DELANO-EARLIMART IRRIGATION DISTRICT

GROUNDWATER SUSTAINABILITY AGENCY

2ND AMENDED

GROUNDWATER SUSTAINABILITY PLAN 2024

PREPARED FOR

DELANO–EARLIMART IRRIGATION DISTRICT GROUNDWATER SUSTAINABILITY AGENCY

PREPARED BY

INTERA

Signature Page

This Updated Groundwater Sustainability Plan for the Delano-Earlimart Irrigation District Groundwater Sustainability Agency has been prepared under the direction of a professional engineer and a professional geologist licensed in the State of California as required per California Code of Regulations, Title 23 Section 354.12 consistent with professional standards of practice.

This Updated Groundwater Sustainability Plan for the Delano-Earlimart Irrigation District Groundwater Sustainability Agency relies on work completed by Thomas Harder & Co. who prepared the Tule Subbasin Monitoring Plan, Tule Subbasin Setting, Groundwater Flow Model and other technical analyses using best available data at the time of preparation. This Updated Groundwater Sustainability Plan for the Delano-Earlimart Irrigation District Groundwater Sustainability Agency relies on this work and additional work prepared by 4Creeks for water quality analyses.

PLACEHOLDER FOR STAMPS

TO BE ADDED IN THE FINAL VERSION OF THIS 2ND AMENDED GSP

Executive Summary

The Delano-Earlimart Irrigation District (DEID) Groundwater Sustainability Agency (GSA) developed this Second Amended Groundwater Sustainability Plan (GSP, Plan) to provide local government, groundwater users, and the local community with a structure to collaboratively (1) maintain sustainable groundwater resources in the DEID GSA and (2) achieve sustainable use of groundwater resources in a coordinated manner with the other GSAs that provide jurisdictional coverage of the Tule Groundwater Subbasin of the San Joaquin Valley Groundwater Basin[1] (referred to herein as the "Tule Subbasin" or "Subbasin"). This GSP is designed to comply with the Emergency Regulations of the Sustainable Groundwater Management Act (SGMA).

The Executive Summary is segmented into two subsections:

1. **ES-1. Synopsis** : A summary of the unique position that DEID GSA is in, as a sustainable GSA in an otherwise unsustainable Subbasin.
2. **ES-2. Plan Overview:** General summary of the key information covered in each section of this Plan.

ES-1. Synopsis of DEID GSA's Uniquely Sustainable Position in the Tule Subbasin

This subsection of the Executive Summary serves as a critical primer for the contents of this Plan. DEID GSA has been operating sustainably and has been a net recharger to the Tule Subbasin for many decades; however, neighboring unsustainable groundwater management has resulted in the Tule Subbasin's status as critically overdrafted.

DEID GSA: A Story of Sustainability

DEID GSA is composed of three management areas totaling approximately 57,600 acres. These management areas are Delano-Earlimart Irrigation District (DEID) (56,571 acres), Richgrove Community Services District (RCSD) (234 acres), and Earlimart Public Utilities District (EPUD) (773 acres). RCSD and EPUD are groundwater-dependent and provide drinking water to approximately 85% to 90% of the residents within DEID GSA. The remaining population is served by domestic wells located throughout the DEID management area. DEID's land use is primarily agricultural, and 944-acres of its service area are dedicated to recharge basins to secure sustainable groundwater supplies for the agricultural and drinking water users today and in the future.

DEID provides surface water for irrigation to over 450 landowners within its management area. The water is distributed through 172 miles of pressurized pipelines, providing an extremely efficient water delivery system that is the foundation for the DEID's water conservation and management program. Due to investments in water efficiency and resiliency infrastructure, a water banking program, and its status

[1] Tule Groundwater Subbasin (DWR Bulletin 118 Basin No. 5-022.13) located within San Joaquin Valley Groundwater Basin (DWR Bulletin 118 Basin No. 5-022).

as the largest surface water contractor in the Friant Division, DEID and its landowners have not overdrafted since the 1950s. The section below explains DEID's story of sustainability, and how this sustainability is at risk due to external overdraft.

DEID is One of the State's First Sustainability Projects

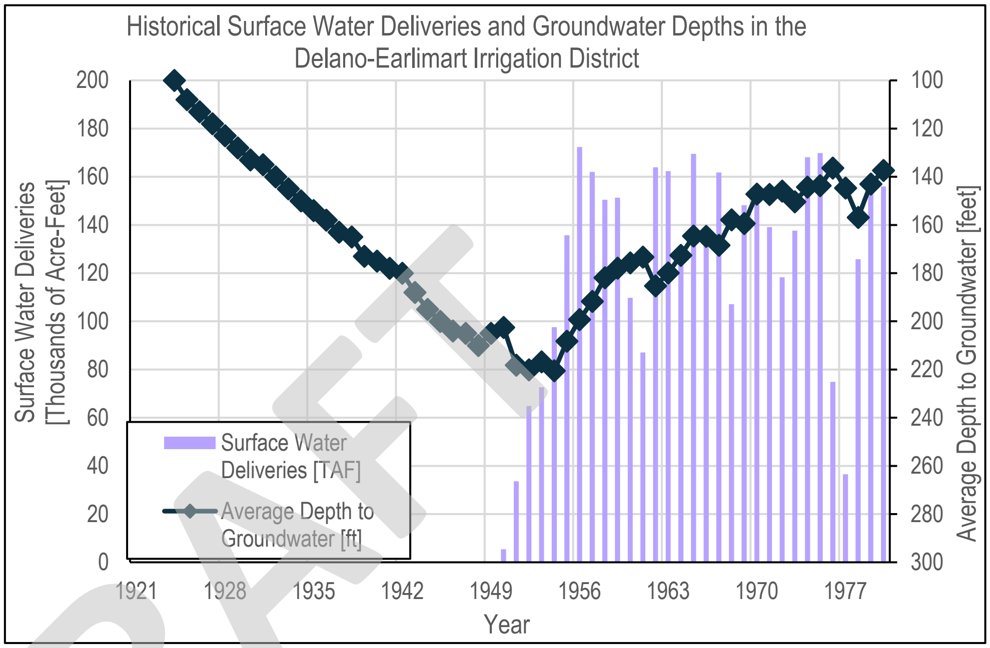


Figure 0-1 Historical Surface Water Deliveries and Groundwater Depths in DEID (1920s-1980s)

Irrigation in the Delano and Earlimart regions began in the late 1800s with artesian wells but, by the 1930s, diminished groundwater supplies threatened the area's continued economic viability. By 1947, the mean depth to groundwater was critically low. TDEID was formed in 1938 and signed its original water service contract for water delivery from the Friant Unit of the Central Valley Project (CVP) with the U.S. Bureau of Reclamation (USBR) in 1951, after the average depth of groundwater in DEID had fallen every year since 1905. The groundwater level and storage recovery associated with surface water deliveries during this period is depicted in **FIGURE 0-1**.

Following the recovery of groundwater levels and storage in the 1950s and 1960s due to the conjunctive use operations afforded by DEID's CVP surface water contract, the groundwater conditions underlying DEID maintained sustainability through the early 2000s. This sustainable position included expected cycles of drought and subsequent recovery, with continuous demand for water being met and negative effects of overuse being prevented through the implementation of sustainable groundwater management.

Impacts from Neighboring Water Resources Management

In the mid-2000s, changes arose in agricultural practices in DEID and the surrounding areas, with a shift from annual row cropping and dry farming to increased cultivation of permanent crops like almonds and pistachios, which now cover a large area within and around DEID GSA. The expansion of agriculture in the region and transition to permanent crops—requiring irrigation in all water year types and for longer periods of the year than the previous crop types— increased water demand. Environmental regulations intended to protect habitat for riverine aquatic species were also implemented more robustly throughout the state, which had the effect of reducing imported surface water deliveries to the region. In addition to anthropogenic changes in water supply and use, climactic changes also reduced the availability of supplies. Climactic changes include reduced snowpack and increased snowmelt rates, causing a reduction in surface water supplies and less flexibility with surface water availability. This increased water demand and reduction in surface supplies in the Tule and other critically overdrafted subbasins in the San Joaquin Valley lowered the groundwater table at an unprecedented rate. While DEID continued to operate sustainably during this period, groundwater levels and storage within DEID were negatively impacted by unstainable pumping outside of its boundaries. **Figure 0-2** depicts the historical recovery of groundwater levels within DEID due to deliveries of CVP surface water supplies and the impact of changes in water demand in the mid-2000s.

DEID has continued to remain sustainable since the 1950s by investing in recharge and water banking facilities and continuing to honor the conjunctive use management recommendations outlined in the DEID CVP contract's Factual Study issued by the USBR. However, groundwater levels began to decline over the last several decades within DEID GSA despite its sustainable practices, due to ongoing unstainable pumping outside of its boundaries.

Areas within the Tule Subbasin surrounding DEID GSA include both groundwater-dependent areas, which cannot offset groundwater use with surface water use or recharge, as well as areas with CVP Contracts receiving imported surface water supplies. However, even neighboring GSA areas with CVP Contracts began operating outside of the recommended conjunctive use recommendations from the USBR. The combination of increased agricultural production, shift to permanent crops, policies reducing surface water supplies available for diversion, and changing climactic conditions exceeded the available water supply, leading to a critical tipping point. Since the mid-2000s, opportunities for recovery from overdraft experienced in dryer years during later wet years have not manifested in the groundwater table at the rates needed to reach sustainable conditions (**Figure 0-2**). Instead, since that time areas surrounding DEID GSA have more regularly operated beyond the sustainable yield in nearly all water year types.

This situation created a unique challenge for DEID GSA – a GSA that has not overdrafted since the 1950s; excessive overdraft in areas surrounding the GSA have been inducing overdraft-related impacts within the GSA's jurisdictional boundary. An attribution analysis detailing the causal relationship between the impacts of external pumping to groundwater levels and land subsidence within DEID GSA is available in **Section 3**'s Groundwater Conditions subsection of this GSP.

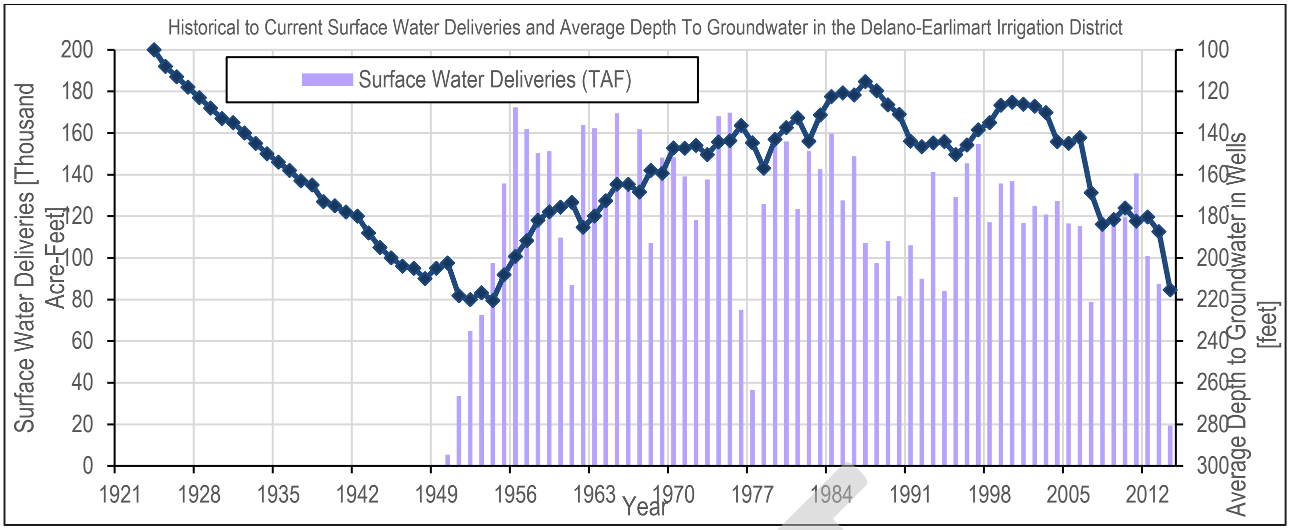


Figure 0-2 Historical to Current Surface Water Deliveries and Average Depth to Groundwater in DEID (1921 to 2015)

Commitment to Overcoming Challenges

Despite the challenge of external activities impacting DEID GSA's ability to achieve sustainability within its service area, DEID GSA has not wavered in its commitment to maintain sustainability for all beneficial users, uses, and property interests dependent on DEID's sustainable water management. Since SGMA was enacted, DEID has invested more than $44 million in projects that expand DEID's ability to honor the sustainability commitment described in **Figure 0-3**. This investment includes 944-acres of recharge and water banking facilities, referred to as the "Turnipseed Water Banking Facility" or "Turnipseed Recharge Basins" in this Plan. Phases 1-5 of the Turnipseed Water Banking Facility are complete and currently operating. Phase 6 of the Turnipseed Water Bank is currently under construction, with completion scheduled for September 2024. Upon the completion of Phase 6, the 944-acre facility will be capable of percolating 12,928 acre-feet per month and, at an average recharge opportunity of 2.41 months per year,[2] will allow the DEID to deposit an average of 31,157 acre-feet per year into the aquifer. Accounting for operational losses and a conservative leave-behind factor, the average net supply available for future recovery in dry years is 28,041 acre-feet per year (of the 31,157 acre-feet per year stored water). The surface water delivered to these recharge facilities and stored in the aquifer is of very good quality, being sourced directly from the Sierra Nevada snowmelt and diverted through the Friant-Kern Canal (FKC).

[2] On average, since Phase 1 of the Turnipseed Recharge Project was completed (1993) to present, DEID has conducted in-District recharge operations for 2.41 months of every year.

These recharge and source water quality activities are important when considering DEID's role in supporting sustainable water supplies for the groundwater-dependent disadvantaged communities of Richgrove, Earlimart, Sierra-Vista Association, Madonna, and Rodriguez Labor Camp, as well as other disadvantaged communities surrounding DEID.

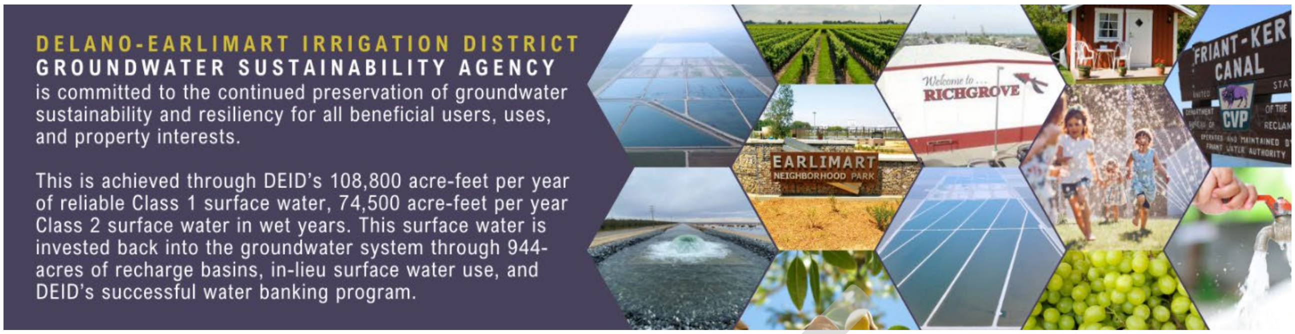


Figure 0-3 DEID GSA's Sustainability Commitment

DEID GSA GSP Deviations from other Tule Subbasin GSPs and the Coordination Agreement

This GSP deviates from the Tule Subbasin Coordination Agreement and other Tule Subbasin GSPs. The rationale for why deviation is necessary to achieve sustainability for DEID GSA and the entire Tule Subbasin is also explained in **Table 0-1**.

DEID GSA recognizes that the Coordination Agreement is an important element of a subbasin's implementation of SGMA policies, demand management, projects, and GSP adaptations that yield subbasin-wide sustainability. However, DEID GSA also recognizes that upholding the intent of SGMA to operate sustainably is more critical than agreeing to Subbasin-wide Plan elements that will likely prevent the Subbasin from achieving sustainability by 2040, to the detriment of beneficial users, uses, and property interests.

Notwithstanding, DEID GSA is committed to continuing to attend coordination meetings and share data, analyses, findings, and other resources with Tule Subbasin GSAs that may be helpful to supporting a sustainable path forward for the entire Subbasin.

Table 0-1 DEID GSA Second Amended GSP Deviations from Coordination Agreement and Other Tule Subbasin GSA GSPs

Plan Element	Reason for Deviation from Coordination Agreement
Sustainability Goal	The Tule Subbasin sustainability goal was limiting and did not reflect the full extent of what sustainability in the Tule Subbasin should represent.
Chronic Lowering of Groundwater Levels Sustainable Management Criteria[1]	The Tule Subbasin sustainable management criteria were not protective of all beneficial users, uses, and property interests reliant on groundwater supplies.
Land Subsidence Sustainable Management Criteria[1]	The Tule Subbasin sustainable management criteria were not protective of DEID GSA's pipeline distribution system and the Friant-Kern Canal.
Historic, Current, and Projected Water Budgets[2]	The revised water budgets for the Tule Subbasin were not finalized by the time of releasing this DEID GSA GSP.

[1]Sustainable Management Criteria include minimum thresholds, measurable objectives, interim milestones, operational flexibility, and undesirable results.
[2]The water budgets include sustainable yield.

DEID GSA's Plan Setting

The DEID GSA comprises three management areas: DEID Management Area (DEID MA), the community of Earlimart, and the community of Richgrove, collectively DEID MAs (see **Figure 0-4**). DEID is the largest water user on the FKC and the largest Class 1 Friant Contractor, with a contract for 108,800 ac-ft of Class 1 water. DEID further contracts for 74,500 ac-ft of Class 2 water[3,4]. Additionally, DEID's CVP contract provides the opportunity to access other water supplies that are sometimes made available during particularly wet years. DEID directly delivers portions of these imported water supplies to its growers, thus offsetting the need for a significant amount of groundwater pumping. In addition, DEID has also installed recharge basins that allow a net of 28,041 acre-feet of imported water, on average, to be stored in the subsurface each year and available for future recovery.

[3] Exhibit E. Irrigation and M&I Contract No. I75r-3327D. Contract Between the United States and Delano-Earlimart Irrigation District Providing for Project Water Service from Friant Division and for Facilities Repayment.
[4] Water Boards (1959), State of California State Water Rights Board. Decision No. D935.

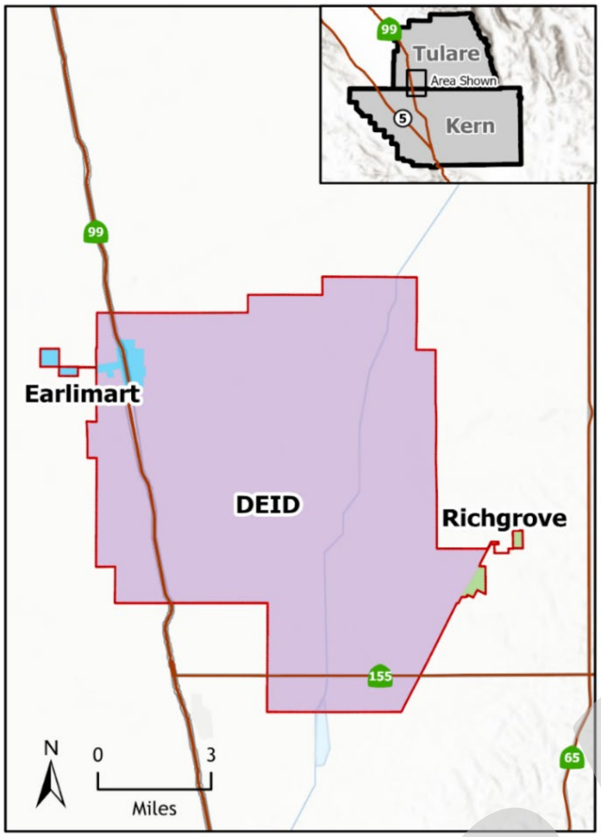


Figure 0-4 DEID GSA Management Areas

When taking into consideration all available water to the DEID during the period of 1987-2023, which includes imported surface water used for irrigation and in-District recharge, precipitation, and sustainable yield, the amount of water available on an average annual basis was 154,842 acre-feet. Over the same 37-year period, the average annual consumptive demand of the District was 135,690 acre-feet per year. Comparing these values yields an average net surplus of 19,152 acre-feet per year, indicating that DEID has been, on average, a net contributor of imported water to the Subbasin.

The DEID GSA is adjacent to the Pixley Irrigation District GSA (Pixley GSA) on the northern boundary, the Eastern Tule GSA (ETGSA) and Kern-Tulare GSA (KTGSA) on the north and east, and the Tri-County Water Authority GSA (TCWA GSA) on the west (**Figure 0-5**). While the DEID GSA provides a net surplus of water, overdraft conditions in the rest of the Tule Subbasin (caused where groundwater extractions exceed safe yield and managed recharge activities) are leading to chronic lowering of groundwater levels and land subsidence throughout the Subbasin, and most importantly along the FKC and in areas that threaten the DEID pipeline distribution system. In addition, due to the importance of DEID's conjunctive use operations, the health and usability of the aquifer system (on which DEID's water banking operations along with

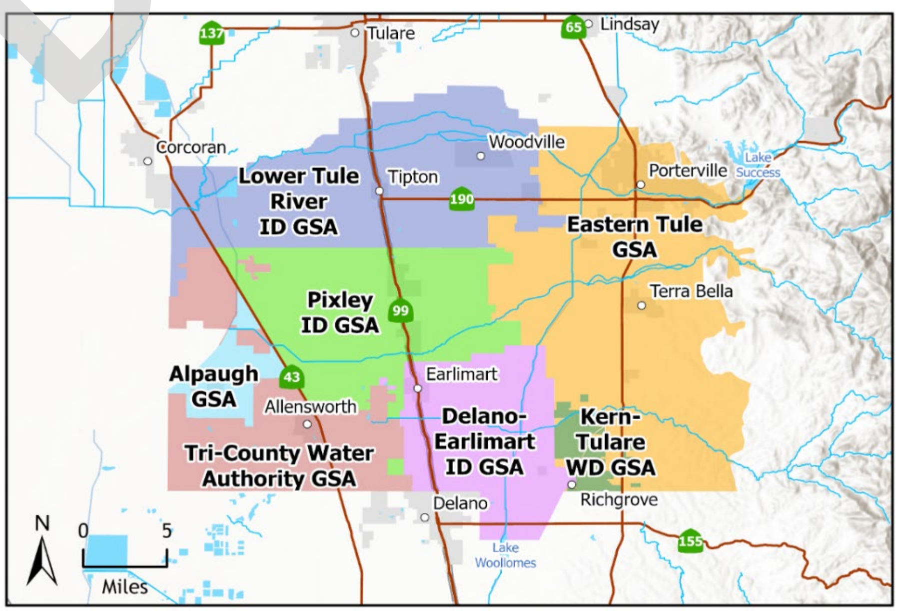


Figure 0-5 Tule Subbasin GSAs

domestic, municipal, and agricultural beneficial users rely) has been and continues to be a priority for DEID. Unfortunately, undesirable results and impacts due to unsustainable pumping and overdraft in areas outside of the DEID GSA do not stop at jurisdictional boundaries.

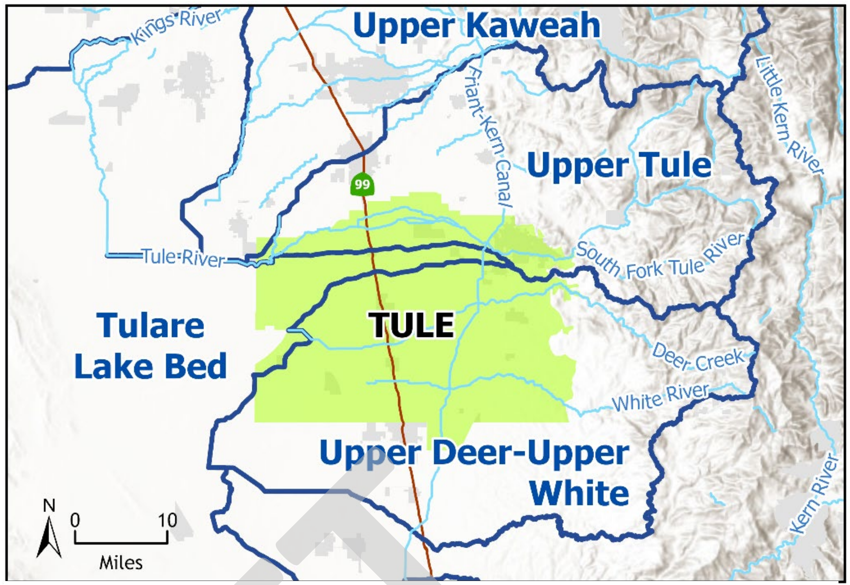


Figure 0-6 Watersheds within and Surrounding the Tule Subbasin

The watersheds within and surrounding the Tule Subbasin are depicted in **Figure 0-6**. The surface water features within DEID GSA are delineated in **Figure 0-7**. DEID GSA's main artery to maintain sustainability is the FKC, which feeds into DEID's extensive pipeline distribution system. This critical infrastructure, conveying clean surface water supply to the Subbasin, is what supports DEID GSAs' historical and ongoing sustainability. The White River rarely flows within the DEID GSA; however, the channel is utilized to convey water for DEID's recharge operations.

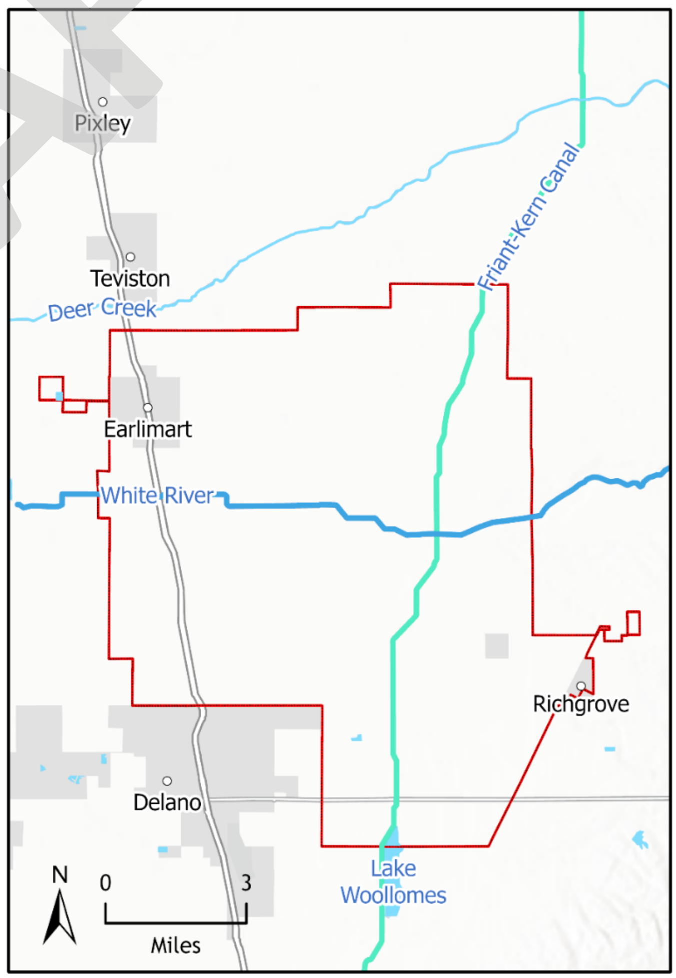


Figure 0 -7 Surface Water Features within DEID GSA

Water records from DEID indicate that, from 1987 to 2023, DEID imported nearly 4 million acre-feet, or an average of approximately 110,000 acre-feet per year. This amount is comprised of two categories: approximately 105,000 acre-feet of irrigation deliveries and approximately 5,000 acre-feet of deliveries to in-District recharge facilities. Note that this average in-District recharge value encompasses two very distinct periods of District operations. From 1987 and up to the passage of SGMA in 2014, DEID's in-District recharge area had grown from nothing to 160 acres, with average annual deliveries of approximately 1,500 acre-feet during this period. In 2015, following the passage of SGMA, DEID began to prioritize in-District recharge operations, maximizing the use of the existing facilities and implementing an aggressive plan to develop new recharge facilities. The sixth and final phase of this expansion project will be completed in September of 2024, increasing the total in-District recharge area to 944 acres. From 2015 to 2023, average in-District recharge deliveries increased to nearly 13,000 acre-feet per year. During this same period of 2015 to 2023, which was comprised of primarily dry or critically dry year types, DEID continued to maintain deliveries to Out-of-District water banks averaging more than 14,000 acre-feet per year. As previously mentioned, DEID has achieved an average net surplus of 19,152 acre-feet per year over a 37-year period, showing that DEID MA has been, on average, a net contributor of imported water to the Subbasin. No other GSA in the Tule Subbasin can substantiate such a positive and sustainable role.

One of the most striking impacts of regional subsidence in the Tule Subbasin caused by pumping and other activities authorized by the GSAs outside of the DEID area is the adverse effect to the FKC. The FKC is a key part of the CVP and delivers water to 1 million acres of highly productive farmland and more than 250,000 people from Fresno to Bakersfield. Due to land subsidence to the north (upstream) of DEID, which has changed the slope of the canal, the canal now has less capacity to convey water to DEID growers and other Friant Contractors—nearly 60% of its capacity has been lost[5]. The current phase of repairs to the canal are estimated to cost approximately $500M. However, these repairs may provide insufficient long-term capacity improvements given ongoing subsidence due to continued unsustainable groundwater pumping.

It is important to reiterate that DEID GSA can meet its sustainability goals. At the same time, the conclusions reached in this Second Amended GSP are subject to the understanding that unsustainable groundwater pumping in neighboring GSAs—which pumping is out of the management authority of the DEID GSA—may create impacts within DEID.

- DEID has invested heavily in sustainable conjunctive use for nearly 75 years.
- DEID imports surface water delivered via the FKC for irrigation to provide growers and domestic pumpers within the DEID community the supplies they need; indeed, DEID's water balance analysis shows that we are in a net positive position with respect to groundwater recharge and use and, as part of DEID's multi-decade conjunctive use program, DEID has significant imported surface water available in storage for potential use during dry periods.
- DEID's net stored imported surface water in the Tule Subbasin has been masking overdraft by non-DEID pumpers in the Subbasin for decades.
- DEID is the largest FKC contractor, with access to 108,800 ac-ft of Class 1 water and 74,500 ac-ft of Class 2 water annually.
- The DEID surface water distribution system represents a $340M (2023 dollars) investment to distribute its imported surface water.
- DEID is actively recharging imported surface water via 944 acres of recharge facilities, built by DEID at a cost of approximately $44M.
- Subsidence within DEID is minimal, but DEID is surrounded by active and ongoing high rates of subsidence caused by unsustainable pumping by those outside DEID. DEID imported surface water direct use on farms and surface water stored in the aquifer actively reduces subsidence in the Subbasin.
- DEID has shown via numerical groundwater flow modeling that groundwater level drawdowns and subsidence within DEID are primarily due to the unsustainable groundwater pumping of neighboring GSAs.

[5] Friant Water Authority (2024)

More information on the attribution analysis validating the role that external unsustainable groundwater management plays on DEID GSA's ability to maintain sustainability is available in **Subsection 2.2** (Groundwater Conditions).

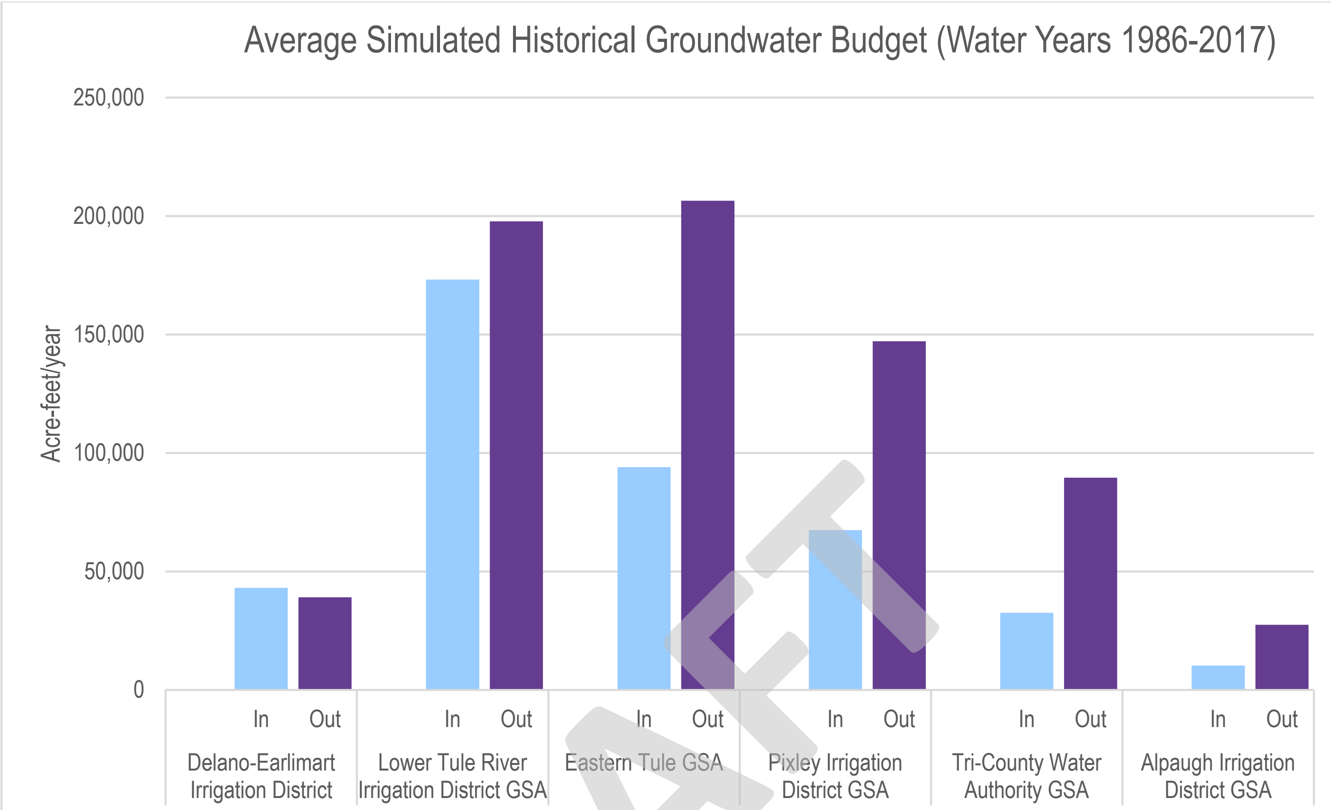
DEID does not contribute to reduction of groundwater in storage

Pumping by those within the Richgrove, Earlimart, and DEID management areas does not contribute to reductions in groundwater in storage and is not expected to do so over the SGMA planning and implementation horizon. **Figure 0-8** presents a bar chart of the modeled groundwater mass balance from water years 1987-2023, which shows that the DEID is the only area of the Subbasin which is, to put it simply, "living within its means" with respect to ensuring that more water flows into the groundwater system than out. However, DEID is surrounded by other GSAs whose extractors are pumping non-sustainably (**Figure 0-8**). As a result, groundwater pumping within neighboring GSAs can have a negative effect on groundwater levels and subsidence rates within the DEID GSA.

As shown in **Figure 0-8**, a water balance calculation demonstrates that DEID operations are net positive with respect to groundwater in storage. On average, DEID puts more imported surface water into the subsurface than local groundwater and banked surface water DEID and its growers remove annually via pumping. DEID continues to construct recharge facilities, including 944 acres of recharge facilities installed since 1994 at a total cost of approximately $44M (**Figure 0-9**).

Since 1950, DEID has imported approximately 8.5M ac-ft of imported surface water to provide its landowners with adequate water for irrigation and to ensure that it can continue recharging water to the aquifer (**Figure 0-7**). DEID's importation of surface water has resulted in a significant balance of surface water that has been stored in the subsurface.

Figure 0-11 presents results of straightforward water accounting developed by DEID and its consultant, INTERA Incorporated (INTERA), to illustrate how a net surplus of imported surface water, beyond what is required for crop irrigation, provides regular deposits to a "savings account" of stored imported water in the subsurface on an annual basis for later use by DEID irrigators during dry periods, such as 2013-2015. During most other periods, as shown in the figure, the annual change to/from groundwater is positive and results in an increasing balance of stored water over time. This stored imported water remains available to DEID. The DEID "savings account" has been funded by DEID for the benefit of its 450 growers and other beneficial users to provide a reliable and sustainable source of water supply over the past 75 years. This savings account also provides incidental benefits to the Richgrove and Earlimart management areas. DEID operates exclusively as a conjunctive use district and no water banking for export elsewhere occurs within DEID.



Notes:
Values shown are an annual average of each inflow and outflow component from the groundwater flow model (DEID, 2022) used to develop the Tule Subbasin GSPs.
Total recharge = recharge from precipitation + seepage from canals and streambeds + active recharge
Return flows = agricultural return flows from pumped groundwater and imported surface water
Mtn Block Recharge = subsurface inflow from the Sierra Nevada mountains
Ag Pumping = groundwater pumping for irrigation
Municipal Pumping = groundwater pumping for municipal use
This graph represents a physical accounting of water within each GSA area and does not represent an accounting of water rights.
ETGSA includes the Kern-Tulare Water District GSA as Kern-Tulare Water District GSA's footprint was included within ETGSA's at the time of performing this analysis.

Figure 0-8 The groundwater budget for the Tule Subbasin from 1987 – 2017 shows that DEID is the only GSA in a net-positive position

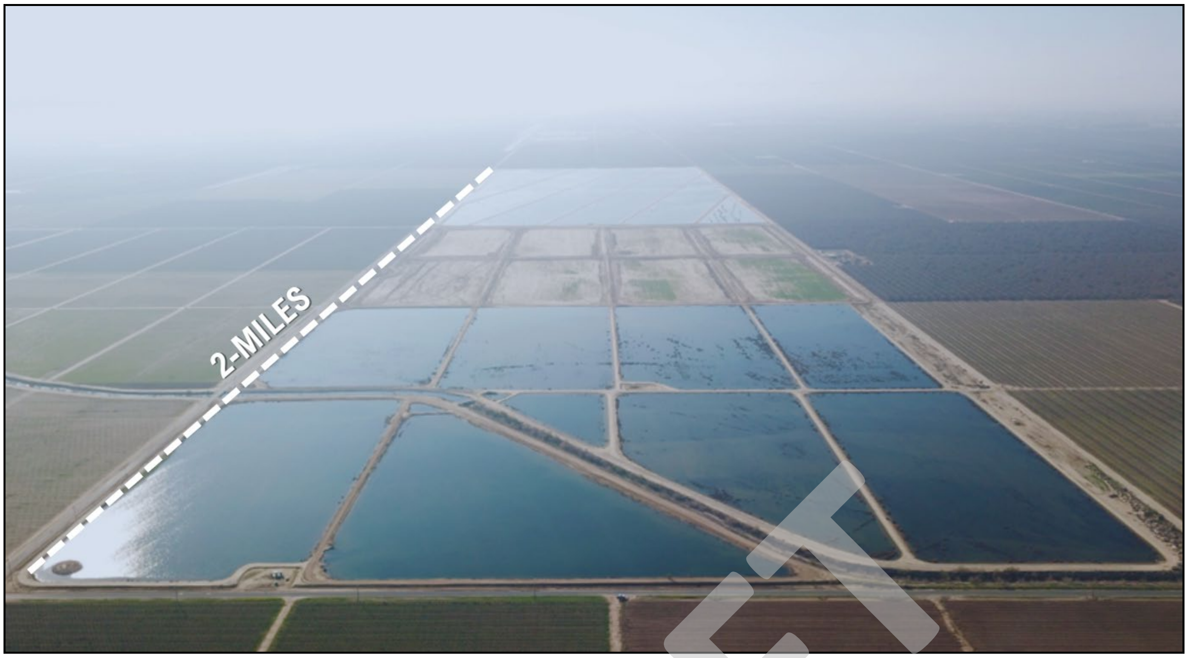


Figure 0-9 DEID has installed 944 acres of recharge capacity since 1994 at a total cost of approximately $44M

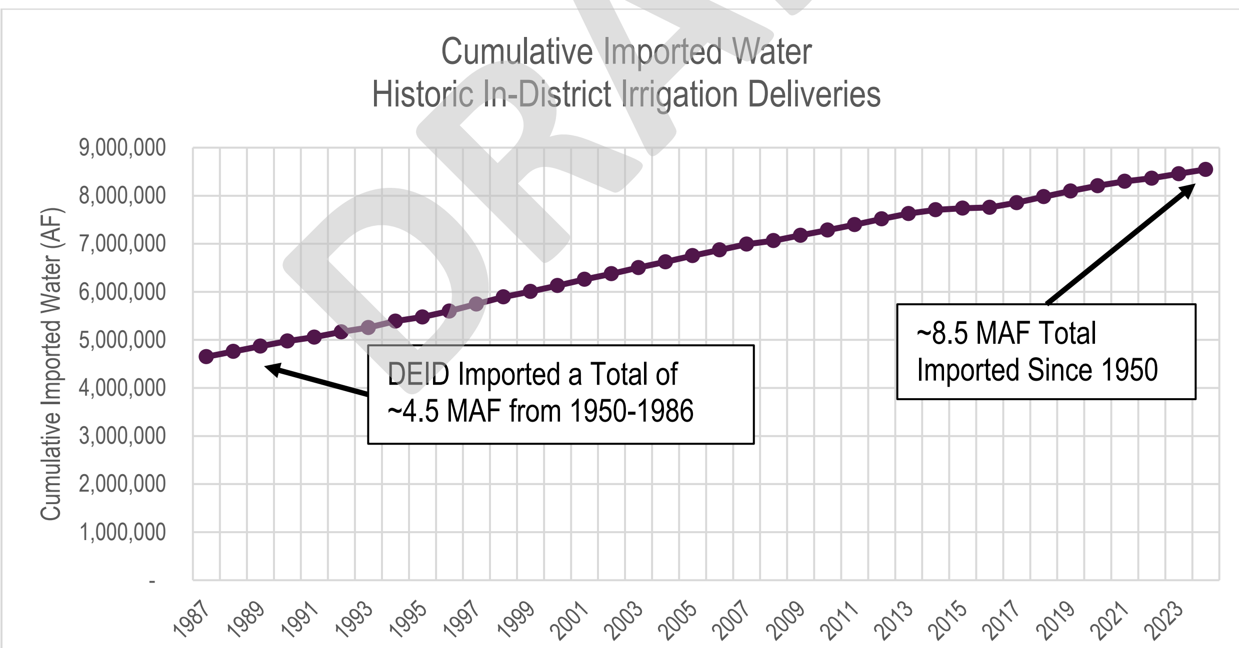


Figure 0-10 DEID has imported approximately 8.5 million acre-feet of water for irrigation since 1950

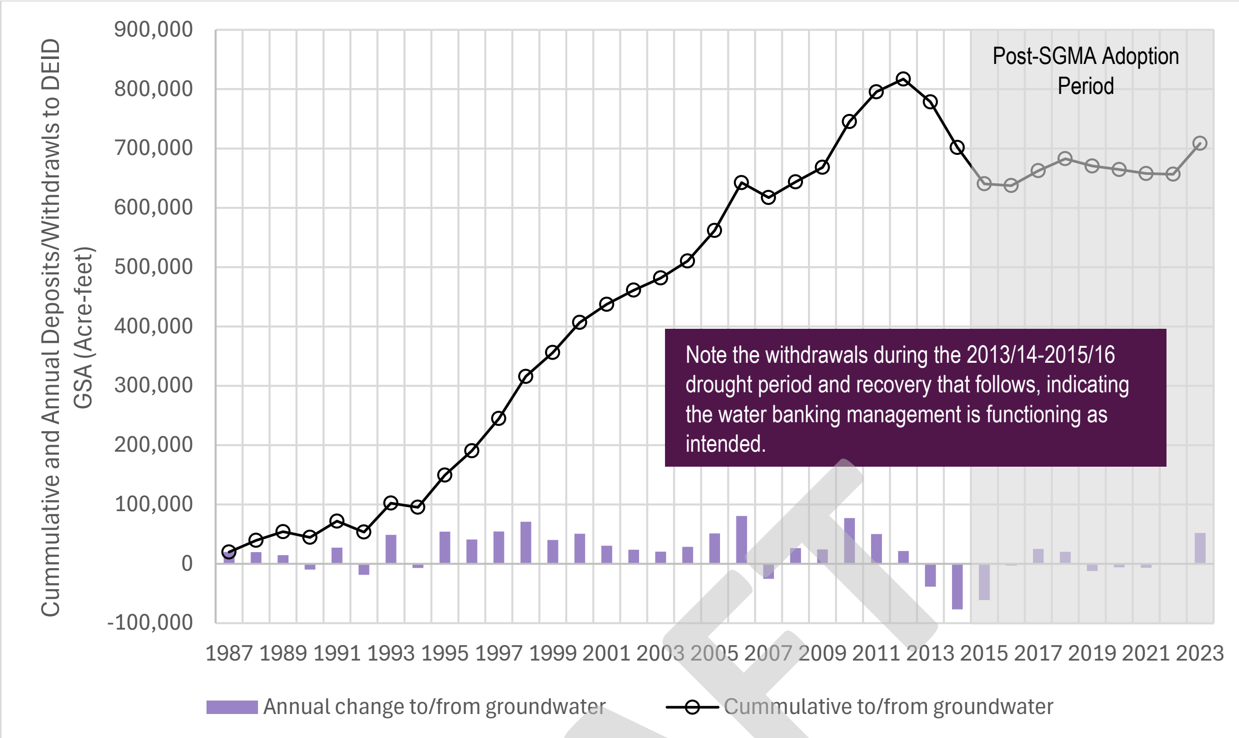


Figure 0-11 Cumulative and Annual Deposits to and Withdrawals from the DEID GSA (1987-2023)

As shown in **Figure 0-11**, DEID deposits imported surface water each year into its "savings account" of stored imported water. The period during which SGMA has been in place is highlighted in blue. DEID has continued to remain sustainable during this period. Note that this accounting method differs from the one used in **Figure 0-8**, although the conclusion is the same.

DEID GSA does not Contribute to Chronic Lowering of Groundwater Levels

Pumping within the Richgrove, Earlimart, and DEID management areas does not contribute to chronic lowering of groundwater levels in the Tule Subbasin. This is because the irrigation needs of DEID growers are primarily met via imported surface water, with excess return flows adding to DEID's subsurface stored imported surface water over time, ensuring that DEID's net balance of stored imported surface water is positive (**Figure 0-8**).

To illustrate the impact to groundwater levels in the Subbasin caused by the operations of other GSAs outside of the DEID area, INTERA simulated three hypothetical scenarios using the Tule Subbasin groundwater flow model (GFM), which was developed by Thomas Harder & Company to support the Tule Subbasin GSPs,[6] over the historical period to which the model was calibrated (**Figure 0-13**):

1. A "background" scenario (gray line), which shows what modeled groundwater levels at the Representative Monitoring Station (RMS) 24S/26E-04P01 would be in absence of any pumping in the Tule Subbasin.

[6] DEID (2022) Appendix A3

2. A "DEID only" scenario (blue line), which shows what modeled groundwater levels would be at the RMS with only DEID pumping in the absence of pumping by any of the neighboring unsustainable GSAs.
3. An "All GSAs" (including DEID) scenario (black line) shows modeled groundwater levels at the RMS with all GSAs pumping under historical conditions. The observed groundwater levels are also shown for comparison and match the simulated results reasonably well for a regional scale model.

Also shown in the figure are the Measurable Objectives (MOs) and Minimum Thresholds (MTs) included in the revised DEID GSP. There are several important conclusions that can be taken from **Figure 0-12**:

1. DEID is managed sustainably based on its own operations, including pumping by DEID landowners (the blue line). Based on the GFM model results, conjunctive operations by DEID would keep water levels generally in the range of background (the grey line), with water levels remaining well above both the MO and the MT. DEID is able to do this by carefully managing its surface water deliveries conjunctively to provide adequate directly-delivered surface water to its growers, while still allowing for "deposits" of imported surface water into its "savings account" of stored imported water. Because these deposits grow over time (**Figure 0-11**), DEID can and does maintain a large amount of stored imported water in the subsurface.
2. Without significant demand management measures by neighboring GSAs who allow pumping groundwater unsustainably, DEID MAs may not always realize the full benefits of its stored imported groundwater with respect to its key sustainability indicators: reduction of groundwater in storage, chronic lowering of groundwater levels, and land subsidence.

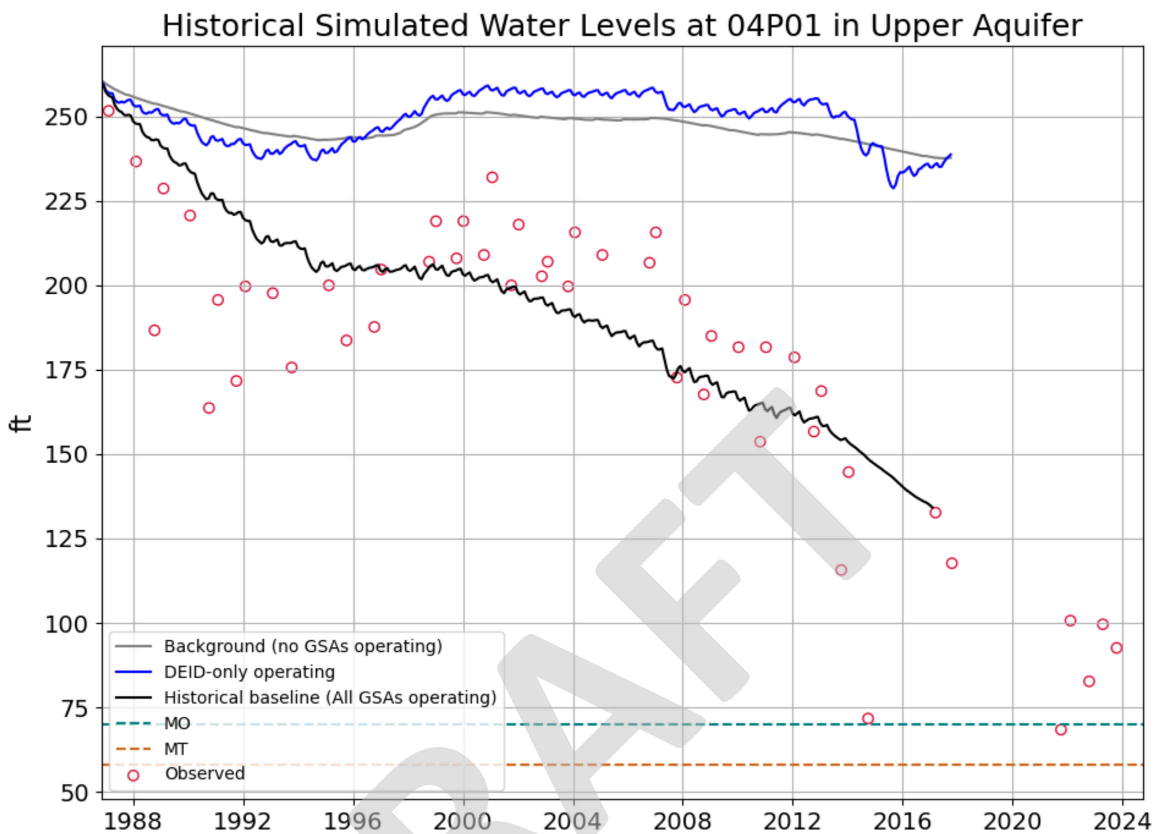


Figure 0-12 Chart depicting that, in the absence of unsustainable pumping by neighboring GSAs, it would be straightforward for DEID to meet its sustainability goal of ensuring no reduction in groundwater storage, no chronic lowering of groundwater levels

DEID GSA does not Contribute to Land Subsidence

The Tule Subbasin is an area of active and ongoing subsidence (**Figure 0-13**). Interferometric Synthetic Aperture Radar (InSAR) data published by the Department of Water Resources (DWR) show that subsidence within some areas of the Tule Subbasin measured more than 7 feet between 2015 and 2024. Subsidence with the DEID GSA amounted to nearly 3 feet over the same period, primarily due to unsustainable groundwater pumping from other GSAs within the Tule Subbasin. The InSAR data also clearly illustrate the positive impact (e.g., limited subsidence) proximal to the Turnipseed Water Bank and throughout the DEID GSA as a result of DEID importing and storing of surface water (**Figure 0-14**).

To Illustrate the impact to groundwater levels and land subsidence in the Tule Subbasin caused by the operations of other GSAs outside of the DEID area, DEID's consultant, INTERA, separately simulated the historical operations of each neighboring GSA using the Tule Subbasin GFM. Two modeling scenarios were performed: one to model the subsidence impacts attributable to surrounding GSAs other than DEID, and one to model subsidence impacts attributable only to DEID. These simulations were run using the historical version of the GFM which simulates the Tule Subbasin from 1986-2017 and has been calibrated with historical subsidence and water-level data[7].

Figure 0-15 shows that cumulative subsidence during the modeled historical period due to pumping within Tule Subbasin GSAs other than DEID is significant – nearly 20 feet in some areas. Conversely, subsidence attributable only to DEID operations during this period is modeled to have been approximately 1 foot or less (**Figure 0-16**). Thus, DEID would expect to experience little or no additional land subsidence through 2040 considering its ongoing and future surface water importation because, without outside pumping stresses, it would be able to hold groundwater levels at or above their current levels. However, actions of others continue to create undesirable results.

Figures 2-20 through **Figure 2-28** in **Subsection 2.3.5** of **Section 2** of this GSP detail the long-term land subsidence trends in relation to lower aquifer groundwater levels at various points within and surrounding DEID GSA. The analysis results clarify the role that surrounding GSAs lower aquifer management and subsequent lowering of groundwater levels have on DEID GSA.

[7] DEID (2022) Appendix A3

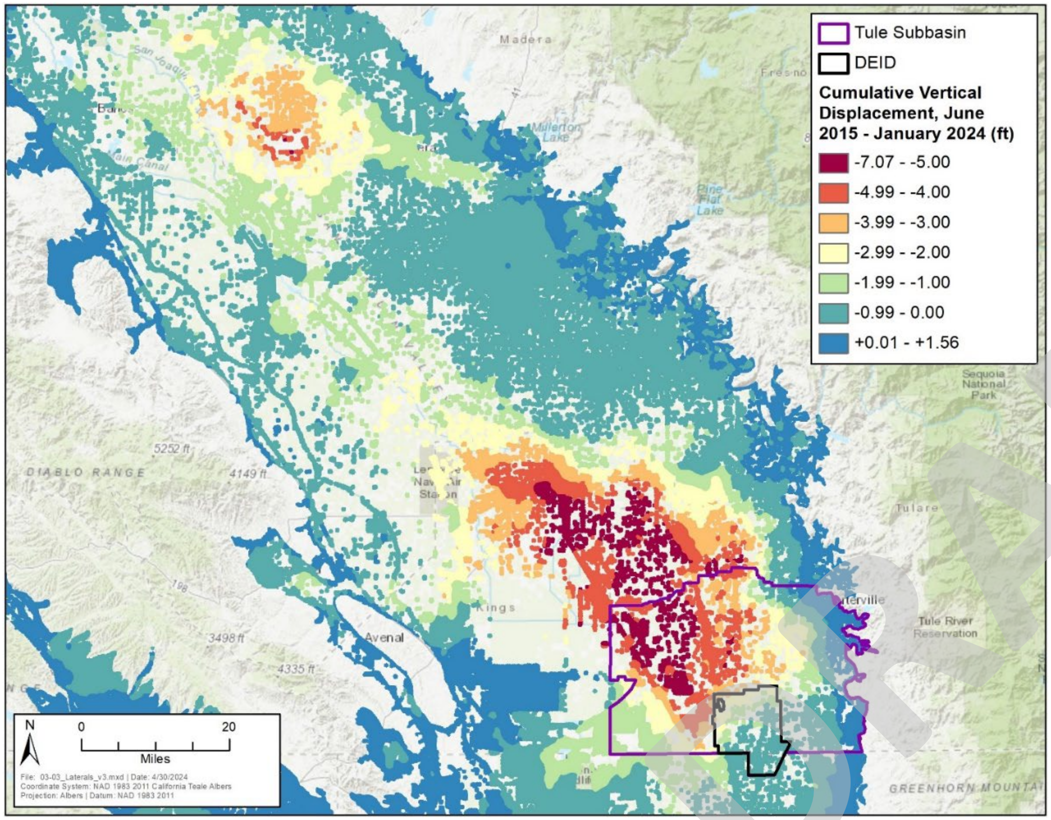


Figure 0-13 InSAR data showing cumulative subsidence (ft) from 2015 – 2024 in the vicinity of the Tule Subbasin

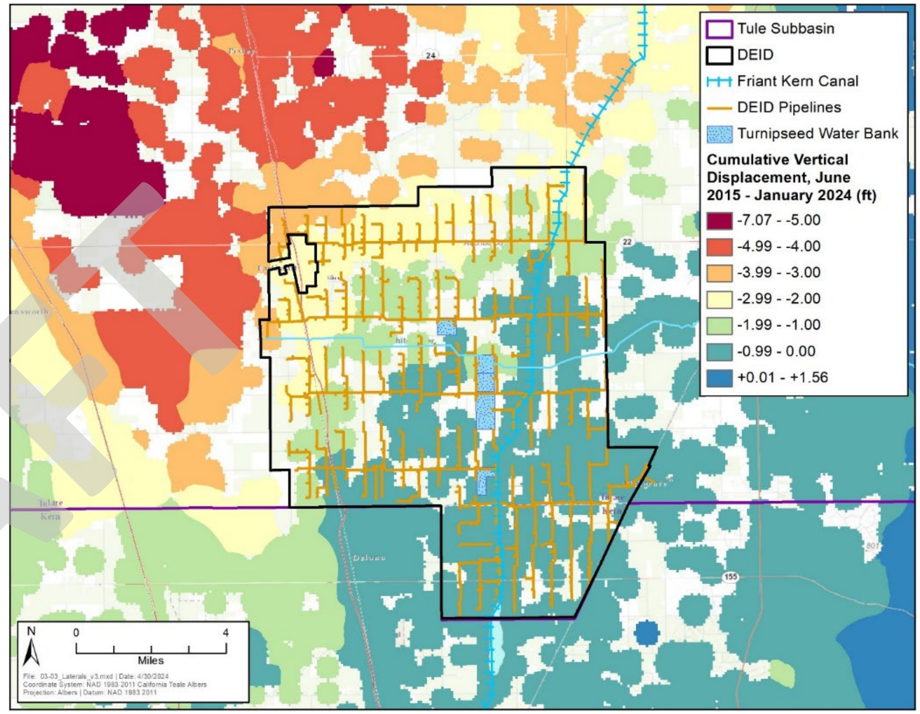


Figure 0-14 Detail of InSAR data showing cumulative subsidence (ft) from 2015 – 2024 in the vicinity of DEID and highlighting the positive impact of the Turnipseed Water Bank Subbasin

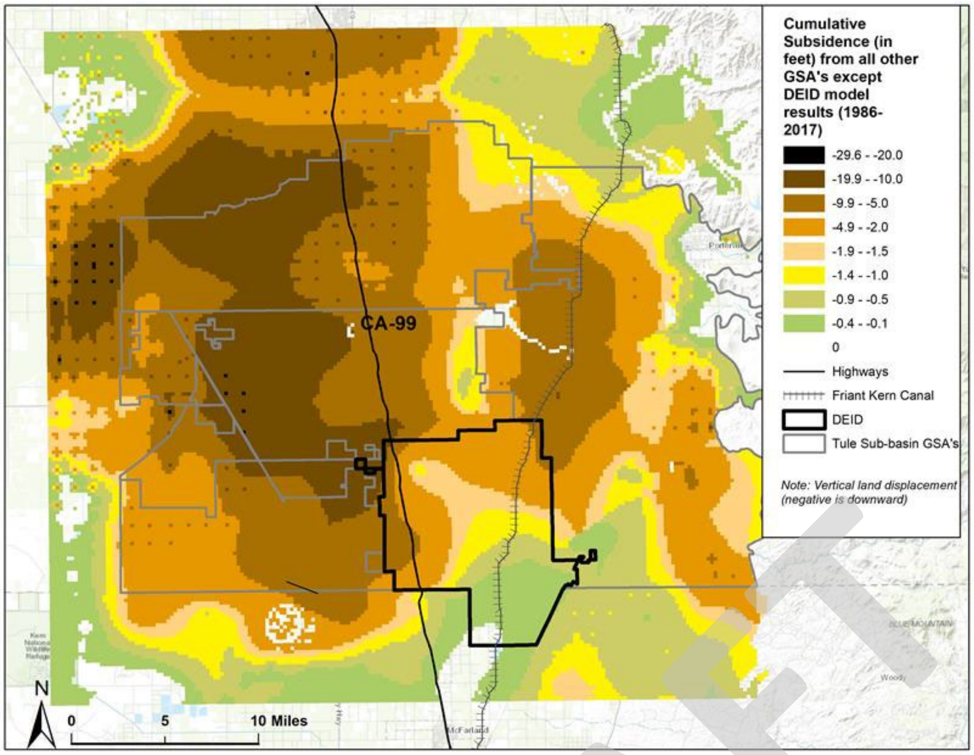


Figure 0-15 Modeled cumulative subsidence 1986 – 2017 due to groundwater pumping from neighboring GSAs around DEID shows that nearly all the observed subsidence is due to the unsustainable groundwater pumping of other GSAs

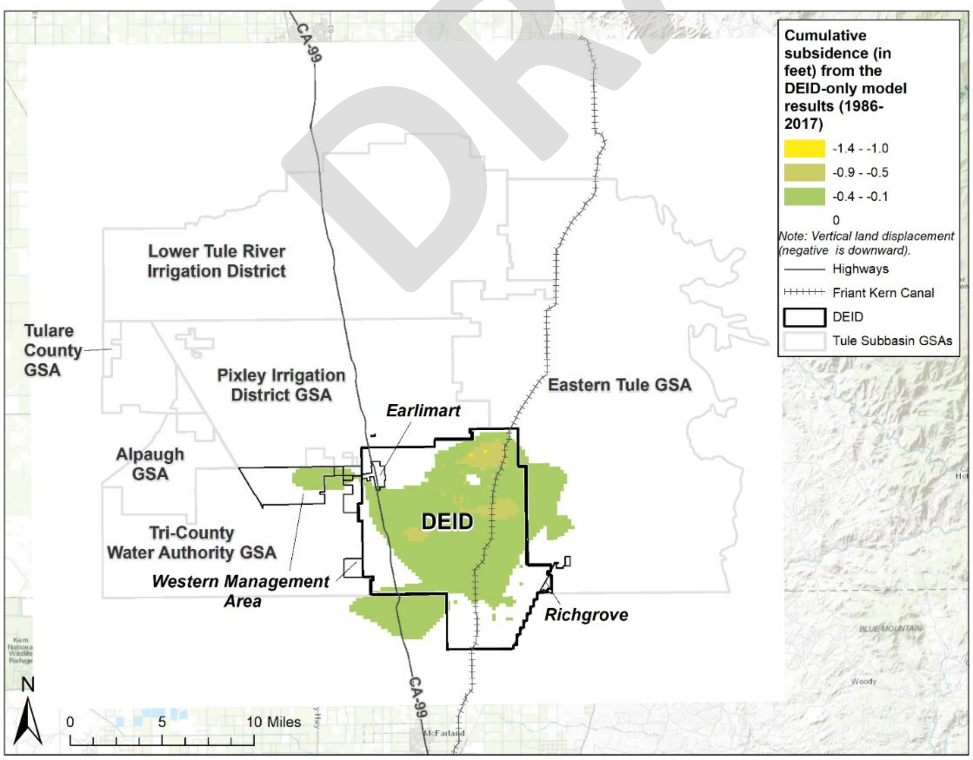


Figure 0-16 Model results show only minimal subsidence (less than 1 foot) is attributable to DEID during 1986 – 2017

DEID GSA does not Contribute to Degraded Groundwater Quality

Post-SGMA groundwater quality impacts in DEID GSA and the surrounding area is generally caused by agricultural activity prior to the passage of SGMA. Simultaneously, over the last several decades, agricultural water quality orders have resulted in improved water quality monitoring, management, and reporting. In particular, the Irrigated Lands Regulatory Program (ILRP)[8], Central Valley Salinity Alternatives for Long-term Sustainability[9] (CV-SALTS), and Dairy General Order[10] have been instrumental in preventing and mitigating groundwater quality challenges in the San Joaquin Valley, including in the Tule Subbasin. There are no dairies within the DEID GSA Plan Area; however, dairies are present in neighboring GSAs, and the DEID GSA monitors nitrates and other constituents of concern (COCs) associated with dairy operations. The State Board and the Central Valley Regional Water Quality Control Board oversee and enforce these programs, and more information on ILRP and CV-SALTS' relationship to DEID GSA's groundwater quality monitoring and impact avoidance planning is described in **Section 3**.

In addition to agriculturally linked COCs, the risk of anthropogenic contamination such as perfluorooctane sulfonic acid (PFOS), 1,2,3-trichloropropane (TCP), and other ubiquitous non-point source COCs, is elevated in the more developed areas, including in the communities of Earlimart and Richgrove.

SGMA requires GSAs to monitor and manage groundwater quality impacts induced by groundwater management that occurred after SGMA was enacted on January 1, 2015. In the case of DEID GSA, the groundwater management activities that may influence concentration or migration changes for COCs are summarized in **Section 3**. DEID GSA's current strategy and next steps for addressing potential adverse water quality issues under SGMA are described in **Section 3** and **Section 5**.

Section 3 includes maps clarifying the groundwater quality before SGMA was enacted (pre-2015) and when wells were first tested for various groundwater quality constituents of concern within DEID GSA. These figures are included to provide context for the baseline (legacy) groundwater quality conditions.

DEID GSA's existing representative monitoring network currently includes monitoring two community wells in Earlimart and Richgrove, which provide drinking water supplies for 85-90%[11] of the residents in DEID GSA. To assess drinking water quality of the remaining 10-15%, a domestic drinking water well is included in the groundwater quality representative monitoring network and supplemental ILRP, CV-SALTS, and GAMA data are evaluated on an annual basis. DEID GSA currently monitors on an annual basis; however, DEID may consider seasonal monitoring in the event groundwater quality degradation trends are identified during the annual evaluation or at new monitoring sites (once constructed) to more quickly establish baseline data.

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[8] State Board (2024c), available at https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/

[9] State Board (2024d), available at https://www.waterboards.ca.gov/centralvalley/water_issues/salinity/

[10] State Board (2023), available at https://www.waterboards.ca.gov/centralvalley/water_issues/confined_animal_facilities/general_order_guidance/dairy/index.html

[11] This assessment is based off on California Census data, which includes the assumptions for 'Hard to Count' areas that are commonplace in the San Joaquin Valley. https://cacensus.maps.arcgis.com/apps/webappviewer/index.html?id=48be59de0ba94a3dacff1c9116df8b37

To improve the understanding of the 10-15% of households that are sourced by domestic wells in DEID GSA, DEID GSA has added a new management action, "Well Registration Program," which is intended to gather existing data and information on well construction, groundwater levels, and groundwater quality from domestic wells in the GSA. This information will be used to fill this data gap and provide the necessary information to proactively manage water quality and notify households if their well is at risk of water quality or other impacts. Any domestic well that experiences an impact induced by groundwater management if the impact occurred after January 1, 2015, can qualify for emergency drinking water (within 24-hours); interim supplies (tank and enrollment in a hauled water program within 72-hours); and long-term solutions, such as a contaminant treatment system, connection to a community well, deepening the well or pump, etc. This program requires groundwater quality monitoring at all wells that participate in the program. These data are available to DEID GSA to further fill groundwater quality data gaps around domestic well depths. More information on the DEID GSA Mitigation Program and its partnership with Self-Help Enterprises to administer the drinking water mitigation, translation, education, and outreach services will be available in the Mitigation Plan. See **Section 5** for more information on this management action.

