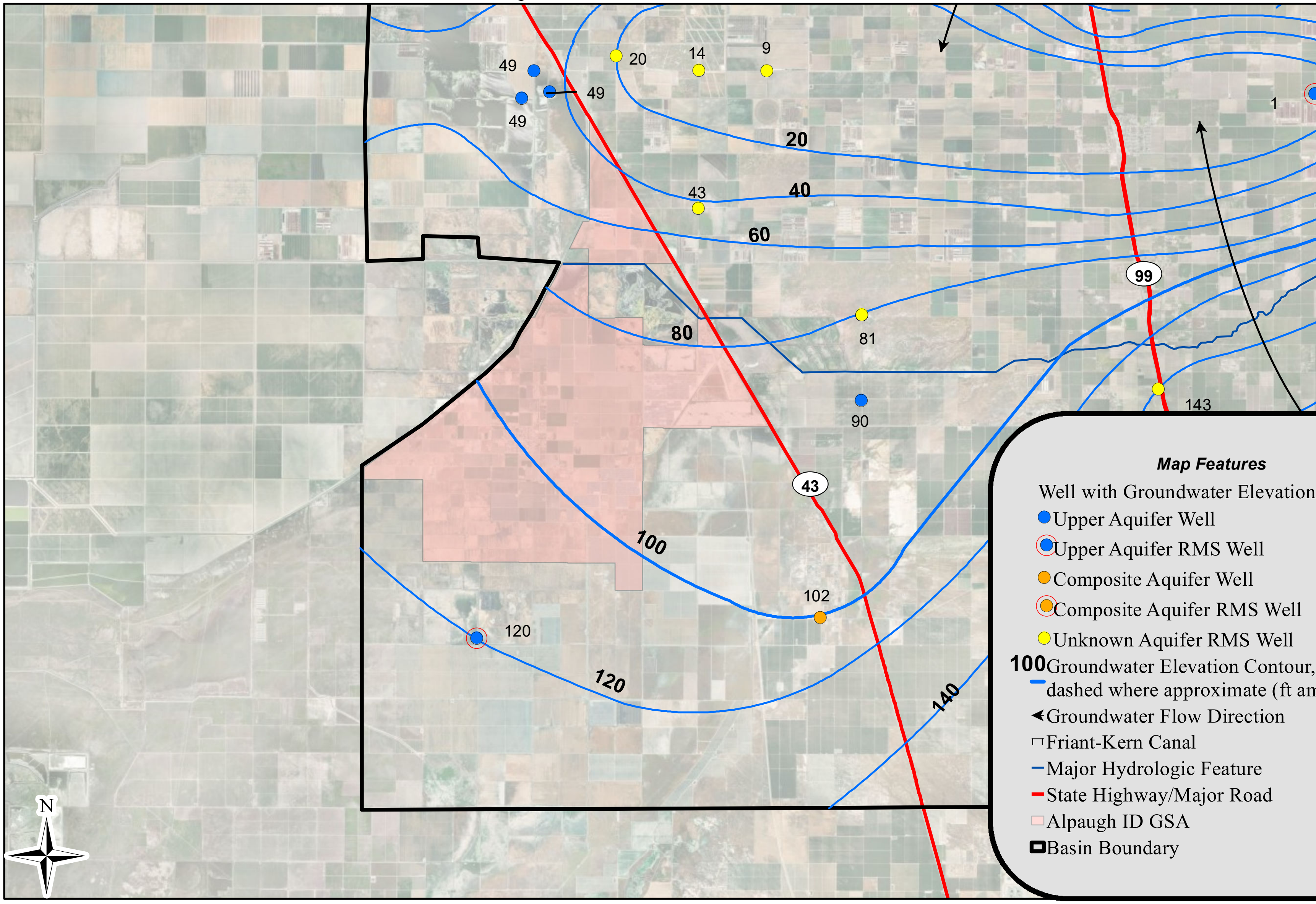


Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Upper Aquifer
Alpaugh I.D. GSA
Appendix F
Figure 5

Tule Subbasin Technical Advisory Committee



Map Features

Well with Groundwater Elevation (ft amsl)
- Upper Aquifer Well
- Upper Aquifer RMS Well
- Composite Aquifer Well
- Composite Aquifer RMS Well
- Unknown Aquifer RMS Well
- 100 Groundwater Elevation Contour, dashed where approximate (ft amsl)
- Groundwater Flow Direction
- Friant-Kern Canal
- Major Hydrologic Feature
- State Highway/Major Road
- Alpaugh ID GSA
- Basin Boundary

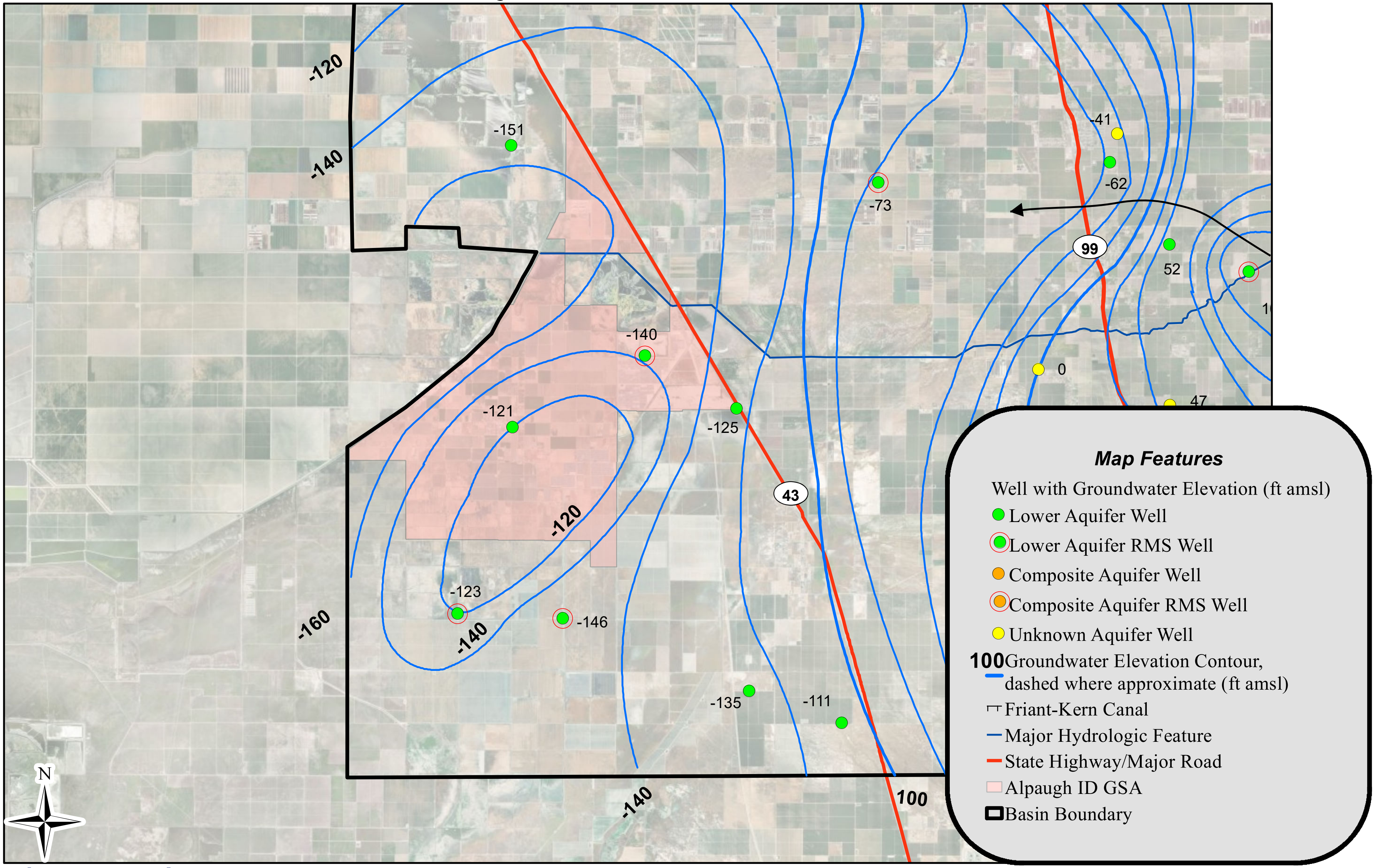
Thomas Harder & Co.
Groundwater Consulting

0 1 2 4 Miles
NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer
Alpaugh I.D. GSA
Appendix F
Figure 6

Tule Subbasin Technical Advisory Committee



Thomas Harder & Co.
Groundwater Consulting

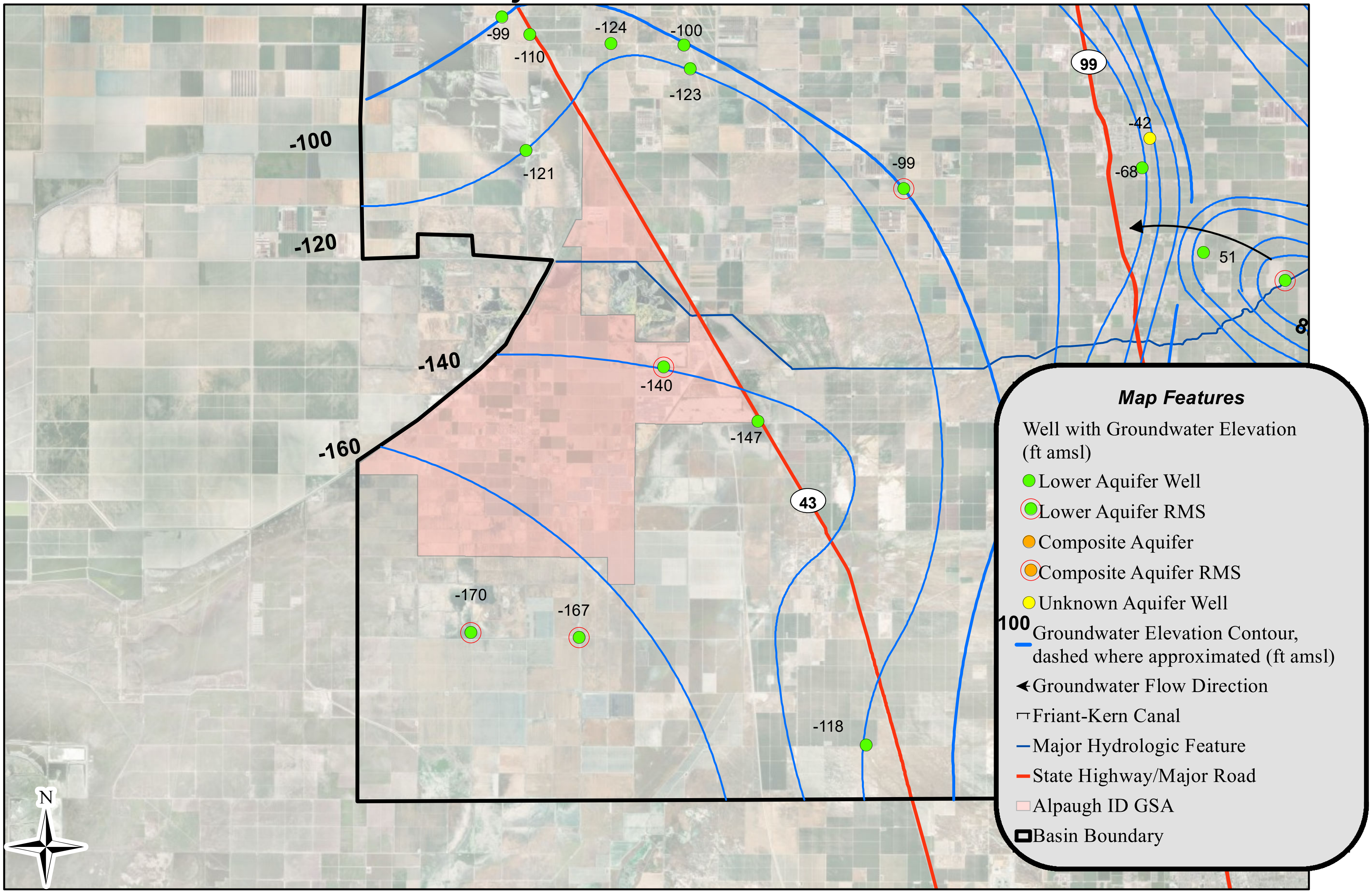
0 1 2 4 Miles

NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer
Alpaugh I.D. GSA
Appendix F
Figure 7

Tule Subbasin Technical Advisory Committee

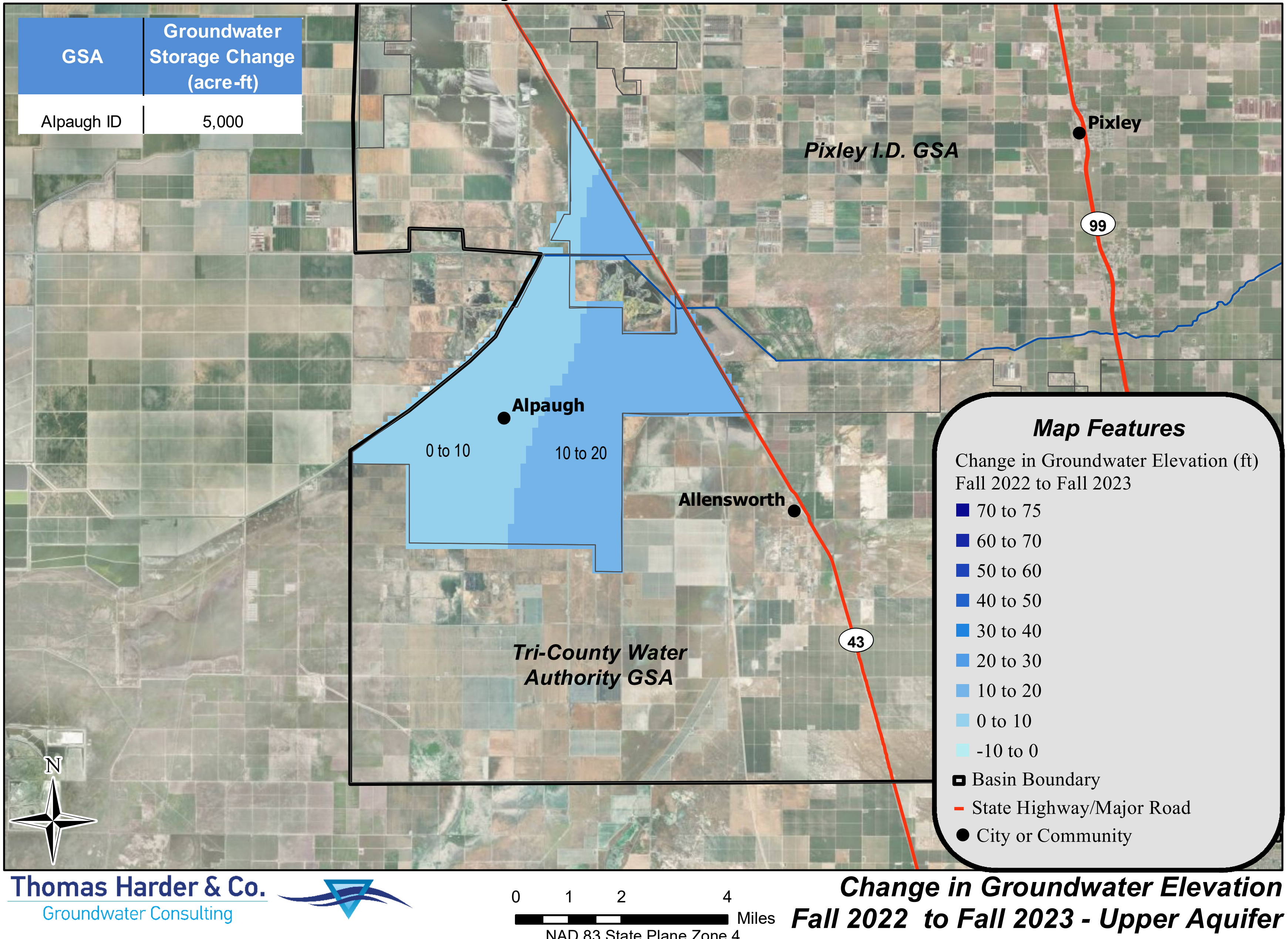


Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
Alpaugh I.D. GSA
Appendix F
Figure 8

Tule Subbasin Technical Advisory Committee



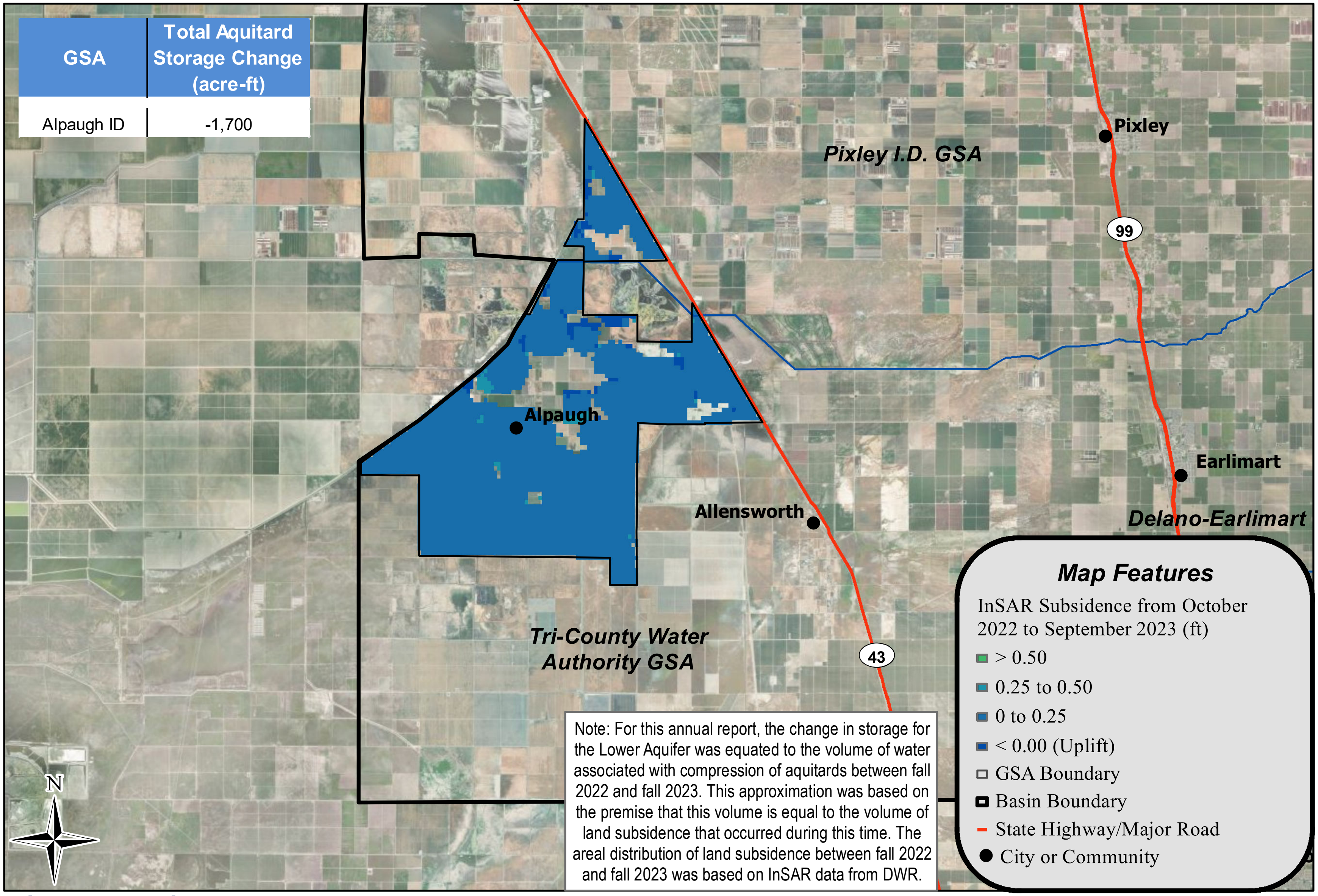
Thomas Harder & Co.
Groundwater Consulting

Change in Groundwater Elevation Fall 2022 to Fall 2023 - Upper Aquifer Alpaugh I.D. GSA

Appendix F
Figure 9

Tule Subbasin Technical Advisory Committee

GSA	Total Aquitard Storage Change (acre-ft)
Alpaugh ID	-1,700



Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.

Thomas Harder & Co.
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
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https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Change in Lower Aquifer Storage as Estimated from Land Subsidence - Fall 2022 to Fall 2023
Alpaugh I.D. GSA

Appendix F
Figure 10

Appendix G

Kern-Tulare Watter District GSA 2022/23 Annual Data

Kern-Tulare Water District GSA
Groundwater Extraction for Water Year 2022/23

GSA	Management Area	Agricultural Pumping	Municipal Pumping	Pumping for Export	Total
KTWD GSA	***Total***	***2,400***	***0***	***0***	***2,400***

Kern-Tulare Water District GSA
Surface Water Supplies for Water Year 2022/23

GSA	Management Area	Stream Diversions	Imported Water	Recycled Water	Oilfield Produced Water	Precipitation	Total
KTWD GSA	***Total***	***0***	***11,000***	***0***	***1,200***	***10,500***	***22,700***

Kern-Tulare Water District GSA
Tule Subbasin Total Water Use by Source for Water Year 2022/23

GSA	Management Area	Groundwater Extraction	Surface Water Supplies	Recycled Water	Reused Water	Total
KTWD GSA	***Total***	***2,400***	***21,500***	***0***	***1,200***	***25,100***

Kern-Tulare Water District GSA
Tule Subbasin Total Water Use by Sector for Water Year 2022/23

GSA	Management Area	Agriculture	Urban	Managed Recharge	Native Vegetation	For Export	Total
KTWD GSA	***Total***	***25,100***	***0***	***0***	***0***	***0***	***25,100***

Kern - Tulare Water District GSA
Land Surface Elevations at Representative Monitoring Sites

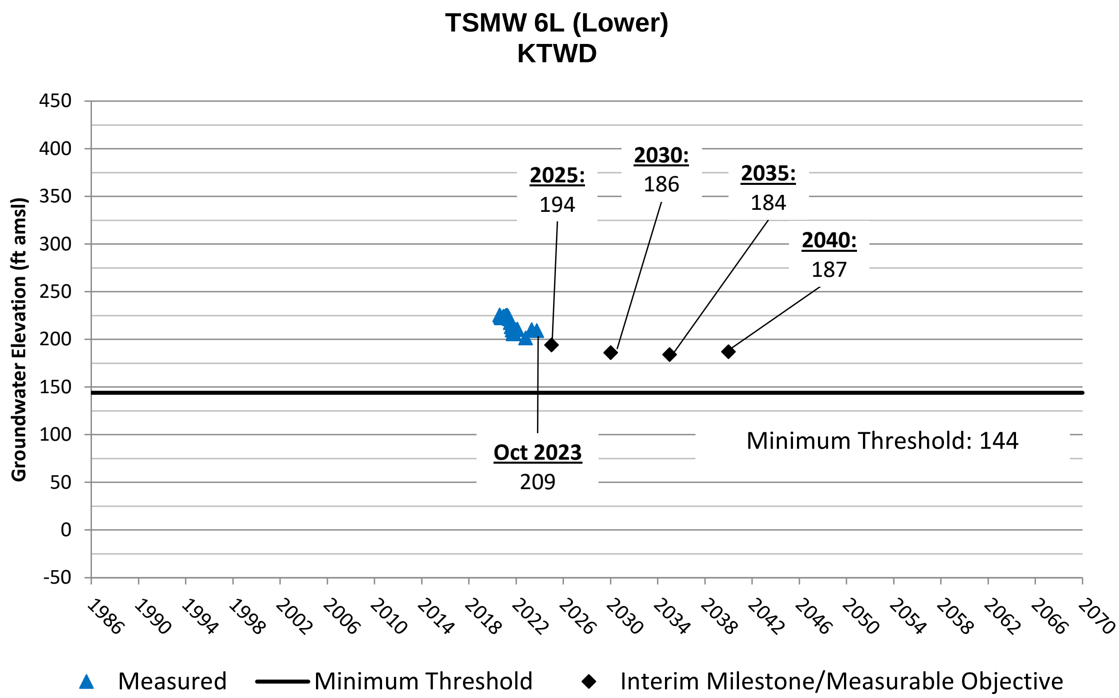
Site	Land Surface Elevation (ft amsl)[1]			
	2020 (Baseline)	2023	Measurable Objective	Minimum Threshold
E0088_B_RMS	457.5	457.1	456.8	455.8

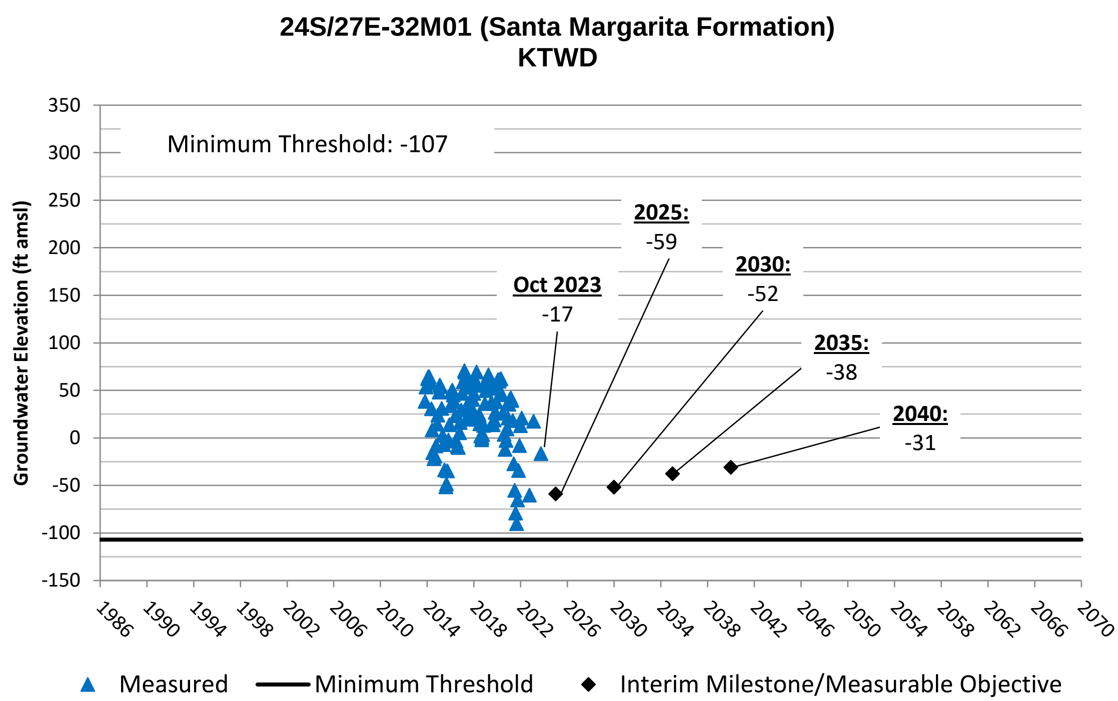
Notes:

N/A = Not available

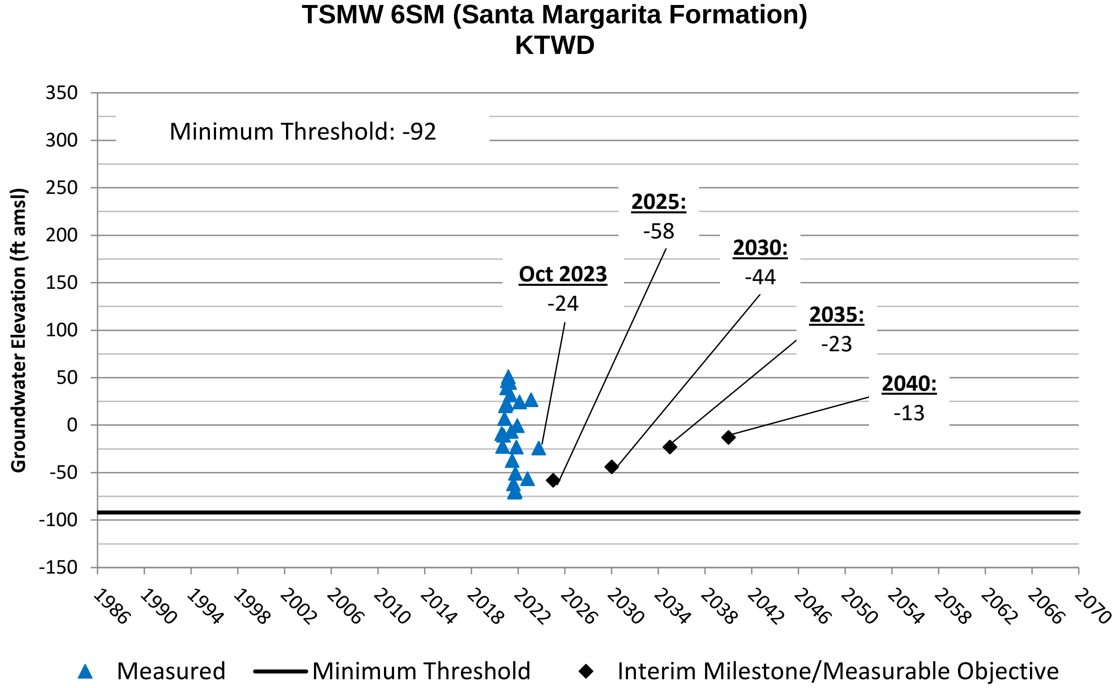
[1] Benchmarks surveyed in July and August of each year.

Kern-Tulare Water District GSA
RMS Groundwater Elevation Hydrographs

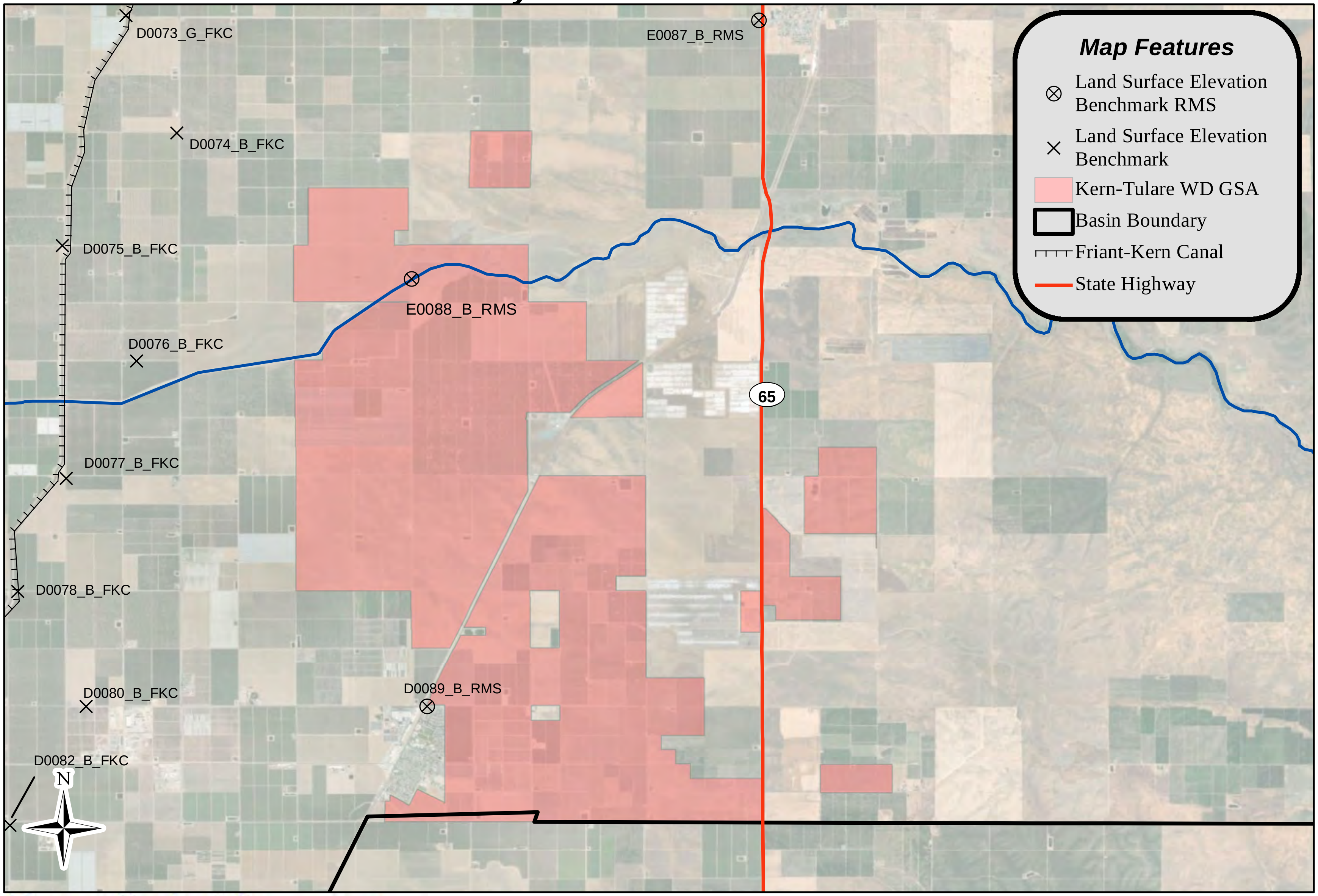




Kern-Tulare Water District GSA
RMS Groundwater Elevation Hydrographs



Tule Subbasin Technical Advisory Committee



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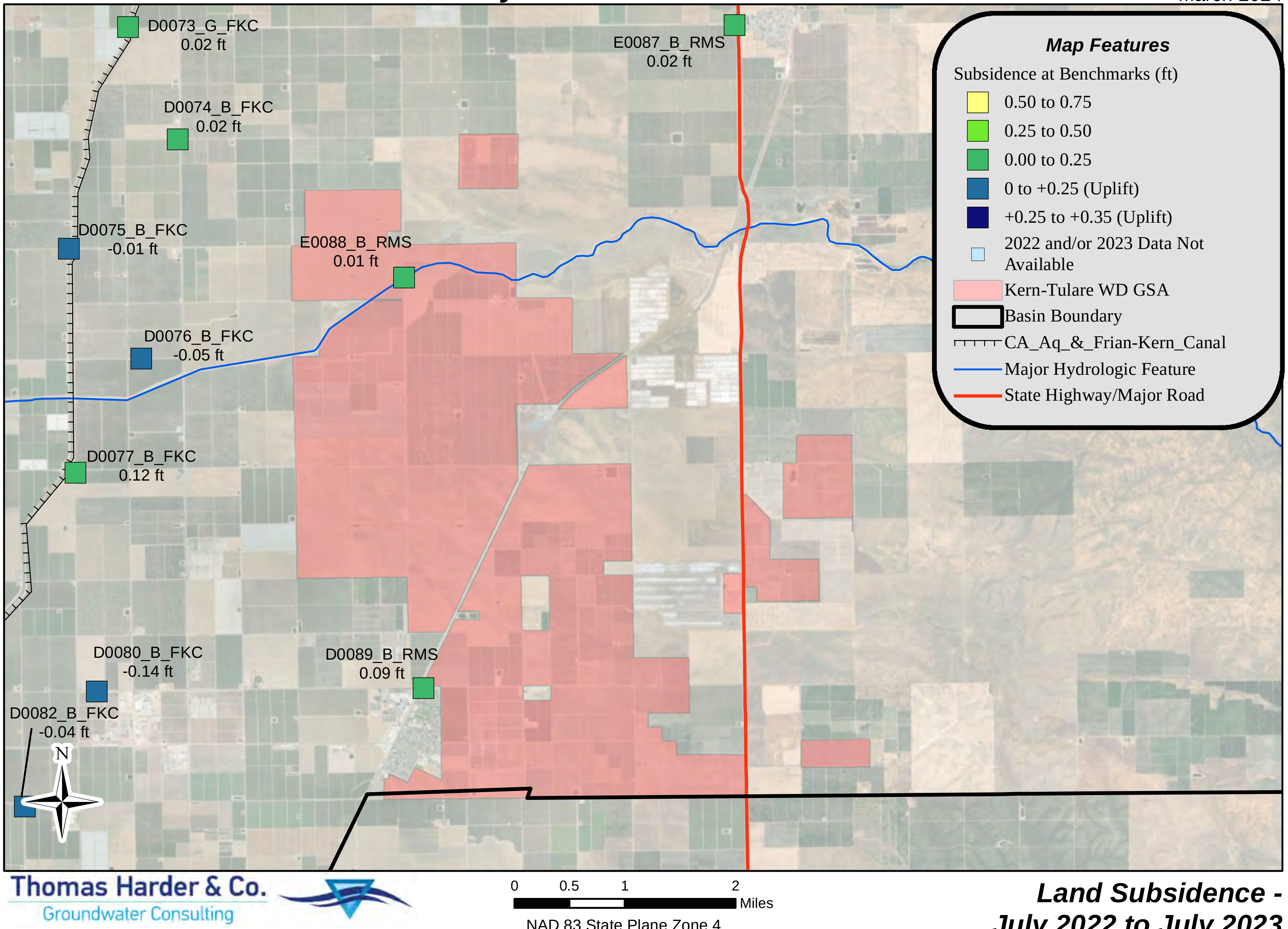
Land Surface Elevation Monitoring Network
Kern-Tulare W.D. GSA

Appendix G
Figure 3

Tule Subbasin Technical Advisory Committee

2022/2023 Annual Report

March 2024



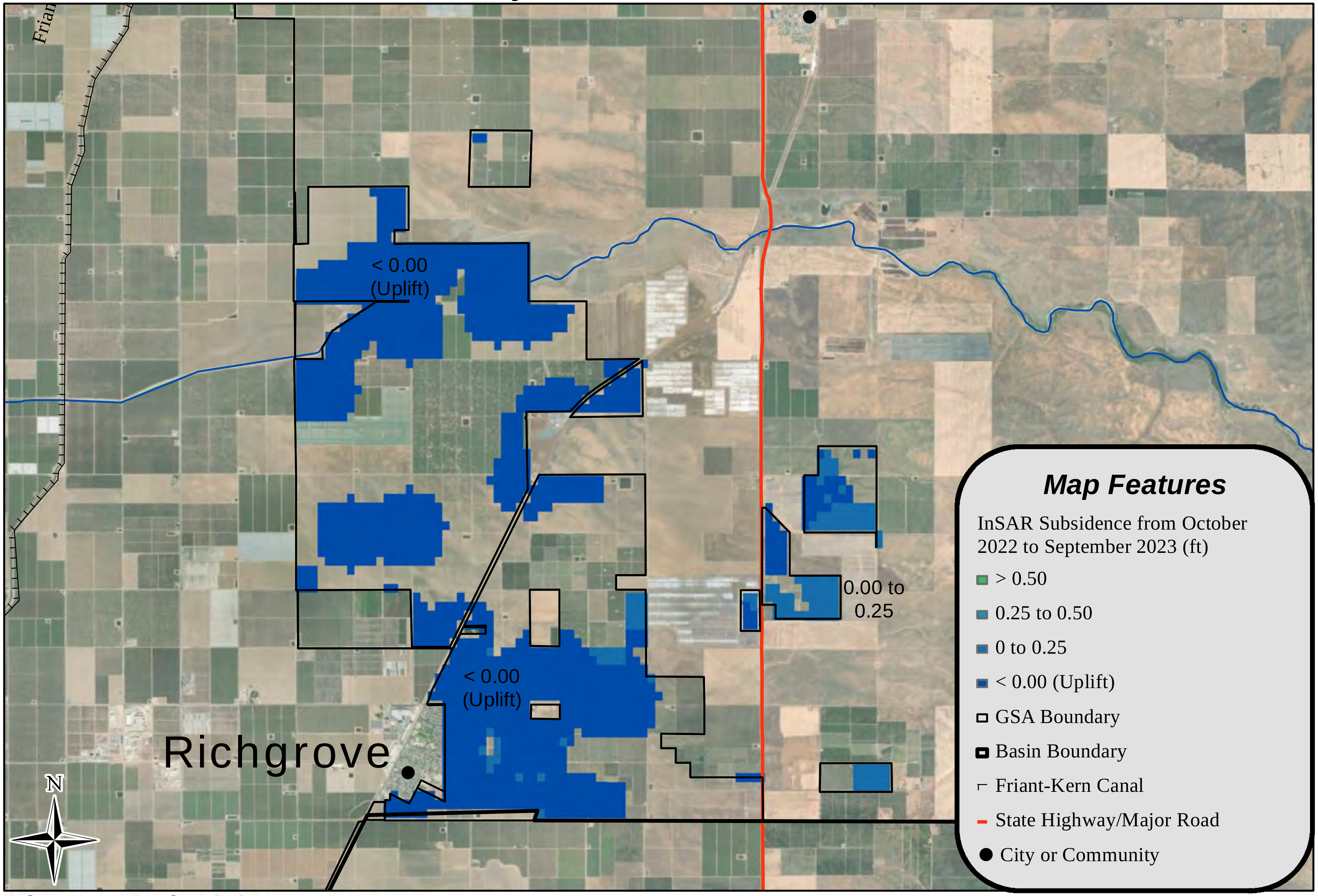
Thomas Harder & Co.
Groundwater Consulting

Data from Tule Subbasin Monitoring Network. Fall 2023 data was used if Summer 2023 data was not available.

Land Subsidence - July 2022 to July 2023 Kern-Tulare W.D. GSA

Appendix G

Figure 4

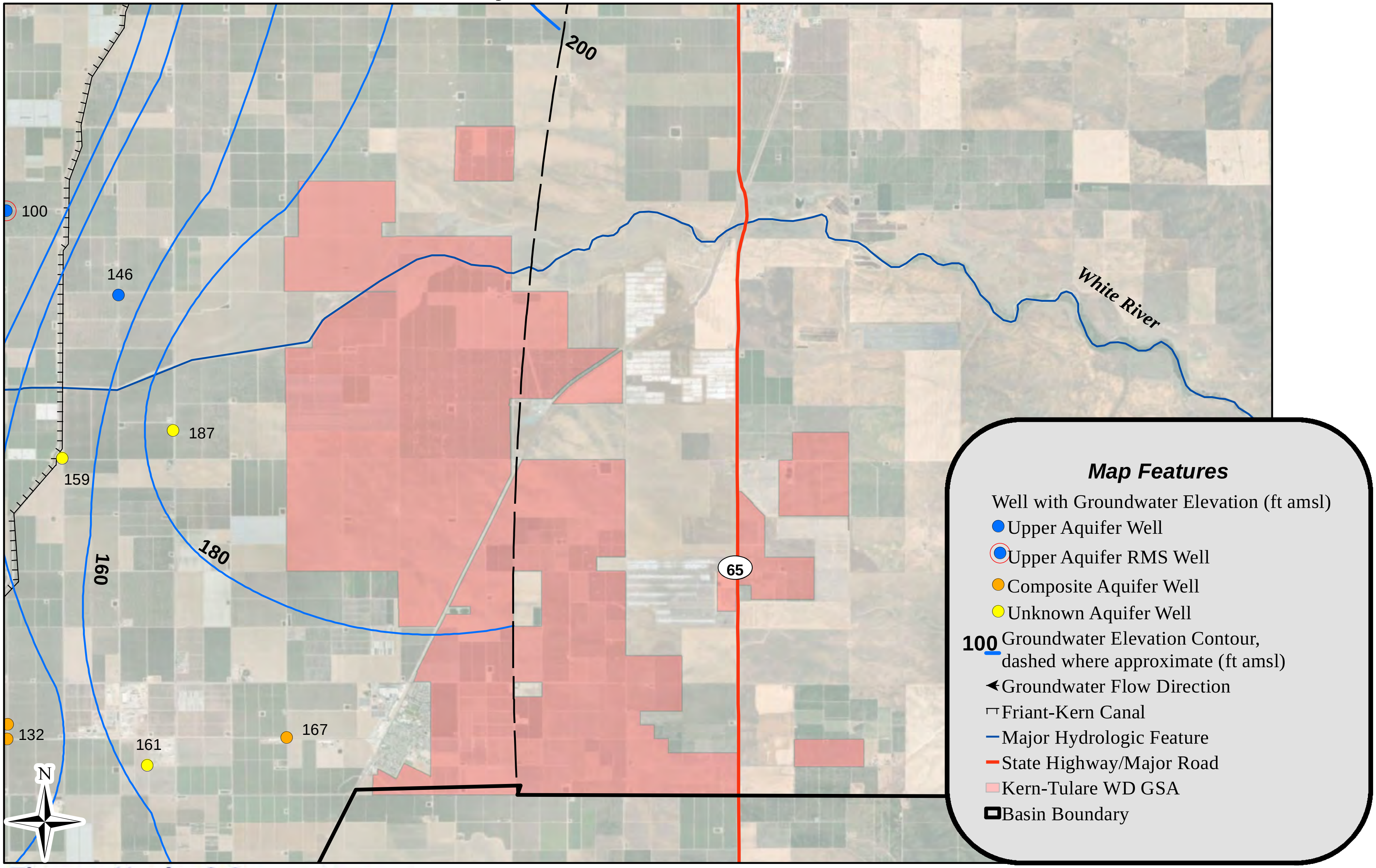


Thomas Harder & Co.
Groundwater Consulting

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

Land Subsidence - Fall 2022 to Fall 2023
Kern-Tulare W.D. GSA

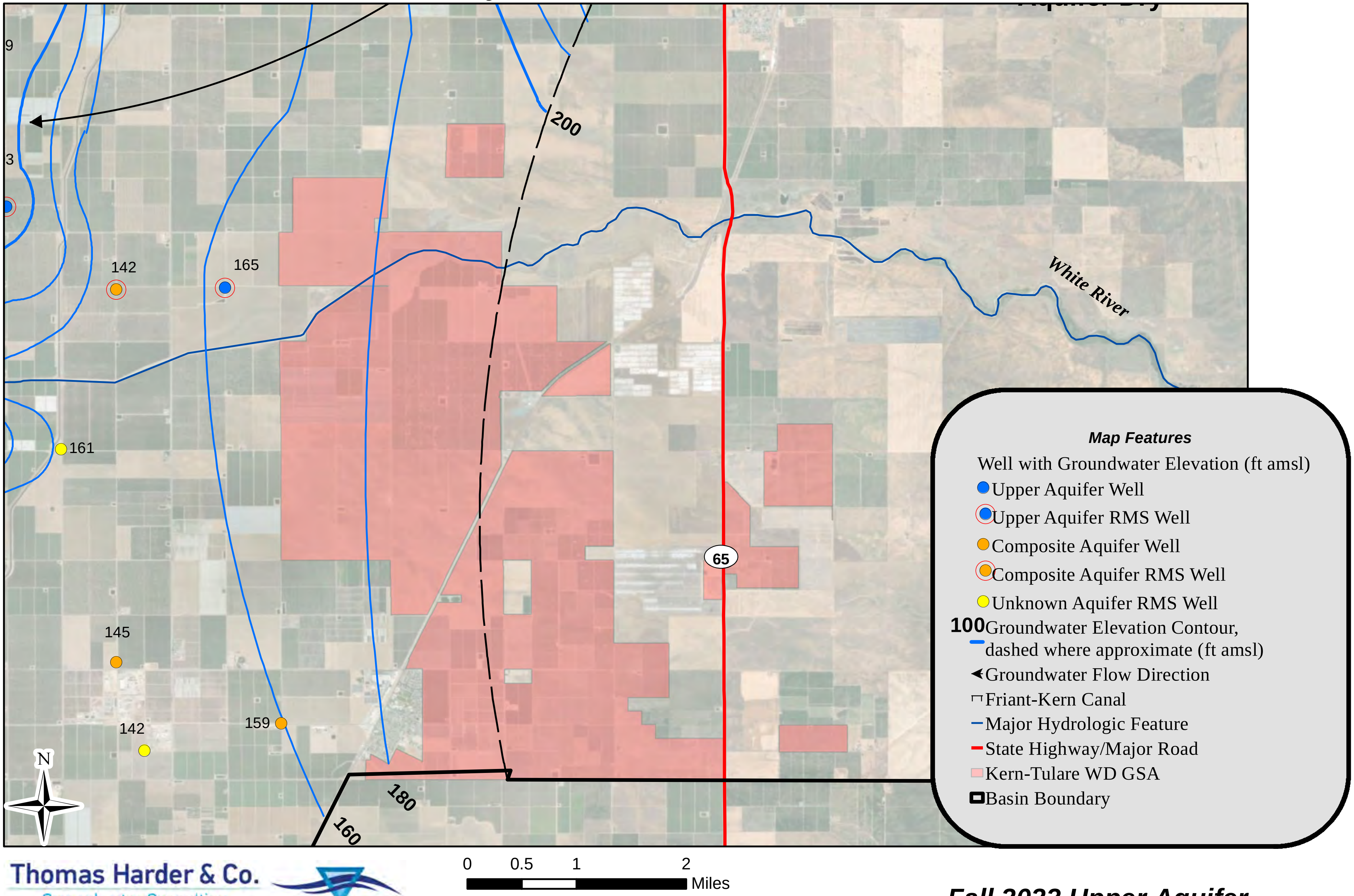
Appendix G
Figure 5



Thomas Harder & Co.
Groundwater Consulting

NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Upper Aquifer
Kern-Tulare W.D. GSA
Appendix G
Figure 6



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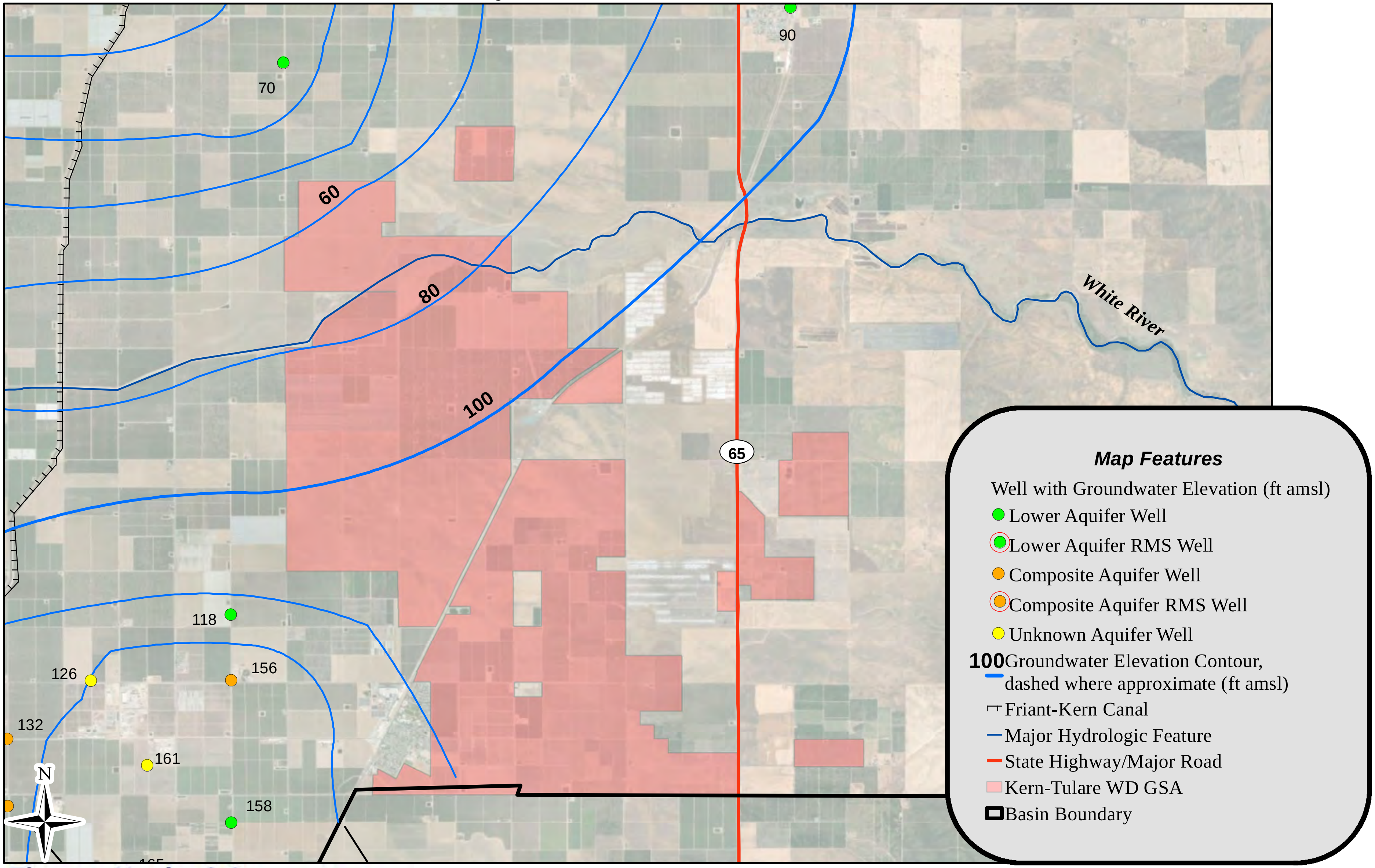
NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Upper Aquifer
Kern-Tulare W.D. GSA
Appendix G
Figure 7



Thomas Harder & Co.
Groundwater Consulting

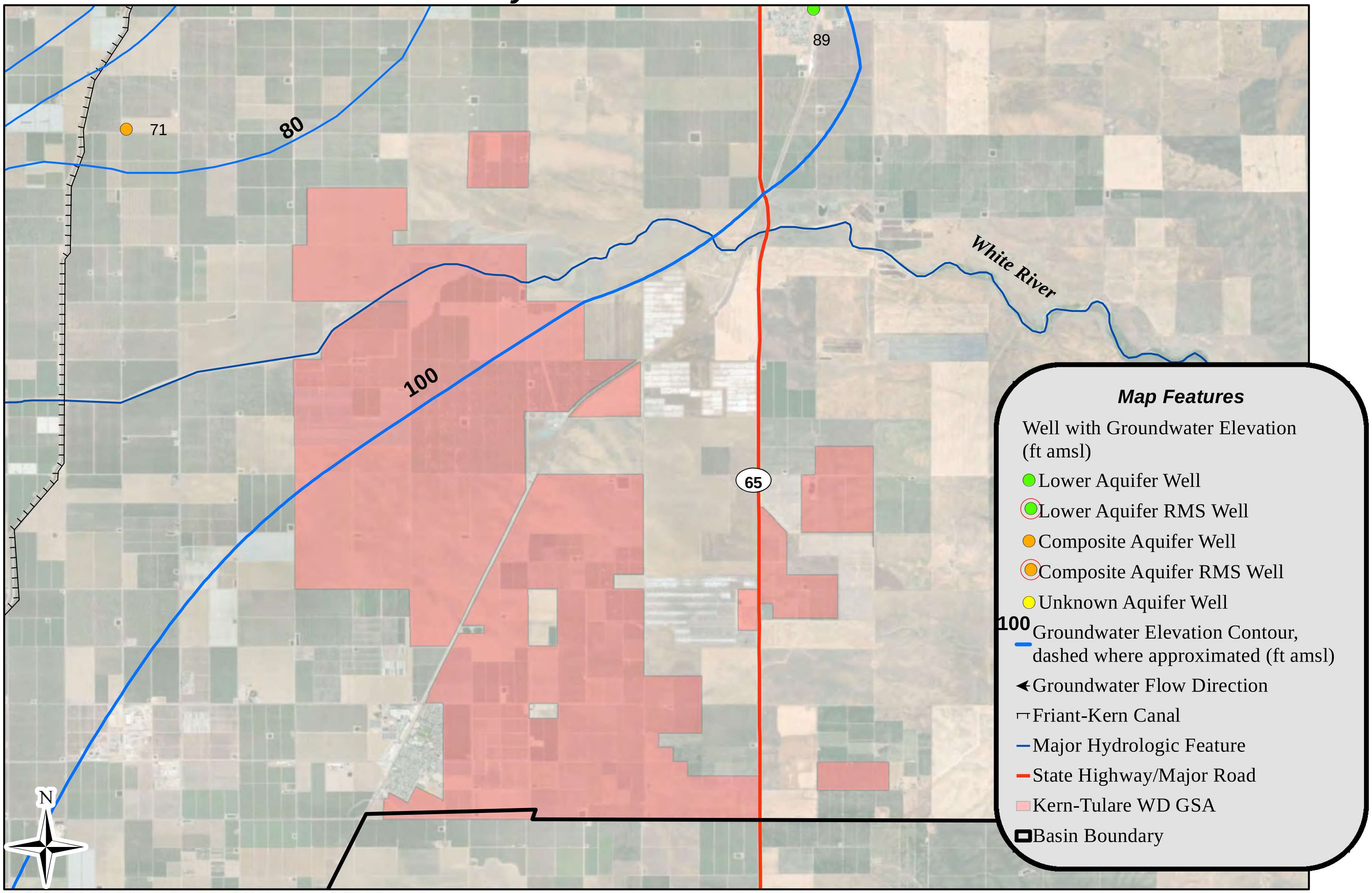
0 0.5 1 2 Miles

NAD 83 State Plane Zone 4

Note: All groundwater elevations are in feet above mean sea level.