DEID GSA recognizes that more data would be helpful in assessing the relationship between DEID's significant recharge activities and the underlying groundwater quality. To address this, DEID GSA has developed a new management action, "Groundwater Quality Monitoring Program," which is detailed in **Section 5** of this GSP.

DEID GSA does not Contribute to Depletions of Interconnected Surface Waters

There are no identified and likely no potential interconnected surface waters or Groundwater Dependent Ecosystems (GDEs) within DEID GSA that existed as of January 1, 2015, as evidenced by the depth to the first encountered groundwater exceeding 100 feet below ground surface. DEID GSA's revised GSP includes improvements in GDE and interconnected surface water evaluation through (1) further review of aerial imagery during the historically wet 2023 conditions to assess the presence of potential GDEs, (2) comparing surface conditions to upper aquifer groundwater level conditions, and (3) reviewing The Nature Conservancy's GDE Pulse 2.2 ool, which was designed to be an update from the Natural Communities Dataset Viewer tool that displays the Natural Communities Commonly Associated with

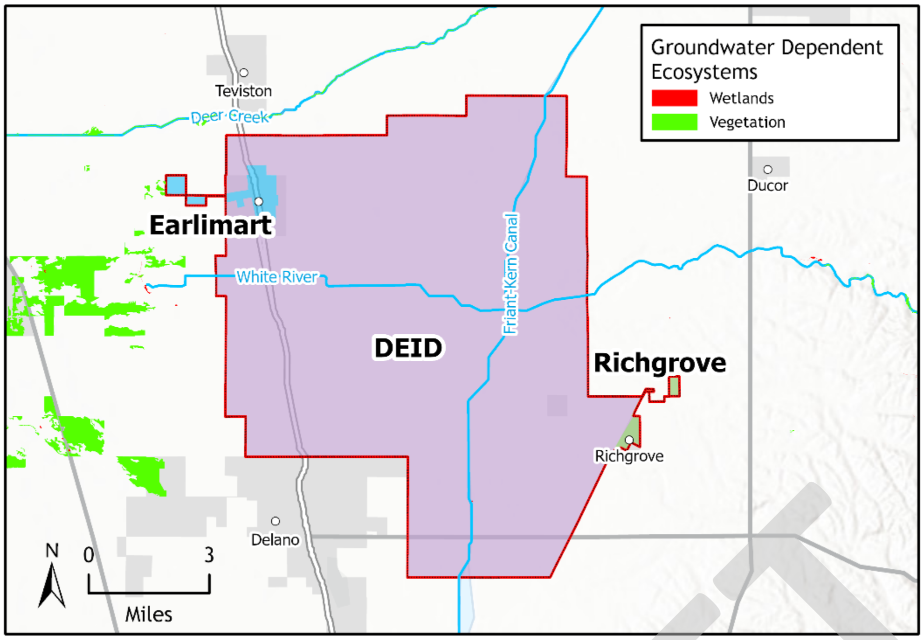


Figure 0-17 Lack of Groundwater Dependent Ecosystems in DEID GSA

Groundwater (NCCAG) dataset with greater accuracy. **Section 3** includes details on the findings of these analyses. Further, **Figure 0-17** depicts the lack of groundwater dependent ecosystems within DEID GSA.

In conclusion, this GSP demonstrates DEID GSA's ongoing sustainable management of groundwater resources within its boundaries and presents a plan moving forward to continue and enhance sustainable practices to continue to meet its sustainability goal, in accordance with the SGMA Emergency Regulations. DEID GSA is currently challenged by the neighbouring GSAs' unsustainable practices, which inhibit its ability to meet its sustainability goal and this GSP is intended to inform DWR, the State Board, and the public that DEID GSA plans to continue to operate sustainably, as it has for many years.

Conclusion

DEID GSA has been sustainable and a net recharger to the Tule Subbasin for many decades. DEID has also made the necessary investments in water banking, recharge, and facility maintenance to secure sustainability in the future. DEID GSA's ability to maintain sustainability and avoid impacts to beneficial users, uses, and property interests is wholly contingent upon neighbouring GSAs' adopting and implementing necessary immediate demand reduction policies and sufficiently funded mitigation program(s).

ES-2. Plan Overview

This subsection of the Executive Summary serves as a general summary of the key content in this 2nd Amended DEID GSA GSP. This GSP includes seven sections, as listed and described in more detail in the sections below.

Section1 – Introduction and Plan Area
Section 2 – Basin Setting
Section 3 – Sustainable Management Criteria
Section 4 – Monitoring Network
Section 5 – Projects and Management Actions
Section 6 – Plan Implementation
Section 7 – References

This GSP is also accompanied by appendices, which are considered part of this Plan.

Section 1: Introduction and Plan Area

Section 1 of this GSP describes the geographic setting, present agencies and entities, jurisdictional boundaries, water use type in the GSA, and lists the beneficial uses, users, and property interests present within DEID GSA. Many of the key points are explained above in **Subsection ES-1**.

The core of SGMA is protection of and avoidance of significant and unreasonable impacts to beneficial users and uses of groundwater. The beneficial users and uses within the Tule Subbasin and their presence in DEID GSA is detailed in **Table 0-2**.

Table 0-2 Beneficial Users, Uses, and Property Interests within Tule Subbasin and within DEID GSA

Beneficial Use	Beneficial User	Present in DEID GSA?
Drinking Water Use	Domestic Well Users	Yes
	Small Community Well Users and Service Providers	Yes
	Municipal Well Users and Service Providers	Yes
	Commercial and Industrial Users	Yes
Environmental Use	Groundwater Dependent Ecosystems	No
	Habitat Conservation	No
	Native Vegetation	No
Agricultural Use	Growers (Irrigation)	Yes
	Produce Packing Facilities (Ag-Industrial Use)	Yes
	Livestock Facilities (Ag-Industrial Use)	Yes
Non-Potable Municipal or Community Use	Golf Courses Irrigation (Municipal Non-Potable Use)	No
	Park and Recreation Irrigation (Municipal Non-Potable Use)	Yes
Property Interests	Critical Infrastructure Users and Owners	Yes
	Homeowners and Residents	Yes
	Business Owners and Employees	Yes

Section 2: Basin Setting

The Basin Setting is comprised of three primary focuses:

1. **Hydrogeologic Conceptual Model**, which is a simplified description of the physical components and interactions of surface and groundwater systems within the Tule Subbasin.
2. **Groundwater Conditions**, which describes the historic and current conditions associated with groundwater storage, levels, and quality, land subsidence, interconnected surface water, and seawater intrusion. The latter two of which are not applicable to the DEID GSA.
3. **Historical, Current, and Projected Water Budgets**, which details the historic, current, and projected inflows to and outflows from the groundwater system and the annual and cumulative change and storage.

A summary of these contents is available in **Subsection ES-1** above.

Section 3: Sustainable Management Criteria

Section 3 of this Plan includes a breakdown of the sustainable management criteria, how they were established, how they are protective of beneficial users, uses, and property interests. Sustainable management criteria include quantitative and qualitative metrics to measure and inform implementation progress towards the sustainability goal. These sustainable management criteria are applied to all of the applicable sustainability indicators. **Table 0-3** summarizes the rationale for all of the sustainable management criteria and **Table 0-4** through **Table 0-7** list the sustainable management criteria for each of the applicable sustainability indicators.

DEID GSA's guiding principles to establish sustainable management criteria are listed in **Figure 0-12**.

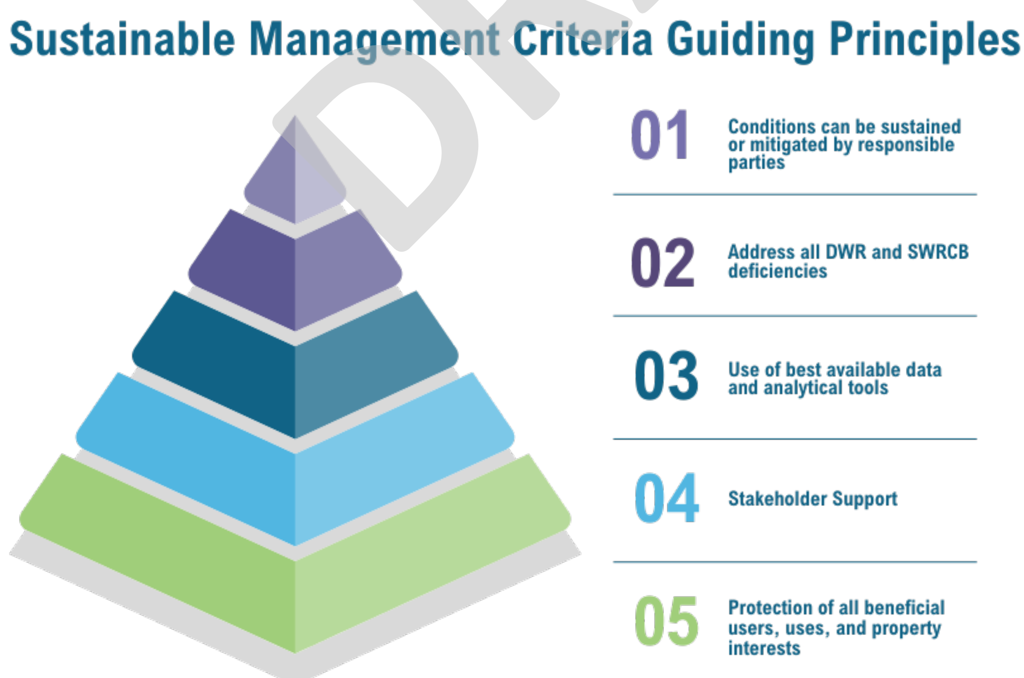


Figure 0-12 Guiding Principles to Establish Sustainable Management Criteria

Sustainability Goal

The sustainability goal serves to guide policies, management decisions, and development of sustainable management criteria. The sustainable goal for the Tule Subbasin, as defined by DEID GSA, is as follows:

Pursuant to the Cal. Water Code §§ 10721(u) and 10727, and 23 Cal. Code Regs. §357.24, the Sustainability Goal of the Tule Subbasin is to operate the groundwater Subbasin within its sustainable yield by (or before) 2040 to avoid undesirable results while preventing significant and unreasonable impacts on all beneficial use and users (including community, environmental, economic, societal, and recreational use and users of groundwater). The goal inherently upholds the Human Right to Water, while expanding it to include access to water for recreational and other uses that impact human dignity, opportunity, and quality of life. Significant and unreasonable impacts are defined as the tipping point at which groundwater conditions cause impacts to these beneficial users, uses and property interests that cannot be sustained or mitigated.

Reaching this sustainability goal entails: eliminating groundwater overdraft; stopping chronic declines in groundwater levels; keeping groundwater levels above minimum thresholds and as close as possible to measurable objectives; preserving groundwater supplies and storage for all beneficial use and users; minimizing subsidence rates and extents by raising groundwater levels above historical lows to avoid significant and unreasonable impacts on infrastructure and property interests due to ongoing and residual subsidence; avoiding groundwater quality impairment from groundwater operations and maintaining groundwater quality across the Tule Subbasin; and avoiding significant and unreasonable impacts on beneficial uses of surface water due to depletions of interconnected surface water caused by groundwater pumping.

The Sustainability Goal will be achieved through a collaborative, Subbasin-wide program of sustainable groundwater management by the Tule Subbasin GSAs implementing coordinated groundwater sustainability plans that include demand reduction in areas with overdraft, supply augmentation, groundwater recharge, active monitoring and management of subsidence, and mitigation programs to address significant and unreasonable impacts on drinking water supplies due to overdraft during the planning and implementation horizon.

DEID occupies a unique position in the Tule Subbasin in that it eliminated overdraft in its area by the 1950s and moved into an ongoing net surplus water budget through effective and proactive conjunctive use via importation of surface water in volumes that are, on average, in excess of pumping within DEID. Pumping and other actions within DEID cause minimal contributions to groundwater level declines and subsidence in the Tule Subbasin, as shown by groundwater modeling, INSAR data, and water budget analyses. In keeping with its historical and current sustainable position, the DEID will continue to remain sustainable and contribute positively to meeting the Tule Subbasin Sustainability Goal *by continuing its ongoing sustainable conjunctive use operations. These activities will ensure that groundwater levels within DEID do not create undesirable results and, in the circumstance that adverse impacts to domestic well owners or others are anticipated to occur or actually do occur within its area, DEID's robust and well-funded mitigation program will protect against significant and unreasonable impacts.*

Notwithstanding, DEID and beneficial uses and users within its management area continue to be adversely affected by overdraft pumping outside the DEID boundary. DEID is fully committed to working with other Tule Subbasin GSAs as they implement GSP management actions, potentially including demand management, within the Tule Subbasin to ensure groundwater levels remain above minimum *thresholds and subsidence is minimized or avoided in and around DEID, and throughout the Tule Subbasin.*

Coordinated implementation of Tule Subbasin GSPs is designed to ensure that the sustainability goal, once achieved, is maintained throughout the remainder of the 50-year planning and implementation horizon and beyond.

Table 0-3 Summary of Sustainable Management Criteria Rationale

	Chronic Lowering of Groundwater Levels	Reduction in Groundwater Storage	Degraded Groundwater Quality	Land Subsidence
Measurement	Groundwater elevations derived from measured depth to groundwater at RMS	Groundwater levels are used as a proxy for the reduction in groundwater storage.	Groundwater quality analysis from samples collected by the GSA or other public agencies	Total subsidence measured at RMS using DWR provided InSAR data and survey benchmark monitoring.
Undesirable Result	Upper/Composite Aquifer: A single MT exceedance at any RMS site. Lower Aquifer: A single MT exceedance at any RMS site	Groundwater level SMC used as a proxy.	A single MT exceedance at any RMS	A single MT exceedance (rate and cumulative) at any RMS site.
Minimum Threshold	Upper Aquifer: Established at projected groundwater levels for Tule Subbasin sustainability goal. Lower Aquifer: Established at groundwater levels correlated to no additional subsidence	Groundwater level SMC used as a proxy.	Establish MTs at each Groundwater Quality RMS based on 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.	Established MTs at each RMS to reflect zero additional subsidence.
Measurable Objective	Upper Aquifer: Established at groundwater levels consistent with historical measurements and operational flexibility. Lower Aquifer: Established at groundwater levels correlated to zero land subsidence.	Groundwater level SMC used as a proxy.	Established at 75% of the MT	Established MOs at each RMS to reflect zero additional subsidence.

Sustainable Management Criteria for Chronic Lowering of Groundwater Levels and Reduction in Groundwater Storage

Table 0-4 includes the sustainable management criteria assigned for groundwater levels and groundwater storage at each Representative Monitoring Site (RMS). Groundwater level sustainable management criteria are used as a proxy for groundwater storage, provided their direct relationship with one another and that by setting protective groundwater level sustainable management criteria, this inherently protects against significant and unreasonable reduction in groundwater storage.

Table 0-4 Sustainable Management Criteria for Groundwater Levels and Groundwater Storage

RMS Well	Aquifer	Groundwater Level SMC (ft-amsl)				
		2025 Interim Milestone	2030 Interim Milestone	2035 Interim Milestone	Measurable Objective	Minimum Threshold
24S/25E-35H01	Upper	144	151	153	154	144
24S/26E-04P01	Upper	58	66	69	70	58
24S/26E-11	Upper	126	138	142	144	126
24S/26E-32G01	Upper	129	138	141	142	129
M19-U	Upper	147	154	157	158	147
23S/26E-29D01	Upper	54	59	60	61	54
25S/26E-9C01	Lower	62	62	62	62	62
M19-L	Lower	65	65	65	65	65
23S/25E-27	Composite	10	10	10	10	10
24S/27E-31	Composite	99	104	106	107	99

Sustainable Management Criteria for Land Subsidence

Table 0-5 includes the sustainable management criteria assigned for groundwater levels and groundwater storage at each RMS.

The land subsidence and lower aquifer groundwater level sustainable management criteria are established with DEID GSA's no-tolerance policy for additional subsidence. Both minimum thresholds and measurable objectives reflect land surface elevation, rate of change, cumulative change, and water surface elevation representative of no additional land subsidence from 2023 onward.

Table 0-5 Sustainable Management Criteria for Land Subsidence

RMS ID	Management Area	GPS Coordinates		2020 Baseline Elevation	2025 Interim Milestone	2030 Interim Milestone	2035 Interim Milestone	Measurable Objective	Minimum Threshold (MT) Elevation (2023)	Cumulative Subsidence MT (2020-2040)	Subsidence MT Rate (post-2024)
		Latitude	Longitude	(ft amsl)						(ft)	(ft per year)
D0012_B_RMS	DEID	35.862818	-119.285763	267.1	266.06	266.06	266.06	266.06	266.06	1.1	0
D0030_B_RMS	Earlimart	35.891982	-119.268016	272.8	271.89	271.89	271.89	271.89	271.89	0.9	0
D0031_B_RMS	DEID	35.833956	-119.255191	296.7	295.86	295.86	295.86	295.86	295.86	0.8	0
D0032_B_RMS	DEID	35.79103	-119.24428	316.7	316.44	316.44	316.44	316.44	316.44	0.3	0
D0033_B_RMS	DEID	35.849263	-119.196881	366.1	365.66	365.66	365.66	365.66	365.66	0.5	0
D0034_B_RMS	DEID	35.891666	-119.196996	340.8	339.61	339.61	339.61	339.61	339.61	1.2	0
D0073_G_FKC	DEID	35.892022	-119.151852	406.2	405.55	405.55	405.55	405.55	405.55	0.7	0
D0074_B_FKC	DEID	35.877256	-119.143982	415.5	415.06	415.06	415.06	415.06	415.06	0.5	0
D0075_B_FKC	DEID	35.86335	-119.162	403.2	402.72	402.72	402.72	402.72	402.72	0.5	0
D0076_B_FKC	DEID	35.84863	-119.150061	408.9	408.20	408.2	408.2	408.2	408.2	0.7	0
D0077_B_FKC	DEID	35.834073	-119.161183	401.9	401.51	401.51	401.51	401.51	401.51	0.4	0
D0078_B_FKC	DEID	35.819486	-119.168215	406.1	405.87	405.87	405.87	405.87	405.87	0.2	0
D0079_G_FKC	DEID	35.805073	-119.178585	407.1	406.99	406.99	406.99	406.99	406.99	0.1	0
D0080_B_FKC	DEID	35.80553	-119.157965	433.1	432.94	432.94	432.94	432.94	432.94	0.1	0
D0081_B_FKC	DEID	35.805089	-119.180813	399.5	399.42	399.42	399.42	399.42	399.42	0.1	0
D0082_B_FKC	DEID	35.790221	-119.169645	423.4	423.43	423.43	423.43	423.43	423.43	0.0	0
D0083_B_FKC	DEID	35.769064	-119.165418	419.5	419.53	419.53	419.53	419.53	419.53	0.0	0
D0084_B_FKC	DEID	35.747001	-119.182358	407.3	406.94	406.94	406.94	406.94	406.94	0.4	0
D0089_B_RMS	Richgrove	35.805288	-119.105225	498.2	498.19	498.19	498.19	498.19	498.19	0.0	0

Sustainable Management Criteria for Degraded Groundwater Quality

Sustainable management criteria for groundwater quality include two layers. The first layer is based off of drinking water standards and agricultural water quality objectives (where they are more restrictive than drinking water standards) for the constituents of concern in DEID GSA (see **Table 0-6**). The second layer is more restrictive for constituents in which there are repeated exceedances (see **Table 0-7** and **Figure 0-8**).

Table 0-6 Groundwater Quality Sustainable Management Criteria (Layer 1)

Constituent	Units	Interim Milestones & Measurable Objectives		Minimum Threshold	
		75% Drinking Water Limits (MCL/SMCL)	75% Agricultural Water Quality Objective (WQOs)	Drinking Water Limits (MCL/SMCL)	Agricultural Water Quality Objective (WQOs)
Arsenic	ppb	7.5	N/A	10	N/A
Nitrate as N	ppm	7.5	N/A	10	N/A
Hexavalent Chromium	ppb	7.5	N/A	10	N/A
Dibromochloropropane (DBCP)	ppb	0.15	N/A	0.20	N/A
1,2,3-Trichloropropane (TCP)	ppt	3.75	N/A	5	N/A
Tetrachloroethene (PCE)	ppb	3.75	N/A	5	N/A
Chloride	ppm	375	79.5	500	106
Sodium	ppm	N/A	51.75	N/A	69
Total Dissolved Solids	ppm	750	337.5	1,000	450
Perchlorate	ppb	4.5	N/A	6	N/A

Table 0-7 Groundwater Quality Minimum Thresholds for Constituents with Multiple Exceedances

RMS ID	Well Use	Management Area	Aquifer	COC Minimum Thresholds[9]				
				Conductivity	pH	Nitrate as N	Arsenic	Hexavalent Chromium
				(µm/cm)	-	*(mg/L)*	*(ppb)*	*(ppb)*
E0083349	Domestic Drinking Water	DEID	Upper	<708	>6.5, <8.3	<14	N/A	N/A
E0070434	Agricultural Irrigation	DEID	Upper	<700	>6.5, <8.3	<15	N/A	N/A
TCSD CCR	Community Drinking Water	Richgrove CSD	Lower	<900	>6.5, <8.5	<10	<10.5	<10
EPUD CCR	Community Drinking Water	Earlimart PUD	Lower	<900	>6.5, <8.5	<10	<10	<10

Overall Note: An exceedance of a minimum threshold for groundwater quality does not indicate that the impact is within SGMA or the GSA's authority to address. SGMA requires GSAs to be responsible for groundwater quality degradation induced by groundwater management, such as groundwater pumping and recharge activities. To assess the presence of significant and unreasonable impacts/undesirable result within the GSA's authority, the GSA may perform a causation analysis to determine if the impact had potential to be caused by changing groundwater levels, migration, introduction of new or increased concentrations of COCs or other mechanism induced by groundwater management.

Table 0-8 Groundwater Quality Interim Milestones and Measurable Objectives for Constituents with Multiple Exceedances

RMS ID	COC Interim Milestone and Measurable Objectives																			
	Conductivity (µm/cm)				pH -				Nitrate as N (mg/L)				Arsenic (ppb)				Hexavalent Chromium (ppb)			
	2025	2030	2035	2040	2025	2030	2035	2040	2025	2030	2035	2040	2025	2030	2035	2040	2025	2030	2035	2040
E0083349	680	680	680	680	>6.5, <8.3	>6.5, <8.3	>6.5, <8.3	>6.5, <8.3	<13.2	<13.2	<13.2	<13.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1095774	<700	<700	<700	<700	>6.5, <8.3	>6.5, <8.3	>6.5, <8.3	>6.5, <8.3	<14.3	<14.3	<14.3	<14.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RCSD CCR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EPUD CCR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

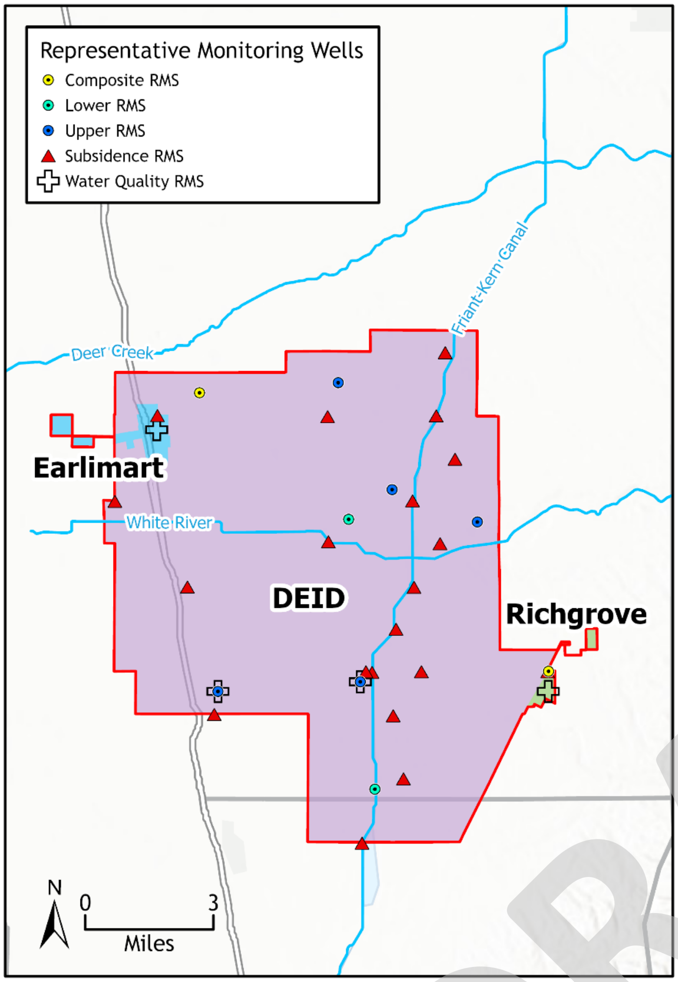


Figure 13 DEID GSA Representative Monitoring Network

Section 4.0 Monitoring Network

A map of the DEID GSA Representative Monitoring Network is available in **Figure 0-30**. Information on monitoring site selection, protocols, and frequency are available in Chapter 5 of this GSP. It is important to distinguish the representative monitoring site as a subset of existing programs, of which have additional data and information that DEID GSA evaluates on an annual and as-needed basis to inform analyses, assess progress towards implementation, and assess status of continued sustainability. Additional monitoring sites are being added around the center of DEID GSA to evaluate groundwater level and groundwater quality conditions at aquifer depth consistent with the average domestic well depth of the locale. More information on these new monitoring wells is available in **Section 4**.

Section 5: Projects and Management Actions

Section 5 of this GSP details the projects and management actions being implemented by each management area to maintain sustainability in DEID GSA. A list of these projects and management actions is available below:

DEID Management Area

Action 1 Continued importation and optimization of imported water supplies to meet consumptive use requirements

Action 2 Actions to increase imported water quantities above historic operations to meet consumptive use requirements and new water demands

Action 3 Continued operations of existing in-district recharge/banking operations for future groundwater extraction needs

Action 4 Actions to increase in-district recharge/banking operations for future groundwater extraction needs

Action 5 Continued operations of existing out-of-district banking operations to augment future imported water supplies

Action 6 Actions to increase out-of-district groundwater banking operations to augment future imported water supplies

Action 7 Implementation of mitigation plan for impacts induced by groundwater management

Action 8 ***New** Actions to support Tulare County well permit effectiveness by reviewing all new agricultural and domestic well permit applications and assessing if proposed well may elevate risk of inducing water level decline or subsidence impacts to nearby wells and/or critical infrastructure

Action 9 ***New** Well Registration Program
Action 10 ***New** Groundwater Quality Monitoring Program
Action 11 ***New** Exceedance Policy & Investigation

Richgrove Community Services District Management Area

Action 1 Water conservation programs
Action 2 2020-2025 interim water supply supplement program
Action 3 2025-2040 groundwater recharge projects for future groundwater extraction needs
Action 4 Mitigation of identified adverse impacts

Earlimart Public Utilities District Management Area

Action 1 Water conservation programs
Action 2 2020-2025 interim water supply supplement program
Action 3 2025-2040 groundwater recharge projects for future groundwater extraction needs
Action 4 Mitigation of identified adverse impacts

Section 6: Plan Implementation

Chapter 6 of this GSP summarizes the data management system, reporting requirements, and estimated cost of maintaining sustainability via GSP implementation.

While **Table 0-9** evaluates the cost of sustainability starting from 2015 to reflect the investments since SGMA was enacted, it is important to clarify that DEID GSA truly began implementing and investing in sustainability in the 1950s in alignment with the District's CVP Contract. DEID since built an extensive pipeline network covering the entirety of the District, built groundwater banking facilities, and invested in out-of-district banking. All of these activities have resulted in DEID GSA having operated above the sustainable yield since the 1950s.

DEID GSA's landowners are already operating sustainably; however, are continuing to invest millions of dollars to secure this sustainability for the present and future. In many other San Joaquin Valley GSAs, funding for such activities is generated from volumetric penalty fees applied to those who contribute to overdraft. In DEID GSA, no landowner is overdrafting or contributing to overdraft indirectly. There is no need for penalty fees in DEID GSA, instead sustainability and resiliency are considered priorities to secure economic opportunity, access to safe drinking water, public safety, and preservation of the cultural significance that agriculture has in the region.

For context of this commitment to sustainability, DEID growers have invested more approximately $44 million since SGMA was enacted (2015) on projects like Turnipseed Water Banking Facility. This amount exceeds the total funding generated by all other Tule Subbasin GSAs to mitigate impacts along the FKC, implement the Tule Subbasin Mitigation Program. In the case of DEID GSA, these are sustainable landowners funding a sustainable future. In the other GSAs of the Tule Subbasin, the funding for these mitigation activities are generated only from overdrafting parties.

Table -9 Cost of Sustainability in DEID GSA

	2015-2019	2020-2024	2025-2029	2030-2034	2035-2039
	Millions of US Dollars (Inflation included for cost estimates post 2024)				
GSA Administration and GSP Development	$1.7	$4.1	$4.1	$2.4	$2.7
Projects and Management Actions	$95.6	$126.3	$112.6	$128.1	$147.2
Total	$97.3	$130.4	$116.70	$130.50	$149.90

Section 1 Introduction to DEID GSA

Table of Contents

List of Figures

List of Tables

Subsection 1.1 Purpose of the Groundwater Sustainability Plan

In 2014, California approved a new groundwater management law commonly known as the Sustainable Groundwater Management Act (SGMA), which became effective January 1, 2015[1]. SGMA requires that all medium- and high-priority groundwater basins, as designated by the California Department of Water Resources (DWR), be governed by one or more Groundwater Sustainability Agencies (GSAs and that a Groundwater Sustainability Plan (GSP), or an alternative to such plan, if applicable, be prepared and adopted by the GSAs, defining a course to achieve sustainable groundwater management within the basin within 20 years of plan implementation.

The Tule Subbasin (Subbasin, DWR Bulletin 118 Basin No. 5-022.13) has been designated by DWR as a high-priority basin subject to critical conditions of overdraft. Multiple local agencies that overlie the Tule Subbasin have formed into seven GSAs, with no overlapping jurisdictions, in conformance with SGMA (**Figure 1-2**). Pursuant to SGMA, each GSA may develop, adopt, and implement a separate GSP within its respective jurisdictional boundaries, so long as the GSPs, collectively, cover the entire Subbasin.

While the Delano-Earlimart Irrigation District (DEID) has worked diligently to coordinate with the other GSAs in the Tule Subbasin, its position is unique in that it is managed sustainably primarily via conjunctive use of its imported surface water.

- DEID, including its growers and other pumpers, does not and will not contribute to reductions in groundwater storage over the SGMA planning period through 2040 because DEID has a net positive benefit to groundwater storage by recharging imported surface water from the Friant Division of the Central Valley Project (CVP) into storage during most water year types; and, on a cumulative, ongoing basis, by depositing more water into the Subbasin than is extracted in DEID.
- DEID does not significantly contribute to lowering of groundwater levels due to pumping within DEID because it has and will continue to conjunctively manage imported surface water to achieve sustainable management of groundwater levels through 2040 and beyond through 2070.
- Pumping within DEID is expected to cause little or no additional subsidence within the Tule Subbasin through the implementation horizon (2070). If not for pumping within neighboring GSAs causing subsidence impacts within DEID, DEID would be able to hold groundwater levels at their current levels within the DEID Management Areas (MAs) through its recharge and other operations, thus avoiding significant and unreasonable impacts related to subsidence.
- DEID expects to cause no degraded water quality because of its operations or GSA authorized actions within the DEID MAs. Monitoring of water quality is being conducted under several programs, including the Irrigated Lands Regulatory Program (ILRP) and Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS), which oversee water quality in the Tule Subbasin. DEID also plans to supplement its existing representative groundwater quality monitoring program through additional groundwater quality sampling in the vicinity of DEID water banking facilities, to ensure that no legacy soil or groundwater contamination is being mobilized because of DEID recharge operations.

[1] California Water Code §§ 10720, et seq.

- There are no interconnected surface waters within the DEID MAs, and thus no depletion of interconnected surface waters within DEID is expected.

Pursuant to the Cal. Water Code §§ 10721(u) and 10727, and 23 Cal. Code Regs. §357.24, the Sustainability Goal of the Tule Subbasin is to operate the groundwater subbasin within its sustainable yield by (or before) 2040 so as to avoid undesirable results while preventing significant and unreasonable impacts on community, environmental, economic, societal, and cultural beneficial use and users of groundwater. Significant and unreasonable impacts are defined as the tipping point at which groundwater conditions cause impacts to beneficial users, uses, and property interests that cannot be sustained or mitigated. In particular, the Subbasin aims to preserve and protect groundwater beneficial use for the most vulnerable communities and ecosystems by upholding California's Human Right to Water and by protecting domestic uses and users.

Reaching this sustainability goal entails 1) eliminating groundwater overdraft; 2) stopping chronic declines in water levels; 3) keeping water levels well above minimum thresholds and as close to measurable objectives as possible; 4) preserving groundwater supplies and storage for all beneficial use and users; 5) minimizing subsidence rates and extents by raising water levels above historical lows to avoid significant and unreasonable impacts on infrastructure and property interests due to ongoing and residual subsidence; 6) avoiding any groundwater quality impairment through groundwater operations and, where possible, improving groundwater quality through management actions such as recharge operations; and 7) avoiding significant and unreasonable impacts on riparian and in-stream beneficial use due to depletions of interconnected surface water.

The Sustainability Goal will be achieved through a collaborative, Subbasin-wide program of sustainable groundwater management by the various Tule Subbasin GSAs implementing coordinated GSPs that include demand reduction in areas with overdraft, supply augmentation and groundwater recharge, active monitoring and management of subsidence, and mitigation programs to address significant and unreasonable impacts on drinking water supplies due to Subbasin overdraft during the implementation phase.

The DEID GSA occupies a unique position in the Tule Subbasin in that it eliminated overdraft within its management area by the late the 1950s and moved into a net surplus water budget through effective and proactive conjunctive use via importation of surface water in volumes that are, on average, in excess of pumping within DEID. Groundwater modeling and water budget analysis have demonstrated that pumping and other actions within DEID cause minimal contributions to groundwater level declines and/or subsidence in the Tule Subbasin, as shown by groundwater modeling, Interferometric Synthetic Aperture Radar (InSAR) data and water budget analyses. In keeping with its historical and current sustainable position, the DEID GSA will further continue to meet the sustainability goal within its management area and contribute positively to meeting the Tule Subbasin Sustainability Goal by preserving and growing its historical water budget surplus through additional continuing (annual) groundwater imported water recharge (at the Turnipseed Groundwater Banking Facility) and continued effective conjunctive use operations. This should, in effect, raise water levels within the DEID GSA area. These activities will ensure that water levels within the DEID GSA management area do not create undesirable results and, in the unexpected circumstance that adverse impacts to domestic well owners or others are anticipated to occur or actually do occur within its management area, DEID's robust and well-funded mitigation program will protect against significant and unreasonable impacts. Notwithstanding, DEID and beneficial uses and users within its management area continue to be adversely affected by overdraft pumping outside the DEID's boundary. Hence, DEID is fully committed to working with other Tule Subbasin GSAs as they implement GSP management actions, potentially including demand management, to stabilize water levels around the DEID boundary within the Tule Subbasin to ensure water levels and subsidence remain above their respective minimum thresholds in and around DEID, and throughout the Tule Subbasin.

Under the provisions of SGMA, all areas of the Tule Subbasin were required to be covered by a duly adopted GSP no later than January 31, 2020. The DEID GSP originally submitted in January 2020 was updated and resubmitted in July 2022 in response to the DWR's January 28, 2022 "Incomplete Determination of the 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Tule Subbasin." DWR responded to the July 2022 submittal with a letter on March 2, 2023, titled "Inadequate Determination of the Revised 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley." The inadequate determination shifted the primary jurisdiction from DWR to the State Water Resources Control Board (SWRCB). This 2nd Amended GSP (2024) document serves as an update to DEID's July 2022 GSP and is intended to be responsive to the DWR's inadequate determination and to concerns expressed by SWRCB in its draft staff report for the Tule Subbasin SGMA probationary hearing.

The DEID GSA has developed this updated GSP or "Plan" for its jurisdictional area of the Tule Subbasin in compliance with SGMA. This GSP describes the DEID GSA and the areas it manages; establishes the quantifiable management objectives for beneficial groundwater uses and users; and identifies a group of projects and management actions that will allow the DEID GSA and all Tule Subbasin GSAs, through formal coordination with the Tule Subbasin Memorandum of Understanding (MOU) group beginning in 2015 via the Tule Subbasin Coordination Agreement (see **Appendix A**), to achieve sustainability by 2040, within 20 years of plan adoption, and further to maintain sustainability through the planning and implementation horizon[2].

Viewed through the lens of projects and management actions, DEID GSA's position is unique because it has operated sustainably since the 1950s via conjunctive use of imported surface water – this is its most important and most effective historical and ongoing project and management action. Over its nearly 75-year history, DEID has invested heavily to continue to provide renewable surface water to its growers, thus diminishing impacts to groundwater levels. The DEID distribution system includes 172 miles of pipeline, 18 pumping plants, and five regulating reservoirs. The DEID water system is a nearly $340M investment in 2023 dollars. DEID also has constructed 796 acres of spreading grounds at the Turnipseed Water Bank for recharge and conjunctive use operations. This acreage is pending to be increased to 944-acres in total as Phase 6 of this project is completed in September 2024.

As such, this recharged and stored imported surface water has been recognized as such by Bureau of Reclamation (2018) as reflecting one of the purposes of delivering water to DEID and as an authorized use of CVP water under Reclamation's water right permits. The Turnipseed Water Bank represents a approximately $44M investment and currently supports a put rate of nearly 13,000 acre-feet per year (nearly 18 cubic feet per second percolation rate).

When taking into consideration all available water to the DEID MA during the period of 1987-2023, which includes imported surface water used for irrigation and in-District recharge, precipitation, and sustainable yield, the amount of water available on an average annual basis was 154,842 acre-feet. Over the same 37-year period, the average annual consumptive demand of the District was 135,690 acre-feet per year. Comparing these values yields an average net surplus of 19,152 acre-feet per year, indicating that DEID MA has been, on average, a net contributor of imported water to the Subbasin.

[2] The "planning and implementation horizon" means the 50-year time period, from the date the GSP is adopted, over which a GSA determines that the GSP will be implemented to ensure that the basin is operated within its sustainable yield; Wat. Code, § 10721(r).

DEID is the largest water user on the FKC and the largest Class 1 Friant Contractor, with a contract for 108,800 ac-ft of Class 1 water. DEID further contracts for 74,500 ac-ft of Class 2 water[3,4]. Additionally, DEID's CVP contract provides the opportunity to access other water supplies that are made available from time to time during particularly wet years. DEID can deliver portions of these imported water supplies directly to its growers, thus offsetting the need for a significant amount of groundwater pumping. The future reliability of the CVP has recently been strengthened via establishment of a south of Delta drought resiliency framework, a historic MOU recently signed by the Bureau of Reclamation, the Friant Water Authority, the San Luis Delta Mendota Water Agency, and the San Joaquin River Exchange Contractors Water Authority[5]. In this MOU, the parties have collectively identified projects and potential actions aimed at improving drought resiliency south of the Delta.

[3] Exhibit E. Irrigation and M&I Contract No. I75r-3327D. CONTRACT BETWEEN THE UNITED STATES AND DELANO-EARLIMART IRRIGATION DISTRICT PROVIDING FOR PROJECT WATER SERVICE FROM FRIANT DIVISION AND FOR FACILITIES REPAYMENT.

[4] Water Boards (1959), State of California State Water Rights Board. Decision No. D935.

[5] MEMORANDUM OF UNDERSTANDING BETWEEN THE UNITED STATES DEPARTMENT OF INTERIOR BUREAU OF RECLAMATION AND FWA, SLDMWA, AND SJRECWA FOR ESTABLISHING A SOUTH OF DELTA DROUGHT RESILIENCY FRAMEWORK. March 21, 2024.

Subsection 1.2 Agency Information

In addition to the information contained in this section, please see **Appendix B: Notice of the Delano-Earlimart Irrigation District to serve as a Groundwater Sustainability Agency for a portion of the Tule Subbasin.**

Subsection 1.2.1 Name and Mailing Address of the Agency *[23 CCR § 354.6(a)]*

23 Cal. Code Regs. § 354. 6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information*:   **(a)** *The name and mailing address of the Agency*

Delano-Earlimart Irrigation District Groundwater Sustainability Agency
14181 Avenue 24
Delano, CA 93215

Subsection 1.2.2 Organization and Management Structure *[23 CCR § 354.6(b)(c)]*

23 Cal. Code Regs. § 354. 6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information*:   **(b)** *The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.*   **(c)** *The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.*

The DEID GSA is governed by its board of directors: President Kelley Hampton; Vice-president Pete Hronis; Director Mark Kovacevich, Director Heath Wooten, and Director Anthony Tartaglia.

The board of directors has final authority for Plan implementation. Mr. Eric R. Quinley has been appointed DEID GSA Manager by the board of directors. DEID GSA and Plan implementation management is the responsibility of DEID GSA Manager Eric R. Quinley.

Contact information for Mr. Quinley:

Mailing address:

14181 Avenue 24
Delano, CA 93215

Telephone:

661-725-2526

Email:

equinley@deid.org

Subsection 1.2.3 Legal Authority *[23 CCR § 354.6(d)]*

> **23 Cal. Code Regs. § 354. 6 Agency Information.** *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information*:
>
> **(d)** *The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.*

The DEID GSA consists of the DEID, the Earlimart Public Utility District (EPUD), and the Richgrove Community Services District (RCSD). DEID, EPUD, and the RCSD are local agencies duly formed and given legal authority under the laws of the State of California (Division 11 of the Water Code, Section 16461 of the California Public Utility District Act, and Section 61060 of the Community Services District Law, respectively) with water supply and groundwater management responsibilities within their jurisdictional boundaries, all within the Tule Subbasin.

The DEID and the EPUD entered into a MOU on May 23, 2016, whereby the EPUD agreed to become a part of the GSA being formed by DEID (see **Appendix C: MOU Between DEID GSA and Earlimart Public Utility District**). DEID submitted the required notice of its election to become a GSA to DWR on September 6, 2016. The Department acknowledged the DEID GSA as the exclusive GSA for the area within its jurisdictional boundaries following the required 90-day public notice period.

On March 14, 2019, the DEID and the RCSD entered into a MOU whereby the RCSD agreed to become a part of the GSA that had been formed by DEID and EPUD (see **Appendix D: MOU Between DEID GSA and Richgrove Community Services District**). DEID GSA submitted the revised boundary notification to include RCSD to DWR on June 5, 2019, and has been acknowledged as the exclusive GSA for the area within its jurisdictional boundaries following the required 90-day public notice period (see **Appendix B**).

As a duly formed Agency under the Act, the DEID GSA has the legal authority to implement the Plan (10723(a)).

Subsection 1.2.4 Cost & Funding of Plan Implementation *[23 CCR § 354.6(e)]*

> **23 Cal. Code Regs. § 354. 6 Agency Information.** *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information*:
>
> **(e)** *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

Administrative costs of implementing the DEID GSP are anticipated to be approximately annually $300,000, over the next 20 years, subject to ongoing revision as time and experience dictates. Funding sources for costs associated with the preparation and implementation of this GSP are outlined in **Section 5** and **Section 6** of this GSP. Please refer to these two sections for additional details.

Table 1-1 provides a summary of the identified annual operating costs for the DEID Management Area, over the next 20 years. This cost estimate is a preliminary estimate of known costs required to implement the DEID GSP as described in **Section 5** and **Section 6** of this GSP.

Table 1-1: Preliminary GSP Implementation Costs for DEID

Cost Item	Annual Operating Cost
Administrative Cost	$300,000
GSP Development	$375,000
Action 1 - Continued importation and optimization of surface water supplies	$17,185,000
Action 2 - Actions to Increase Importation of Surface Water	$2,210,000
Action 3 - Continued In-District Recharge and Banking	$1,905,000
Action 4 - Actions to Increase In-District Recharge and Banking (Work Complete)	$0
Action 5 - Continued Out-of-District Banking	$2,700,000
Action 6 - Actions to increase existing out-of-district groundwater recharge/banking (Work Complete)	$0
Action 7 - DEID GSA Mitigation Plan	$200,000
Action 8 – Well Permit Application Review (Costs for this management action are included in the GSA Administrative costs in Item 1 above)	$0
Action 9 – Well Registration Program	$5,000
Action 10 – Groundwater Quality Monitoring Program	$5,000
Action 11 – Exceedance Policy and Investigation (Costs for this management action are included in the GSA Administrative costs in Item 1 above)	$0
Sub-total Ongoing DEID Management Area Annual Costs	***24,885,000***

Subsection 1.3 Description of Plan Area

Subsection 1.3.1 DEID GSA Plan Area *[23 CCR § 354.8(a)(1), (b)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(a) *One or more maps of the basin that depict the following, as applicable:*

(1) *The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.*

(b) *A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.*

The total area covered by the DEID GSA is approximately 57,000 acres. It is located in southern Tulare County with a small portion within northern Kern County. Its northern-most boundary is Avenue 72, eastern-most boundary is California Highway 65, southern-most boundary is Woollomes Avenue, and the western-most boundary is County Road 128. All boundaries are irregular.

The area covered by the DEID GSA has been divided into three separate MAs corresponding to the jurisdictional status, principal land use, water use sector, and the water source type of those respective areas. The following sections describe the three MAs and their jurisdictional status. **Figure 1-1**: DEID GSA Management Areas shows the boundaries of the MAs within the DEID GSA.

Management Area 1 - DEID Management Area

The DEID MA follows the original service area of the DEID and excludes the areas served by EPUD and RCSD. The DEID MA is 56,203 acres in size. It is located in southern Tulare County with a small portion within northern Kern County. Its northern-most boundary is Avenue 72, eastern-most boundary is

California Highway 65, southern-most is Woollomes Avenue, and the western-most boundary is Avenue 128. All boundaries are irregular.

Management Area 2 - Richgrove Community Service District Management Area:

The RCSD MA follows the service area of the RCSD. It is 234 acres in size. It serves the unincorporated townsite of Richgrove and is located in southeastern Tulare County. Its northern-most boundary is along the alignment of Avenue 8, eastern-most boundary is along the alignment of Road 120, southern-most is Avenue 0, and the eastern-most boundary follows Richgrove Drive. All boundaries are irregular. The MOU between DEID GSA and RCSD designates DEID GSA as the primary agency with jurisdiction over RCSD MA for the purposes of SGMA and the implementation of this Plan (see **Appendix D**).

Management Area 3 - Earlimart Public Utility District Management Area:

The EPUD MA follows the service area of the EPUD. It is 773 acres in size. It serves the unincorporated townsite of Earlimart and is located in southern Tulare County. Its northern-most boundary is along the alignment of Avenue 60, eastern-most boundary is along the alignment of Road 139, southern-most is Avenue 44, and the western-most boundary is Avenue 128. All boundaries are irregular. The MOU between DEID GSA and EPUD designates DEID GSA as the primary agency with jurisdiction over EPUD MA for the purposes of SGMA and the implementation of this Plan (see **Appendix C**).

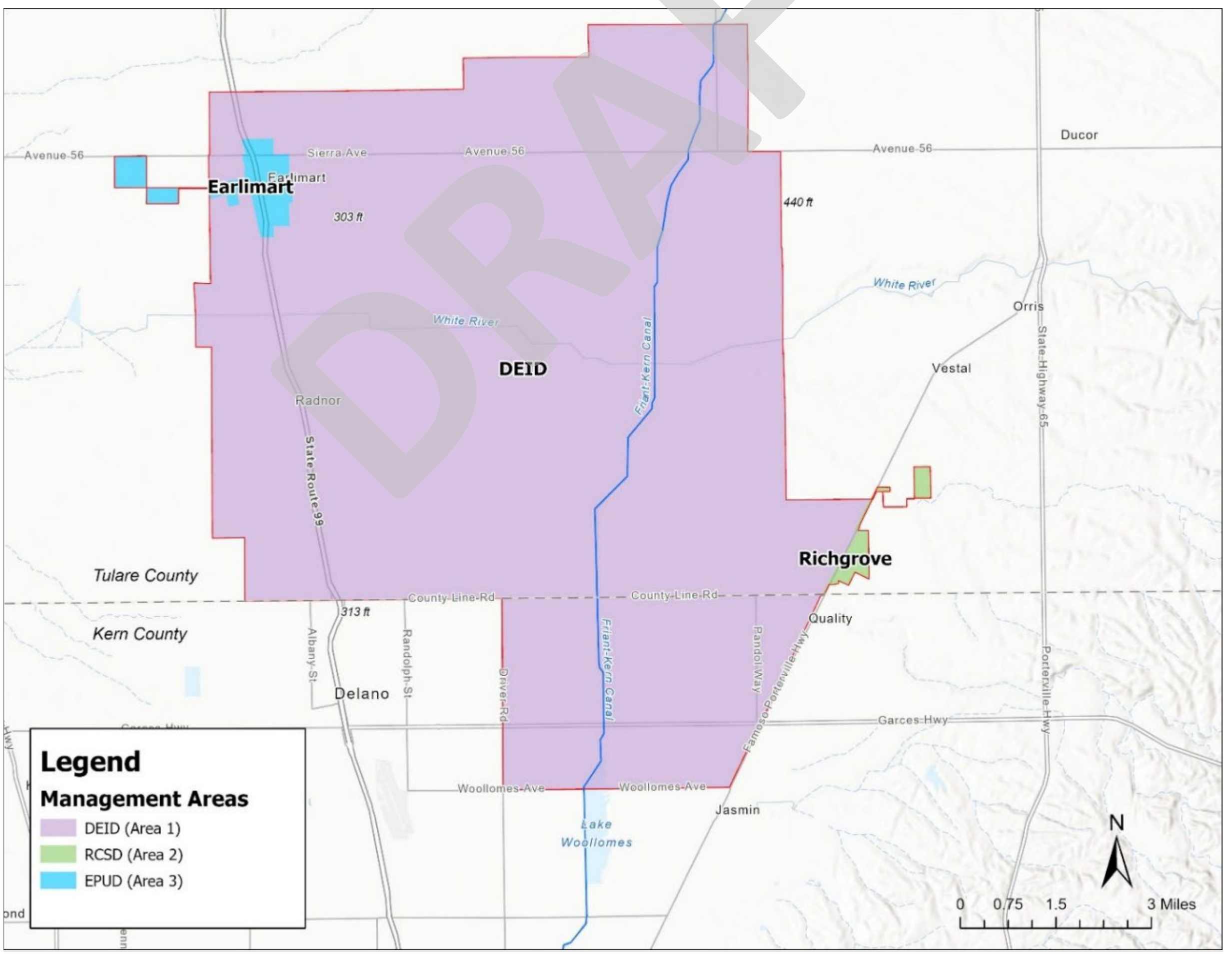


Figure 1-1: DEID GSA Management Areas

Subsection 1.3.1.1 Other Plans in the Subbasin and Adjacent Basins

The DEID GSA is located in the southern part of the Tule Subbasin (DWR Basin 5-022.13) as described in **Subsection Subsection 1.3.1** of this Plan. The Tule Subbasin includes seven separate GSAs:

1. Alpaugh GSA
2. Delano-Earlimart Irrigation District GSA
3. Eastern Tule GSA
4. Kern-Tulare Water District GSA
5. Lower Tule River Irrigation District GSA
6. Pixley Irrigation District GSA
7. Tri-County Water Authority GSA

See **Figure 1-2** for the boundaries of each of the seven GSAs within the Subbasin. **Figure 1-3** also shows the following three subbasins adjacent to the Tule Subbasin:

1. Kaweah Subbasin (DWR Basin 5-022.11)
2. Tulare Lake Subbasin (DWR Basin 5-022.12)
3. Kern County Subbasin (DWR Basin 5-022.14)

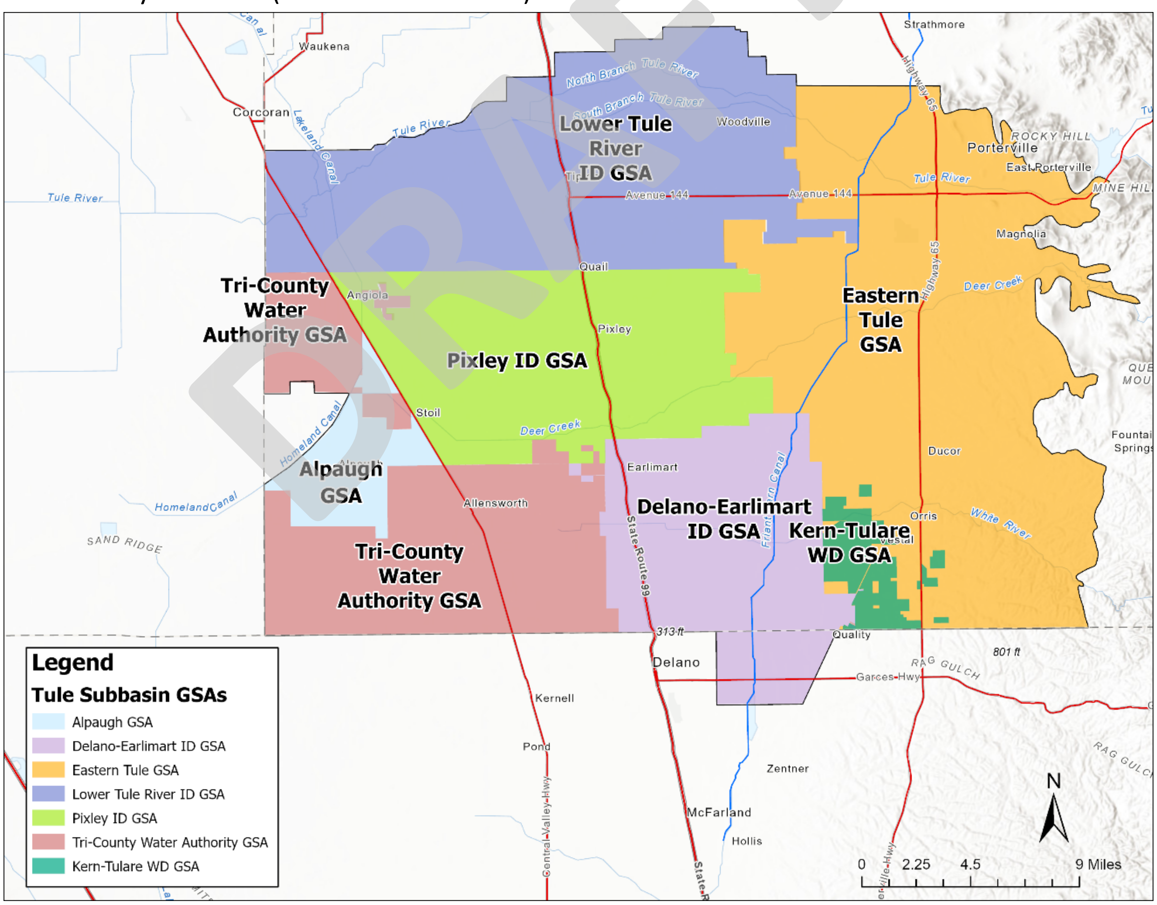


Figure 1-2: Tule Subbasin GSAs

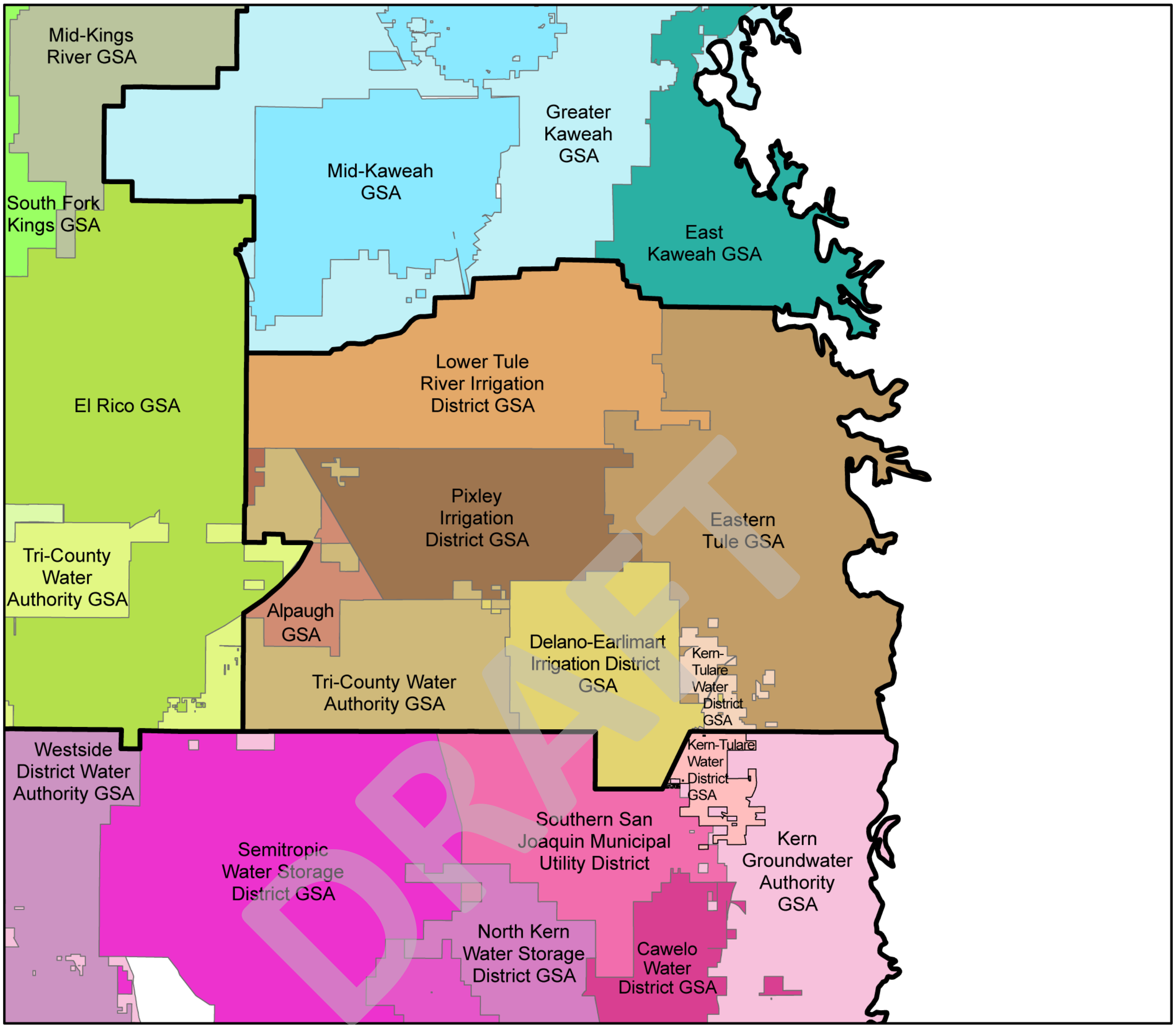


Figure 1-3: Adjacent Subbasins and their respective GSAs[6]

[6] The subbasins adjacent to the Tule Subbasin include Kern County Subbasin (south in pink), Tulare Lake Basin (west in green), and Kaweah Subbasin (north in blue)

Subsection 1.3.1.2 Jurisdictional Boundaries within DEID GSA *[23 CCR § 354.8(a)(3)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(a) *One or more maps of the basin that depict the following, as applicable:*

(3) *Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.*

The DEID GSA includes three agencies with separate, water-related jurisdictions: the DEID, EPUD, and RCSD. The County of Tulare and the County of Kern each has a General Plan covering specific portions of the DEID GSA area, following county lines. The county governments each retain general land use planning authority and jurisdiction over its respective area. **Figure 1-4** indicates the jurisdictional boundaries of the agencies along with the DEID GSA.

As noted previously, the DEID GSP covers a total of 57,000 acres and wholly includes the jurisdictional boundaries of the DEID, EPUD, and the RCSD. A discussion of the water management responsibilities of each of the agencies within the DEID GSA area is provided in **Subsection Subsection 1.3.1.4 Identification of Water Use Sector & Water Source Type.** Combined, RCSD and EPUD cover the entirety of the unincorporated communities of Richgrove and Earlimart. Both the Richgrove and Earlimart communities are recognized by the State of California as Severely Disadvantaged Communities (SDACs).

The U.S. Department of the Interior, Bureau of Reclamation (Bureau of Reclamation) is the only federal agency with any significant land holdings and water management responsibilities within or near DEID GSA. Specifically, a reach of the FKC, a canal integral to the Friant Division of the CVP, runs through the western portion of DEID GSA boundary over the entire length of the GSA north to south between Road 160 and Road 208. The lands associated with the FKC are owned by the Bureau of Reclamation, while the Friant Water Authority maintains and operates the FKC. The FKC conveys imported water to approximately 850,000 acres of irrigated land and several communities by way of contracts maintained by various water districts. There are no ecological reserves administered by the California Department of Fish and Wildlife within the DEID GSA, nor are there any other significant state or federal agencies known to administer land within the DEID GSA. Further, no tribal lands are documented in the DWR Water Management Planning Tool or are known to exist within the DEID GSA area.

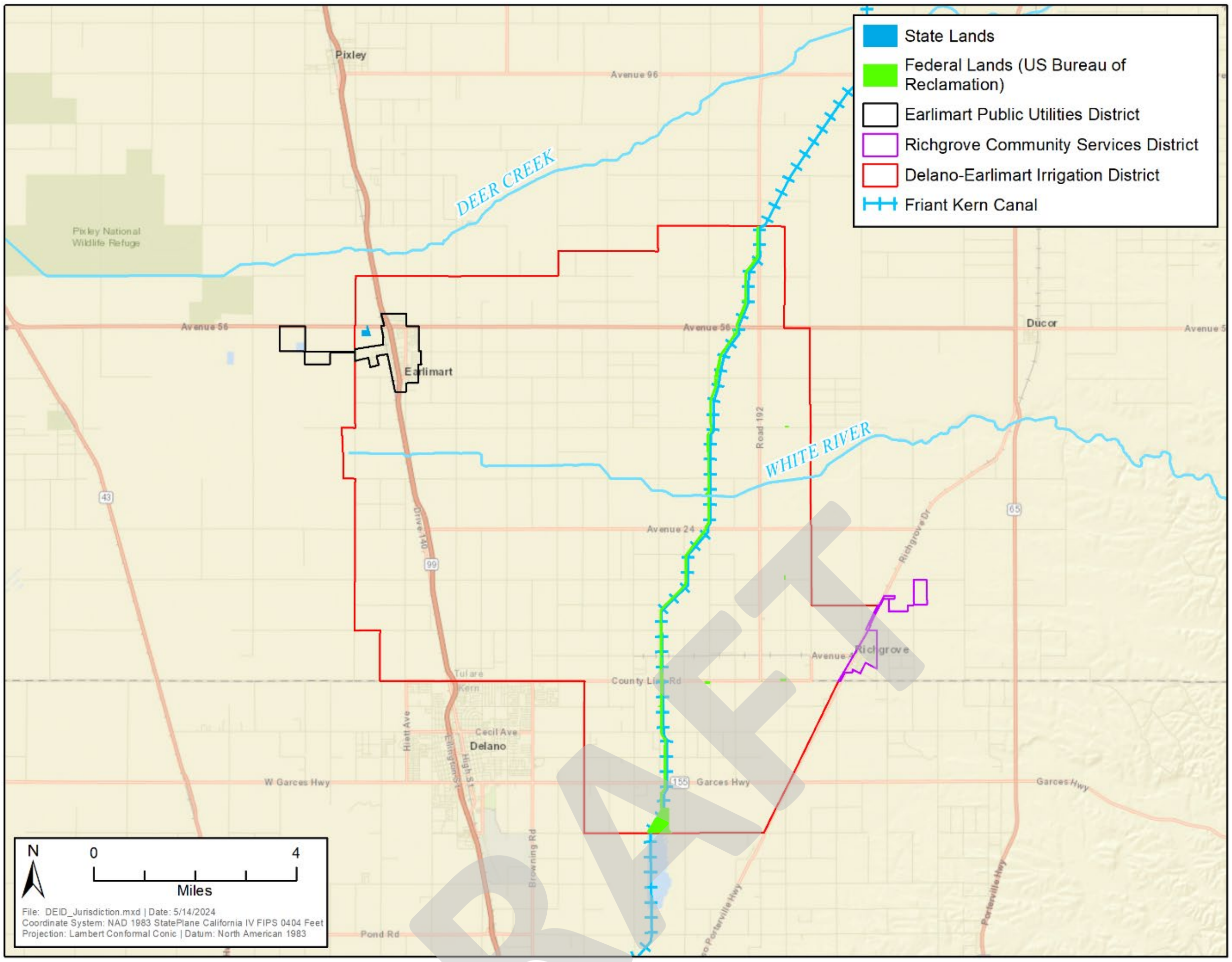


Figure 1-4: Jurisdictional Boundaries within DEID GSA

Subsection 1.3.1.3 Existing Land Use Designations *[23 CCR § 354.8(a)(4)*

> **23 Cal. Code Regs. § 354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> **(a)** *One or more maps of the basin that depict the following, as applicable:*
>
> **(4)** *Existing land use designations and the identification of water use sector and water source type.*

Current land use is primarily permanent planting of grapes, almonds, pistachios, and other tree crops within DEID. Land use within the EPUD and the RCSD, which includes the unincorporated cities of Earlimart and Richgrove, is that of a typical rural community. **Figure 1-5:** Land Use within DEID GSA provides land use of the DEID GSA according to 2014 Statewide Crop Mapping Global Information Systems Geodatabase (Land IQ, 2014). These are not General Plan land use designations. See **Subsection Subsection 1.3.4.1** for further information and discussion of General Plan land use designations.