Spring 2023 Lower Aquifer
Kern-Tulare W.D. GSA
Appendix G
Figure 8

Tule Subbasin Technical Advisory Committee



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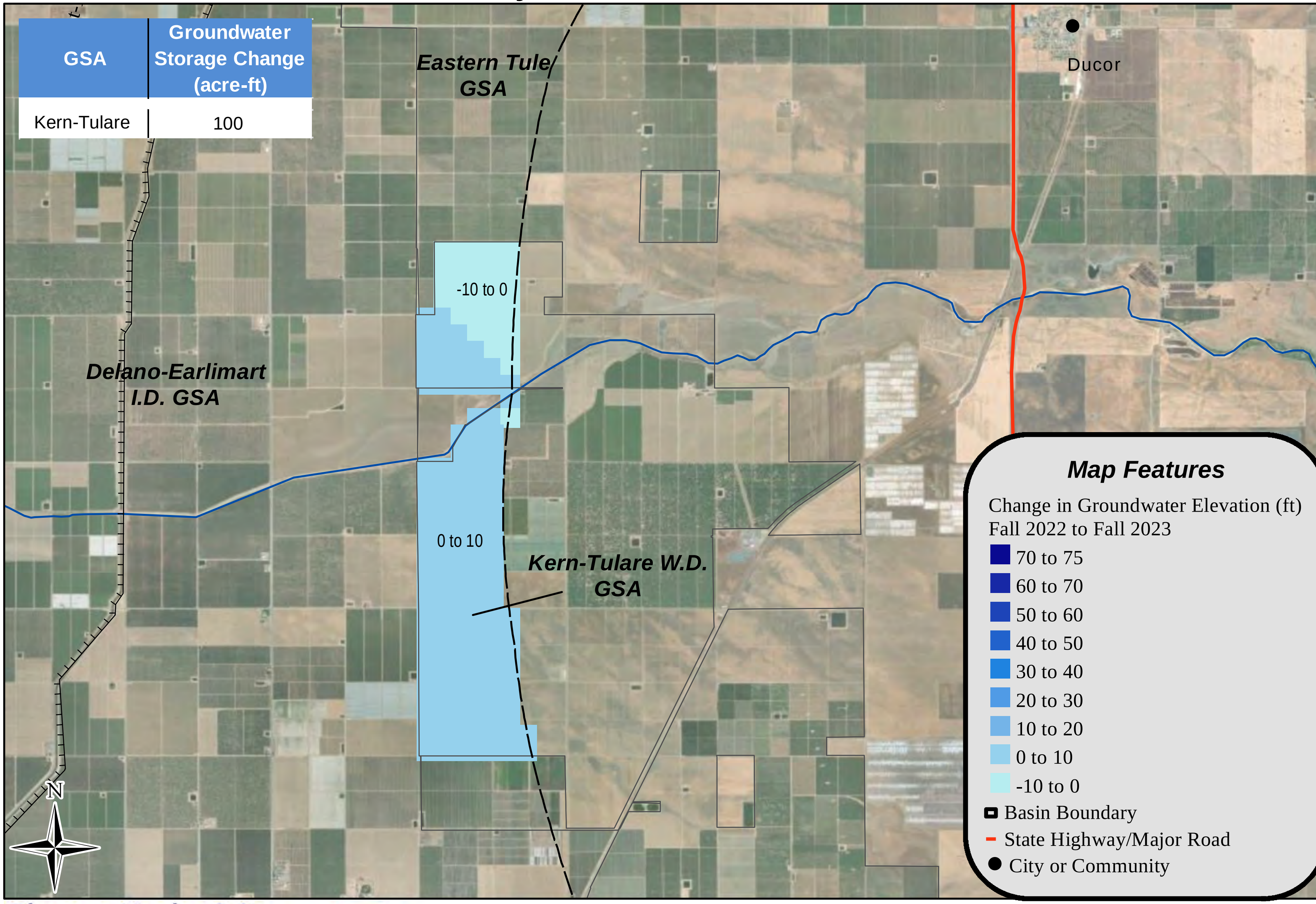
NAD 83 State Plane Zone 4
Note: All groundwater elevations are in feet above mean sea level.

Fall 2023 Lower Aquifer
Kern-Tulare W.D. GSA
Appendix G
Figure 9

GSA	Groundwater Storage Change (acre-ft)
Kern-Tulare	100



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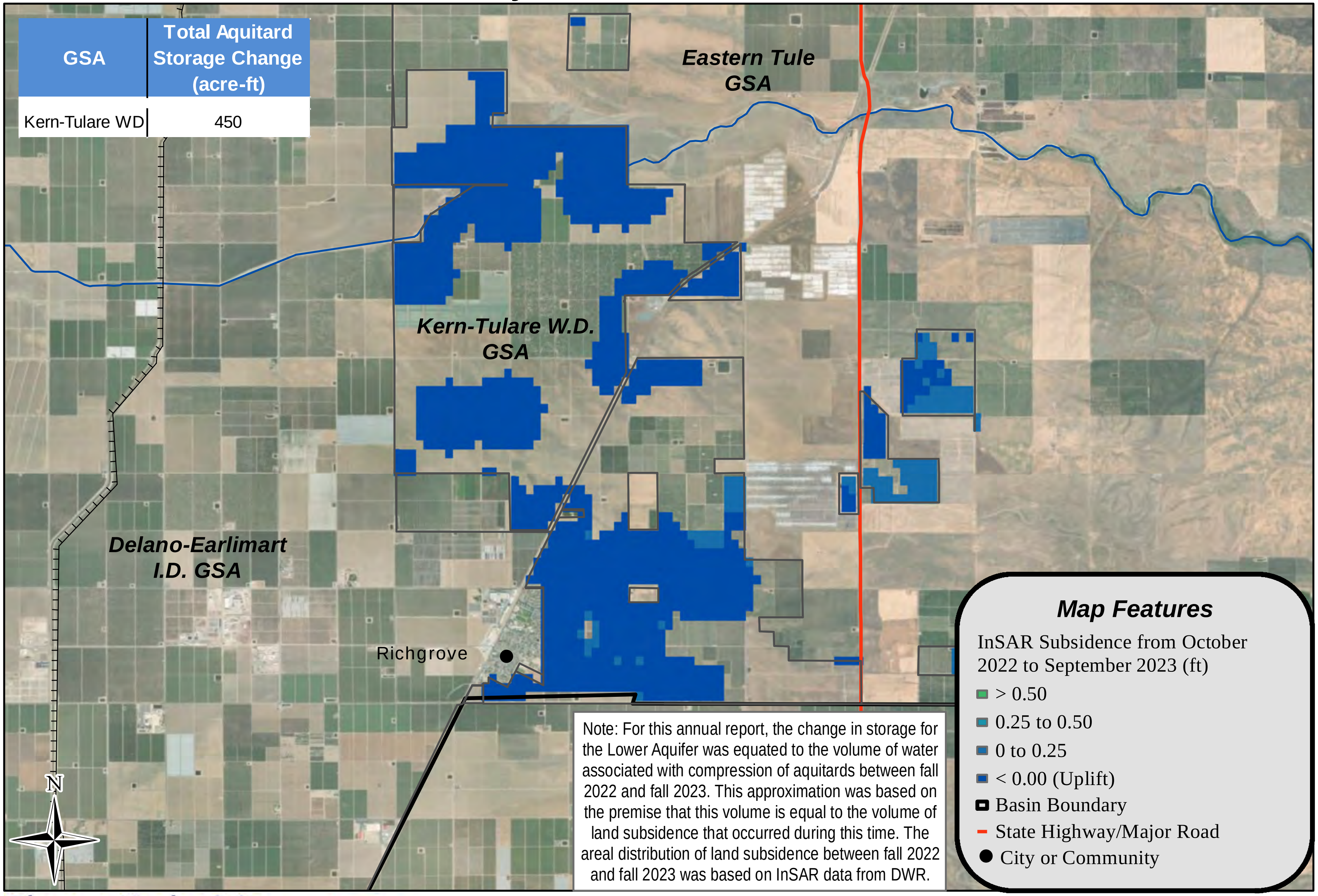
Change in Groundwater Elevation Fall 2022 to Fall 2023 - Upper Aquifer Kern-Tulare W.D. GSA

Appendix G
Figure 10

Tule Subbasin Technical Advisory Committee

GSA	Total Aquitard Storage Change (acre-ft)
Kern-Tulare WD	450



Note: For this annual report, the change in storage for the Lower Aquifer was equated to the volume of water associated with compression of aquitards between fall 2022 and fall 2023. This approximation was based on the premise that this volume is equal to the volume of land subsidence that occurred during this time. The areal distribution of land subsidence between fall 2022 and fall 2023 was based on InSAR data from DWR.

Thomas Harder & Co.
Groundwater Consulting

Change in Lower Aquifer Storage as Estimated from Land Subsidence - Fall 2022 to Fall 2023
Kern-Tulare W.D. GSA

Appendix F
Figure 11

InSAR data from:
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20221001/ImageServer
and
https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_Total_Since_20150613_20231001/ImageServer

ATTACHMENT 2: PIXID GSA RULES AND OPERATING POLICIES

PIXLEY IRRIGATION DISTRICT
GROUNDWATER SUSTAINABILITY AGENCY
POLICIES

Table of Contents

POLICY 1: WATER MEASUREMENT & METERING

The landowners within the GSA utilize both surface water and groundwater to meet the needs of the business operations and producing agricultural products. A key component to manage the sustainability of groundwater is to measure quantitatively the total amount of water used by each landowner within the GSA. This will allow the GSA to track groundwater water usage by landowner, which can then be correlated to the amounts allowed to achieve sustainability. The GSA will utilize satellite imagery to determine crop demands at the landowner level.

Per the Pixley Irrigation District Surface Water Allocation Policy, adopted 8/8/19, the District has determined that imported surface water should be allocated proportionally to lands within the District on an annual basis. Since not all lands in the District are connected to the District canal system, the District policy is to accomplish such an allocation by annually allocating surface water as groundwater credits. Surface water, once actually delivered to lands with access to the District canal system and consumed by those lands through crop production would then be accounted for as a reduction against their allocated groundwater credits.

Total Crop Demand (Evapotranspiration or ET) is calculated by a third party, using NASA Landsat satellite imagery.

Consumption, based on the ET calculations will be tracked and will be available in the following sequencing:

i. Precipitation Yield
ii. Sustainable Yield
iii. District allocated groundwater credits (per surface water allocation policy)
iv. Transitional groundwater credits**
v. Landowner developed groundwater credits**

**The sequencing of the Transitional water credits and Landowner developed groundwater credits can be switched at the landowner's discretion.

The satellite imagery used to determine the ET values, will be audited by the GSA through spot checking land use for cropping patterns and compared to available District metered data.

POLICY 2: GROUNDWATER BANKING AT LANDOWNER LEVEL

Irrigation District Recharge

The irrigation district oversees and manages the surface water for the district, separate and apart for the Groundwater Sustainability Agency. The irrigation district recognizes the surface water supplied is very important to achieve groundwater sustainability and needed for the landowners to continue operations of their farms and that landowners need to be able to balance all of these resources to achieve sustainability under SGMA.

When Millerton Reservoir is in flood control operations and surface water beyond what is needed to meet irrigation demands is available, the irrigation district will maximize the use of these surface waters and divert these waters into the natural waterways, open channel canals, and district-owned recharge basins. This will occur most often during above-average water years when those waters cannot be stored and are released from local reservoirs. The surface water diverted and recharged into groundwater into district-owned facilities is done to benefit all the landowners within the district without regard for specific credits under SGMA. Additionally, the irrigation district will continue to optimize the distribution systems to maximize the recharge of surface water while supplying surface water to landowners as efficiently as possible.

Landowner Groundwater Banking

During these periods of flood operations, and where surplus surface waters are deemed to be available by the District, landowners within the GSA can divert surface water into landowners-owned designated recharge facilities for future groundwater credits as follows:

1. Water that the landowner purchases from the irrigation district through a regular surface water purchase procedure.

2. The district has established the following priority order of water service and related canal capacities.

    - Deliveries for irrigation demand
    - District recharge/banking for the benefit of all landowners
    - Landowner recharge/banking

When these periods occur, the landowner can bank this surface water recharged to groundwater under the following conditions.

1. The surface water purchased must be applied directly to a specific groundwater recharge basin that meets the minimum GSA requirements for a groundwater recharge basin. The basin must be registered with the

GSA to receive any credits.

- All surface water diverted to the landowner is required to be metered per GSA metering requirements.
- Surface water diverted will be credited to the landowner at 90% of the surface water diverted. The remaining 10% credit will remain with the GSA to account for evaporation, groundwater migration and for the benefit of all the landowners.
- The groundwater credits issued to the landowners will be available and carried over to subsequent years. The term of the credits will be perpetual. The groundwater credits can also be transferred, sold, or leased to other landowners based upon the GSA groundwater transfer criteria.

2. Landowners can apply surface water above crop demand and generate groundwater credits as follows:
   - All surface water diverted to the landowner is required to be metered per GSA metering requirements.
   - Surface water diverted will be credited to the landowner at 90% of the surface water diverted. The remaining 10% credit will remain with the GSA to account for evaporation, groundwater migration and for the benefit of all the landowners.
   - The groundwater credits issued to the landowners will be available and carried over to subsequent years. The term of the credits will be perpetual. The groundwater credits can also be transferred, sold, or leased to other landowners based upon the GSA groundwater transfer criteria.

POLICY 3: WATER ACCOUNTING AND WATER TRANSFERS

To effectively achieve groundwater sustainability within the GSA and the Tule Subbasin, while maintaining the agriculture operations during the implementation of SGMA, each landowner within the GSA will be provided baseline groundwater credit allocations. These groundwater credit allocations are inputs into the individual water bank accounts for each landowner, allowing each landowner to decide how to feasibly and economically manage their farm operation within the rules established by the GSA and the Tule Subbasin.

Water Accounting:

To adequately track, monitor, and account for the water credits within the GSA as required by Policy 1 (Water Measuring and Metering), groundwater accounts will be established and monitored for each landowner. Groundwater credits are allocated by APN and added to landowner accounts. Following is a description of the type of additions and subtractions from landowner groundwater accounts in the GSA:

Groundwater Credit Allocations (Additions)	**Definition:**
Tule Subbasin Sustainable Yield	Common Groundwater available to all landowners within Tule Subbasin, defined under Subbasin Coordination Agreement
Precipitation Yield	Annual average precipitation in the GSA, calculated from 1991 going forward. Precipitation yield credits are not transferrable.
District Allocated Groundwater Credits	Allocated by the Board annually, per the Pixley Irrigation District Surface Water Allocation Policy, adopted 8/8/2019. Allocated amounts will be credited to landowners proportionally based on assessed acres.
Transitional Groundwater Credits	Transitional groundwater credit allocations are allocations of water above the long-term sustainable limits in the GSA, in order to assist landowners to transition to sustainability. Transitional credits are allocated per Policy 4.
Landowner Developed Credits	• Surface Water diverted by the landowners into a specified recharge basin, credit per criteria set forth in policy 2: Banking at Landowner Level.

	• Surface Water over-applied by landowner during flood operations, beyond crop demand, credited per criteria set forth in policy 2.

Groundwater Debits from Account (Subtraction:	**Definition:**
Groundwater Consumption	Monthly crop demand measured, per Policy 1.
Exceedance Consumption	Consumption above Allowable Limits. Administered per Policy 8

Credits and debits in each landowner account will be accounted for on a monthly basis by the GSA.

Allowable Limits:

The sum of groundwater credit allocations added to each landowner account shall be considered the Allowable Limit of groundwater use for each landowner account. Consumption will be measured and debited from each landowner account monthly, per Policy 1. Any exceedance of the Allowable Limit shall be considered a violation, subject to enforcement under Policy 8.

Water Transfers:

Landowners may transfer groundwater water credits through either a direct sale or lease. The process for transferring groundwater credits is as follows:

1. Transfers within the GSA;
    - Groundwater credits will be tracked at a land-based level. Transfers of any credits accrued to the land requires the written approval of the landowner to transfer.
    - Groundwater credits can only be transferred by a landowner that has a positive balance in their groundwater budget. Deficit groundwater credit transferring is not allowed.
    - For every one acre-foot of groundwater credit a Landowner transfers out of their account, they cannot use one acre-foot of Transitional Groundwater Credit in that year. They will regain access to the restricted Transitional Pumping amounts in the next year.
    - A groundwater credit transfer is a one-to-one transfer within the GSA. Transfers outside the GSA are subject to the Coordination with other Tule Subbasin GSAs.
    - All groundwater credit transfers require formal notification (GSA-approved transfer template) and approval of the GSA. The GSA will keep an account of all transfers within the GSA Water Accounting Program. The sale or lease terms of the groundwater credits are between

landowners and not subject to disclosure.

2. Transfers to or from other GSAs;
    - General Provisions;
        - Groundwater credits will be tracked at a land-based level.
        - Groundwater credits can only be transferred by a landowner that has a positive balance in their groundwater budget. Deficit groundwater credit transferring is not allowed.
        - For every one acre-foot of groundwater credit a Landowner transfers out of their account, they cannot use one acre-foot of Transitional Groundwater Credit in that year. They will regain access to the restricted Transitional Pumping amounts in the next year.
        - Groundwater Credits can only be transferred and used in GSAs within the Tule Subbasin that have similar landowner-based groundwater accounting systems as the Pixley GSA.
        - Groundwater credits may not be transferred or used outside of the Tule Subbasin.
        - A groundwater credit transfer is a one-to-one transfer ratio.
        - The maximum amount of groundwater transfers out of the GSA per year could be limited to 10,000 AF. Each transfer will be evaluated to ensure landowner's account maintains a positive balance, without going over the Allowable Limit. Transfers out of the GSA will be processed as they are requested.
        - The maximum amount of groundwater transfers accepted into the District per year will be limited to 10,000 AF.
        - Transfer requests into the GSA will be reviewed monthly and will be processed at the end of the month. The transfer request will be evaluated individually
        - If the total transfers requested are in excess of the 10,000 AF annual limit, the transfers approved will be allocated on a per acre owned basis. Once the 10,000 AF annual limit is reached, any further requests will be denied, unless otherwise determined by the GSA.

            - Example
                - Grower A requests 6,000 AF transfer
                - Grower B requests 6,000 AF transfer
                - Grower C requests 6,000 AF transfer
                - Grower A owns 1,000 acres
                - Grower B owns 500 acres
                - Grower C owns 250 acres
                - Each landowner will be allowed to transfer 5.71 AF/AC (10,000 AF limit / 1,750 acres)

3. Administration and Approval
    - All groundwater credit transfers require formal notification (GSA-

approved transfer template) and approval of the GSA. The GSA will keep an account of all transfers within the GSA Water Accounting Program. The sale or lease terms of the groundwater credits are between landowners and not subject to disclosure.

- There will be a $100 fee, per transfer, charged by the GSA for administration and coordination with the other GSAs.

- In order to avoid undesirable results and avoid localized impacts, transfers in to certain areas may be limited or restricted even further by the GSA.
    - The Groundwater Planning Commission and Board of Directors will annually review the hydrographs at each Representative Monitoring Site in the GSA to determine such restrictions for that year.

4. Implementation of the terms of this entire policy will be reviewed and determined annually by the Groundwater Planning Commission and Board of Directors. The Board of Directors reserves the right to change the terms of this policy at any time.

POLICY 4: TRANSITIONAL GROUNDWATER CONSUMPTION

Management Act, groundwater use and extraction above basin wide sustainable yield will be phased based on periodic reviews of the GSP per the guidelines of SGMA. This will be accomplished by adding Transitional groundwater credit allocations to landowner accounts. Transitional groundwater allocations are allocations of water above the long-term sustainable limits in the GSA, in order to assist landowners to transition to sustainability.

During the period of GSP implementation, transitional water credits (groundwater consumption above other available credits), may be consumed consistent with the following criteria:

1. Use will be consistent with the policies established for avoiding the undesirable effects under SGMA;

2. Transitional water will be available based on the following sequencing:
    i. Precipitation yield credits
    ii. Sustainable yield groundwater credits
    iii. District allocated groundwater credits
    iv. Transitional water credits**
    v. Landowner developed groundwater credits**

    **The sequencing of the Transitional water credits and Landowner developed groundwater credits can be switched at the landowner's discretion.

3. Transitional water credits will be available based on assessed acres and made available in 5-year blocks.

4. Transitional water credits stay with the landowner to be used on properties within the GSA and cannot be transferred to other landowners. Tier 1 transitional water allocations can be transferred to lease tenants on an annual basis.

5. An upper limit for net groundwater use will be established, including transitional water allocations. Exceeding this limit will result in fines and

reduced allocations in the next year, per Policy #8 Implementation & Enforcement of Plan Actions.

6. There will be a phased approach to the availability of groundwater for transitional water. The GSP will provide for levels of groundwater consumption that will be higher during the initial phases and decreasing over time to reach sustainable consumption levels (as required by SGMA) by 2040. The amount of Transitional water available will be determined at the beginning of each phase.
    a. The first phase of transitional water will be from 2020 through 2024 (2 AF/Acre/year)
    b. The second phase of transitional water will be from 2025 through 2029 (Allocation TBD after 2024 GSP revisions)
    c. The third phase of transitional water will be 2030 through 2034 (Allocation TBD after 2024 GSP revisions)
    d. The final phase of transitional water will be from 2035 through 2039 (Allocation TBD after 2024 GSP revisions)

7. There will be a fee schedule for transitional water consumption. The fee schedule will be implemented as described below.
    i. Tier 1 of transitional water consumption is 50% of the total transitional water allocated for the period and shall be assessed a fee of $90 per acre foot. . The price will be adjusted annually by the Board based on a an analysis of SGMA implementation costs, including amounts collected for mitigation and project implementation.
    ii. Tier 2 is transitional water consumption over Tier 1, up to the total transitional water allocation and shall be charged a fee based on an analysis of SGMA implementation costs, including amounts collected for mitigation and project implementation.

    The above fee schedule is intended to serve as both a disincentive mechanism while also relating to the cost of mitigating the impacts of use of transitional pumping allocations. Further analysis and additional justifications for the level of the fee may be considered annually by the GSA.

8. Exceedance Tier. Consumption of groundwater beyond the Allowable Limit

as defined in Policy 3 will be subject to enforcement as described in Policy 8. Unless an exceedance is corrected as provided in Policy 8, the total amount of groundwater consumed beyond the Allowable Limit shall be considered Exceedance Tier consumption. Each acre foot of Exceedance Tier consumption which is not corrected shall be subject to a fee to be analyzed and determined annually by the GSA, in addition to any fine and administrative penalty (including reduction of future groundwater credits) as may be established in Policy 8.

The Exceedance Tier fee is to be established annually by the GSA as a fair representation of the cost to mitigate the damage to the GSA and the lands served by the GSA due to the contribution toward undesirable results, as defined in SGMA, caused by the exceedance of groundwater use beyond the established Allowable Limits. Such fee is subject to reassessment and determination by the GSA from time to time based on changing analysis of the cost of mitigation of damages caused by exceedance of the Allowable Limits.

9. Revenues will be used to mitigate impacts and implement projects and programs including, but not limited to:
    - Friant Kern Canal capacity correction
    - Surface water and groundwater banking development
    - Additional recharge basin construction
    - Water conservation grants to GSA members
    - Land conservation and set-aside programs
    - Monitoring impacts and effects of groundwater pumping.
    - Mitigation of impacts due to SGMA
    - Other projects that may be identified by the GSA.

The district adopted a mitigation plan to address significant and undesirable impacts to beneficial groundwater uses during the sustainability transition period between 2020 and 2040. The mitigation plan can be found at www.ltrid.org, under SGMA and Groundwater Sustainability Plans (http://www.ltrid.org/wp-content/uploads/2023/06/ltrid-mitgation-plan-updated-6.29.23.pdf)

POLICY 5: LANDOWNER SURFACE WATER IMPORTED INTO THE GSA

District Landowners may participate in water exchanges or transfers outside of the GSA boundary that result in surface water being available for direct use by the landowner. Use of that water by the landowner within the GSA requires the use of Irrigation District infrastructure to divert this surface water to their land.

This surface water that is brought into the GSA by the landowner will be tracked and accounted by the GSA and applied to the landowner's water budget according to the following procedures:

1. Surface water brought into the GSA and credited to the landowner will be subject to a loss/reduction factor as determined by the Irrigation District Board of Directors.

2. Surface water brought into the GSA will be delivered to the landowner based upon canal capacity. No surface water delivery brought into the GSA will interrupt or interfere with scheduled allocations of the District surface water supplies.

3. Imported surface water may be used for groundwater recharge subject to the policies of the GSP.

POLICY 6: DISTRICT ALLOCATED GROUNDWATER CREDITS

One of the primary purposes of the Pixley Irrigation District is to enhance the groundwater resources that underlie the District through the importation of surface water. The District overlies the Tule Subbasin Groundwater Basin, which has been defined by the State of California as being in a state of critical overdraft. Since it's formation in 1958, the District has imported as much surface water as possible to offset the use of groundwater for irrigation purposes and to replenish the aquifer through direct recharge via sinking basins, river channels and unlined canals. The District's efforts are funded through assessments and water charges paid by landowners in the District. The lack of access to a reliable surface water supply for Pixley means that providing water to landowners through both direct and in- lieu recharge in wetter years becomes a method for stabilizing access to water for the landowners of the District.

In 2014, the State of California passed the Sustainable Groundwater Management Act (SGMA), which regulates the use of groundwater in the State of California. Groundwater Sustainability Plans, under SGMA, are to be implemented by January 1, 2020. As part of the SGMA process, and consistent with the provisions of the California Water Code that are applicable to Irrigation Districts related to distribution of water resources among District lands, the District has determined that imported surface water should be allocated proportionally to lands within the District on an annual basis.

Historically, proportional distribution of the District's available surface water has presented a challenge in that not all the lands in the district have direct access to surface water. However, with the development of a GSP as required by SGMA, the distribution of surface water on a District-wide proportional basis can now be accomplished by coordination with a groundwater allocation system. The approach taken in the District's Surface Water Allocation Policy is designed to provide proportional access to imported surface water to all lands in the District and not just those with access to the District's distribution system. To meet this goal, the surface water is allocated to all lands as an additional groundwater credit. Surface water actually delivered to lands with access to the canal system and consumed by those lands through crop production would then be accounted for as a debit against their groundwater credit balance.

District groundwater credit allocations will not be allocated in full to the landowners if a determination is made by the GSA Board that minimum threshold amounts identified in the GSP have not been met.

1. Allocation will occur annually on January 1 based on the prior year surface water supply received by the District.
    - Allocation will be made in the form of groundwater credits.
    - The amount of the allocation will be a maximum of 90% of prior year surface water deliveries to account for evapotranspiration and the ability to meet the goals of the Groundwater Sustainability Plan.

- The Board will address a variety of factors related to meeting the goals of the Groundwater Sustainability Plan before finalizing the allocation. As an example, if minimum thresholds of groundwater elevation have been exceeded, the leave behind factor may have to be greater and less water will be allocated

2. Allocations will be made to total developed, assessed acres. Non-irrigated lands will not receive an allocation.

3. Use and transfer of groundwater credits must follow the policies adopted by the GSA.

4. When surface water is made available, the District will make it available for irrigation purposes on a first come, first served basis.
    - Each acre-foot of water consumed (ETc) by a landowner's crop through surface water delivered will result in an acre-foot of groundwater credit reduction from their groundwater account
    - Any water not delivered as irrigation demand will be recharged by the District
    - Taking surface water will be on a voluntary basis
    - The price to access surface water will be set by the District and may be based on the approximate cost to pump groundwater or other factors as deemed appropriate by the Board.