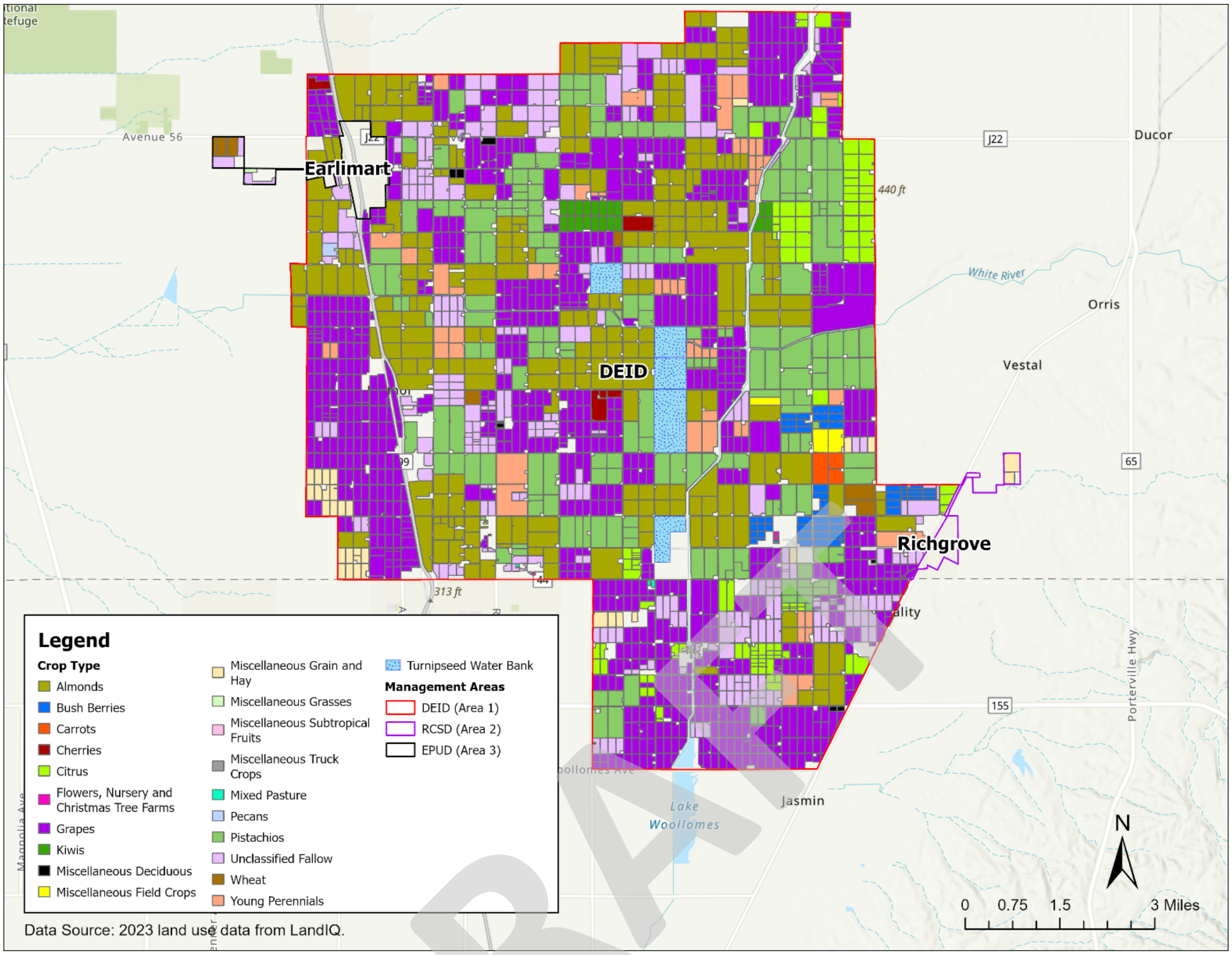


Figure 1-5: Land Use within DEID GSA (LandIQ, 2023)

Subsection 1.3.1.4 Identification of Water Use Sector & Water Source Type

Each water use sector within DEID GSA area utilizes one or more water source types. Pursuant to the definition of water use sector in 23 CCR § 351(al), DEID GSA has identified and grouped water use into three primary sectors:

- **Urban/Industrial**: Urban and industrial water use is assigned to household and commercial water use in the two communities, rural domestic household use, and the limited industrial use of water—primarily associated with packing houses and agricultural facilities—that resides both within and outside of incorporated areas.
- **Agricultural:** Agricultural water use is assigned to water applied for commercial crop production, water utilized in dairy facilities, and water for livestock.
- **Managed Recharge:** Managed recharge water use is assigned to imported water specifically diverted to percolation water banking basins.

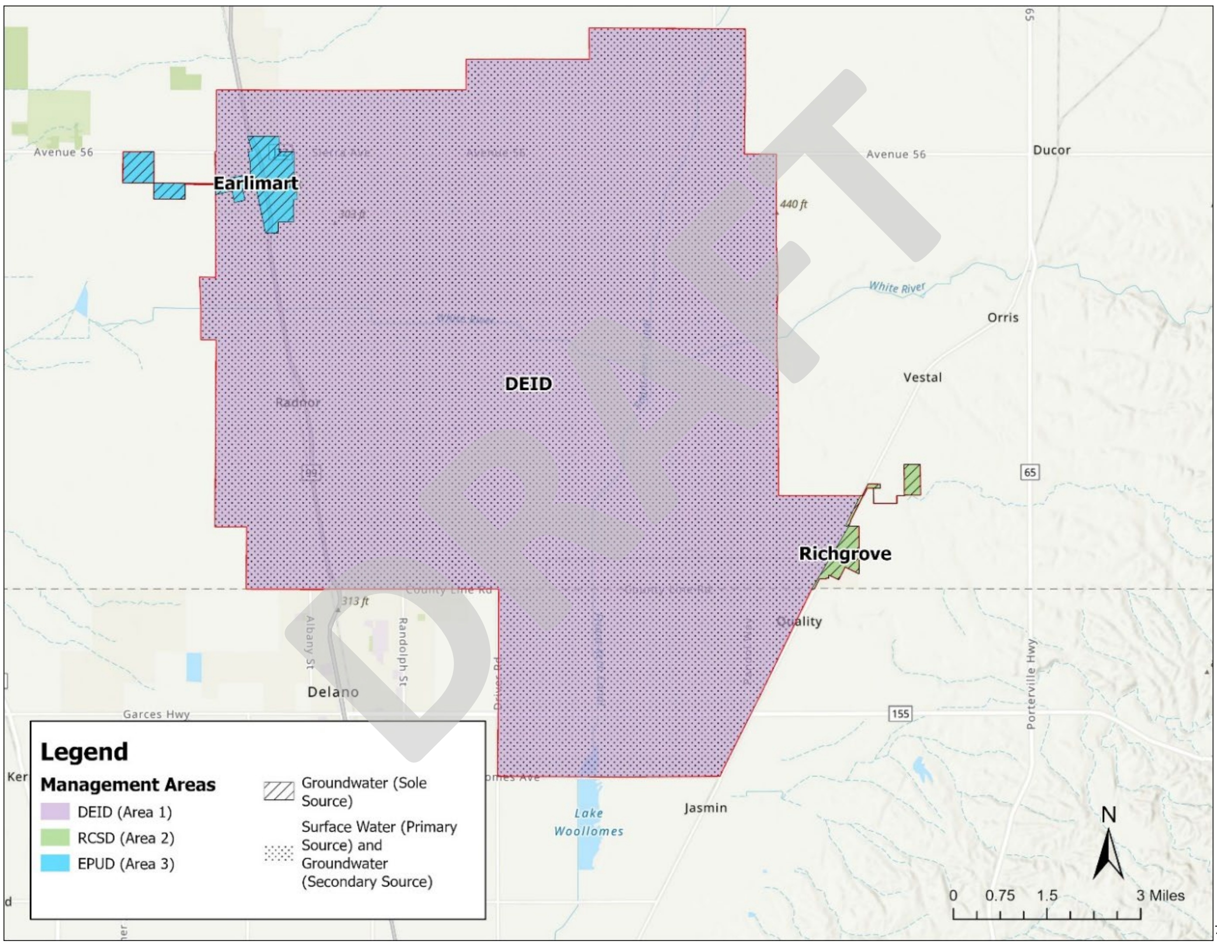
The DEID, EPUD, and RCSD each operate and maintain separate water supply and distribution systems. DEID primarily provides water for agricultural irrigation purposes. RCSD and EPUD rely on potable water sourced from groundwater to supply customers within their respective service areas. Within the DEID

GSA are also several private water wells utilizing groundwater for irrigation, industrial, and domestic uses.

Water use sectors within the DEID GSA area utilize one or more of the following water source types: areal precipitation, groundwater, local surface water, imported surface water, and recharged imported surface water.

Subsection 2.3 of this Plan provides additional detail regarding DEID GSA's water budget and further describes the water use sectors and the water source types used to meet the demand of each sector within DEID GSA.

Figure 1-6: Water Use within DEID GSA identifies water use sectors within the DEID GSA by water source, and existing and planned recharge percolation water banking basins within the GSA area.



[7]

Figure 1-6: Water Use within DEID GSA

[7] Lands within DEID Management Area include surface water and groundwater for agricultural use as well as rural domestic and small community wells that are supplied by groundwater. Both RCSD and EPUD Management Areas are supplied by groundwater to meet household drinking water, municipal, industrial, and commercial drinking water supplies.

Subsection 1.3.1.4.1 Existing Wells, Well Types, and Density *[23 CCR § 354.8(a)(5)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(a) *One or more maps of the basin that depict the following, as applicable:*

(5) *The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.*

Figure 1-7: Well Density within DEID GSA reflects the density of wells in the DEID GSA per square mile based on the DWR Well Completion Report Map Application tool and **Table 1-2**: Wells within DEID GSA by Well Type identifies the count of wells by type. Please note that not all wells within each category of well types identified in **Table 1-4** may have been reported by the DWR reporting tool.

It is important to note that DEID GSA is managed conjunctively, whereby imported surface water is used directly for irrigation, and pumping is used to capture imported water return flows and recover of "banked" surface water that was previously recharged into the Tule Subbasin, both of which accrue to the aquifer as stored imported water. DEID GSA is not in overdraft, having historically provided an average annual net deposit of 19,152 ac-ft/year[8] due to long-established sustainable management actions, including conjunctive use and storage of imported water sourced from the FKC. DEID delivers portions of these imported water supplies directly to its growers, thus offsetting the need for a significant amount of groundwater pumping. DEID has also installed recharge basins that allow over 30,000 ac-ft, on average, to be stored in the subsurface each year.

[8] This value was determined through an analysis of water year 1987 through water year 2023 that is summarized in Subsection 2.4.10 of the DEID Revised Groundwater Sustainability Plan (DEID, 2022).

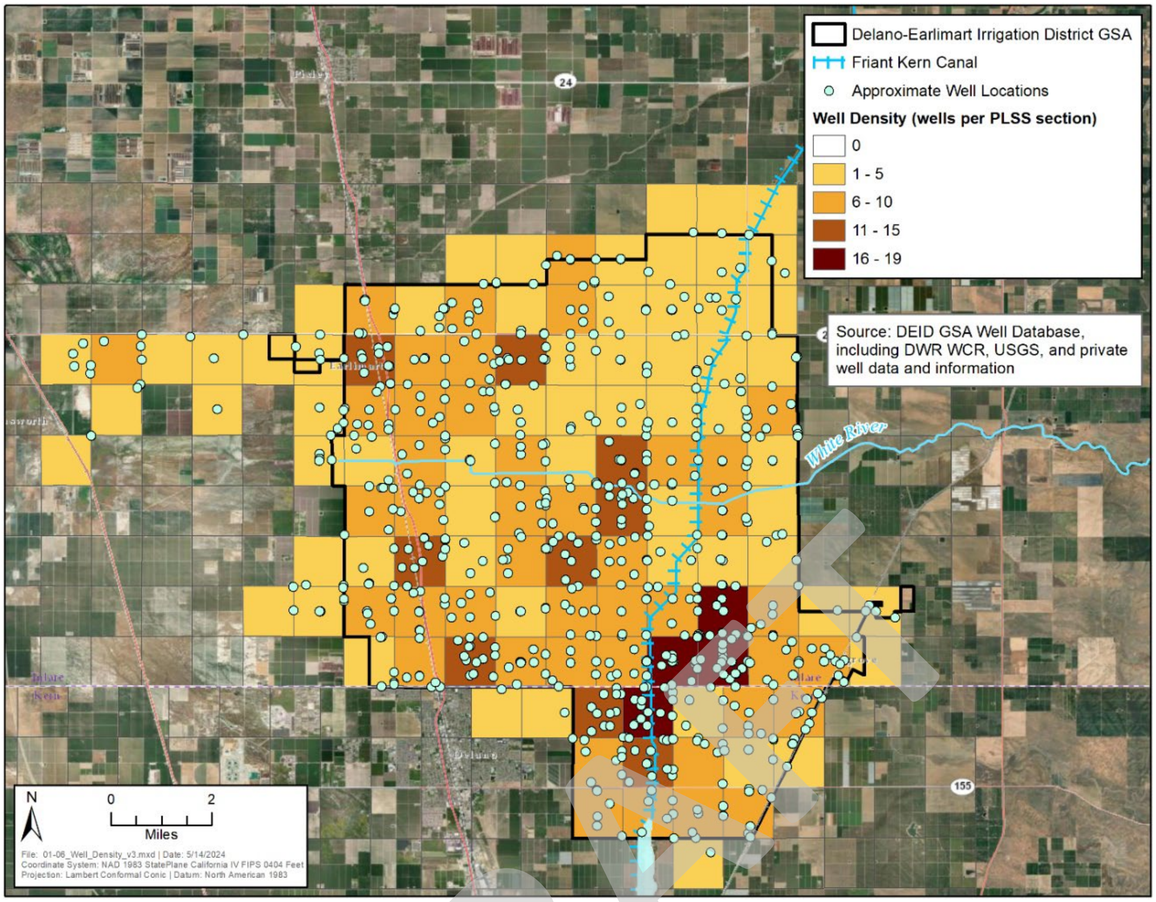


Figure 1-7: Well Density within DEID GSA

Table 1-2: Wells within DEID GSA by Well Type

Well Type[1]	Count
Public/Municipal/Industrial	21
Domestic	63
Agricultural	258
Monitoring	13
Other[2]	15
Unknown Well Type	327
Total	**697**

Notes: [1]Type and number of wells described within DEID GSA is the best available data at the time of this document (2024); [2]"Other" wells are often non-production wells used for environmental monitoring or remediation purposes.

Subsection 1.3.1.4.2 Communities Dependent on Groundwater

> **23 Cal. Code Regs. § 354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> **(a)** *One or more maps of the basin that depict the following, as applicable:*
>
> **(5)** *The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.*

This plan distinguishes between human communities (i.e., Groundwater Dependent Communities) and ecological communities (i.e., Groundwater Dependent Ecosystems [GDEs]) in its description of those communities dependent upon groundwater.

Subsection 1.3.1.4.2.1 Potential Groundwater Dependent Ecosystems

There are no identified and likely no potential interconnected surface waters or GDEs within DEID GSA that existed as of January 1, 2015, as evidenced by the depth to the first encountered groundwater exceeding hundreds of feet. Even during and following historic wet year conditions, like those experienced in 2023, aerial imagery and depth to groundwater data evidenced that there were no GDEs present within DEID GSA. Nevertheless, this revised GSP includes improvements in the GDE and interconnected surface water evaluation through 1) further review of aerial imagery during the historically wet 2023 conditions to assess the presence of potential GDEs, 2) comparing surface conditions to upper aquifer groundwater level conditions, and 3) reviewing The Nature Conservancy's GDE Pulse 2.2 Tool, which was designed to be an update from the Natural Communities Dataset Viewer tool that displays the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset with greater accuracy.

Figure 1-8 depicts the upper aquifer groundwater elevations in the historic wet conditions of spring 2023. The depth to groundwater exceeds hundreds of feet across the DEID GSA, which exceeds the possibility of waterbody interconnections or GDEs.

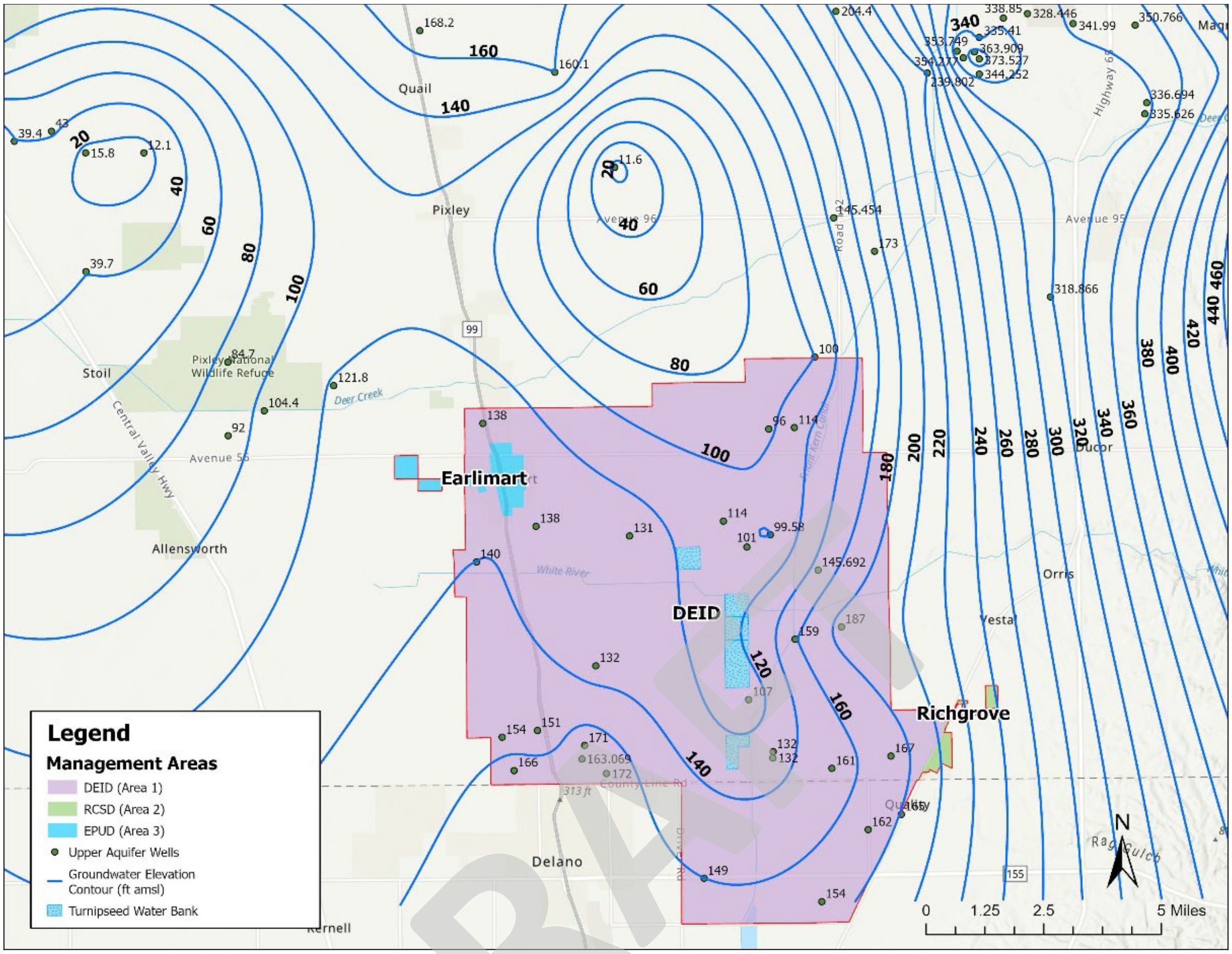


Figure 1-8: **2023 Water year seasonal high (spring 2023) upper aquifer groundwater level contours for the DEID GSA plan area.**

Figure 1-9 is a snapshot of the State Board (2024b) Draft Staff Report for the Tule Subbasin Probationary Hearing, **Figure 3-11**, which depicts the State Board staff's evaluation of potential GDEs within the DEID GSA sourced by the Natural Communities Dataset Viewer and California Native Plant Society Manual. Four potential GDEs were identified by the State Board staff analysis and identified as Sites 1 through 4 in **Figure 1-9** .

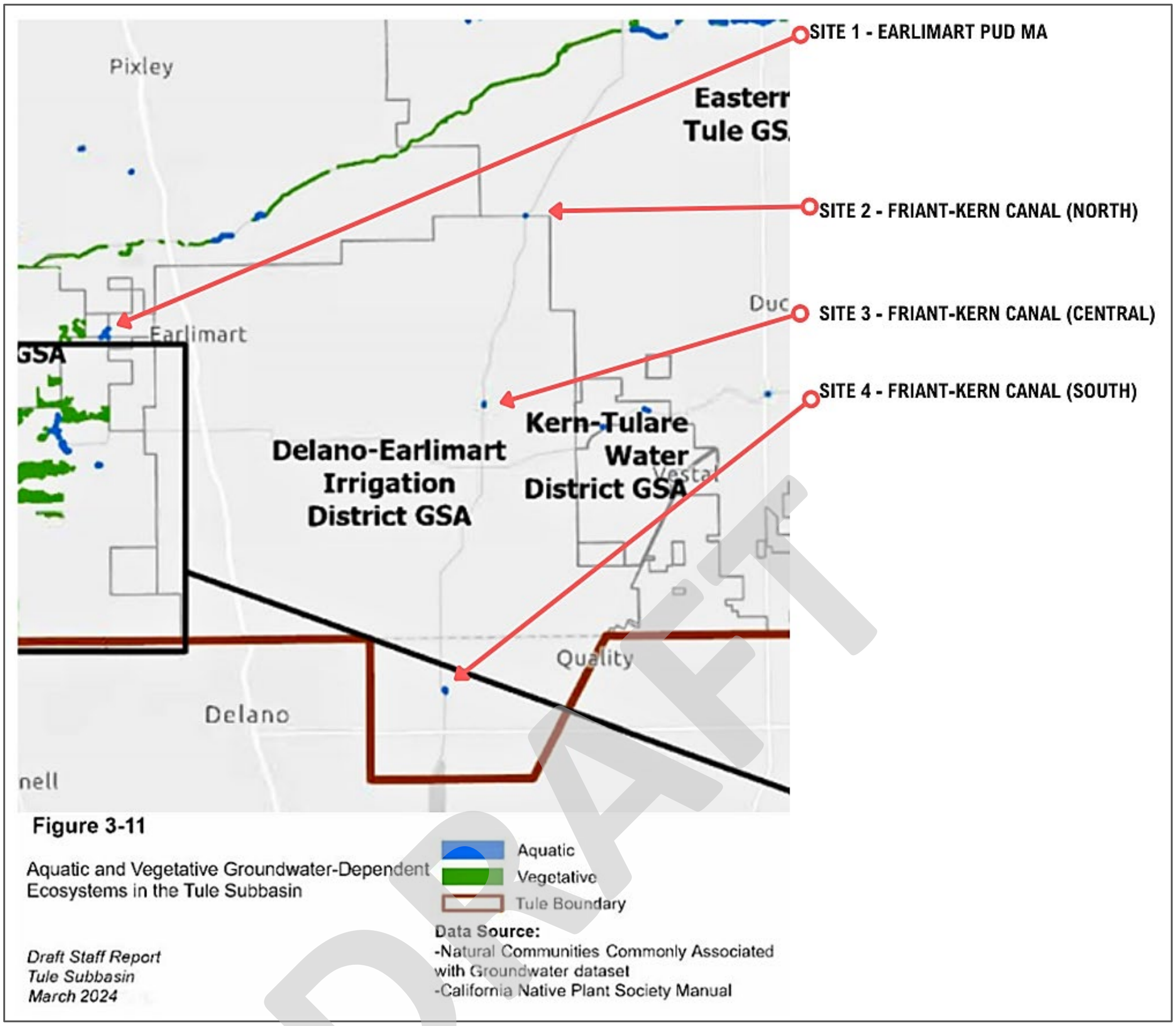


Figure 1-9: Potential GDEs identified in the State Board Staff Report and sites evaluated by DEID GSA

DEID GSA verified these four sites do not have GDEs or interconnected surface water present based on the upper aquifer groundwater levels exceeding possible rooting depths and review of the land use at these four sites, as summarized below:

- Site 1 (Earlimart) – This site is in the vicinity of agricultural lands and recharge and wastewater treatment facility ponding basins for the community of Earlimart. It is likely that these basins were mischaracterized as GDEs. **Figure 1-10** is a snapshot of Google Earth in May 2023 of the site. More information on the EPUD Wastewater Treatment Facility is documented in their Waste Discharge Requirements Order Number 98-140[9] and in the California Environmental Quality Act documentation for the facility[10]
- Sites 2-4 (FKC North, Central, South) – These sites are located within and/or adjacent to the FKC, which is a lined system and disconnected from groundwater. It is likely that the Natural Communities Dataset Viewer sources mischaracterized these portions of the FKC as being

[9] Water Boards (1958), available at https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/tulare/98-140.pdf
[10] State of California (2024), CEQANet, available at https://ceqanet.opr.ca.gov/1996012045

aquatic ecosystems. **Figure 1-10, Figure 1-11,** and **Figure 1-12** are snapshots from Google Earth in May 2023, in which groundwater levels were at or near their peak in the historic wet year[11]. These figures indicate the only potential aquatic systems as being a likely mischaracterization of the FKC, or in the case of **Figure 1-13,** possible mischaracterizing a recharge basin as an aquatic GDE.

For further verification, DEID GSA reviewed the Nature Conservancy's GDE Pulse tool, which was developed with improvements in accuracy from the NC Dataset Viewer[12], and no GDEs appear present within DEID GSA throughout the 2014-2023 period. **Figure 1-14** is a snapshot from the GDE Pulse 2.2 tool over the DEID GSA area. The nearest GDEs are outside of the GSA's jurisdiction. Thus, while State Board staff identified putative aquatic groundwater dependent ecosystems with DEID (Tule Basin Draft Staff Report, March 2024), DEID's analysis shows that these do not exist.

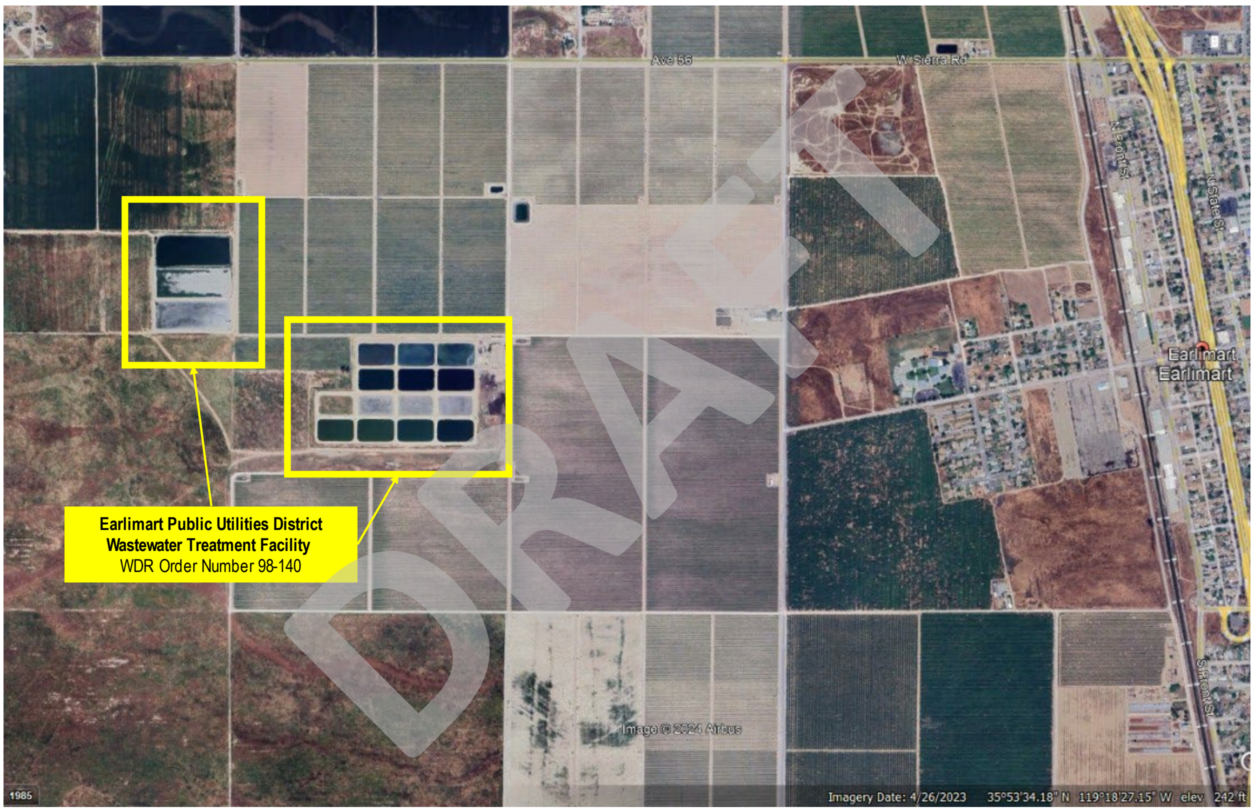


Figure 1-10:Site 1 (Earlimart) Source: Google Earth aerial photography from May 2023 (during historic wet year)[13,14]

[11] Aerial imagery was not available for February, March, or April 2024 via Google Earth; however, the groundwater levels in May 2023 are understood to be comparable to April 2023 conditions, with the surrounding wells not being used due to demand needs being met by precipitation and surface water access.
[12] The Nature Conservancy (2024), available at https://gde.codefornature.org/#/methodology
[13] Water Boards (1958), available at https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/tulare/98-140.pdf
[14] State of California (2024), CEQANet, available at https://ceqanet.opr.ca.gov/1996012045

Figure 1-11:Site 2 (FKC North) Source: Google Earth aerial photography from May 2023 (during historic wet year)

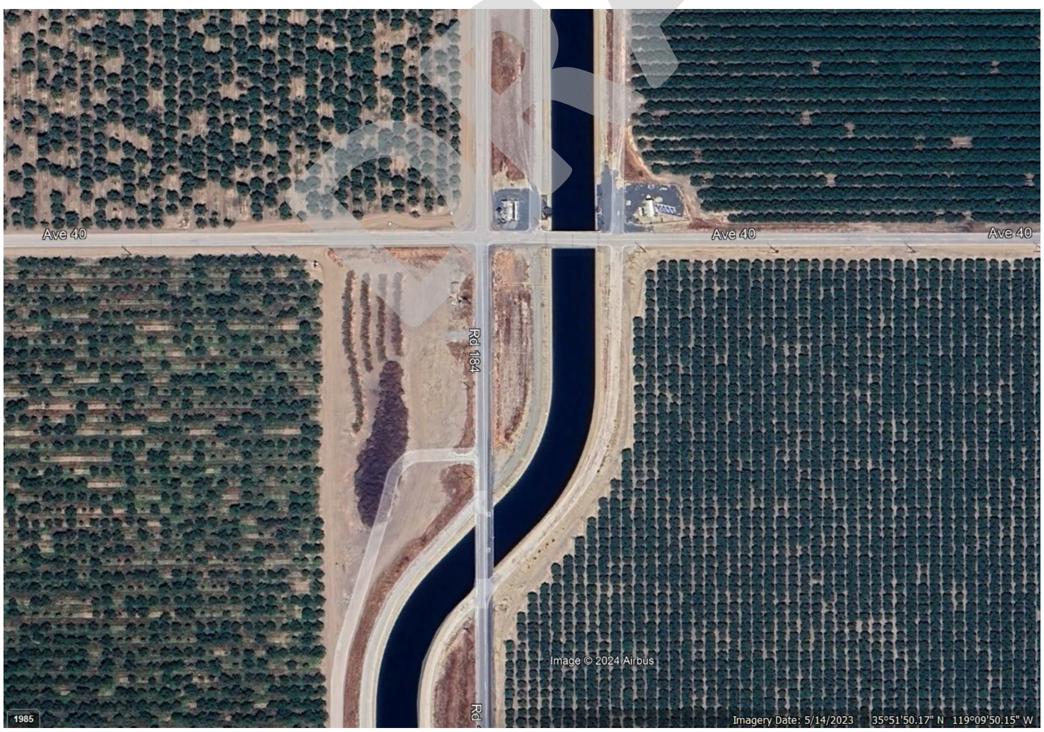


Figure 1-12:Site 3 (FKC Central) Source: Google Earth aerial photography from May 2023 (during historic wet year).

Figure 1-13:Site 4 (FKC South) Source: Google Earth aerial photography from May 2023 (during historic wet year).

Figure 1-14: Snapshot from GDE Pulse 2.2 tool over DEID GSA plan area (2014 – 2023)

Subsection 1.3.1.4.2.2 Groundwater Dependent Communities

As previously described in **Subsection Subsection 1.3.1.4 Identification of Water Use Sector & Water Source Type** (see **Figure 1-6),** the Earlimart and Richgrove communities, which are part of the DEID GSA as their own respective MAs, rely exclusively on groundwater extractions to meet their municipal and industrial needs. Both communities are considered either Disadvantaged or Severely Disadvantaged Communities (S/DACs). Additionally, the small S/DACs of Madonna, Rodriguez Labor Camp, and Sierra Vista Association within the DEID GSA MA are also groundwater dependent. See **Figure 1-15** for a map of the S/DACs within the Plan Area. DEID GSA recharge operations at its Turnipseed Water Bank continues to benefit groundwater levels and, in turn, domestic and municipal groundwater users throughout the GSA, and in particular nearby communities such as Sierra Vista and Rodriguez Labor Camp.

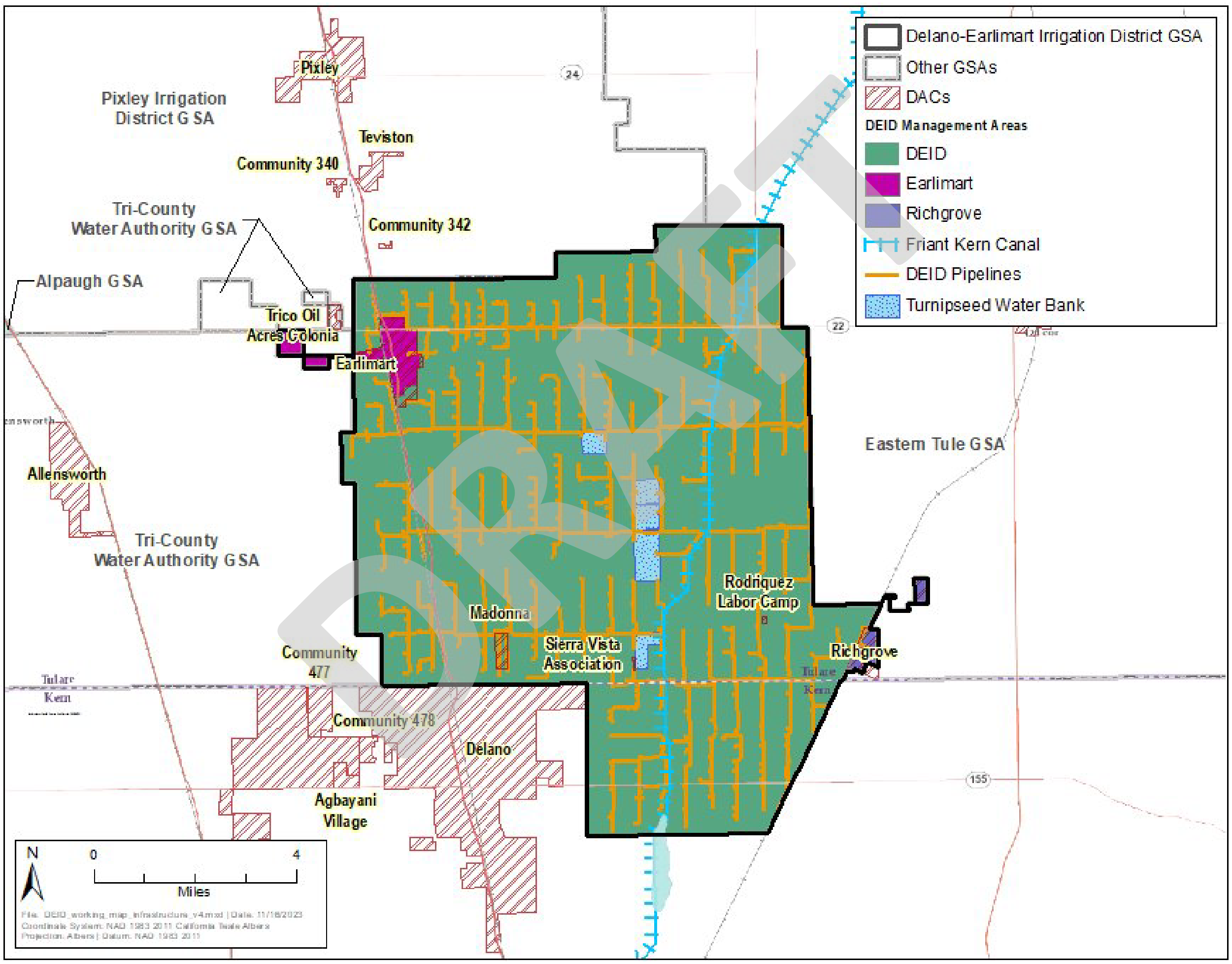


Figure 1-15: Disadvantaged & Severely Disadvantaged Communities within DEID GSA

Subsection 1.3.2 Existing Water Resource Monitoring and Management Programs *[23 CCR § 354.8(c)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(c) *Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.*

DEID GSA tracks its overall water balance on an annual basis based on quantification of surface water imports, precipitation, deliveries to water banks, withdrawals of recharged imported surface water, and a remote-sensing based estimate of crop consumptive use. DEID has been performing this analysis since 1987, and the results are illustrated in **Figure 1-16.** The data used for these calculations is presented in **Appendix 1-D.**

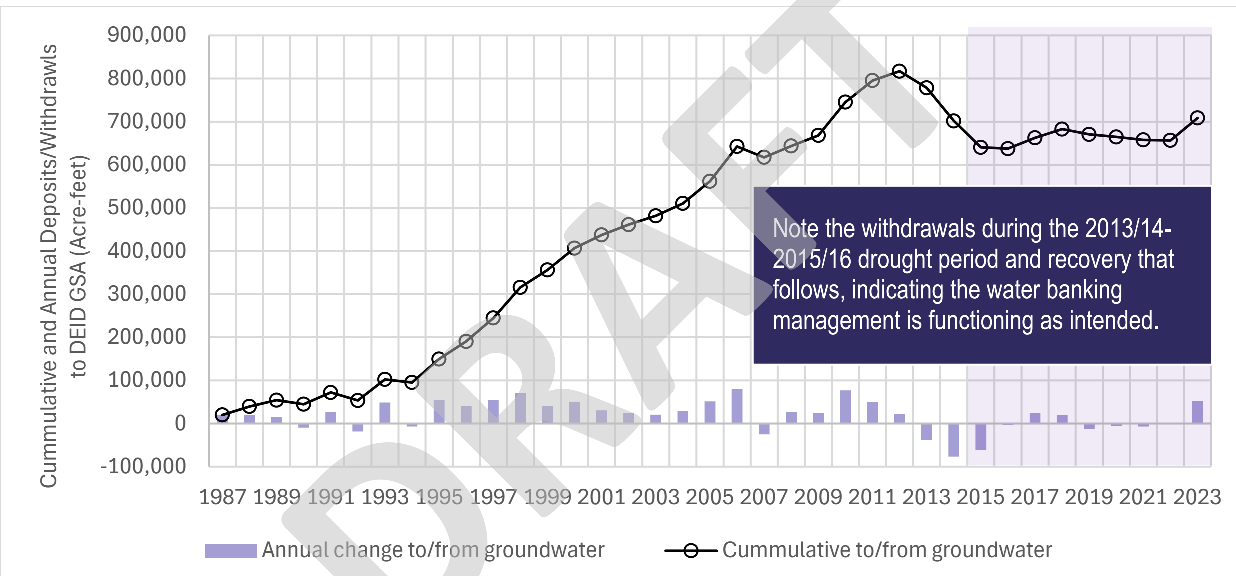


Figure 1-16: Cumulative and Annual Deposits to and Withdrawals from Aquifer in DEID GSA

This analysis illustrates how a net surplus of imported surface water, beyond what is required for crop irrigation, provides regular deposits to a “savings account” of stored imported water in the subsurface on an annual basis for later use by DEID irrigators during dry periods, such as 2013-2015. During most other periods, as shown in the figure, the annual change to/from groundwater is positive, and results in an increasing balance of stored water over time. This stored imported water remains available to DEID. The DEID “savings account” has been funded by DEID for the benefit of its 450 growers and other beneficial users to provide a reliable and sustainable source of water supply over the past 75 years. This savings account also provides incidental benefits to the Richgrove and Earlimart MAs. DEID operates exclusively as a conjunctive use district and no water banking for export elsewhere occurs within DEID. Since 1950, DEID has imported approximately 8.5M ac-ft of surface water to provide its landowners with adequate water for irrigation and to ensure that it can continue recharging water to the aquifer. DEID GSA’s importation of surface water has resulted in a significant balance of surface water that has been stored in the subsurface. DEID’s conjunctive use operations using imported surface water provides on average about 17,000 ac-ft/year recharge to groundwater. Based on ongoing DEID record-keeping illustrated in **Figure 1-16,** DEID deposits imported surface water each year into its "savings account" of stored imported water.

The period during which SGMA has been in place is highlighted in blue. DEID has continued to remain sustainable during this period.

Within the DEID GSA, DEID first established an ongoing groundwater monitoring program in its 2007 adopted Groundwater Management Plan (GWMP) for the DEID MA. Regular monitoring of groundwater levels, groundwater quality, imported water, and conjunctive use operations continues today. Additional monitoring data are available from local, state, and federal agencies. Water resource monitoring programs for the DEID GSA are summarized below.

Water resources monitoring and management have a long history in the Tule Subbasin. Monitoring and management programs are conducted at regional and local scales, ranging from Federal and State programs (e.g., National Oceanic and Atmospheric Administration and California Statewide Groundwater Elevation Monitoring Program, respectively) and regional plans (e.g., Integrated Regional Water Management Plan) to water system monitoring by local entities. Water resource monitoring programs reviewed in the development of this plan include:

Central Valley Salinity Alternatives for Long Term Sustainability (CV-SALTS)

The CV-SALTS Program is a collaborative initiative among business, government, and community organizations to address nitrate and salt accumulation affecting water supplies in the Central Valley. The Tule Basin Management Zone (TBMZ) is the CV-SALTS agency presiding within the DEID GSA, which monitors groundwater quality, requires salinity and nitrogen management plan implementation, provides grower and agricultural specialist education workshops, and provides access to free, always available drinking water supplies. DEID GSA growers and communities are engaged with the TBMZ.

DEID Groundwater Management Plans (GWMP)

The Groundwater Management Act, passed in 1992 as AB 3030, provided for local groundwater management through voluntary GWMPs developed by existing local agencies. The bill has since been modified by SB 1938 and AB 359**.** GWMPs provide for planned and coordinated groundwater monitoring, operation, and administration of groundwater basins with the goal of long-term groundwater conjunctive use and resource sustainability. DEID last prepared a GWMP in 2007; however, with the development of this GSP, much of the data contained in the GWMP has been updated and in some cases corrected. Even to the extent the GWMP may no longer be in effect due to DEID's adoption of its GSP, the monitoring program continues.

Irrigated Lands Regulatory Program (ILRP)

The ILRP of the Regional Water Quality Control Board (RWQCB) regulates waste discharges from irrigated lands. The ILRP focuses on priority water quality issues, such as pesticides and toxicity, nutrients, and sediments. There are 14 coalitions in the Central Valley region that help growers comply with the general orders; one of these is the Tule Basin Water Quality Coalition (TBWQC), which operates programs to monitor and improve surface water and groundwater quality associated with agricultural activities.

In response to the RWQCB's General Order, TBWQC prepared a Groundwater Quality Assessment Report (TBWQC, 2015), which provided a groundwater quality assessment and documented high vulnerability areas where discharges from irrigated agriculture may have degraded groundwater quality. The focus was primarily on nitrate (NO_3) with evaluation of electrical conductivity (EC) in the same area.

With the recognition of high vulnerability areas and areas with confirmed water quality exceedances, in 2017, TBWQC also prepared a Revised Comprehensive Groundwater Quality Management Plan (CGWMP; TBWQC, 2017). While CGQMP implementation is focused on irrigation and nutrient management practices to improve water quality, it also provides a Groundwater Quality Trend Monitoring Program (GQTMP) to develop long-term groundwater quality information to evaluate regional effects of irrigated agriculture.

Surface Water Quality Monitoring Plan, 2014

TBWQC has prepared a Surface Water Quality Monitoring Plan (TBWQC, 2014) in response to the RWQCB's General Order No. R5-2013-0120 (Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group; herein General Order).

In the TBWQC area, there are three natural waterways that enter the TBWQC coverage area and exit into other areas that can benefit from its beneficial uses: the Tule River, the Deer Creek, and the White River (TBWQC, 2014).

Since 2006, the Tule River Sub-Watershed has sampled and monitored the surface water quality at each of seven monitoring stations as follows:

- Porter Slough below Road 192
- Tule River at Road 144
- Tule River at Road 92
- Deer Creek at Road 248
- Deer Creek at Road 176
- Deer Creek at Road 120
- White River at Road 208

The proposed sites selected for the fixed monitoring locations along the Tule River, Deer Creek, and White River were chosen to provide a series of monitoring sites among the irrigated agricultural lands along each water body within the TBWQC. In general, along each of the three natural waterways within the TBWQC, a monitoring station was established at the location the waterway enters the irrigated agriculture area of the Subbasin from the Sierra Nevada Mountains and at the downstream end of the waterway where limited flow occurs. For the Tule River and Deer Creek, intermediate monitoring sites were added to better characterize and distinguish between potential discharges from the different irrigated lands and municipalities along the channel.

Sampling generally occurs over one or two days per monitoring event, with one event occurring each month. Consistent with RWQCB requirements, the surface water monitoring parameters include field measurements, general physical parameters, metals, nutrients, pesticides, and water toxicity for designated species. These parameters are provided in the TBWQC Surface Water Quality Monitoring Plan (TBWQC, 2014).

State-Wide Groundwater Quality Monitoring

State-wide sources of groundwater quality data include the Water Data Library, GeoTracker/GAMA program, and the SWRCB Division of Drinking Water (DDW). DWR's Water Data Library is a repository for groundwater quality data. Samples are collected from a variety of well types including irrigation, stock, domestic, and some public supply wells.

Established in 2000, the GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) Program monitors groundwater quality throughout the state of California. GAMA is intended to create a comprehensive groundwater monitoring program throughout California and increase public availability and access to groundwater quality and contamination information. GAMA receives data from a variety of monitoring entities including DWR, U.S. Geological Survey (USGS), and the SWRCB.

The SWRCB DDW (and formerly the Department of Health Services) monitors public water system wells for California Code of Regulations Title 22 requirements relative to levels of organic and inorganic compounds such as metals, microbial compounds and radiological analytes. Data are available for active and inactive drinking water sources for water systems that serve the public, and wells defined as serving 15 or more connections or more than 25 people per day. Such systems within the DEID GSA include EPUD, RCSD, and the Rodriquez Labor Camp. The Rodriquez Labor Camp is a rural housing area of approximately 60 acres in size with approximately 35 homes served by a single groundwater extraction well.

DEID Water Quality Monitoring

The DEID relies on the water quality monitoring program conducted by the Friant Water Authority as well as monitoring programs conducted by other contractors that receive imported water for municipal drinking water supplies from the FKC. These programs provide a history of ongoing water quality sampling events and test results. Test results are public information and available to any interested party upon request. While this program is primarily designed to address domestic water quality, the generated data covers many constituents of concern related to agricultural uses as well.

Subsection 1.3.2.1 Limitations of Existing Monitoring and Management *[23 CCR § 354.8(d)]*

> **23 Cal. Code Regs. § 354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> **(d)** *A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.*

In terms of limiting operational flexibility, there exists a redundancy between the California Statewide Groundwater Elevation Monitoring (CASGEM) and the Assembly Bill (AB) 3030 plan, requiring individuals and agencies to complete the same work in multiple efforts.

Since 2009, the CASGEM Program has tracked seasonal and long-term groundwater elevation trends in groundwater basins statewide. The program's mission is to establish a permanent, locally managed program of regular and systematic monitoring in all of California's alluvial groundwater basins. This early attempt to monitor groundwater continues to exist as a tool to help achieve the goals set out under the SGMA.

Additionally, **Section 4. Monitoring Network** and the Tule Subbasin Monitoring Network (**Appendix A-1** as Attachment 1 of the Tule Subbasin Coordination Agreement) provides a description of existing monitoring programs that will be utilized for implementing this Plan and where data gaps exist in said programs that will be addressed throughout the implementation period.

Subsection 1.3.3 Conjunctive Use Programs *[23 CCR § 354.8(e)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(e) *A description of conjunctive use programs in the basin.*

Conjunctive use of water is defined as the coordinated use of both subsurface and imported water sources so that the combination will result in optimum benefits. Importation of water through contracts held by irrigation and water districts with the federal government along with local surface water projects provides the basic water supply that allows conjunctive use to be employed in the Tule Subbasin. By utilizing imported water, conjunctive use can be implemented through in-lieu use (direct delivery of imported water to users that is a direct offset of groundwater that would have otherwise been extracted), direct groundwater recharge (delivery of imported water to projects designed and constructed for recharging groundwater), and groundwater banking (direct recharge projects that include the ability to recover surface water that was previously recharged for delivery to or pumped by users). See **Figure 1-16** for a graphical depiction of the benefits of DEID GSA's conjunctive use.

DEID Management Area

The DEID MA is the area of the DEID GSA that is within the boundaries of the DEID. Irrigation in the Delano and Earlimart areas began in the late 1800s with artesian wells, but, by the 1930s, declining groundwater levels threatened the continued economic viability of agricultural operations. By 1947, the mean depth to groundwater had fallen every year since 1905, indicating an imbalance of water demand and supply. DEID was formed in 1938 and signed its original water service contract for water delivery from the Friant Division of the CVP with the Bureau of Reclamation in 1951, which has been renewed several times since. The Bureau of Reclamation facilities include the Friant Dam (Millerton Reservoir), the 152-mile FKC, and the 36-mile Madera Canal. Construction of Friant Dam was completed in 1944, the FKC in 1951, and the Madera Canal in 1945. On average, the canals deliver 1.2M ac-ft of irrigation water annually to more than 15,000 farms on over 1M acres of the most productive farmland in the world (Friant Water Authority, 2022). The Friant Division was designed and is operated as a conjunctive use project to convey surface water for direct beneficial uses, such as irrigation and municipal supplies, and to recharge/provide conjunctive use in groundwater basins in the southern San Joaquin Valley. The ability to move significant water through the Friant Division's canals in wetter years to store in groundwater recharge basins is critically important for the project to work as intended, and these operations sustain the primary source of drinking water for nearly all cities, towns, and rural communities on the Valley's East side (Friant Water Authority, 2022).

Water records from DEID indicate that from 1987 to 2023 DEID imported nearly 4.0 million acre-feet or an average of approximately 110,000 acre-feet per year. This figure is comprised of two categories: approximately 105,000 acre-feet of irrigation deliveries, and approximately 5,000 acre-feet of deliveries to in-District recharge facilities. Note that this average in-District recharge value encompasses two very distinct periods of District operations. From 1987 and up to the passage of SGMA in 2014, DEID's in-District recharge area had grown from nothing to 160 acres, with average annual deliveries of 1,490 acre-feet during this period. In 2015, following the passage of SGMA, DEID began to prioritize in-District recharge operations, maximizing the use of the existing facilities and implementing an aggressive plan to develop new facilities. The sixth and final phase of this expansion project will be completed in late summer of 2024, increasing the total in-District recharge area to 944 acres. From 2015 to 2023, average in-District recharge deliveries increased to nearly 13,000 acre-feet per year. During this same period of 2015 – 2023, which was comprised of primarily dry or critically dry year types, DEID continued to maintain deliveries to Out-of-District water banks averaging more than 14,000 acre-feet per year. When taking into consideration all available water to the DEID MA during the period of 1987-2023, which includes imported surface water used for irrigation and in-District recharge, precipitation, and sustainable yield, the amount of water available on an average annual basis was 154,842 acre-feet. Over the same 37-year period, the average annual consumptive demand of the District was 135,690 acre-feet per year. Comparing these values yields an average net surplus of 19,152 acre-feet per year, indicating that DEID MA has been, on average, a net contributor of imported water to the Subbasin.

Imported water is delivered to DEID through nine separate points of diversion on the FKC. From 1951 to 1955 DEID constructed a distribution system consisting of 172 miles of pipeline, 18 pumping plants and five regulating reservoirs that serves over 450 landowners, with an average farm size of approximately 120 acres. **Figure 1-17:** DEID Distribution System and Recharge shows the location of pipelines and recharge facilities. The cost of the distribution system exceeded $14 million at the time of construction in 1950 ($341 million in 2023 dollars). Since its inception, DEID has implemented a conjunctive use program to provide a consistent and reliable water supply.

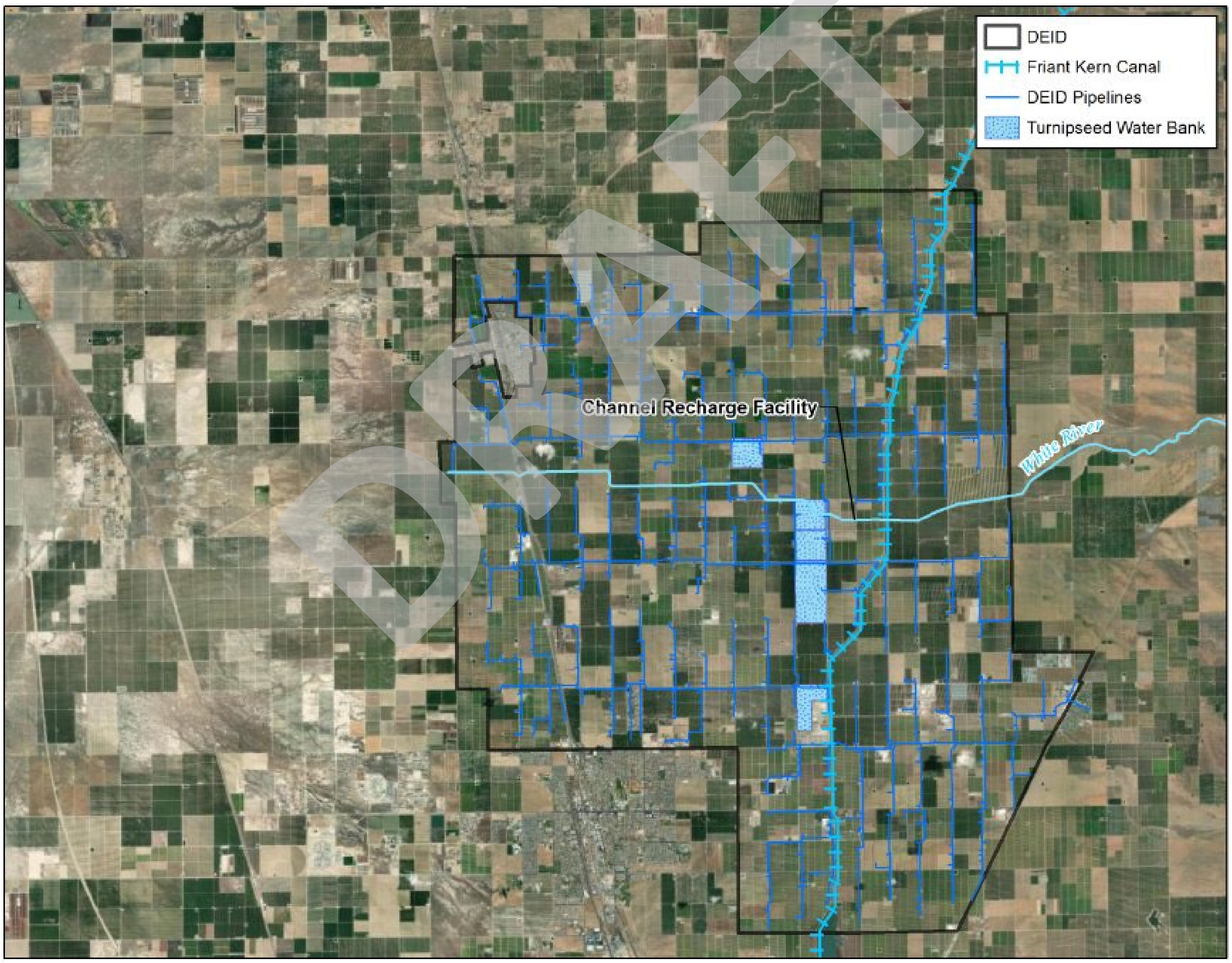


Figure 1-17: DEID Distribution System and Recharge Facilities

The Friant Division of the CVP uses a “Class 1/Class 2” water contracting system. Class 1 water is commonly referred to as the “firm yield” of the CVP and was intended to be a supply that would be dependable in every year regardless of hydrology. Class 1 water has historically been reliable until the

2006 San Joaquin River Restoration Settlement (SJRRS or Settlement) Agreement in *NRDC, et al., v. Kirk Rodgers*.

The SJRRS provides for water supply benefits to Friant Contractors described in the Stipulation of Settlement Paragraph 16(a) for recirculation, recapture, reuse, exchange or transfer of Interim Flows and Restoration Flows and 16(b) a Recovered Water Account (RWA) and water program to make water available to all Friant water contractors who provide water to meet Interim Flows and Restoration Flows (Stipulation of Settlement 2006). The Friant Water Authority indicates Paragraph 16(a) recaptured/recirculated water is restricted at this time and limited to recapture of flows that can be released from Friant Dam for the purpose of meeting the Restoration Goal (Friant Water Authority 2018). Paragraph 16(b) RWA is currently underutilized but provides for a fixed $10 per ac-ft price for wet year supplies of water spilled from Friant Dam. Paragraph 16(b) stipulates RWA that represents water not required to meet SJRRS or other requirements be made available to Class 1 and 2 contract supplies that experience a reduction in water deliveries from the implementation of the SJRRS.

The first 800,000 acre-ft of CVP Friant Division yield made available is considered Class 1 water. Class 2 water is the next 1.4M acre-ft. Historically, on average, about 650,000 ac-ft of Class 2 water is made available in a water year. DEID is the largest Class 1 Friant contractor, with a contract for 108,800 ac-ft of Class 1 water. DEID also contracts for 74,500 acre-ft of Class 2 water (Bureau of Reclamation Contract Number I75r-3327D [**Appendix K**]). Additionally, DEID’s CVP contract provides opportunity to access other water supplies that are made available from time to time during particularly wet years. Such supplies including the following categories:

1. Section 215 Water: Unsortable water that is made available to Friant Contractors pursuant to contracts with the Bureau of Reclamation when the opportunity to fully utilize their Class 1 and 2 contracts is afforded and hydrology further requires an urgent evacuation of water from Millerton Lake for flood control purposes.

2. Flood Waters: In extremely wet hydrologic periods when the Bureau of Reclamation has exercised all available contractual and flood control means to evacuate water from Millerton Lake and further need exists to evacuate water, flood water has been provided to contractors.
3. Unreleased Restoration Flows: Restoration Flows not released for purposes of the Restoration Goal are made available to Friant Contractors on an exchange or sale basis as Unreleased Restoration Flows.
4. Recaptured/Recirculated Water: When Restoration Flows are released from Millerton Lake into the San Joaquin River to meet the Restoration Goal, any water no longer needed for the Restoration Goal that is recaptured in Mendota Pool or remaining flows recaptured past the confluence of the Merced River is accounted for as Recaptured Water. These volumes accrue in San Luis Reservoir in the accounts of Friant Contractors and can be exchanged for other water or recirculated back to the Friant Division.
5. RWA Water: Prior to implementation of the Settlement, Restoration Flows would have been delivered to Friant Contractors as contracted Friant Supply. The Recovered Water Accounts are used to track the cumulative volumes of water that have been taken out of the Friant Supply by the SJRRP. As hydrology allows, these volumes are then made available to Friant Contractors to offset the impacts of reduced deliveries experienced during drier years.

The historical surface water available to DEID from the Bureau of Reclamation during each hydrologic year was further defined in the 2006 Settlement Agreement and has since been updated by the Friant Water Authority as provided in **Table 1-3**: Available CVP Allocation 2015 Historical which presents simulated water availability by water year type and for three levels of restoration and water management goal implementation. The future reliability of the CVP has recently been strengthened via establishment of a south of Delta drought resiliency framework, a historic memorandum of agreement (MOU) recently signed by the Bureau of Reclamation, the Friant Water Authority, the San Luis Delta Mendota Water Agency, and the San Joaquin River Exchange Contractors Water Authority[15]. In this MOU, the parties have collectively identified projects and potential actions aimed at improving drought resiliency south of the Delta.

Table 1-3: Available CVP Allocation 2015 Historical Conditions

Water Year Type[1]	Percent of Total Years	Millerton Inflow (TAF/yr)	SJRRP Releases (TAF/yr)	Number of Years in Water Year Type	DEID Class 1 Allocation Percent / Acre-feet	DEID Class 2 Allocation Percent / Acre-feet
Pre-SJRSS						
Wet	20%	2,947.8	116.8	16	100% / 108,800	100% / 74,500
Normal-Wet	30%	1,922.7	116.8	25	100% / 108,800	66.8% / 49,780
Normal-Dry	29%	1,317.6	116.8	24	99.5% / 108,292	28.0% / 20,837
Dry	15%	1,002.9	116.8	12	88.1% / 95,890	2.4% / 1,774
Critical[2]	6%	694.1	116.8	5	50.5% / 54,915	0.0% / 0
Long-Term		1,733.8	116.8	82	95.1% / 103,411	48.2 % / 35,903
Limited SJRSS / Limited Access						
Wet	20%	2,947.8	501.5	16	100% / 108,800	98.6% / 73,483
Normal-Wet	30%	1,922.7	358.3	25	100% / 108,800	61.2% / 45,590
Normal-Dry	29%	1,317.6	331.6	24	95.8% / 104,192	9.6% / 7,128
Dry	15%	1,002.9	287.2	12	71.4% / 77,712	0.1% / 40
Critical[2]	6%	694.1	227.9	5	43.4% / 47,264	0.0% / 0
Long-Term		1,733.8	360.1	82	91.0% / 99,031	40.5 % / 30,141
Limited SJRSS / Full Access						
Wet	20%	2,947.8	501.5	16	100% / 108,800	99.1% / 73,844
Normal-Wet	30%	1,922.7	358.3	25	100% / 108,800	61.2% / 45,588
Normal-Dry	29%	1,317.6	331.6	24	95.4% / 103,762	9.6% / 7,145
Dry	15%	1,002.9	287.2	12	69.8% / 75,952	0.0% / 0
Critical[2]	6%	694.1	227.9	5	44.1% / 48,029	0.0% / 0
Long-Term		1,733.8	360.1	82	90.7% / 98,690	40.6 % / 30,211

Notes: 1. The six water year types are classified as follows: 20% wet, 30% normal-wet, 30% normal-dry, 15% dry and 5% critical.
2. A subset of critical years are classified as critical high and critical low with the critical low yeas having less than 400,000 acre-ft of unimpaired runoff. DEID's Class 1 delivery in critical years 2014 and 2015 was 30% and 16%, respectively. Under current and future conditions, it is expected that less water will be available under critical conditions than under historical conditions. DEID will have access to additional water supply from the RWA and other sources under wet conditions.

Source: Friant Water Authority, 2018.

[15] MEMORANDUM OF UNDERSTANDING BETWEEN THE UNITED STATES DEPARTMENT OF INTERIOR BUREAU OF RECLAMATION AND FWA, SLDMWA, AND SJRECWA FOR ESTABLISHING A SOUTH OF DELTA DROUGHT RESILIENCY FRAMEWORK. March 21, 2024.

As a result of DEID's extremely efficient distribution system and its large CVP water contracts, the DEID MA has successfully implemented conjunctive use programs throughout its history. When taking into consideration all available water to the DEID MA during the period of 1987-2023, which includes imported surface water used for irrigation and in-District recharge, precipitation, and sustainable yield, the amount of water available on an average annual basis was 154,842 acre-feet. Over the same 37-year period, the average annual consumptive demand of the District was 135,690 acre-feet per year. Comparing these values yields an average net surplus of 19,152 acre-feet per year, indicating that DEID MA has been, on average, a net contributor of imported water to the Subbasin.

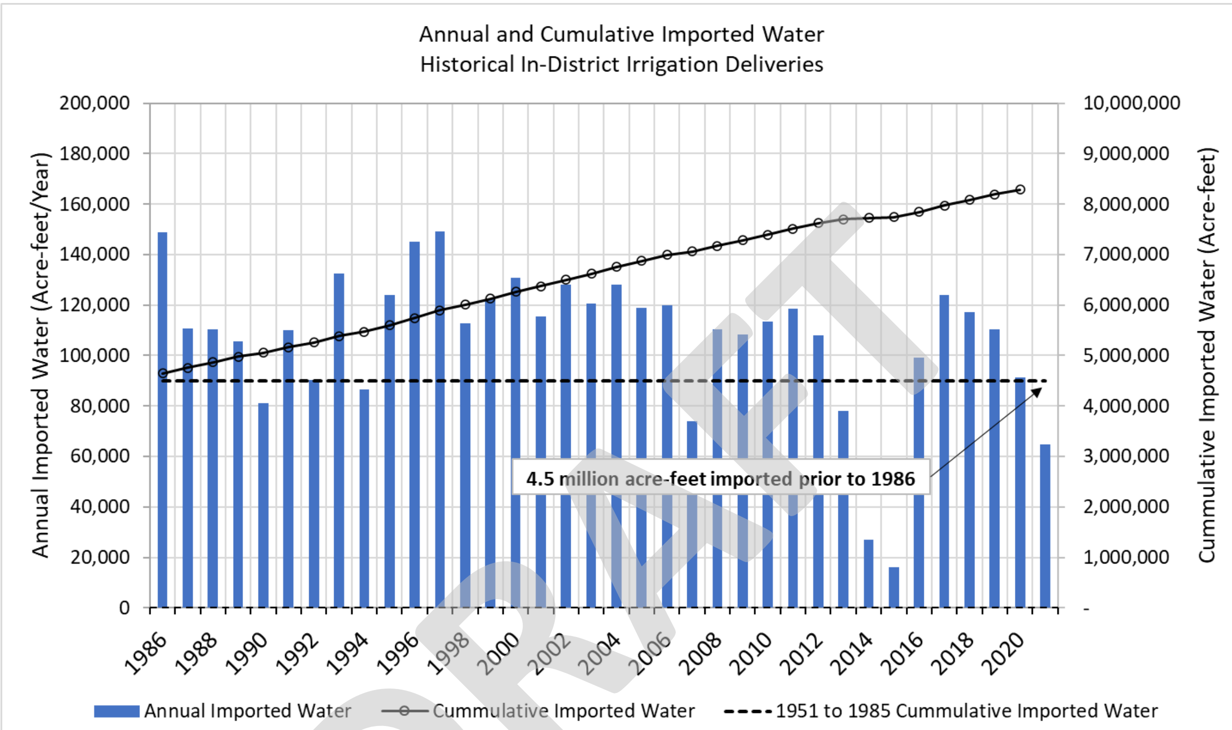


Figure 1-18: DEID Imported Water

DEID conducts direct groundwater recharge during surplus water years through recharge operations within the White River channel, at a small 5-acre recharge basin near the DEID headquarters, and at the dedicated Turnipseed groundwater banking project within the DEID MA. The banking project initially began in 1993 with the purchase of an 80-acre parcel adjacent to White River. The site was developed for direct recharge with five separate cells and dual methods of introducing water to each cell, either from DEID's distribution system or from direct diversions of Friant Division supply from White River.

Since SGMA was enacted, DEID has invested more than $44 million in projects that expand DEID's ability to honor the sustainability commitment described in **Figure 0-3**. This investment includes 944-acres of recharge and water banking facilities, referred to as the "Turnipseed Water Banking Facility" or "Turnipseed Recharge Basins" in this Plan. Phases 1-5 of the Turnipseed Water Banking Facility are complete and currently operating. Phase 6 of the Turnipseed Water Bank is currently under construction with completion scheduled for September 2024. Upon the completion of Phase 6, the 944-acre facility will be capable of percolating 12,928 acre-feet per month and, at an average recharge opportunity of

2.41 months per year[16], will allow the District to deposit an average of 31,157 acre-feet per year into the aquifer. Accounting for operational losses and a conservative leave-behind factor, the average net supply available for future recovery in dry years is 28,041 acre-feet per year (of the 31,157 acre-feet per year stored water). It is important to note that the surface water delivered to these recharge facilities and stored in the aquifer is of very good quality, being sourced directly from the Sierra Nevada snowmelt and diverted through the Friant Kern Canal.

See **Table 1-4** for a tabular breakdown of this information.

Table 1-4: Turnipseed Water Banking Facilities - Average Annual Recharge

Turnipseed Phase	Gross Area	Effective Recharge Area	Acre-Feet/Day	Acre-Feet/Year	Net Returnable Supply
[-]	[ac]	[ac]	[ac-ft]	[ac-ft]	[ac-ft]
I	80	66	37	2,640	2,376
II	80	66	37	2,640	2,376
III	320	266	146	10,562	9,505
IV	160	133	73	5,281	4,753
V	156	129	71	5,149	4,634
VI	148	123	68	4,885	4,396
			Total	**31,157**	**28,041**

DEID is also involved in two separate out-of-district (OOD) water banking projects that allows DEID to deliver project and non-project water in surplus years for later recovery and use in DEID. DEID has been involved in OOD projects since 2006. DEID's OOD banking projects have a total banking capacity of 154,000 acre-ft. A total of 240,833 ac-ft have been banked over the life of the two OOD projects. From 2006 to 2021, approximately 103,494 acre-ft or an average annual water supply of 6,468 ac-ft was recovered from OOD projects.