5. During flood release and unlimited uncontrolled season operations, based on the amount of water available to the District, the District may make water available to landowners for purchase by the landowner for on-farm recharge per Policy #2.

POLICY 7: CSD & PUD WATER USE WITHIN THE GSA

A community service district (CSD) is an entity formed by residents of an unincorporated area to pro\/ide a wide \/ariety of services to its residences, particularly water and wastewater management, along with many others. A CSD may be formed and operated in accordance with the Community Services District Law (Government Code §61000-61850), which was created to provide an alternate method of providing services in unincorporated areas.

The Public Utility District Act authorizes the formation of public utility districts (PUD) and authorizes a district to acquire, construct, own, operate, and control works for supplying its inhabitants with water and other critical components for everyday life.

Within the Pixley GSA boundary are the following CSDs and PUDs (”Community):

-Teviston CSD
-Pixley PUD

Each Community entered into an MOU with the Pixley GSA to cooperate on SGMA implementation. Consistent with Section 3 of the MOU, the Community will be considered within the boundaries of the Pixley GSA and included in the Pixley Groundwater Sustainability Plan.

Consistent with Section 6 of the MOU, Pixley will identify the Community as a separate management area. As its own management area, Pixley will specifically address the minimum thresholds and measurable objectives for the Community to achieve sustainable management.

<u>Reporting of Community Water Use</u>

Consistent with Section 7 of the MOU, the Community will provide Pixley the following information for determining the net groundwater usage of the Community:

On a quarterly basis:

- Each Community will submit the total of groundwater pumped from Community wells.
- Each Community will submit the total of water discharged to the wastewater treatment system that is treated and diverted to percolation/evaporation ponds

Minimum Thresholds and Measurable Objectives

The following will be considered the minimum thresholds and measurable objectives required by the Community to meet the sustainability for the implementation of the Pixley GSP for the period from January 2020 to January 2026:

- The net of water pumped minus water discharged will be considered total Community water use
- The total of all treated water discharged to percolation/evaporation ponds, less than 10%, will be available to the Pixley GSA for Calculation and use in the total Pixley GSA water balance.
- If the Community is providing any treated discharge to adjacent lands, the Community shall provide a regular accounting to the Pixley GSA that includes the total volume amount discharged and APN(s) receiving the discharge.
- The water use will be reviewed through periodic updates to the GSP and will be compared to the available sustainable yield for the community and pumping limits acceptable to the GSA, as allowed under the regulatory code of SGMA.
- Community wells will include all wells used by the Community that are connected to the Community water distribution system.
- The Community and the GSA Board of Directors agree to cooperate on conditions of approval for future growth to ensure they are consistent with GSA and Community policies including pursing grant funding opportunities, outreach and joint projects for developing additional water supply for the Community.

POLICY 8: ENFORCEMENT OF GROUNDWATER POLICIES

This Groundwater Sustainability Plan (GSP) establishes the actions, which include the policies, projects, and implementation schedule, to achieve groundwater sustainability in accordance with the Sustainable Groundwater Management Act (SGMA). GSA Policies 1 through 7 have been adopted and implemented in furtherance of GSP Management Action 5.2.1 as set forth in the Pixley Irrigation District Groundwater Sustainability Plan.

SGMA provides the GSA with the authority to enforce the adopted Management Actions of a GSP. (See Water Code section 10732(a)(1) – authority to assess penalties for extraction of groundwater in excess of the amount that is authorized under a GSA rule, regulation, ordination or resolution; and Water Code section 10730.6 - authority to collect any delinquent groundwater charges and any applicable penalties and interest on the groundwater charges in the same manner as the GSA may collect delinquent assessments or water charges)

Pursuant to such authorities, the following actions shall be considered violations of the GSA's established GSP and Policies adopted thereunder and shall be subject to administrative enforcement penalties and actions specified for each category of violation:

8.1 Failure to Pay GSA Assessments or Groundwater Consumption Fees and Fines

8.1.1 Non-Compliance. Pursuant to Water Code section 10730.6, an owner or operator who knowingly fails to pay a groundwater fee within 30 days of it becoming due shall be liable to the groundwater sustainability agency for interest at the rate of 1 percent per month on the delinquent amount of the groundwater fee and a 10- percent penalty.

8.1.2 Process for collecting unpaid fees and fines. The GSA may collect any unpaid fees and fines by: a) bringing suit in Tulare County Superior Court for the collection of unpaid fees and fines and seeking attachment against the property of the named defendant, pursuant to the authority of Water Code section 10730.6(c); or b) adding such unpaid fees, fines, penalties and interest to the charges and assessments payable to the Pixley Irrigation District, after which remaining unpaid fees, fines, penalties and interest may be collected in the manner established by Division 11 of the Water for the collection of assessments and charges of California Irrigation Districts.

8.2 Consumption of groundwater beyond the Allowable Limits. The Allowable Limits of groundwater consumption are as set forth in Policies 3 and 4, and shall be accounted for pursuant to Policy 1. Any time the GSA determines that an owner or operator subject to the Groundwater Measurement and Metering provisions of Policy 1 of the PIXID GSA has exceeded the Allowable Limits, as established by Policy 3 of the PIXID GSA, the exceedance shall be enforced through the following process:

8.2.1 Notice of Non-Compliance. The GSA shall provide written notice of the non- compliance, specifying the quantity of exceedance, and requesting response and plan for correction of non-compliance within 30 days. The notice of non-compliance shall be in writing and shall be deemed delivered when placed in U.S. Mail, certified, to the owner or operators address of record, or if the owner or operator has consented to receiving notices from the GSA via email, via email to the address provided at the time of providing consent.

8.2.2 Opportunity to Correct Exceedance. An owner or operator who is provided a notice of non-compliance related to exceedance of the Allowable Limits of groundwater consumption shall respond within 30 days of delivery of the notice by either a) disputing the determination of non-compliance and requesting an appeal hearing, in which case the owner or operator shall provide a documentary basis for such dispute, or b) identifying a plan to correct such non-compliance. An exceedance of the allowable groundwater use limits may be corrected by procurement of sufficient credits, through purchase or otherwise, to the account of the owner or operator, provided that any such credits are obtained in a manner that is consistent with the policies of the GSA.

8.2.3 Determination of Failure to Correct Non-Compliance. An owner or operator who responds to a notice of non-compliance by timely disputing the determination of non-compliance shall be provided with an opportunity to present such dispute, and evidence supporting the owner or operator’s position, to the PIXIDGSA Groundwater Planning Commission. An administrative hearing to consider the dispute shall be scheduled within 30 days of the response and shall occur whenever possible at a regular meeting of the Groundwater Planning Commission. The Groundwater Planning Commission shall provide notice of its determination within 5 days of the hearing, which notice shall be provided in accordance with section 8.2.4.

8.2.4 Final Notice of Non-compliance - Monetary and Administrative Penalties for Failure to Correct. If an owner or operator fails to respond to or correct notice of non- compliance issued under 8.2.1, or if the Groundwater

Planning Commission sustains the finding of non-compliance in the case of disputed notices, a final notice of non-compliance shall be issued which shall include the following:

8.2.4.1 Assessment of a penalty of $500 per acre foot for every acre foot of groundwater determined to have been consumed beyond the allowable limits (Water Code section 10732(a)(1)).

8.2.4.3 Assessment of charges for Exceedance tier groundwater consumption pursuant to the provisions of Policy 4 for each acre foot determined to have been consumed beyond the allowable limits.

8.2.4.2 Imposition of Exceedance tier consumption, which shall consist of groundwater credits to be subtracted from the owner or operator’s account at the rate of 1 acre foot for every acre foot of groundwater determined to have been consumed beyond the Allowable Limits.

8.2.4.3 An order to Cease and Desist continued exceedances.

8.2.5 Enforcement. Fines, penalties and charges imposed pursuant to section 8.2.4, shall be due and payable within 30 days of the issuance of a final notice of noncompliance, and if unpaid may be collected pursuant to the processes established by Policy 8.2.1. Cease and desist orders issued as part of a final notice of non-compliance may be enforced through civil adjudication processes including by seeking civil mandate orders.

ATTACHMENT 3: PIXLEY ID GSA DOMESTIC WELL PROTECTION PROJECTS AND MANAGEMENT ACTIONS

Lower Tule River Irrigation District Groundwater Sustainability Agency
Pixley Irrigation District Groundwater Sustainability Agency
Groundwater Sustainability Plan Impact Mitigation Plan

1.0 INTRODUCTION – Establishment of Groundwater Well Mitigation Program.

Sustainable management criteria identified in each of the Tule Subbasin Groundwater Sustainability Agencies' (GSAs) Groundwater Sustainability Plans (GSPs) have been developed to address significant and unreasonable impacts to agricultural, municipal, and industrial beneficial uses of groundwater. However, analysis based on available data suggest that numerous shallow domestic wells and potentially other wells may be impacted during the Sustainable Groundwater Management Act (SGMA) GSP implementation period between 2020 and 2040 as a result of continued lowering of groundwater levels during this period. Wells, land use, property, and infrastructure may also be impacted from land subsidence and changes in groundwater quality during this period.

The Subbasin has been in overdraft for many years resulting in a significant lowering of regional and local groundwater levels. The GSPs are designed for the Subbasin to reach sustainability by 2040 and beyond. However, until sustainability is reached, some level of continued groundwater level decline and land subsidence is expected in areas of the Subbasin while the GSAs are in the process of implementing projects and management actions to achieve sustainability by 2040. The purpose of the GSAs' Mitigation Programs is to mitigate those wells, critical infrastructure, and land uses that are adversely affected by declining groundwater levels, land subsidence, and changes to groundwater quality while the GSAs reach sustainability.

As part of revisions to the Tule Subbasin Groundwater Sustainability Plans (GSPs) and Coordination Agreement approved by the Groundwater Sustainability Agencies (GSAs) within the Tule Subbasin, the GSAs each agreed to develop mitigation plans to address significant and unreasonable impacts to beneficial uses of groundwater during the sustainability transition period between 2020 and 2040. The revised Tule Subbasin Coordination Agreement submitted in July 2022 included a Mitigation Program Framework as Attachment 7, which outlined the general standards that each GSA would commit to in developing their respective Mitigation Programs. The GSAs further committed to completing the mitigation claims process for domestic and municipal wells by December 31, 2022 and all other aspects of the Mitigation Programs by June 30, 2023. The Mitigation Framework is attached to this policy as Attachment 1.

1.1 Purpose and Scope

Thomas Harder and Company prepared a Technical Memorandums, attached as Attachment 2, to provide the minimum technical requirements for use by each Tule Subbasin GSA to address claims of impact from lowered groundwater levels, subsidence impacts, and water quality impacts associated with GSP-/GSA-approved or authorized activities. In consideration of the technical information provided therein, and in accordance with the Mitigation Framework in the Coordination Agreement, each GSA Mitigation Program will identify the specific criteria and processes for mitigating claims of impact caused by pumping within their respective GSA boundaries. The purpose of this policy is to establish a Mitigation Program for the Lower Tule River Irrigation District GSA and Pixley Irrigation District GSA consistent with the Mitigation Framework (Attachment 1) and the Harder Technical Memorandums (Attachment 2).

2.0 GROUNDWATER WELL LEVEL IMPACT – MITIGATION CLAIM PROCESS

The Mitigation Program allows for domestic, industrial, municipal, and certain agricultural well owners adversely affected by groundwater level impacts to file a claim with the GSA in which the well is located. The process for receiving and investigating claims of groundwater level impact is set forth in sections 2.1 through 2.3 is shown in Attachment 3, Groundwater Level Impact Claim Process – Investigation Phase. For groundwater levels, an "impact" is defined as the inability of a well owner to pump groundwater of sufficient quantity to meet their water supply needs due to lowered groundwater levels resulting from Tule Subbasin GSP-/GSA-approved or authorized activities. The impact must be realized after January 2015. Responsibilities of the claimant are shown in green, and responsibilities of the GSA are shown in blue in Attachment 3. Decision points are shown in orange.

All claims will be investigated and evaluated within 45 days of receipt of the claim.

2.1 Filing a Claim

The claim process starts with the affected party ("Claimant") filing a claim with the GSA in which the party's well is located, or in which the Claimant asserts the activity was the cause of the Claimant's impacts. The claim will be filed using a form like that provided in Attachment 5 -Impact Claim Form.

- Claim forms will only be accepted for claim impacts occurring after January 1, 2023
- Claims can only be filed by the owner of the well
- Claim forms will only be accepted on wells that were in existence and actively in service as of December 31, 2022.
- Wells older than 25 years (per IRS depreciation schedules) will not be eligible for mitigation.

To process a claim, the Claimant must provide some basic information on the Impact Claim Form to enable further investigation of the claim, including:

a) The Claimant's name and contact information,
b) The type and location of the well,
c) Request for interim water supply,
d) Well construction information
e) Pump information
f) description of the issue with the well, and
g) The applicant's signature.

The filing of a claim will require that the Claimant provide access to the well to verify the claim. In signing the impact claim form, the Claimant agrees to release all data associated with the well and provide access to the well for inspection by a GSA technical representative. Denial of access to the well for inspection by the GSA will result in denial of the claim.

2.2 Impact Assessment

<u>2.2.1. Technical Review and Verification of Claimant-Provided Data</u>
A GSA technical representative will review all available information provided by the Claimant for the affected well prior to inspection in the field. Data to be reviewed will include, but not limited to:

a) The CDWR driller's log,
b) Information on date the well was constructed,
c) Well construction information (casing diameter, casing depth, perforation interval),
   Available downhole video surveys,
d) Historical groundwater levels,
e) Pump type and intake depth,
f) Motor size,
g) Pump age,
h) Typical discharge rate,
i) Last pump test date,
j) Last service date,
k) Last static and pumping groundwater levels, and
l) Information on the nature of the problem.

Based on a review of the available data provided by the Claimant, the GSA will determine whether the claim can be verified based on the data.

Completeness of the dataset relative to the requested information will be reviewed for the following criteria, reliability of the data provided, the nature and status of the issue, and evidence of well impact due to GSP-/GSA-approved or authorized activities, as opposed to impact from other sources.

If the completeness of the data supporting the claim can be verified based on available information, then the GSA technical representative will assess the claim pursuant to section 2.3.1, 2.3.2, or 2.3.3. If not, a GSA technical representative will need to inspect the well and collect supplemental information. The types of information to be collected will depend on the data available from the Claimant. Determination of the extent of additional data collection necessary to verify the claim will be at the sole discretion of the GSA.

In general, the minimum data to be collected in the field will include:

- Well name
- Pump size (horsepower)
- Casing type and diameter
- Static groundwater level
- Discharge rate
- Pumping groundwater level

The owner or owner's representative authorized to operate the pump will be asked to be onsite at the time of inspection to operate the pump. The GSA technical representative will record observations from the inspection. If a driller's log or other information is not available to confirm the total depth and condition of the well and if the pump intake depth cannot be confirmed from available information, it may be necessary to have the pump removed from the well and conduct a downhole video survey. Removing the pump will enable the GSA technical representative to measure the column pipe and thus confirm the pump intake depth and inspect the condition of the pump. The video log will enable inspection of the condition of the casing and perforations and confirm the perforation interval, total depth, and static groundwater level of the well. Upon completion of the investigation, the contractor will be required to reinstall the pump and reestablish all connections. If the pump was operating prior to removal, the contractor will be required to demonstrate that the pump is functioning properly after reinstallation. A sounding port or flow meter may also be installed to collect pumping water level data or discharge rate data, respectively. The GSA will fund the contractor to remove the pump and conduct the video survey. If the claim is ultimately denied, the claimant will reimburse the GSA. The GSA require the well owner to sign a release of liability for any damage to the pump, pump column, or well resulting from removal of the pump and conducting the video log.

2.2.2 Evaluations of Claims of Groundwater Level Impacts

Based on the analysis of data for the impacted well, the GSA technical representative will provide a recommendation to the Groundwater Planning Commission whether the well qualifies for mitigation. In making the recommendation, the GSA technical representative will consider primarily that the foundational premise of the Mitigation Program, as it relates to groundwater levels, is to address impacts to domestic, municipal, industrial, and agricultural wells from GSP-/GSA-approved or authorized activities. As SGMA does not require the GSAs to address impacts prior to January 2015, only impacts associated with groundwater level declines after this time will be considered.

The graphic in Attachment 4 provides a basis for evaluating claims based on the data provided by the Claimant or collected by the GSA. As shown, Examples 1 and 2 illustrate groundwater level impacts that would qualify for mitigation. Example 1 is a case where the static groundwater level is below the 2015 groundwater level and the pumping groundwater level, at the historical discharge rate, is within 10 feet of the bottom of the well. In Example 2, the static groundwater level is measured below the 2015 groundwater level and the pumping groundwater level, at the historical discharge rate, has dropped to within 20 feet of the pump intake. In both cases, the lowered groundwater levels can be attributed to transitional pumping overdraft and there is no option to restore the water supply without mitigation. The evaluation should consider whether there is adequate separation between the pump intake and the bottom of the well (e.g., 10 feet) and whether there is adequate pump submergence (e.g., 20 feet).

Examples 3 through 6 on Figure 2 illustrate cases where the well impact is not associated with lowered groundwater levels from GSP-/GSA-approved or authorized activities. In these cases:

- The pumping groundwater level would have already been below the bottom of the well before January 2015 (Example 3),
- The pumping groundwater level would have already been below the bottom of the pump intake before January 2015 (Example 4),
- The static groundwater level would have been below the pump intake prior to January 2015 (Example 5),
- The pump is not functioning for reasons other than groundwater level decline (e.g. mechanical failure) (Example 6).

In many cases, it is anticipated that a static groundwater level measured in the impacted well from January 2015 will not be available. For those cases, the reference January 2015 static groundwater level will be inferred from a groundwater level contour map generated based on available data from other wells measured at that time. Separate groundwater contour maps will be generated for the Upper and Lower Aquifers. The reference static groundwater level will be assigned from the contour map of the aquifer in which the well is predominantly perforated.

There are other factors, independent of lowered groundwater levels, that can cause a well to stop functioning, such as pump mechanical failure due to age or malfunction, holes in the well casing allowing sand into the pump intake, holes in the pump column associated with corrosion and wear, excessive plugging of screens due to lack of maintenance (e.g. well rehabilitation), and others. All these factors will need to be taken into consideration when assessing the need for mitigation.

Other factors to be considered when evaluating a claim will include, but are not limited to:

- If the Claimant is asserting an impact to an agricultural well, and the Claimant has been utilizing groundwater under a transitional pumping allocation, or otherwise contributing to transitional overdraft, the GSA will reject the claim. This includes claims where a well is being used for both domestic use and irrigation.

If the relative contribution to the problem by the claimant, or by neighboring property owner actions or other overdraft results are not attributable to the GSP, the claim is not eligible for mitigation. If the problem is being caused by specific neighboring well issues, a claimant may be able to pursue corrections through the civil court process and will be so advised.

If the GSA Technical Representative recommends that the impact is eligible for mitigation, a specific mitigation measure as described in Section 2.3 will be considered for recommendation.

2.23 GSA Consideration of Technical Representative Recommendation

The Technical Representative Recommendation will be submitted to Groundwater Planning Commission (GPC). The GPC is delegated authority by the GSA Governing Body to determine whether to accept claims, and to determine mitigation measures. The claimant has a right to appeal GPC decisions to the GSA Governing Body.

Decisions by the GPC or the GSA governing body to accept a mitigation claim are not an acceptance of liability and shall not be a legal determination of any parties' rights. The Mitigation Program is provided as an administrative action to further the goals and objectives of the GSP and SGMA in general.

2.3 IDENTIFICATION OF MITIGATION MEASURES FOR ACCEPTED CLAIMS

In the event that, under the Impact Assessment process, the GSA determines that GSA or GSA-allowed activities have had an impact on an existing well (i.e., impacts related to post-2015 overdraft), the GSA will implement a mitigation measure(s) for the existing well. Mitigation measures that could be adopted to address impacts attributed to the GSA allowed activities could include the following:

- Providing a short-term emergency interim water supply to domestic well owners. Short-term emergency supplies shall be provided as soon as reasonably possible, but in all cases within 14 days of notification to the GSA of such needs.
- Providing funds to lower a well pump.
- Providing funds to complete a connection to an M&I water provider.
- Supplying an equivalent water supply from an alternate source.
- Providing funds to replace the affected well with a deeper well that meets state and local requirements; or with the consent of the affected landowner, providing other acceptable mitigation.
- The GSA require the well owner to sign a release of liability for any claims following mitigation implementation

Factors to be considered when determining the level of mitigation include, but are not limited to, the following:

- Well age – mitigation measures may be prorated based on well age, per manufacturer well life specifications
- Well depth – mitigation measures may be prorated, per linear foot, based on the depth the current well is drilled to vs. the depth a new well needs to be drilled to.

Mitigation measures will be determined by the GPC, on the recommendation of the technical representative. Once a long term solution is identified and offered by the GSA, if it is not accepted by the claimant within 30 days, the claim will be denied and not eligible for a future claim to be filed.

2.3.1 Provision for Interim Water Supply

The claim process allows for the provision of an interim water supply should the Claimant request it. The interim water supply is meant to provide water to the applicant while the claim is investigated and prior to arranging a more permanent mitigation. If a claim is denied, it no longer qualifies for the provision of an interim water supply. Potential sources of interim water supply include (but are not limited to):

- Trucking water
- Connecting to the water supply of a neighboring landowner
- Obtaining a temporary/permanent connection to the municipal water supply system

- The GSA will fund the interim water supply or refer the claimant to existing programs that provide short term water supplies. If the claim is denied by the GSA, the cost is subject to reimbursement by the Claimant.

2.3.2 Evaluation of Potential for Municipal Water Supply Connection

In some urban areas of the Tule Subbasin, impacted domestic or industrial wells may be in close proximity to existing municipal water supply infrastructure. If so, the GSA will contact the local municipality, on behalf of the Claimant, to determine the feasibility of connecting the Claimant to the existing municipal water supply system. If a connection is feasible, the Claimant will be provided with a contact person at the municipality to arrange the connection to the municipal system. For those claims that can be satisfied through a municipal water supply connection, the GSA will waive all well inspection requirements. However, the Claimant must agree to allow the GSA to destroy or properly abandon the impacted well, in accordance with California Department of Water Resources requirements and County of Tulare regulations.

- The GSA, or other existing program that provides short term water supplies, will continue to fund the interim water supply to the Claimant, until the connection to the municipal system is complete
- GSA, municipality, and Claimant will work together to determine cost share funding to connect the Claimant to the municipal water system and the cost to destroy the impacted well

If the Claimant refuses to connect to the municipal water system, the Claimant will be required to allow the GSA to inspect the well in accordance with Section 2 herein.

2.3.3 Assistance for Claimants Whose Claims have been denied

For claimants who have denied claims, the GSA will provide references to other local, county and state programs that provide solutions.

3. SUBSIDENCE IMPACT – MITIGATION CLAIM PROCESS

The Mitigation Program allows entities, whether public or private, adversely affected by land subsidence associated with GSP-/GSA-approved or authorized activities, to file a claim with the GSA in which the impact is located. The process for receiving and investigating claims of subsidence impacts is set forth in sections 3.1 through 3.3 is shown in Attachment 8, Land Subsidence Impact Claim Process. For land subsidence, an "impact" is defined as damage and/or loss of functionality of a structure or a facility occurring to the extent that the structure or facility cannot reasonably operate without either repair or replacement, as determined by the GSA where the structure and facility are located or where beneficial use is impacted due to the damage and/or loss of functionality of the structure or facility.

All claims will be investigated and evaluated within 45 days of receipt of the claim.

3.1 Filing a Claim

The claim process starts with the affected party ("Claimant") filing a claim with the GSA in which the party's well is located, or in which the Claimant asserts the activity was the cause of the Claimant's impacts. The claim will be filed using a form like that provided in Attachment 9 -Impact Claim Form.

- Claim forms will only be accepted for claim impacts occurring after July 1, 2023
- Claims can only be filed by the owner of the infrastructure claimed to be impacted

To process a claim, the Claimant must provide some basic information on the Impact Claim Form to enable further investigation of the claim, including:

- The Claimant's name and contact information,
- The type and location of the structure or facility,
- Infrastructure construction information
- description of the issue with the infrastructure, and
- The applicant's signature.

The filing of a claim will require that the Claimant provide access to the infrastructure to verify the claim. In signing the impact claim form, the Claimant agrees to release all data associated with the infrastructure and provide access for inspection by a GSA technical representative. Denial of access to the infrastructure for inspection by the GSA will result in denial of the claim.

3.2 Impact Assessment

3.2.1. Technical Review and Verification of Claimant-Provided Data

A GSA technical representative will review all available information provided by the Claimant for the affected infrastructure prior to inspection in the field. Data to be reviewed will include, but not limited to:

- A description of the type of structure/facility and what it is used for,
- Original as-built drawings of the structure/facility,
- Information on the date the structure/facility was constructed,
- Any geotechnical reports, including borehole logs, generated prior to or at the time the structure/facility was constructed,
- Photographs of the structure/facility prior to the impact, and
- Information on the nature of the problem including photographs showing the impacted structure/facility.

Based on a review of the available data provided by the Claimant, the GSA will determine whether the claim can be verified based on the data.

Completeness of the dataset relative to the requested information will be reviewed for the following criteria, reliability of the data provided, the nature and status of the issue, and evidence of infrastructure impact due to GSP-/GSA-approved or authorized activities, as opposed to impact from other sources.

If the completeness of the data supporting the claim can be verified based on available information, then the GSA technical representative will assess the claim pursuant to section 3.2. If not, a GSA technical representative will need to conduct an additional investigation and collect supplemental information. The types of information to be collected will depend on the data available from the Claimant. Determination of the extent of additional data collection necessary to verify the claim will be at the sole discretion of the GSA.

In general, the minimum data to be collected in the field will include:

- Structure/facility address,
- Nature and use of the structure/facility,
- Notes on the nature of the damage to the structure or facility,
- Photographs of the damage.

If the claim is related to gravity-driven water conveyance infrastructure (e.g. canals, turnouts, recharge basins, stream channels used to convey water, pipelines, and field irrigation), it may be necessary to inspect the entire facility to determine if factors other than land subsidence are impacting the functionality of the structure or facility. The GSA may arrange for water delivery to the facility to document the facility's operating condition. It may also be necessary to survey the structure/facility to obtain data needed to verify the structure's hydraulic capacity.

If the claim is related to well damage suspected of being caused by land subsidence, it may be necessary to have the pump removed from the well and conduct a downhole video survey. Removing the pump will enable the GSA technical representative to measure the column pipe and thus confirm the pump intake depth and inspect the condition of the pump. The video log will enable inspection of the condition of the casing and perforations and confirm the perforation interval, total depth, and static groundwater level of the well. Upon completion of the investigation, the contractor will be required to reinstall the pump and reestablish all connections. If the pump was operating prior to removal, the contractor will be required to demonstrate that the pump is functioning properly after reinstallation. The GSA will fund the contractor to remove the pump and conduct the video survey. If the claim is ultimately denied, the claimant will reimburse the GSA. The GSA requires the well owner to sign a release of liability for any damage to the pump, pump column, or well resulting from removal of the pump and conducting the video log.

If the claim is related to flood control facilities it may be necessary to inspect the entire facility to determine if there are factors other than land subsidence impacting the functionality of the structure or facility. The GSA may survey the structure/facility to obtain data needed to verify the structure's hydraulic capacity. In certain cases, the GSA may also have a hydraulic analysis completed by an engineer.

Finally, additional data may be required to evaluate a claim (e.g. soil testing, materials testing, etc.) and will be obtained on a case-by-case basis depending on the structure/facility (e.g. roads, railroads, pipelines, bridges, wastewater collection) and the nature of the impact.

3.2.2 Evaluations of Claims of Groundwater Level Impacts

Land subsidence can manifest itself as a regional phenomenon or on a local scale. Regional land subsidence results in a large area (e.g. 10's to 100's of square miles) subsiding at similar rates such that the effect of the lowered land elevation cannot be discerned except through periodic surveying of bench marks or information from satellites. Impacts to land uses, property interests, and critical infrastructure from this type of land subsidence are most likely to occur in the form of reduced surface carrying capacity of gravity-driven water conveyance, well damage, and flood control. Differential land subsidence results in localized adjoining areas subsiding at different rates relative to each other. This can result in land fissuring and often occurs along a fault or geologic boundary. Differential land subsidence has the most potential to cause damage to surface infrastructure such as roads, bridges, and buildings.

Criteria for attributing structural/facility impacts to land subsidence include the following:

- The total amount of land subsidence and, if applicable, change in land surface slope at the structure/facility since 2015 based on the best available data.
- Evidence of ground fissures at the structure/facility that can be linked to active land subsidence in the area from other data.
- For gravity-driven water conveyance facilities, reduced flow capacity relative to 2015, that affects the functionality of the facility.
- For wells: observed casing collapse, damage, or protrusion attributable to subsidence.
- For flood control facilities, changes in water height or channel slope attributable to subsidence since 2015 that affects the functionality of the facility.

Other factors to be considered when evaluating a claim will include, but are not limited to:

If the Claimant is asserting an impact to an agricultural well, and the Claimant has been utilizing groundwater under a transitional pumping allocation, or otherwise contributing to transitional overdraft, the GSA will reject the claim. This includes claims where a well is being used for both domestic use and irrigation.

If the relative contribution to the problem by the claimant, or by neighboring property owner actions or other results are not attributable to the GSP, the claim is not eligible for mitigation. If the problem is being caused by specific neighboring issues, a claimant may be able to pursue corrections through the civil court process and will be so advised.

If the GSA Technical Representative recommends that the impact is eligible for mitigation, a specific mitigation measure as described in Section 3.3 will be considered for recommendation.

3.2.3 GSA Consideration of Technical Representative Recommendation

The Technical Representative Recommendation will be submitted to Groundwater Planning Commission (GPC). The GPC is delegated authority by the GSA Governing Body to determine whether to accept claims, and to determine mitigation measures. Claimant has right to appeal GPC decisions to the GSA Governing Body.

Decisions by the GPC or the GSA governing body to accept a mitigation claim are not an acceptance of liability and shall not be a legal determination of any parties' rights. The Mitigation Program is provided as an administrative action to further the goals and objectives of the GSP and SGMA in general.

3.3 IDENTIFICATION OF MITIGATION MEASURES FOR ACCEPTED CLAIMS

In the event that, under the Impact Assessment process, the GSA determines that GSA or GSA-allowed activities have had an impact on existing infrastructure (i.e., impacts related to post-2015 overdraft), the GSA will implement a mitigation measure(s) for the infrastructure. Mitigation measures that could be adopted to address impacts attributed to the GSA allowed activities could include the following:

- In coordination with the affected landowner, developing a plan with acceptable mitigation.

Mitigation measures will be determined by the GPC, on the recommendation of the technical representative. Once a long-term solution is identified and offered by the GSA, if it is not accepted by the claimant within 30 days, the claim will be denied and not eligible for a future claim to be filed.

3.3.1 Assistance for Claimants Whose Claims have been denied

For claimants who have denied claims, the GSA will provide references to other local, county and state programs that provide solutions.

4. WATER QUALITY IMPACT – MITIGATION CLAIM PROCESS

The monitoring and characterization of groundwater quality conditions has historically been conducted and reported by other public agencies and/or non-profits to meet requirements of other regulatory programs, which focus on the prevention of degradation of groundwater quality and providing mitigation to those who are found to be impacted.

To prevent duplication of efforts and competing datasets for the ILRP, CV-Salts Nitrate Control Program, and SGMA GSAs, the Tule Subbasin utilizes a single group to manage the monitoring efforts within the Subbasin for collectively meeting the various requirements of these programs being implemented at the local level. This level of coordination between these agencies and groups ensures that the efforts performed under each program help provide a cohesive response to providing short term and long-term solutions to groundwater management.

As it relates to providing replacement water for those impacted, the Tule Basin Management Zone (TBMZ), a local management zone formed to comply with the CV-Salts Nitrate Control Program is providing clean drinking water to residents within the Tule Subbasin who's drinking water supply is impacted from elevated concentrations of nitrate as nitrogen (NO_3-N). As of recent, the Management Zone has begun working with the Tule Basin Water Foundation (TBWF) to expand their responsibilities for testing and providing short-term and long-term solutions replacement water solutions to include additional constituents of concern (COCs) found to be harmful for human consumption at elevated concentrations through the State funded SAFER program. The expansion of the TBMZ and TBWF efforts allows for the coordinated implementation efforts with the GSAs within the Tule Subbasin.

The Mitigation Program allows for domestic and municipal well users adversely affected by groundwater level impacts associated with GSP-/GSA-approved or authorized activities to file a claim with the GSA in which the well is located. Each GSA will allow for a domestic or municipal with potentially impacted groundwater quality to file a claim against the GSA the well is located within. Once a claim is filed against the GSA, the claim will be routed to the to the TBWZ/TBWF claim process which triggers an eligibility investigation as shown in Attachment 10, before the well can be tested for impacts.

For degraded groundwater quality, an "impact" is defined as a well user's groundwater quality degraded beyond the drinking water standards maximum contaminate level (MCL) for COCs defined in the Tule Subbasin Coordination Agreement due to Tule Subbasin GSP-/GSA-approved or authorized activities. The impact must be realized after January 2015.

For eligible claims that tests return results exceeding the MCL for the COCs, the process outlined in Section 4.1 will be followed to determine if the impact was caused by a Tule Subbasin GSA-/GSP- approved or authorized activity.

All claims will be investigated and evaluated within 45 days of receipt of the claim.

4.1 Filing a Claim

The claim process starts with the affected party ("Claimant") filing a claim with the GSA in which the party's well is located, or in which the Claimant asserts the activity was the cause of the Claimant's impacts. The claim will be filed using a form like that provided in Attachment 11 -Impact Claim Form.

- Claim forms will only be accepted for claim impacts occurring after July 1, 2023
- Claims can only be filed by the owner of the well

To process a claim, the Claimant must provide some basic information on the Impact Claim Form to enable further investigation of the claim, including:

- The Claimant's name and contact information,
- The type and location of the well,
- Request for interim water supply,
- description of the issue with the well, and
- The applicant's signature.

The filing of a claim will require that the Claimant provide access to the well to verify the claim. In signing the impact claim form, the Claimant agrees to release all data associated with the well and provide access to the well for inspection by a GSA technical representative. Denial of access to the well for inspection by the GSA will result in denial of the claim.

4.2 Impact Assessment

4.2.1. Technical Review and Verification of Claimant-Provided Data

A GSA technical representative will review all available information provided by the Claimant for the affected well prior to inspection in the field. Data to be reviewed will include, but not limited to:

- Data from nearby groundwater quality Representative Monitoring Sites (RMS) wells designated for monitoring drinking water COCs will be evaluated.
- Review readily available historical groundwater quality and level data within the vicinity of the potentially impacted well;
- Evaluate potential GSA-/GSP- approved or authorized activities within the vicinity of the potentially impacted well that may have contributed to the exceedance; and
- Evaluate other potential dischargers within the vicinity of the potentially impacted well to determine if activities outside of the GSA may have contributed to the exceedance.

If the findings from the above actions listed prove that a GSA-/GSP- approved or authorized activity have impacted the claim well, the GSA will address the impact as described in Section 4.2.2. Irrespective if the GSA is or is not found to have contributed to the impacted well, the GSA will coordinate with the TBMZ/TBWF to perform outreach to potentially impacted residents within the vicinity of the well, notifying them of the exceedance and offering resources for free well testing and replacement drinking water.

Based on a review of the available data provided by the Claimant, the GSA will determine whether the claim can be verified based on the data.

Completeness of the dataset relative to the requested information will be reviewed for the following criteria, reliability of the data provided, the nature and status of the issue, and evidence of well impact due to GSP-/GSA-approved or authorized activities, as opposed to impact from other sources.

The owner or owner's representative authorized to operate the pump will be asked to be onsite at the time of inspection to operate the pump. The GSA technical representative will record observations from the inspection. If a driller's log or other information is not available to confirm the total depth and condition of the well and if the pump intake depth cannot be confirmed from available information, it may be necessary to have the pump removed from the well and conduct a downhole video survey. Removing the pump will enable the GSA technical representative to measure the column pipe and thus confirm the pump intake depth and inspect the condition of the pump. The video log will enable inspection of the condition of the casing and perforations and confirm the perforation interval, total depth, and static groundwater level of the well. Upon completion of the investigation, the contractor will be required to reinstall the pump and reestablish all connections. If the pump was operating prior to removal, the contractor will be required to demonstrate that the pump is functioning properly after reinstallation. A sounding port or flow meter may also be installed to collect pumping water level data or discharge rate data, respectively. The GSA will fund the contractor to remove the pump and conduct the video survey. If the claim is ultimately denied, the claimant will reimburse the GSA. The GSA require the well owner to sign a release of liability for any damage to the pump, pump column, or well resulting from removal of the pump and conducting the video log.

4.2.2 Evaluations of Claims of Groundwater Level Impacts

Based on the analysis of data for the impacted well, the GSA technical representative will provide a recommendation to the Groundwater Planning Commision whether the well qualifies for mitigation. In making the recommendation, the GSA technical representative will consider primarily that the foundational premise of the Mitigation Program, as it relates to water quality, is to address impacts to domestic, municipal, industrial, and agricultural wells from GSP-/GSA- approved or authorized activities. As SGMA does not require the GSAs to address impacts prior to January 2015, only impacts associated with water quality after this time will be considered.

Other factors to be considered when evaluating a claim will include, but are not limited to:

- If the Claimant is asserting an impact, and the Claimant has been utilizing groundwater under a transitional pumping allocation, or otherwise contributing to transitional overdraft, the GSA will reject the claim. This includes claims where a well is being used for both domestic use and irrigation.

If the relative contribution to the problem by the claimant, or by neighboring property owner actions or other overdraft results are not attributable to the GSP, the claim is not eligible for mitigation. If the problem is being caused by specific neighboring well issues, a claimant may be able to pursue corrections through the civil court process and will be so advised.

If the GSA Technical Representative recommends that the impact is eligible for mitigation, a specific mitigation measure as described in Section 4.3 will be considered for recommendation.

4.23 GSA Consideration of Technical Representative Recommendation

The Technical Representative Recommendation will be submitted to Groundwater Planning Commission (GPC). The GPC is delegated authority by the GSA Governing Body to determine whether to accept claims, and to determine mitigation measures. The claimant has right to appeal GPC decisions to the GSA Governing Body.

Decisions by the GPC or the GSA governing body to accept a mitigation claim is not an acceptance of liability and shall not be a legal determination of any parties' rights. The Mitigation Program is provided as an administrative action to further the goals and objectives of the GSP and SGMA in general.

4.3 IDENTIFICATION OF MITIGATION MEASURES FOR ACCEPTED CLAIMS

In the event that, under the Impact Assessment process, the GSA determines that GSA or GSA-allowed activities have had an impact on an existing well (i.e., impacts related to post-2015 activities), the GSA will identify suitable mitigation to alleviate the impact either independent of the TBMZ/ TBWF or in coordination (i.e., financial contributions), may include one or more of the following:

- Adjusting groundwater pumping locations, rates, or schedules;
- Providing interim or permanent replacement water;
- Coordinating consolidation with existing water systems; or
- With the consent of the affected user, providing other acceptable means of mitigation.

Mitigation measures will be determined by the GPC, on the recommendation of the technical representative. Once a long-term solution is identified and offered by the GSA, if it is not accepted by the claimant within 30 days, the claim will be denied and not eligible for a future claim to be filed.

4.3.1 Provision for Interim Water Supply

The claim process allows for the provision of an interim water supply should the Claimant request it. The interim water supply is meant to provide water to the applicant while the claim is investigated and prior to arranging a more permanent mitigation. If a claim is denied, it no longer qualifies for the provision of an interim water supply. Potential sources of interim water supply include (but are not limited to):

- Trucking water
- Connecting to the water supply of a neighboring landowner
- Obtaining a temporary/permanent connection to the municipal water supply system

The GSA will fund the interim water supply or refer the claimant to the TBMZ that provides short term water supplies. If the claim is denied by the GSA, the cost is subject to reimbursement by the Claimant.

4.3.2 Evaluation of Potential for Municipal Water Supply Connection

In some urban areas of the Tule Subbasin, impacted domestic or industrial wells may be in close proximity to existing municipal water supply infrastructure. If so, the GSA will contact the local municipality, on behalf of the Claimant, to determine the feasibility of connecting the Claimant to the existing municipal water supply system. If a connection is feasible, the Claimant will be provided with a contact person at the municipality to arrange the connection to the municipal system. For those claims that can be satisfied through a municipal water supply connection, the GSA will waive all well inspection requirements. However, the Claimant must agree to allow the GSA to destroy or properly abandon the impacted well, in accordance with California Department of Water Resources requirements and County of Tulare regulations.

- The GSA, or other existing program that provides short term water supplies, will continue to fund the interim water supply to the Claimant, until the connection to the municipal system is complete
- GSA, municipality, and Claimant will work together to determine cost share funding to connect the Claimant to the municipal water system and the cost to destroy the impacted well

If the Claimant refuses to connect to the municipal water system, the Claimant will be required to allow the GSA to inspect the well in accordance with Section 2 herein.

4.3.3 Assistance for Claimants Whose Claims have been denied

For claimants who have denied claims, the GSA will provide references to other local, county and state programs that provide solutions.

5.0 Funding Plan

The GSA will develop a budget and reserve account for in order to implement this plan. It is anticipated that the funding for the budget and reserve account will come from Transitional Fees collected by the GSA.

6.0 Reporting and Monitoring of Plan Implementation

The GSA will monitor mitigation implementation activities on an ongoing basis. Mitigation Plan implementation and actions will be included in the GSA's annual GSP update to the Department of Water Resources.

ATTACHMENTS

Attachment 1 – Mitigation Program Framework, Coordination Agreement Attachment 7
Attachment 2 – Thomas Harder and Company Technical Memorandum – Technical Requirements for Addressing Impact Claims from Groundwater Levels for Tule Subbasin Groundwater Sustainability Agencies
Attachment 3 – Groundwater Level Impact Claim Process – Investigation Phase Flow Chart
Attachment 4 – Groundwater Level Impact Claim Process – Evaluation Examples
Attachment 5 – Groundwater Level Impact Claim Form
Attachment 6 - Well Inspection Form
Attachment 7-Release of liability forms
Attachment 8 – Land Subsidence Impact Claim Process
Attachment 9 – Land Subsidence Impact Claim Form
Attachment 10- Tule Basin Management Zone Safe – Eligibility Investigation Process
Attachment 11 – Water Quality and Tule Basin Management Zone – Claim Forms

MITIGATION PROGRAM FRAMEWORK
COORDINATION AGREEMENT ATTACHMENT 7
Framework for GSA Mitigation Programs to Address
Groundwater Levels, Land Subsidence and Groundwater Quality Impacts

Introduction

Sustainable management criteria identified in each of the Tule Subbasin Groundwater Sustainability Agencies' (GSAs) Groundwater Sustainability Plans (GSPs) have been developed to address significant and unreasonable impacts to agricultural, municipal, and industrial beneficial uses of groundwater. However, analysis based on available data suggests that numerous shallow domestic wells and potentially other wells may be impacted during the Sustainable Groundwater Management Act (SGMA) GSP implementation period between 2020 and 2040 as a result of continued lowering of groundwater levels during this period. Wells, land use, property, and infrastructure may also be impacted from land subsidence and changes in groundwater quality during this period.

The Tule Subbasin GSAs agree to each individually implement a Mitigation Program (Program) as needed to offset impacts associated with GSP-allowed activities, subject to the following framework and subject to the schedule provided herein. The goal of this framework is to establish a standard for mitigation programs to be implemented by each GSA for the purpose of mitigating anticipated impacts to beneficial uses to a level that avoids the occurrence of an Undesirable Result.

Each Mitigation Program may be extended or revised based on groundwater conditions in the future.

Mitigation Program Framework

The Subbasin has been in overdraft for many years, resulting in a significant lowering of regional and local groundwater levels. The GSPs are designed for the Subbasin to reach sustainability by 2040 and beyond. However, until sustainability is reached, some level of continued groundwater level decline and land subsidence is expected in areas of the Subbasin while the GSAs are in the process of implementing projects and management actions to achieve sustainability by 2040. The purpose of the GSAs' Mitigation Programs is to mitigate those wells, critical infrastructure, and land uses that are adversely affected by declining groundwater levels, land subsidence, and changes to groundwater quality while the GSAs reach sustainability.

Each GSA shall include a Program as a project or management action identified in that GSA's GSP, describing the following elements:

a) Identification of Impacts to be Addressed by Mitigation Program

Each Tule Subbasin GSA will adopt and implement a Mitigation Program to identify the specific needs for mitigation caused by pumping within the GSA's boundaries. Each GSA Mitigation

Program will separately identify the impacts to beneficial uses that the Program is intended to address. Each GSA Mitigation Program must provide a claim process to address impacts to (i) domestic and municipal wells, (ii) agricultural wells, and (iii) critical infrastructure. Decisions to include or exclude impacted users from participation in a GSA's Mitigation Program shall be supported by appropriate written technical data and analysis.

b) Process

For claims of impact to wells related to groundwater level declines, the process to be adopted by each GSA's Mitigation Program may include:

1) an application process by the well owner;
2) data collection by the GSA to verify the claim;
3) identification of suitable mitigation; and/or
4) response to said affected user.

For claims of impact to land uses from land subsidence, the process may include:

1) an application process by the affected party;
2) data collection by the GSA to verify the claim;
3) identification of suitable mitigation; and/or
4) coordination, as necessary, with said affected parties to implement the mitigation.

For claims of impact to groundwater quality that is attributable to pumping allowed by a GSA/GSP, the process may include:

1) an application process by the affected party;
2) data collection by the GSA to verify the claim;
3) identification of suitable mitigation; and/or
4) coordination, as necessary, with said affected parties to implement the mitigation.

SGMA requires GSAs and GSPs to measure sustainability from 2015 forward. As a result, GSAs do not necessarily need to provide mitigation for impacts that occurred prior to January 1, 2015.

For those claims that are shown not to be related to GSP-/GSA-approved or authorized activities, the GSA will, to the extent possible, provide assistance to the affected party to identify programs for addressing their issue.

c) *Investigation*

Once a claim of adverse impact has been made to a GSA, whether it be for well, specific land use, critical infrastructure or groundwater quality issue(s), the GSA will investigate the claim.

d) *Qualifications for Mitigation*

GSAs may determine whether to provide full or partial mitigation based on a user's compliance with the GSA's GSP, Rules & Regulations, and other laws or regulations. For example, a user whose own pumping has caused or contributed to overdraft or damage to their own well may not qualify for mitigation under the Program. Further, mitigation will be applied only to those claims that are shown to be attributable to GSP-/GSA-approved or authorized activities. Each GSA's Program will also address how claims that a GSA determines are caused by pumping outside the GSA's boundaries will be addressed.

e) *Mitigation*

Once a claim of impact has been confirmed to be due to GSP-/GSA-approved or authorized activities, the GSA will identify suitable mitigation to alleviate the impact.

For groundwater level impacts, this could be any of the following:

1) Deepening the well;
2) Constructing a new well;
3) Modifying pump equipment;
4) Providing temporary or permanent replacement water;
5) Coordinating consolidation of the domestic well owner with existing water systems; or
6) With the consent of the affected user, providing other acceptable means of mitigation.

For land use impacts, this could be any of the following:

1) Repair to canals, turnouts, stream channels, water delivery pipelines, and basins;
2) Repair to damaged wells;
3) Addressing flood control;
4) Addressing other damaged infrastructure; or
5) With the consent of the affected user, providing other acceptable means of mitigation.

For groundwater quality impacts (due to groundwater management/actions), this could be any of the following:

1) Adjusting groundwater pumping locations, rates, or schedules;
2) Modifying project operations;
3) Providing temporary or permanent replacement water;
4) Coordinating consolidation with existing water systems; or
5) With the consent of the affected user, providing other acceptable means of mitigation.

Various factors may reflect the proper mitigation methods for the specific issue. For example, age, location, financial impact to the beneficial user as a result of mitigation, and the beneficial user may reflect which mitigation measures are chosen by a particular GSA.

f) *Outreach*

Public outreach and education will be separately performed during development of the Mitigation Program and prior to implementation by each GSA.

Prior to implementation, extensive outreach will be needed to notify landowners of each GSA's Program requirements and how they can apply for assistance. Outreach may need to be performed in multiple languages as appropriate for each particular GSA. Outreach methods could include workshops, mailings, flyers, website postings, Board meeting announcements, etc.

g) Program Adoption Schedule

Each GSA will formulate and implement a mitigation claims process for domestic and municipal use impacts by December 31, 2022 and complete all other aspects of the Mitigation Program by June 30, 2023. During Program development, the GSAs will conduct community outreach and refer landowners and others to available local programs as well as other resources and funding programs from the County, State, or non-profit organizations, including the Tule Basin Water Foundation.

h) Mitigation Program Funding Source

Each GSA will develop a funding mechanism for the Program, which is dependent on the specific GSA needs for specific expected impacted wells, critical infrastructure, and land uses within each GSA. Funding is anticipated to be available for each GSA's Mitigation Program through implementation of assessments, fees, charges, and penalties. In addition, the GSAs will explore grant funding. The State has many existing grant programs for community water systems and well construction funding. County, state, and federal assistance will be needed to successfully implement the respective Mitigation Programs. Each GSA may, separately or in coordination with other GSAs, also work with local NGOs that may be able to provide assistance or seek grant monies to help fund the Program. GSAs may act individually or collectively to address and fund mitigation measures.

Technical Memorandum

To:	Tule Subbasin Technical Advisory Committee
From:	Thomas Harder, P.G., C.HG. Thomas Harder & Co.
Date:	13-Dec-22
Re:	Technical Requirements for Addressing Impact Claims from Groundwater Levels for Tule Subbasin Groundwater Sustainability Agencies

1 Background and Purpose

In response to California Department of Water Resources (CDWR) comments to the Tule Subbasin draft Groundwater Sustainability Plans (GSPs) and Coordination Agreement, the Groundwater Sustainability Agencies (GSAs) each agreed to develop mitigation plans to address significant and unreasonable impacts to beneficial uses of groundwater during the sustainability transition period between 2020 and 2040. The revised Tule Subbasin Coordination Agreement submitted in July 2022 included a Mitigation Program Framework as Attachment 7, which outlined the general standards that each GSA would commit to in developing their respective Mitigation Programs. The GSAs further committed to completing the mitigation claims process for domestic and municipal wells by December 31, 2022 and all other aspects of the Mitigation Programs by June 30, 2023.

The purpose of this document is to provide the minimum technical requirements for use by each Tule Subbasin GSA to address claims of impact from lowered groundwater levels associated with GSP-/GSA-approved or authorized activities or unmanaged pumping. In consideration of the technical information provided herein, and in accordance with the Mitigation Framework in Attachment 7 of the Coordination Agreement, each GSA Mitigation Program will identify the specific criteria and processes for mitigating claims of impact caused by pumping within their respective GSA boundaries. Each Mitigation Program must provide a claim process to address impacts to:

(i) domestic and municipal wells,
(ii) agricultural wells, and
(iii) critical infrastructure.

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Impacts may be related to one or more of the three sustainability indicators related to GSP-/GSA-approved or authorized activities:

1. Groundwater level declines
2. Land subsidence, and
3. Groundwater quality.

This TM addresses impacts related to groundwater levels.[1] Decisions to include or exclude impacted users from participation in a GSA's Mitigation Program shall be supported by appropriate written technical data and analysis, as described herein. In addition, this TM includes additional considerations, outside the technical requirements, for developing Mitigation Programs.

Each Mitigation Program will document:

1. Types of Impacts to be Addressed by the Mitigation Program
2. A Process for Responding to Claims of Impact
3. A Process for Investigating Claims
4. Qualifications for Mitigation
5. Types of Mitigation to Address Claims
6. An Outreach Program Prior To and During Mitigation Program Development
7. The Program Adoption Schedule
8. Mitigation Program Funding Source(s)

Mitigation will be applied only to those claims that are shown to be attributable to GSP-/GSA-approved or authorized activities.

2 Process Overview for Claims of Groundwater Level Impacts

The Mitigation Program framework outlined in the Tule Subbasin Coordination Agreement allows for domestic, industrial, municipal, and certain agricultural beneficial users of groundwater suffering from significant and unreasonable impacts (as defined in the Tule Subbasin Coordination Agreement and Mitigation Program Framework) to file a claim with the GSA in which the well is located. The overall process for receiving and investigating claims of groundwater level impact is shown on Figure 1. For groundwater levels, a significant and unreasonable "impact" is defined as the inability of a beneficial user to pump groundwater of sufficient quantity to meet their water supply needs due to lowered groundwater levels resulting from Tule Subbasin GSP-/GSA-approved or authorized activities. The GSAs are not required to address impacts that occurred prior to January 2015. Responsibilities of the claimant are shown in green and responsibilities of the GSA are shown in blue on Figure 1. Decision points are shown in orange. All claims will be investigated and evaluated within 45 days of receipt of the claim.

[1] Technical requirements for mitigation of impacts associated with land subsidence and groundwater quality will be addressed in separate Technical Memoranda.

2.1 Filing a Claim

The claim process starts with the affected party ("Claimant") filing a claim with the GSA in which the party's well is located. The claim will be filed using a form like that provided in Attachment 1. To process a claim, the Claimant must provide some basic information to enable further investigation of the claim, including (but not limited to):

- The Claimant's name and contact information,
- The type and location of the well,
- Request for interim water supply,
- Well construction information,
- Pump information,
- Historical operating and groundwater conditions for the well,
- A description of the issue with the well, and
- The applicant's signature.

GSAs may determine whether to provide full or partial mitigation based on a user's compliance with the GSA's GSP, Rules & Regulations, and other laws or regulations. Further, mitigation will be applied only to those claims that are shown to be attributable to GSP-/GSA-approved or authorized activities. If the Claimant is pumping groundwater under a transitional pumping allocation, or otherwise contributing to transitional overdraft, a GSA may consider this fact in determining whether to accept or reject the claim.

2.2 Provision for Interim Water Supply

For claims not denied in Section 2.1, the claim process allows for the provision of an interim water supply should the Claimant request it. The interim water supply is meant to provide water to the applicant while the claim is investigated and prior to arranging a more permanent mitigation. Potential sources of interim water supply include (but are not limited to):

- Trucking water
- Utilizing filling stations
- Connecting to the water supply of a neighboring landowner
- Obtaining a temporary/permanent connection to the municipal water supply system

Considerations for each GSA Mitigation Program include:

- Funding
- If the GSA funds it, is the cost subject to reimbursement by the Claimant if the investigation finds that the issue is not associated with GSA activities or post-2015 overdraft?

2.3 Evaluation of Potential for Municipal Water Supply Connection

In some urban areas of the Tule Subbasin (e.g. Porterville), impacted domestic or industrial wells may be in close proximity to existing municipal water supply infrastructure. If so, the GSA will contact the local municipality, on behalf of the Claimant, to determine the feasibility of connecting the Claimant to the existing municipal water supply system. If a connection is feasible, the Claimant will be provided a contact person at the municipality to arrange the connection to the municipal system. For those claims that can be satisfied through a municipal water supply connection, the GSA may waive well inspection requirements. However, the Claimant must agree to allow the GSA to destroy or properly abandon the impacted well, in accordance with California Department of Water Resources requirements and County of Tulare regulations, if it is in the GSA's interest to do so.

Considerations for each GSA Mitigation Program include:

- Will the GSA continue the interim water supply to the Claimant, free of cost, until the connection to the municipal system is complete?
- Who will fund the cost to connect the Claimant to the municipal water system (GSA, municipality, Claimant)?
- Who will fund the cost to destroy the impacted well?

If the Claimant refuses to connect to the municipal water system, the Claimant will be required to allow the GSA to inspect the well in accordance with Sections 2.4, 2.5, and 2.6, herein.