Additional long-term OOD water exchanges have also been entered into for the benefit of the DEID MA. In 2017, 2018, 2019, 2020, and 2021 surplus CVP supplies were banked through long-term exchanges that will provide 36,322 acre-feet of return water.

On an average annual basis, DEID has deposited 18,002 ac-ft of water in all OOD projects and as of 2022 has over 76,456 ac-ft of OOD project water available for recovery in future years. This is an important extension of DEID's conjunctive use program.

[16] The average number of months per year during which recharge opportunities are available to the District is derived from historic DEID recharge operations data, starting in 1993. On average, from 1993 to present, DEID has been able to conduct recharge operations for 2.41 months per year.

RCSD Management Area:

No dedicated conjunctive use program exists within the RCSD MA. However, DEID GSA's ongoing recharge efforts directly benefit the municipal, residential, commercial, and industrial groundwater use within RCSD by maintaining access to groundwater through sustainable groundwater levels.

EPUD Management Area:

No dedicated conjunctive use program exists within the EPUD MA. However, DEID GSA's ongoing recharge efforts directly benefit the municipal, residential, commercial, and industrial groundwater use within EPUD by maintaining access to groundwater through sustainable groundwater levels.

Subsection 1.3.4 Summary of Land Use Plans *[23 CCR § 354.8(f)(1)]*

> **23 Cal. Code Regs. § 354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> **(f)** *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
>
> **(1)** *A summary of general plans and other land use plans governing the basin.*

The Tulare County General Plan is provided by the Tulare County Zoning Ordinance. Zoning in the DEID GSA is mostly classified as Exclusive Agricultural. The communities of Earlimart and Richgrove are comprised mainly of residential, retail, agricultural cold storage, and light manufacturing zones.

Under Government Code section 65300 *et seq*, state law requires each City and County to prepare and adopt a comprehensive long-range General Plan (GP) for its future development. City and county land use plans contain provisions that may affect water demand in the basin. Further, the Urban Water Management Planning Act of 1983 requires urban water suppliers report on water resources and water shortage contingency planning. Within that context, SGMA requires that the GSP include a description of the considerations given to applicable city and county GPs and a description of any other adopted plans or programs related to water resources within the basin. The GSP must also include an assessment of how the GSP may affect those plans.[17]

GPs must address, to the extent the elements exist in the planning area (GOV §§ 65301(c), 65302), seven mandatory elements which are: land use; circulation; housing; open space; conservation; safety; and noise.

Tulare County possesses the land use authority within DEID GSA. Tulare County also administers Community Plans, which are a part of the land use element of the county-wide GP. Within DEID GSA, areas with Community Plans addressed in this GSP include Richgrove and Earlimart.

Below is a description of land use and water management plans applicable to the Tule Subbasin, a discussion of the consideration given to those plans and an assessment of how the DEID GSP may affect those plans.

Subsection 1.3.4.1 Tulare County 2030 General Plan Update

The Tulare County General Plan 2030 Update (Tulare County GP, County of Tulare, 2012) is a three-part planning document, officially adopted by the County Board of Supervisors in August 2012. Part I, entitled

[17] Water Code, § 10727.2(g).

"Goals and Policies Report," covers the seven mandatory elements of a GP and several optional elements. Part II, entitled "Area Plans," consists of four adopted area plans: The Rural Valley Lands Plan, the Corridors Framework Plan, the Foothill Growth Management Plan, and The Mountain Framework Plan. These four plans cover the major geographical areas within the unincorporated areas of the County and establish policies applicable in these areas. Part III, entitled "Community, Hamlet, County Adopted City General, Valley Sub-Area, Corridor Sub-Area, Foothill Sub-Area, and Mountain Sub-Area Plans" consists of a number of existing planning documents and applies tailored policies to specified portions of the County.

Specific policies related to general plan Elements are found in Part I, which is organized into four components. Each of the components address one or more of the 14 elements covered by the Tulare County GP, guided by a series of concepts and principles. Listed under each element are a series of goals and policies that are to be implemented through measures that constitute a preliminary, anticipated work plan to carry out the identified goals and policies.

The County's Area Plans in Part II provide policies and designate land uses that generally encompass agricultural, rural, semi-rural, open space, and mountainous areas not otherwise within the designated urban or community boundaries described in Part III. Individual community plans are found in Part III. These plans provide an overview of each community plan area's general conditions, describe specific policies relevant to the area, and designate land use and development boundaries.

Land Use

Land Use is a primary focus of the Tulare County GP and is specifically addressed as an Element in Chapter 4 of Part I in the Tulare County GP. Among other things, this element describes the County's land use designations, which are applied based upon regional planning frameworks and other land use boundaries. A land use designation is "*an applied policy on the General Plan Land Use Diagrams that defines allowable uses and development standards for agricultural, residential, commercial, industrial development, and other basic categories of land use*." **Exhibit 3-1** provided at the end of **Section 3** shows the land use planning Framework for within DEID according to Tulare County 2030 general Plan Update (County of Tulare, 2012) and the Kern County 2040 General Plan Update (Kern County, 2009). Other Elements and Parts of the Tulare County GP relevant to general land uses within DEID GSA include:

- Part I, Component A, Chapter 2 - Planning Framework
- Part I, Component B, Chapter 3 – Agriculture
- Part I, Component C, Chapter 8 – Environmental Resource Management
- Part II, Chapter 1 – Rural Valley Lands Plan

Urban land use is more specifically managed in the Tulare County GP through the official adoption of Urban Development Boundaries (UDBs) and Urban Area Boundaries (UABs). UDBs establish a 20-year growth boundary that is consistent with the General Plan's time horizon and delineate an area around incorporated cities or unincorporated communities wherein urban development is allowed and services are likely to be extended. UABs are areas where land uses are presumed to have an impact upon the adjacent incorporated city. To coordinate land use planning with cities, the County adopts City UABs and City UDBs wherein the city regulates land use within the City UDB and the city and the County coordinate on land use within the City UAB. Generally, the Planning Area of a city's General Plan is coterminous with the County Adopted City UAB. Within DEID GSA, there are two Community Plans that include UDBs and/or UABs that are addressed by this GSP. The most recent version of these plans, as well as the UDBs and/or UABs that they define, include:

- Richgrove Community Plan Update (County of Tulare, 2017a)
  - UDB for Richgrove
- Earlimart Community Plan Update (County of Tulare, 2017b)
  - UDB for Earlimart

The Rural Valley Lands Plan encompasses the majority of DEID GSA's non-urban areas (County of Tulare 2012). This plan establishes policies for preserving agricultural and working landscapes. Policies include the establishment of minimum parcel sizes for areas zoned for agricultural and a fifteen-factor evaluation that must be undertaken to determine if certain agricultural lands may be suitable for urban/suburban type uses prior to approving such a change in land use designation or zoning.

The individual Community Plans noted above, as well as the respective information provided on population, land use, and water supply, are provided in Part III of the Tulare County GP, and are further described in **Subsection Subsection 1.3.4.2** and **Subsection 1.4.4.3.**

Water Resources and Supply

The Water Resources Element (Part 1, Component C, Chapter 11) of the Tulare County GP specifically addresses water resources Goals and Policies related to both County water quality and supply. Several other Elements described in Part 1 of the Tulare County GP also include Concepts, Principles, and Policies that address water resources management, including the Planning Framework Element (Part 1, Component A, Chapter 2), the Agriculture Element (Part 1, Component B, Chapter 3), the Environmental Resources Management Element (Part 1, Component C, Chapter 8), the Health and Safety Element (Part 1, Component C, Chapter 10), and the Public Facilities and Services Element (Part 1, Component D, Chapter 14). Additionally, the County's Community Plans also address water resources and supply.

Following the structure for Part I of the Tulare County GP, a selected subset of Part I's Concepts, Principles, Goals and Policies from various Elements describing water resources management have been provided below:

Component:	**A. General Plan Framework**
Element:	**2. Planning Framework**
Section:	**2.5 New Towns**
Policy:	**PF-5.2 Criteria for New Towns**
Policy Text:	*"When evaluating proposals for New Town development, the County shall require all of the following: … 9. The adequate and sustainable water supplies be documented…."*

Component:	**B. Prosperity**
Element:	**3. Agriculture**
Section:	**3.1 Agriculture Preservation**
Policy:	**AG-1.13 Agriculture Related Land Uses**
Policy Text:	*"The County shall allow agriculturally related uses, including value-added processing facilities by discretionary approvals in areas designated Valley or Foothill Agriculture, subject to the following criteria: … The operational or physical characteristics of the use shall not have a significant adverse impact on water resources or the use or*

management of surrounding agricultural properties within at least one-quarter (1/4) mile radius…."

Policy: **AG-1.17 Agricultural Water Resources**

Policy Text: *"The County shall seek to protect and enhance surface water and groundwater resources critical to agriculture."*

Component: C. Environmental

Concept: **5. Water**

Concept Text: *"The long-term strategy for water in Tulare County centers on protecting and conserving existing water supplies and identifying new sources of water. As Tulare County continues to grow, new methods for conserving, treating, and supplying water will enable County residents and farmers to continue to have an adequate supply of quality water that limits long-term impacts on groundwater."*

Principle: **1. Protection**

Principle Text: *"Protect the supply and quality of urban, agricultural, and environmental water serving the County..."*

Principle: **2. New Sources**

Principle Text: *"Identify and encourage the development of new sources for water that do not deplete or negative impact groundwater…."*

Principle: **3. Recharge**

Principle Text: *"Identify and encourage the development of locations where water recharge systems can be developed to replenish water supplies…."*

Principle: **4. Adequate Supply**

Principle Text: *"Plan delivery systems to ensure adequate water is available to meet demands..."*

Principle: **5. Conservation**

Principle Text: *"Encourage efficient use, conservation, and reuse of water…"*

Element: **10. Health and Safety**

Section: **10.2 Geologic and Seismic Hazards**

Policy: **HS-2.7 Subsidence**

Policy Text: *"The County shall confirm the development is not located any known areas of active subsidence. If urban development may be located in such an area, a special safety study will be prepared and needed safety measures implemented. The County shall also request that developments provide evidence that its long-term use of ground water resources, where applicable, will not result in notable subsidence attributed to the new extraction of groundwater resources for the use by the development."*

Section: **10.5 Flood Hazards**

Policy: **HS-5.4 Multi-Purpose Flood Control Measures**

Policy Text: *"The County shall encourage multipurpose flood control projects that incorporate recreation, resource conservation, preservation of natural riparian habitat, and scenic values of the County's streams, creeks, and lakes. Where appropriate, the County shall also encourage the use of flood and/or stormwater retention facilities for use as groundwater recharge facilities."*

Element: **11. Water Resources**

Section: **11.1 General**

Policy: **WR-1.1 Groundwater Withdrawal**

Policy Text: *"The County shall cooperate with water agencies and management agencies during land development processes to help promote an adequate, safe, and economically viable groundwater supply of existing and future development within the County. These actions shall be intended to help the County mitigate the potential impact on groundwater resources identified during the planning and approval processes."*

Policy: **WR-1.3 Water Export Outside County**

Policy Text: *The County shall regulate the permanent export of groundwater and surface water resources allocated to users within the county to cities and service providers outside the County to the extent necessary to protect the public health, safety, and welfare. The County shall strive for a "no net loss" where there may be exchanges serving a public purpose."*

Policy: **WR-1.8 Groundwater Basin Management**

Policy Text: *"The County shall take an active role in cooperating in the management of the County's groundwater resources."*

Policy: **WR-1.11 Groundwater Overdraft**

Policy Text: *"The County shall consult with water agencies within those areas of the County where groundwater extraction exceeds groundwater recharge, with the goal of reducing and ultimately reversing groundwater overdraft conditions in the County."*

Section: **11.2 Water Quality**

Policy: **WR-2.1 Protect Water Quality**

Policy Text: *"All major land use and development plans shall be evaluated as to their potential to create surface and groundwater contamination hazards from point and non-point sources. The County shall confer with other appropriate agencies, as necessary, to assure adequate water quality review to prevent soil erosion; direct discharge of potentially harmful substances; ground leaching from storage of raw materials, petroleum products, or wastes; floating debris; and runoff from the site."*

Section: **11.3 Water Supply**

Policy: **WR-3.1 Develop Additional Water Resources**

Policy Text: *"The County shall encourage, support and, as warranted, require the identification and development of additional water sources through the expansion of water storage reservoirs, development of groundwater banking for recharge and infiltration, and promotion of water conservation programs, and support of other projects and programs that intend to increase the water resources available to the County and reduce the individual demands of urban and agricultural users."*

Policy: **WR-3.3 Adequate Water Availability**

Policy Text: *"The County shall review new development proposals to ensure the intensity and timing of growth will be consistent with the availability of adequate water supplies. Projects must submit a Will-Serve letter as part of the application process and provide evidence of adequate and sustainable water availability prior to approval of the tentative map or other urban development entitlement."*

Policy: **WR-3.4 Water Resource Planning**

Policy Text: *"The County shall continue participation in State, regional, and local water resource planning efforts affecting water resource supply and quality."*

Policy: **WR-3.9 Establish Critical Water Supply Areas**

Policy Text: *"The County shall designate Critical Water Supply Areas to include the specific areas used by a municipality or community for its water supply system, areas critical to groundwater recharge, and other areas possessing a vital role in the management of the water resources in the County, including those areas with degraded groundwater quality."*

Pursuant SB 244, County of Tulare undertook and included as Appendix D of the Tulare County GP a Disadvantaged Communities Assessment. This Assessment provides an inventory of water and sewer systems, services, and connections for the County's S/DACs. Communities described in this report that reside within DEID GSA include Tipton, Woodville, and Poplar.

Additionally, the County prepared an Environmental Impact Report (EIR) as part of the development and adoption of the Tulare County GP. Included as Exhibit G of this EIR is the County's Phase 1 Water Supply Evaluation. This document provides an initial analysis to support the determination of environmental impacts to water resources within Tulare County as associated with the adoption of the General Plan Update. The analysis indicates that groundwater basins within Tulare County are in a state of overdraft, but states "*the actions contemplated in the General Plan Update are not anticipated to cause overall demand in the County to vary from within the range of demands seen historically and documented by DWR - a range of about 2,600,000 acre-feet to 2,850,000 acre-feet." (Tulare County General Plan Update, Phase 1 - Water Supply Evaluation*). Several issues that the EIR assumes may affect water supplies include changes in California groundwater law, water supply and use legislation, regulatory risk, groundwater adjudications, population growth, and ongoing groundwater overdraft.

Tulare County's role in water management is broad and active, particularly through the implementation of its General Plan and its Zoning Ordinance (*Ordinance No. 352*), which translates Tulare County GP policies into specific use regulations and development standards. The County also administers other ordinances that influence the use and management of water within the County, and it may adopt additional ordinances in the future if deemed necessary. However, limited only to the implementation of its GP, Tulare County recognizes that its role in water management is neither comprehensive, nor is it to be construed as such; rather, water management within the County is carried out by way of dynamic interactions between the many participants who each bear a variety of responsibilities:

> "*Policies in this Element discussing the management of water resources are relative to the areas of water usage that the County has regulatory control, such as the approval of new land use development. The policies in this Element should not be construed to insert the County into the allocation or management of water resources. This is a complicated system over which the County does not have direct regulatory control.*" (*Tulare County General Plan 2030 Update)*

More explicit discussion of water needs, water supply, and water resources and services infrastructure for communities within DEID GSA with active Community Plans is provided on the following pages.

Subsection 1.3.4.2 Richgrove Community Plan Update 2017

The Richgrove Community Plan 2017 Update (Richgrove CP) is a component of Part III of the Tulare County GP. Richgrove is a small, unincorporated severely disadvantaged community with a UBD of approximately 234 acres (County of Tulare, 2015). The community is located in the southeastern portion of Tulare County. The Richgrove CP provides an overview of the community's general conditions, states the Tulare County GP policies relevant to Richgrove, describes goals and policies specific to Richgrove, and designates land use and development boundaries.

Land Use

The Richgrove CP provides four categories of Goals, Objectives, and Policies specific to Richgrove that generally provide a framework for sustainable community and land use development. These are, namely, Community Development, Housing, Economic Base, and Environmental Quality.

Pursuant to the adoption of the Richgrove CP by the County of Tulare, land uses within Richgrove's UDB were updated in 2017. These land uses reflect the policies specific to Richgrove pursuant the Richgrove CP, as well as the policies within the Tulare County GP relevant to Richgrove. The current UBD for the community is projected to be sufficient for the community's growth according to the Richgrove CP, as vacant land is available for future development. However, it should be noted that some land uses identified in the Richgrove CP may have changed since adoption of the document, as warranted or requested in relation to various development projects and General Plan Amendments. **Exhibit 3-2** provided at the end of **Section 3** shows the proposed land uses within Richgrove from the 2017 community plan update (County of Tulare 2017a). See **Figure 1-19** for a map of Richgrove's planned land use as of the 2017 community plan update.

Water Resources and Supply

Water resources and supply are addressed under the Infrastructure section of the Richgrove CP. Municipal water services are supplied to the community by the RCSD. Richgrove CSD utilizes several underground wells for supplying municipal water to the community for residential and commercial usage.

The Richgrove CP addresses policies related to land development in the *Goals, Objective and Policies Specific to Richgrove* section of the Tulare County GP.

RCSD has installed a new safe drinking water well with plans to operate in 2024. This well (Well 6) is connected to the communities of Richgrove and the neighboring Rodriguez Labor Camp. RCSD is also in the process of funding applications for an additional new well to offset use of Well 4 and Well 5 which currently have groundwater quality contamination orders.

Subsection 1.3.4.3 Earlimart Community Plan Update 2017

The Earlimart Community Plan 2017 Update (Earlimart CP) is a component of Part III of the Tulare County GP. Earlimart is a small, unincorporated Severely Disadvantaged Community with a UBD of approximately 773 acres (County of Tulare, 2017b). The community is located in the southeastern portion of Tulare County. The Earlimart CP provides an overview of the community's general conditions, states the Tulare County GP policies relevant to Earlimart, describes goals and policies specific to Earlimart, and designates land use and development boundaries.

Land Use

The Earlimart CP provides four categories of Goals, Objectives, and Policies specific to Earlimart that generally provide a framework for sustainable community and land use development. These are, namely, Community Development, Housing, Economic Base, and Environmental Quality.

Pursuant to the adoption of the Earlimart CP by the County of Tulare, land uses within Earlimart's UDB were updated in 2015. These land uses reflect the policies specific to Earlimart pursuant the Earlimart CP, as well as the policies within the Tulare County GP relevant to Earlimart. The current UBD for the community is projected to be sufficient for the community's growth according to the Earlimart CP, as vacant land is available for future development. However, it should be noted that some land uses identified in the Earlimart CP may have changed since adoption of the document, as warranted or requested in relation to various development projects and General Plan Amendments. See **Figure 1-20** for a map of Earlimart's proposed land use as of the 2017 community plan update.

Water Resources and Supply

Water resources and supply are addressed under the Infrastructure section of the Earlimart CP. Municipal water services are supplied to the community by the Earlimart Community Service District (CSD). Earlimart CSD utilizes two underground wells for supplying municipal water to the community for residential and commercial usage.

The Earlimart CP addresses policies related to land development in the *Goals, Objective and Policies Specific to Earlimart* section of the Tulare County GP.

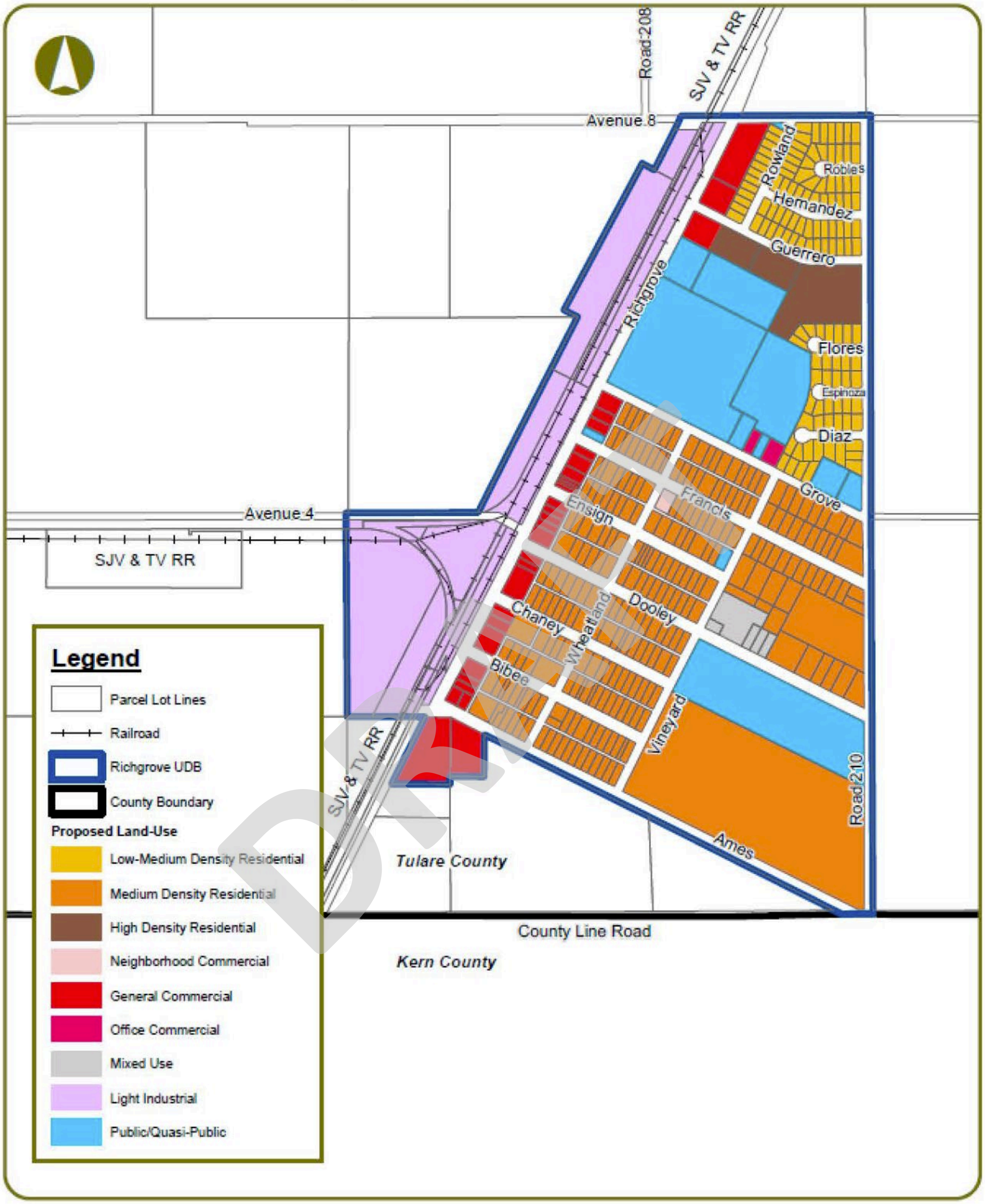


Figure 1-19 Richgrove Proposed Land Use

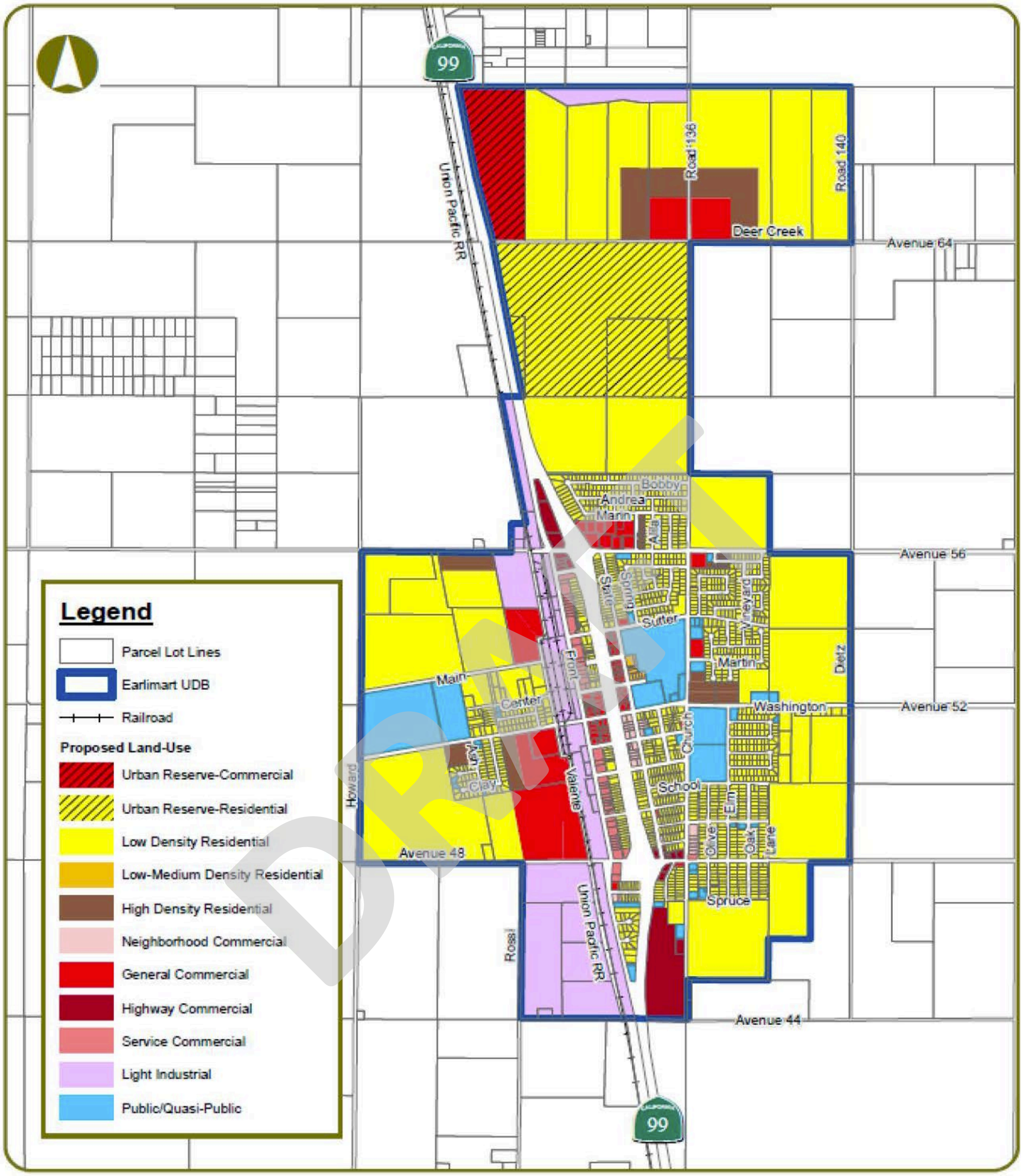


Figure 1-20 Earlimart Proposed Land Use

Subsection 1.3.4.4 Effects of Land Use Plans within the Tule Subbasin *[23 CCR § 354.8(f)(2)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*

(2) *A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects.*

The long-term strategy for water in Tulare County centers on protecting and conserving existing water supplies and identifying new sources of water. As Tulare County continues to grow, continuing current and identifying new methods for conserving, treating, and supplying water will enable County residents and farmers to continue to have an adequate supply of quality water that limits long-term impacts on groundwater.

This GSP provides a detailed approach for sustainable use of water resources within its jurisdiction, staying within the generally stated goals and policies detailed in land use plans in **Subsection Subsection 1.3.4.1** through **Subsection Subsection 1.3.4.3.** Therefore, the implementation of existing land use plans is not anticipated to cause significant changes in water demand that would alter the GSA's ability to successfully implement its GSP and ultimately achieve its sustainability goal.

The DEID GSA does anticipate being involved in future proposed land use changes within its jurisdiction by the County of Tulare and the County of Kern as the agencies with jurisdiction over water use to ensure future land use plans align with the objectives outlined by this GSP.

Subsection 1.3.4.5 Water Supply Assumptions of Land Use Plans *[23 CCR § 354.8(f)(3)]*

23 Cal. Code Regs. § 354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*

(3) *A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.*

Water supply assumptions within the recently adopted General and Community Plans active within DEID GSA's jurisdiction generally provide global estimations (which may or may not extend out to 2070 population levels) of future water supplies and demands. Additionally, these plans provide Goals and Policies that recognize the need and, when implemented, provide for sustainable water management.

As part of the EIR developed for the Tulare County GP, the Phase 1- Water Supply Evaluation contemplates four scenarios of future supplies assuming baseline groundwater use across the County to be 1,633,100 ac-ft/year (County of Tulare, 2018). This groundwater use is expected to decrease as demand management is executed under SGMA. It should be noted that Scenarios 1 and 2 assume groundwater supplies to be available as historically used with projected groundwater use increasing or decreasing depending on hydrologic year type and implemented conservation measures, and Scenarios 3 and 4 assume constraints in available surface water supplies that project increases in average annual groundwater use. However, the EIR indicates that several issues may affect future water supplies, including changes in California groundwater law, water supply and use legislation, regulatory risk, groundwater adjudications, population growth, and ongoing groundwater overdraft.

Tulare County's Water Resources Goal 3, which recognizes the importance of a sustainable water supply, is "[t]o provide a sustainable, long-term supply of water resources to meet domestic, agricultural, industrial, and recreational needs and to assure that new urban development is consistent with available water resources" (County of Tulare, 2012). This Goal resonates across all the Community Plans administered and adopted by Tulare County.

Development of this GSP has occurred in consultation with Tulare County who is a Member Agency of the Tule Subbasin MOU Group. This GSP provides for a sustainable groundwater management approach that appropriately observes the land use designations maintained by the county, and has considered the relative impact that current land use may have on existing groundwater supply and demand. DEID anticipates an active role in the future development and facilitation of the Tulare County's respective land use plans.

The projects and management actions proposed in this GSP provide a framework by which the opportunity to use lands according to existing land use designations as permitted by land use designations and zoning ordinances remains unaltered, subject to the sustainable use of groundwater within the DEID GSA's jurisdiction. However, the assumptions made by DEID GSA in this GSP anticipate a shift in water demand due to the implementation of certain projects and management actions that ultimately reduces the total volume of groundwater supply available for extraction on an annual basis and, therefore, current actual land uses reliant upon these groundwater supplies may change during the Plan's implementation horizon.

Subsection 1.3.4.6 Well Permitting Process *[23 CCR § 354.8(f)(4)]*

> **23 Cal. Code Regs. § 354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> **(f)** *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
>
> **(4)** *A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.*

Permitting of new or replacement water supply wells in Tulare County and Kern County are administered by their respective departments of jurisdiction. Each county maintains its own standards for the design, construction, repair, and reconstruction of agricultural wells, domestic wells, cathodic protection wells, industrial wells, monitoring wells, observation wells, geothermal heat exchange wells, and test wells in such a manner that the groundwater of the county will not be contaminated or polluted, and that water obtained for beneficial uses will not jeopardize the health and safety or welfare of the citizens of the respective county.

Each county has its own policies and procedures to obtain a water well permit. The DEID GSA shall request notification of any proposed water wells within the DEID GSA and shall further request the opportunity to review said requests so that the potential for undesirable effects that a new well might have on implementation of the GSP and provide comments and/or approval prior to issuance of any well permit. This process will also allow accurate tracking of groundwater wells in the GSA. DEID will comply with any executive orders or state legislation regarding the role of GSAs in review of well permit applications.

The Tulare County Well Ordinance has been revised to comply with Governor Newsom's Executive Order N-7-22 which requires that GSAs review permits for new wells to ensure consistency with the GSP.

See **Section 5** for a description of the Well Permit Application Review that DEID GSA performs to assess if proposed wells pose a risk of impacts or if they are consistent with sustainability goals.

Subsection 1.3.4.7 Effect of Land Use Plans Outside of the Tule Subbasin *[23 CCR § 354.8(f)(5)]*

> **23 Cal. Code Regs. § 354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> **(f)** *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
>
> **(5)** *To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.*

All Subbasins adjacent to the Tule Subbasin, which include the Kaweah Subbasin, Tulare Lake Subbasin, and Kern Subbasin, are considered critically over-drafted and must achieve sustainable groundwater management by 2040. Moreover, DWR is required to evaluation all GSPs "… [*C*]*onsistent with the objective that a basin be sustainably managed within 20 years of Plan implementation without adversely affecting the ability of an adjacent basin to implement its Plan that groundwater resources within their respective Subbasins are sustainability managed by 2040*."

Given that GSPs implemented within adjacent Subbasins must (1) ensure no adverse impact to the GSPs implemented within the Tule Subbasin and must also (2) address any impact that the various land use plans active within their GSPs' respective Plan Areas may have on their successful implementation of their respective GSPs, DEID GSA does not anticipate any significant adverse impacts resulting from the implementation of land use plans adjacent to the Tule Subbasin.

Subsection 1.4 Notices and Communications

Subsection 1.4.1 Beneficial Uses and Users *[23 CCR § 354.10(a)]*

> **23 Cal. Code Regs. § 354.10 Notice and Communication.** *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
>
> **(a)** *A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.*

The DEID GSA has a number of beneficial uses and users of groundwater. Beneficial uses include agricultural irrigation as the primary use with municipal water and water used by agricultural support industries (i.e., processing facilities, cold storage facilities) as additional uses. Rural homesteads, which use groundwater for domestic purposes, are also located throughout the DEID GSA area.

Users associated with the above water uses include agricultural operators/irrigators, residents of the unincorporated communities of Richgrove and Earlimart, owners of agriculture-related industries, and rural homeowners.

Stakeholders from each of these types of users of groundwater are invited to various public meetings. Additionally, the DEID board of directors as well as the DEID GSA board held publicly noticed meetings where members of the public could meet with and ask questions of their locally elected representatives.

As of 2023, the Tule Subbasin has engaged in technical outreach workshops with drinking water advocacy groups, representing S/DACs across the San Joaquin Valley. These groups include Community Water Center, Leadership Council for Accountability and Justice, and Self-Help Enterprises. In addition to the subbasin-wide outreach with these parties, DEID GSA has had a separate meeting with Self-Help Enterprises in preparation of a partnership for the Well Mitigation Program in September 2023 and a GSA-specific engagement and feedback solicitation meeting with Community Water Center in February 2024.

Subsection 1.4.2 List of Public Meetings *[23 CCR § 354.10(b)]*

> **23 Cal. Code Regs. § 354.10 Notice and Communication.** *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
>
> **(b)** *A list of public meetings at which the Plan was discussed or considered by the Agency.*

The DEID GSA held a number of public meetings and other meetings to engage stakeholders. See Section VIII of the DEID GSA Communication and Engagement Plan (**Appendix G**) for the public outreach/engagement logs for a listing of meetings held. These meetings were held on both the original DEID GSP and this updated DEID GSP.

Subsection 1.4.3 Comments Received on Plan and Agency Responses *[23 CCR § 354.10(c)]*

> **23 Cal. Code Regs. § 354.10 Notice and Communication.** *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
>
> **(c)** *Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.*

A number of oral comments were received on GSP elements as they were proposed and discussed during various stakeholder meetings as the GSP was being developed. Written comments were also received during the development period, which were considered as a part of stakeholder comments (**Appendix L**). DEID also reviewed the January 2022 Deficiency Letter to the Tule Subbasin from DWR and revised its GSP based upon the detailed review comments provided. Following the GSP revision and resubmittal in 2022, the Tule Subbasin received a letter from DWR establishing the Tule Subbasin GSPs as inadequate. This GSP iteration includes revisions in alignment with DWR's recommendations, much of which required coordination with the neighboring GSAs.   The updated GSP also addresses comments raised by SWRCB in its draft staff report for the Tule Subbasin probationary hearing.

Subsection 1.4.3.1 Agency Decision-Making Process *[23 CCR § 354.10(d)(1)]*

> **23 Cal. Code Regs. § 354.10 Notice and Communication.** *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
>
> **(d)** *A communication section of the Plan that includes the following:*
>
> **(1)** *An explanation of the Agency's decision-making process.*

The DEID GSA's decision-making process is broken down by the roles of the Board of Directors, Stakeholder Committee, and through a Subbasin Coordination Committee. The roles of these DEID GSA entities and their responsibilities are outlined below and described in more detail in Section I.A.3 of the DEID GSA's Communication and Engagement Plan (**Appendix G**).

- **Board of Directors** – Responsible for all final decisions relative to the development of the GSA, GSP adoption, implementation of the GSP, and other related matters.
- **Stakeholder Committee** – Advises the Board of Directors on matters dealing with GSA and GSP development, GSP implementation, and other GSA/GSP matters; open to all interested stakeholders who wish to participate. Future meetings will be held in each management area during the public review of the revised GSP.
- **Subbasin Coordination Committee** – The Committee consists of representatives from each of the Tule Subbasin GSAs to thoroughly collaborate efforts throughout the GSP development phase to meet the sustainability requirements for the entire Tule Subbasin.

Subsection 1.4.3.2 Public Engagement Opportunities [23 CCR § 354.10(d)(2)]

23 Cal. Code Regs. § 354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*

(d) *A communication section of the Plan that includes the following:*

(2) *Identification of opportunities for public engagement and a discussion of how public input and response will be used.*

In addition to the information contained in the following sections, **Appendix G** provides more detail regarding public engagement opportunities, how DEID GSA encourages public involvement, and the processes in place informing the public of the progress of implementing this Plan.

Regular meetings with active stakeholder groups have been and are continuing to be held. Members of the public and partners from other local agencies are encouraged to attend Board of Directors and Stakeholder Committee meetings to voice their thoughts and concerns throughout the GSP development process, public review, and implementation phases. Meeting notices and agendas are routinely distributed to the Interested Parties List and on the DEID GSA's page on the DEID website.

Public input has been and will continue to be important in the development and implementation of the updated GSP, as the GSP will affect all groundwater users within the DEID GSA jurisdiction, and the impact of the SGMA implementation is significant. With that in mind, the DEID GSA views all public input as key to a successful sustainability plan. Input received from the public will be used in all aspects of GSP development and implementation.

Public engagement opportunities center around the following:

- Board of Directors Meetings – Held periodically, as necessary, usually preceding the DEID Board of Directors meeting at 4 p.m. on the second Thursday of every month at the DEID office, located at 14181 Avenue 24 in Delano, California.
- Stakeholder Committee Meetings – Held periodically at the DEID office, located at 14181 Avenue 24 in Delano, California; open to all stakeholders, interested parties and the public.
- Subbasin Coordination Committee Meetings – Public meeting notices are distributed to the Interested Parties List when scheduled.

More specifically, educational and public outreach meetings are scheduled for the identified distinct phases of GSP development and implementation contained in the DEID GSA's Communication and Engagement Plan as noted below.

- Subbasin Technical Advisory Committee Meetings – Held quarterly, stakeholders representing various beneficial users of groundwater, such as including drinking water advocacy groups, growers, dairy advocates, and municipality representatives, meet with the Tule Subbasin GSA staff and technical consultants to update and solicit feedback on GSP implementation and revision progress.

Subsection 1.4.3.3 Encouragement of Active Participation of the Public *[23 CCR § 354.10(d)(3)]*

23 Cal. Code Regs. § 354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*

(d) *A communication section of the Plan that includes the following:*

(3) *A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.*

Community organizations, public agencies and other entities listed in **Appendix G,** the DEID GSA's Communication and Engagement Plan, have been and will continue to be contacted to schedule opportunities to present or facilitate discussions with their members throughout the GSP development and implementation phase. These entities include local and regional entities that represent agricultural/industry organizations, environmental justice, irrigation/water districts/water agencies/water organizations, municipal agencies, school districts, and service clubs. Presentations and discussions will include an overview on SGMA and why it is important to them, an explanation of the GSP development process, including an awareness of the public review period. In addition, the DEID GSA will work with these organizations and agencies to distribute newsletters, public outreach meeting notices, and other educational information via email distribution, social media posts, and printed materials.

Subsection 1.4.3.4 Informing the Public [23 CCR § 354.10(d)(4)]

23 Cal. Code Regs. § 354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*

(d) *A communication section of the Plan that includes the following:*

(4) *The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.*

Venues and methods to inform the public on plan implementation and progress will be a continuation of the public outreach efforts used during GSP development, including updated GSP development, which include the following:

- Stakeholders will be invited to public meetings through direct mail and email blasts by obtaining mailing and email addresses of property owners within the DEID GSA boundary through the DEID, RCSD and EPUD customer lists. For direct mailings, postcards are most cost effective for mailing and can later be used to expedite meeting check-in and track attendance, if required during the implementation phases. Local community organizations will be asked to distribute meeting notices via email blasts to their membership/contact lists.

- Venue locations will be selected to provide convenient places to meet that can accommodate anticipated audience size and needs. The DEID GSA will work various stakeholder groups including S/DACs and potentially community organizations to hold outreach meetings at convenient times and locations. Since the Covid-19 pandemic, there has been a transition in the GSA and the Tule Subbasin to host more virtual and/or hybrid-options, which has improved accessibility.
- Printed materials will incorporate the visual imagery established through branding efforts and will be tailored for specific means of communication throughout the phases of GSP development, public review, and implementation. Printed materials will be translated into Spanish as needed. Printed materials to be used include:
  - Periodic newsletters will be created to inform stakeholders of compliance requirements and groundwater sustainability updates, opportunities and programs within the DEID GSA and Tule Subbasin. Newsletters will be distributed to those on the Interested Parties List and made available in public locations such as the school sites within the Columbine, Richgrove and Earlimart school districts and EPUD, RCSD and DEID offices.
  - Fact sheets, fliers, or post cards will be developed, as needed. Information may include meeting notices or updated SGMA information for the DEID GSA. These materials will be available for download on the DEID GSA's website, distributed at public meetings and community organizations/entities meetings, distributed door-to-door if necessary, and emailed to the Interested Parties List and other organizations' email distribution lists.
  - Letter correspondence may be necessary in certain situations, particularly during the public review and implementation phases. Letters will be distributed via email and/or direct mail. Letters will include pertinent facts and explanations that need to be communicated to stakeholders.
  - PowerPoint presentations will be utilized at educational/outreach public meetings. If a PowerPoint isn't possible to display for a meeting, display boards printed at 24-inch x 36-inch or larger in size will be used and set up on easels. Handouts of presentations and smaller versions of display boards may be distributed to stakeholders in attendance and can also be emailed to the Interested Parties list and posted on DEID GSA's website for access by stakeholders as a recap of the meeting.
- Digital communication outlets will be a significant mode of communication through the GSP implementation phase and will include:
  - Website – Public meeting notices and agendas of the Board of Directors meetings are posted on the GSA's page on the DEID website. This website will serve as an integral resource for stakeholders within the DEID GSA boundary. Electronic files of newsletters, presentations, fact sheets/fliers/postcards, and other educational resources will be accessible via the website in both English and Spanish translations. This will serve as a way for stakeholders to easily educate themselves on the GSP implementation process.
  - Email Distribution – As required by SGMA 10723.4 "Maintenance of Interested Persons List," DEID GSA maintains a contact list and regularly distribute emails to those who have expressed interest in the GSA's progress. These email blasts consist of meeting notices and other documents that are pertinent to the DEID GSA and stakeholder communication efforts. This process will continue.

- Email blasts with newsletter links, meeting notices, public review notices, and other crucial information will be coordinated with community organizations and stakeholder groups by utilizing their distribution lists. Examples of these organizations are DEID, RCSD, EPUD, and school districts within the DEID GSA boundary. A complete working list of organizations that will be contacted are listed in Table II-3 in the DEID GSA's Communication and Engagement Plan.

- While there is a lack of specific news sources representing the communities and stakeholders within the DEID GSA boundary, the GSA will be responsive to any requests received from media outlets regarding GSP and SGMA implementation.
- DEID GSA has partnered with Self-Help Enterprises in administering the DEID GSA Mitigation Program. This partnership also provides opportunities for resource sharing amongst the two parties, including outreach support and guidance from Self-Help Enterprises which has established a uniquely trusted role with underrepresented communities across the San Joaquin Valley. These services include translation services, outreach and engagement support, and guidance on effective outreach.

Section 2 Basin Setting

Table of Contents

List of Figures

List of Tables

Subsection 2.1 Introduction *[23 CCR § 354.12]*

23 Cal. Code Regs. § 354.12 Introduction to Basin Setting. *This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.*

The Basin Setting for the DEID GSA is primarily derived from the Tule Subbasin Setting, which was developed for the Tule Subbasin by Thomas Harder & Company (TH&Co) (**Appendix A-2**[1]). Additional work prepared by INTERA Incorporated (INTERA) provides GSA-specific information for (1) the hydrogeological conceptual model (**Subsection 2.2**), (2) further evaluation of groundwater conditions (**Subsection 2.3**), and (3) the water budget (**Subsection 2.4**). This section of the GSP describes information about the physical setting and characteristics of the Subbasin, its historical and current conditions by providing reference to the Tule Subbasin Setting, and when necessary, provides additional information specific to the DEID GSA. This section of the GSP also describes and quantifies the historical and projected surface and groundwater water budget components for the DEID GSA. Since the publication of the Tule Subbasin Setting in 2022, DEID GSA has modified its basin boundary to exclude the Western Management Area (WMA) (DEID GSA, 2023). Therefore, the quantities provided in the 2022 version of the Tule Subbasin Setting for the DEID GSA water budget components required an update to calculate volumes without the WMA, which are provided in Appendix M of this GSP. The Appendix M water budget components are based on the same approach, source data, and numerical model that was used for the 2022 Tule Subbasin Setting. DEID GSA recognizes that an updated draft version of the Tule Subbasin Setting is ongoing; however, significant changes have been made to the model and water budgets, including the sustainable yield estimate, which DEID GSA has not had sufficient time to review and incorporate into this GSP. DEID GSA is actively collaborating with all the GSAs in the Tule Subbasin to further update and refine the Basin Setting. Nonetheless, the current understanding of the Basin Setting is based on the most recent (2022) version of the Subbasin Coordination Agreement (**Appendix A**), which was jointly adopted by all Tule Subbasin GSAs and is sufficient for DEID GSA to develop and implement this GSP.

DEID GSA's particular jurisdictional setting within the Tule Subbasin and its Plan Area is described in **Subsection 1.4.** The DEID GSA is located in the south-central portion of the Tule Subbasin (DWR, Basin 5-22.13). The DEID GSA is comprised of approximately 57,600 acres or approximately 12 percent of the Tule Subbasin area. DEID GSA is bordered to the north by the Pixley Irrigation District GSA, to the east by the Eastern Tule GSA and Kern-Tulare GSA, to the west by the Tri-County Water Authority GSA and to the south by the Kern County Subbasin (DWR Basin 5-022.14).

[1] The *Tule Subbasin Setting* is referenced as Appendix A-2 hereafter.

Subsection 2.2 Hydrogeologic Conceptual Model *[23 CCR § 354.14(a)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. **(a)** *Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.*

The Hydrogeologic Conceptual Model (HCM) for the Tule Subbasin is provided in Chapter 2.1: Hydrogeologic Conceptual Model of the Tule Subbasin Setting (**Appendix A-2**).

The regulatory requirements provided in 23 CCR § 354.14 are addressed and fulfilled by the HCM described in Chapter 2.1 of the Tule Subbasin Setting (**Appendix A-2**).

Table 2-1 links the requirements of 23 CCR § 354.14 to the sections in the Tule Subbasin Setting and the sections of this GSP that apply to and fulfill each regulatory component.

Table 2-1: Components of CCR 354.14

23 CCR	Section Title	Tule Subbasin Setting	DEID GSA GSP
N/A	Sources of Data	2.1.1	n/a
§ 354.14 (b)(1) & (c)	Geologic Setting	2.1.2	2.2.1
§ 354.14 (b)(2)	Lateral Basin Boundaries	2.1.3	2.2.2
§ 354.14 (b)(3)	Bottom of Basin	2.1.4	2.2.3
§ 354.14 (d)(5)	Surface Water Features	2.1.5	2.2.4
§ 354.14 (d)(6)	Imported Water	2.1.5.6	2.2.4.6
§ 354.14 (d)(4)	Areas of Groundwater Recharge and Discharge	2.1.6	2.2.5
§ 354.14 (b)(4)	Principle Aquifers and Aquitards	2.1.7	2.2.6
§ 354.14 (b)(4)(A)	Aquifer Formations	2.1.7.1	2.2.6.1
§ 354.14 (b)(4)(B)	Aquifer Physical Properties	2.1.7.2	2.2.6.2
§ 354.14 (b)(4)(C)	Geologic Structures that Affect Groundwater Flow	2.1.7.3	2.2.6.3
§ 354.14 (b)(4)(D)	Aquifer Water Quality	2.1.7.4	2.2.6.4
§ 354.14 (b)(4)(E)	Aquifer Primary Uses	2.1.7.5	2.2.6.5
§ 354.14 (b)(5)	Uncertainty in the Hydrogeologic Conceptual Model	2.1.8	2.2.7

The HCM provides the framework for the development of water budgets, analytical and numerical models, and monitoring networks. Additionally, the HCM serves as a tool for stakeholder outreach and communication and assists with the identification of data gaps. The HCM does not compute specific quantities of water flowing through or moving into or out of the DEID GSA but rather provides a general understanding of the physical setting, characteristics, and processes that govern groundwater occurrence and movement. The parameters of the HCM developed for the DEID GSA are depicted on **Figure 2-1.** These parameters include DEID GSA jurisdictional boundaries, stratigraphy, surface water bodies, distribution pipelines, and the general processes that contribute to recharge and discharge to/from the DEID GSA. Excerpts and brief summaries of the HCM information described in the Tule Subbasin Setting, as well as brief descriptions of the physical and hydrogeological components of the HCM present within the DEID GSA, are provided on the following pages.

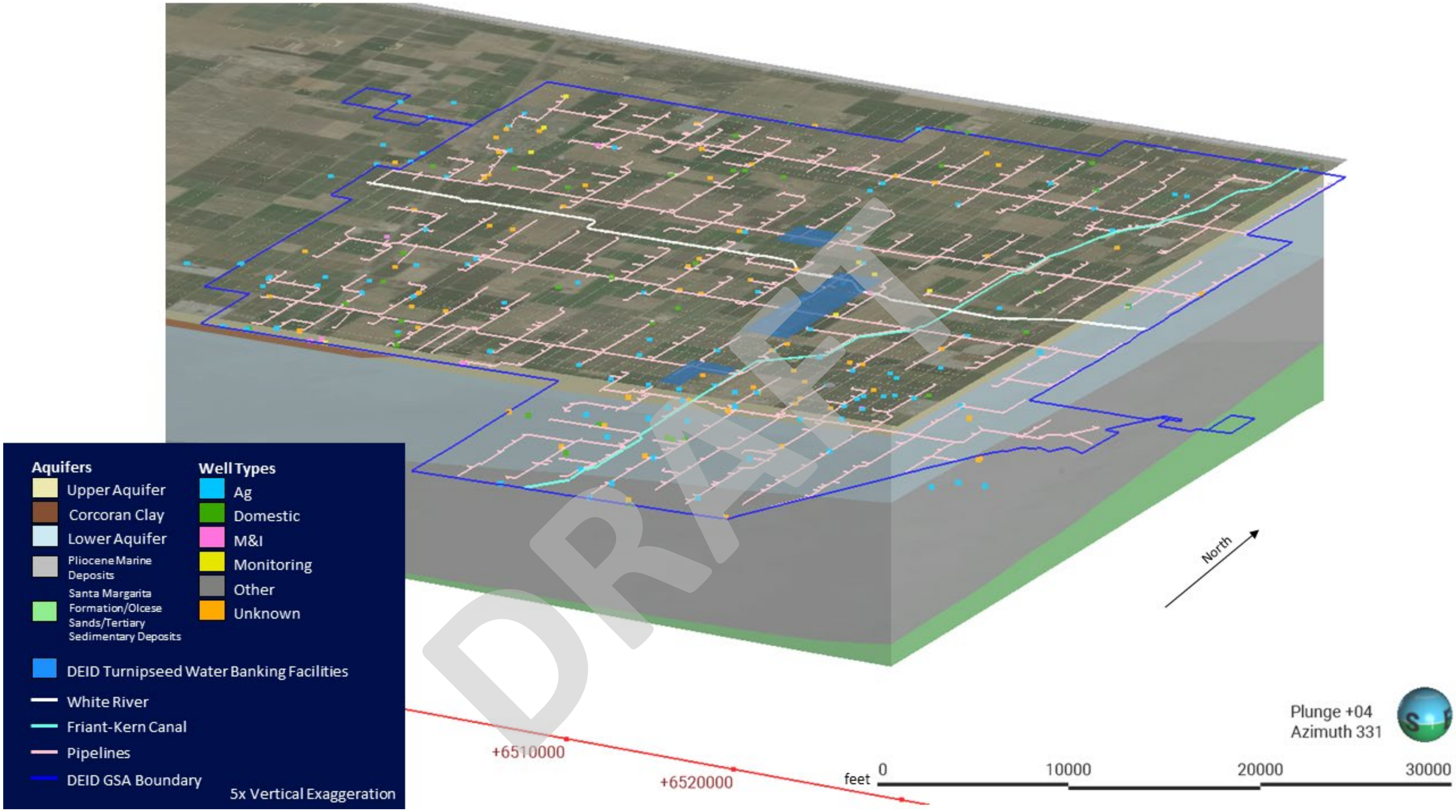


Figure 2-1 Hydrogeologic Conceptual Model

Subsection 2.2.1 Geologic Setting *[23 CCR § 354.14(b)(1) & (c)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(1) *The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.*

(c) *The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.*

(d) *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*

(1) *Topographic information derived from the U.S. Geological Survey or another reliable source.*

(2) *Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.*

(3) *Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.*

DEID GSA is located in the south-central portion of the Tule Subbasin within the Tulare Lake Hydrologic Region (see Figure 2-1 and Figure 2-3 in **Appendix A-2**).

The Tule Subbasin is located on a series of coalescing alluvial fans that extend toward the center of the of the Subbasin (**Figure**). Land surface elevations for the DEID GSA range from 500 ft above mean sea level (amsl) along the eastern boundary of the GSA to 250 ft amsl at the western edge of the GSA. The DEID GSA geologic conditions are characterized by thick sequences of unconsolidated sediments, eroded from the surrounding mountains. The sedimentary deposits are interfingered with fine-grained units that can act as local confining or semi-confining units. The Corcoran Clay is a relatively shallow (approximately 200-300 ft bgs), regional fine-grained deposit that extends across the majority of the San Joaquin Valley, separating the groundwater into upper and lower aquifers, and covers approximately half of the DEID GSA area.

Six cross sections are used to describe the geologic features within the Tule Subbasin (see **Figure**). Of these six cross sections, two occur within the DEID GSA as follows: B-B' east, C-C' south (see dashed lines on **Figure**). Cross-section B-B' is provided below as **Figure 2-3**, and cross-section C-C' is included as **Appendix H**. By examination of the cross-sections, four of the five geologic formations observed within the Subbasin occur within the DEID GSA or along the GSA's boundary. These formations, described in more detail in the Tule Subbasin Setting (**Appendix A-2**), include:

- Unconsolidated Continental Deposits
- Pliocene Marine Deposits; and
- Santa Margarita Formation
- Tertiary Sedimentary Deposits/Olcese Sands
- Granitic Crystalline Basement (absent).

Soil characteristics of the Subbasin are shown in Figure 2-8 of the Tule Subbasin Setting (**Appendix A-2**). From visual examination of Figure 2-8, DEID GSA soil is a mixture of:

- Centerville Clay;
- Exeter loam;

- Nord fine loam;
- Honcut sandy loam; and
- Yettem sandy loam

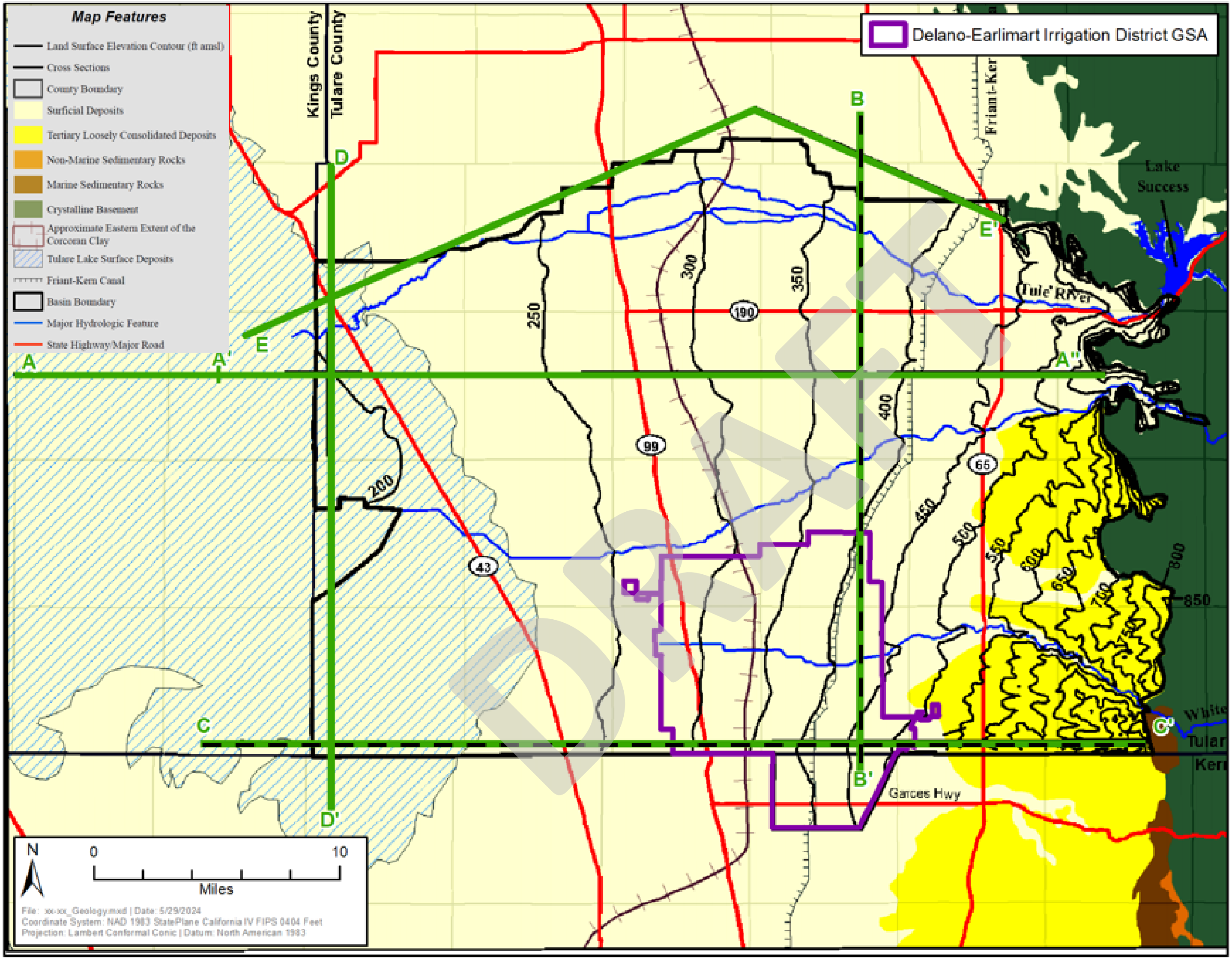


Figure 2-2 Geology and Cross Section Locations

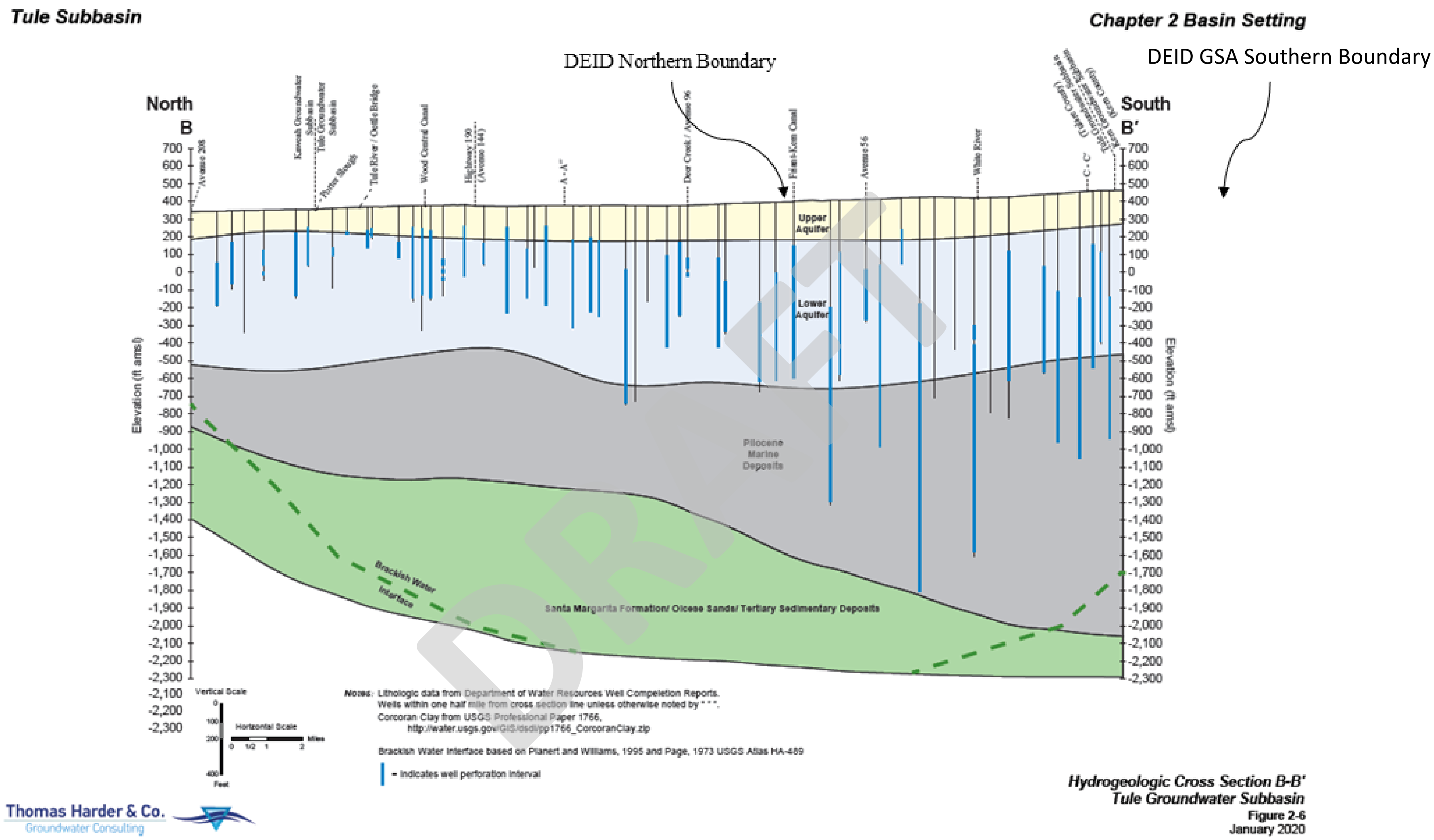


Figure 2-3 Cross Section B–B'

Subsection 2.2.2 Lateral Basin Boundary [23 CCR § 354.14 (b)(2)]

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(2) The lateral basin boundary.

The lateral Basin Boundaries for the Tule Subbasin are defined in DWR Bulletin 118 (DWR, 2016) and include both natural and political boundaries. Chapter 2.1.3 of the Tule Subbasin Setting (**Appendix A-2**), provides a detailed description of the lateral boundaries of the Subbasin.

The western portion of the DEID GSA is defined by the political boundaries of the Tri-County Water Authority GSA (see **Figure 1-2**). The northern portion is defined by the political boundary of Pixley Irrigation District and the Saucelito Irrigation District[2]. The southern boundary is defined by the political boundaries of the Southern San Joaquin Municipal Utility District and the Kern Subbasin. The eastern boundary of the GSA is generally defined by political boundaries of the Kern-Tulare Water District and the Eastern Tule GSA.

Subsection 2.2.3 Bottom of Basin *[23 CCR § 354.14 (b)(3)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(3) *The definable bottom of the basin.*

The definable bottom of the Tule Subbasin is described in the Tule Subbasin Setting, Chapter 2.1.4 of **Appendix A-2**.

The bottom of the basin beneath the DEID GSA is estimated to be greater than 3,000 ft below ground surface (bgs) and is defined by the interface between the Santa Margarita Formation and the relatively impermeable granitic bedrock (see **Figure** and **Appendix H**). The fresh water/brackish water interface may occur at depths less than 2,000 ft bgs in portions of the GSA and extends to a depth greater than 2,500 ft bgs in the eastern portion of the GSA (Page, 1973; Planert and Williams, 1995). The bottom of the effective groundwater basin within the DEID area, based on the fresh water/brackish water interface, is shown in the cross section on Figure 2-3, and **Appendix H**.

Subsection 2.2.4 Surface Water Features *[23 CCR § 354.14 (d)(5)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(5) *Surface water bodies that are significant to the management of the basin.*

The natural water ways within the Tule Subbasin consist of Tule River, Deer Creek, and White River. These systems form in the Sierra Nevada Mountains east of the Tule Subbasin and flow westerly toward

[2] Saucelito Irrigation District was formed on July 29, 1941, under the Irrigation District Act with a current size of 19,737 acres. The district has a contract with the Bureau of Reclamation for 21,200 acre-ft of Class 1 water and 32,800 acre-ft of Class 2 water. The district is a member of the Eastern Tule GSA.

the lakebed of the historic Tulare Lake. The White River is oriented east-west across the DEID GSA and intermittently flows during wet years. Each of the major surface water features of the Tule Subbasin are described in further detail in Chapter 2.1.5 of the Tule Subbasin Setting (**Appendix A-2**) and those occurring within DEID GSA are the White River and the FKC.

Imported water from the FKC is distributed within DEID GSA using a pipeline distribution system and the White River channel. DEID's distribution system covers all of the DEID GSA area (**Figure 1-8**). Imported surface water is conveyed in the White River channel to the recharge basins that comprise DEID's Turnipseed Recharge Facilities as supply is available.