2.4 Provision of Access to the Well for Inspection by the GSA

Mitigation of any claim of impact not rejected in Section 2.1 and not mitigated in Section 2.3 herein, will require that the Claimant provide access to the well to verify the claim. In signing the impact claim form (Attachment 1), the Claimant agrees to release all data associated with the well and provide access to the well for inspection by a GSA technical representative. Denial of access to the well for inspection by the GSA will result in denial of mitigation.

2.5 Preliminary Well Assessment Based on Existing Data

A GSA technical representative will review all available information provided by the Claimant for the affected well prior to inspection in the field. Data to be reviewed will include (but not necessarily be limited to):

- The CDWR driller's log,
- Information on date the well was constructed,
- Well construction information (casing diameter, casing depth, perforation interval),
- Available downhole video surveys,

- Historical groundwater levels,
- Pump type and intake depth,
- Motor size,
- Pump age,
- Typical discharge rate,
- Historical electrical use,
- Historical production,
- End use of the water (e.g. agricultural irrigation, domestic supply, etc.),
- Land IQ satellite consumptive use data (if agricultural),
- Last pump test date,
- Last service date,
- Last static and pumping groundwater levels, and
- Information on the nature of the problem.

Based on a review of the available data provided by the Claimant, the GSA will determine whether the claim can be verified based on the data. Criteria for the determination will include:

- Completeness of the dataset relative to the requested information,
- Reliability of the data provided,
- Nature and status of the issue,
- Evidence of well impact due to GSP-/GSA-approved or authorized activities.

If the claim can be verified based on available information from the Claimant or the Tule Subbasin Data Management System, then the GSA technical representative will issue a recommendation for appropriate mitigation. If not, the GSA will conduct additional investigation to verify the claim as described in Section 2.6.

2.6 As-Needed Supplemental Well Inspection and Data Collection

To verify a claim that cannot be confirmed from existing information provided by the Claimant, a GSA technical representative will need to inspect the well and collect supplemental information. The types of information to be collected will depend on the data available from the Claimant. Determination of the extent of additional data collection necessary to verify the claim will be at the sole discretion of the GSA.

In general, the minimum data to be collected in the field will include:

- Well name
- Pump size (horsepower)
- Casing type and diameter
- Static groundwater level

- Discharge rate
- Pumping groundwater level

The owner or owner's representative authorized to operate the pump will be asked to be onsite at the time of inspection to operate the pump. The GSA technical representative will record observations from the inspection on a form like that provided in Attachment 2.

If a CDWR driller's log or other information is not available to confirm the total depth and condition of the well and if the pump intake depth cannot be confirmed from available information, it may be necessary to have the pump removed from the well and conduct a downhole video survey. Removing the pump will enable the GSA technical representative to measure the column pipe and thus confirm the pump intake depth and inspect the condition of the pump. The video log will enable inspection of the condition of the casing and perforations and confirm the perforation interval, total depth, and static groundwater level of the well. Upon completion of the investigation, the contractor will be required to reinstall the pump and reestablish all connections. If the pump was operating prior to removal, the contractor will be required to demonstrate that the pump is functioning properly after reinstallation. A sounding port or flow meter may also be installed to collect pumping water level data or discharge rate data, respectively.

Considerations for each GSA Mitigation Program include:

- Who will fund the contractor to remove the pump and conduct the video survey?
- If the GSA funds it, is the cost subject to reimbursement by the Claimant if the investigation finds that the issue is not associated with transitional overdraft pumping.
- Will the GSA require the well owner to sign a release of liability for any damage to the pump, pump column, or well resulting from removal of the pump and conducting the video log?

3 Evaluation of Claims of Groundwater Level Impacts

The foundational premise of the Mitigation Program, as it relates to groundwater levels, is to address significant and unreasonable impacts to domestic, municipal, industrial and agricultural wells from GSP-/GSA-approved or authorized activities.

The graphic on Figure 2 provides illustrated examples of groundwater level conditions that could be cause to approve or deny claims based on the data provided by the Claimant or collected by the GSA. It is noted that the examples shown on Figure 2 are not exhaustive and are provided for guidance only. Further, as SGMA does not require the GSAs to address impacts prior to January 2015, the examples assume that impacts prior to this time will not be considered for mitigation. In practice, it will be up to each GSA to determine if impacts that occurred prior to January 2015 will be evaluated and factored into considerations of mitigation. As shown, Examples 1 and 2 illustrate groundwater level impacts that would qualify for mitigation. Example 1 is a case where the static groundwater level is below the 2015 groundwater level and the pumping groundwater level, at the historical discharge rate, is within 10 feet of the bottom of the well. In Example 2, the static groundwater level is measured below the 2015 groundwater level and the pumping groundwater level, at the historical discharge rate, has dropped to within 20 feet of the pump intake. In both cases, the lowered groundwater levels can be attributed to overdraft and there is no option to restore the water supply without mitigation. The evaluation should consider whether there is adequate separation between the pump intake and the bottom of the well (e.g., 10 feet) and whether there is adequate pump submergence (e.g., 20 feet).

Examples 3 through 6 on Figure 2 illustrate cases where the well impact is not associated with lowered groundwater levels from GSP-/GSA-approved or authorized activities. In these cases:

- The pumping groundwater level would have already been below the bottom of the well before January 2015 (Example 3),
- The pumping groundwater level would have already been below the bottom of the pump intake before January 2015 (Example 4),
- The static groundwater level would have been below the pump intake prior to January 2015 (Example 5),
- The pump is not functioning for reasons other than groundwater level decline (e.g. mechanical failure)(Example 6).

In many cases, it is anticipated that a static groundwater level measured in the impacted well from January 2015 will not be available. For those cases, the reference January 2015 static groundwater level will be inferred from a groundwater level contour map generated based on available data from other wells measured at that time. Separate groundwater contour maps will be generated for the Upper and Lower Aquifers. The reference static groundwater level will be assigned from the contour map of the aquifer in which the well is predominantly perforated.

There are other factors, independent of lowered groundwater levels, that can cause a well to stop functioning, such as pump mechanical failure due to age or malfunction, holes in the well casing allowing sand into the pump intake, holes in the pump column associated with corrosion and wear, excessive plugging of screens due to lack of maintenance (e.g. well rehabilitation), and others. All these factors will need to be taken into consideration when assessing the need for mitigation.

Based on the analysis of data for the impacted well, the GSA technical representative will provide a recommendation to the GSA Board of Directors whether the well qualifies for mitigation.

A consideration for each GSA Mitigation Program includes:

- Will there be an appeal process available to the Claimant and, if so, what will that process consist of?

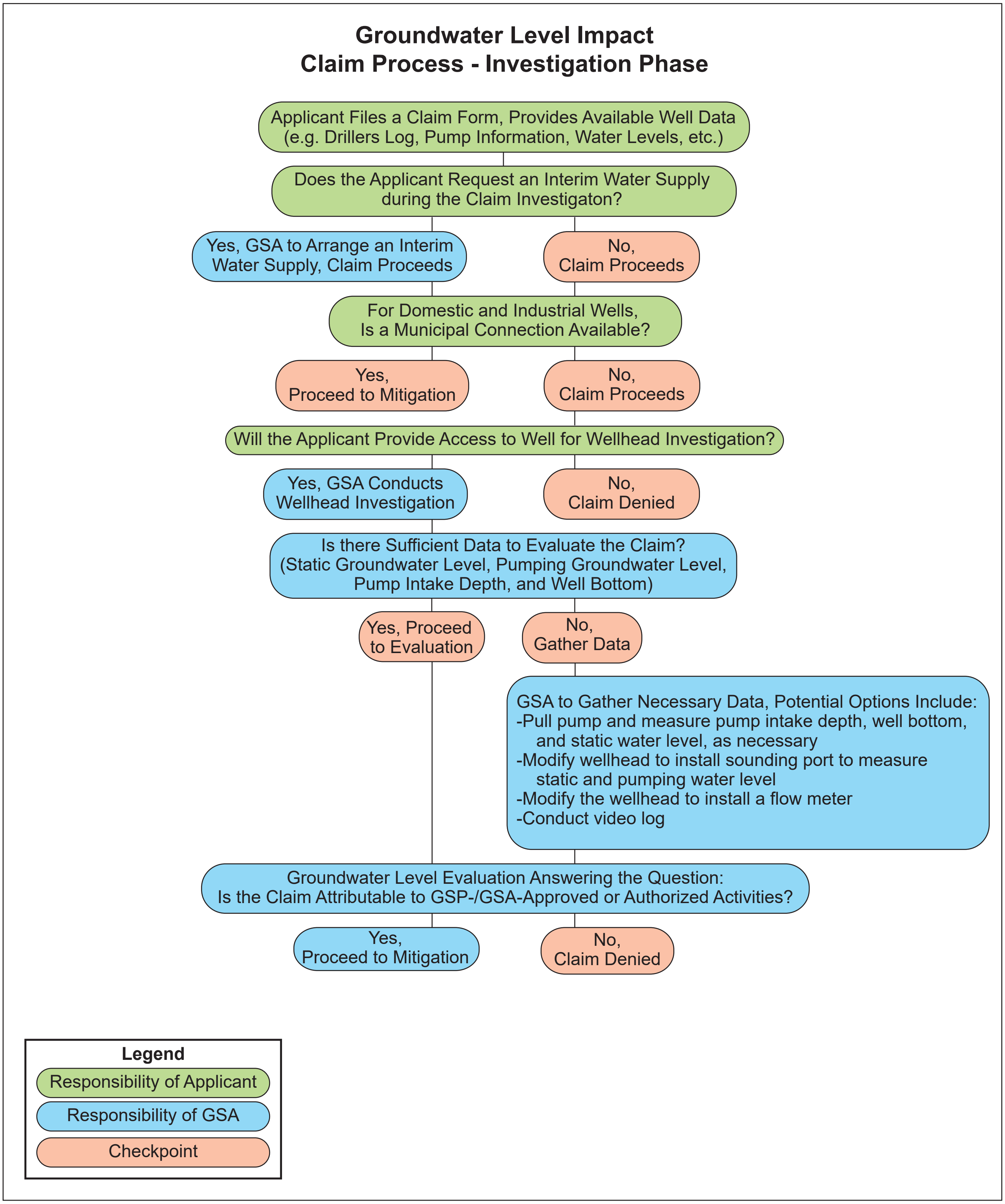
4 Potential Options for Mitigation

Mitigation measures, if approved, could include (but are not necessarily limited to) one or more of the following:

- Providing a short-term emergency water supply to domestic and municipal well owners. Short-term emergency supplies shall be provided as soon as reasonably possible, but in all cases within 14 days of notification to the GSA of such needs;
- Providing funds to lower a well pump;
- Providing funds to complete a connection to an M&I water provider;
- Supplying an equivalent water supply from an alternate source;
- Providing funds to replace the affected well with a deeper well that meets state and local requirements; or
- With the consent of the affected landowner, providing other acceptable mitigation.

Tule Subbasin Technical Advisory Committee
Mitigation Program - Technical Framework

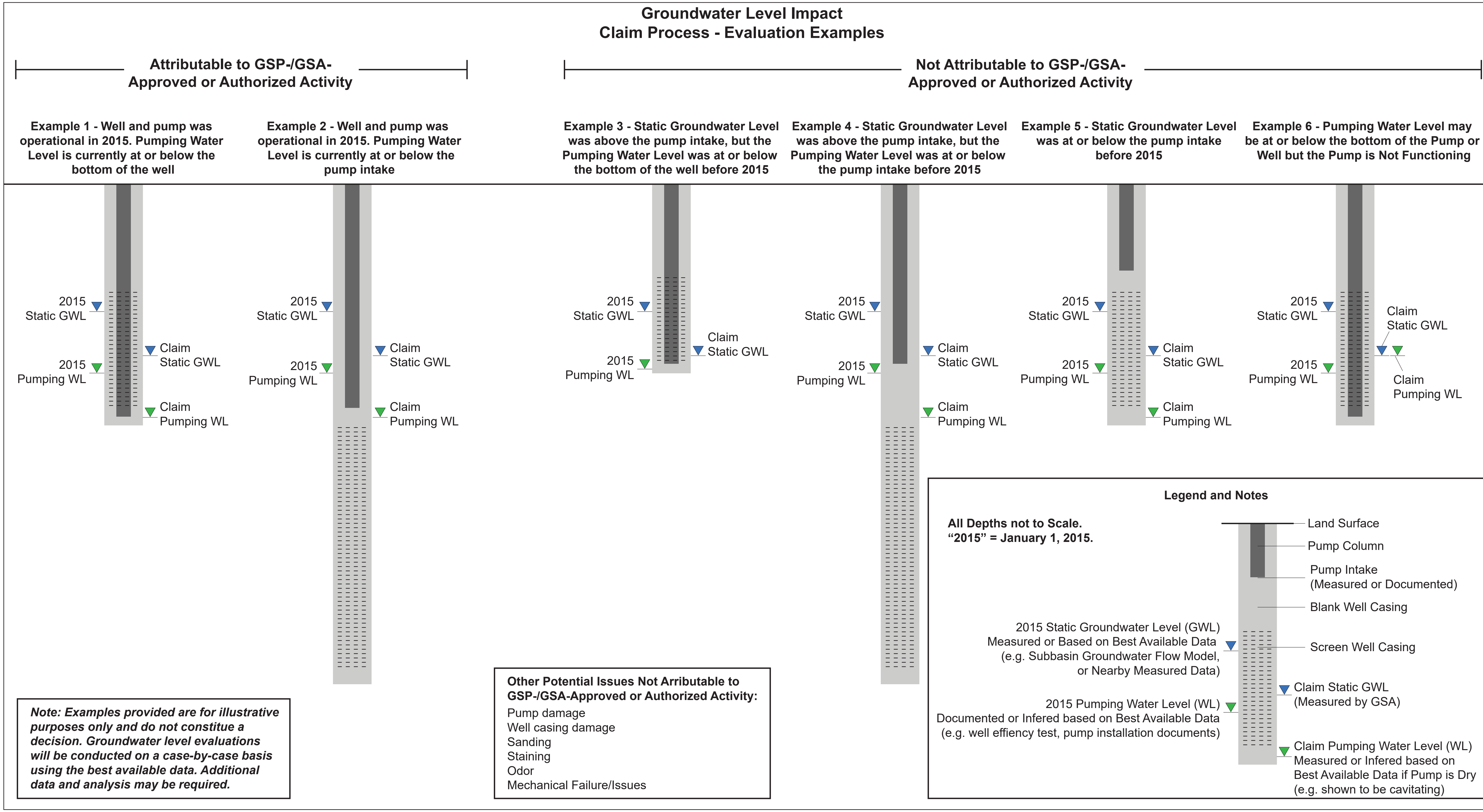
Figure 1



Thomas Harder & Co.
Groundwater Consulting

December 2022

Figure 2



Thomas Harder & Co.
Groundwater Consulting

December 2022

Attachment 1

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Groundwater Level Impact Claim Form

Claimant Information	
Contact Name:	**Well Location Sketch:**
Phone Number:	
Mailing Address:	
Well Name:	
Well Location (Address/Description):	
Well Type: ☐ **Domestic** ☐ **Industrial** ☐ **Agricultural** ☐ **Other (Specify):**	

Interim Water Supply	
Does the Claimant Request an Interim Water Supply?	☐ **Yes** ☐ **No**
Number of Residences/Business Served (If Applicable):	
Number of Cropped Acres and Crop Type (If Applicable):	
Estimated Daily Water Use (Gallons, Cubic Feet, or Acre-Ft):	

Well Construction Information		
Is a Department of Water Resources Well Completion Report (i.e. Driller's Log) Available?		☐ **Yes (Attach if Available)** ☐ **No**
Casing/Well Depth (ft):		
Perforation Interval(s) (ft):		
Casing Material:	**Casing Diameter (inches):**	
Date Constructed (If Known) and/or Well Age (Estimated):		
Date of Last Video Survey (If Available):		
Well Photos Attached:	☐ **Yes**	☐ **No**

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Groundwater Level Impact Claim Form

Pump Information	
Type: ☐ **Submersible**	☐ **Vertical Turbine**
Intake Depth (ft):	**Motor Size (horsepower):**
Age (Known or Estimated):	**Typical Discharge Rate (gpm):**
Last Pump Test Date (Attach Record if Available):	
Last Service Date (Attach Record if Available):	

Issue Status	
Date Issue Arose:	
Issue: ☐ **No flow** ☐ **Reduced Flow** ☐ **Breaking Suction** ☐ **Future Concern**	
Comments/Description:	
Static Water Level (ft):	**Pumping Water Level (ft):**
Status: ☐ **Not Resolved, Contractor not Contacted (Note: Contacting a Contractor Not Required)** ☐ **Not Resolved, Contractor Provided Estimate (attach estimate if applicable)** ☐ **Resolved (attached records if applicable)**	
Contractor Company Name:	
Contractor Contact Name:	**Contact Phone Number:**
Contractor Address:	

Applicant	
By signing this Groundwater Level Impact Claim Form, the applicant agrees to provide the GSA with access to the well for the Wellhead Investigation.	
Print Name:	**Date:**
Signature:	

GSA Use Only	
Received By:	**Date:**

Attachment 2

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Groundwater Level Impact Well Inspection Form

Inspector	
Inspector Name:	**Date:**
Representing (e.g. Irrigation District, Consultant, etc.):	

Owner Information
Owner's Name:
Field Contact Name (If Different):
Address:
Phone Number:

Well Information
Well Name:
Date Constructed:
Casing/Well Depth:
Casing Material:
Casing Diameter (inches):
Perforation Interval(s):

Pump Information:	
Type: ☐ **Submersible** ☐ **Vertical Turbine**	
Electrical Power (kW):	**Motor Size (horsepower):**
Intake Depth (ft):	
Equipped with Flow Meter: ☐ **Yes** ☐ **No**	
Flow Meter Description (Attach Photo):	
Discharge Rate (gpm) and Source:	
Discharge Line Diameter (Inches):	

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Groundwater Level Impact Well Inspection Form

Site Inspection	
Sounder Access Port Description and Opening Diameter (in):	
Reference Point Description and Stick Up (ft):	
Time Since Last Pumped:	**Time Since Pumping Started:**
Measured Static Water Level (ft):	**Measured Pumping Water Level (ft):**
Observed Pumping Description (e.g., working, won't turn on, dry after 5 minutes, pumping air, cavitating, etc.):	
Observed Pumping Rate (gpm) and Description (e.g., flow meter, bucket test, etc.):	
Distribution System Description (e.g., pressure tank, storage tank, residence, etc.)	

Location Sketch		
Well Coordinates:		
Survey Method:	**Latitude:**	**Longitude:**

DRAFT Technical Memorandum

To: Tule Subbasin Technical Advisory Committee

From: Thomas Harder, P.G., C.HG.
Thomas Harder & Co.

Date: 3-May-23

Re: DRAFT Technical Requirements for Addressing Impact Claims from Land Subsidence in the Tule Subbasin

1 Background and Purpose

In response to California Department of Water Resources (CDWR) comments to the Tule Subbasin draft Groundwater Sustainability Plans (GSPs) and Coordination Agreement, the Groundwater Sustainability Agencies (GSAs) each agreed to develop mitigation plans to address significant and unreasonable impacts to beneficial uses of groundwater during the sustainability transition period between 2020 and 2040. The revised Tule Subbasin Coordination Agreement submitted in July 2022 included a Mitigation Program Framework as Attachment 7, which outlined the general standards that each GSA would commit to in developing their respective Mitigation Programs. The GSAs further committed to completing the mitigation claims process for domestic and municipal wells by December 31, 2022 and all other aspects of the Mitigation Programs by June 30, 2023.

The purpose of this document is to provide the minimum technical requirements for use by each Tule Subbasin GSA to address claims of impact from land subsidence associated with transitional pumping overdraft. In consideration of the technical information provided herein, each GSA Mitigation Program will identify the specific criteria and processes for mitigating claims of impact caused by pumping within their respective GSA boundaries. Each Mitigation Program must provide a claim process to address impacts to:

(i) domestic and municipal wells,
(ii) agricultural wells, and
(iii) critical infrastructure.

Impacts may be related to one or more of the three sustainability indicators related to GSP-/GSA-approved or authorized activities:

1. Groundwater level declines
2. Land subsidence, and
3. Groundwater quality.

This TM addresses impacts related to land subsidence. Decisions to include or exclude impacted users from participation in a GSA's Mitigation Program shall be supported by appropriate written technical data and analysis, as described herein. In addition, this TM includes additional considerations, outside the technical requirements, for developing Mitigation Programs.

Each Mitigation Program will document:

1. Types of Impacts to be Addressed by the Mitigation Program
2. A Process for Responding to Claims of Impact
3. A Process for Investigating Claims
4. Qualifications for Mitigation
5. Types of Mitigation to Address Claims
6. An Outreach Program Prior To and During Mitigation Program Development
7. The Program Adoption Schedule
8. Mitigation Program Funding Source(s)

Mitigation will be applied only to those claims that are shown to be attributable to GSP-/GSA-approved or authorized activities.

2 Process Overview for Claims of Land Subsidence Impacts

The Mitigation Program framework outlined in the Tule Subbasin Coordination Agreement allows for entities, whether public or private, adversely affected by land subsidence to file a claim with the GSA in which the impact is located. The overall process for receiving and investigating claims of land subsidence impact is shown on Figure 1. For land subsidence, an "impact" is defined as damage and/or loss of functionality of a structure or a facility occurring to the extent that the structure or facility cannot reasonably operate without either repair or replacement, as determined by the GSA where the structure and facility are located or where beneficial use is impacted due to the damage and/or loss of functionality of the structure or facility. The impact must by realized after January 2015. Responsibilities of the claimant are shown in green and responsibilities of the GSA are shown in blue on Figure 1. Decision points are shown in orange.

2.1 Filing a Claim

The claim process starts with the affected party ("Claimant") filing a claim with the GSA in which the party's structure or facility is located. The claim will be filed using a form like that provided in Attachment 1. To process a claim, the Claimant must provide some basic information to enable further investigation of the claim, including:

- The Claimant's name and contact information,
- The location of the impacted structure or facility,
- A description of the impacted structure or facility,
- A description of the damage attributed to land subsidence, and
- The applicant's signature.

GSAs may determine whether to provide full or partial mitigation based on a Claimant's compliance with the GSA's GSP, Rules & Regulations, and other laws or regulations. Further, mitigation will be applied only to those claims that are shown to be attributable to GSP-/GSA-approved or authorized activities.

2.2 Provision of Access to the Structure/Facility for Inspection by the GSA

Mitigation of any claim of impact not rejected in Section 2.1 herein, will require that the Claimant provide access to the impacted structure or facility to verify the claim. In signing the impact claim form (Attachment 1), the Claimant agrees to release all data associated with the structure or facility and provide access to the structure or facility for inspection by a GSA technical representative. Denial of access to the structure or facility for inspection by the GSA will result in denial of mitigation.

2.3 Preliminary Structure/Facility Assessment Based on Existing Data

A GSA technical representative will review all available information provided by the Claimant for the affected structure/facility prior to inspection in the field. Data to be reviewed will include (but not necessarily be limited to):

- A description of the type of structure/facility and what it is used for,
- Original as-built drawings of the structure/facility,
- Information on the date the structure/facility was constructed,
- Any geotechnical reports, including borehole logs, generated prior to or at the time the structure/facility was constructed,
- Photographs of the structure/facility prior to the impact, and
- Information on the nature of the problem including photographs showing the impacted structure/facility.

Based on a review of the available data provided by the Claimant, the GSA will determine whether the claim can be verified based on the data. Criteria for the determination will include:

- Completeness of the dataset relative to the requested information,
- Reliability of the data provided,
- Nature and status of the issue, and

- Evidence of structure/facility impact from land subsidence attributed to GSP-/GSA-approved or authorized activities.

If the claim can be verified based on available information from the Claimant or the Tule Subbasin Data Management System, then the GSA technical representative will issue a recommendation for appropriate mitigation. If not, the GSA will conduct additional investigation to verify the claim as described in Section 2.4.

2.4 As-Needed Supplemental Data Collection

To verify a claim that cannot be confirmed from existing information provided by the Claimant, a GSA technical representative will need to inspect the structure/facility and collect supplemental information. The types of information to be collected will depend on the data available from the Claimant and the nature of the structure/facility. Determination of the extent of additional data collection necessary to verify the claim will be at the sole discretion of the GSA. In general, the minimum data to be collected in the field will include:

- Structure/facility address,
- Nature and use of the structure/facility,
- Notes on the nature of the damage to the structure or facility, and
- Photographs of the damage.

The GSA technical representative will record observations from the inspection on a form like that provided in Attachment 2.

If the claim is related to gravity-driven water conveyance infrastructure (e.g. canals, turnouts, recharge basins, stream channels used to convey water, pipelines, and field irrigation), it may be necessary to inspect the entire facility to determine if factors other than land subsidence are impacting the functionality of the structure or facility. The GSA may arrange for water delivery to the facility to document the facility's operating condition. It may also be necessary to survey the structure/facility to obtain data needed to verify the structure's hydraulic capacity.

If the claim is related to well damage suspected of being caused by land subsidence, it may be necessary to have the pump removed from the well and conduct a downhole video survey. Removing the pump will enable the GSA technical representative to measure the column pipe and thus confirm the pump intake depth and inspect the condition of the pump. The video log will enable inspection of the condition of the casing and perforations and confirm the perforation interval, total depth, and static groundwater level of the well. Upon completion of the investigation, the contractor will be required to reinstall the pump and reestablish all connections. If the pump was operating prior to removal, the contractor will be required to demonstrate that the pump is functioning properly after reinstallation.

If the claim is related to flood control facilities it may be necessary to inspect the entire facility to determine if there are factors other than land subsidence impacting the functionality of the structure or facility. The GSA may survey the structure/facility to obtain data needed to verify the structure's hydraulic capacity. In certain cases, the GSA may also have a hydraulic analysis completed by an engineer.

Finally, additional data may be required to evaluate a claim (e.g. soil testing, materials testing, etc.) and will be obtained on a case-by-case basis depending on the structure/facility (e.g. roads, railroads, pipelines, bridges, wastewater collection) and the nature of the impact.

Considerations for each GSA Mitigation Program include:

- Should a landowner making a claim be required to provide documentation that they did not contribute to the groundwater overdraft causing land subsidence to be eligible for mitigation?
- Who will fund a surveyor, well contractor, engineer, or other consultant/contractor, if needed, to collect and analyze additional data?
- If the GSA funds it, is the cost subject to reimbursement by the Claimant if the investigation finds that the issue is not associated with transitional overdraft pumping.
- Will the GSA require the Claimant to sign a release of liability for any damage to the structure/facility resulting from the data collection (e.g. removal of the pump and conducting the video log)?

3 Evaluation of Claims of Land Subsidence Impacts

Land subsidence can manifest itself as a regional phenomenon or on a local scale. Regional land subsidence results in a large area (e.g. 10's to 100's of square miles) subsiding at similar rates such that the effect of the lowered land elevation cannot be discerned except through periodic surveying of bench marks or information from satellites. Impacts to land uses, property interests, and critical infrastructure from this type of land subsidence are most likely to occur in the form of reduced surface carrying capacity of gravity-driven water conveyance, well damage, and flood control. Differential land subsidence results in localized adjoining areas subsiding at different rates relative to each other. This can result in land fissuring and often occurs along a fault or geologic boundary. Differential land subsidence has the most potential to cause damage to surface infrastructure such as roads, bridges, and buildings.

Criteria for attributing structural/facility impacts to land subsidence include the following:

- The total amount of land subsidence and, if applicable, change in land surface slope at the structure/facility since 2015 based on the best available data.

- Evidence of ground fissures at the structure/facility that can be linked to active land subsidence in the area from other data.
- For gravity-driven water conveyance facilities, reduced flow capacity relative to 2015, that affects the functionality of the facility.
- For wells: observed casing collapse, damage, or protrusion attributable to subsidence.
- For flood control facilities, changes in water height or channel slope attributable to subsidence since 2015 that affects the functionality of the facility.