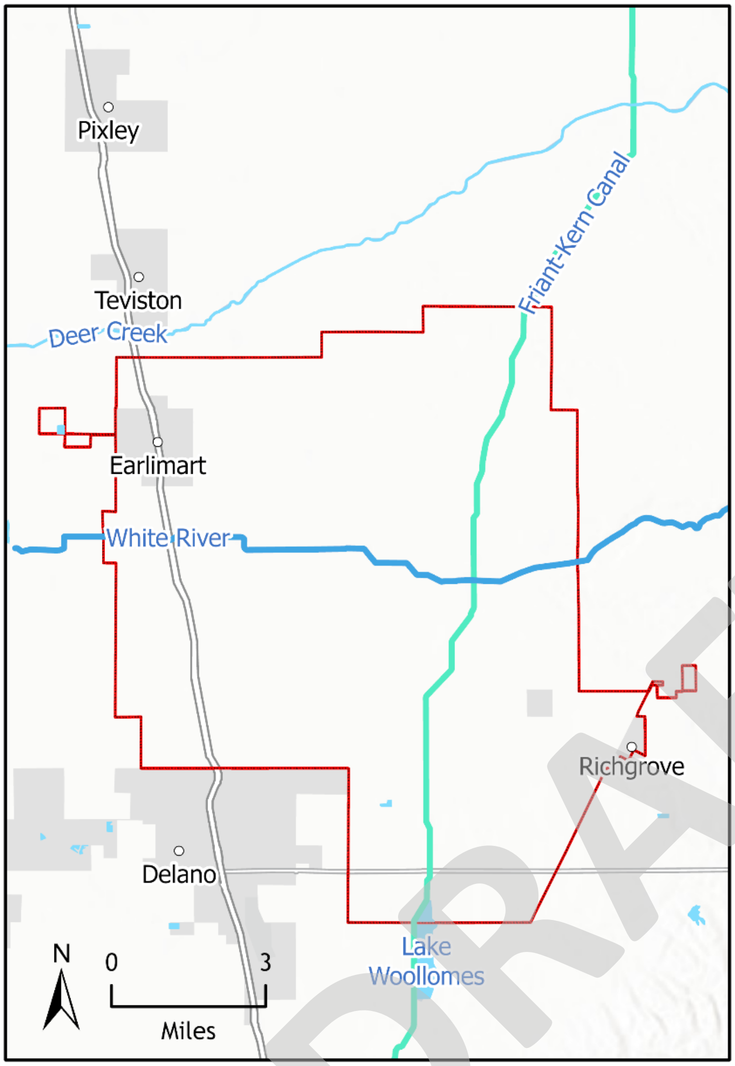


Figure 2-4 Surface Water Features in DEID GSA

Subsection 2.2.4.1 White River

As described in Tule Subbasin Setting Chapter 2.1.5.5 (**Appendix A-2**), stream flow in the White River has been measured at the U.S. Geological Survey (USGS) gaging station near Ducor (outside of the DEID GSA area) from 1972-2005. Data after 2005 have been interpolated. Average annual flow from water year 1986/1987 to 2016/2017 was approximately 5,800 acre-ft/year, with a low of approximately 250 acre-ft in water year 2014/2015 and a high of approximately 37,000 acre-ft in water year 1997/1998. The White River channel extends as far as State Highway 99 but does not reach the historic Tulare Lakebed. DEID manages direct groundwater recharge during surplus water years through recharge operations within the White River channel at a small 5-acre recharge basin near the DEID headquarters and at a dedicated groundwater banking project within the DEID GSA as previously described in **Section 1.4.3**. The Turnipseed Water Banking Facilities are designed to recharge imported water, which is delivered from the FKC via the White River channel and DEID's pipeline distribution system. A map of the Friant-Kern Canal and the White River is present in **Figure 2-4**.

Subsection 2.2.4.2 Imported Water [23 CCR §354.14(d)(6)]

> **23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b)** *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
>
> **(6)** *The source and point of delivery for imported water supplies.*

Tule Subbasin Setting Chapter 2.1.5.6 (**Appendix A-2**) describes imported water sources for the Tule Subbasin. DEID imports water from the Friant Division of the CVP through nine separate points of diversion on the FKC. DEID distributes water to over 450 growers exclusively via pipeline distribution systems (**Figure 1-8**). DEID is the largest Class 1 Friant contractor, with a contract for 108,800 acre-ft of Class 1 water and 74,500 acre-ft of Class 2 water (Bureau of Reclamation, Contract number I75r-3327D). Additionally, DEID's CVP contract provides opportunity to access other water supplies that, depending on hydrologic conditions, may be made available to it, including flood waters, unreleased restoration flows, Section 215 water, and recaptured/recirculated water. Other non-CVP water supplies are also accessible on an opportunistic basis. From 1986 to 2023, DEID imported a total of 4.0 million acre-ft of water or on average 105,000 acre-ft/year. Since 1950, cumulative imported water is calculated to be more than 8.5 million acre-ft.

When taking into consideration all available water to the DEID MA during the period of 1987-2023, which includes imported surface water used for irrigation and in-District recharge, precipitation, and sustainable yield, the amount of water available on an average annual basis was 154,842 acre-feet. Over the same 37-year period, the average annual consumptive demand of the District was 135,690 acre-feet per year. Comparing these values yields an average net surplus of 19,152 acre-feet per year, indicating that DEID MA has been, on average, a net contributor of imported water to the Subbasin.

DEID conducts direct groundwater recharge through recharge operations within the White River channel and groundwater baking operations within the Turnipseed Water Bank (**Figure 1-8**). Additional information regarding imported water to DEID is provided in **Section 1.4.3**.

Subsection 2.2.5 Areas of Groundwater Recharge and Discharge *[23 CCR § 354.14(d)(4)]*

> **23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (d)** *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*
>
> **(4)** *Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

Groundwater recharge occurs throughout the Tule Subbasin within stream channels, unlined canals, in managed recharge basins, and in areas of the Subbasin with irrigated agriculture. All these types of features occur within the DEID GSA except for unlined canals. Imported water distribution within the DEID GSA occurs through DEID's pipeline distribution system. According to the Soil Agricultural Groundwater Banking Index (SAGBI) (see Figure 2-9 in **Appendix A-2**), areas generally suitable for recharge within the DEID GSA occur along the stream channels and floodplains of the White River. DEID directly recharges local and imported water at its Turnipseed Water Banking Facilities (see

Section 1.4.3). **Figure 1-8** displays the locations of existing and planned groundwater recharge basins. Although there are recharge basins located in areas designated as "poor" SAGBI index, DEID has measured sustained recharge rates of 0.4 to 0.7 ft/day (pers. comm. with DEID, 2024).

Because groundwater is deep, there are no springs, seeps, wetlands, or interconnected surface water within or adjacent to the DEID GSA. See Tule Subbasin Setting Chapter 2.1.6 (**Appendix A-2**) for additional information regarding areas of groundwater recharge and discharge within the Tule Subbasin.

Subsection 2.2.6 Principal Aquifers and Aquitards

Subsection 2.2.6.1 Aquifer Formations *[23 CCR § 354.14(b)(4)(A)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (d) *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*

(4) *Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(A) *Formation names, if defined.*

Of the five-general aquifer/aquitard units described to be present in the subsurface beneath the Tule Subbasin, all five occur within the subsurface of the DEID GSA area (see **Figure** and **Appendix A-2***)*:

1. Upper Aquifer;
2. The Corcoran Clay Confining Layer;
3. Lower Aquifer;
4. Pliocene Marine Deposits (generally considered an aquitard); and
5. Santa Margarita Formation and Olcese Sands/Tertiary Sedimentary Deposits.

The upper aquifer is present beneath the entire DEID GSA area and is generally unconfined to semi-confined. The upper aquifer occurs in the upper 450 ft of sediments on the western side of the DEID area and shallows to the east to approximately 250 ft along DEID's eastern boundary. The Corcoran Clay confining unit occurs beneath the upper aquifer in the western portions of the DEID area. The Corcoran Clay thins to the east, pinching out approximately 2 to 3 miles east of State Highway 99. The lower aquifer is conceptualized as semi-confined generally to the east of Highway 99 and confined by the Corcoran clay layer generally to the west of the Highway (Cross-Section C-C,' presented as **Appendix H**). The depth to the top of the lower aquifer is approximately 250 ft bgs in the eastern portion of the GSA and deepens to approximately 350 ft toward the western edge of the GSA boundary, where the base of the Corcoran Clay defines the top of the lower aquifer. In the eastern region of the GSA, the lower aquifer system is separated from the underlying Santa Margarita Formation and the Olcese Formation by a thick layer (approximately 500 to 1,600 ft) of Pliocene marine deposits. These deposits are conceptualized as a confining unit that separates the lower aquifer from the Santa Margarita Formation Aquifer and the Olcese Sands/Tertiary Sedimentary Deposits. The Santa Margarita Formation and Olcese Sands/Tertiary Sedimentary Deposits form a localized aquifer in the southeastern portion of the Tule Subbasin but are typically not targeted within the DEID area because this formation is at depths greater than approximately 2,000 feet. The formations and their occurrence are described in Chapter 2.1.7.1. of the Tule Subbasin Setting (**Appendix A-2**).

Subsection 2.2.6.2 Aquifer Physical Properties *[23 CCR § 354.14(b)(4)(B)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(4) *Principal aquifers and aquitards, including the following information:*

(B) *Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.*

The principal water-bearing aquifers of the Tule Subbasin (i.e., Upper and Lower Aquifers) consist of permeable sand and gravel layers, interbedded with low-permeability silt and clay lenses. Shallower saturated sediments are generally unconfined to semi-confined, whereas aquifers beneath the Corcoran Clay (i.e., Lower Aquifer) in the western portion of the basin are confined. The relatively permeable Santa Margarita Formation and Olcese Sands aquifers are conceptualized to be separated from the Lower aquifer underlying the confining Pliocene marine deposits and are present in the extreme eastern areas of the DEID GSA. **Appendix A-2** provides additional descriptions of the physical properties of the principal aquifers.

The ability of aquifer sediments to transmit and store water is described in terms of transmissivity, hydraulic conductivity, specific yield, and storativity. The quantitative values for each of these parameters (for both the upper aquifer and lower aquifer) and the process by which these values were developed or derived are discussed in Chapter 2.1.7.2 and Figures 2-10 through 2-11 of the Tule Subbasin Setting (**Appendix A-2**). Aquifer parameters were developed and assigned using short-term aquifer tests, long-term aquifer tests (24 hours or more at a constant rate), and values published in the literature.

<u>Transmissivity/Hydraulic Conductivity</u>

The description of transmissivity is provided in Chapter 2.1.7.2 of the Tule Subbasin Setting (**Appendix A-2**).

Horizontal hydraulic conductivity for the upper aquifer within the DEID GSA ranges from 20 to 40 feet per day (ft/day) (see Figure 2-10 of Tule Subbasin Setting [**Appendix A-2**]). The higher values in the eastern portion of the GSA indicate more permeable sediments, and the lower values in the western portion of the GSA indicate less permeable sediments. Horizontal hydraulic conductivity values in the lower aquifer within the DEID GSA range from less than 5 ft/day to 80–100 ft/day (see Figure 2-11, Tule Subbasin Setting, **Appendix A-2**).

<u>Specific Yield/Storativity</u>

Chapter 2.1.7.2 of the Tule Subbasin Setting (**Appendix A-2**) describes the storage properties of the Tule Subbasin's upper aquifer in terms of specific yield.

Specific yield values range from approximately 0.05 to 0.25 in the upper aquifer within the DEID GSA (see Figure 2-12; Tule Subbasin Setting, **Appendix A-2**). Areas of higher specific yield occur around the areas east of Highway 99 in the GSA, and areas of low specific yield are more common in the areas west of Highway 99 in the GSA.

In the Subbasin's lower aquifer, Chapter 2.1.7.2 of **Appendix A-2** describes specific yield in terms of storativity.

Figure 2-13 of **Appendix A-2** indicates that specific yield applies to areas of the Subbasin that are unconfined in the upper aquifer (generally occurring in the east side of the Subbasin), and storativity is the measure used for the lower aquifer under confined conditions. In unconfined conditions, the specific yield values of the lower aquifer range from 0.05 to 0.25 within the DEID GSA. Areas of higher specific yield are prevalent in the eastern parts of the GSA around the White River. In confined conditions, storativity values for the lower aquifer underlying DEID GSA range from 1.5e-04 to 5.7e-04, generally increasing from east to west.

Subsection 2.2.6.3 Geologic Structures that Affect Groundwater Flow *[23 CCR § 354.14(b)(4)(C)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(4) *Principal aquifers and aquitards, including the following information:*

(C) *Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features*

Chapter 2.1.7.3 of the Tule Subbasin Setting (**Appendix A-2**) provides a description of features throughout the entire Subbasin that affect groundwater flow. There are no significant faults mapped within the Tule Subbasin that would affect groundwater flow. The Corcoran Clay is the most significant feature to affect groundwater flow in the Subbasin. The Corcoran Clay and associated clay lenses act as a confining unit that separates the upper aquifer from the lower aquifer where present in the western portion of the DEID GSA area. In addition, there may be communication between the upper and lower aquifers in areas where composite wells perforate both aquifer systems; such wells may also facilitate recharge of the deep aquifer from the shallow aquifer. The Pliocene marine deposits are conceptualized as a confining unit that separates the deep alluvial aquifer from the Santa Margarita Formation aquifer and the Olcese Sands/Tertiary Sedimentary Deposits.

Subsection 2.2.6.4 Groundwater Quality *[23 CCR § 354.14(b)(4)(D)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(4) *Principal aquifers and aquitards, including the following information:*

(D) *General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.*

Groundwater quality varies across the DEID GSA and with depth in the aquifer system. The native groundwater quality is generally considered good with respect to electrical conductivity (EC) and total dissolved solids (TDS) concentrations, with groundwater quality issues stemming from both anthropogenic and natural contamination as detailed in **Section 2.3.4** Groundwater Quality Issues.

Concentrations for EC in the DEID GSA are low with concentrations in the upper aquifer to the fresh water/brackish water interface, typically ranging from 180 to 500 micromhos per centimeter (µmho/cm) (see Figure 2-14, Tule Subbasin Setting, **Appendix A-2**). The altitude of the fresh water/brackish water interface is approximately 1,600 ft below mean sea level (bmsl) as defined by EC concentrations exceeding 3,000 µmoh/cm (Page, 1973). While the depth to the fresh water/brackish water interface varies spatially in the DEID GSA, it likely ranges from less than 2,000 ft bgs to greater than 2,500 ft bgs (Page, 1973). TDS concentrations in the DEID GSA for samples collected post-2010 range from 210 to 590 mg/L[3] (**Figure 2-5**). TDS concentrations are generally below the recommend California secondary maximum contaminant level (MCL) of 500 mg/L except for ten wells sampled along the southern portion of the DEID GSA with detections above the recommend MCL but below the upper California secondary MCL of 1,000 mg/L.

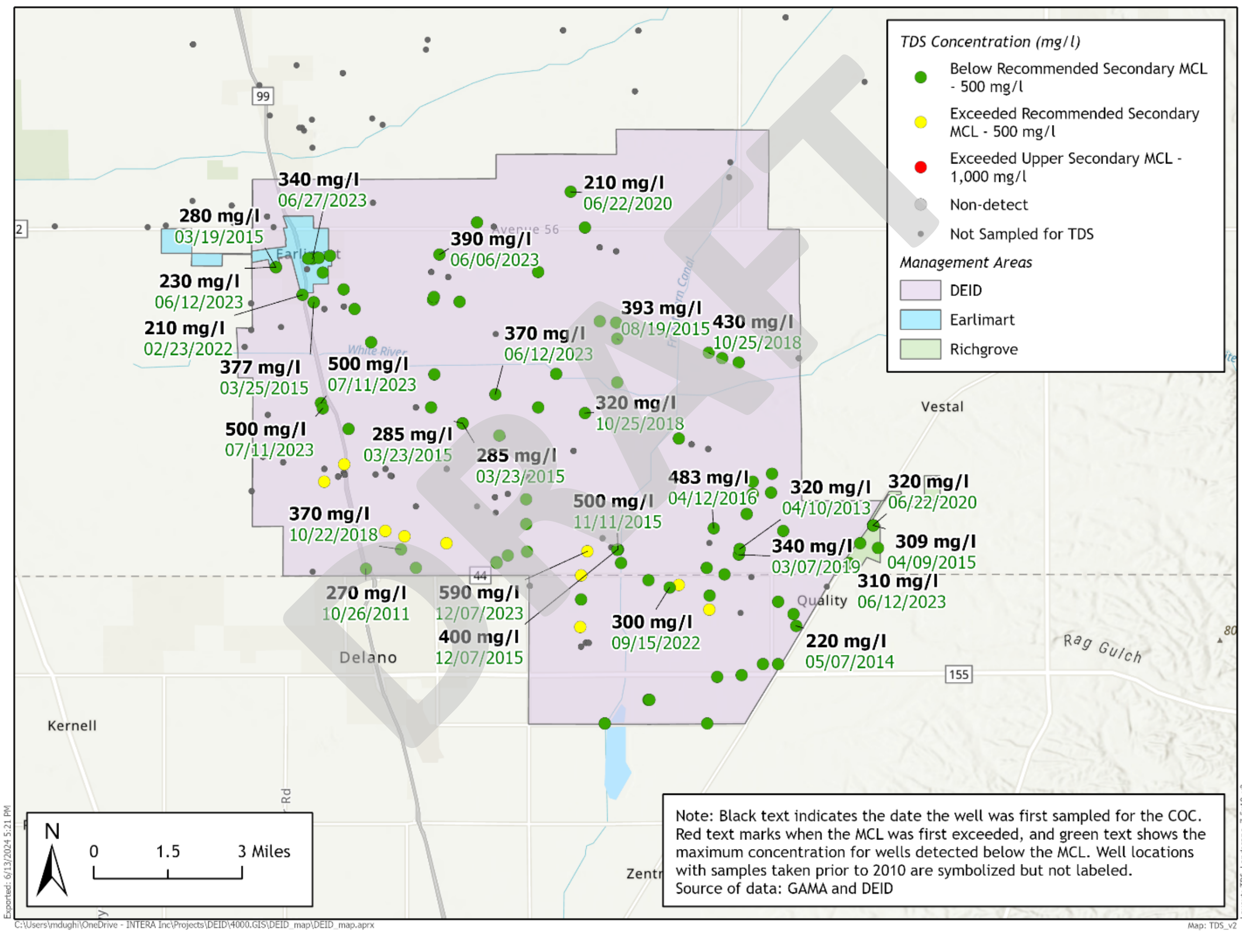


Figure 2-5 Total Dissolved Solids Groundwater Quality

Information on additional water quality constituents is provided in **Section 2.3.4**.

[3] If we include the entire dataset (the earliest sample taken in 1954), the maximum TDS range from 76 to 2,470 mg/l.

Subsection 2.2.6.5 Aquifer Primary Uses [23 CCR § 354.14(b)(4)(E)]

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(4) *Principal aquifers and aquitards, including the following information:*

(E) *Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.*

Chapter 2.1.7.5 of the Tule Subbasin Setting (**Appendix A-2**) describes the predominant beneficial uses and users of groundwater in the Subbasin as agricultural irrigation, with other beneficial uses including municipal water supply, private domestic water supply, and livestock washing and watering. Both the upper and lower aquifers are used to supply agricultural, municipal, and domestic water supply. The contribution of water from each aquifer is unknown because composite wells extract groundwater from both the upper and lower aquifers and pumping is not metered. Therefore, pumping cannot be assigned to individual wells with known screened interval by aquifer type. Furthermore, the screened intervals for many wells are unknown. Pumping by aquifer type is a recognized data gap in the Tule Subbasin and DEID GSA.

Subsection 1.4.1.4 of this GSP details the primary water use sectors and water source types within the DEID GSA.

Subsection 2.2.7 Uncertainty in the Hydrogeologic Conceptual Model *[23 CCR § 354.14(b)(5)]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(5) *Identification of data gaps and uncertainty within the hydrogeologic conceptual model.*

The primary sources of uncertainty in the hydrogeologic conceptual model are listed in Chapter 2.1.8 of **Appendix A-2** and described as follows:

- Knowledge of the hydraulic interaction between the shallow and deep aquifer
- Lack of aquifer-specific groundwater levels with adequate spatial distribution to enable preparation of representative groundwater level maps of each aquifer in parts of the Subbasin
- Characteristics of the Santa Margarita Formation aquifer and the Olcese Sands/Tertiary Sedimentary Deposits
- Underflow recharge into the alluvial aquifer system from the Sierra Nevada mountain block
- Aquifer characteristics of hydraulic conductivity, transmissivity, and storativity
- Well construction and pumping proportion between the shallow and deep aquifers
- Canal seepage
- Travel time for recharge from the land surface through the unsaturated zone to the groundwater

- Distribution and extent of clay layers in the subsurface within the Subbasin that are susceptible to compaction and resulting land subsidence (additional DEID GSA identified data gap)
- Lack of differentiation among static, recovering, and pumping groundwater levels that may skew analysis of groundwater levels, groundwater flow direction and gradients (additional DEID GSA identified data gap)
- Lack of historical water quality data with adequate sampling frequency to track seasonal and long-term water quality variability and trend (additional DEID GSA identified data gap)

All the uncertainties listed in Chapter 2.1.8 of **Appendix A-2** are applicable to the DEID GSA.

Subsection 2.3 Groundwater Conditions *[23 CCR § 354.16]*

23 Cal. Code Regs. § 354.14 Hydrogeologic Conceptual Model. (b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(5) *Identification of data gaps and uncertainty within the hydrogeologic conceptual model.*

The regulatory requirements outlined in 23 CCR § 354.16 for describing the current and historical groundwater conditions of the Tule Subbasin are addressed and fulfilled throughout Chapter 2.2 (**Appendix A-2**).

Table 2-2 links the requirements of 23 CCR § 354.16 to the sections in the Tule Subbasin Setting (**Appendix A-2)** and the sections of this GSP that apply to and fulfill each regulatory component.

Table 2-2: Components of 23 CCR § 354.16

23 CCR	Section Title	Tule Subbasin Setting	DEID GSA GSP
§ 354.16 (a)	Groundwater Occurrence and Flow	2.2.1	2.3.1
§ 354.16 (b)	Groundwater Storage	2.2.2	2.3.2
§ 354.16 (c)	Seawater Intrusion	2.2.3	2.3.3
§ 354.16 (d)	Groundwater Quality Issues	2.2.4	2.3.4
§ 354.16 (e)	Subsidence	2.2.5	2.3.5
§ 354.16 (f)	Interconnected Surface Water Systems	2.2.6	2.3.6
§ 354.16 (g)	Groundwater Dependent Ecosystems	2.1.7	2.3.7

Excerpts and brief summaries of the groundwater conditions described in the Tule Subbasin Setting (**Appendix A-2**) and brief descriptions of the Subbasin groundwater conditions observed historically or currently within DEID GSA, are provided below.

Subsection 2.3.1 Groundwater Occurrence and Flow *[23 CCR § 354.16 (a)]*

23 Cal. Code Regs. § 354.16 Groundwater Conditions. (a) *Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:*

(1) *Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.*

(2) *Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.*

The groundwater elevation, flow, gradient, and regional pumping patterns in the Tule Subbasin are described in Chapter 2.2.1 of the Tule Subbasin Setting (**Appendix A-2**) and further discussed in this subsection.

Groundwater occurrence and flow in the DEID GSA and Tule Subbasin have been radically altered from pre-development conditions. As previously described in **Section 1.4.3**, overdraft conditions were first identified in the DEID GSA in the 1930s. Prior to the availability of imported water from the FKC, the mean depth to groundwater had fallen every year from 1905 to 1947. Groundwater level measurements for the representative monitoring site well 24S/26E-32G01 demonstrate the general history of the groundwater conditions for the DEID area (see **Figure 2-6**). The lowest historic groundwater elevation within the upper aquifer occurred at well 24S/26E-32G01 in 1947 at 70 ft amsl. Once conjunctive use was implemented by the DEID starting in 1951, groundwater levels increased by 225 ft from 1947-1976. Groundwater level elevations ranged from 228 to 310 ft amsl between 1960 to 2006. From 2006-2016, the groundwater levels declined by 134 ft to a groundwater elevation of 106 ft amsl (36 ft higher than the historic low that occurred in 1947) due to unsustainable groundwater extractions by neighboring pumpers and other GSAs, since DEID had not changed their conjunctive use practices. In Spring 2022, the groundwater elevation at this well was 139 ft amsl, which is approximately 55 ft higher than the historic low. Additional wells within DEID also show historic low water levels in the early 1950s (**Figure 2-6**). Groundwater levels shown in hydrographs in **Figure 2-6** all recovered by 100 to 200 ft or more from the early 1950s through the 1970s, 1980s, and 1990s, depending on location and aquifer in the DEID GSA. These hydrographs demonstrate the successful conjunctive use operations of DEID.

From 1951-1985, DEID imported 4.5 million acre-ft of water and 4.0 million acre-ft of water from 1986-2023 (**Figure 1-9**). Imported water is the primary source of recharge within DEID. Recharge occurs through on-farm recharge from irrigation return flows and groundwater banking. This artificial recharge has resulted in a net positive water balance and a local groundwater mound of stored water within the DEID GSA. Groundwater levels at nested well M-19 in the vicinity of the Turnipseed recharge ponds indicate that the upper aquifer and lower aquifer recover when water is infiltrated at these facilities (**Figure 2-7**).

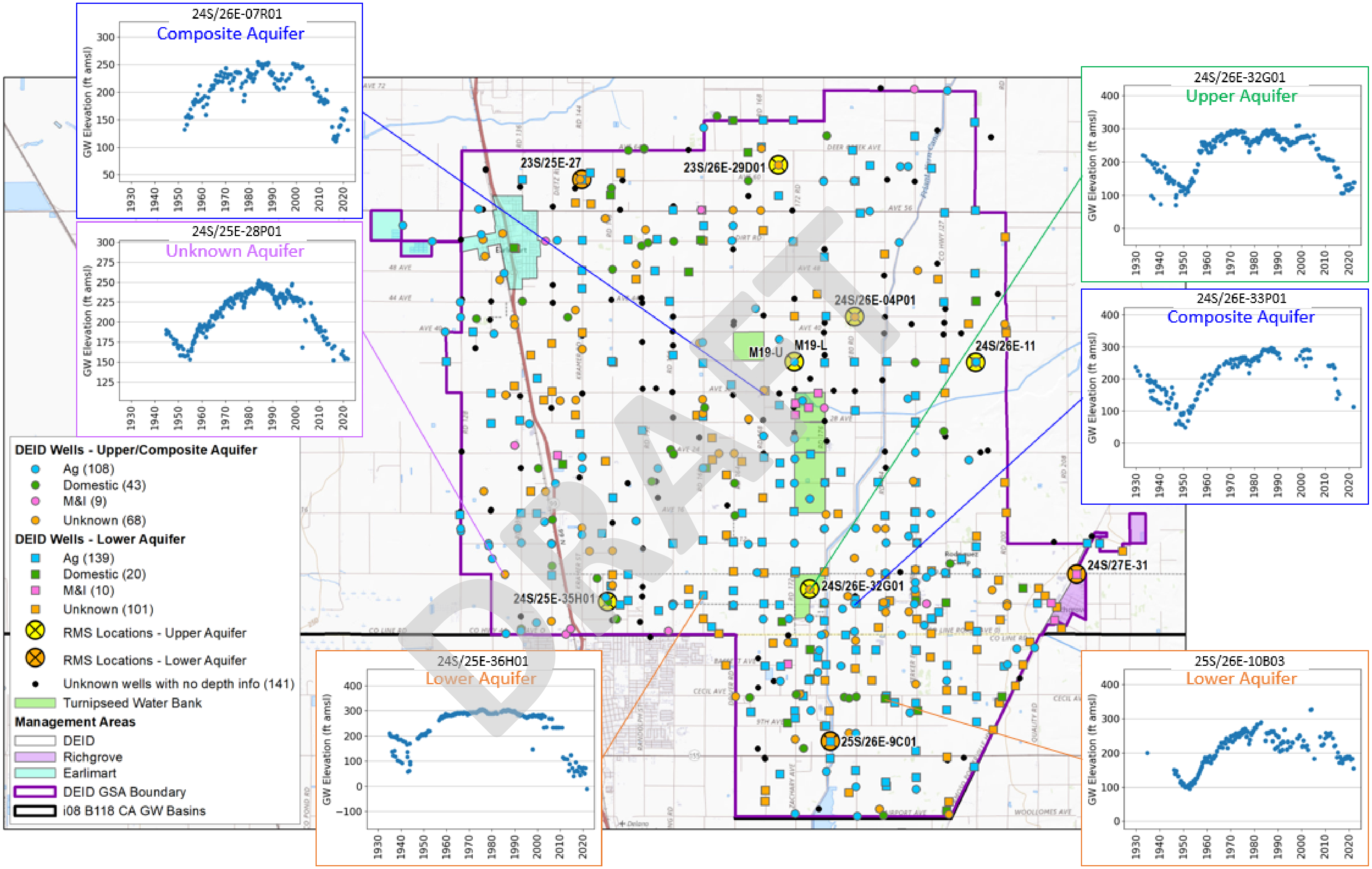


Figure 2-6 Long-term groundwater level hydrographs within the DEID GSA

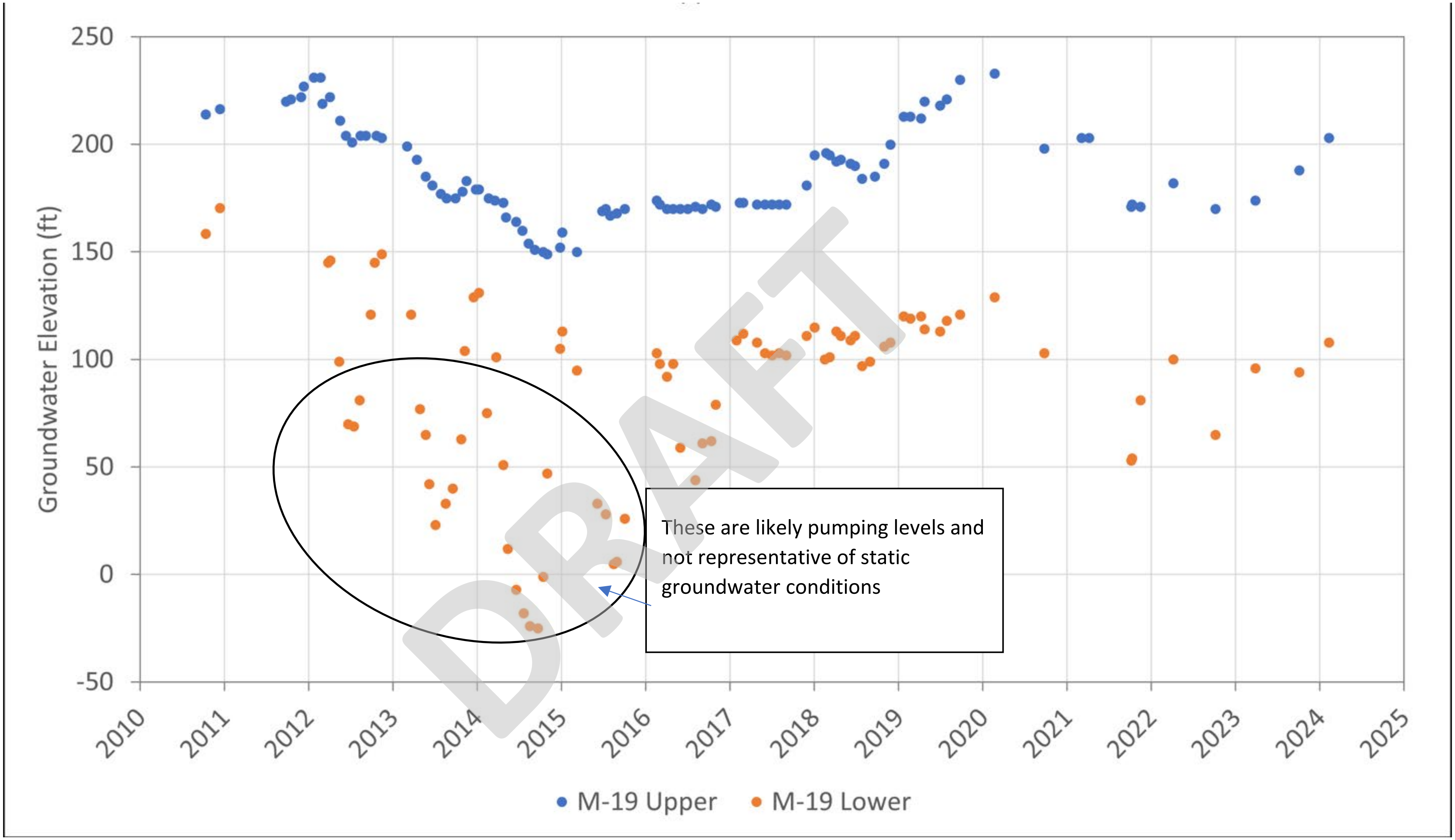


Figure 2-7 Groundwater levels for nested monitoring well M-19 U/L

The Corcoran Clay layer is present underlying western portions of the DEID GSA as previously described and bifurcates the aquifer system into an upper aquifer and lower aquifer. This complicates the development of groundwater level contours and analysis of groundwater flow direction. As previously indicated, there is a lack of aquifer-specific groundwater levels with adequate spatial distribution to enable preparation of representative groundwater level maps of each aquifer in parts of the Subbasin. The groundwater elevation contours provided in Figures 2-17 through 2-20 in **Appendix A-2** were prepared using best available data and generally represent groundwater elevations and groundwater flow directions for the upper and lower aquifers at the Subbasin scale; however, they may not be representative of localized conditions due to lack of well construction information and limited known extent of hydraulic connection in portions of the DEID GSA.

Groundwater elevations and contours within the Tule Subbasin's upper aquifer as of the spring and fall of 2022 are shown in the *Tule Subbasin Setting* (see Figures 2-17 and Figure 2-18 in **Appendix A-2**). Groundwater elevations and contours within the Tule Subbasin's lower aquifer as of the spring and fall of 2022 are shown in Figures 2-19 and 2-20 of the Tule Subbasin Setting (**Appendix A-2**). By examination of these contour maps, groundwater in the DEID GSA is shown to predominantly flow in an east-to-west and northwest fashion from areas of artificial (primary) and natural (minor) recharge. Within the east-central portion of the DEID GSA, there is a groundwater mound of stored imported water resulting from on-farm recharge and direct recharge/banking of significant amounts of imported CVP water by the DEID; a schematic of this stored water is provided in Error! Reference source not found.. Because of DEID's historical conjunctive use and direct recharge efforts in conjunction with overdraft pumping of groundwater outside DEID GSA plan area, post-development conditions have resulted in the upper aquifer flowing west and northwest out of the DEID GSA towards a large groundwater pumping depression in the west-central portion of the Tule Subbasin (see Figures 2-17 and Figure 2-18 in **Appendix A-2**). The lower aquifer also generally flows to the west, northwest, and southwest out of the DEID GSA toward groundwater pumping depressions in the west and central portions of the Tule Subbasin and the northern portion of the Kern Subbasin. These conditions are shown as subsurface outflow in Table 2 of Appendix C of the Tule Subbasin Setting (**Appendix A-2**). Section 2.4.4.3 Subsurface Outflow of **Appendix A-2** provides more details to this condition in DEID GSA.

A more complete dataset of upper aquifer groundwater levels has been compiled for 2023 and shows localized flow direction patterns consistent with DEID's sustainable practices (**Figure 2-8**). The localized groundwater mound of imported surface water resulting from on-farm recharge and direct recharge/banking can be seen in the vicinity of the Turnipseed water bank facilities. Because of DEID's historical conjunctive use and direct recharge efforts juxtaposed by overdraft pumping of groundwater outside DEID GSA plan area, conditions have been altered resulting in flow accelerating to the north and west out of the DEID GSA towards groundwater pumping depressions in the northwest and central portions of the Tule Subbasin. These conditions are shown as subsurface outflow in Table 2 of Appendix C of the Tule Subbasin Setting (**Appendix A-2**). Section 2.4.4.3 Subsurface Outflow of **Appendix A-2** provides more details to this condition in DEID GSA.

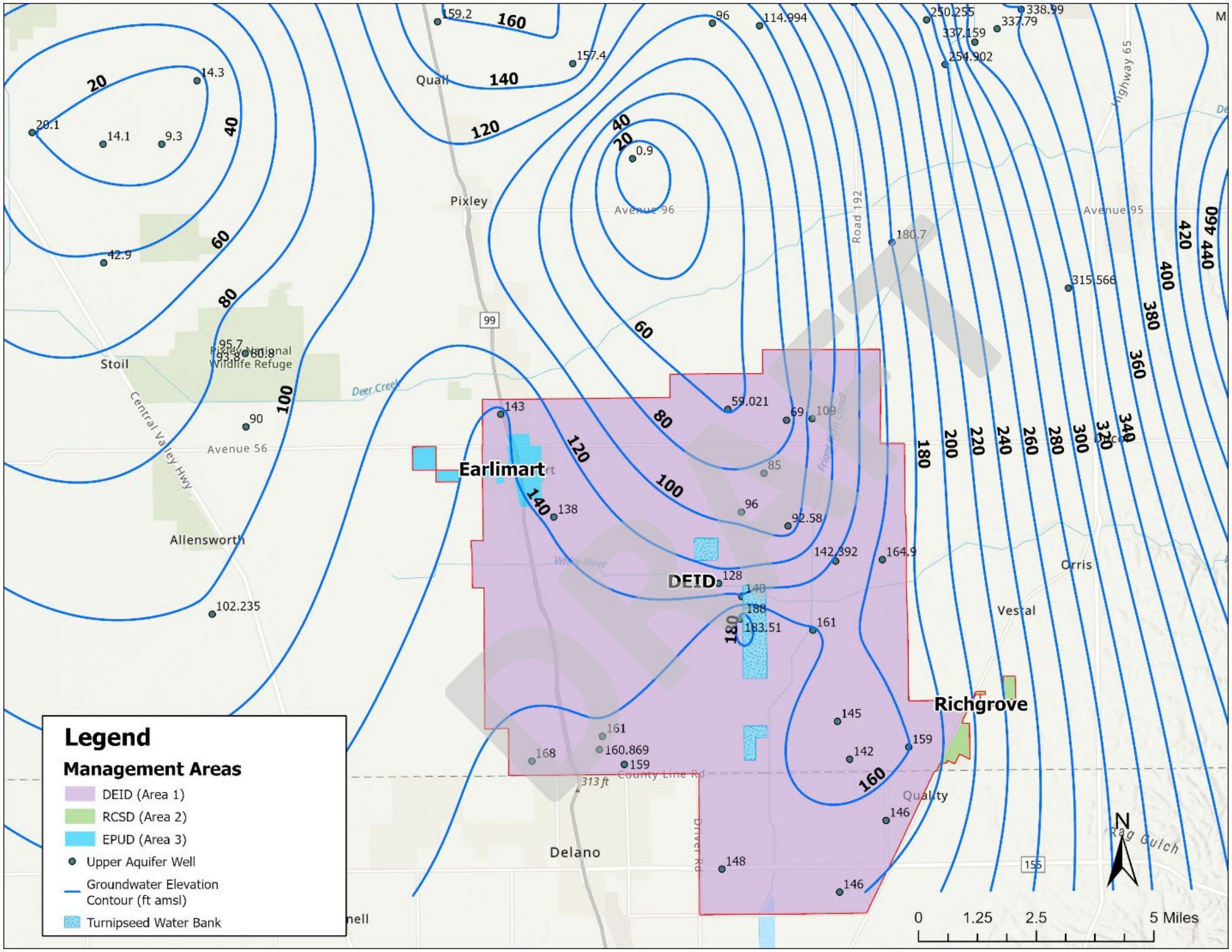


Figure 2-8 Fall 2023 Groundwater Level Contours for the DEID GSA Area

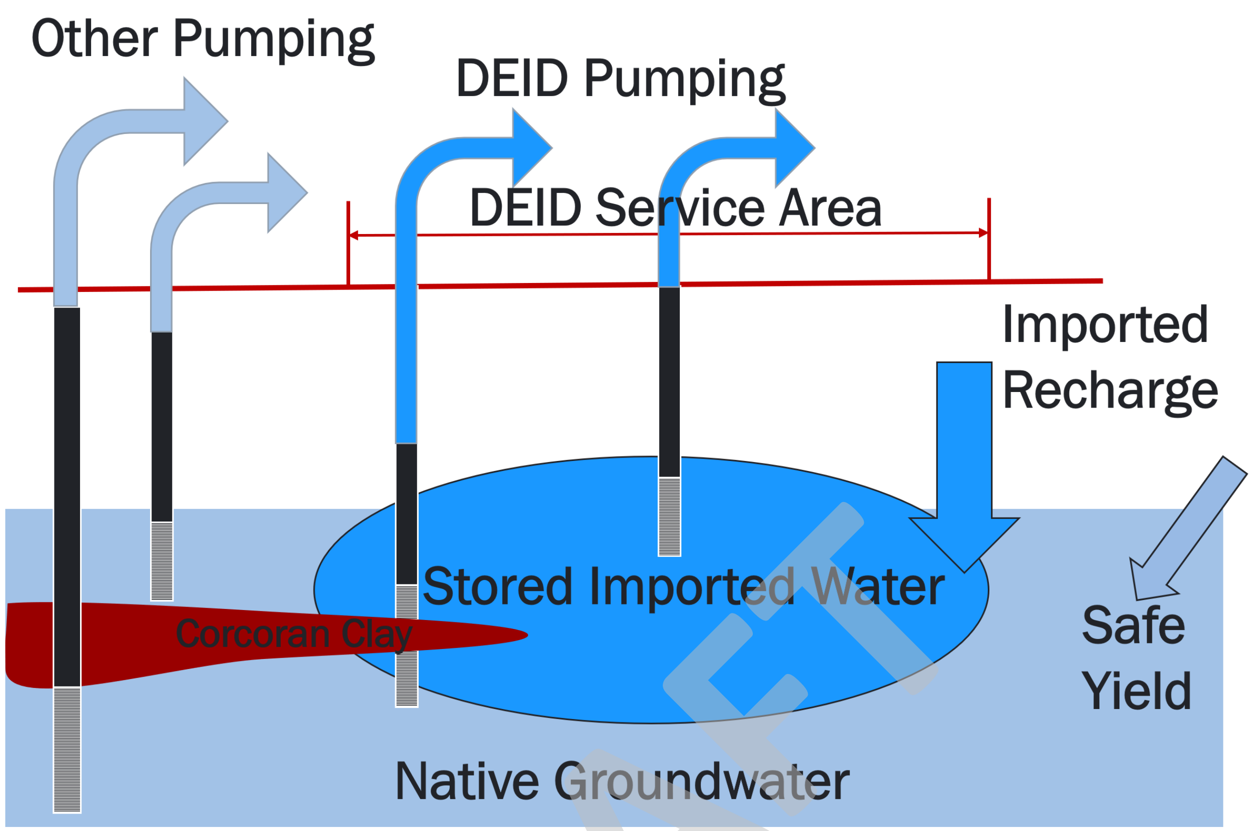


Figure 2-9 Schematic of Stored Groundwater within the DEID

Chapter 2.2.1 in **Appendix A-2** describes historical groundwater level changes with time for the upper and lower aquifers[4]. Groundwater levels in upper aquifer wells indicate a general downward trend between 1987-2022 (see Figure 2-21 in **Appendix A-2**); however, there are wells that have responded to increased recharge in the vicinity of the Tule River (R-11 and C-1) and the DEID recharge facilities (M19-U). In the lower aquifer, a long-term downward trend is apparent in the western portion of the Tule Subbasin; however, within DEID, M19-L shows an increasing trend in the recent years in response to increased recharge at the Turnipseed facility (see Figure 2-22 in **Appendix A-2**). Groundwater levels in the Subbasin are generally higher in the shallow aquifer than in the deep aquifer, indicating a downward hydraulic gradient that may suggest possible recharge to the deep aquifer from the shallow aquifer in some parts of the Subbasin, particularly in areas where the Corcoran Clay is absent or where composite wells perforate both aquifers where the Corcoran Clay is present.

Subsection 2.3.2 Groundwater Storage *[23 CCR § 354.16 (b)]*

23 Cal. Code Regs. § 354.16 Groundwater Conditions. (b) *A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of*

[4] Wells used in the analysis include composite wells screened in the upper and lower aquifers. In addition, the Corcoran Clay layer is not present in the eastern portion of the DEID GSA where the upper and lower aquifers are hydraulically connected.

groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.

Groundwater storage in the Tule Subbasin is described in Chapter 2.2.2 and listed in Table 2-3 in the Tule Subbasin Setting (**Appendix A-2)**. The average annual change in storage for the Tule Subbasin from 1986/1987 to 2016/2017 is estimated to be approximately -160,000 acre-ft/year. The cumulative change in storage for the Tule Subbasin from 1986/1987 to 2016/2017 is -4,948,000 acre-ft. A graph depicting estimates of the change in groundwater in storage for the Tule Subbasin is shown in Figure 2-24 of the Tule Subbasin Setting (**Appendix A-2**).

Groundwater storage for the DEID GSA is evaluated using the same methodology based on the Tule groundwater model developed in the Tule Subbasin Setting (**Appendix A-2**); however, the WMA is removed from the DEID GSA. **Appendix M** presents the groundwater budget components accounting for the removal of the WMA. The average annual change in storage from 1986/1987 to 2016/2017 based on the Tule Subbasin Setting estimation method is estimated to be approximately -42,000 acre-ft/year and the cumulative change in storage is approximately -1,301,400 acre-ft (**Figure 2-10 and Appendix M**). This estimated negative storage is a misleading depiction of the historical groundwater budget for the DEID GSA since it includes subsurface inflow and outflow components. The subsurface outflow is much greater than subsurface inflow due to the unsustainable groundwater management practices of the GSAs surrounding DEID GSA. This average difference between estimated subsurface inflows and outflows to the DEID GSA is -44,000 acre-ft/year, which is 105% of the average net change in storage. The unsustainable pumping in surrounding GSAs creates an accelerated drawdown which induces excessive subsurface outflow from DEID GSA, overwhelming the net positive recharge of stored imported water in the DEID GSA. Therefore, when removing the subsurface inflows and outflows (assuming they are in balance), the estimated average change in storage is approximately 2,000 acre-ft/year and the cumulative change in storage is approximately 61,000 acre-ft.

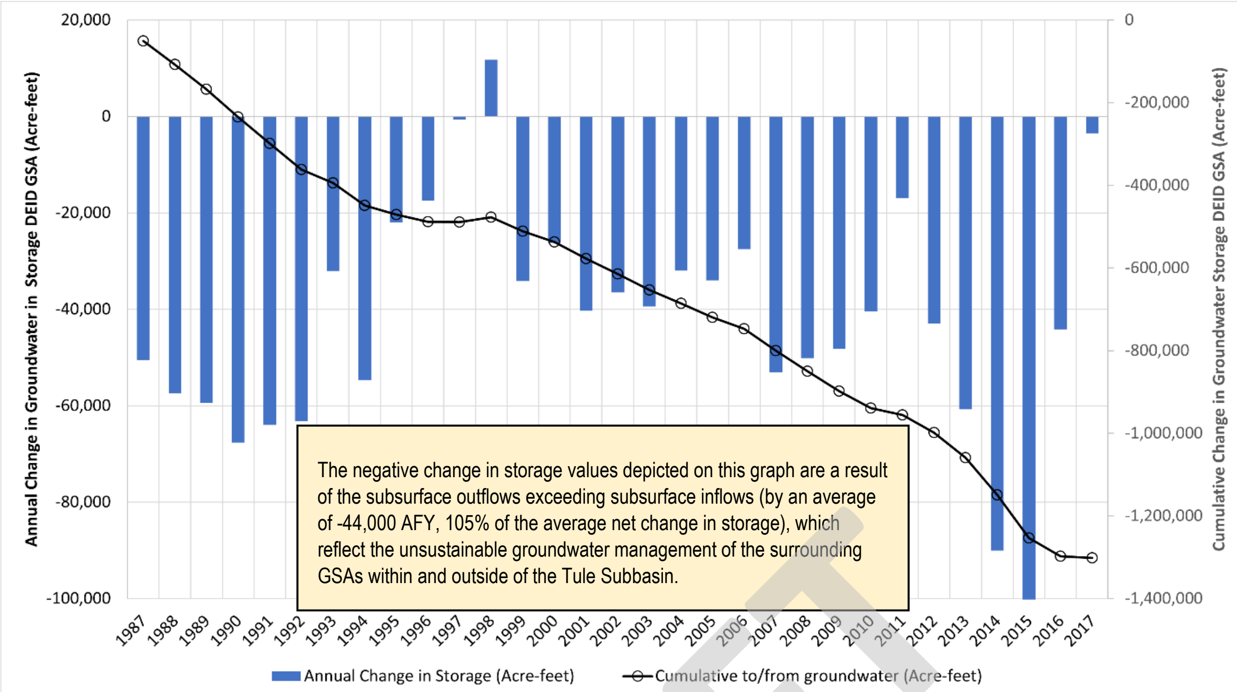


Figure 2-10 Change in Groundwater Storage from 1986/87 to 2016/17 within the DEID[5]

To provide supporting context of the sustainable practices of DIED GSA, alternative assessments of the groundwater budget have been developed independently of the Tule Subbasin Setting methodology. These alternative methods are described in the Water Balance Technical Memorandum included as **Appendix N** in this GSP. One method utilizes the Tule groundwater model results with a hybrid approach which applies an area-weighted native yield of the Tule Subbasin to each GSA instead of the net subsurface inflow/outflow components. Another non-model-based approach is also presented in **Appendix N** by estimating the net deposits of water within the DEID GSA based on imported water deliveries and consumptive use through 2023. These independent analyses are meant to quantify the surplus of groundwater based on DEID GSA sustainable practices, while removing the impacts caused by neighboring unsustainable pumping. The average annual change in storage for the model-based estimates in **Appendix N** are approximately 4,000 acre-ft/year for the water years 1986/1987 to 2016/2017 period, which results in a cumulative change in storage of approximately 124,000 acre-ft. For comparison, the non-model-based analysis estimated the average annual change in storage to be 21,400 acre-feet/year surplus for the calendar years 1987 to 2017 period, which results in a cumulative change in storage of approximately 662,500 acre-ft. The non-model-based approach is also expanded to include calendar years 2018 through 2023, and the average annual change in storage for the 1987-2023 period is 19,152 acre-feet/year surplus, which results in a cumulative change in storage of approximately 708,600 acre-ft. See **Subsection 2.4** for additional information on the water budget components for the DEID GSA.

[5] Figure 2-9, Change in Groundwater Storage from 1986/87 to 2016/17 within the DEID represents the annual and cumulative change in groundwater in storage for SGMA reporting purposes and does not represent an accounting of water rights.

Subsection 2.3.3 Seawater Intrusion *[23 CCR § 354.16 (c)]*

23 Cal. Code Regs. § 354.16 Groundwater Conditions. (c) *Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.*

Seawater intrusion does not occur in the Tule Subbasin for reasons described in Chapter 2.2.3 of the Tule Subbasin Setting (**Appendix A-2**). The Tule Subbasin is separated from the ocean by the coast ranges and is approximately 100 miles from the coastline, therefore there is no possibility of seawater intrusion.

Subsection 2.3.4 Groundwater Quality Issues *[23 CCR § 354.16 (d)]*

23 Cal. Code Regs. § 354.16 Groundwater Conditions. (d) *Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.*

Groundwater quality was previously discussed in **Subsection 2.2.6.4** of this GSP, and groundwater quality issues are further described in Chapter 2.2.4 of the Tule Subbasin Setting (**Appendix A-2**). The DEID GSA experiences relatively good groundwater quality with respect to EC and total dissolved solids (TDS) concentrations; however, per data obtained from SWRCB's Geotracker (SWRCB 2024), there is one active clean-up site within the jurisdiction of the Board (see **Figure 2-11** below). This site, Styrotek, Inc., used tetrachloroethylene (PCE)-based solvents for approximately two years from 1986 to 1988 as a cleaning step in their manufacturing process. Consequently, the primary constituent of concern is PCE. According to the most recent quarterly monitoring report, additional constituents being sampled include trichloroethylene (TCE), cis- 1,2-DCE, 1,2-Dichloropropane, Toluene, and Xylenes. While the full extent of the groundwater plume has not been explicitly documented, ongoing monitoring is in place to track the presence of and potential migration of these contaminants. Of the 23 Geotracker sites present in the DEID GSA, 5 are cased-closed Clean-up Program and 17 are case-closed Leaking Underground Storage Tank (LUST) clean-up sites.

Groundwater quality data for the DEID GSA were also obtained from reporting by public water supply systems to the SWRCB Division of Drinking Water (DDW) for the purpose of ensuring adequate drinking water quality. Earlimart Public Utility District (PUD) has four active wells (Well A, Well B, Tulare Street Well, and Well 07) and two inactive wells (Well C and Well D) that have both been properly abandoned. Richgrove Community Services District (CSD) has two active wells (Well 04 and Well 05), one pending well (Well 06), and three inactive wells (1947 Well, 1961 Well, and Well 03) that have all been properly abandoned. **Figure 2-12** through **Figure 2-18** document historical groundwater quality available from the SWRCB DDW and Groundwater Ambient Monitoring and Assessment (GAMA) Program. The figures indicate the date when the wells within the DEID GSA were first sampled, the date when an exceedance of the MCL was first detected, and comparison of the groundwater quality results with regulatory and non-regulatory health-based benchmarks established by the U.S. Environmental Protection Agency and SWRCB DDW. The primary metric for identifying undesirable results related to groundwater quality within the Subbasin are exceedances of Basin Plan Water Quality Objectives and State of California Maximum Contaminant Limits (Title 17 CCR and Title 22 CCR). It should be noted that these regulatory benchmarks apply to water that is delivered to the consumer, not to untreated groundwater. Exceedances of MCLs within raw groundwater indicate potential threats to human health in untreated groundwater and the potential need for additional treatment steps to make groundwater suitable for potable use. Current and historical data was reviewed for constituents of concern (COC) concentrations exceeding applicable MCLs.

The methodology for plotting the maximum concentrations and MCL exceedances of specific constituents of concern involved several steps. The GAMA datasets for Kern and Tulare counties were obtained from the GAMA website and filtered to include only the data within the DEID GSA boundary. The DEID-specific water quality data that were received from Earlimart PUD and Richgrove CSD were then integrated with the filtered GAMA dataset. The combined dataset was subsequently filtered to retain only the constituents that have primary or secondary MCL drinking water standards. This refined dataset was then aggregated by well location to determine the maximum concentrations of each constituent, the date of these maximum concentrations, and the initial sampling date of each well for the respective COC, and to identify any exceedances of the primary or secondary MCLs along with the dates these exceedances occurred. It should be noted that some well locations are depicted as "not sampled" in the figures because they have data for other constituents of concern that are not part of the eight COCs of interest in this DEID GSP (1,2-DBCP, 1,2,3-TCP, arsenic, hexavalent chromium, iron, manganese, nitrate, and TDS). These locations do not have sampling data for the specified COCs but may have data for other constituents regulated by drinking water standards. Consequently, they are displayed as "not sampled" for the COCs of interest.

The Mann-Kendall test, an industry standard for non-parametric trend detection, was applied to assess trends in groundwater quality (Helsel, 2012; Helsel et al., 2020). The Mann-Kendall test does not require regularly spaced sample intervals, is unaffected by missing time periods, avoids substitution for data that contain non-detects, and does not assume a pre-determined data distribution. The Mann-Kendall test assesses whether a dataset exhibits a monotonic trend (increasing or decreasing) within a selected significance level. A significance level of 0.05 (i.e. a confidence level of 95%) was selected for this analysis. The results are summarized in the following sections.

The following COCs were identified to exceed drinking water standards within the DEID GSA:

1,2,3- Trichloropropane (TCP)

1,2,3-TCP is a man-made, chlorinated hydrocarbon typically found at industrial or hazardous waste sites and has been used as an industrial solvent and as a cleaning and degreasing agent; it has also been found as an impurity resulting from the production of soil fumigants, distributed starting in the 1950s by Shell and Dow. 1,2,3-TCP was removed from pesticides in the 1980s, however, due to its prevalent use; it has become a water quality concern for drinking water systems relying on groundwater in areas where it was applied. In 2017, the SWRCB established an MCL for 1,2,3-TCP of 5 parts per trillion (ppt). **Figure 2-12** shows available water quality data for 1,2,3-TCP within the DEID GSA; concentrations range from not detected to 0.39 ug/L and are generally above the recommend California secondary MCL of 0.005 ug/L. 1,2,3-TCP exceeds the drinking water MCL for both Richgrove CSD wells and four Earlimart PUD wells and 14 additional wells within the DEID GSA.

The Mann-Kendall trend analysis for 1,2,3-TCP indicates that most locations show no trend (22 well locations), suggesting stable concentration levels of this constituent over time. However, at one location (CA1504008_001_001), a decreasing trend was detected, indicating a reduction in 1,2,3-TCP levels at this well. Of the 202 wells present in the dataset, 164 locations were not sampled for 1,2,3-TCP and 15 locations had insufficient data (less than 5 samples).

1,2- dibromo-3-chloropropane (DBCP)

Prior to 1979, 1,2-DBCP was primarily used as a soil fumigant for the control of nematodes in over 40 different crops. In 1989, SWRCB established an MCL for 1,2-DBCP of 0.2 micrograms per liter (µg/L). **Figure 2-13** shows available water quality data for 1,2-DBCP within the DEID GSA, concentrations range from 0.1 to 1.12 ug/L and are generally above the recommend California secondary MCL of 0.2 ug/L. 1,2-DBCP exceeds the drinking water MCL for one Richgrove CSD well and one Earlimart PUD well and nine additional wells within the DEID GSA.

The Mann-Kendall trend analysis for 1,2-DBCP reveals no significant trends of increasing or decreasing concentrations. Most results indicate no trend (25 locations), pointing to stable levels of 1,2-DBCP across the DEID GSA. There are 159 well locations that were not sampled for 1,2-DBCP and 18 locations that had insufficient data.

Arsenic

Arsenic is naturally occurring, and concentrations of arsenic in California groundwater basins commonly exceed California's drinking water MCL. The U.S. EPA MCL for total arsenic in drinking water was reduced from 50 to 10 µg/L in January 2001, and compliance with this standard was required beginning in January 2006. The California arsenic MCL is 0.010 milligrams per liter (mg/L) (equivalent to 10 µg/L) and became effective on November 28, 2008. Arsenic naturally sorbs onto oxide surfaces of mineral grains in sedimentary aquifer matrix material. Naturally occurring arsenic concentrations in groundwater are highly variable in semi-arid and arid groundwater basins of the western United States (Welch et al., 2000). In these sedimentary basins, groundwater recharge is limited due to low precipitation, and the residence time of the groundwater in the basin is high. The long residence time of the groundwater in the basin allows for interaction between the groundwater and the minerals that comprise the aquifer matrix material. With time and high pH values, particularly above 8.5, arsenic desorbs from iron, manganese, and aluminum oxides on the surfaces of mineral grains of sediments and enters the groundwater (Izbicki et al., 2008). Anoxic conditions also induce reductive dissolution of iron and manganese oxide coatings on mineral grains, releasing sorbed arsenic. **Figure 2-14** shows available water quality data for arsenic within the DEID GSA, concentrations range from 0.67 to 79 ug/L and are generally below the recommended California secondary MCL of 10 ug/L except for seven wells. Arsenic exceeds the drinking water MCL for Richgrove CSD wells and one Earlimart PUD well and three DEID wells. Arsenic exceedances of the drinking water standard at these wells pre-date SGMA and were documented to have occurred in the 1990s and early 2000s.

The Mann-Kendall trend analysis shows that most locations with data have no trend (17 well locations), indicating stable concentrations over time. However, at one location (CA5410021_004_004), an increasing trend was detected, suggesting a rise in Arsenic concentration for this well site. There are 155 well locations with no data and 29 locations with insufficient data.

Hexavalent Chromium

Chromium can be found in two anion forms, trivalent chromium Cr(III), and hexavalent chromium Cr(VI). Naturally occurring chromium is found in chromium-rich iron oxides, which are most abundant in mafic igneous rocks and older volcanic rocks (Ernst, 2012). Often, these rock formations are found along tectonically active areas such as California, which exposes these materials to weathering (Ernst 2012). Weathering of chromium-rich deposits leads to naturally high concentrations of chromium as both Cr(III) and Cr(VI) (Oze, 2007). In 2024, California adopted a hexavalent chromium MCL of 10 ug/L. Previously, the MCL was set at 50 ug/L for total chromium that was a summation of the two forms of chromium. Water systems have from two to four years to comply with the regulations depending on the system size. Systems smaller than 1,000 connections have four years to comply. **Figure 2-15** shows available water quality data for Cr(VI) within the DEID GSA, concentrations range from 0.2 to 12 ug/L and are generally below the recommended California secondary MCL of 10 ug/L except for three wells sampled along the western portion of the DEID GSA. All Earlimart PUD wells are above or near the hexavalent chromium drinking water standard and wellhead treatment will be required to meet the new hexavalent chromium MCL. Hexavalent chromium is detected at concentrations approximately an order of magnitude lower at Richgrove CSD, indicating variable water quality between the eastern and central western portions of the DEID GSA.

The Mann-Kendall trend analysis for Hexavalent Chromium reveals that most locations were not sampled for Hexavalent Chromium (180 well locations) and those that did have data did not indicate a trend (5 locations). The remaining 17 locations had insufficient data, preventing a definitive trend analysis for those sites.

<u>**Iron**</u>

Iron is the fourth most abundant element on Earth and is found naturally in the water in diverse forms. It is a vital mineral nutrient which acts as a co-factor for many enzymes and plays a role in the maintenance of energy metabolism. Sedimentary rocks contain iron and iron weathers or dissolves into water naturally (Hem and Cropper, 1962). Iron can be a water quality issue at elevated levels. The California secondary MCL for iron is 0.3 mg/L. Secondary MCLs are non-mandatory water quality standards that provide guidelines to manage aesthetic considerations such as taste, color, and odor. Iron can be problematic at levels above secondary MCLs because it may impart color to the water, which can stain plumbing fixtures with rusty, reddish-brown deposits. **Figure 2-16** shows available water quality data for iron within the DEID GSA, concentrations range from 5.2 to 3200 ug/L and are generally below the recommended California secondary MCL of 300 ug/L, except for eleven wells sampled along the western and eastern portion of the DEID GSA.

The Mann-Kendall trend analysis for Iron indicates that most well locations show no trend (9 locations), suggesting stable concentrations of Iron over time. However, at one location (CA5410021_011_011), a decreasing trend was detected, indicating a reduction in iron concentration at that well site. A significant number of well locations had no data (148), and the remaining 44 locations had insufficient data.

<u>**Manganese**</u>

Manganese is a transition metal and one of the most abundant metals in Earth's crust, frequently co-occurring with iron. Adverse health effects can be caused by inadequate intake or excessive intake. The California secondary MCL for manganese is 0.5 mg/L. Like iron, it can be problematic at levels above secondary MCLs because it may stain plumbing fixtures and laundry with rusty, reddish-brown deposits. The SWRCB has notified the public of the neurotoxic risk of high levels of manganese in drinking water and has initiated the process of revising the current notification and response levels for manganese. The

U.S. EPA has a manganese health advisory level of 0.3 mg/L. **Figure 2-17** shows available water quality data for manganese within the DEID GSA, concentrations range from 0.44 to 280 ug/L and are generally below the recommend California secondary MCL of 300 ug/L, except for eleven wells sampled along the western and eastern portion of the DEID GSA. Manganese exceeds the secondary drinking water MCL at two of the Earlimart PUD wells and two of the Richgrove CSD wells and two DEID wells. Manganese exceedances of the drinking water standard were documented as early as the 1990s and most exceedances occurred pre-SGMA.

The Mann-Kendall trend analysis for Manganese shows that most well locations have no trend (10 locations), indicating stable concentration of manganese over time. There were no locations with either increasing or decreasing trends. A significant number of well locations (159) were not sampled for manganese, and the remaining 33 wells had insufficient data, preventing a definitive trends analysis for those sites.

Nitrate

Sources of nitrate in groundwater are commonly associated with fertilizers and septic tanks; however, nitrate can also be naturally occurring. Fertilizers and septic tanks are common anthropogenic sources of nitrate detected in groundwater. The California drinking water MCL for nitrate as nitrogen is 10 mg/L as nitrate-nitrogen (NO3-N). **Figure 2-18** shows available water quality data for nitrate within the DEID GSA; concentrations range from 0.1 to 210 mg/L, and there are over 40 wells that exceeded the recommended California secondary MCL of 10 mg/L. Nitrate exceeds the drinking water MCL at one Earlimart PUD wells, both Richgrove CSD wells, and an additional eight wells within the DEID GSA. There is relatively good spatial coverage of nitrate water quality data within the DEID GSA. Wells previously sampled for nitrate should be considered for sampling of other COCs to fill identified data gaps.

The Mann-Kendall trend analysis indicates that most well locations show no trend (39 locations), suggesting stable concentration levels of nitrate over time. One location (CA5410021_003_003) showed a decreasing trend, indicating a reduction in nitrate levels at that well site. A significant number of locations (50) were not sampled for nitrate, and 112 locations had insufficient data, preventing a definitive trend analysis for those well sites.

Post-SGMA (after January 1, 2015) groundwater quality challenges in DEID GSA and the surrounding area are generally caused by agricultural activity prior to the passage of SGMA. Simultaneously, over the last several decades agricultural water quality orders have resulted in positive changes in water quality monitoring, management, and reporting. In particular, the Irrigated Lands Regulatory Program (ILRP)[6], Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS)[7], and Dairy General Order[8] have been instrumental in preventing and mitigating groundwater quality challenges in the San Joaquin Valley, including in the Tule Subbasin. There are no dairies within the DEID GSA Plan Area; however, dairies are present in neighboring GSAs and the DEID GSAs' RMS network requires monitoring of nitrates and other COC associated with dairy operations. The SWRCB and their regional office (Central Valley Regional Water Quality Control Board) oversee and enforce these programs, more information on ILRP

[6] State Board (2024c), available at https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/
[7] State Board (2024d), available at https://www.waterboards.ca.gov/centralvalley/water_issues/salinity/
[8] State Board (2023), available at https://www.waterboards.ca.gov/centralvalley/water_issues/confined_animal_facilities/general_order_guidance/dairy/index.html

and CV-SALTS' relationship to DEID GSA's groundwater quality monitoring and impact avoidance planning is described in **Section 3**.

In addition to agriculturally linked COC, the risk of anthropogenic contamination such as per- and polyfluoroalkyl substances (PFAS)[9] and other ubiquitous non-point source COCs is elevated in the more developed areas, including the communities of Earlimart and Richgrove.

Figure 2-12 through **Figure 2-18** document historical groundwater quality, including available data collected before SGMA was enacted (pre-2015), and identify when wells were first tested for various groundwater quality COCs within DEID GSA. These figures provide context to establish baseline (legacy) groundwater quality conditions.

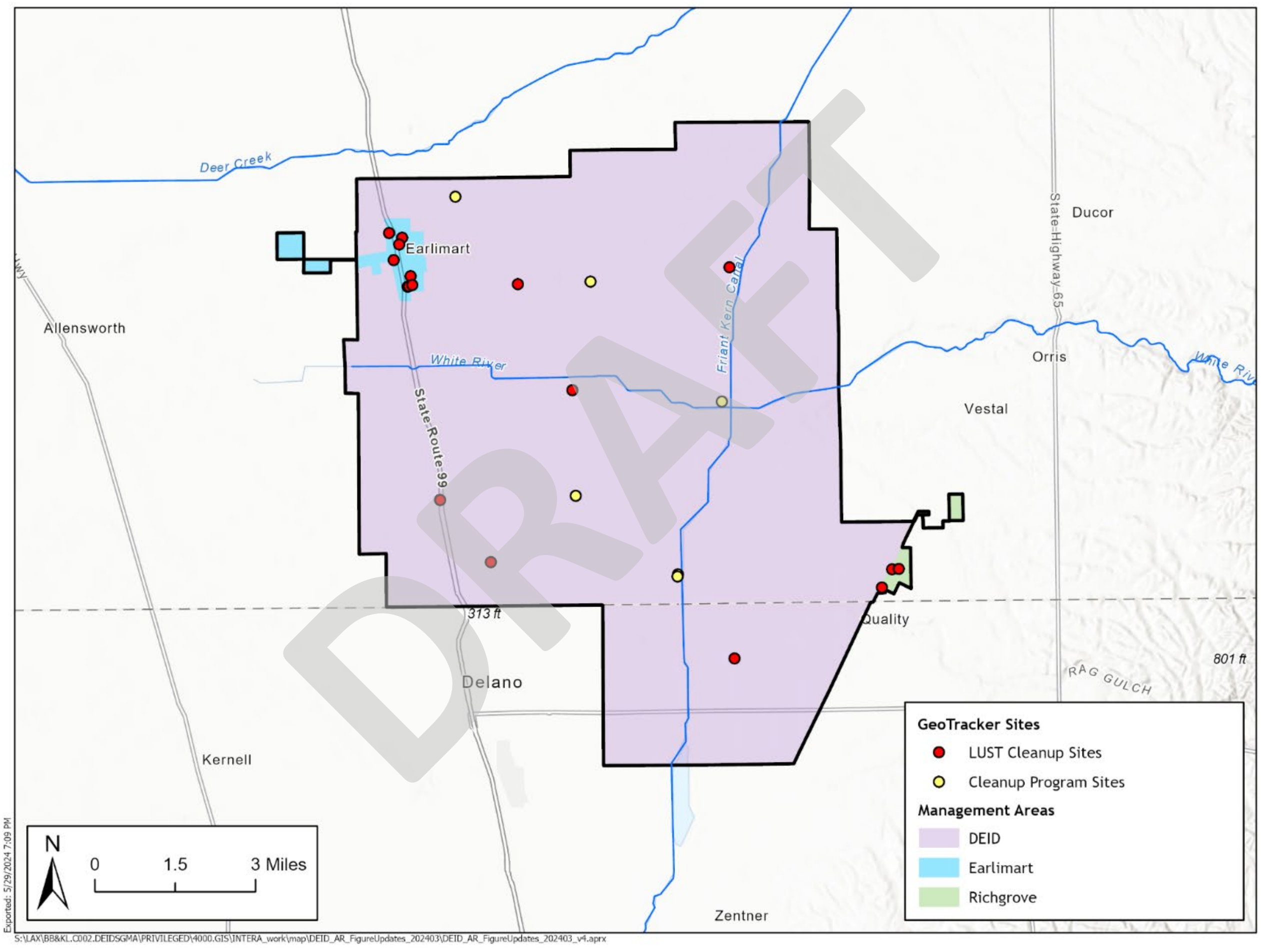


Figure 2-11 Geotracker Environmental Cleanup Sites within DEID GSA

[9] PFAS are a group of synthetic chemicals. Although there are thousands of PFAS compounds, Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonic acid (PFOS) are the two that are the most studied and most prevalent

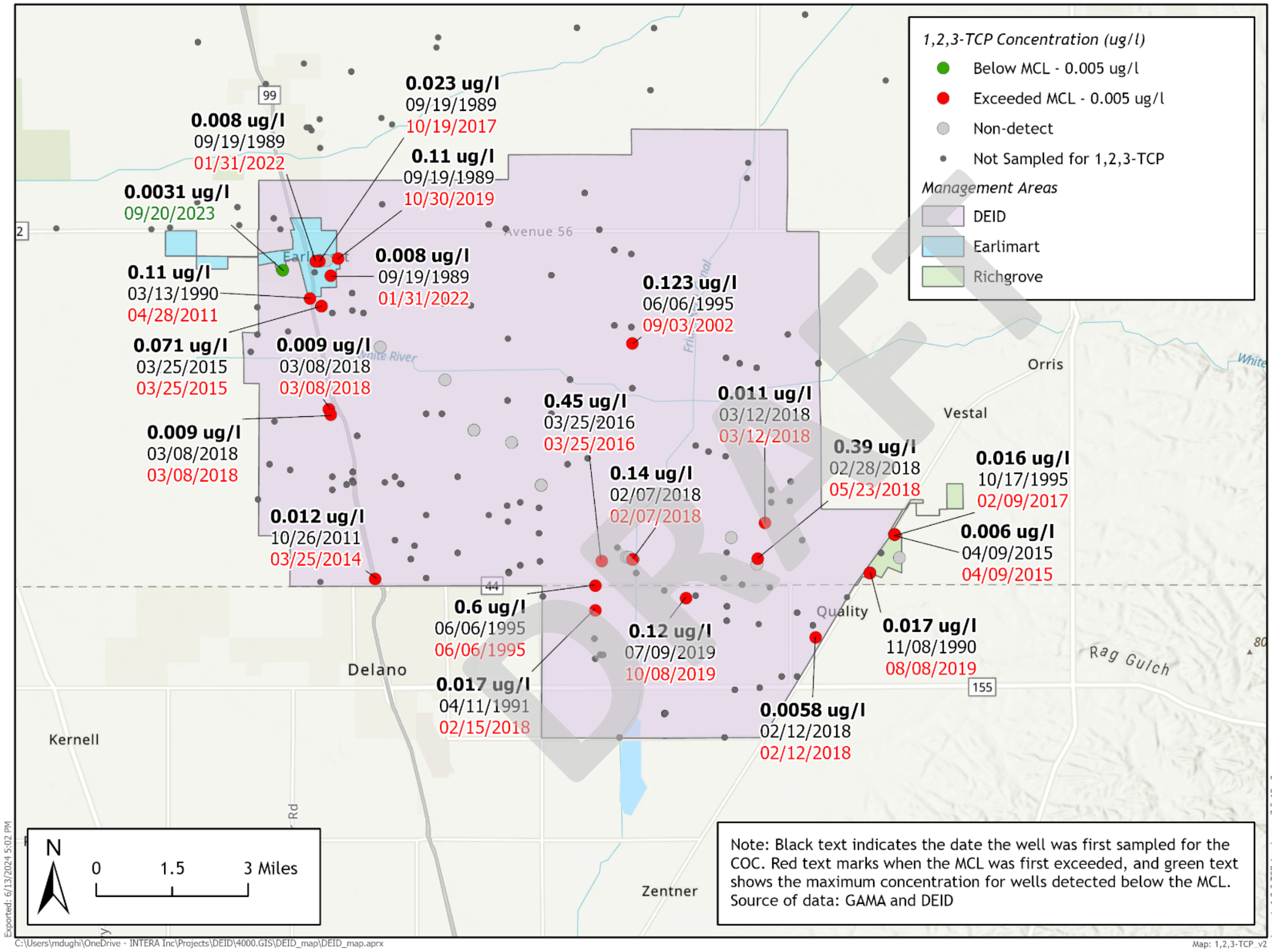


Figure 2-12 1,2,3-TCP Groundwater Quality Concentration

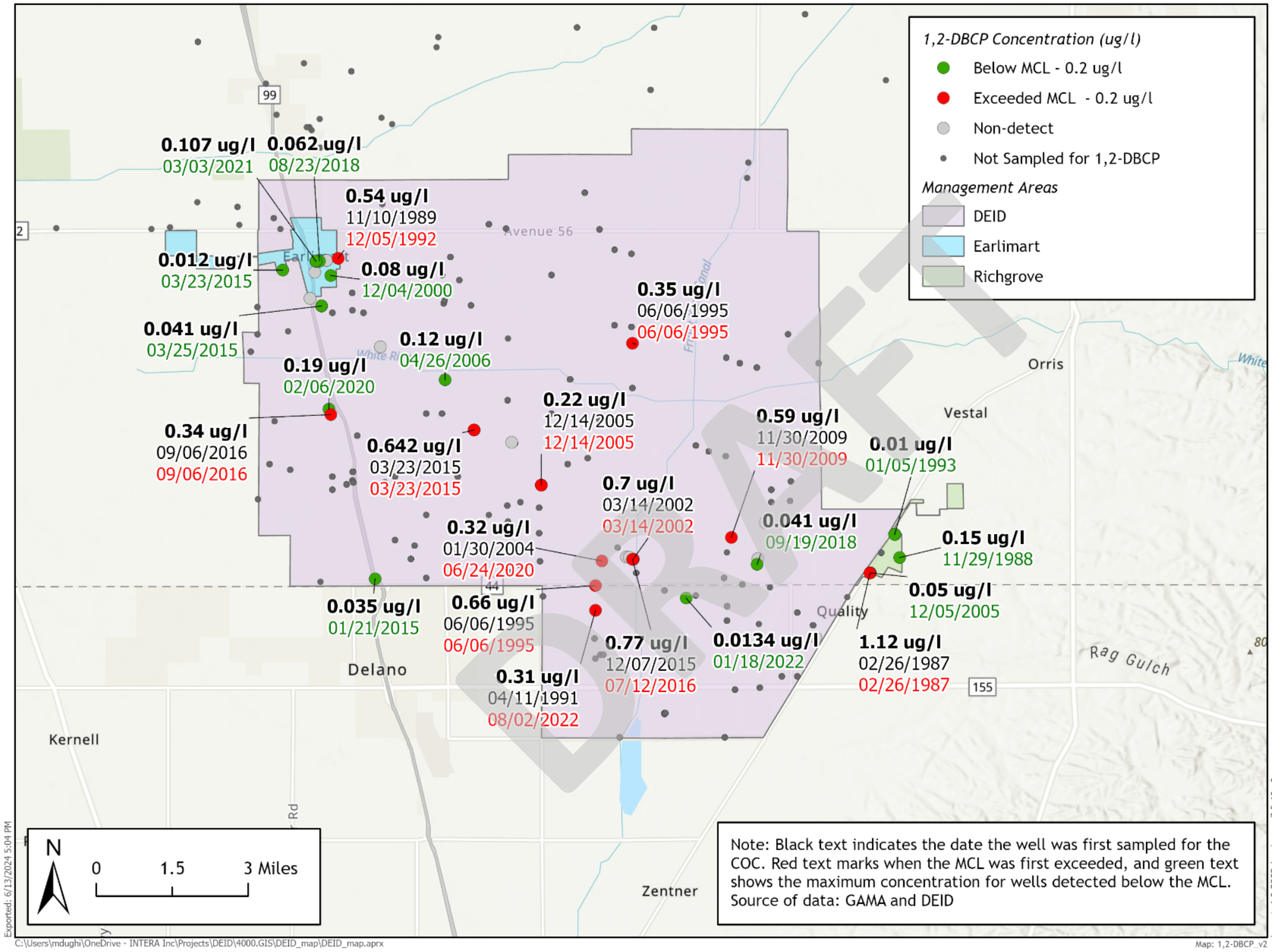


Figure 2-13 1,2-DBCP Groundwater Quality Concentration

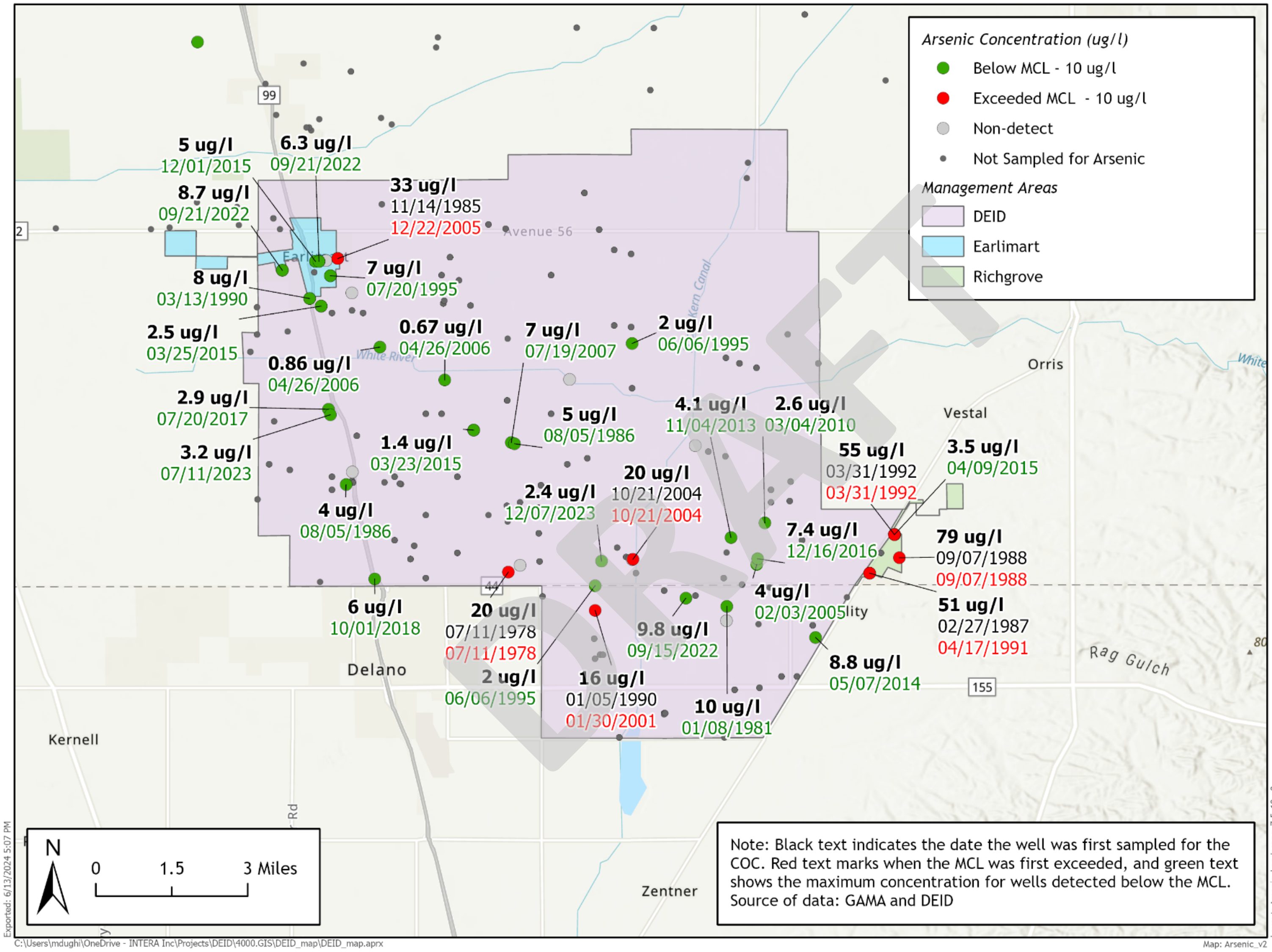


Figure 2-14 **Arsenic Groundwater Quality Concentration**

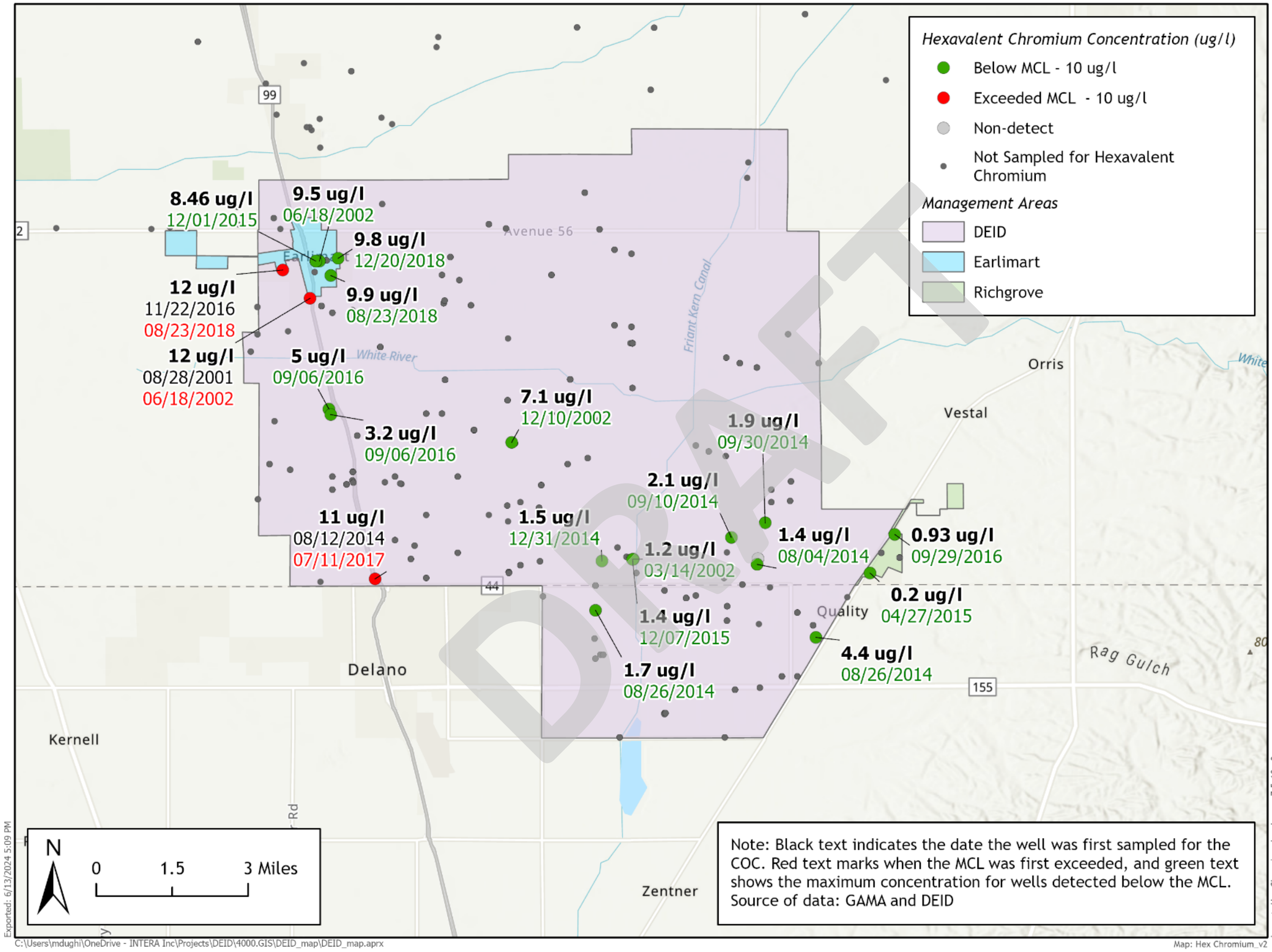


Figure 2-15 Hexavalent Chromium Groundwater Quality Concentration

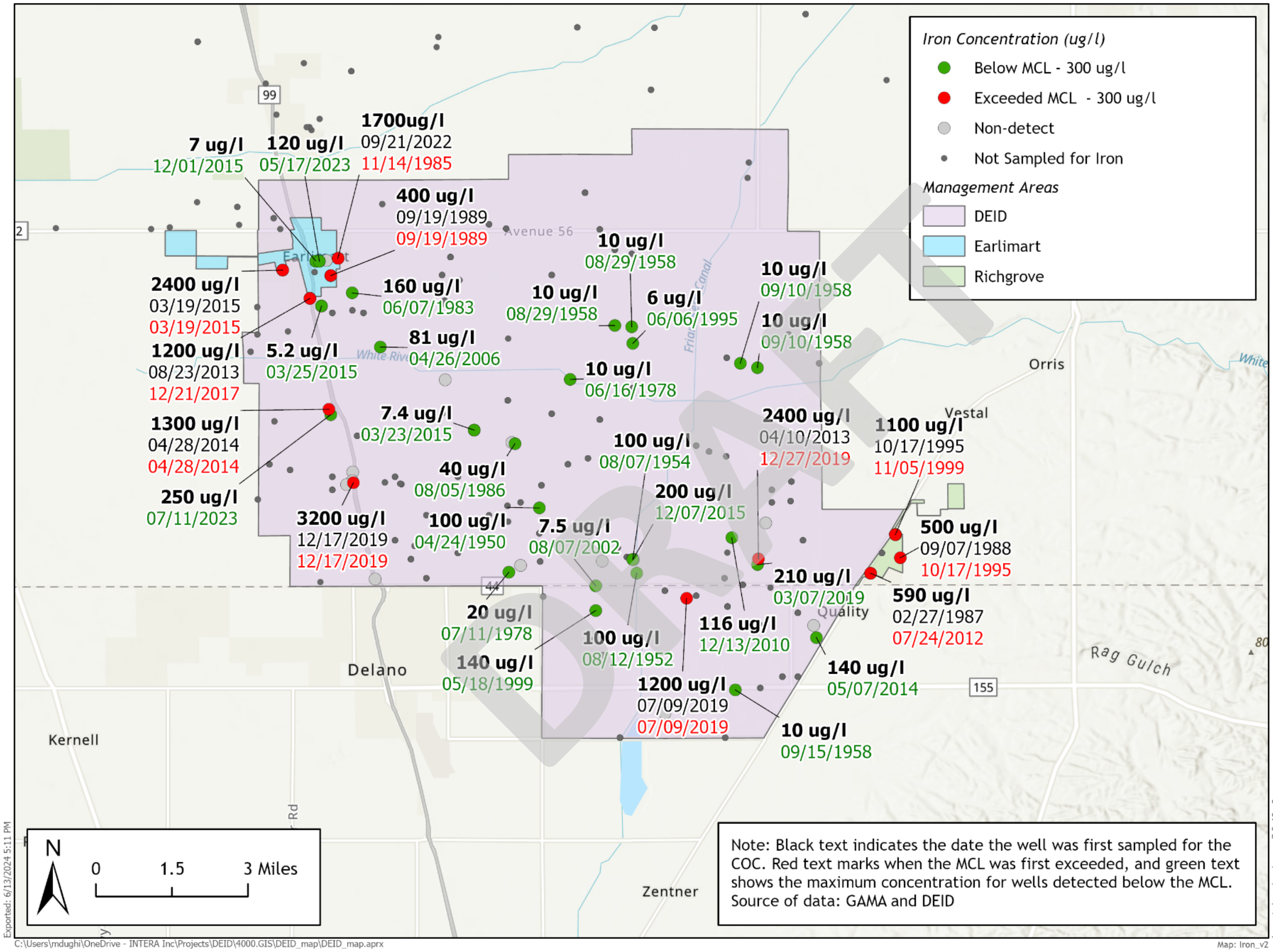


Figure 2-16 Iron Groundwater Quality Concentration

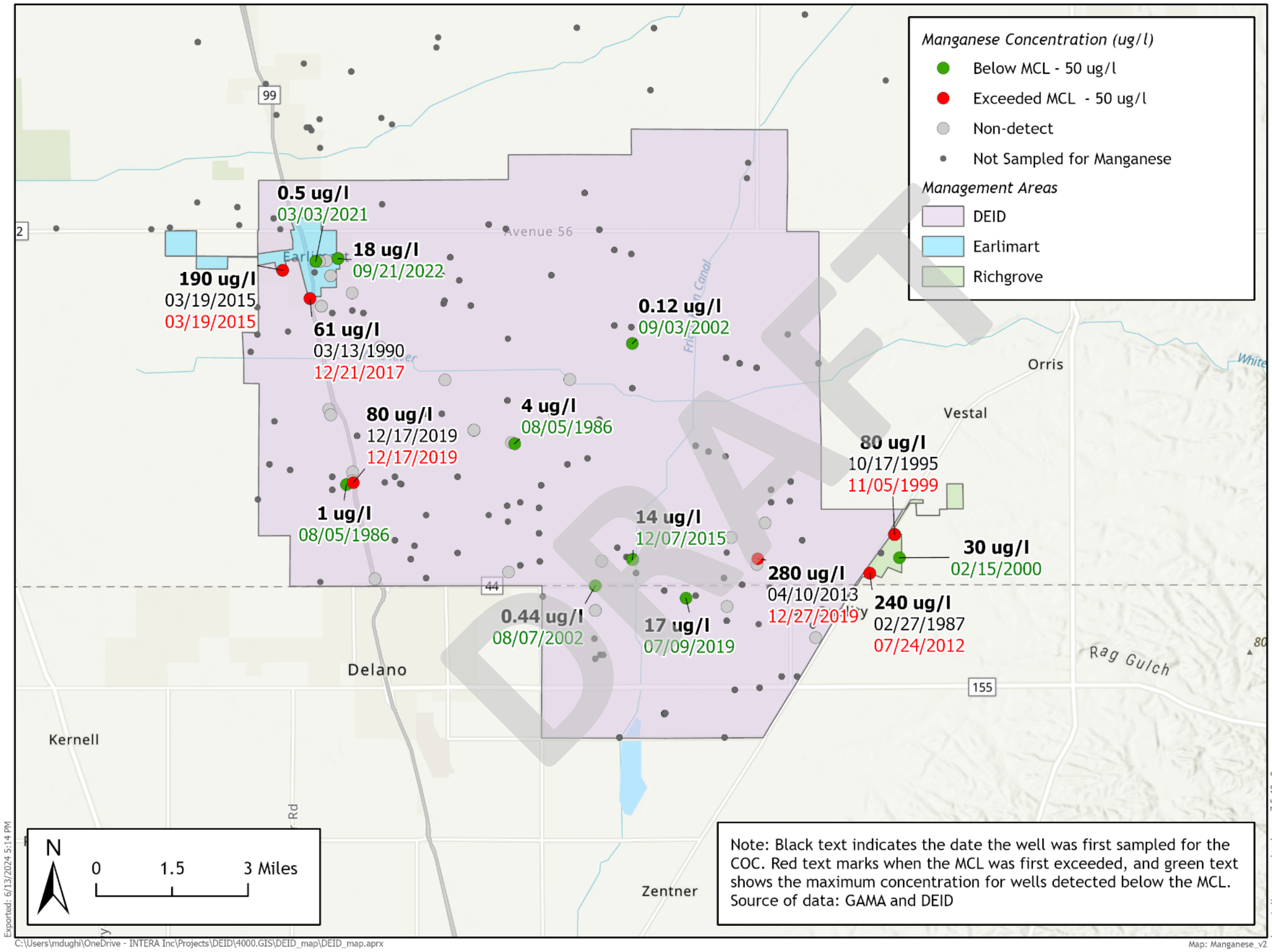


Figure 2-17 Manganese Groundwater Quality Concentration

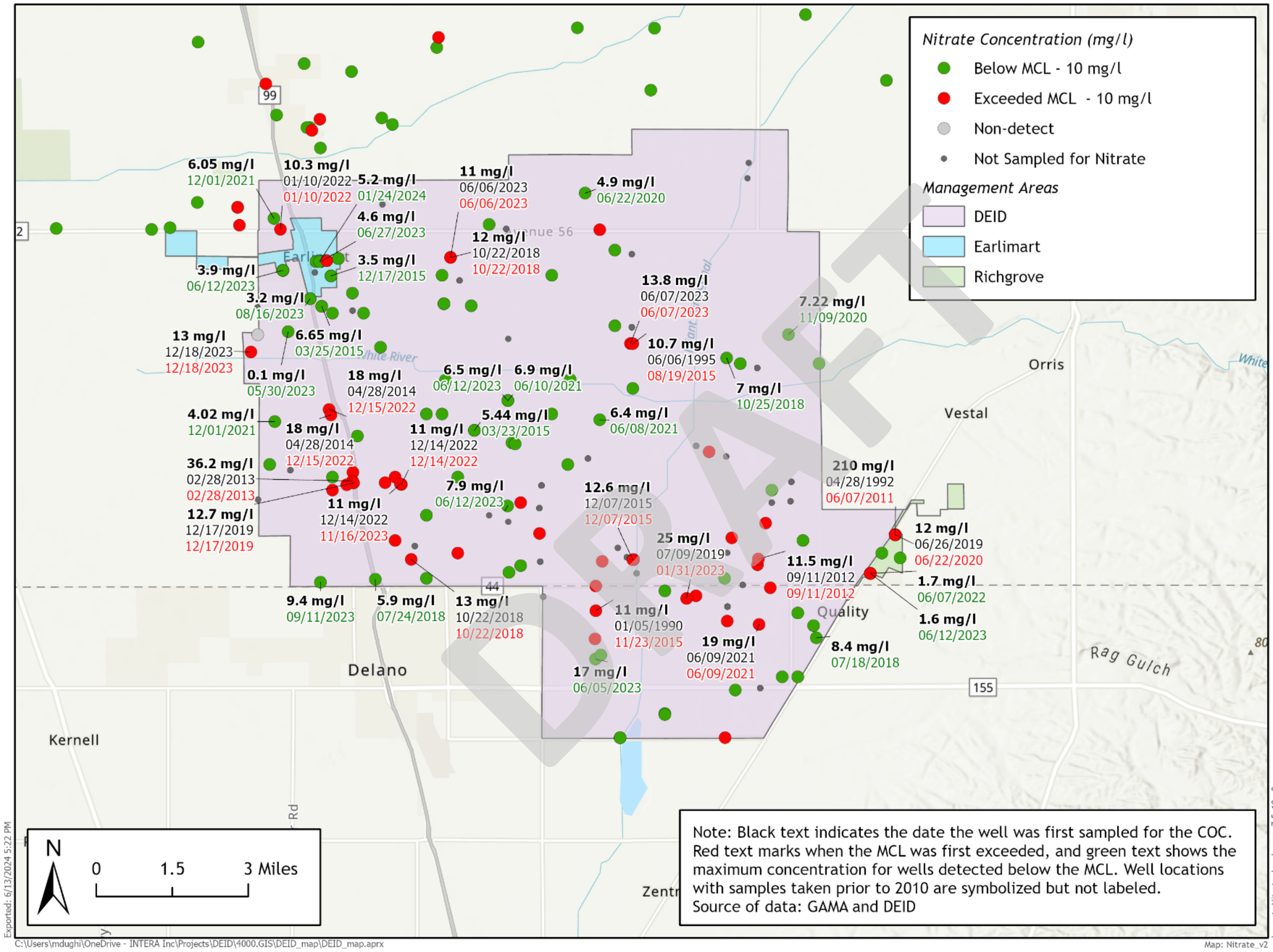


Figure 2-18 Nitrate Groundwater Quality Concentration

Subsection 2.3.5 Land Subsidence *[23 CCR § 354.16 (e)]*

23 Cal. Code Regs. § 354.16 Groundwater Conditions. (e) *The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.*

Subsection 2.3.5.1 Background

The California San Joaquin Valley region forms part of one of the largest land-surface-elevation change (subsidence) areas in the United States. Subsidence, which causes a decrease in land-surface elevation, has been extensively documented for more than 65 years in the Central Valley (Poland, 1958; Lofgren and Klausing, 1969; Poland and others, 1975; Lofgren, 1976; Ireland and others, 1984; Chapter 2.2.5 of Appendix A-2). Historical and ongoing subsidence has resulted in substantial damage to surface water infrastructure conveyance, particularly in the Tule subbasin to the Fraint-Kern Canal.

Land can subside because of groundwater withdrawals in susceptible aquifer systems—typically unconsolidated alluvial or basin-fill aquifer systems comprising aquifers and fine-grained units (interbeds and confining units) that have undergone extensive groundwater development (Galloway and Burbey, 2011). The fine-grained interbeds and confining units have higher porosity but are much less permeable and generally are substantially more compressible than the coarse-grained deposits constituting the aquifers, and they impede the vertical flow of water within and between the aquifers.

The pore structure of a sedimentary aquifer system is supported by the granular skeleton of the aquifer system and the pore-fluid pressure of the groundwater that fills the intergranular pore space (Meinzer, 1928). When groundwater is withdrawn in quantities that result in a decreased water level elevation (reduced pore-fluid pressure), the reduction of the pore-fluid pressure support increases the intergranular stress, or effective stress, on the skeleton. An increase in effective stress compresses the skeleton. This deformation is sometimes inelastic (nonrecoverable), depending on the stress history of fine-grained sediment, resulting in a vertical decrease in thickness (or "compaction") of the aquifer system, which is a permanent reduction in aquifer-system storage capacity, and subsidence, illustrated in **Figure 2-19**. For the purposes of this GSP subsection, the term "groundwater level" is synonymous with the water level elevation measured relative to the North American Vertical Datum of 1988 and applies to wells screened in either (1) the upper aquifer, where the upper groundwater surface (water table) is at atmospheric pressure, or (2) the lower aquifer or Pliocene unit, where fine-grained units above the lower aquifer result in pressurized conditions.

Aquifer-system deformation of fine-grained sediments is elastic (recoverable) if the effective stress is less than any previous maximum effective stress (Terzaghi, 1925) (**Figure 2-19**). The greatest historical effective stress imposed on the collapsable fine-grained units—generally the result of the lowest groundwater levels for the aquifer system—is the "preconsolidation stress," and the corresponding (lowest) groundwater level is the "preconsolidation head" (Leake and Prudic, 1991). The persistent long-term water-level declines in the Central Valley have resulted in a new maximum effective stress (critical head) that is preserved in the memory of the confining units following this long-term water level cycle. If the effective stress does not exceed the new maximum effective stress, then the fine-grained units undergoes elastic (recoverable) compaction. If the effective stress within a confining unit or interbed exceeds the new maximum effective stress, the pore structure of the granular matrix of the fine-grained sediment is rearranged, and inelastic (permanent) compaction results. A primary objective of the DEID GSA GSP is to control the rate of water level decline and reduce the continuation of subsidence. Therefore, understanding the aquifer system's stress history and present-day compaction and water level dynamics in the DEID GSA and the Tule subbasin is important.

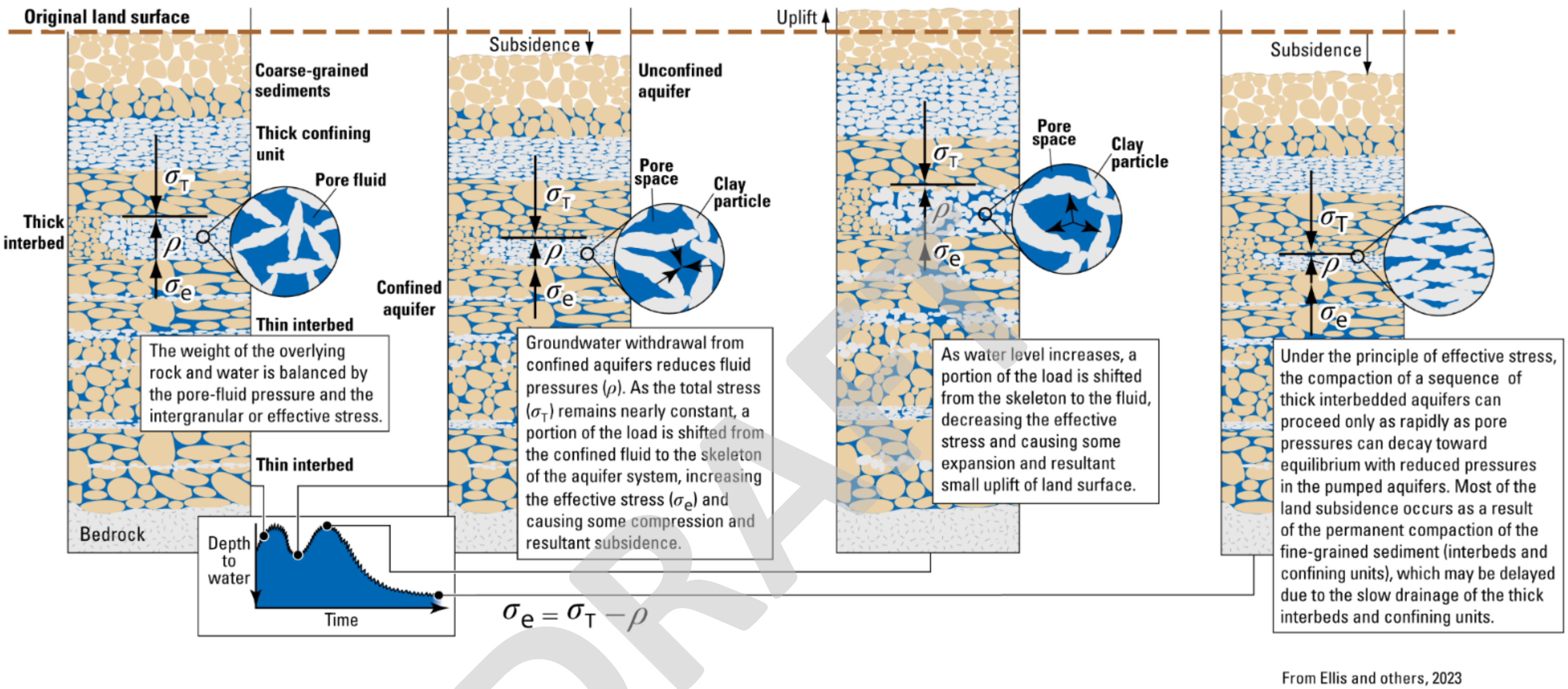


Figure 2-19 Land Subsidence and Aquifer Compaction

Subsection 2.3.5.2 Measurement Techniques

In this Groundwater Sustainability Plan, compaction is defined as a change in the vertical thickness of the aquifer system, whereas subsidence is defined as the lowering of the land-surface elevation because of aquifer-system compaction. Thus, an extensometer—which measures the distance between the base of the extensometer (bottom of a borehole) and a reference point on or near the surface—is used to measure compaction. Subsidence is calculated by differencing the repeated elevation measurements derived from spirit leveling (hereinafter referred to as "leveling") or the repeated distance measurements between the ground and satellites using campaign Global Positioning System (GPS) surveying or interferometric synthetic aperture radar (InSAR).

Leveling is the oldest method used to precisely measure elevation and, in California, was commonly performed along linear infrastructure, including roads, railroad tracks, and canals, as part of initial construction or ongoing maintenance. The installation (or "monumenting") of the more than 550 benchmarks in the Tule subbasin was first performed by the USGS in 1901 and 1924, then the U.S. Coast and Geodetic Survey in 1931 (predecessor agency of the National Geodetic Survey [NGS]). The leveling technique allows the surveyor to carry an elevation from a known reference point (such as a benchmark) to other points using a precisely leveled telescope and a graduated rod resting vertically on a benchmark. Repeated surveys of the same benchmarks over time yield a series of elevations from which elevation changes are calculated.

A borehole extensometer (hereinafter, "extensometer") is used to measure the one-dimensional thickness of a specified depth interval of an aquifer system. An extensometer is often described as a deep benchmark, in which changes in the vertical distance between the deep benchmark (bottom or anchor depth of the extensometer) and a surface reference point (a concrete pad at land surface or the depth of the extensometer concrete pad piers, typically about 20 feet below land surface) are measured. Compaction in the aquifer system shortens this distance, and expansion lengthens this distance.

Interferometric synthetic aperture radar (InSAR) is a satellite- or airborne-based remote sensing technique that can detect centimeter- to millimeter-level ground-surface deformation over a broad scale (Bawden and others, 2003). Synthetic aperture radar (SAR) imagery is produced by reflecting radar signals off a target area and measuring the two-way travel time back to the antenna. InSAR uses two SAR scenes of the same area made at different times and "interferes" (differences) them, resulting in maps called interferograms that show relative ground-elevation change (range change) between the two times.

The InSAR imagery has two components: amplitude and phase. The amplitude is the radar signal intensity returned to the satellite and depends on the varying reflective properties that delineate landscape features such as roads, mountains, and structures. The phase component is proportional to the line-of-sight distance from the ground to the satellite (range) and is the component used to measure land-surface displacement (subsidence or uplift). If the ground has moved away from the satellite (subsidence), a more distal phase portion of the waveform is reflected back to the satellite. Conversely, if the ground has moved closer to the satellite (uplift), a more proximal phase portion of the waveform is reflected back to the satellite. The phase difference, or shift, between the two SAR images, is then calculated for each pixel. The map of phase shifts, or interferogram, can be depicted with a color scale that shows relative range change between the first and the second SAR acquisitions (Sneed and others, 2018).

GPS surveying is a method used to measure data from satellites and Earth-based reference stations to accurately determine the position and ellipsoid height of geodetic monuments (Sneed and others, 2001). The GPS technique allows the GPS surveyor to obtain elevations at specific locations autonomously rather than carrying an elevation from a known reference point to other points, as the leveling technique requires. Just like leveling, however, repeated GPS surveys of the same points over time yield a series of elevations from which elevation changes are calculated. The use of GPS equipment when determining the elevation at a benchmark is referred to as a "recovery" in this Groundwater Sustainability Plan.

Subsection 2.3.5.3 Methodology for Evaluating Current Land Subsidence Conditions

Selected benchmarks were chosen from the more than 550 benchmarks monumented in the Tule subbasin for this subsidence analysis. These benchmarks were selected based on (1) a long history of leveling generally before 1940 to avoid the issue of "floating lines" that are routinely encountered with leveled elevations in the 1950s to 1970s, (2) the proximity (generally 0.5 mile) to more recent benchmarks with leveled elevations during the 1980s to present, (3) location in proximity to a sufficient number of wells with 70 or more years (collectively) of groundwater-level data, and (4) successful benchmark recoveries with leveled elevations available in the NGS Online Positioning User Service (OPUS) system or the potential to be recovered.

A total of seven benchmark sites were selected based on the criteria described above to characterize long-term subsidence in the Tule subbasin. A benchmark "site" is a location where multiple benchmarks are located generally within a 0.5-mile radius. Four sites were selected in the DEID GSA, and three sites were selected in the northwestern part of the subbasin. Historical leveled elevations (prior to 1989) at the seven benchmarks were obtained from the NGS levels database. These elevations included the following adjustments: orthometric, rod, level, temperature, astro, refraction, and magnetic. The majority of the leveling at these sites was performed by NGS; however, their database contains blue-booked (or equivalent) leveled elevations surveyed by the California Department of Transportation (or predecessor agency) for some of the benchmark sites. Leveled elevations for benchmarks monumented in 1901 and 1924 were obtained from the USGS. The 1990 to 2023 elevations were obtained from the NGS OPUS system for five of the seven sites. Three benchmark sites required a recovery using Realtime Kinematic GPS techniques to establish a cumulative subsidence time series through 2023.

The 1931 to 1989 leveled elevations were provided by NGS in the National Geodetic Vertical Datum of 1929 (NGVD29). Leveled elevations from the NGS OPUS database were provided in the National American Vertical Datum of 1988 (NAVD88). The 1990 to 2023 elevations for some benchmarks were derived from OPUS ellipsoid heights (where the orthometric height [elevation] is the difference of the ellipsoid and geoid heights). Leveled elevations for the 1901 and 1924 USGS benchmarks (documented in Birdseye, 1925) used a pre-NGVD29 datum approximating sea level and did not include adjustments similar to the NGS leveled elevations. Therefore, uncertainty exists when comparing the 1901 and 1924 leveled elevations to the 1931 and later leveled elevations at the same benchmarks. To compare the 1931–1989 NGVD29 elevations to the 1990 and later NAVD88 elevations, the NGS VERTCON tool was used to adjust the pre-1990 elevations to NAVD88. Once each elevation was converted to the NAVD88 datum, the leveled elevation from each leveling epoch (i.e. 1931, 1940, 1970) was differenced from the first leveled elevation at each benchmark to produce a cumulative subsidence time series of data. The more recent benchmarks at each benchmark site were selected if they (1) had a tie to the historical benchmark time series (i.e. the historical benchmark time series ended in 1970, and the more recent benchmark time series began the same year) or (2) if the more recent benchmark time series ended between 2015 and 2023 and the historical benchmark had an NGS OPUS elevation obtained during this period.

Once the cumulative subsidence time series was constructed for each benchmark site, the 2015 to 2023 InSAR data was anchored to the most recent leveled elevation at the benchmark sites. That is, if a benchmark had an elevation showing cumulative subsidence of 8 feet as of November 2022, the InSAR subsidence value in that same month was registered to these 8 feet of subsidence. The 2008 to 2010 InSAR data was incorporated into the leveled elevation time series by registering the beginning value to the interpolated leveling time series.

Subsection 2.3.5.4 Subsidence Results

Much of the historical subsidence in the Tule subbasin before the early 1980s has been well-documented; however, few studies have extended the subsidence analysis to the present day using a combination of leveling, extensometer, and InSAR data. This GSP integrates this data to describe cumulative subsidence and subsidence rates from the early 1900s to the present day. The historical subsidence is well-described; therefore, most of the following discussion pertains to the post-1970 period.

Subsidence in the Tule subbasin was first recognized by 1935, particularly in the DEID GSA two miles north of Delano and in Earlimart, where the land surface elevation had decreased by five feet and by two feet, respectively, compared to the 1927 elevation (Lofgren and Klausing, 1969). This subsidence was due to large water-level declines of as much as 125 feet. Substantial water-level declines continued through 1953 in the DEID GSA, culminating in more than 9 feet of cumulative subsidence two miles north of Delano (Site E; **Figure 2-22**)—among the greatest amounts of subsidence in California at the time. However, surface water contracts were negotiated in earnest, and water deliveries began from the newly completed Friant-Kern Canal in 1951. As a result, water levels recovered rapidly after 1951, and the subsidence rate in the DEID GSA decreased from more than 0.5 foot per year (1948–1953) two miles north of Delano to less than 0.05 foot per year (1953–1970) (Site E; **Figure 2-22**). This substantial decrease in the subsidence rate after 1953 was also realized across the DEID GSA (Site D**, Figure 2-21**; Sites E and F, **Figure 2-22**, Site G, **Figure 2-23).**

While the subsidence in the DEID GSA was abating, subsidence in the north and northwestern parts of the subbasin in the LTRID GSA and PID GSA began to increase (Sites A and B, **Figure 2-20**; Site C, **Figure 2-21**) as the center of subsidence in the subbasin shifted that direction. Funding for Tule subsidence research in the early 1980s ended due to a slowing of the compaction rates observed at the six historical Poland extensometers in Pixley and Richgrove (three sites each) (**Figure 2-20**). As a result, the operation of the last of these six extensometers ceased by 1982, and little further subsidence monitoring was performed as it was thought that the subsidence had been halted by stabilizing groundwater-level altitudes in this area of the subbasin through importation of surface water from the CVP.

Towards the end and after subsidence monitoring was discontinued, the onset of a more than 40-year-long pattern of water-level declines began in the north and northwestern parts of the Tule subbasin (Sites A and B, **Figure 2-20**; Site C, **Figure 2-21**). These water-level declines resulted in between 3 and 11 feet of subsidence between 1970 and 2006 in this area. The water level declines propagated through the DEID GSA, particularly the northwestern area of this GSA, resulting in a reactivation of subsidence where it had largely been halted (Site D, **Figure 2-20** through **Figure 2-23**).

The pattern of water-level declines accelerated around 2006 to culminate in the greatest rate of water-level decline in the northern and northwestern parts of the subbasin since water levels have been recorded. Between 2006 and 2020, the lower aquifer water-level declines at Sites A, B, and C were 222, 162, and 192 feet, respectively (Sites A and B, **Figure 2-20**; Site C, **Figure 2-21**)—record declines for this area of the Tule subbasin. These water-level declines rapidly propagated into the northwestern part of the DEID GSA, resulting in additional subsidence (Site D, **Figure 2-21**). Cumulative subsidence at Sites A–C from 2015 to 2024 was between 4.1 and 4.7 feet (**Figure 2-20** and **Figure 2-21**) and the average subsidence rate was about 0.5 foot per year. Between 2015 and 2016, subsidence at all three sites (Sites A–C) was above 0.7 foot per year; at Site A, the subsidence rate was over 1.0 foot per year. Lower aquifer water level declines to the south in Kern County also propagated into the southern parts of DEID (sites E and F, **Figure 2-22),** lowering the water levels and resulting in subsidence. Lower aquifer water level declines in ETGSA have also affected the water levels in the northeastern part of the DEID (site G, **Figure 2-23**). By comparison, a total of 0.95 foot of subsidence has occurred in the center of the DEID GSA (Site H, figures **Figure 2-25** and **Figure 2-26**) between 2015 and 2024, and somewhat greater amounts at the edges of the DEID GSA (sites D–G, **Figure 2-25** and **Figure 2-26**). Subsidence during 2015–2024 in the DEID GSA at all sites (D–H, **Figure 2-26**) is less than the other Tule subbasin sites (sites A–C, I–J, **Figure 2-26**).

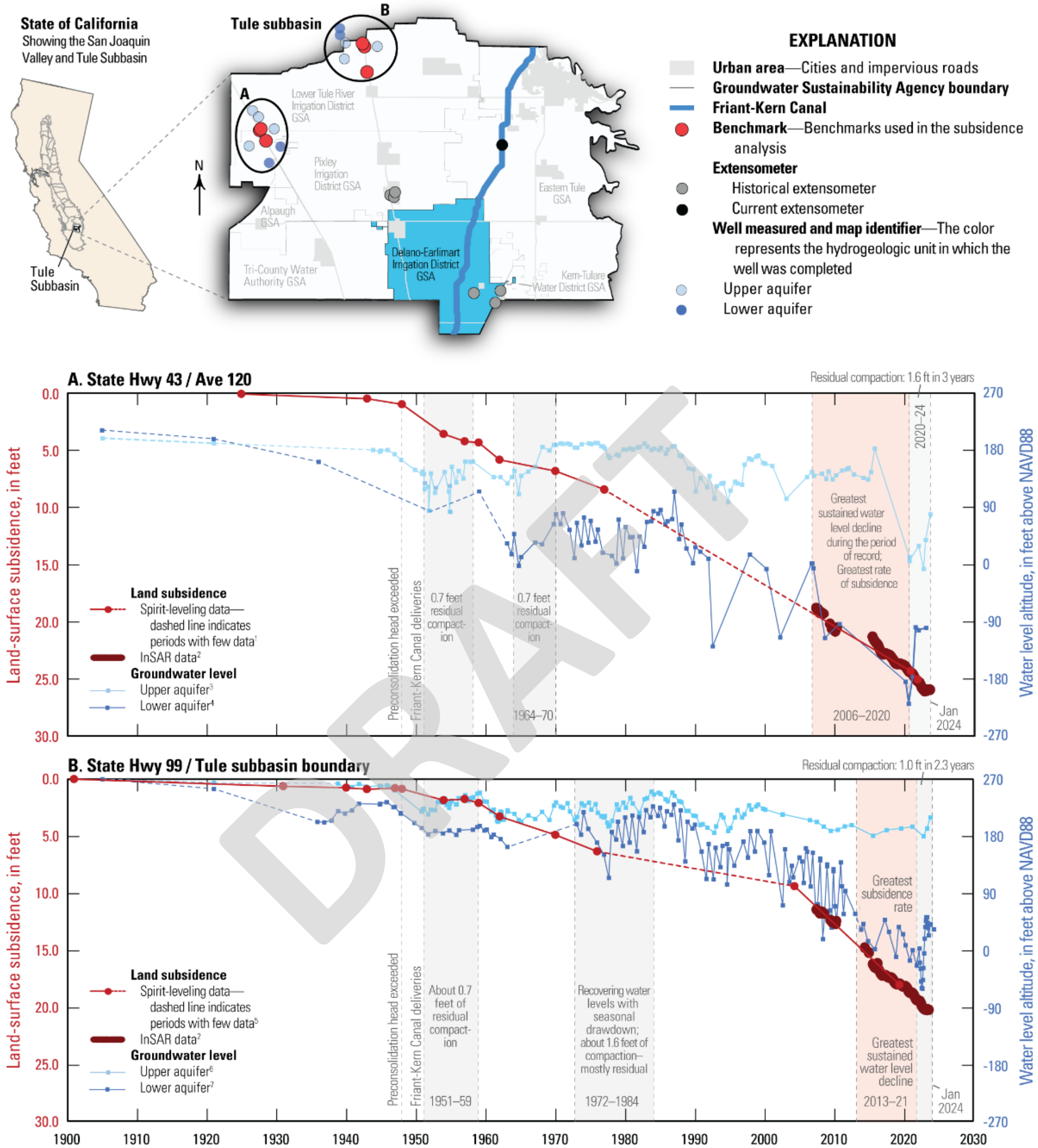
Figure 2-27 and **Figure 2-28** show the 2015–2024 subsidence gradient across the Tule subbasin. Subsidence increases to the northeast, north, northwest, and west of the DEID GSA (**Figure 2-25**, **Figure 2-27, Figure 2-28**). These 2015–2024 subsidence trends outside of the boundaries of the DEID GSA are a continuation of subsidence trends that have persisted for many years, particularly in the north and northwestern part of the Tule Subbasin (Sites A–C, **Figure 2-24**). Greater subsidence occurs in the areas where the Corcoran Clay is present; however, the primary driver for subsidence is the lowering of groundwater levels. Although the DEID GSA water levels have declined somewhat during the last 15 years—driven by declines in the surrounding areas—the substantial water level recoveries after the 1950s mean that these water levels have not declined substantially below the critical head (site D, **Figure 2-21**; sites E–F, **Figure 2-22**; site G, **Figure 2-23**). Meanwhile, the water levels in the northern and northwestern parts of the basin are substantially below their historical levels and have only recently approached the estimated critical head due to recent large water level recoveries (Sites A–C, **Figure 2-20**, **Figure 2-21**). Additionally, substantial amounts of subsidence have occurred where the Corcoran Clay is absent, particularly along the Friant-Kern Canal in the ET GSA (B–B', **Figure 2-27**), and directly north of the DEID GSA (D–D', **Figure 2-28**).

From 2020–2022, water levels have recovered due to substantial precipitation and reduced pumping due to higher (imported and native) surface water availability in the Tule subbasin, and subsidence has slowed considerably since early 2023 (**Figure 2-26**). This is a result of the aquifer groundwater level reaching (or nearly so) the critical head. Although water levels began a recovery generally around 2020–

2022, subsidence continued at a substantial rate at Sites A–C, referred to as "residual compaction[10]." In the process of residual compaction, faster draining, thinner units are compacted first, followed by the compaction of thicker and more slowly draining fine-grained units. Excess pore pressures in the thicker fine-grained units slowly dissipate and approach equilibrium with the pore-pressure declines in the adjacent aquifer units, resulting in a time lag between the water level recovery and the ceasing of compaction. Depending on the thickness and the vertical hydraulic diffusivity of a thick confining unit, and the extent of the water-level declines in the aquifer, compaction lags pore-pressure declines in the adjacent aquifers, and the associated compaction can require decades or more to ultimately be realized (Ellis and others, 2023). In the north and northwestern areas of the Tule subbasin, between 1.0 and 1.6 feet of residual compaction occurred in a 2-to-3-year period between fall 2020 and 2024. The rapid water level recovery from fall 2020 to 2023 (sites A–C, **Figure 2-20**, **Figure 2-21**) resulted in the rapid equilibration (or nearly so) of water levels between the fine-grained units and the surrounding aquifer; otherwise, this residual compaction would have almost certainly continued for many years if water levels had continued at the pre-recovery (prior to fall 2020) water levels. By comparison, residual compaction in most areas of DEID has been minimal—ranging from 0.05 to 0.24 ft during a 2.5-3-year period.

Water-level declines in the lower aquifer (or deeper units) due to groundwater use are the primary cause of subsidence in the Tule subbasin and the DEID GSA. Based on historical extensometer data, generally west of the Friant-Kern Canal, historical (pre-1982) upper aquifer water-level declines have been responsible for about 20% of the subsidence. East of the Friant-Kern Canal, lower aquifer water-level declines have been responsible for about 18% of the subsidence. The remaining subsidence occurs in the Pliocene (about 71%) and the Santa Margarita (about 11%).

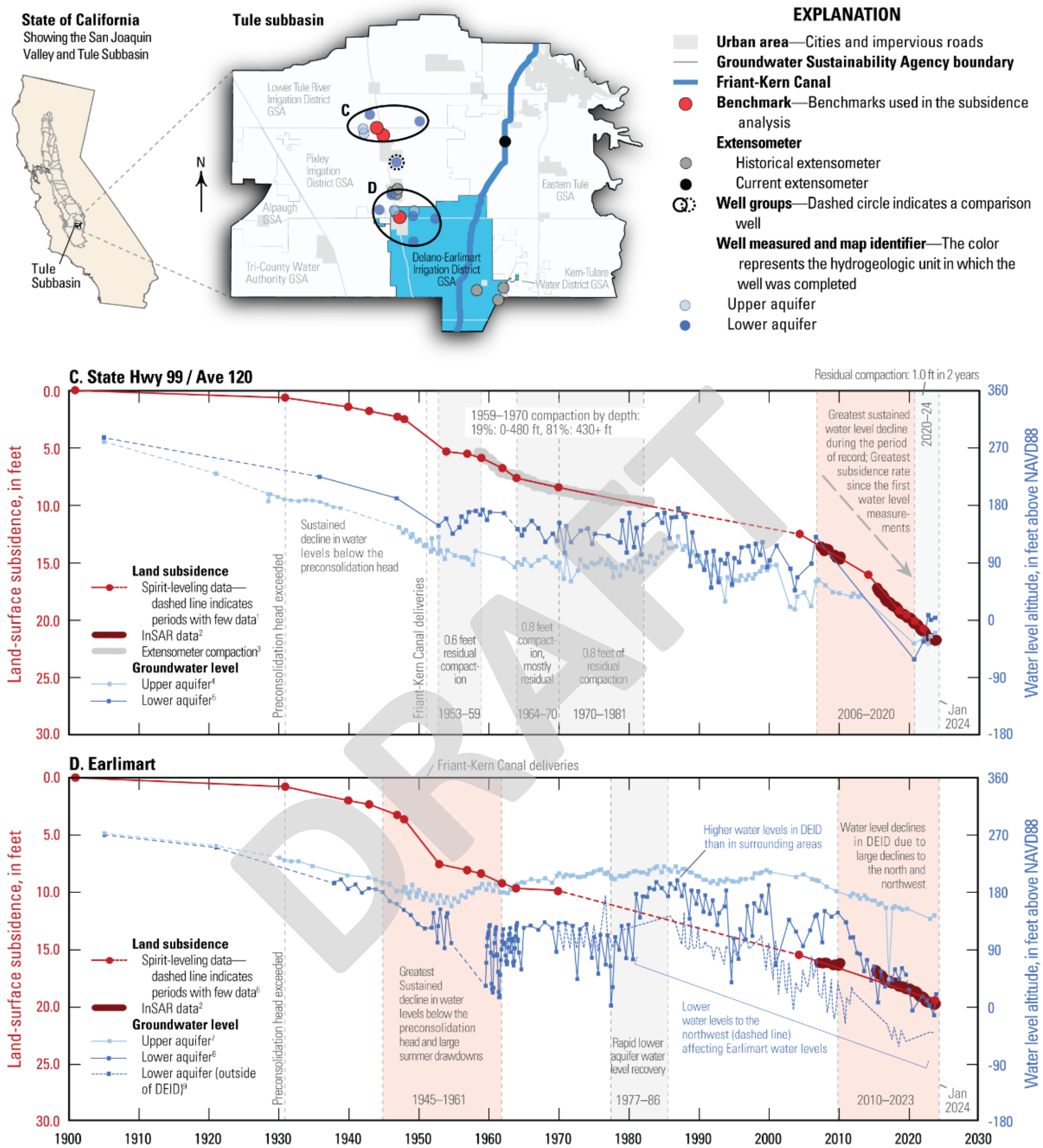
[10] Subsidence that continues past the point that water levels stabilize at historical lows.



[1]Benchmarks PTS 57, T 949, T949 RESET, and G 458 were used to determine cumulative subsidence from 1924 to 2021. [2]The initial value for the InSAR vertical displacement is registered to the amount of cumulative subsidence determined from sprit leveling. Data obtained from CADWR and extracted at cells containing the benchmark. [3]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1943–51: 22S23E15R001M; 1951–2007: 22S23E08A001M; 2008–23: 22S23E30J001M. [4]The 1901, 1921, and 1959 estimated water levels are from Lofgren and Klausing (1969); 1963–91: 23S23E03C005M; 1991–2021: E18; 2021–23: 360220N1195184W001.

[5]Benchmarks 266.177, OCTOL, and TULE were used to determine cumulative subsidence from 1901 to 2021. [6]The 1901 and 1921 estimated water level from Lofgren and Klausing (1969); 1938–64: 21S25E05J001M; 1964–2000: 21S24E14N001M; 2002–21: 21S24E11C001M; 2021–23: 21S25E06K001M. [7]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1935–63: 21S24E03A001M; 1973–2013: 21S25E19A001M; 2014–2022: 21S24E03L001M; 2022–2024: 21S25E06K002M

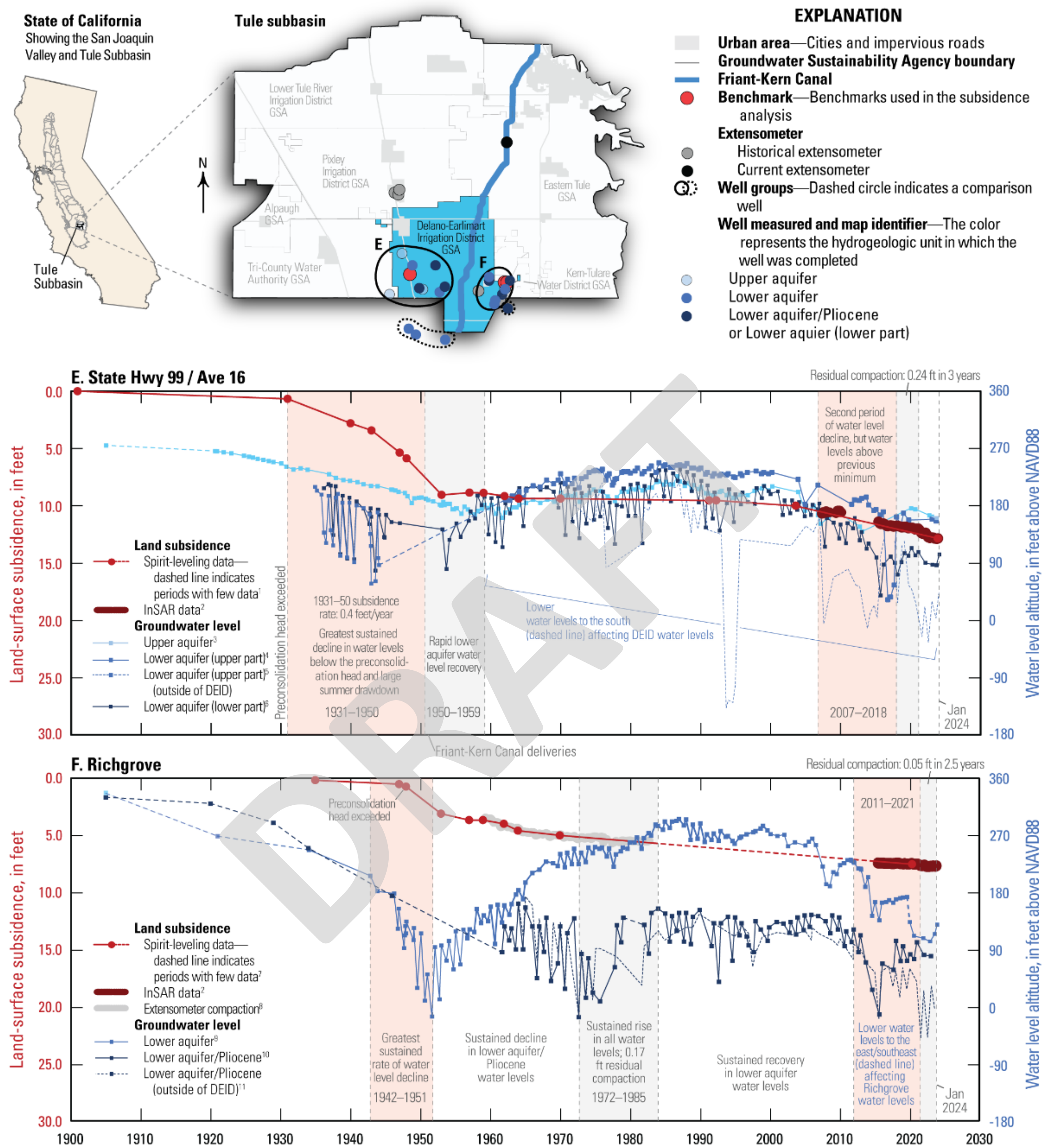
Figure 2-20 Long-term Land Subsidence in LTRID GSA and PID GSA (Sites A and B)



[1]Benchmarks 272.394, J 88, and QUAIL were used to determine cumulative subsidence from 1901 to 2021. [2]The initial value for the InSAR vertical displacement is registered to the amount of cumulative subsidence determined from sprit leveling. Data obtained from CADWR and extracted at cells containing the benchmark. [3]Extensometer data from extensometer 23S/25E-16N1 operational from 1958 to 1983 located in Pixley. [4]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1928–38: 22S24E23A001M; 1947–2023: 22S24E23J001M. [5]The 1901 estimated water level from Lofgren and Klausing (1969); 1935–62: 22S25E14J002M; 1964–2023: RMS well 22S24E01Q001M.

[6]Benchmarks 276B, EARLIMART, and PM 7.1 were used to determine cumulative subsidence from 1901 to 2021. [7]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1930–62: 23S25E27J002M; 1962–2023: 23S25E28F001M. [8]The 1901, 1921 estimated water level from Lofgren and Klausing (1969); 1937–54: 24S25E10A001M; 1959–64: 23S25E16N003M; 1964–2011: 23S25E30H002M; 2011–19: 23S25E25R001M; 2020–24: 358995N1192507W001; [9]1963–2023: 22S25E33P001M

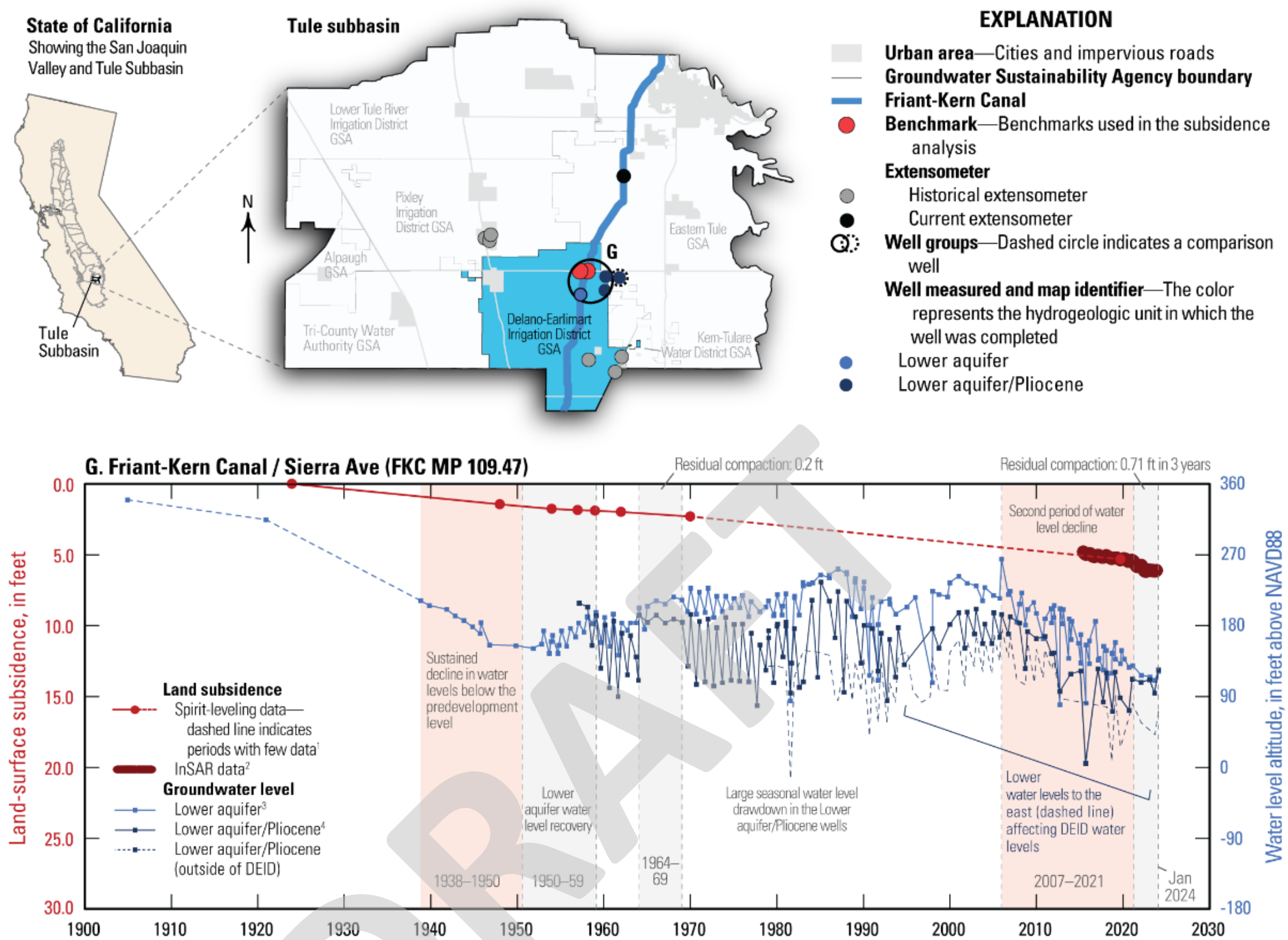
Figure 2-21 Long-term Land Subsidence in PID GSA and Northwest DEID GSA (Sites C and D)



[1]Benchmarks 302.847, T 88, and HPGN CA 06 13 were used to determine cumulative subsidence from 1901 to 2021. [2]The initial value for the InSAR vertical displacement is registered to the amount of cumulative subsidence determined from sprit leveling. Data obtained from CADWR and extracted at cells containing the benchmark. [3]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1920–57: 25S25E04C001M; 1957–2013: 24S25E16B001M; 2020–23: 24S25E35H001M. [4]The 1901, 1921, and 1959 estimated water levels are from Lofgren and Klausing (1969); 1935–44: 24S25E36H001M; 1962–2023: 24S25E22B001M. [5]1972–11: 25S26E30A001M; 2012–2020: 357395N1192052W001; 2020–24: 357436N1192587W001. [6]1936–55: 24S26E30P001M; 1956–2000: 24S25E35D001M; 2000–24: 24S25E13F001M.