4 Potential Options for Mitigation

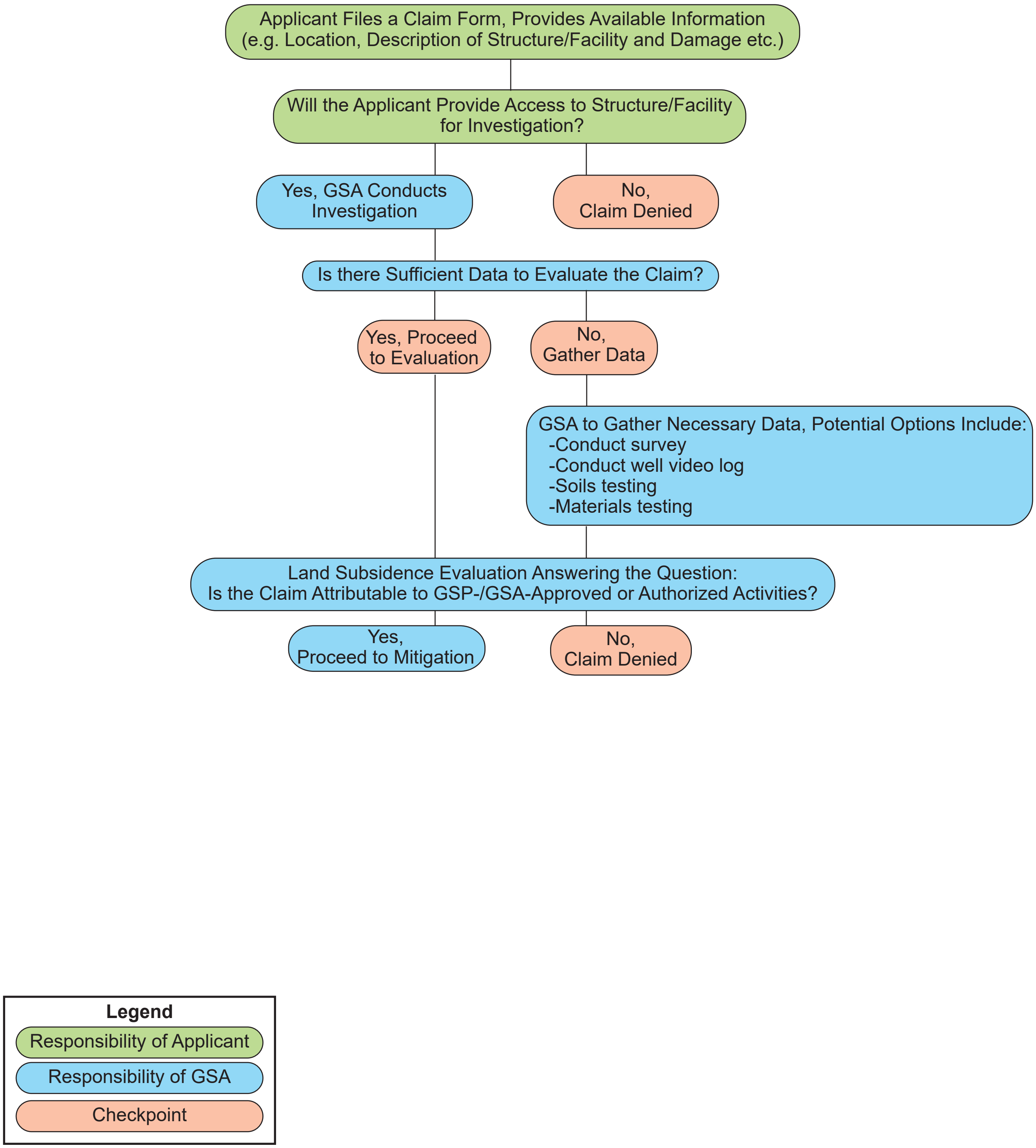
Mitigation measures, if approved, could include (but are not necessarily limited to) one or more of the following:

- Providing funds to repair or replace the impacted structure/facility; or
- With the consent of the affected landowner, providing other acceptable mitigation.

Tule Subbasin Technical Advisory Committee
Mitigation Program - Technical Framework

Figure 1

Land Subsidence Impact Claim Process



Thomas Harder & Co.
Groundwater Consulting

April 2023

Attachment 1

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Land Subsidence Impact Claim Form

Claimant Information	
Contact Name:	**Structure/Facility Location Sketch:**
Phone Number:	
Mailing Address:	
Structure/Facility Name:	
Structure/Facility Location (Address):	
Structure/Facility Description:	

Structure/Facility Information	
Are Original As-Built Drawings Available?	☐ **Yes (Attach if Available)** ☐ **No**
Date Structure/Facility was Constructed:	
Are Geotechnical Reports, Borehole Logs, Hydraulic Studies, or Other Data Available?	☐ **Yes (Attach if Available)** ☐ **No**
Are Structure/Facility Photos Prior to Impact Available?	☐ **Yes (Attach if Available)** ☐ **No**

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Land Subsidence Impact Claim Form

Issue Status	
Date Issue Arose:	
Description of the Impact (Attach Photographs):	
Status: ☐ **Not Resolved, Contractor not Contacted (Note: Contacting a Contractor Not Required)** ☐ **Not Resolved, Contractor Provided Estimate (attach estimate if applicable)** ☐ **Resolved (attached records if applicable)**	
Contractor Company Name:	
Contractor Contact Name:	**Contact Phone Number:**
Contractor Address:	

Applicant	
By signing this Land Subsidence Impact Claim Form, the applicant agrees to provide the GSA with access to the Structure/Facility for the Investigation.	
Print Name:	**Date:**
Signature:	

GSA Use Only	
Received By:	**Date:**

Attachment 2

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Land Subsidence Impact Site Inspection Form

Inspector	
Inspector Name:	**Date:**
Representing (e.g. Irrigation District, Consultant, etc.):	

Owner Information
Owner's Name:
Field Contact Name (If Different):
Address:
Phone Number:

Structure/Facility Information
Name:
Date Constructed:
Nature and Use of Structure/Facility (Fill in Appropriate Section Below)
Gravity-Driven Water Conveyance (Provide Description; e.g. canal, turnout, basin, stream channel, etc.)
Well (Provide Description; e.g. Depth, Casing Material, Casing Diameter, Perforation Interval, etc.):

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Land Subsidence Impact Site Inspection Form

Flood Control Facilities (Provide Description):
Other (Provide Description):

Site Inspection Notes
Nature of Damage (Attach Photographs):

Tule Subbasin Technical Advisory Committee
Example Groundwater Sustainability Agency
Land Subsidence Impact Site Inspection Form

Location Sketch		
Site Coordinates/APN:		
Survey Method:	**Latitude:**	**Longitude:**

TECHNICAL MEMORANDUM

To: Tule Subbasin SGMA Managers

From: Don Tucker – 4Creeks, Inc.

Date: June 29, 2022

Re: Technical Support for Addressing DWRs Comments Regarding Groundwater Quality Sustainable Management Criteria in the Tule Subbasin

1 Introduction

This technical memorandum (TM) was prepared to address the groundwater quality comments from the California Department of Water Resources (CDWR) on groundwater sustainability plans (GSPs) prepared by each of the six Groundwater Sustainability Agencies (GSAs) within the Tule Subbasin.

1.1 Background

The originally submitted Tule Subbasin Coordination Agreement addressed undesirable results related to groundwater quality as stated: "*…the criteria for an undesirable result for the degradation of groundwater quality is defined as the unreasonable long-term changes of groundwater quality above the minimum thresholds at greater than 50% of GSA Management Area RMS wells caused by groundwater pumping and/or groundwater recharge.*"

The original Coordination Agreement further stated that "*…the avoidance of an undesirable result for degraded groundwater quality is to protect the those using the groundwater, which varies depending on the use of the groundwater. The effects of degraded water quality caused by recharge or lowering of groundwater levels may impact crop growth or impact drinking water systems, both of which would cause additional expense of treatment to obtain suitable water."*

Each of the Tule Subbasin GSA originally submitted GSPs further described the process/methodology used for setting Sustainable Management Criteria: "*The following four (4) steps detail the process for setting interim milestones and the measurable objective at individual RMS related to Groundwater Quality:*

Step 1: *Locate the RMS defined in the Tule Subbasin Monitoring Plan, identify which portion of the aquifer it represents, and the associated Constituents of Concern (COC) at the RMS based on groundwater suitability (Agriculture use, Domestic Use, Municipal Use).*

Step 2*: Prepare a table summarizing available historical groundwater quality data for each COC at the RMS well.*

Step 3*: Establish interim milestones and the measurable objective at each RMS well with calculating a change above the baseline groundwater quality to not exceed 10% of long term 10 year running average.*

Step 4: *Each year, during the Plan Implementation Period, re-calculate the long term 10 year running average. Evaluate changes to groundwater quality based on reduction of groundwater elevation or from recharge efforts."*

Similar to the process described for interim milestones and measurable objectives, minimum thresholds at each RMS well were established to not exceed 15% change in the long-term 10-year running average.

Lastly, each of the Tule Subbasin GSA GSPs described the Constituent of Concerns (COC) that will be monitored at each RMS wells as follows: "*The COC vary depending on the suitability of the groundwater. Each of the COC to be monitored by the GSA at the RMS wells to serve as indicators for changes in groundwater quality are identified in the table below.*"

Municipal / Domestic	*Agricultural*
Arsenic	*pH*
Chromium (Total)	*Conductivity*
Nitrogen as N	*Nitrogen as N*
(any specific Title 22 MCL exceedance at baseline sampling event in Spring 2020)	

1.2 DWR Response

The CDWR made the following comments relating to addressing groundwater quality in the Coordination Agreement and individual GSPs within the Tule Subbasin:

"The GSPs do not provide sufficient information to justify the proposed sustainable management criteria for degraded water quality.

1. *The GSPs do not specify what groundwater conditions are considered suitable for agricultural irrigation and domestic use. The GSPs do not explain the choice of constituents (pH, conductivity, and nitrate) as a means of evaluating impacts to beneficial uses and users, especially agricultural irrigation.*

2. *The GSPs do not explain how the use of a 10-year running average to establish the sustainable management criteria will avoid undesirable results due to degraded groundwater quality and related potential effects of the undesirable results to existing regulatory standards. The GSPs do not explain how the criteria defining when undesirable results occur in the Subbasin was established, the rationale behind the approach, and why it is consistent with avoiding significant and unreasonable effects associated with groundwater pumping and other aspects of the GSAs' implementation of their GSPs.*

3. *The GSPs do not explain how the sustainable management criteria for degraded water quality relate to existing groundwater regulatory requirements in the Subbasin and how the GSAs will coordinate with existing agencies and programs to assess whether or not implementation of the GSPs is contributing to the degradation of water quality throughout the Subbasin."*

1.3 Purpose and Scope

The purpose of this TM is to provide the revised approach for re-establishing the sustainability management criteria (SMC) for groundwater quality as is relates to selection constituents of concerns for determining impacts to beneficial uses and users, the rationale used to quantify undesirable results as they relate to existing regulatory standards, and how impacts will be assessed to determine if GSA implementation efforts are a contributing factor to groundwater quality.

In general, the following items were prepared relating to DWRs comments for degradation of groundwater quality:

1. A detailed description of how the overlying beneficial uses and users were defined for determining constituent of concerns to monitor at each RMS groundwater quality well.
2. Redefined rationale for setting groundwater quality SMCs to align with existing regulatory requirements.
3. A detailed description of how ongoing coordination with existing groundwater regulatory agencies and programs will take place to evaluate if GSP implementation is contributing to degradation to groundwater quality.

1.4 Proposed Approach

1.4.1 Defining Beneficial Uses and Users at each RMS Well

Each groundwater quality RMS well will be designated as representative of agricultural or drinking water or both based on the beneficial use and users of groundwater within a representative area surrounding the well based on the following evaluation:

Drinking Water: The RMS well is within an urban MA or 1-mile of a public water system**.**

Agricultural: Greater than 50% of the pumping within the representative area is determined to be agricultural and there are no public water systems within a 1-mile radius.

An RMS well may be designated as representative of both agricultural and drinking water if it possesses a representative area with greater than 50% agricultural pumping and a public water system was within 1-mile.

The analysis used to determine the beneficial uses at each RMS well consisted of querying DWR well completion reports, public water systems, and schools using ArcGIS. The detailed breakdown of the steps to conduct analysis is described below.

1. Create a layer in ArcGIS by combining data from the following:
    - Well locations and well types from DWRs Well Completion Report Mapping Application
    - Boundaries of SWDIS Public Water Systems
    - Boundaries of Community/Urban areas from LAFCO
2. Overlay groundwater quality locations of RMS wells and create 1 mile buffer for analyzing.
3. Summarize the data identified in step 1 relative to each groundwater quality RMS well 1-mile buffer.
4. Define the groundwater quality RMS well as representative of drinking water and/or agricultural beneficial pumping beneficial use.

Wells types are categorized as drinking water, agricultural, or not applicable based on breakdown in **Table 1**.

Table 1: Categories of Well Types

Drinking Water	Agricultural	Not Applicable
Domestic	Irrigation - Agricultural	Cathodic Protection
Public	Other Irrigation	Destruction Monitoring
Water Supply	Water Supply Irrigation - Agricultural	Destruction Unknown Soil Boring
Water Supply Domestic	Water Supply Irrigation - Agriculture	Monitoring
Water Supply Public	Water Supply Stock or Animal Watering	Other Destruction
		Test Well
		Test Well Unknown
		Unknown
		Vapor Extraction
		Vapor Extraction n/a
		Water Supply Industrial
		Blanks

Results of this analysis are provided as part of the Monitoring Network Section of each GSP.

1.4.2 Rationale for Establishing Sustainable Management Criteria

Agricultural and drinking water constituents of concerns (COC) will be evaluated based on the established Maximum Contaminate Level (MCL) or Water Quality Objectives (WQO) by the responsible regulatory agency. In the case of drinking water, the following Title 22 constituents will be monitored and for agricultural the following Basin Plan Water Quality Objective (WQO) constituents of concern will be monitored:

Drinking Water Constituents of Concern

- Arsenic
- Nitrate as N
- Chromium-VI
- Dibromochloropropane (DBCP)
- 1,2,3- Trichloropropane (TCP)
- Tetrachloroethene (PCE)
- Chloride
- Total Dissolved Solids
- Perchlorate

Agricultural Constituents of Concern

- Chloride
- Sodium
- Total Dissolved Solids

Measurable objectives are proposed to be 75% of the regulatory limits for the COCs and the minimum thresholds are proposed to be the regulatory limits as identified in **Table 2**. For RMS wells that have historical exceedances of the MCLs or WQOs which were not caused by implementation of a GSP, minimum thresholds will not be set at the MCLs or WQOs, but rather the pre-SGMA implementation concentration. These RMS wells closely monitored to evaluate if further degradation is occurring at the RMS site as a result of GSP implementation into the future.

Table 2: Measurable Objectives and Minimum Thresholds for Groundwater Quality

Constituent	Units	Minimum Threshold		Measurable Objective	
		Drinking Water Limits (MCL/SMCL)	Agricultural Water Quality Objective	Drinking Water Limits (MCL/SMCL)	Agricultural Water Quality Objective
Arsenic	ppb	10	N/A	7.5	N/A
Nitrate as N	ppm	10	N/A	7.5	N/A
Hexavalent Chromium	ppb	10	N/A	7.5	N/A
Dibromochloropropane (DBCP)	ppb	0.2	N/A	0.15	N/A
1,2,3-Trichloropropane (TCP)	ppt	5	N/A	3.75	N/A
Tetrachloroethene (PCE)	ppb	5	N/A	3.75	N/A
Chloride	ppm	500	106	375	79.5
Sodium	ppm	N/A	69	N/A	51.75
Total Dissolved Solids	ppm	1,000	450	750	337.5
Perchlorate	ppb	6	N/A	4.5	N/A

Utilizing the criteria described above, the Tule Subbasin GSAs have revised the definition of undesirable results for degradation of groundwater quality in *Section 4.3.3.2 - Criteria to Define Undesirable Results (§354.26(b)(2))* in the Tule Subbasin Coordination Agreement as:

> *"..the exceedance of a minimum threshold at a groundwater quality RMS in any given GSA resulting from the implementation of a GSP. This condition would indicate that more aggressive management actions were needed to mitigate the overdraft."*

Additionally, the Tule Subbasin has developed a Mitigation Program Framework included as Attachment 7 of the Tule Subbasin Coordination Agreement, which describes the framework the Tule Subbasin GSAs would utilize to address impacts that occur from implementation of a GSP relative to degradation of groundwater quality due to GSA actions.

1.4.3 Coordination with Existing Groundwater Quality Regulatory Agencies and Programs

The monitoring and characterization of groundwater quality conditions has historically been conducted and reported by other public agencies and/or non-profits to meet requirements of other regulatory programs, which focus on the prevention of degradation of groundwater quality. The existing groundwater monitoring programs that the Tule Subbasin GSAs coordinate with are described in **Table 3**.

To prevent duplication of efforts and competing datasets for the ILRP, CV-Salts Nitrate Control Program, and SGMA GSAs, the Tule Subbasin utilizes a single group to manage the monitoring efforts within the Subbasin for collectively meeting the various requirements of these programs being implemented at the local level. This level of coordination between these agencies and groups ensures that the efforts performed under each program help provide a cohesive response to providing short term and long-term solutions to groundwater management.

The evaluation as to whether the implementation of a GSP may be contributing to the degradation of water quality will be completed as outlined in Attachment 7 of the Tule Subbasin Coordination Agreement. The types of mitigation for degradation of groundwater quality will vary by GSA and will be coordinated with the agencies listed in Table 2.

Other forms of mitigation may consist of joint ventures to secure grant funding to address GSA related impacts.

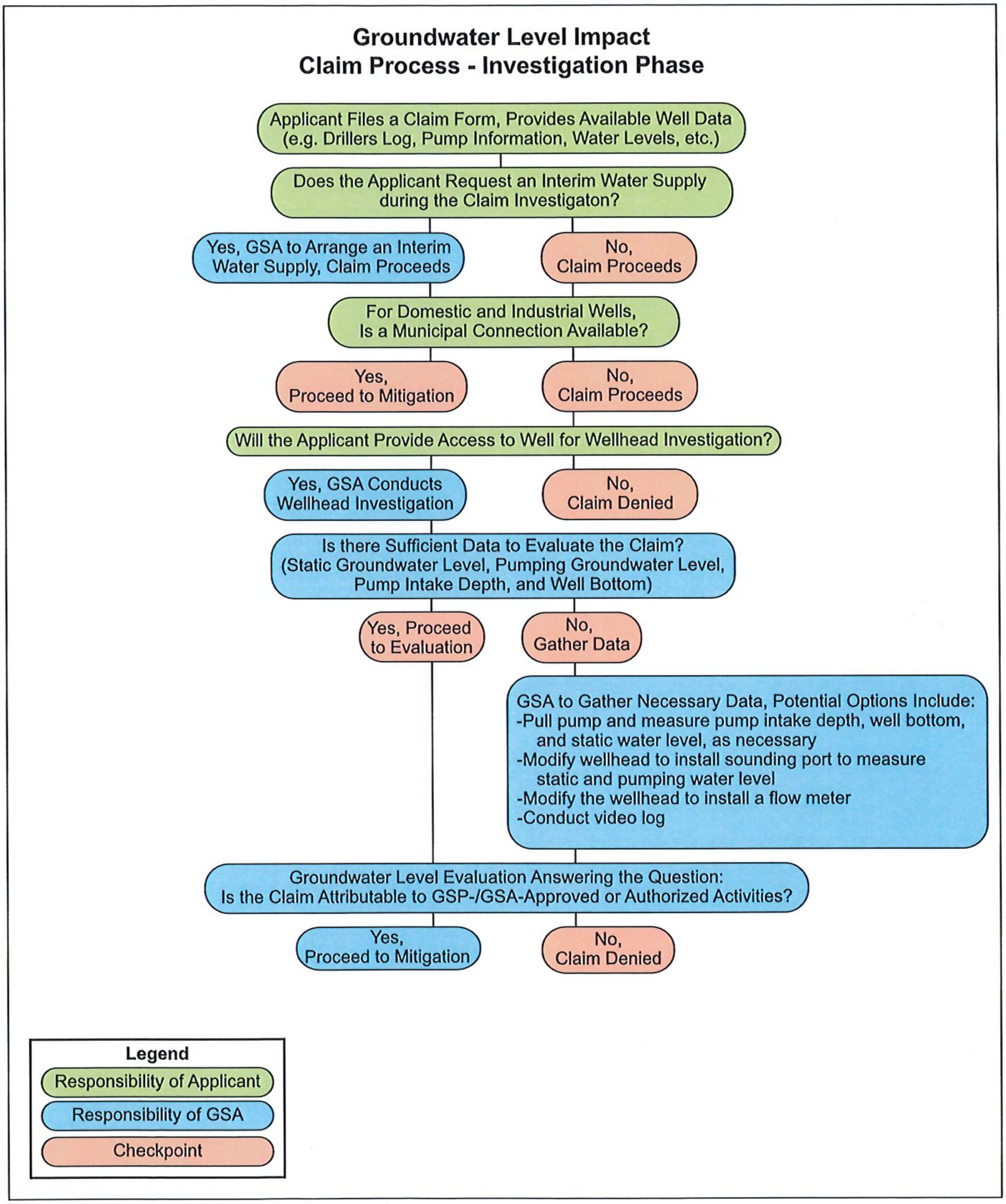
Table 3: Existing Groundwater Quality Monitoring Programs

Programs or Data Portals	Tule Subbasin Agency Coordinating with GSAs	Parameters	Monitoring Frequency	Program Objectives
AB-3030 and SB-1938 Groundwater Management Plans	Tule Subbasin GSAs, requirements incorporated into GSP Annual Reports	• Water levels are typically monitored annually. • Ag Suitability analysis (limited suite of general minerals) monitoring frequency between annual to once every 3 years.	Semiannual to Annual	
California SDWIS	Varies Public Water Systems	Database for all public water system wells and historical sample results. Data available includes all Title 22 regulated constituents.	• Title 22 General Minerals and Metals every 3 years. • Nitrate as N annually, if ≥ 5 ppm, sampled quarterly • VOCs and SOCs sampled every 3 years. • Uranium sampling depends on historical results but varies between 1 sample every 3 (when ≥ 10 pCi/L), 6 (when < 10 pCi/L) or 9 (when no historical detection) years.	Demonstrate compliance with Drinking Water Standards through monitoring and reporting water quality data.
CV-SALTS	Tule Basin Management Zone, Tule Basin Water Foundation	Sampling parameters required through Waste Discharge Requirements (WDR): typically include monthly sodium, chloride, electrical conductivity, nitrogen species (N, NO2, NO3, NH3), pH and other constituents of concern identified in the Report of Waste Discharge. A limited suite of general minerals is required quarterly from the source and annually from the wastewater.	Most constituents sampled monthly, quarterly general minerals from source water and annual general minerals from waste discharge.	To monitor degradation potential from wastewaters discharged to land application areas and provide interim replacement water when MCL for nitrate as N is exceeded while developing long term solutions for safe drinking water.
Department of Pesticide Regulation	County of Tulare	Pesticides	Annual	DPR samples groundwater to determine: (1) whether pesticides with the potential to pollute groundwater are present, (2) the extent and source of pesticide contamination, and (3) the effectiveness of regulatory mitigation measures.
GAMA (Collaboration with SWQCB, RWQCB, DWR, DPR, NWIS, LLNL)		• Constituents sampled vary by the Program Objectives. • Typically, USGS is the technical lead in conducting the studies and reporting data.	Varies	• Improve statewide comprehensive e groundwater monitoring. • Increase the availability of groundwater quality and contamination information to the public.
Geotracker and Envirostor Databases		Many contaminants of concern, organic and inorganic.	Depends on program. Monthly, Semiannually, Annually, etc.	Records database for cleanup program sites, permitted waste dischargers
ILRP	Tule Basin Water Quality Coalition	• Annually: static water level, temperature, pH, electrical conductivity, nitrate as nitrogen, and dissolved oxygen. • Once every five years: general minerals collection	Annual and Every 5 years	Monitor impacts of agricultural and fertilizer applications on first encountered groundwater
USGS California Water Science Center		Conducted multiple groundwater quality studies of the Tule Subbasin.	Reports, factsheet, and data publications range from 1994through 2017.	Special studies related to groundwater quality that provide comprehensive studies to characterize the basin.

Attachment 3 - Groundwater Level Impact Claim Process - Investigation Phase Flow Chart

Tule Subbasin Technical Advisory Committee
Mitigation Program - Technical Framework

Figure 1



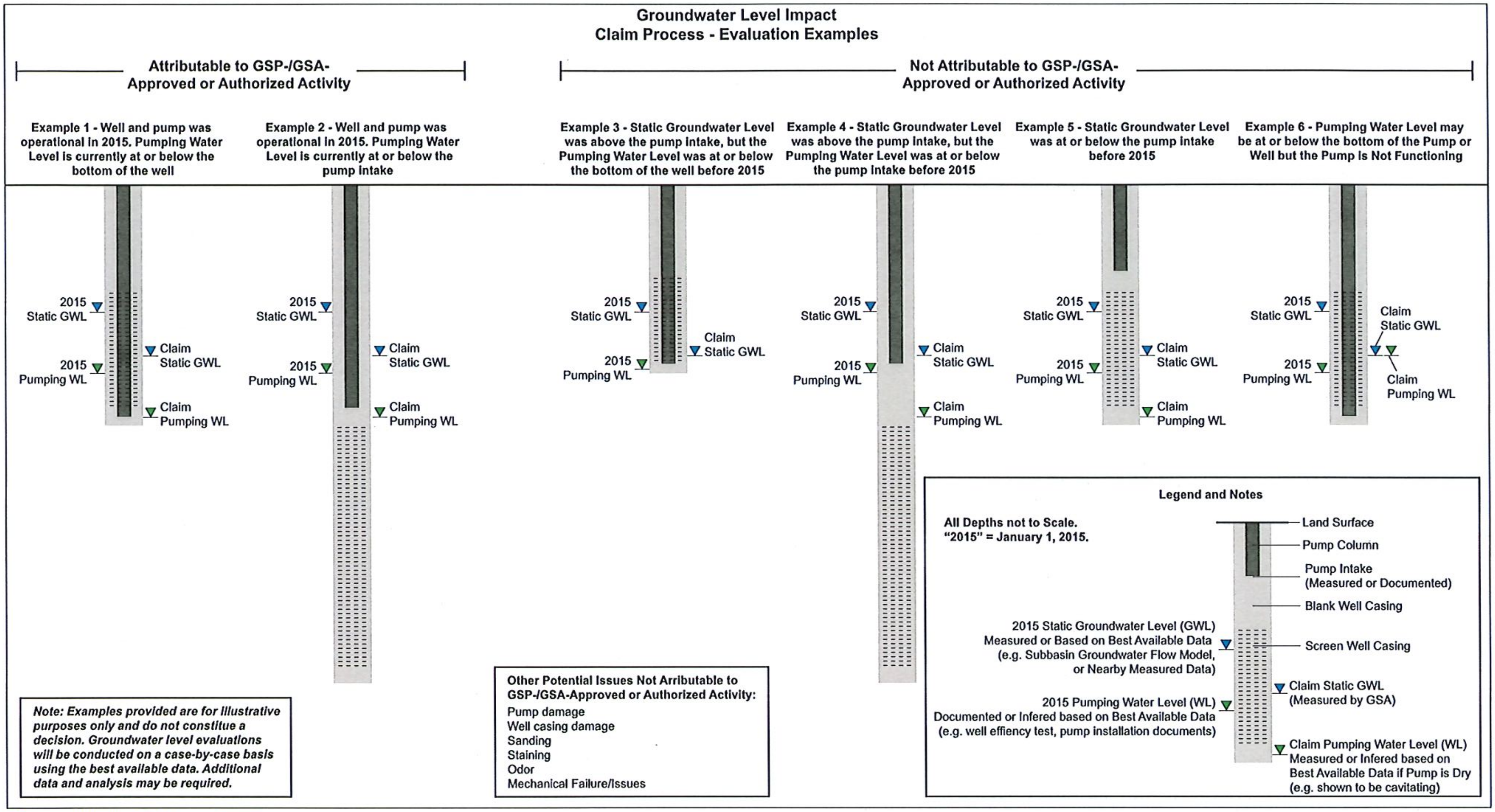
Thomas Harder & Co.
Groundwater Consulting

December 2022

Attachment 4 - Groundwater Level Impact Claim Process - Evaluation Examples

Tule Subbasin Technical Advisory Committee
Mitigation Program - Technical Framework

Figure 2



Thomas Harder & Co.
Groundwater Consulting

December 2022

Lower Tule River and Pixley Irrigation Districts
Groundwater Sustainability Agency
Groundwater Level Impact Claim Form

Claimant Information	
Contact Name:	**Well Location Sketch:**
Phone Number:	
Mailing Address:	
Well Name:	
Well Location (Address/Description):	
Well Type:	

☐ **Domestic** ☐ **Industrial** ☐ **Agricultural** ☐ **Other (Specify):**

Interim Water Supply	
Does the Claimant Request an Interim Water Supply?	☐ **Yes** ☐ **No**
Number of Residences/Business Served (If Applicable):	
Number of Cropped Acres and Crop Type (If Applicable):	
Estimated Daily Water Use (Gallons, Cubic Feet, or Acre-Ft):	

Well Construction Information		
Is a Department of Water Resources Well Completion Report (i.e. Driller's Log) Available?	☐ **Yes (Attach if Available)** ☐ **No**	
Casing/Well Depth (ft):		
Perforation Interval(s) (ft):		
Casing Material:	**Casing Diameter (inches):**	
Date Constructed (If Known) and/or Well Age (Estimated):		
Date of Last Video Survey (If Available):		
Well Photos Attached:	☐ **Yes**	☐ **No**

Pump Information	
Type: ☐ Submersible	☐ Vertical Turbine
Intake Depth (ft):	Motor Size (horsepower):
Age (Known or Estimated):	Typical Discharge Rate (gpm):
Last Pump Test Date (Attach Record if Available):	
Last Service Date (Attach Record if Available):	

Issue Status				
Date Issue Arose:				
Issue:	☐ No flow	☐ Reduced Flow	☐ Breaking Suction	☐ Future Concern
Comments/Description:				
Static Water Level (ft):		Pumping Water Level (ft):		
Status: ☐ Not Resolved, Contractor not Contacted (Note: Contacting a Contractor Not Required) ☐ Not Resolved, Contractor Provided Estimate (attach estimate if applicable) ☐ Resolved (attached records if applicable)				
Contractor Company Name:				
Contractor Contact Name:		Contact Phone Number:		
Contractor Address:				

Applicant	
By signing this Groundwater Level Impact Claim Form, the applicant agrees to provide the GSA with access to the well for the Wellhead Investigation.	
Print Name:	Date:
Signature:	

GSA Use Only	
Received By:	Date:

Attachment 6 - Well Inspection Form

Lower Tule River and Pixley Irrigation Districts Groundwater Sustainability Agency Groundwater Level Impact Well Inspection Form

Inspector	
Inspector Name:	**Date:**
Representing (e.g. Irrigation District, Consultant, etc.):	

Owner Information
Owner's Name:
Field Contact Name (If Different):
Address:
Phone Number:

Well Information
Well Name:
Date Constructed:
Casing/Well Depth:
Casing Material:
Casing Diameter (inches):
Perforation Interval(s):

Pump Information:		
Type:	☐ **Submersible**	☐ **Vertical Turbine**
Electrical Power (kW):	**Motor Size (horsepower):**	
Intake Depth (ft):		
Equipped with Flow Meter:	☐ **Yes**	☐ **No**
Flow Meter Description (Attach Photo):		
Discharge Rate (gpm) and Source:		
Discharge Line Diameter (Inches):		

Site Inspection	
Sounder Access Port Description and Opening Diameter (in):	
Reference Point Description and Stick Up (ft):	
Time Since Last Pumped:	**Time Since Pumping Started:**
Measured Static Water Level (ft):	**Measured Pumping Water Level (ft):**
Observed Pumping Description (e.g., working, won’t turn on, dry after 5 minutes, pumping air, cavitating, etc.):	
Observed Pumping Rate (gpm) and Description (e.g., flow meter, bucket test, etc.):	
Distribution System Description (e.g., pressure tank, storage tank, residence, etc.)	