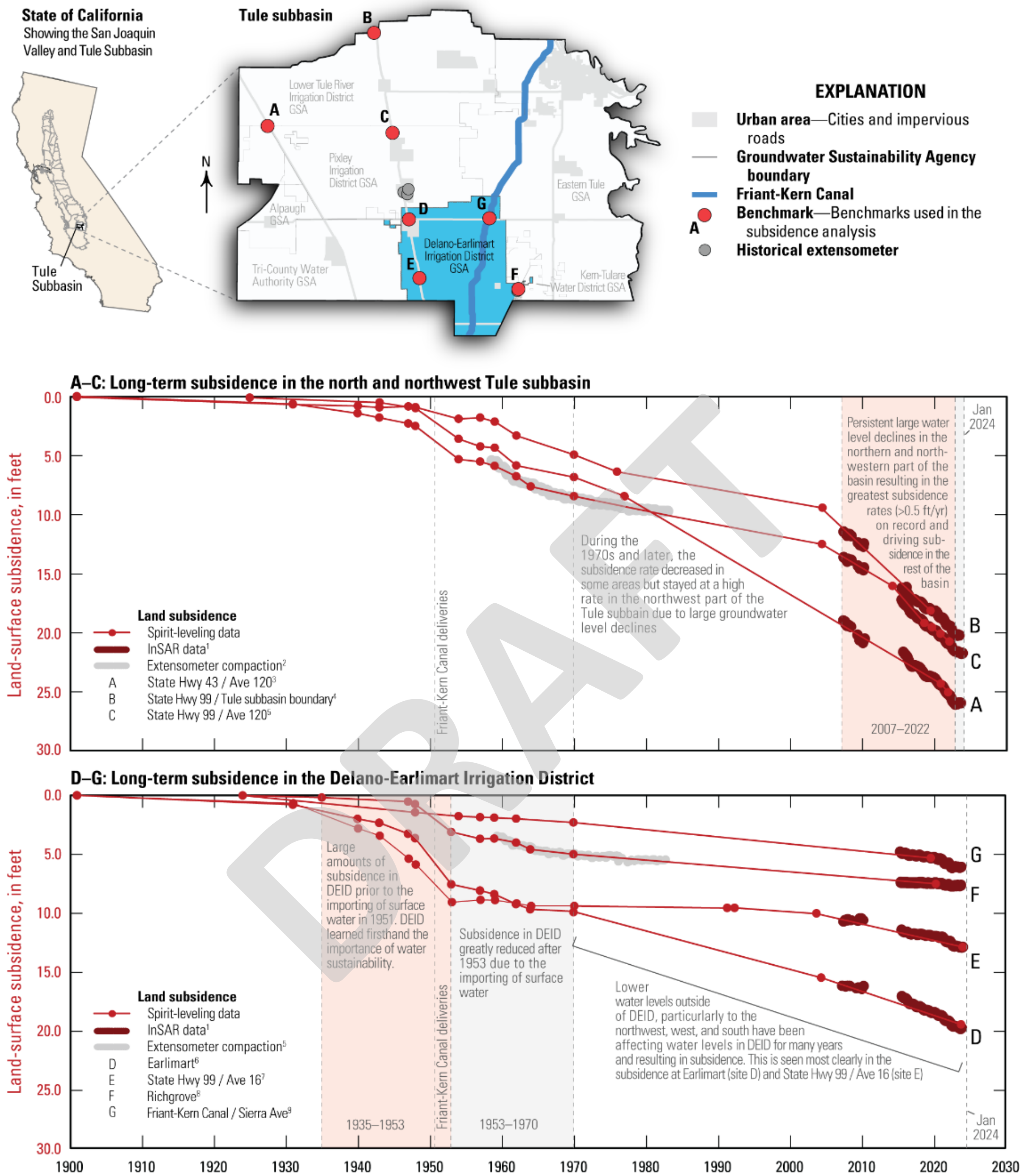
[7]Benchmarks U822 and PTS 31 were used to determine cumulative subsidence from 1924 to 2021. [8]Extensometer data from extensometer 24S/26E-36A2 operational from 1959 to 1982 located in Richgrove. [9]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1942–43: 24S26E26C002M; 1934, 1946–57: 25S26E01J003M; 1957–2000: 24S26E26C002M; 2000–2019: 25S26E02H001M; 2020–24: 358051N1191050W001. [10]The 1905–1946 estimated water level from Lofgren and Klausing (1969); 1953–61: 24S26E26F001M; 1961–78: 25S27E06A001M; 1987–2023: 24S27E30F001M. [11]1964–2023: 25S27E06R001M.

Figure 2-22 Long-term Land Subsidence in Southern DEID GSA (Sites E and F)



[1]Benchmarks PTS 18 and D 454 USBR were used to determine cumulative subsidence from 1901 to 2021. [2]The initial value for the InSAR vertical displacement is registered to the amount of cumulative subsidence determined from sprit leveling. Data obtained from CADWR and extracted at cells containing the benchmark. [3]The 1901 and 1921 estimated water levels are from Lofgren and Klausing (1969); 1938–1949: 23S26E31L001M; 1949–2024: 24S26E04R001M. [4]The 1901 and 1921 and estimated water levels are from Lofgren and Klausing (1969); 1957–2015: 23S26E35H001M; 2015–2024: 24S26E02H001M. [5]1979–2024: 23S26E36L001M.

Figure 2-23 Long-term Land Subsidence in Northeast DEID GSA (Site G)



[1]The initial value for the InSAR vertical displacement is registered to the amount of cumulative subsidence determined from sprit leveling. Data obtained from CADWR and extracted at cells containing the benchmark. [2]Extensometer data from extensometer 23S/25E-16N1 operational from 1958 to 1983 located in Pixley. [3]Benchmarks PTS 57, T 949 RESET, and ANGIOLA AZ MK were used to determine cumulative subsidence from 1924 to 2021. [4]Benchmarks 266.177, OCTOL, and TULE were used to determine cumulative subsidence from 1901 to 2021. [5]Benchmarks 272.394, J 88, and QUAIL were used to determine cumulative subsidence from 1901 to 2021.

[5]Extensometer data from extensometer 24S/26E-36A2 operational from 1959 to 1982 located in Richgrove. [6]Benchmarks 276B, EARLIMART, and PM 7.1 were used to determine cumulative subsidence from 1901 to 2021. [7]Benchmarks 302.847, T 88, and HPGN CA 06 13 were used to determine cumulative subsidence from 1901 to 2021. [8]Benchmarks U822 and PTS 31 were used to determine cumulative subsidence from 1924 to 2021. [9]Benchmarks PTS 18 and D 454 USBR were used to determine cumulative subsidence from 1901 to 2021.

Figure 2-24 Long-term Land Subsidence in the North and Northwest Tule Subbasin vs. Land Subsidence in DEID GSA

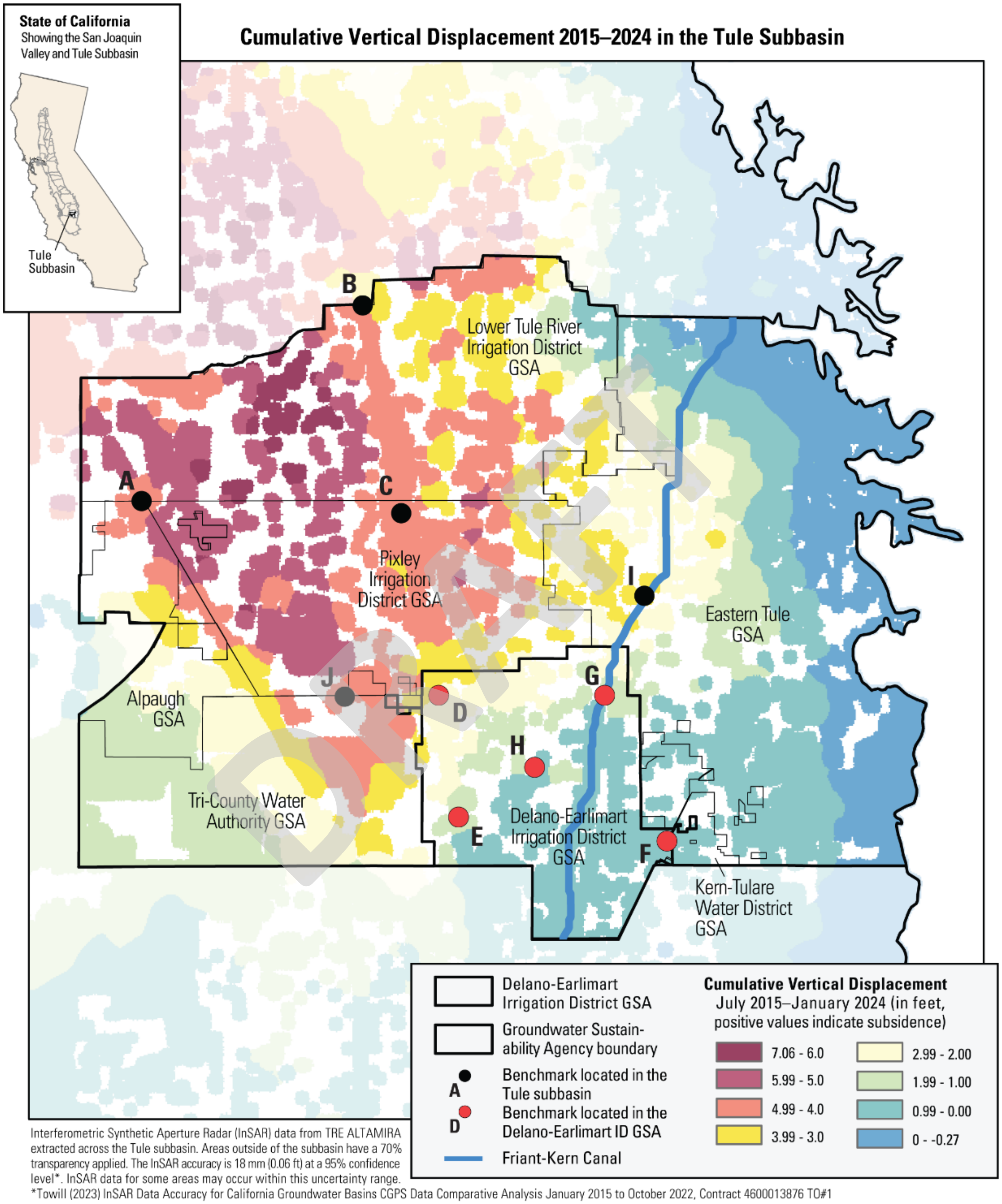
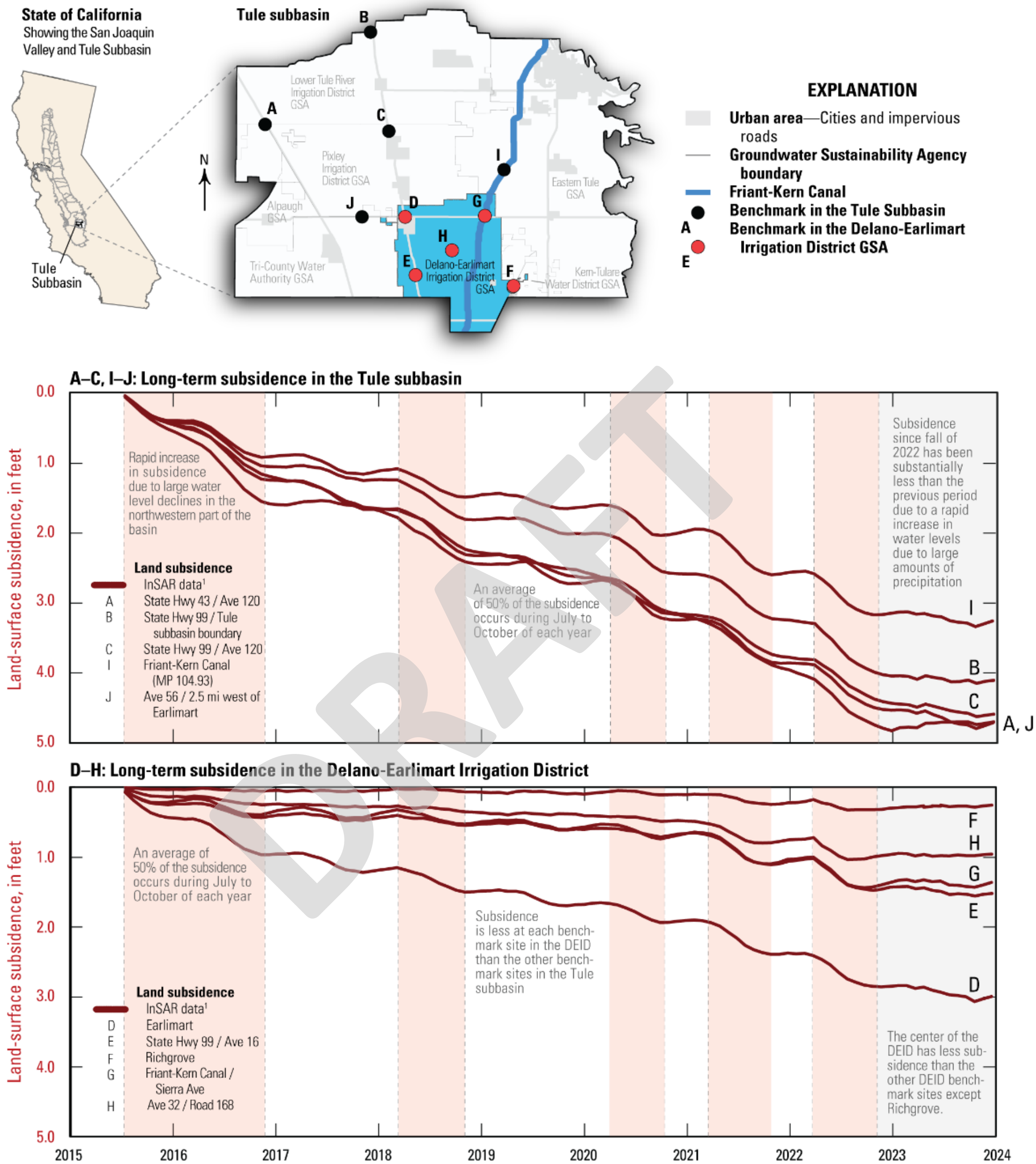
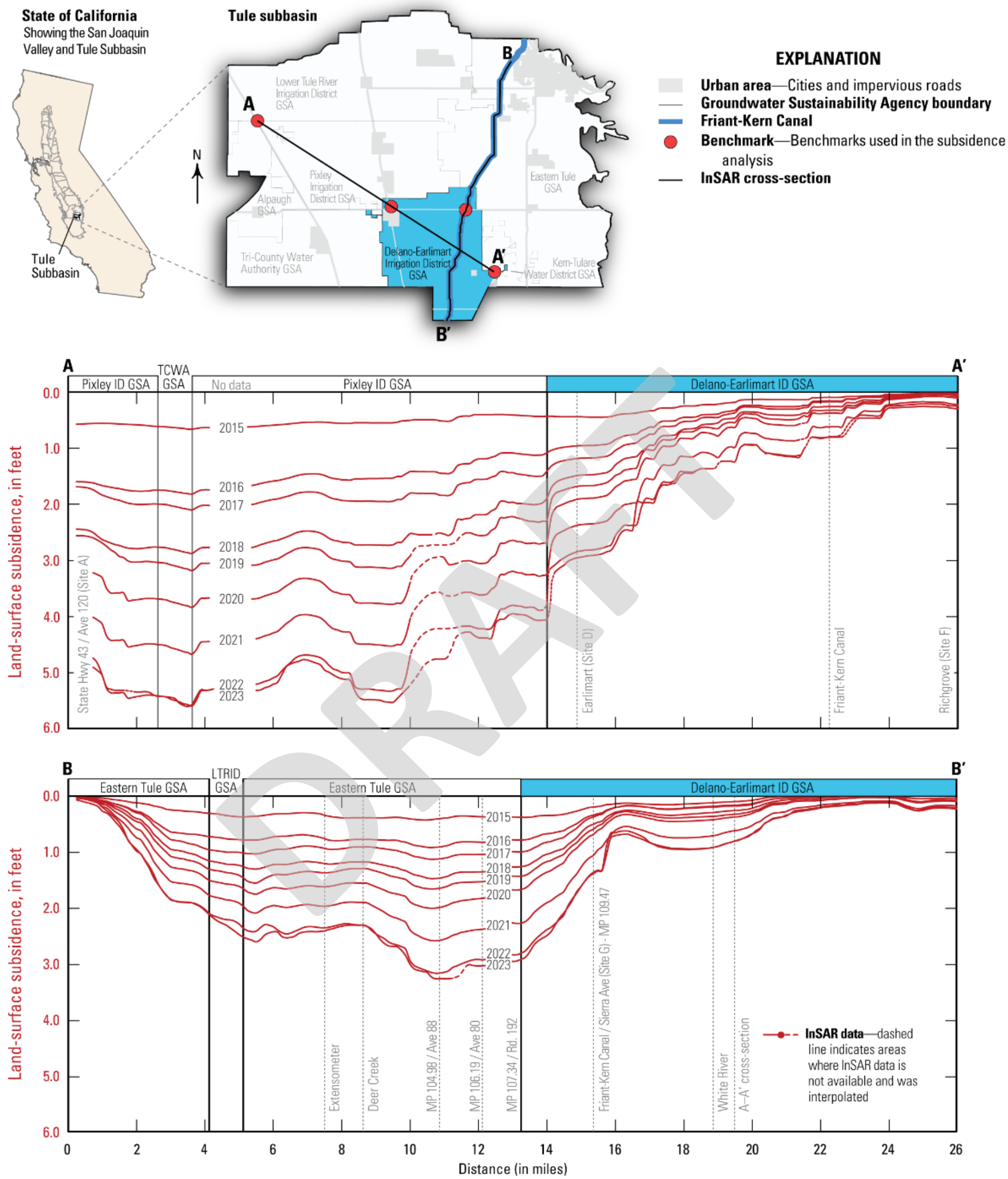


Figure 2-25 Cumulative Vertical Displacement July 2015 - January 2024 in Tule Subbasin



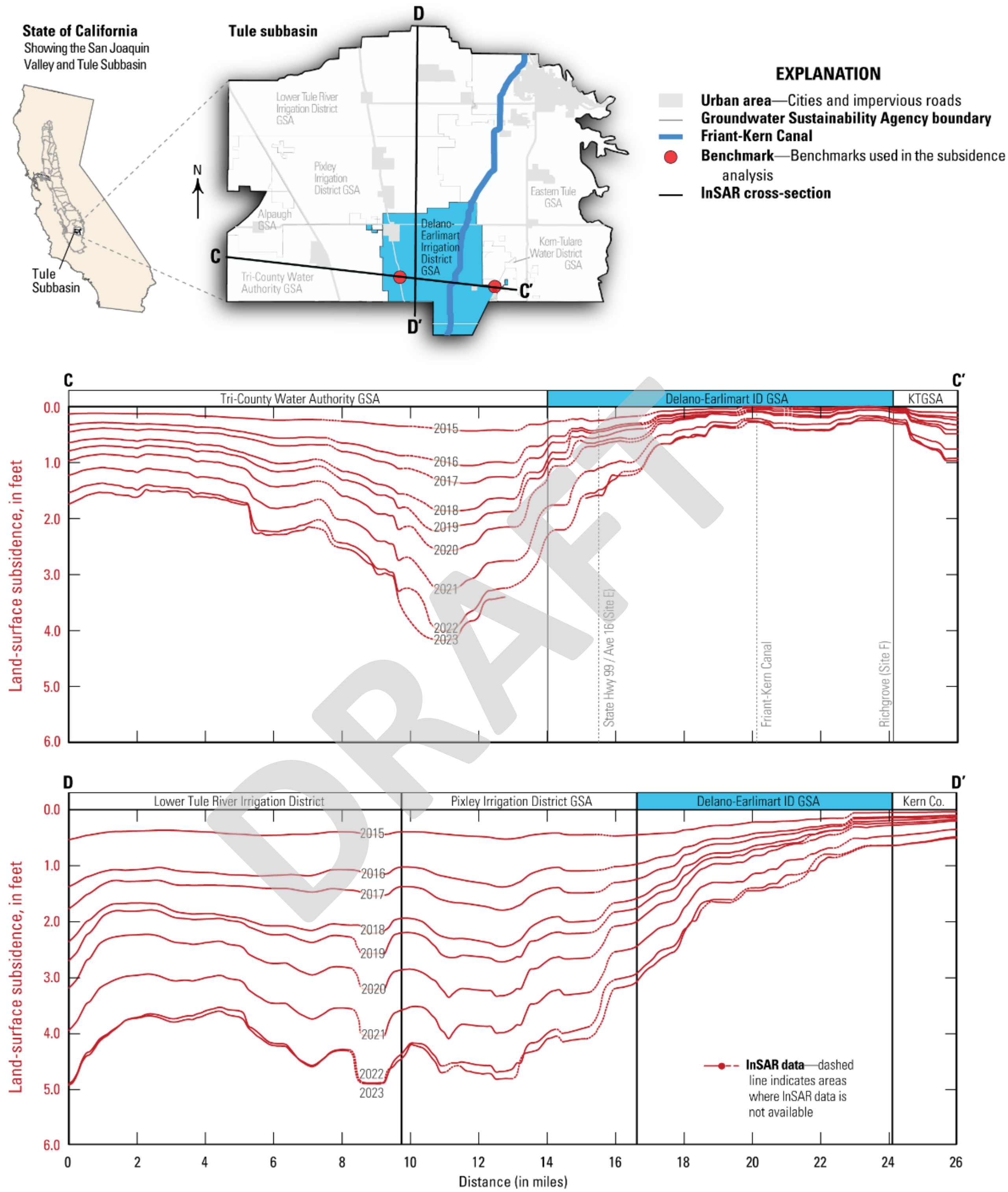
¹Interferometric Synthetic Aperture Radar (InSAR) data from TRE ALTAMIRA extracted at 660-foot intervals across the Tule subbasin. The InSAR accuracy is 18 mm (0.06 ft) at a 95% confidence level*. InSAR data for some locations on this figure may occur within this uncertainty range in 2015. *Towill (2023) InSAR Data Accuracy for California Groundwater Basins CGPS Data Comparative Analysis January 2015 to October 2022, Contract 4600013876 TO#1

Figure 2-26 Long-term Land Subsidence in Tule Subbasin and DEID GSA



[1]Interferometric Synthetic Aperture Radar (InSAR) data from TRE ALTAMIRA extracted at 660-foot intervals across the Tule subbasin. The InSAR accuracy is 18 mm (0.06 ft) at a 95% confidence level*. InSAR data for some locations on this figure may occur within this uncertainty range in 2015. *Towill (2023) InSAR Data Accuracy for California Groundwater Basins CGPS Data Comparative Analysis January 2015 to October 2022, Contract 4600013876 TO#1

Figure 2-27 Land Subsidence Cross-Section from DEID GSA to LTRID GSA



[1]Interferometric Synthetic Aperture Radar (InSAR) data from TRE ALTAMIRA extracted at 660-foot intervals across the Tule subbasin. The InSAR accuracy is 18 mm (0.06 ft) at a 95% confidence level*. InSAR data for some locations on this figure may occur within this uncertainty range in 2015. *Towill (2023) InSAR Data Accuracy for California Groundwater Basins CGPS Data Comparative Analysis January 2015 to October 2022, Contract 4600013876 TO#1

Figure 2-28 Land Subsidence Cross-Section from DEID GSA to TCWA GSA

Subsection 2.3.6 Interconnected Surface Water Systems *[23 CCR § 354.16 (f)]*

23 Cal. Code Regs. § 354.16 Groundwater Conditions. (f) *Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.*

"Interconnected surface water refers to surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted" (Title 23 CCR Section 351(o)). The interaction between surface water and groundwater are part of the natural hydrologic system and can be summarized in three ways (DWR, 2024):

1. Surface water gains water from groundwater (i.e. "gaining stream").
2. Surface water loses water to groundwater (i.e. "losing stream").
3. Both, gaining in some locations and losing in other locations or gaining at some times and losing at other times.

Losing streams can be connected to the underlying aquifer from a continuous saturated zone or can be disconnected from the aquifer system by an unsaturated zone, the latter being a disconnected surface water system. Changes in the relationship between surface water and groundwater can occur naturally from seasonal precipitation changes and seasonal pumping. In areas where groundwater naturally discharges at the land surface (gaining stream), lowering of groundwater levels from pumping near the discharge point can impact the flow in the stream. Other factors that can affect flow in the stream include releases of water from upstream reservoirs, managed recharge near the stream channel, long-term precipitation trends, and post-development conditions of the aquifer system.

In the Tule Subbasin, the exact location and timing of interconnected surface water (ISW) is not currently known and is a data gap. However, based on the best available data, ISW conditions likely exist in certain parts of the Subbasin. To identify areas of potential ISWs for further study, an analysis was conducted consistent with method utilized by The Nature Conservancy's ICON: Interconnected Surface Water in the Central Valley database (The Nature Conservancy, 2023). The method categorizes the likelihood of the ISW connection based on the minimum depth to groundwater and uses the following four categories:

- Likely Connected – Gaining: Groundwater elevation is equal to or greater than the surface water elevation and thus groundwater is likely flowing into the surface water body.
- Likely Connected – Losing: Groundwater elevation is between 0 and 20 feet below the surface water elevation and thus groundwater is likely receiving water from the surface water body through a continuous saturated zone.
- Uncertain: Conditions where the groundwater elevation is between 20 and 50 feet below the surface water elevation are labeled as uncertain because the groundwater may or may not be connected to surface water.
- Likely Disconnected: Groundwater elevation is greater than 50 feet below the surface water elevation and thus is likely disconnected from the surface water body.

The method also uses the following criteria to further identify the likelihood of ISW connection:

- Potentially Gaining (Jasechko et al. 2021): Less than 50% of nearby wells have water levels below the stream surface and thus groundwater is potentially flowing into the surface water.

- Potentially Losing (Jasechko et al. 2021): Greater than 50% of nearby wells have water levels below the stream surface and thus surface water is potentially seeping into groundwater.
- No Groundwater Data: No groundwater depth data available from the California Department of Water Resources or Jasechko et al. 2021.
- *Canal, Ditch, or Pipeline: Labeled as canal/ditch or pipeline in NHDPlus version 2.

Based on the ICONS database and a review of groundwater levels, there are no likely identified and no likely potential ISW within DEID GSA that existed as of January 1, 2015, as evidenced by the depth to the first encountered groundwater that exceeds hundreds of feet below ground surface and review of vegetation data described in **Subsection 2.4.7**.

Based on the ICONS database, the Upper White River from the Subbasin Boundary to Highway 65 (outside the DEID GSA) is a potential ISW.

Figure 2-29 depicts the upper aquifer groundwater elevations in the historic wet conditions of spring 2023 and **Figure 2-30** depicts the output form the ICONS database. The depth to groundwater exceeds hundreds of feet across the DEID GSA, which exceeds the possibility of depletions of interconnected surface water.

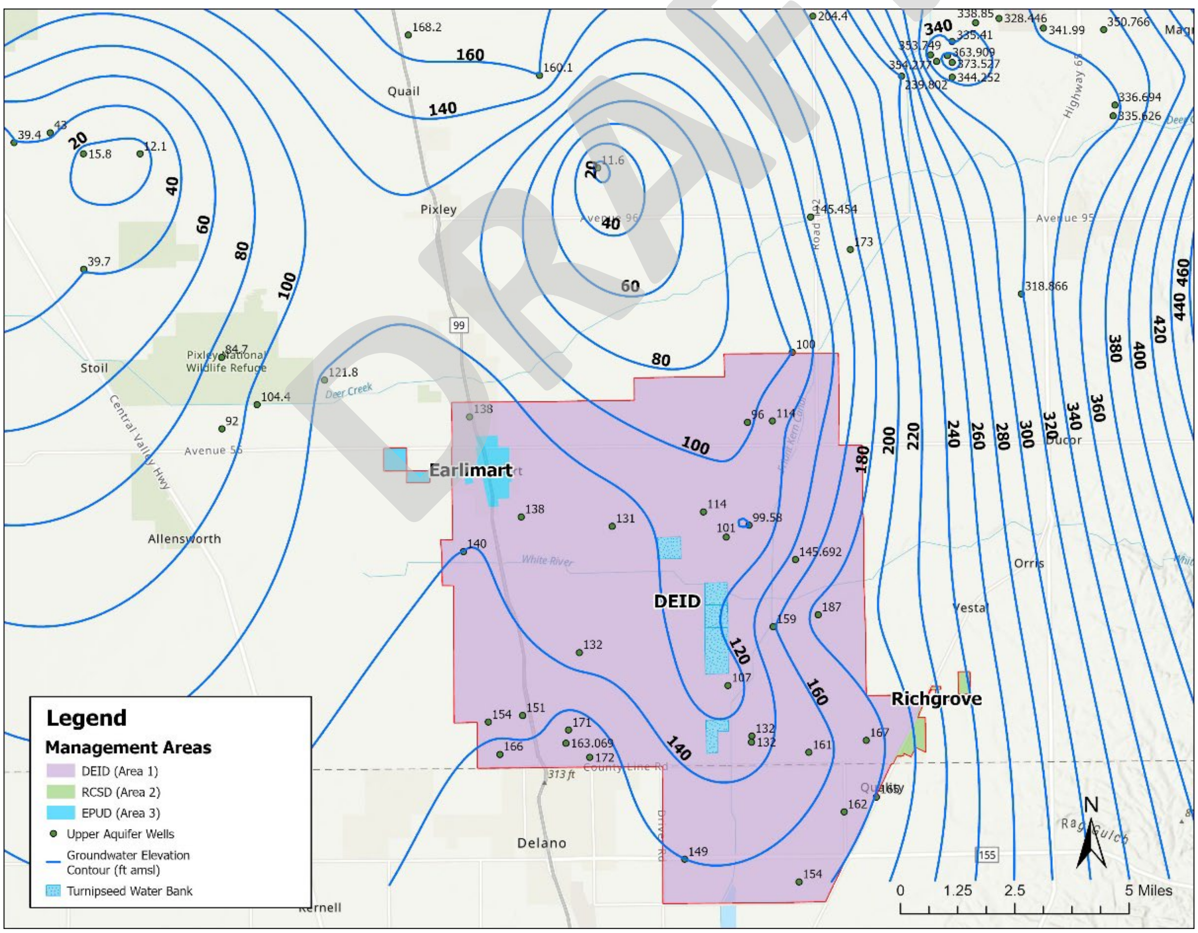


Figure 2-29 2023 Water year seasonal high (spring 2023) upper aquifer groundwater level contours for the DEID GSA plan area

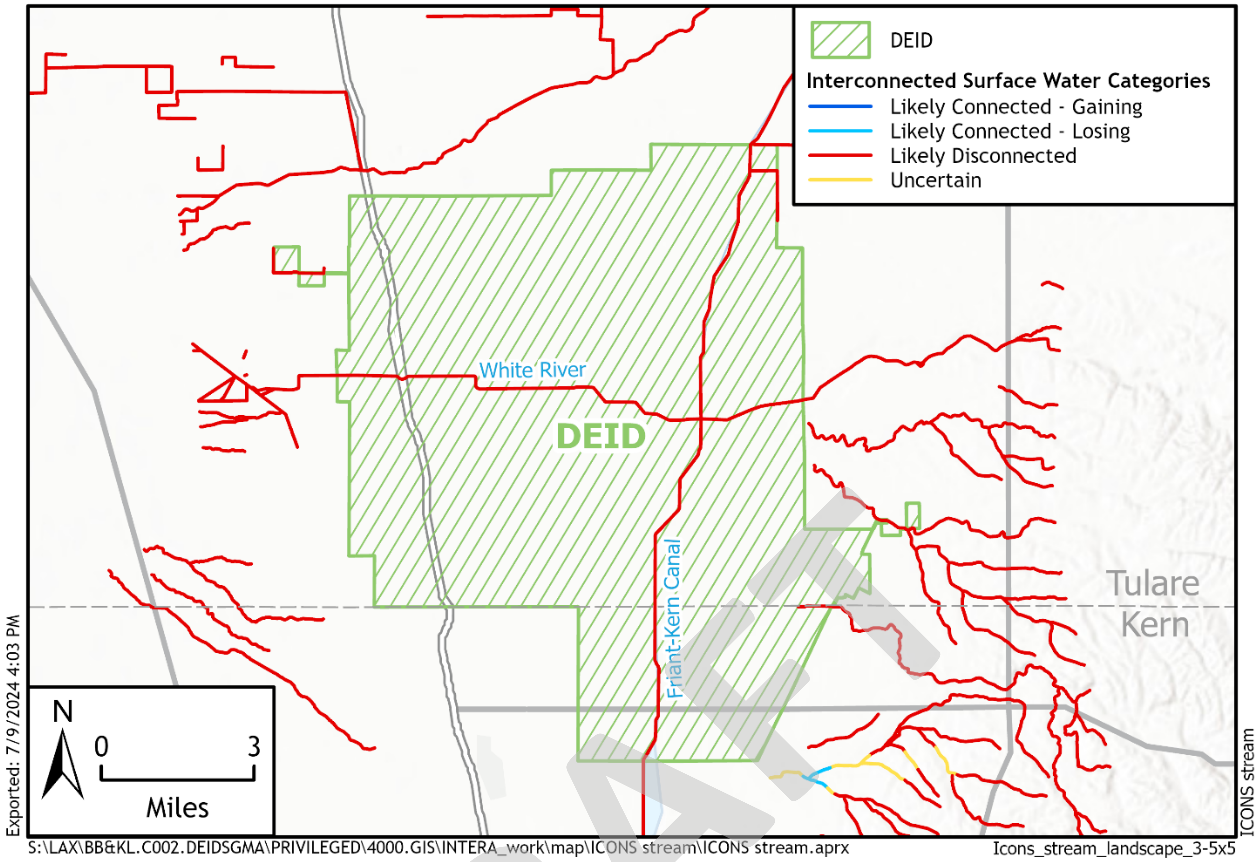


Figure 2-30 Interconnected Surface Waters within DEID GSA based on ICONS

Stream inflow into the DEID GSA occurs along the White River and has historically been measured at the USGS stream gage near Ducor (outside of the DEID GSA) by the USGS at Site No. 11199500. The measured data from this station is available over two periods: 1942 to 1953 and 1971 to 2005 (**Figure 2-31**). The data indicate intermittent stream flow into the Tule Subbasin. The White River channel extends as far as State Highway 99 but does not reach the historical Tulare Lakebed. Streamflow is currently monitored manually at Road 208 by the Tule Basin Water Quality Coalition and the DEID. Considering the intermittent nature of streamflow and the depth to groundwater of greater than 100 feet along the course of the White River, all sections of the White River east of State Highway 65 are losing to the underlying sediments and groundwater is disconnected from streamflow.

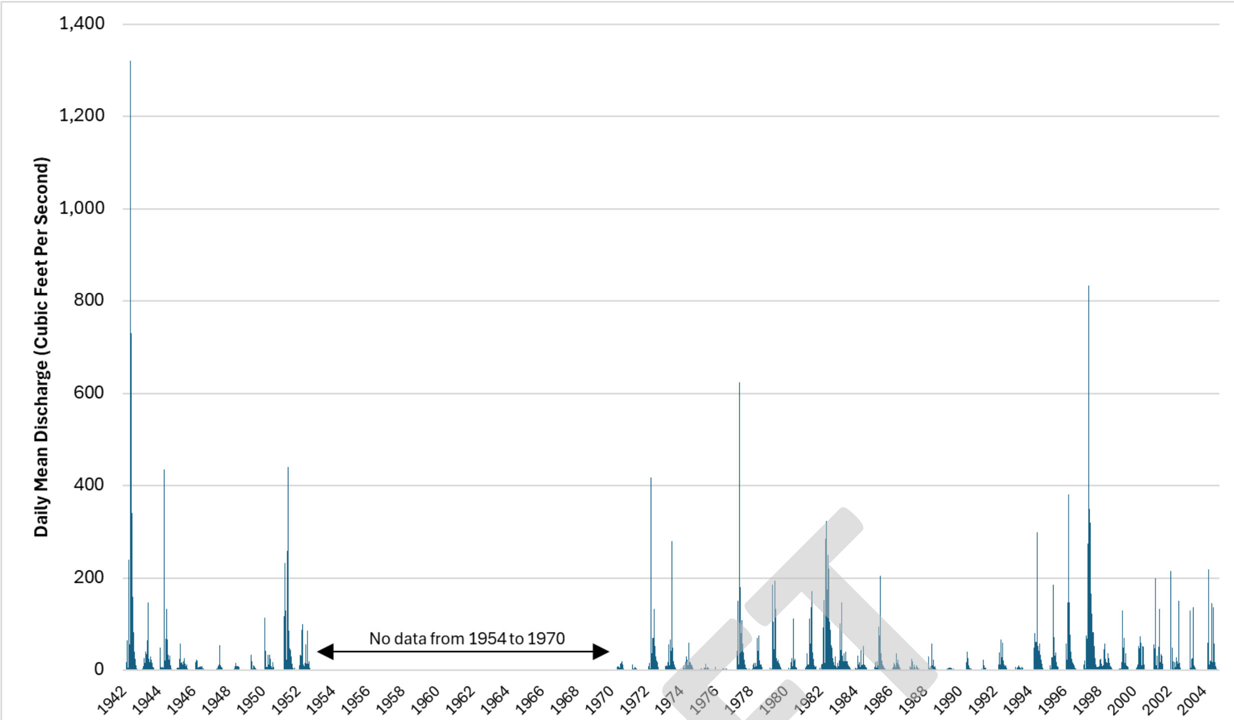


Figure 2-31 Daily Mean Discharge for White River Near Ducor 1942 to 2005

Subsection 2.3.7 Groundwater Dependent Ecosystems *[23 CCR § 354.16 (g)]*

> **23 Cal. Code Regs. § 354.16 Groundwater Conditions. (g)** *Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.*

Groundwater Dependent Ecosystems (GDEs) are defined under the SGMA as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (Title 23 CCR Section 351(m)).

There are no GDEs within DEID GSA based on the best available data and tools.

The presence of potential GDEs were within the DEID GSA were evaluated using the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset provided by DWR (DWR, 2018). The NCCAG dataset comprises 48 publicly available state and federal agency mapping datasets including but not limited to the following: VegCAMP—The Vegetation Classification and Mapping Program, California Department of Fish and Wildlife; CALVEG—Classification and Assessment with Landsat Of Visible Ecological Groupings, U.S. Department of Agriculture Forest Service; NWI V 2.0—National Wetlands Inventory (Version 2.0), U.S. Fish and Wildlife Service; FVEG— California Department of Forestry and Fire Protection, Fire and Resources Assessment Program; and USGS National Hydrography Dataset (CDFW, 2018; CDFW, 2023). Vegetation types less commonly associated with groundwater were removed from these datasets and the NCCAG only retained vegetation types commonly associated with groundwater. **Figure 2-32 s**hows the aerial extent of the aquatic and vegetative GDEs mapped by the NCCAG dataset in the context of DEID GSA's boundary extent.

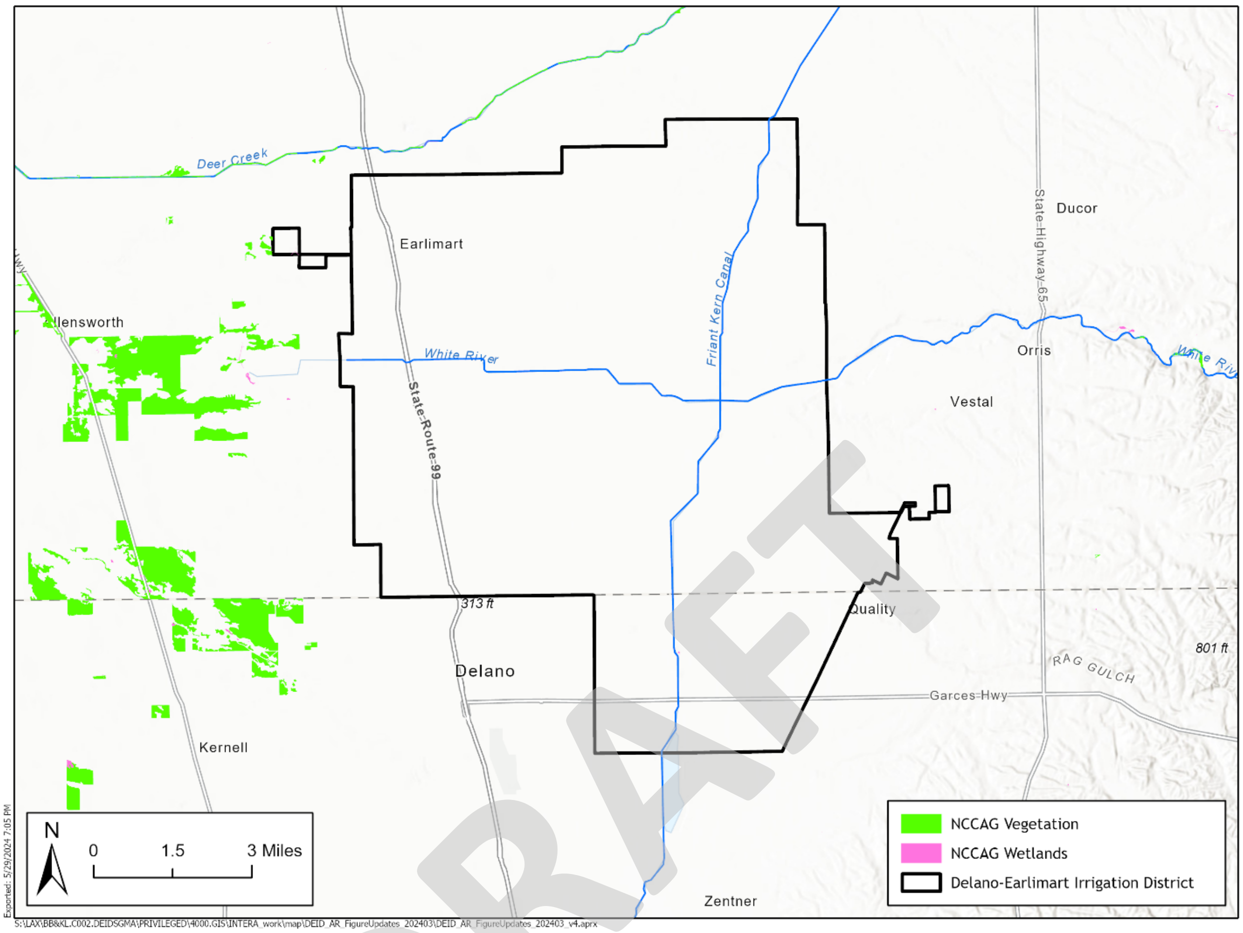


Figure 2-32 Potential GDEs mapped by the NCCAG dataset

Subsection 2.4 Water Budget *[23 CCR § 354.18]*

23 Cal. Code Regs. § 354.18 Water Budget. (a) *Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.*

The regulatory requirements outlined in CCR § 354.18 for describing the total annual volume of groundwater, imported water, and surface water entering and leaving the Tule Subbasin, including historical, current, and projected water budget conditions, and the change in the volume of water stored are addressed and fulfilled in Chapter 2.3 of the Tule Subbasin Setting (**Appendix A-2**). The Tule Subbasin Setting is currently in the process of being updated for the 2024 GSP versions for each GSA of the Tule Subbasin to incorporate the results from an updated numerical groundwater model, which has been extended to include two additional water years of historical data. However, the projected water budget for the Tule Subbasin Setting has not been developed at the time of writing this draft GSP. Also, DEID has not had sufficient time to review the water budget updates based on the updated numerical groundwater model; therefore, DEID GSA is presenting the water budget components based on the methodology described in the original Tule Subbasin Setting (**Appendix A-2**). One important update for the DEID GSA is the exclusion of the Western Management Area (WMA) and this section presents the water budgets quantified based on this exclusion (see **Appendix M**).

Additional historical water budgets for the DEID GSA have also been developed by DEID independently from the Tule Subbasin Setting to provide supporting context of the sustainable practices of DIED GSA. These alternative water budget estimation methods are described in the Water Balance Technical Memorandum included as **Appendix N** in this GSP. One method utilizes the Tule groundwater model results with a hybrid approach which applies an area-weighted native yield of the Tule Subbasin to each GSA instead of the net subsurface inflow/outflow components. Another non-model-based approach is also presented in **Appendix N** by estimating the net deposits of water within the DEID GSA based on imported water deliveries and consumptive use through 2023. These independent analyses are meant to quantify the surplus of groundwater based on DEID GSA sustainable practices, while removing the negative impacts to the water budget caused by neighboring unsustainable pumping. As stated throughout this GSP, DEID GSA is unique in the Tule Subbasin because they have been practicing sustainable groundwater management since the Central Valley Project (CVP) was contracted for the distribution of imported surface water for beneficial uses throughout the DEID area. In addition, DEID GSA has further utilized contracted CVP water by developing aquifer recharge facilities which not only bank surplus imported water for DEID, but also help offset the overdraft conditions throughout the Tule Subbasin (see **Section 5**). The purpose of providing alternative water budget estimation methods in this section is to ensure the sustainable practices of DEID GSA are not shadowed by the unsustainable practices of the surrounding GSAs.

Table 2-3 links the requirements of 23 CCR § 354.18 to the sections in the Tule Subbasin Setting (**Appendix A-2**) and the sections of this GSP that apply to and fulfil each regulatory component.

Table 2-3: Components of 23 CCR § 354.18

23 CCR	Section Title	Tule Subbasin Setting	DEID GSA GSP
§ 354.18 (b)(1)	Surface Water Budget	2.3.1	2.4.1
§ 354.18 (b)(2)	Sources of Groundwater Recharge	2.3.2.1	2.4.2.1
§ 354.18 (b)(3)	Sources of Groundwater Discharge	2.3.2.2	2.4.2.2
§ 354.18 (d)(4)	Change in Groundwater Storage	2.3.2.3	2.4.2.3
§ 354.18 (d)(5)	Overdraft	2.3.2.4	2.4.2.4
§ 354.18 (d)(6)	Water Year Type	2.3.2.5	2.4.2.5
§ 354.18 (b)(7)	Sustainable Yield	2.3.2.6	2.4.2.6
§ 354.18 (c)(1)	Current Water Budget	2.3.3	2.4.3
§ 354.18 (c)(2)	Historical Water Budget	2.3.4	2.4.4
§ 354.18 (c)(3)	Projected Water Budget	2.3.5	2.4.5

Excerpts and brief summaries of the Water Budget information described in the Tule Subbasin Setting (**Appendix A-2**), as well as brief descriptions of the water budget components and their accounting within the DEID GSA, are provided below.

Subsection 2.4.1 Surface Water Budget *[23 CCR § 354.18(b)(1)]*

23 Cal. Code Regs. § 354.18 Water Budget. (b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:* **(1)** *Total surface water entering and leaving a basin by water source type.*

Chapter 2.3.1 of **Appendix A-2** provides an overview of the Tule Subbasin's surface water budget and its components, including imported water. The surface water budget is based on a complete and accurate accounting of surface and imported water inflow and outflow over the period 1986/1987 to 2016/2017, with an average annual surface and imported water inflow of 1,477,000 acre-ft (see Table 2-2a in **Appendix A-2**) and average annual outflow of 1,474,000 acre-ft (see Table 2-2b in **Appendix A-2**). Based on the percent difference of 0.2 percent, the surface water budget is considered an accurate representation of actual surface water conditions in the Tule Subbasin.

Several sources of surface and imported water outflow are also sources of groundwater inflow. Of those water outflows that provide groundwater recharge, many sources are associated with diversions undertaken in accordance with existing water rights and/or purchased import water. These types of diversions are excluded from the estimate of sustainable yield.

DEID GSA's historical surface/imported water budget is a sub-budget of the total Tule Subbasin surface water budget. When surface water inflows are compared to surface water outflows with the WMA removed, the DEID GSA is in balance (Table 1 of **Appendix M**).

Subsection 2.4.1.1 Surface Water Inflow

Surface water inflow refers to all waters the enter or interact with the DEID GSA system via the ground surface. A summary of the components of surface water inflow is available below.

Subsection 2.4.1.1.1 Precipitation

Chapter 2.3.1.1.1 of the Tule Subbasin Setting (**Appendix A-2**) describes the methodology used to determine annual average precipitation throughout the Tule Subbasin. Annual precipitation was derived from annual precipitation values recorded at Porterville Station (see Figure 2-28 in **Appendix A-2**) and applying them against the long-term average annual isohyetal (rainfall) map for the region (see Figure 2-27 in **Appendix A-2**), with total estimated precipitation varying within each isohyetal zone based on historical records.

The total annual precipitation within the DEID GSA from water years 1986/1987 to 2016/2017 ranged from approximately 10,600 acre-ft in 2013/2014 to 80,700 acre-ft in 1997/1998, with an annual average volume of 33,900 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.1.2 Stream Inflow

As previously mentioned in **Section 2.2.4** of this GSP, White River is the only natural surface waterway that flows through the DEID GSA.

As described in Chapter 2.3.1.1.2 of the Tule Subbasin Setting (**Appendix A-2**), several different sources were used to estimate surface water inflows from native streams. The USGS White River Station along White River was used to estimate flow from White River; however, historical records at this station are only available from 1971-2005. Per a linear regression model indicating a correlation coefficient of 0.91 between White River and Deer Creek, the streamflow of White River was assumed to be proportional to the magnitude of flow in Deer Creek. For the period of 2005-2017, White River streamflow was based on a linear interpretation of measured data.

For the period from 1986/1987 to 2016/2017, average annual stream inflow into the DEID GSA was estimated to be approximately 2,000 acre-ft/year from White River (see Table 1 of **Appendix M**).

Subsection 2.4.1.1.3 Imported Water

Imported water is delivered to the DEID within the DEID GSA from the FKC (see Table 1 of **Appendix M**). Data related to the DEID service area was obtained directly from DEID. Additional information related to imported water in the Tule Subbasin is provided in Chapter 2.3.1.1.3 of the Tule Subbasin Setting (**Appendix A-2**).

For the period from 1986/1987 to 2016/2017, average annual imported water inflow into the DEID GSA was estimated to be approximately 110,000 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.1.4 Discharge to Crops from Wells

For the Tule Subbasin surface water budget and as described in Chapter 2.3.1.1.4 of the Tule Subbasin Setting (**Appendix A-2**), the water applied to crops was assumed to be the total applied water minus water deliveries from imported water and diverted native streamflow (see Figure 2-30 in **Appendix A-2**). Total crop demand was assumed based on estimates of crop evapotranspiration and an assumed average irrigation efficiency of 0.79 (Thomas Harder & Co., 2017). However, it should be noted that this irrigation efficiency is different by crop type and year, and that the Tule Subbasin average is a volume-adjusted mean of these various irrigation efficiencies over time.

The estimated average annual discharge to crops from wells for water years 1986/1987 to 2016/2017 in the DEID GSA was estimated to be approximately 36,500 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.1.5 Municipal Deliveries from Wells

As described in Chapter 2.3.1.1.5 of **Appendix A-2,** groundwater pumping for municipal supply is conducted by small municipalities in the DEID GSA. Households in the rural portions of the Tule Subbasin rely on private wells to meet their domestic needs; however, the volume pumped is negligible and de minimis (i.e. <2 acre-feet/year) under SGMA standards (Water Code, section 10721(e)). The total average annual municipal pumping in the DEID GSA is a small fraction of the total average annual municipal pumping in the Subbasin.

For the period from 1986/1987 to 2016/2017, municipal pumping within DEID GSA ranged from 1,600 acre-ft/year to a current amount of 2,800 acre-ft/year with an average annual estimated amount of approximately 2,100 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2 Surface Water Outflow

Surface water outflow refers to all waters the exit the DEID GSA system. A summary of the components of surface water outflow is available below.

Subsection 2.4.1.2.1 Areal Recharge from Precipitation

Areal recharge for the Tule Subbasin is derived using the Williamson Method (Williamson et al., 1989). The method estimates net infiltration from annual precipitation falling to the valley floor based on monthly soil moisture budgets from the period 1922-1971. For each year in the Tule Subbasin water budget, annual groundwater recharge was estimated for each isohyetal zone. It should be noted that the Williamson Method results in no groundwater recharge if annual precipitation is less than 9.69 inches per year. Further description of this method and areal recharge in the Tule Subbasin is provided in Chapter 2.3.1.2.1 of the Tule Subbasin Setting (**Appendix A-2**).

For the period from 1986/1987 to 2016/2017, areal recharge within DEID GSA ranged from 0 to 23,600 acre-ft/year, with an average annual volume estimated to be approximately 1,700 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2.2 Streambed Infiltration (Channel Loss)

Descriptions of streambed infiltration, or channel loss, occurring in White River and the methodology by which they were estimated are provided in Chapter 2.3.1.2.2 of **Appendix A-2.** Streambed infiltration within the Tule Subbasin is accounted between various reaches of each natural waterway, generally subdivided by monitoring or diversion points. Streambed infiltration within DEID GSA is described in Table 1 of **Appendix M**.

Subsection 2.4.1.2.2.1 *White River*

All surface water that is measured or interpolated at the White River stream gage, after accounting for ET losses, is assumed to become streambed infiltration. For the water years 1986/1987 to 2016/2017, annual streambed infiltration volumes of the White River within DEID GSA ranged from 0 acre-ft/year to 27,100 acre-ft/year, with an average annual volume estimated to be approximately 2,000 acre-ft/year (see Table 1 of **Appendix M**). The total average annual infiltration for the White River within the Tule Subbasin is estimated to be approximately 5,600 acre-feet/year.

Subsection 2.4.1.2.3 Canal Loss

As described in Chapter 2.3.1.2.3 of the Tule Subbasin Setting (**Appendix A-2**), canal losses from diversions of local surface water deliveries occur outside the DEID and therefore no canal losses are accounted for in the water outflow portion of the DEID GSA surface water budget.

Subsection 2.4.1.2.4 Managed Recharge in Basins

Managed aquifer recharge within the DEID GSA results from imported water supplies by DEID (see Chapter 2.3.1.2.4 in **Appendix A-2**).

Subsection 1.3.1.4. of this GSP provides additional discussion regarding the recharge efforts of the DEID. **Figure 1-5** provides a map of percolation ponds and groundwater recharge sites currently operating within the DEID GSA.

For the period from 1986/1987 to 2016/2017, managed recharge in basins within DEID GSA on an average annual basis was estimated to be approximately 2,200 acre-ft/year (see Table 1 of **Appendix**

M). Additional information regarding DEID recharge operations including ongoing expansion of the Turnipseed groundwater bank is described in **Section 1.4.3**.

Subsection 2.4.1.2.5 Deep Percolation of Applied Water

Chapter 2.3.1.2.5 of the Tule Subbasin Setting (**Appendix A-2**) describes the deep percolation of applied water from native waterways, imported water, recycled water and native groundwater for the subbasin, including efficiencies that were used to determine the volume of water contributing to deep percolation compared to volume applied.

Table 1 of **Appendix M** identifies sources of deep percolation of applied water within the DEID GSA, which include imported water, agricultural groundwater pumping, and municipal groundwater pumping. Each of these sources and the volume of water attributed to deep precoalition are described below.

Subsection 2.4.1.2.5.1 *Deep Percolation of Applied Imported Water*

The estimate of deep percolation resulting from imported water applied to crops is based on total volume of imported water delivered to DEID minus evapotranspiration and recharge in the DEID GSA. Deep percolation of applied imported water is assumed to be approximately 21 percent (Thomas Harder &Co., 2017) of the total applied water, which is the balance after applying the basin-wide assumption of 79 percent irrigation efficiency.

For the period from 1986/1987 to 2016/2017, deep percolation of applied imported water within DEID GSA on an average annual basis was estimated to be approximately 22,500 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2.5.2 *Deep Percolation of Applied Native Groundwater for Agricultural Irrigation (Agricultural Pumping)*

The balance of agricultural irrigation demand that is not met by imported water or stream diversions is assumed to be met by groundwater pumping. Return flow of applied water from groundwater pumping is assumed to be 21 percent of the applied water.

For the period from 1986/1987 to 2016/2017, deep percolation of applied agricultural pumping within DEID GSA on an average annual basis was estimated to be approximately 5,900 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2.5.3 *Deep Percolation of Applied Native Groundwater for Municipal Irrigation (Municipal Pumping)*

Deep percolation of applied groundwater for municipal irrigation is described in Chapter 2.3.1.2.5 of **Appendix A-2**.

For the period from 1986/1987 to 2016/2017, deep percolation of applied groundwater for municipal irrigation within DEID GSA ranged from 1,100 acre-ft/year to a current estimated amount of 1,800 acre-ft/year with an average annual amount estimated to be approximately 1,400 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2.6 Evapotranspiration

Evapotranspiration is the loss of water to the atmosphere from free-water evaporation, soil moisture evaporation, and transpiration by plants (Fetter, 1994). Evapotranspiration occurs in multiple forms and utilizing a variety of water sources within the Tule Subbasin, and its various occurrences within the Tule Subbasin are described by source in Chapter 2.3.1.2.6 of the Tule Subbasin Setting (**Appendix A-2**).

Table 1 of **Appendix M** identifies sources of evapotranspiration within the DEID GSA as evapotranspiration of precipitation from crops and native vegetation, agricultural consumptive use of imported water, agricultural consumptive use of pumped groundwater, and municipal consumptive use (landscape irrigation). Each of these sources and the volume of water attributed to evapotranspiration are described below.

Subsection 2.4.1.2.7 Evapotranspiration of Precipitation from Crops and Native Vegetation

Chapter 2.3.1.2.6 of **Appendix A-2** describes evapotranspiration of precipitation from crops and native vegetation.

For the period from 1986/1987 to 2016/2017, evapotranspiration of precipitation from crops and native vegetation within the DEID GSA on an average annual basis was estimated to be approximately 32,200 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2.8 Agricultural Consumptive Use of Imported Water and Groundwater Pumping

Agricultural consumptive use and its method of estimation within the Tule Subbasin is described in Chapter 2.3.1.2.6 of the Tule Subbasin Setting (**Appendix A-2**).

For **Appendix A-2,** types of and areas of crops grown in the Tulare County portion of the DEID GSA were estimated from land use maps and associated data published by the DWR for 1993, 1999, 2007, and 2014[11]. For the portion of the DEID GSA in Kern County, land use maps were obtained from DWR (1990)[9] and the Kern County Department of Agriculture and Measurement Standards (1999 and 2007). These maps are provided in Figure 2-31 of the Tule Subbasin Setting (**Appendix A-2**). Consumptive use estimates were based on crop coefficients published in ITRC (2003) multiplied by the area of the crop multiplied by a return flow factor reflecting irrigation efficiency.

For the period from 1986/1987 to 2016/2017, the agricultural consumptive use of imported water within the DEID GSA on an average annual basis was estimated to be approximately 85,300 acre-ft/year. For the same period, the estimated consumptive use of groundwater pumping (discharges from wells) was 29,800 acre-ft/year (see Table 1 of **Appendix M**).

[11] Land use data was obtained from California Department of Water Resources Land Use Viewer available at: https://gis.water.ca.gov/app/CADWRLandUseViewer/.

Subsection 2.4.1.2.9 **Municipal Consumptive Use**

Municipal consumptive use is described in Chapter 2.3.1.2.6 of the Tule Subbasin Setting (**Appendix A-2**).

For the period from 1986/1987 to 2016/2017, the estimated municipal consumptive use from landscape irrigation within the DEID GSA ranged from 600 acre-ft/year to the current amount of 1,000 acre-ft/year with an average annual amount estimated to be approximately 700 acre-ft/year (see Table 1 of **Appendix M**).

Subsection 2.4.1.2.10 **Surface Water Outflow to Rivers and Streams**

Surface water outflow from the DEID GSA could occur via the White River during extreme precipitation events; however, this is considered rare, and there are no available measured surface water outflows from the DEID GSA, warranting this component to be excluded from the surface water budget.

Subsection 2.4.2 Groundwater Budget

The fundamental premise of the Tule Subbasin Groundwater Budget is as follows:

Inflow – Outflow = +/- ΔS

In this equation, "ΔS" serves as "change in groundwater storage." The groundwater budget of the Tule Subbasin, its component terms, and methodology of development, are described in Chapter 2.3.2 of the Tule Subbasin Setting (**Appendix A-2**). The accounting of DEID GSA's groundwater budget (with WMA removed) is provided in Table 2 of **Appendix M** and shown in **Figure 2-17**. For the period from 1986/1987 to 2016/2017, the estimated average annual inflows to the DEID GSA are approximately 55,700 acre-ft/year and the estimated outflows are approximately 97,700 acre-ft/year. As discussed in **Section 2.4.2**, the primary cause of the outflows exceeding the inflows is from the subsurface outflows exceeding the subsurface inflows. Each component of the groundwater budget is discussed in the subsequent subsections.

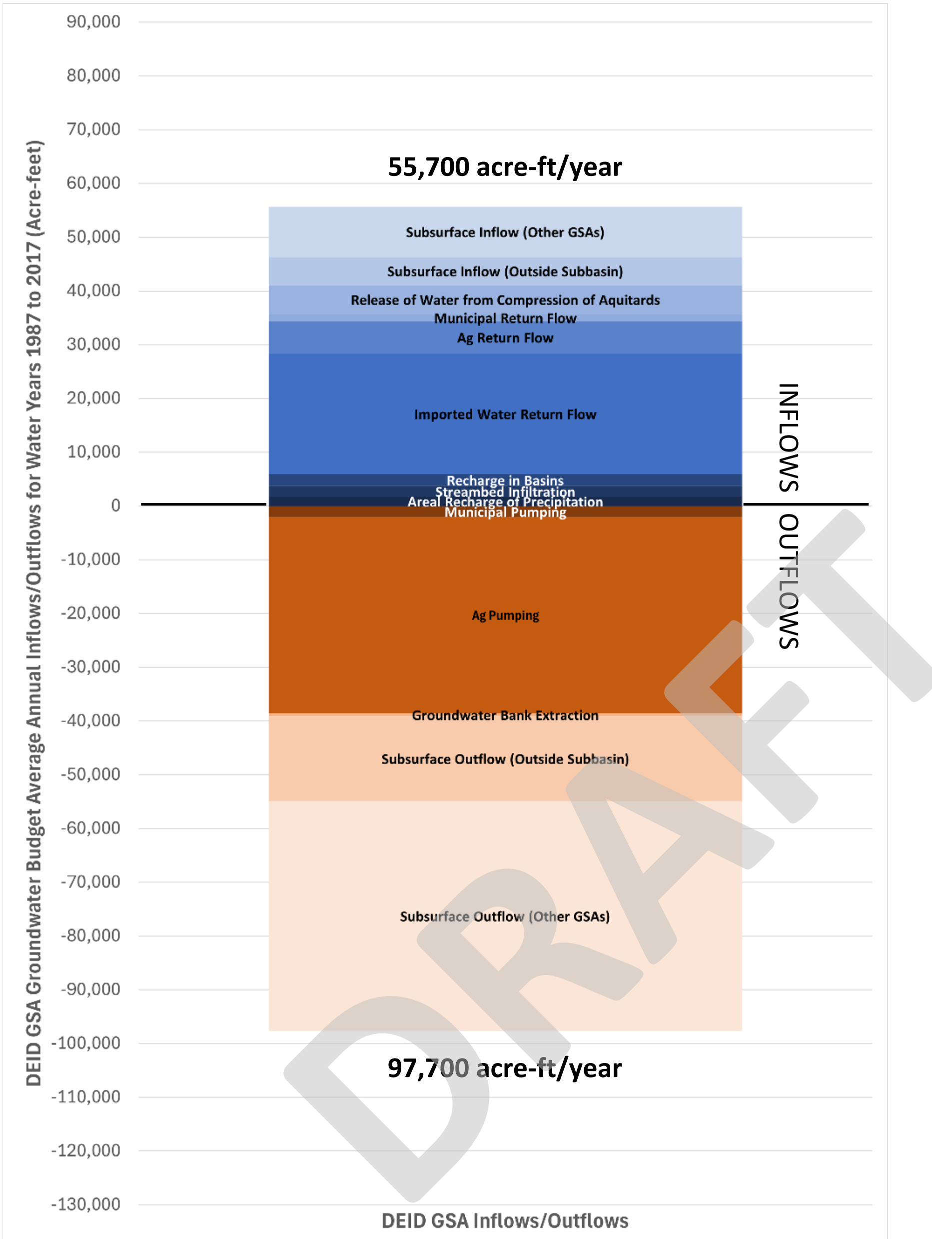


Figure 2-33 DEID GSA Groundwater Budget Average Annual Inflows/Outflows from 1986/87 to 2016/17[12]

[12] Figure 2-33: DEID GSA Groundwater Budget Average Annual Inflows/Outflows from 1986/87 to 2016/17 represents the average annual inflows and outflows to the DEID GSA for SGMA reporting purposes and does not represent an accounting of water rights.

Subsection 2.4.3 Sources of Groundwater Recharge *[23 CCR § 354.18(b)(2)]*

23 Cal. Code Regs. § 354.18 Water Budget. (b) The water budget shall quantify the following, either through direct measurements or estimates based on data:

(2) Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.

Sources of groundwater recharge are described Chapter 2.3.2.1 of the Tule Subbasin Setting (**Appendix A-2).** Those sources of groundwater recharge that are present and occur within DEID GSA are identified and discussed below.

Subsection 2.4.3.1 Areal Infiltration of Recharge from Precipitation

Chapter 2.3.2.1.1 of the Tule Subbasin Setting (**Appendix A-2**) describes this "areal recharge" term as, "Groundwater recharge from precipitation falling on the valley floor in the Tule Subbasin…" See Section 2.3.1.2.1 of **Appendix A-2** for additional discussion on areal recharge.

For the period from 1986/1987 to 2016/2017, areal recharge within DEID GSA ranged from 0 to 23,600 acre-ft/year, with an average annual volume estimated to be approximately 1,700 acre-ft/year (see Table 2 of **Appendix M**).

Subsection 2.4.3.2 Groundwater Recharge from the White River

As described in Chapter 2.3.2.1.4 of the Tule Subbasin Setting (**Appendix A-2**), "Groundwater recharge of White River water occurs as streambed infiltration as described in Section 2.3.1.2 summarized in Column L of Table 2-3. Estimated average annual groundwater recharge from White River water was approximately 5,600 acre/ft/year for water years 1986/87 to 2016/17." See Section of **Appendix A-2** for additional discussion on sources of groundwater recharge from the White River within the Tule Subbasin.

For the period from 1986/1987 to 2016/2017, groundwater recharge from the White River within DEID GSA on an average annual basis was estimated to be approximately 2,000 acre-ft/year from streambed infiltration (see Table 2 of **Appendix M**).

Subsection 2.4.3.3 Groundwater Recharge from Imported Water Deliveries

As described in Chapter 2.3.2.1.5 of the Tule Subbasin Setting (**Appendix A-2**), "Groundwater recharge of imported water occurs as canal loss, recharge in basins, and deep percolation of applied water as described in Section 2.3.1.2…" See Section 2.3.1.1.3 of **Appendix A-2** for additional discussion on sources of groundwater recharge from imported water within the Tule Subbasin.