Location Sketch		
Well Coordinates:		
Survey Method:	**Latitude:**	**Longitude:**

Attachment 7 - Waiver and Release of Liability

LOWER TULE RIVER AND PIXLEY IRRIGATION DISTRICTS
GROUNDWATER SUSTAINIBILITY AGENCY

WAIVER AND RELEASE OF LIABILITY AND
INDEMNITY AGREEMENT

Landowner Names and Addresses (Please Print):

______________ ______________
______________ ______________
______________ ______________

I have submitted an impact claim form to the Groundwater Sustainability Agency ("GSA"). It is understood that I must give access to my well for inspection and that the GSA may provide a temporary alternative water supply.

<u>It is acknowledged and agreed that any temporary water supply being provided is non-potable and is not for human consumption, and that the entities providing such water make no representation, warranty or guarantee as to the quality of the water provided or its suitability for any particular use. It is acknowledged and agreed that the temporary water supply provided shall be used for in-home emergency use only and shall not be used or applied outside of the home on, including but not limited to, hardscapes, landscapes, vegetation, plants, crops, etc. It is acknowledged and agreed that the provision of an interim water supply hereunder is temporary; neither this agreement nor the provision of water hereunder creates a water right, public utility service right or any right to continued or permanent water service; and the provision of this temporary water supply may be terminated in the sole discretion of the entities listed above.</u>

In consideration for the provision of temporary water supplies to the Property, I, for myself and on behalf of any other person residing at or visiting the Property, if any (collectively "Water Users"), do hereby release, waive, discharge, and covenant not to sue the above named irrigation district serving as the GSA, and the district's respective project participants, including the directors, officers, owners, employees, independent contractors or agents of all of the same (collectively referred to herein as the "GSA"), from liability for any and all claims for personal injury, illness, death, property damage, or any other claim, including but not limited to claims arising out of the negligence of the GSA that relates to or results from the provision of a temporary interim water supply to the Property.

It is expressly agreed that the GSA shall not be liable for any injuries or any damages to the Water Users, or the property of such persons, or be subject to any claim, demand, damages or causes of action arising out of or relating to any use of the interim temporary water supply, and well inspections by the GSA, regardless of whether the negligence of the GSA caused or contributed to the injury or damage. This waiver and release of claims is intended to be as broadly interpreted as allowed under California law but does not include gross negligence or willful misconduct by the GSA.

By signing this waiver and release the Water User is agreeing to waive all rights that they may have under the provisions of section 1542 of the Civil Code of California, which reads in part as follows:

> "A general release does not extend to claims that the creditor or releasing party does not know or suspect to exist in his or her favor at the time of executing the release and that, if known by him or her would have materially affected his or her settlement with the debtor or released party."
> _________ (Water User's initials)

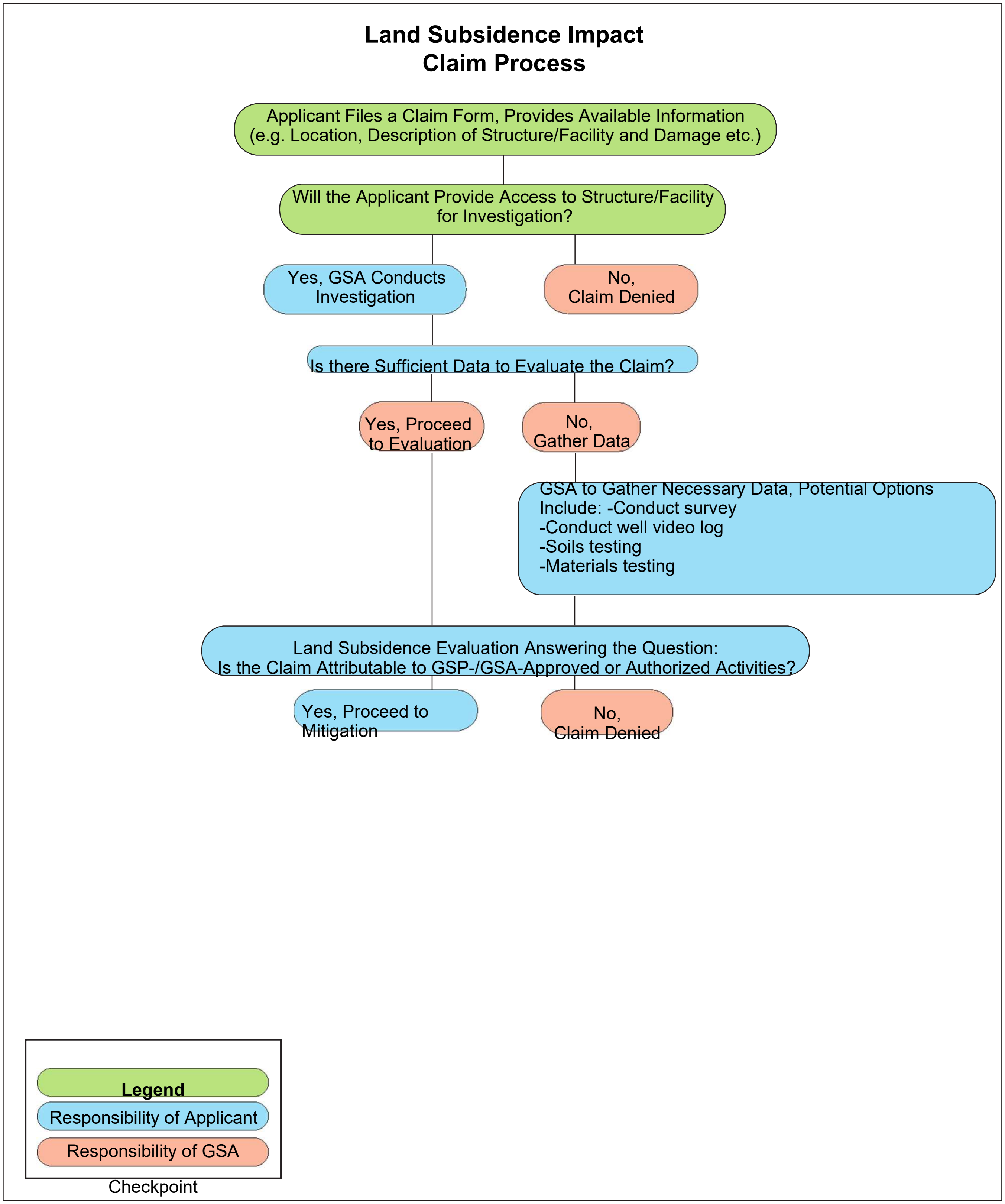
The Water User acknowledges that if the GSA ultimately accepts the claim and provides mitigation measures, the well subject to the claim is not eligible for future mitigation and the Water User releases the GSA from future claims regarding such well.

The Water User executing this waiver and release of liability hereby agrees to hold the GSA harmless from all claims which may be made by or on behalf of the Water User, and to indemnify the GSA from any such claims to the fullest extent allowed under California law. This express indemnification provision specifically includes reimbursement for all attorneys' fees and litigation costs incurred by the GSA or on their behalf as a result of any such claim. Neither this Agreement nor the provision (or offering) of temporary, emergency water supplies hereunder constitutes any admission of liability or wrongdoing, or an agreement or admission of any duty, fact, matter, or contention whatsoever.

Signature:__________________ Date: ______________ Signature:__________________ Date: ______________

Attachment 8 - Land Subsidence Impact Claim Process

Tule Subbasin Technical Advisory Committee
Mitigation Program - Technical Framework



Attachment 9 - Land Subsidence Impact Claim Form

Lower Tule River and Pixley Irrigation Districts
Groundwater Sustainability Agency
Subsidence Impact Claim Form

Claimant Information	
Contact Name:	Location Sketch:
Phone Number:	
Mailing Address:	
Well Name:	
Location (Address/Description):	
Infrastructure Type:	

☐ Domestic ☐ Industrial ☐ Agricultural ☐ Other (Specify):

Interim Water Supply	
Does the Claimant Request an Interim Water Supply?	☐ Yes ☐ No
Number of Residences/Business Served (If Applicable):	
Number of Cropped Acres and Crop Type (If Applicable):	
Estimated Daily Water Use (Gallons, Cubic Feet, or Acre-Ft):	

Well Construction Information (If applicable)		
Is a Department of Water Resources Well Completion Report (i.e. Driller's Log) Available?	☐ Yes (Attach if Available) ☐ No	
Casing/Well Depth (ft):		
Perforation Interval(s) (ft):		
Casing Material:	Casing Diameter (inches):	
Date Constructed (If Known) and/or Well Age (Estimated):		
Date of Last Video Survey (If Available):		
Well Photos Attached:	☐ Yes	☐ No

Pump Information	
Type: ☐ Submersible	☐ Vertical Turbine
Intake Depth (ft):	Motor Size (horsepower):
Age (Known or Estimated):	Typical Discharge Rate (gpm):
Last Pump Test Date (Attach Record if Available):	
Last Service Date (Attach Record if Available):	

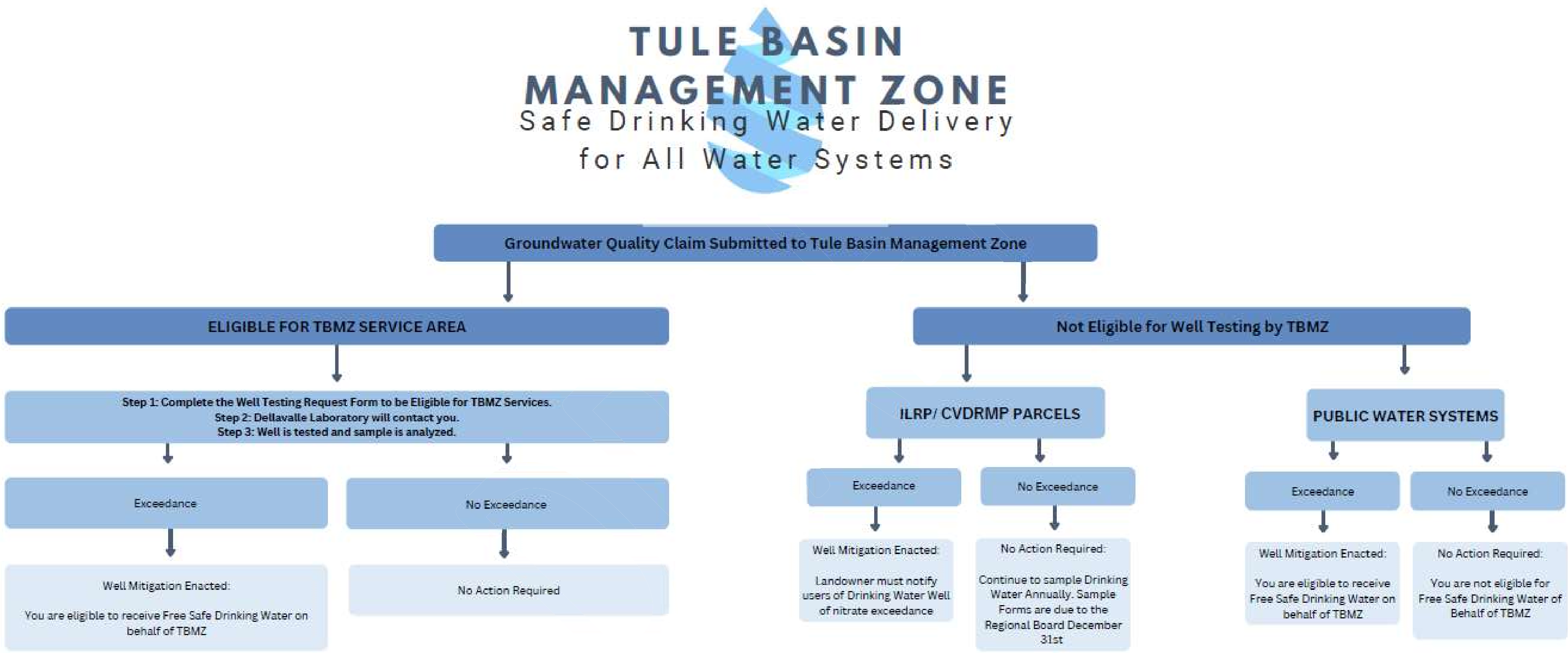
Issue Status	
Date Issue Arose:	
Issue: ☐ No flow ☐ Reduced Flow ☐ Breaking Suction ☐ Future Concern	
Comments/Description:	
Static Water Level (ft):	Pumping Water Level (ft):
Status: ☐ Not Resolved, Contractor not Contacted (Note: Contacting a Contractor Not Required) ☐ Not Resolved, Contractor Provided Estimate (attach estimate if applicable) ☐ Resolved (attached records if applicable)	
Contractor Company Name:	
Contractor Contact Name:	Contact Phone Number:
Contractor Address:	

Applicant	
By signing this Groundwater Level Impact Claim Form, the applicant agrees to provide the GSA with access to the infrastructure for the investigation.	
Print Name:	Date:
Signature:	

GSA Use Only	
Received By:	Date:

Attachment 10 - Tule Basin Management Zone Safe - Eligibility Investigation Process

Figure 1 – TBMZ Potentially Impacted Well Eligibility Flow Chart



Attachment 11 - Water Quality and Tule Basin Management Zone Claim Form

Lower Tule River and Pixley Irrigation Districts
Groundwater Sustainability Agency
Groundwater Quality Impact Claim Form

Claimant Information	
Contact Name:	Well Location Sketch:
Phone Number:	
Mailing Address:	
Well Name:	
Well Location (Address/Description):	
Well Type:	

☐ Domestic ☐ Industrial ☐ Agricultural ☐ Other (Specify):

Interim Water Supply	
Does the Claimant Request an Interim Water Supply?	☐ Yes ☐ No
Number of Residences/Business Served (If Applicable):	
Number of Cropped Acres and Crop Type (If Applicable):	
Estimated Daily Water Use (Gallons, Cubic Feet, or Acre-Ft):	

Well Construction Information		
Is a Department of Water Resources Well Completion Report (i.e. Driller's Log) Available?	☐ Yes (Attach if Available) ☐ No	
Casing/Well Depth (ft):		
Perforation Interval(s) (ft):		
Casing Material:	Casing Diameter (inches):	
Date Constructed (If Known) and/or Well Age (Estimated):		
Date of Last Video Survey (If Available):		
Well Photos Attached:	☐ Yes	☐ No

Pump Information				
Type:	☐ Submersible		☐ Vertical Turbine	
Intake Depth (ft):			Motor Size (horsepower):	
Age (Known or Estimated):			Typical Discharge Rate (gpm):	
Last Pump Test Date (Attach Record if Available):				
Last Service Date (Attach Record if Available):				

Issue Status				
Date Issue Arose:				
Issue:	☐ No flow	☐ Reduced Flow	☐ Breaking Suction	☐ Future Concern
Comments/Description:				
Static Water Level (ft):			Pumping Water Level (ft):	
Status:	☐ Not Resolved, Contractor not Contacted (Note: Contacting a Contractor Not Required) ☐ Not Resolved, Contractor Provided Estimate (attach estimate if applicable) ☐ Resolved (attached records if applicable)			
Contractor Company Name:				
Contractor Contact Name:			Contact Phone Number:	
Contractor Address:				

Applicant	
By signing this Groundwater Quality Impact Claim Form, the applicant agrees to provide the GSA with access to the well for the investigation.	
Print Name:	Date:
Signature:	

GSA Use Only	
Received By:	Date:

The Tule Basin Management Zone is a California nonprofit corporation created to serve Tulare County and a small portion of Kern County.

Our mission is to educate residents within the Management Zone Service Area of potential nitrate contamination in their drinking water and to ensure the availability of safe drinking water to these residents.

Our program offers free, safe drinking water to those residents whose drinking water supply is contaminated by nitrates.

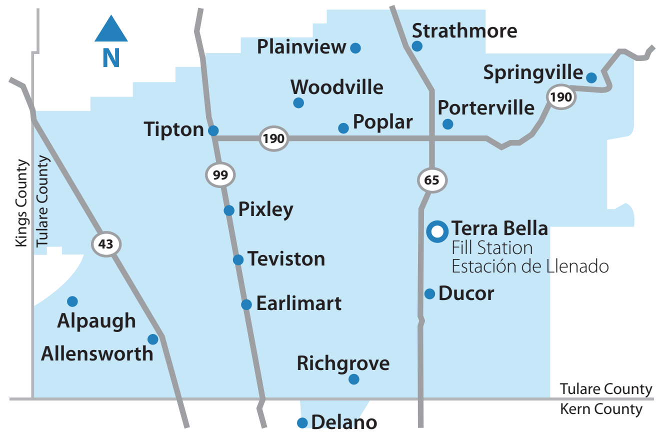
La Zona de Manejo de la Cuenca de Tule es una corporación sin fines de lucro de California creada para servir al Condado de Tulare y a una pequeña porción del Condado de Kern.

Nuestra misión es educar a los residentes dentro del Área de Servicio de la Zona de Manejo de la posible contaminación de nitratos de su agua potable y garantizar la disponibilidad de agua potable segura para estos residentes.

Nuestro programa ofrece agua potable gratuita y segura a aquellos residentes cuyo suministro de agua potable está contaminada por nitratos.

TULE BASIN MANAGEMENT ZONE

Service Area • Área de Servício



Free Water Fill Station

TBMZ has constructed a water fill station in the community of Terra Bella and is working towards constructing additional water fill stations.

The fill station is available to any person to access clean drinking water, 24 hours a day, 7 days a week. You must provide your own drinking water container and the size must be 5 gallons or less, but there is no limit on the number of containers you may fill. To learn more about water fill stations, including future locations, visit www.tulemz.com/safe-drinking-water/.

Estación de Llenado de Agua Gratis

La TBMZ ha construido una estación de agua en la comunidad de Terra Bella y está en proceso de construir dos estaciones adicionales de llenado de agua.

La estación de agua está disponible para que cualquier persona pueda acceder agua potable limpia, las 24 horas del día los 7días de la semana. Usted debe proporcionar sus propios garrafones y el tamaño del contenedor debe ser de 5 galones o menos, pero no hay límite en el número de contenedores que puede llenar. Para obtener más información sobre estaciones de lleno de agua, incluyendo sitios futuros, visite www.tulemz.com/safe-drinking-water/.

TULE BASIN
MANAGEMENT ZONE

Mon-Thurs 8am-5pm | Friday 8am-12pm
324 S. Santa Fe Visalia, CA 93292 | 559.429.6970
admin@tulebasin.com | Facebook @tulebasin

Is your domestic well water safe to drink?

¿Es seguro beber el agua de su pozo domestico?

TULE BASIN
MANAGEMENT ZONE

www.tulemz.com | 559.429.6970

Safe Drinking Water Program & Well Test Request

FREE-SAFE drinking water programs are being offered by the Tule Basin Management Zone (TBMZ) to residents that use a private well for their drinking water and it is determined that the well water has an elevated nitrate concentration, which may be harmful for your health.

To determine if you are eligible to enroll in the Safe Drinking Water Program, fill out the form to the right and return to:

Tule Basin Management Zone
324 S. Santa Fe, Visalia, CA 93292

Or scan and email to: admin@tulemz.com

Or you can fill out the application online at:
tulemz.com/safe-drinking-water/

Eligibility will be contingent on TBMZ's review of the applicant's information. If eligible, TBMZ staff or consultant will contact you to schedule the collection of a water sample from the drinking water well at your residence.

TBMZ will share the results from your well test with the following determinations:

1. If the nitrate water quality sample exceeds 10 mg/L, this determines that you are eligible for the Safe Drinking Water Program which provides for you to receive safe drinking water by:
   - Bottled water regularly delivered to your home (limit of 60 gallon per month per household). TBMZ staff will coordinate the delivery of safe drinking water with you.

   Or

   - In-home water treatment device installed at your residence (subject to additional evaluation criteria).
2. If the nitrate content in your water sample is less than 10 mg/L, you will not be eligible for the Safe Drinking Water Program, but you may still access safe drinking water at our water fill station at no cost to you.

*Note: Results showing nitrate concentrations less than 10 mg/L does not guarantee your water is safe for drinking. Your water may contain other harmful constituents not covered under this program. If you have questions or concerns regarding well failure or a dry well, contact **Self-Help Enterprises at 559.802.1685 or 559.802.1284** for water quality issues. Applicant information may be shared with other organizations operating safe drinking water programs.*

Programa de Agua Potable Segura y Solicitud de Prueba de Pozo

La Zona de Manejo de la Cuenca del Tule (TBMZ) ofrece programas de agua potable GRATIS y SEGURA a los residentes que usan un pozo privado para su agua potable y se determina que el agua del pozo tiene una concentración elevada de nitratos, lo que puede ser perjudicial para su salud.

Para determinar si usted es elegible para inscribirse en el Programa de Agua Potable Segura, complete el formulario a la derecha y regreselo a:

Tule Basin Management Zone
324 S. Santa Fe, Visalia, CA 93292

O por correo electonico: admin@tulemz.com

O puede completar la solicitud en línea en:
tulemz.com/safe-drinking-water/

Su eligibilidad dependerá de la revisión de la información del solicitante por parte de TBMZ. Si es elegible, el personal o consultor de TBMZ se comunicará con usted para programar la colección de una muestra de agua del pozo de agua potable de su residencia.

TBMZ compartirá los resultados de su prueba de pozo con las siguientes determinaciones:

1. Si la muestra de calidad de agua de nitrato excede los 10 mg/L, esto determina que usted es elegible para el Programa de Agua Potable Segura que le proporciona recibir agua potable segura por medio de:
   - Agua embotellada entregada regularmente a su hogar (límite de 60 galones por mes por hogar). El personal de TBMZ coordinará la entrega de agua potable segura con usted. O...
   - Dispositivo de tratamiento de agua en el hogar instalado en su residencia (sujeto a criterios de evaluación adicionales).
2. Si el contenido de nitrato en su muestra de agua es menos de 10 mg/L, no será elegible para el Programa de Agua Potable Segura, pero aún puede acceder a agua potable segura en nuestras estaciones de llenado de agua sin costo alguno para usted.

*Nota: Los resultados que muestran concentraciones de nitrato menos de 10 mg/L no garantizan que su agua sea segura para beber. Su agua puede contener otros componentes dañinos no cubiertos por este programa. Si tiene preguntas o inquietudes acerca de la falla de su pozo o sobre un pozo seco, comuníquese con **Self-Help Enterprises al 559.802.1685 o al 559.802.1284** para asuntos de agua. La información del solicitante puede compartirse con otras organizaciones que operan programas de agua potable segura.*

Inquiry Form for Domestic Use Well

Do you receive water from a public water system or private domestic well? ☐ Public ☐ Private ☐ Not Sure

Legal Owner of Property Information:

Name: ____________________

Mailing Address: ____________________

Street Address: ____________________

Phone: ____________________

Email: ____________________

Authorization to Test for Nitrates:

I am the legal owner of the property described above as Domestic Well/Household information and I hereby grant the Tule Basin Management Zone (TBMZ) authority to test my domestic well for nitrate contamination. The cost to test my well for nitrate will bore by the TBMZ, and I will be provided a copy of the test results. I understand that my domestic well will be tested for nitrates only, and that lack of nitrate contamination does not construe that water in my private well is safe to drink. I have read the attached brochure and understand and accept the terms of the Bottled Water Delivery.

Date: ____________________

Signature: ____________________

Formulario de Consulta de Uso de Pozo Doméstico

¿Recibe agua de un sistema publico de agua o de un pozo domestico privado?
☐ Público ☐ Privado ☐ No Estoy Seguro

Informacion de Propietario Legal de la Propiedad:

Nombre: ____________________

Dirección Postal: ____________________

Dirección de Calle: ____________________

Teléfono: ____________________

Correo Electrónico: ____________________

Autorización para la Prueba de Nitratos:

Yo soy el propietario legal de la propiedad descrita anteriormente como información de Pozo Doméstico/Hogar y por la presente otorgo a la Zona de Manejo de la Cuenca del Tule (TBMZ) autoridad para probar mi pozo doméstico para detectar contaminación de nitratos. El costo de probar mi pozo para detectar nitrato será soportado por el TBMZ, y se me proporcionará una copia de los resultados de la prueba. Entiendo que mi pozo doméstico será analizado solo para detectar nitratos, y que la falta de contaminación de nitratos no significa que el agua en mi pozo privado es segura para beber. He leído el folleto adjunto y entiendo y acepto los términos de la Entrega de Agua Embotellada.

Fecha: ____________________

Firma: ____________________