For the period from 1986/1987 to 2016/2017, groundwater recharge from imported water within DEID GSA on an average annual basis was estimated to be approximately 2,200 acre-ft/year resulting from imported water delivered to recharge basins, and 22,500 acre-ft/year from return flow of applied water (see Table 2 of **Appendix M**).

Subsection 2.4.3.4 Recycled Water

As described in Chapter in Chapter 2.3.2.1.6 of the Tule Subbasin Setting (**Appendix A-2**), "Groundwater recharge of recycled water occurs as artificial recharge and return flow of applied water as described in Section 2.3.1.2…" There are no sources of groundwater recharge from recycled water within DEID GSA.

Subsection 2.4.3.5 Deep Percolation of Applied Water from Groundwater Pumping

As described in Chapter 2.3.2.1.7 of the Tule Subbasin Setting (**Appendix A-2**), "A portion of irrigated agriculture and municipal applied water from groundwater pumping becomes deep percolation and groundwater recharge as described in Section 2.3.1.2.5…" See 2.3.1.2.5 of **Appendix A-2** for additional discussion on sources of groundwater recharge from return flow of applied groundwater pumping within the Tule Subbasin.

For the period from 1986/1987 to 2016/2017, groundwater recharge from applied water from groundwater pumping within DEID GSA on an average annual basis was estimated to be approximately 5,900 acre-ft/year from return flow of groundwater applied for agricultural irrigation, and 1,400 acre-ft/year from return flow of groundwater applied for municipal irrigation (see Table 2 of **Appendix M**).

Subsection 2.4.3.6 Release of Water from Compression of Aquitards

Water released from compression of aquitards in the Tule Subbasin is described in Chapter 2.3.2.1.8 of the Tule Subbasin Setting (**Appendix A-2**).

For the period from 1986/1987 to 2016/2017, groundwater inflow from compression of aquitards within DEID GSA on an average annual basis was estimated to be approximately 8,300 acre-ft/year (see Table 2 of **Appendix M**).

Subsection 2.4.3.7 Subsurface Inflow

Subsurface inflow in the Tule Subbasin is described in Chapter 2.3.2.1.9 of the Tule Subbasin Setting (**Appendix A-2**).

Subsurface inflow into the DEID GSA occurs from inter- and intra-subbasin sources.

For the period from 1986/1987 to 2016/2017, groundwater inflow from subsurface inflow into DEID GSA on an average annual basis was estimated to be approximately 6,000 acre-ft/year from outside of the Tule Subbasin and 32,400 acre-ft/year from other GSAs within the Tule Subbasin (see Table 2 of **Appendix M**).

Subsection 2.4.3.8 Mountain Front Recharge

Chapter 2.3.2.1.10 of the Tule Subbasin Setting (**Appendix A-2**) describes mountain front recharge occurring in the subbasin and the methodology used to estimate the volume occurring within the Tule Subbasin.

The Eastern Tule GSA is on the DEID GSA's eastern boundary and is directly adjacent to the mountain front and, thus, the Eastern Tule GSA is the recipient of all mountain front recharge coming into the Tule Subbasin. As such, the DEID GSA receives no mountain front recharge.

Subsection 2.4.4 Sources of Groundwater Discharge *[23 CCR § 354.18(b)(3)]*

> **23 Cal. Code Regs. § 354.18 Water Budget. (b)** The water budget shall quantify the following, either through direct measurements or estimates based on data:
>
> **(3)** Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.

Chapter 2.3.2.2 of the Tule Subbasin Setting (**Appendix A-2**) discusses sources of groundwater discharge or outflow within the Tule Subbasin. Those sources of groundwater recharge or outflow that are present and occur within DEID GSA are identified and discussed below.

Subsection 2.4.4.1 Municipal Groundwater Pumping

As described in Chapter 2.3.2.2.1 of the Tule Subbasin Setting (**Appendix A-2**)**,** "Groundwater pumping for municipal supply is conducted by the City of Porterville and small municipalities for the local communities in the Tule Subbasin as described in Section 2.3.1.1.5." See Section 2.1.1.5 of **Appendix A-2** for additional discussion on municipal groundwater pumping within the Tule Subbasin. Additionally, households in the rural portions of the Tule Subbasin rely on private wells to meet their domestic needs; however, the volume pumped is de minimis or negligible.

For the period from 1986/1987 to 2016/2017, municipal groundwater pumping within DEID GSA ranged from 1,600 acre-ft/year to the current amount of 2,800 acre-ft/year with an average annual amount estimated to be approximately 2,100 acre-ft/year (see Table 2 of **Appendix M**).

Subsection 2.4.4.2 Agricultural Groundwater Pumping

As described in Chapter 2.3.2.2.2 of the Tule Subbasin Setting (**Appendix A-2**), "Agricultural groundwater production is estimated as the total applied water demand for crops minus surface deliveries."

For the period from 1986/1987 to 2016/2017, agricultural groundwater pumping within DEID GSA on an average annual basis was estimated to be approximately 36,500 acre-ft/year (see Table 2 of **Appendix M**).

Subsection 2.4.4.3 Subsurface Outflow

As described in Chapter 2.3.2.2.4 of the Tule Subbasin Setting (**Appendix A-2**), "Subsurface outflow for 1986/87 through 2016/17 is based on output from the calibrated groundwater flow model of the Tule Subbasin."

Subsurface outflow from DEID GSA flows into adjacent GSAs within the Tule Subbasin and into subbasins adjacent to the Tule Subbasin. The cause of subsurface outflow from the DEID GSA to adjacent GSAs is due to a combination of DEID in-lieu and direct recharge of imported water in excess of the DEID's consumptive demand and the pumping depressions created outside of the DEID's boundaries. This combination of groundwater conditions results in a groundwater gradient flowing from areas of in-lieu and direct recharge of imported water towards pumping depressions outside of the DEID GSA.

For the period from 1986/1987 to 2016/2017, subsurface outflow from DEID GSA on an average annual basis was estimated to be approximately 17,000 acre-ft/year to outside subbasins and 49,000 acre-ft/year to other GSAs within the Tule Subbasin (see Table 2 of **Appendix M**).

Subsection 2.4.5 Change in Groundwater Storage *[23 CCR § 354.18(b)(4)]*

23 Cal. Code Regs. § 354.18 Water Budget. (b) The water budget shall quantify the following, either through direct measurements or estimates based on data: **(4)** The change in the annual volume of groundwater in storage between seasonal high conditions

The change in groundwater storage within the Tule Subbasin was estimated by comparing the groundwater inflow elements with the groundwater outflow elements of the groundwater budget. For the period from 1986/1987 to 2016/2017, the cumulative change in groundwater storage across the Tule Subbasin was estimated to be approximately -4,948,000 acre-ft. This is approximately -160,000 acre-ft/year (see Chapter 2.3.2.3 and Table 2-3 in **Appendix A-2**).

Within DEID GSA, the cumulative and average-annual change in storage can be estimated by utilizing the fundamental premise of the groundwater budget (Inflow – Outflow = +/- ΔS) to compare the sources of groundwater recharge and groundwater discharge within DEID GSA, as described in **Subsection 2.5.3** and **Subsection 2.5.4.**

For the period from 1986/1987 to 2016/2017, the cumulative change in groundwater storage within DEID GSA was estimated to be approximately -1,301,400 acre-ft. This is approximately -41,980 acre-ft/year (see Table 2 of **Appendix M**). The negative change in storage is not representative of DEID GSA's sustainable practices and additional discussion in **Section 2.4.2** and **Section 2.5.6** of this GSP describe alternative calculations of the change in groundwater in storage for the DEID GSA.

Subsection 2.4.6 Overdraft *[23 CCR § 354.18(b)(5)]*

23 Cal. Code Regs. § 354.18 Water Budget. (b) The water budget shall quantify the following, either through direct measurements or estimates based on data: **(5)** If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.

Average hydrologic conditions in the Tule Subbasin are represented by the 20-year period from 1990/1991 to 2009/2010 (see Chapter 2.3.2.4 in **Appendix A-2**). Average annual overdraft during this period is estimated to be approximately 115,300 acre-ft/year.

There are several ways to present overdraft within DEID GSA. One methodology is defining overdraft by change in groundwater storage based on the same average hydrologic period, which includes subsurface inflow and outflow of groundwater between DEID GSA and other Tule Subbasin GSAs and adjacent subbasins (see **Section 2.5.5 above**). This method shows an overdraft of approximately 42,000 acre-feet/year within DEID GSA; however, this value is not representative of practices within

DEID because the change in groundwater storage includes groundwater leaving the GSA as subsurface outflow which is caused by surrounding GSAs and other subbasins in overdraft conditions (see **Section 2.5.4.3**).

DEID GSA is the only GSA that is not in overdraft in the Tule Subbasin. Instead, DEID GSA is a net recharger in the Tule Basin, with a surplus ranging from approximately 4,000 acre-ft/year over the period of 1986/1987 to 2016/2017 to approximately 19,000 acre-ft/year over the period of 1987 to 2023 (see **Subsection 2.4.2** and **Appendix N**). The range of values are considered representative of practices within DEID GSA and are based on independent evaluations of water balance components. On-farm recharge and banking of imported water results in higher groundwater levels within portions of the DEID GSA than adjacent Tule Subbasin GSAs and other subbasins (see **Section 2.4.1**). The overall groundwater flow gradient is from higher groundwater levels in the DEID GSA to pumping depressions caused by over-pumping of groundwater outside the DEID service area.

Subsection 2.4.7 Water Year Type *[23 CCR § 354.18(b)(6)]*

23 Cal. Code Regs. § 354.18 Water Budget. (b) The water budget shall quantify the following, either through direct measurements or estimates based on data: **(6)** The water year type associated with the annual supply, demand, and change in groundwater stored.

All water year elements presented herein are based on a water year, which begins October 1 and ends September 30 (see Chapter 2.3.2.5 in **Appendix A-2**).

Subsection 2.4.8 Sustainable Yield *[23 CCR § 354.18(b)(7)]*

23 Cal. Code Regs. § 354.18 Water Budget. (b) The water budget shall quantify the following, either through direct measurements or estimates based on data: **(7)** An estimate of sustainable yield for the basin.

Chapter 2.3.2.6 of the Tule Subbasin Setting estimates the Sustainable Yield for the Tule Subbasin to be approximately 130,000 acre-ft/year (see Table 2-4 in **Appendix A-2**). This is based on the average hydrologic period of 1986/1987 to 2016/2017. The groundwater inflow components not included in the estimate of the Tule Subbasin's sustainable yield described below:

> "It is noted that sources of groundwater recharge in the subbasin that are associated with pre-existing water rights and/or imported water deliveries are not included in the Sustainable Yield estimate. These recharge sources include:
>
> - Diverted Tule River water canal losses, recharge in basins, and deep percolation of applied water.
> - Diverted Deer Creek water canal losses, recharge in basins, and deep percolation of applied water.
> - Imported water canal losses, recharge in basins, and deep percolation of applied water, and
> - Recycled water deep percolation of applied water and recharge in basins." (see Section 2.3.2.6 in **Appendix A-2**).

The Tule Subbasin Setting also provides an "estimated consumptive use rate that can be sustained under the Subbasin-wide Sustainable Yield" of 65,000 acre-ft/year (see Section 2.3.2.6 in **Appendix A-2**). If shared on a gross acreage basis, wherein each GSA's proportionate areal coverage of the Tule Subbasin is multiplied by the total sustainable yield, the DEID GSA's sustainable yield is estimated to be approximately 7,868 acre-ft/year[13]. While this number is based on a consumptive use sustainable yield of 0.14 acre/ft-acre, it is expected to be updated as conditions within the Tule Subbasin vary over time and could change during the public comment period based on new information.

A recent draft update to the Tule Subbasin Setting revised the calculation of the sustainable yield, which resulted in a value nearly four times the original value (Thomas Harder & Co, 2024). This was due to a revised interpretation of the sustainable yield to be the total amount of groundwater that can be extracted from the Subbasin without any long-term negative change in storage, regardless of the aquifer or potential impacts on sustainability indicators from the pumping. The revised sustainable yield relied upon an updated version of the numerical groundwater model. In addition, the process of converting the sustainable yield into a consumptive use rate was removed from the Tule Subbasin Setting language. This change does not impact DEID GSA's position as a sustainable groundwater user; however, because DEID GSA has not been able to fully review and vet the revised sustainable yield, DEID GSA will continue to reference the sustainable yield calculations from the 2022 Tule Subbasin Setting.

Subsection 2.4.9 Current Water Budget *[23 CCR § 354.18(c)(1)]*

23 Cal. Code Regs. § 354.18 Water Budget. (c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(1) Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.

The surface and groundwater budgets for the Tule Subbasin for the 2016/2017 water year are described in Chapter 2.3.3 and their full accounting is provided in Tables 1 and 2 of **Appendix M**. For 2017, total groundwater inflows were approximately 855,000 acre-ft and total groundwater outflows were approximately 550,000 acre-ft.

For the DEID GSA (without WMA), the surface/imported and groundwater budgets for the 2016/2017 water year is shown in Tables 1 and 2 of **Appendix M**. For the current year (2016/2017), total groundwater inflows were approximately 103,000 acre-ft and total groundwater outflows were approximately 85,000 acre-ft.

Subsection 2.4.10 Historical Water Budget *[23 CCR § 354.18(c)(2)]*

23 Cal. Code Regs. § 354.18 Water Budget. (c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(2) Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:

[13] 56,200 acres (based on parcels within DEID GSA) x 0.14 acre-ft/year per acre = 7,868 acre-ft/year.

> **(A)** A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.
>
> **(B)** A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.
>
> **(C)** A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.

The historical surface and groundwater budgets for the Tule Subbasin, as assessed over the water years 1986/87 to 2016/17, are shown in Table 2a, 2b and 2-3 of the Tule Subbasin Setting (**Appendix A-2**). The DEID GSA's historical surface/imported water and groundwater budgets are assessed over the same period (without the WMA) and are presented in Tables 1 and 2 of **Appendix M** and summarized throughout **Section 2.5** of this GSP.

As introduced in **Section 2.4** and discussed in **Sections 2.3.2** and **2.4.6**, DEID GSA developed an independent non-model-based water budget accounting method to evaluate net the net deposits of water within the DEID GSA based on imported water deliveries and consumptive use through 2023 (**Appendix N**). This water budget approach used by the DEID GSA generally follows the net contribution to or extraction from groundwater (NTFGW) developed by the Irrigation Training and Research Center (ITRC), BioResource and Agricultural Engineering Department, California Polytechnic State University (Howes et al., 2014, 2018). The following equation was used for the water accounting for the DEID Management Area:

Imported Water + Banked Water + Precipitation + Sustainable Yield = Net DEID MA Water Supply – Etc = inflow/outflow from groundwater

where,

Imported Water = Annual imported water. Data are sourced from Tule Subbasin Chapter 2 – Basin Setting Appendix C, Table 1a (Appendix A-2 and **Appendix M**) - DEID GSA Historical Surface Water Budget 1986/1987 to 2016/2017, updated with 2018 through 2023 data from DEID delivery records and adjusted to a calendar year basis.

Banked Water = CVP contract and CVP water transferred In-District. This is imported water that is stored in the subsurface for later use and reflects water that has been infiltrated through DEID's operation of their Turnipseed Basin recharge facilities.

Precipitation = Observed precipitation using LandSAT data from 1991-2018 and LandIQ data from 2019-present. Historical Averages were used during 1987 – 1990 calendar years.

Sustainable Yield = 0.14 acre-ft per acre * 56,200 acres (DEID GSA acreage based on land parcels) = 7,868 acre-ft/year.

ETc = Actual Evapotranspiration as calculated by ITRC using Landsat Thematic Mapper (Landsat) data (ITRC, 2021) from 1991 – 2018. Data from LandIQ was used for 2020 – Present. Historical

Averages were used during 1987 – 1990, 2012, and 2020 calendar years. Analog data from 2017 was used in place of missing data for 2019 Calendar year.

The annual and cumulative net change in inflow and outflow to the groundwater system within the DEID Management Area over the calendar years 1987 to 2023 is shown in **Figure 2-34**.

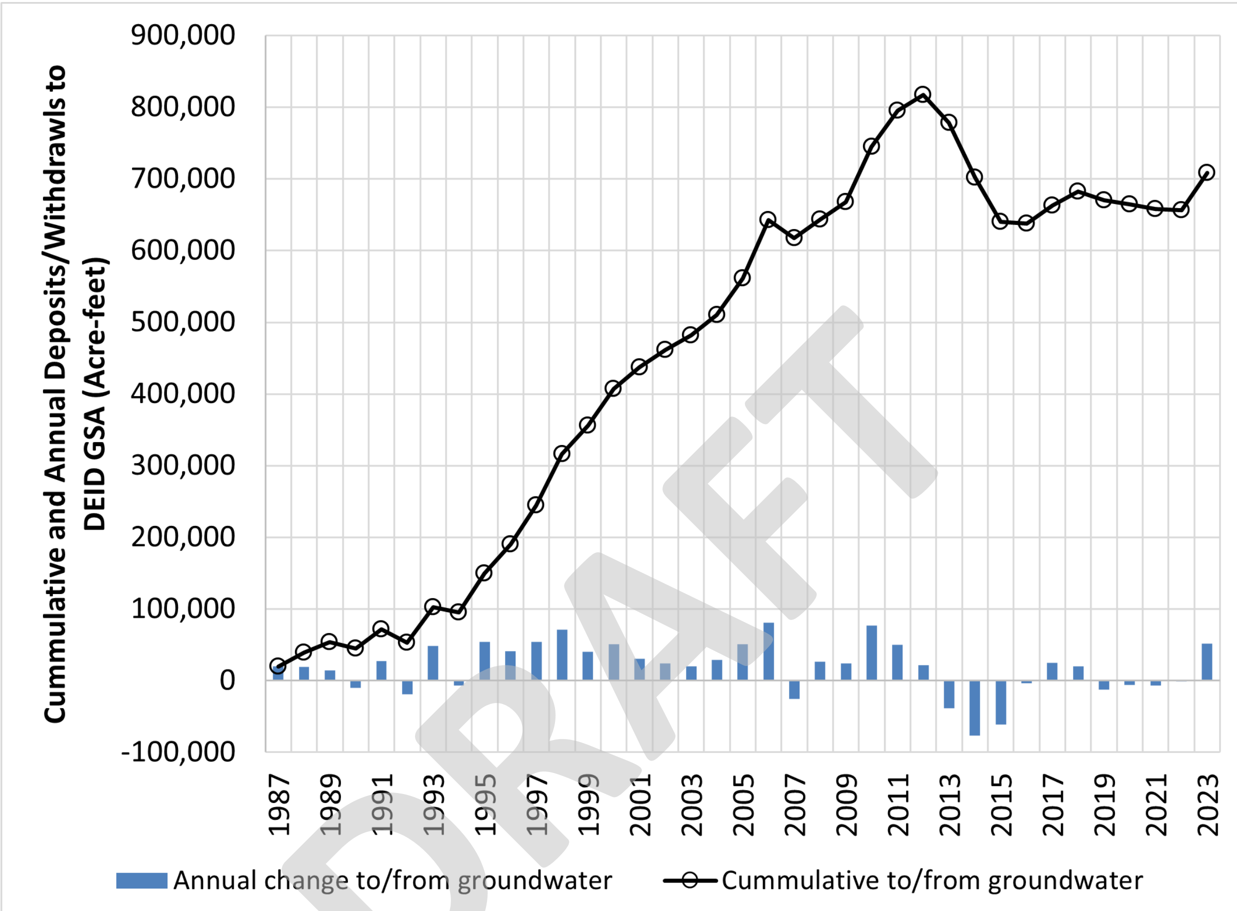


Figure 2-34 Preliminary DEID Water Accounting

Subsection 2.4.10.1 Evaluation of Historical Availability of Planned Surface Water Supplies versus Actual Deliveries *[23 CCR § 354.18(c)(2)(A)]*

The DEID GSA has historically operated in a sustainable manner, with total supply from imported water and sustainable yield exceeding water demands. This is discussed and evaluated in Table 2-2a, 2-2b and 2-3 of the Tule Subbasin Setting (**Appendix A-2**) and are accounted for in Tables 1 and 2 of **Appendix M** and summarized throughout **Section 2.5** of this GSP.

The DEID is the largest Class 1 Friant contractor, with an annual contract for 108,800 acre-ft of Class 1 water. Class 1 water is commonly referred to as the “firm yield” of the CVP and was intended to be used as the supply that would be dependable in every year regardless of hydrology. Class 1 water has historically been reliable until the 2006 SJRRS Agreement in *NRDC, et al., v. Kirk Rodgers.* The agreement characterized deliveries by six hydrologic year types based on a recurrence over an 82-year simulation

(1922–2003): wet, normal-wet, normal-dry, dry, critical-high, and critical-low. Under the wet, normal-wet, and normal-dry scenarios, DEID typically receives almost 100% of its Class 1 allocation as shown in **Subsection 1.4.3** in **Table 1-4**. The DEID also contracts for 74,500 acre-ft of Class 2 water.

Subsection 2.4.10.2 Quantitative Assessment of Historical Water Budget *[23 CCR § 354.18(c)(2)(B)]*

The quantitative assessment and accounting of the Tule Subbasin's historical water budget and the DEID GSA's historical water budget are described throughout Chapter 2.3 of the Tule Subbasin Setting (**Appendix A-2**) and throughout **Section 2.5** of this GSP, respectively.

Subsection 2.4.10.3 Assessment of Impact of Historical Hydrological Conditions on the Ability of the Agency to Operate its Jurisdiction within the Sustainable Yield *[23 CCR § 354.18(c)(2)(C)]*

Based on the historical average hydrologic conditions presented in **Section 2.5.6,** when taken as a whole, the lands within the jurisdiction of DEID GSA have historically operated within its sustainable yield, and moreover provided a net benefit to groundwater conditions.

Subsection 2.4.11 Projected Water Budget *[23 CCR § 354.18(c)(3)]*

23 Cal. Code Regs. § 354.18 Water Budget. (c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:

(3) Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:

(A) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.

(B) Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.

Chapter 2.3.5 of the Tule Subbasin Setting (**Appendix A-2**) discusses methodologies and information used to develop the Tule Subbasin projected water budget in the Groundwater Flow Model. The projected surface and groundwater budgets for the Tule Subbasin, as assessed over the water years 2018-2070, are shown in Table 2-8a, 2-8b and 2-9 of the Tule Subbasin Setting (**Appendix A-2**). The projected water budget for the Tule Subbasin incorporates the projects and management actions of each GSA for achieving sustainability (except DEID GSA). During development of the first two GSPs, DEID chose not to include its project and management actions because they were not comfortable with surrounding GSAs who are pumping groundwater unsustainably and taking credit for recharge water stored into the subsurface via active DEID recharge operations. While DEID has valid surface water rights and constructed facilities for groundwater recharge and is currently actively recharging groundwater (as shown in the 2022/2023 Annual Report), other surrounding unsustainable GSAs facilities are yet to be constructed and are based on questionable surface water rights. For the purpose of demonstrating the future increasing sustainability of DEID GSA, all six phases of the recharge facilities (Management Action #4) are included in this version of the projected water budget for DEID GSA.

Projected surface and groundwater budgets for the DEID GSA (for the updated boundary modification without the WMA) over water years 2018-2070 are provided in Tables 3 and 4, respectively, in **Appendix M**. This projected water budget excluding the WMA is derived from the Groundwater Flow Model results, consistent with the Tule Subbasin projected water budget methodology, and incorporates adjustments to the hydrology and water deliveries to account for potential climate change (see Section 2.3.5 in **Appendix A-2**). Projected water budget components derived from precipitation, streamflow, and municipal pumping are based on averages of the historical period (water years 1987-2017). Projected surface water deliveries are based on the reliability of the CVP Class 1 allocation, of which DEID typically receives almost 100% annually, as shown in **Subsection 1.4.3** in **Table 1-4**. The DEID also contracts for 74,500 acre-ft of Class 2 water. Projected groundwater pumping for irrigation was developed based on projected crop consumptive use (see **Appendix A-2**). (see **Appendix M).** As a result of incorporating DEID GSA's current and planned recharge facilities (Management Action #4), the projected "recharge in basins" water budget term was updated in comparison to the original projected water budged developed for the Tule Subbasin Setting (see Appendix C in **Appendix A-2**). This term assumes an average annual recharge rate based on Management Action #4 (see **Section 5.2.1.4**) implementing Phases of constructed recharge basins, for Phases I through VI (see **Table 5-2**). By 2025, all six Phases of the recharge basins will be operational, and an average recharge rate of approximately 10,000 acre-ft per month across an average of approximately 2.5 months of operation is assumed (based on data collected since 1993 and the reliability of contracted Class 1 and 2 CVP imported water) and projected out to 2070 (DEID pers. comm., 2024). **Figure 2-19** presents a comparison of the projected water budget with and without the implementation of Management Action #4, which demonstrates the positive effect of DEID GSA's water banking facilities. In addition, note the overall negative cumulative change in storage with no MA#4 is calculated for the projected groundwater budget, which includes the subsurface inflows and outflows, which are not representative of DEID GSA's sustainable practices (see **Subsections 2.3.2** and **2.4.6**).

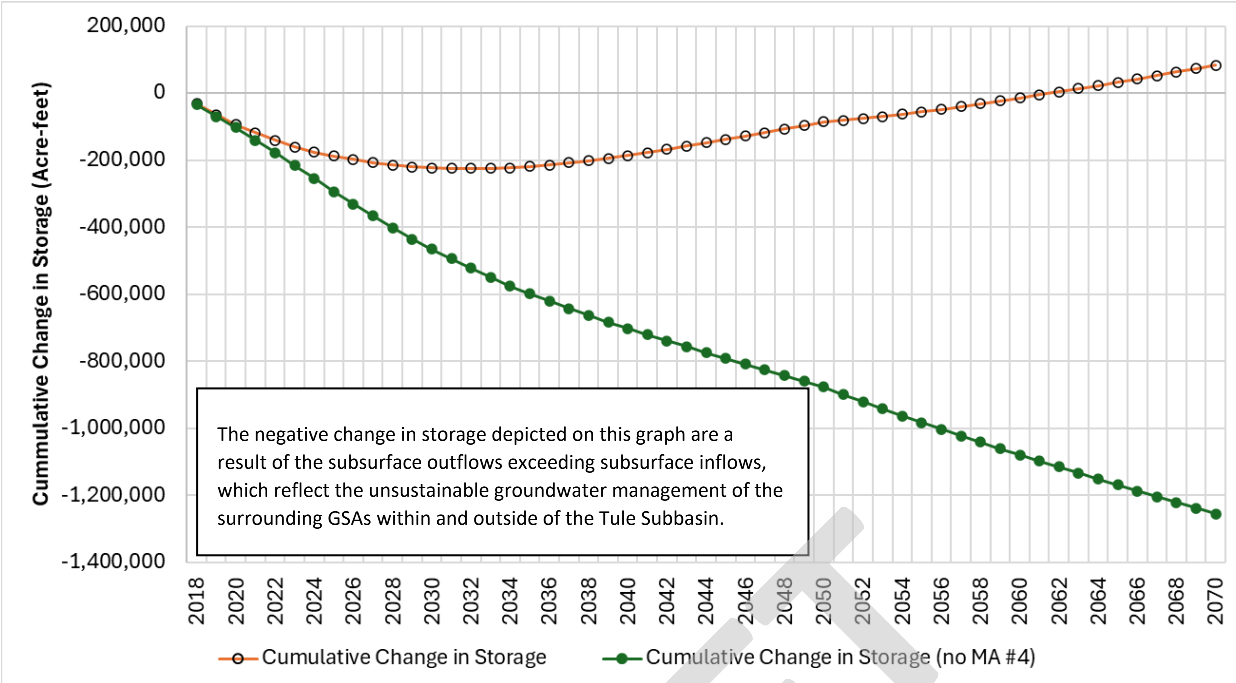


Figure 2-35 Projected Cumulative Change in Storage With and Without MA #4

Subsection 2.5 Management Areas *[23 CCR § 354.20]*

> **23 Cal. Code Regs. § 354.20 Management Areas. (a)** Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.
>
> **(c)** If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.

The DEID GSA is subdivided into three Management Areas. These Management Areas are described in **Subsection 1.4.1** of this Plan and are summarized on the following page:

- The DEID MA- this management area is composed of the area that was formed in 1938 and initially received its first imported water supplies in 1950. It is the area served by the DEID water distribution system and has contractual rights to a federal water supply through the Friant Division of the Central Valley Project. It is approximately 56,571 acres in size.
- The Richgrove Community Services District MA- The RCSD serves the water and wastewater needs of the unincorporated community of Richgrove. With a service area of 234 acres, the RCSD has been historically dependent on groundwater. Because of its location and being a purveyor of domestic water and managing wastewater, the RCSD is its own management area.
- The Earlimart Public Utilities District MA - The EPUD serves the water and wastewater needs of the unincorporated community of Earlimart. With a service area of 773 acres, the EPUD has

been historically dependent on groundwater. Because of its location and being a purveyor of domestic water and managing wastewater, the EPUD is its own management area.

Section 3 Sustainable Management Criteria

Table of Contents

Table of Figures

List of Tables

Subsection 3.1 Introduction to Sustainable Management Criteria *[§354.22]*

§354.22 Introduction to Sustainable Management Criteria. *This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable*

This section provides location-specific sustainable management criteria (SMC) for the five applicable sustainability indicators, including the definition of undesirable results (URs), minimum thresholds (MTs), interim milestones (IMs), and measurable objectives (MOs). This section builds from the DEID GSA sustainability goal described in **Subsection 5.2**.

As discussed in the executive summary and previous sections of this GSP, DEID GSA has been managing its groundwater resources sustainably for many decades through conjunctive use of imported surface water and groundwater to meet demands. **Section 2** of this GSP describes the groundwater conditions and water budget components that demonstrate DEID GSA's historical and current sustainable groundwater use, and that significant and unreasonable effects within the Tule Subbasin are caused by other GSAs' actions. DEID GSA intends to maintain sustainability through establishing sustainable management criteria that aim to, (1) be protective of beneficial uses and users throughout the GSA, and (2) avoid undesirable results caused by neighboring GSAs. The intent of #2 is to bring awareness to the Tule Subbasin that any significant and unreasonable impacts observed within the DEID GSA are due to the unsustainable practices of neighboring GSAs. Ultimately, DEID GSA hopes to facilitate and promote sustainable groundwater management within the Tule Subbasin by setting sustainable management criteria that avoid and prevent undesirable results. One aspect of protective sustainable management criteria is for the land subsidence sustainability indicator, for which DEID GSA is setting a zero-subsidence policy since ongoing subsidence throughout the Tule Subbasin has resulted in significant and unreasonable impacts to the Friant-Kern Canal (FKC) and increased risk of failure of DEID's pipeline infrastructure.

The sustainable management criteria for groundwater levels and land subsidence for DEID GSA differ from the Tule Subbasin Coordination Agreement and other Tule Subbasin GSAs' 2nd Amended GSPs. DEID GSA honors every opportunity to coordinate with the Tule Subbasin GSAs to achieve Subbasin-wide sustainability; however, DEID GSA's analyses determined that more protective sustainable management criteria are needed subbasin-wide to achieve the sustainability goal. At this time, not all Tule Subbasin GSAs are in agreement with establishing sustainable management criteria at the levels at which DEID GSA has determined avoid significant and unreasonable effects. DEID GSA has decided to establish SMC that are protective of all beneficial users, uses, and property interests despite the deviation from subbasin coordination. DEID GSA will continue to coordinate with the Tule Subbasin by sharing all analyses, data, and information that form the technical and policy decisions of the GSA, participating in coordination meetings, and encouraging the Tule Subbasin GSAs to collectively make necessary changes to demand management policies, SMC, and other critical elements of groundwater sustainability planning to achieve Subbasin-wide sustainability by 2040.

The overall goal of SGMA is to achieve sustainable management of groundwater basins by 2040. In the unique case of DEID GSA, the GSA is already sustainable, having not overdrafted since the 1950s. However, more unsustainable groundwater management from surrounding areas challenge DEID GSA's ability to maintain and protect sustainability in the GSA. More information on this is available in the Executive Summary under the "Story of Sustainability" subsection.

DEID GSA has established SMC reflective of maintaining existing and protecting future sustainability. Demonstration of the absence of URs supports a determination that the Subbasin is operating within its sustainable yield and, thus, that the sustainability goal has been achieved. However, the occurrence of one or more URs within the initial 20-year implementation period does not, by itself, indicate that the Subbasin is not being managed sustainably. In the case of DEID GSA, instances of URs may be induced by the continued unsustainable management of neighboring areas. See the Executive Summary subsection "ES-02 Basin Setting" for a summary of the attribution analyses of impacts within DEID GSA.

Sustainable groundwater management is defined by SGMA as the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing URs. Thus, the avoidance of URs, defined later in this Section, is vital to the success of the Tule Subbasin and DEID GSA. The purpose of this section is to define various SMC by stating the sustainability goal for the Tule Subbasin as defined by DEID GSA, defining URs, and establishing the MTs, IMs, and MOs for each applicable sustainability indicator. A thorough understanding of the historical, current, and future groundwater conditions of the Subbasin is necessary to properly define SMC. Therefore, the development of the criteria is dependent on basin information presented in the hydrogeologic conceptual model, groundwater conditions, and water budget sections of the DEID GSA GSP (**Section 2**).

The SMC methodology and approach are shown in **Figure 3-1,** and a summary of the definitions and qualitative and quantitative functions of the SMC are available in **Figure 3-2**.

Two appendices contain supplemental information on the process, analyses, and results that informed the revisions to the SMC for chronic lowering of groundwater levels and land subsidence for this 2nd Amended GSP. These appendices are considered extensions of **Section 3:**

1. **Appendix A-4** – Chronic Lowering of Groundwater Level Technical Memorandum (Thomas Harder & Company, 2024)
2. **Appendix A-6** – Land Subsidence Technical Memorandum (Thomas Harder & Company, 2024)

In addition to the appendices, this Section closes with three Exhibits that are also considered extensions of this Section:

1. **Exhibit 3-1**– RMS Groundwater Level Hydrographs
2. **Exhibit 3-2**- COC Groundwater Quality Isocontour Maps
3. **Exhibit 3-3**- Well Impact Analysis

The process and analyses vary for each sustainability indicator's SMC development; however, the general methodology remains consistent with the goal of avoiding significant and unreasonable effects on beneficial uses and users of groundwater in the Tule Subbasin (**Figure 3-1**).

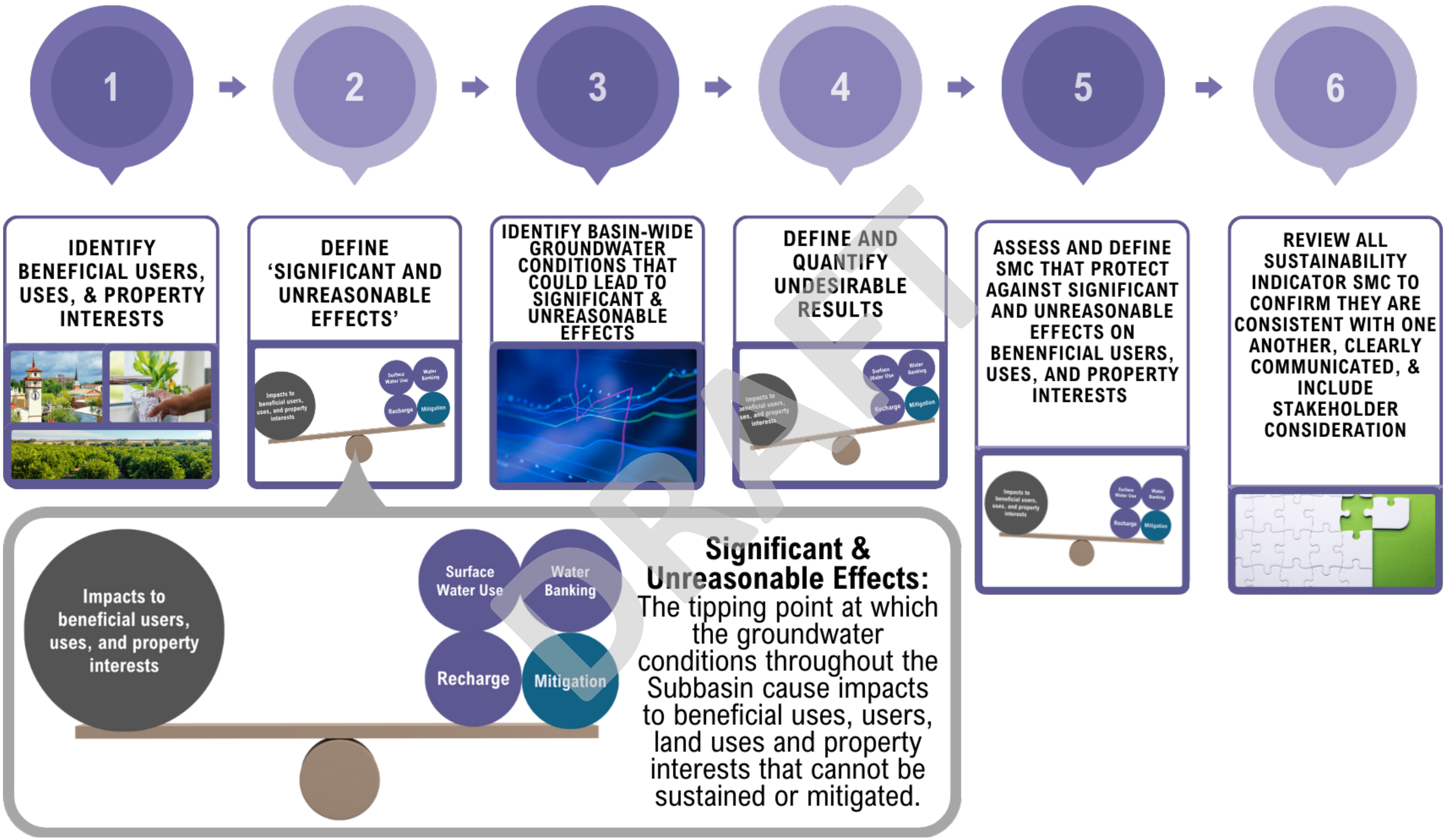


Figure 3-1: SMC Methodology and Approach

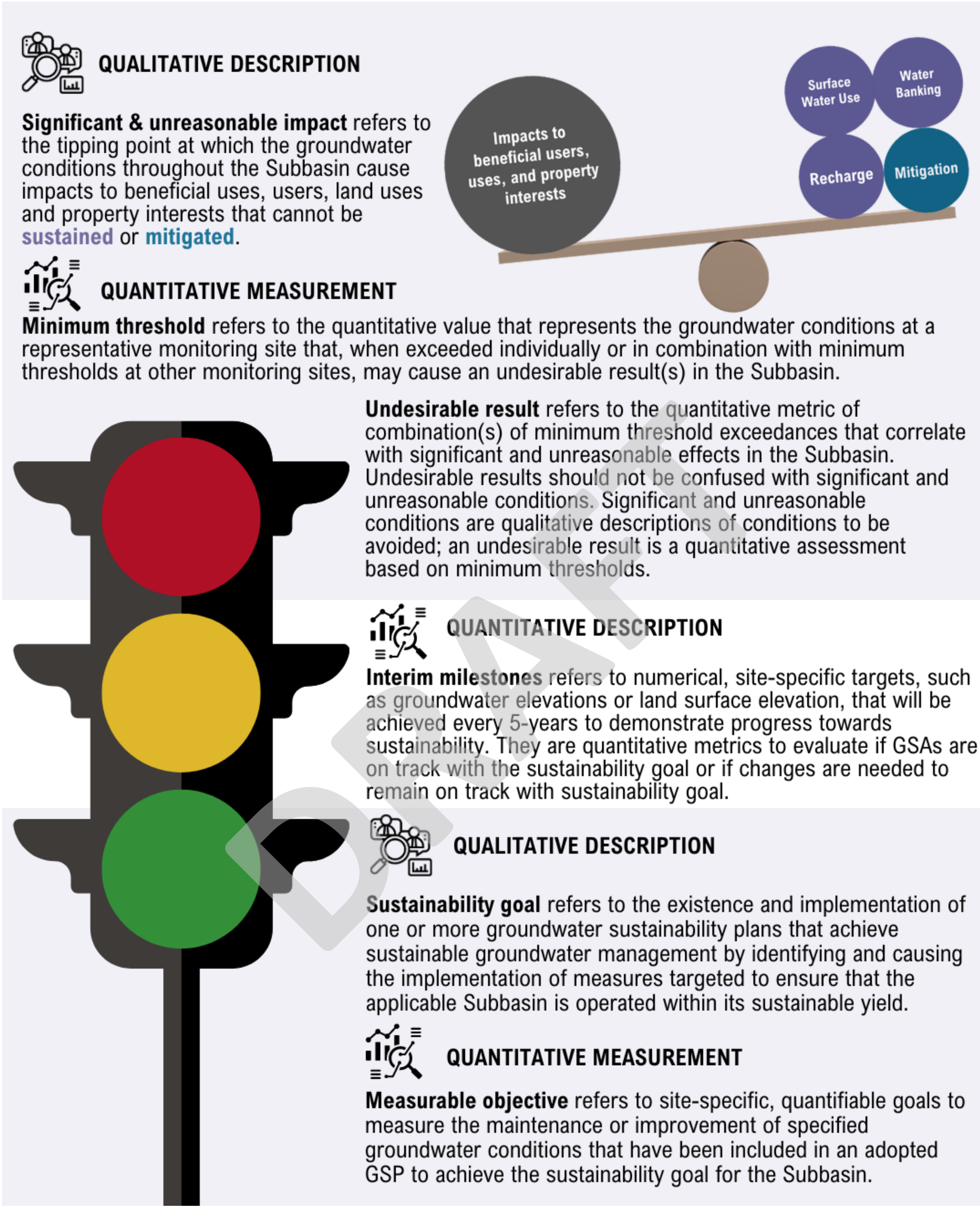


Figure 3-2 SMC Definitions & Functions

Subsection 3.1.1 General Description of Undesirable Result

DEID GSA carefully considered and determined the groundwater conditions at which each of the four applicable sustainability indicators exhibit significant and unreasonable effects. URs are considered to occur when any of the four applicable sustainability indicators exceed a combination of MTs. Further subsections describe the data and rationale used as justification for determining significant and unreasonable conditions that lead to URs for each specific sustainability indicator and provide the following rationales, as required by §354.26:

- Investigation of the cause of groundwater conditions that will lead, or has led to, URs impacting beneficial uses and users in the subbasin;
- Criteria used to define when and where the effects of groundwater conditions cause URs;
- Quantification of URs via localized MT exceedances; and,
- Description of the potential effects of the UR on beneficial uses or users.

Subsection 3.1.2 General Description of Minimum Thresholds *[§354.28]*

§354.28 Minimum Thresholds.

(b) *The description of minimum thresholds shall include the following:*

(a) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.*

(b) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

(c) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

(d) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

In addition to a qualitative description, each UR must also be substantiated using a quantitative combination of MT exceedances. An MT is a quantitative value that represents the groundwater conditions at a Representative Monitoring Site (RMS) that, when exceeded individually or in combination with MTs at other RMS, may cause UR(s) in the Subbasin. When setting the MT for each sustainability indicator, potential impacts to the relevant beneficial uses and users of groundwater were considered. In addition, the DEID GSA MTs were set at levels that do not impede adjacent GSAs or subbasins from avoiding their MTs or achieving their sustainability goals.

The following components are presented in each sustainability indicator's relevant MT section:

(1) The information and criteria relied upon to establish and justify the MTs for each sustainability indicator. The justification for the MT shall be supported by information provided in the Basin Setting and other data or models as appropriate and qualified by uncertainty in the understanding of the Basin Setting.

(2) The relationship between the MTs for each sustainability indicator, including an explanation of how DEID GSA has determined that conditions for levels at each MT will avoid URs.

(3) How MTs have been selected to avoid causing URs in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.
(4) How MTs may potentially impact beneficial uses and users of groundwater or land uses and property interests.
(5) How state, federal, or local standards relate to the relevant sustainability indicator. If an MT differs from other regulatory standards, DEID GSA will explain the nature and basis for the difference.
(6) How each MT will be quantitatively measured, consistent with monitoring network requirements.
(7) How SMC for one sustainability indicator may be used as a proxy for another sustainability indicator.
(8) Each of the sustainability indicators must be monitored for MT exceedances. However, based on the strong relationship between groundwater levels and changes in aquifer storage (i.e., rising groundwater levels indicate an increase in groundwater storage and vice versa) and land subsidence, whichever indicator is the most sensitive to groundwater level reduction will be the limiting MT for groundwater conditions in that threshold region. Nonetheless, in addition to monitoring groundwater levels, the groundwater quality, and land subsidence sustainability indicators will also be monitored separately, and results will continue to be analyzed in relation to one another.

Subsection 3.1.3 General Description of Measurable Objectives *[§354.30]*

§354.30 Measurable Objectives.

(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(f) *Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.*

MOs are quantitative goals that reflect the desired groundwater conditions and allow DEID GSA to continue operating in alignment with the sustainability goal. MOs are set to allow for a reasonable margin of operational flexibility relative to the MT. This operational flexibility provides accommodation for extended droughts, climate change factors, conjunctive use operations, and other groundwater management activities.

Subsection 3.1.4 General Description of Interim Milestones

Five-year IMs for DEID GSA's implementation timeline were designed to support DEID GSA's progress tracking and evaluate if impacts induced by neighboring GSAs threaten the GSA from achieving and maintaining alignment with the sustainability goal. A summary of the URs, MTs, MOs, and IMs for each sustainability indicator is available in the below subsections.

Subsection 3.1.5 Potential Effects on Beneficial Users, Uses, and Property Interests by Sustainability Indicator

Figure 3-4 summarizes potential effects on beneficial uses, users, and property interests that are considered when establishing SMCs for the four applicable sustainability indicators.

Subsection 3.1.6 Sustainability Indicators Applicable in DEID GSA

The applicability of sustainability indicators is described in **SECTION 4 – MONITORING NETWORK** and summarized in **FIGURE 3-3.**

Figure 3-3: SGMA Sustainability Indicators

Subsection 3.1.7 Management Areas

Descriptions of each Management Area and their rationale for their formation are available in **SECTION 1.** The Management Areas in the DEID GSA do not have different SMC approaches and will not be operated to different MTs and MOs objectives than the DEID GSA at large. Additionally, URs are defined consistently throughout the DEID GSA.

Figure 3-4: Potential Effects on Beneficial Users

Subsection 3.2 Sustainability Goal *[§354.24]*

§354.24 Sustainability Goal.

Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.

SGMA requires GSAs to establish, within their GSP, a sustainability goal applicable for the entire Subbasin that culminates in the sustainable management of groundwater resources through the absence of URs within 20 years. The sustainability goal and basis for the SMC are not coordinated across the Subbasin as DEID GSA believes the definition below more comprehensively addresses the GSA's commitment to protecting all beneficial users, uses, and property interests from impacts that affect their safety, health, opportunity, and individual and collective dignity. The sustainability goal for the Tule Subbasin as defined by DEID GSA is as follows:

Pursuant to the Cal. Water Code §§ 10721(u) and 10727, and 23 Cal. Code Regs. §357.24, the Sustainability Goal of the Tule Subbasin is to operate the groundwater Subbasin within its sustainable yield by (or before) 2040 to avoid undesirable results while preventing significant and unreasonable impacts on all beneficial use and users (including community, environmental, economic, societal, and recreational use and users of groundwater). The goal inherently upholds the Human Right to Water, while expanding it to include access to water for recreational and other uses that impact human dignity, opportunity, and quality of life. Significant and unreasonable impacts are defined as the tipping point at which groundwater conditions cause impacts to these beneficial users, uses and property interests that cannot be sustained or mitigated.

Reaching this sustainability goal entails: eliminating groundwater overdraft; stopping chronic declines in groundwater levels; keeping groundwater levels above minimum thresholds and as close as possible to measurable objectives; preserving groundwater supplies and storage for all beneficial use and users; minimizing subsidence rates and extents by raising groundwater levels above historical lows to avoid significant and unreasonable impacts on infrastructure and property interests due to ongoing and residual subsidence; avoiding groundwater quality impairment from groundwater operations and maintaining groundwater quality across the Tule Subbasin; and avoiding significant and unreasonable impacts on beneficial uses of surface water due to depletions of interconnected surface water caused by groundwater pumping.

The Sustainability Goal will be achieved through a collaborative, Subbasin-wide program of sustainable groundwater management by the Tule Subbasin GSAs implementing coordinated groundwater sustainability plans that include demand reduction in areas with overdraft, supply augmentation, groundwater recharge, active monitoring and management of subsidence, and mitigation programs to address significant and unreasonable impacts on drinking water supplies due to overdraft during the planning and implementation horizon.

DEID occupies a unique position in the Tule Subbasin in that it eliminated overdraft in its area by the 1950s and moved into an ongoing net surplus water budget through effective and proactive conjunctive use via importation of surface water in volumes that are, on average, in excess of consumptive use within DEID. Pumping and other actions within DEID cause minimal contributions to groundwater level declines and subsidence in the Tule Subbasin, as shown by groundwater modeling, INSAR data, and water budget analyses. In keeping with its historical and current sustainable position, the DEID will continue to remain sustainable and contribute positively to meeting the Tule Subbasin Sustainability Goal by continuing its ongoing sustainable conjunctive use operations. These activities will ensure that groundwater levels within DEID do not create undesirable results and, in the circumstance that adverse impacts to domestic well owners or others are anticipated to occur or actually do occur within its area, DEID's robust and well-funded mitigation program will protect against significant and unreasonable impacts.

Notwithstanding, DEID and beneficial uses and users within its management area continue to be adversely affected by overdraft pumping outside the DEID boundary. DEID is fully committed to working with other Tule Subbasin GSAs as they implement GSP management actions, potentially including demand management, within the Tule Subbasin to ensure groundwater levels remain above minimum thresholds and subsidence is minimized or avoided in and around DEID, and throughout the Tule Subbasin. Coordinated implementation of Tule Subbasin GSPs is designed to ensure that the sustainability goal, once achieved, is maintained throughout the remainder of the 50-year planning and implementation horizon and beyond.

The sustainability goal will be accomplished by DEID GSA continuing sustainable management, continued investments in projects to support adaptability and resiliency associated with climate change related reductions in surface water supplies, prolonged droughts, and a more condensed snowmelt season. More information on this is available in the **Executive Summary**. For the sustainability goal to be achieved by the remaining GSAs in the Tule Subbasin, a reduction in allowable overdraft via demand management policy revisions, halting of lower aquifer extractions from wells contributing to the sinking of the FKC, and a more comprehensive mitigation program are needed at this point. DEID GSA is committed to continued coordination with all the GSAs within the Tule Subbasin in an effort to manifest this sustainability goal.

Subsection 3.3 General Process for Establishing Sustainable Management Criteria *[§354.22]*

§354.22 Introduction to Sustainable Management Criteria

This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.

For lands outside of the DEID GSA, throughout the Tule Subbasin, transitional pumping has been proposed as a project and management action for the Subbasin to reach sustainability by 2040. This allows lands that are reliant on groundwater pumping to transition to levels that are sustainable while reducing the economic impact that would be otherwise felt in an "overnight" reduction in water supplies (see **Subsection 5.2.2.2**). As demonstrated and discussed in the Basin Setting (Section 2), DEID GSA has historically and is currently managing groundwater sustainably, generating a surplus of groundwater storage through their conjunctive use program. This GSP recognizes that the unsustainable groundwater conditions of the GSAs outside of DEID GSA are negatively impacting the DEID GSA groundwater levels, storage, and land subsidence. Hence, there will be continued impacts to groundwater conditions as a result of transitional pumping, which prolongs the unsustainable management of groundwater resources outside of DEID GSA, and these activities increase the risk of impacts occurring within DEID GSA, despite the GSA's decades of sustainability. DEID GSA has established SMC that are protective of beneficial uses and users, and the minimum thresholds for upper aquifer groundwater levels are based on the projected transitional pumping decline in groundwater levels; however, the measurable objectives and interim milestones are designed to keep groundwater levels above these projected declines. For the lower aquifer, since the critical infrastructure is prioritized as a beneficial use for the DEID GSA, the minimum thresholds were designed to avoid any further declines in groundwater levels, so the recent historical low groundwater elevation was used. Although DEID GSA will maintain and enhance their sustainable practices throughout the GSA, the transitional pumping of surrounding GSAs may cause exceedances of groundwater level minimum thresholds for the lower aquifer (which is an undesirable result), so DEID GSA intends to inform the neighboring GSAs that they are the cause when this occurs.

Throughout this Section of the GSP, minimum thresholds are informed by the Tule Subbasin Groundwater Flow Model (GFM) results (provided as Appendix A-3), which incorporate transitional pumping, along with all other projects and management actions proposed by GSAs in the Subbasin, and interim milestones and measurable objectives are established based on the GFM results for the scenario where the entire Subbasin operates at sustainable levels starting in 2020 and including Management Action #4 (see **Subsection 5.2.1.4** - Increase In-District Recharge/Banking Operations; referred to as "safe yield" conditions). This comparison is intended to show the estimated difference in groundwater conditions in the DEID GSA as a result of transitional pumping and to identify impacts subject to mitigation due to those utilizing transitional pumping. This comparison is also intended to show the impacts from transitional pumping that are not a result of pumping from lands that operate sustainably, such as those in the DEID MA. Alternatively, for the land subsidence sustainability indicator, a risk analysis for the DEID water distribution pipelines indicated that any additional subsidence within DEID GSA would increase the risk of pipeline failure, which is considered a significant and unreasonable effect. Therefore, the SMC (i.e., minimum thresholds and measurable objectives) for land subsidence were set at zero to be protective of beneficial uses and users.

The general process leading up to the development and establishment of these SMC included:

- Regular agenda items, material reviews, and presentations at DEID GSA Board meetings and Stakeholder meetings wherein information pertinent to the development of SMC was discussed with recommendations provided.

- Holding public outreach landowner meetings within DEID GSA and, with other GSAs throughout the Tule Subbasin outlining the process for GSP development, discussing SMC, and providing data and context related to local groundwater-related issues.

- Reviewing existing hydrogeologic data, current and historical groundwater information assembled in the Tule Subbasin Setting (**Appendix A-2**), and future projections prepared by the DEID Hydrogeologist utilizing the GFM (**Appendix A-3**) to provide a summary of historical and projected groundwater conditions based upon implementation of the proposed projects and management actions described in **Section 5** of this Plan. Additionally, projected groundwater conditions based on the Subbasin operating sustainably starting in 2020 were evaluated, for the purpose of comparing how continued pumping above sustainable yield (i.e., transitional pumping) throughout the Subbasin affects conditions within the DEID GSA (see Exhibit 3-1 for examples of SMC with projected conditions with and without transitional pumping).

- Reviewing proposed SMC in relation to the potential impacts to beneficial uses and users and deciding what constitutes significant and unreasonable conditions which lead to undesirable results.

- Developing a mitigation plan if SMC are exceeded or localized impacts occur that result in significant and unreasonable conditions, such as wells rendered inoperable due to lowering of groundwater levels.

Subsection 3.3.1 SMC Revision Priorities

The SMC presented in this GSP has been revised from previous versions to meet regulatory requirements under SGMA. Priorities for establishing the revised SMC are summarized in **Figure 3-5** and more information on the general process to establish revised SMC is available in **Figure 3-6.**

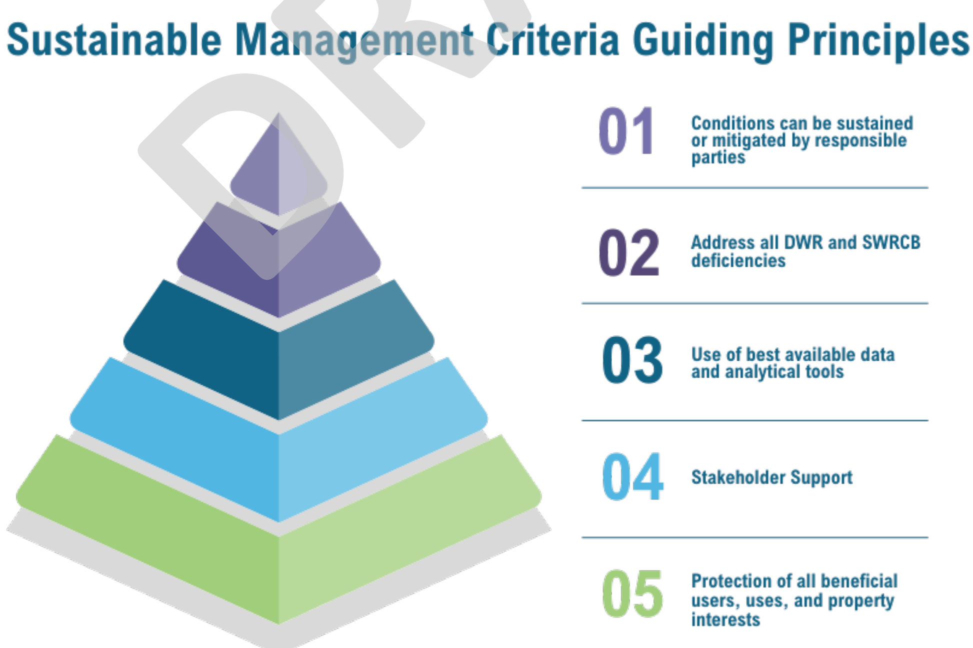


Figure 3-5: DEID GSA SMC Revision Priority Considerations

Subsection 3.4 Sustainable Management Criteria Summary

[§354.26(b)(1),(2),(3)]

§354.26 Undesirable Results.

(b) *The description of undesirable results shall include the following:*

1. *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
2. *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

Table 3-1 provides a summary of the SMC for each of the applicable sustainability indicators. It is important to clarify the relationship between different sustainability indicators. A summary of these relationships and clarification of proxy usage for SMC development is available below:

Use of Proxy SMC [§354.28(d)]

- There is a significant correlation between groundwater levels and aquifer storage for the unconfined aquifer; therefore, the DEID GSA utilized groundwater levels as a proxy metric for the reduction in aquifer storage sustainability indicator.
- For land subsidence, DEID GSA is using a rate of land subsidence that avoids impacts on critical infrastructure (i.e., the FKC), the most vulnerable beneficial user associated with this sustainability indicator. Lower aquifer groundwater management is directly correlated with land subsidence; therefore, the lower aquifer SMC is established as the groundwater elevation that is consistent with the SMC for land subsidence.

Table 3-1: General SMC Summary for DEID GSA [§354.26(b)(2)]

	Chronic Lowering of Groundwater Levels	Reduction in Groundwater Storage	Degraded Groundwater Quality	Land Subsidence
Measurement	Groundwater elevations derived from measured depth to groundwater at RMS	Groundwater levels are used as a proxy for the reduction in groundwater storage.	Groundwater quality analysis from samples collected by the GSA or other public agencies	Total subsidence measured at RMS using DWR provided InSAR data and survey benchmark monitoring.
UR	Upper/Composite Aquifer: A single MT exceedance at any RMS site. Lower Aquifer: A single MT exceedance at any RMS site	Groundwater level SMC used as a proxy.	A single MT exceedance at any RMS	A single MT exceedance (rate and cumulative) at any RMS site.
MT	Upper Aquifer: Established at projected groundwater levels for Tule Subbasin sustainability goal. Lower Aquifer: Established at groundwater levels consistent with no additional subsidence (land subsidence MT)	Groundwater level SMC used as a proxy.	Establish MTs at each Groundwater Quality RMS based on 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.	Established MTs at each RMS to reflect zero additional subsidence.
MO	Upper Aquifer: Established at groundwater levels consistent with historical measurements and operational flexibility. Lower Aquifer: Established at groundwater levels consistent with no additional subsidence (land subsidence MT)	Groundwater level SMC used as a proxy.	Established at 75% of the MT	Established MOs at each RMS to reflect zero additional subsidence.

Subsection 3.5 Chronic Lowering of Groundwater Levels

> ***§ 354.26. Undesirable Results***
> *(a) Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*
> *(b) The description of undesirable results shall include the following:*
> *(1) The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
> *(2) The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
> *(3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*
> *(c) The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*
> *(d) An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

Revised chronic lowering of groundwater levels SMC are developed based on the best available science, input collected from stakeholders, coordination amongst the GSAs' technical experts, and discussions with the SWRCB staff.

The revised SMC methodology began by identifying all beneficial users, uses, and property interests of groundwater in the Tule Subbasin and DEID GSA and then the risk of potentially impacting these users was evaluated. This well impact analysis evaluated the potential risk of impairing domestic wells, agricultural wells, small community wells, and municipal wells function under various groundwater level scenarios. More information on this analysis is available in the following subsections.

Subsection 3.5.1 Groundwater Beneficial Uses and Users *[§354.26(b)(3)]*

The first step of the SMC approach (**Figure 3-1**) is to identify beneficial users, uses, and property interests. Beneficial uses, users, and property interests are identified in **Section 1**. Potential effects on beneficial uses induced by chronic lowering of groundwater levels are summarized **Figure 3-4** and **Exhibit 3-3**. DEID GSA has been managing to avoid these potential effects through decades of conjunctive use and investments in groundwater recharge and water banking (described more in **Section 5**).

In evaluating the potential effects of impacts related to the chronic lowering of groundwater levels, DEID GSA determined that domestic drinking water wells are the most vulnerable beneficial users in the upper aquifer. Based upon the determination of domestic wells being the most vulnerable beneficial user in the upper aquifer, the Tule Subbasin and DEID GSA developed a well impact analysis (**Exhibit 3-3**), which formed the basis for defining upper aquifer groundwater level MTs.

During ongoing work, it was also identified that the lower aquifer in the DEID GSA would need to be evaluated independently of the upper aquifer. The lower aquifer MTs (which are based on land subsidence MTs) were also evaluated to ensure there were no potential impacts to domestic wells. The beneficial users and uses, and property interests most vulnerable to the chronic lowering of groundwater levels include critical infrastructure and their users listed for land subsidence under **Subsection 3.6**.

Subsection 3.5.2 Chronic Lowering of Groundwater Levels Undesirable Results *[§354.26 (b)(2)]*

Undesirable results are caused by groundwater conditions occurring throughout the Subbasin that, for any sustainability indicator, are considered significant and unreasonable. DEID GSA defines undesirable results for the chronic lowering of groundwater levels (by aquifer) as the following combination of minimum threshold exceedances:

Upper/Composite Aquifer: A single MT exceedance at any RMS.

Lower Aquifer: A single MT exceedance at any RMS.

The basis for these definitions of undesirable result(s) are described in more detail in the subsections below.

Subsection 3.5.2.1 Subbasin Defined Significant and Unreasonable Chronic Decline in Groundwater Levels *[§354.26(a),(b)(2)]*

It is important to distinguish the role of SGMA in evaluating subbasin-wide challenges. Subbasins and their GSAs are asked to evaluate impacts on a subbasin-wide level to determine what constitutes significant and unreasonable effects that could lead to URs. DEID GSA recognizes the importance of also addressing localized, individual impacts that may occur as the Subbasin works towards achieving and maintaining sustainability. DEID GSA developed a Mitigation Plan in partnership with Self-Help Enterprises that is intended to address these individual impacts on the path to achieving sustainability.

As stated throughout this Plan, groundwater management within DEID GSA does not contribute to significant and unreasonable impacts, as the GSA is a net recharger to the Subbasin and DEID MA (98% of the GSA) has not overdrafted since the 1950s. Despite this, chronic lowering of groundwater levels and land subsidence has been measured within the GSA due to the unsustainable management of neighboring areas impacting DEID GSA’s beneficial users, uses, and property interests.

The undesirable result is a quantitative reflection of significant and unreasonable effects occurring subbasin-wide. The Tule Subbasin has defined significant and unreasonable effects as:

The tipping point at which groundwater conditions across the Tule Subbasin cause impacts to beneficial users, uses, and property interests that cannot be sustained or mitigated.

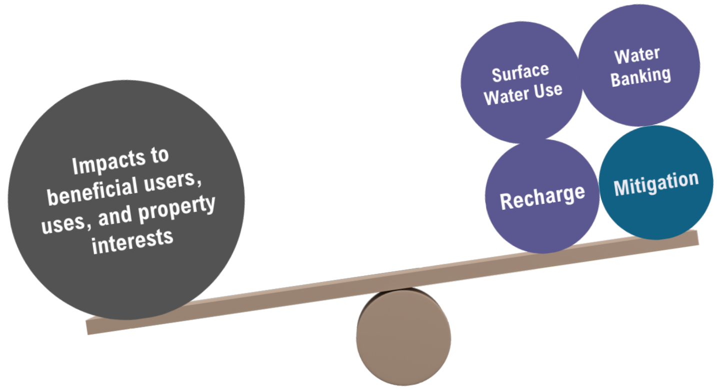


Figure 3-6: Analogy Diagram of Significant and Unreasonable Effects

Elsewhere in the Tule Subbasin, this balancing can be achieved through significant reductions in water demand through revised allocation policies, fallowing incentives, financial incentives to reduce water consumption, conjunctive use, and recharge projects. In DEID GSA, the need for demand management isn't necessary because the growers within the GSA have not overdrafted since the 1950s and the remaining groundwater use is for drinking water consumption, which is exempt from demand management policies to protect the human right to water. For DEID GSA, avoiding significant and unreasonable results requires continued implementation of DEID's surface water use (conjunctive use), recharge activities, water banking, and mitigation plan (**Figure 3-6**).

In the case of groundwater levels, this may include the number of domestic wells impacted which exceeds the Tule Subbasin's mitigation capacity and community water systems unable to meet their supplies. As stated, throughout this Plan, DEID GSA has been operating sustainably for decades and the risk of significant and unreasonable effects is contingent on neighboring GSAs' capacity to reduce water consumption, build an effective mitigation program that awards mitigation support to all impacted beneficial users by the responsible party and independent of GSA jurisdictional boundary. The prevention of significant and unreasonable effects in DEID GSA is wholly correlated to the neighboring GSAs' capacity to adopt necessary demand management changes, implement projects, and adopt an attribution-based mitigation program.

Subsection 3.5.2.2 Significant and Unreasonable Impacts on the Most Sensitive Beneficial Uses and Users

DEID GSA's beneficial uses, users, and property interests are listed in **Section 1.** The vulnerability of these groups to the potential impacts of chronic lowering of groundwater levels varies based on the depths at which the wells are constructed. In the Tule Subbasin, domestic wells are often drilled to more shallow depths than agricultural and community wells. Therefore, as groundwater levels are lowered, the first wells to be impacted are the shallower domestic wells. DEID GSA will continue to closely monitor the potential risks of impacts to shallow domestic wells and is committed to improving the capabilities of appropriately notifying landowners of well impacts through the Well Registration Program. This Program is intended to gather well-construction information and contact information needed to meaningfully evaluate well-specific risks and notify the landowner when appropriate (see description in **Section 5**). In addition to supporting early notification, all the gathered information on domestic wells and their potential risks will be evaluated by the GSA to annually reassess the SMC and available options to avoid localized, individual impacts, which are projected to be induced by the unsustainable management of neighboring GSAs. The GSAs have an ethical and financial interest in this reassessment protocol – it is more affordable for the GSA to be proactive and avoid the need for mitigation than to retroactively mitigate. Significant and unreasonable effects on the beneficial uses, users, and property interests include:

- Individual Impact: any domestic well unable to supply safe drinking water to a household due to lowering of groundwater levels.
    - Significant and Unreasonable Effect: The number of impacted domestic wells exceeds the capacity of the responsible party's/parties' mitigation budget(s).
- Individual Impact: A small community groundwater production system is unable to supply safe drinking water to connected households due to the lowering of groundwater levels.
    - Significant and Unreasonable Effect: The number of impacted small community wells exceeds the capacity of the responsible party's/parties' mitigation budget(s).

As stated throughout this Plan, DEID GSA has operated sustainably for many decades, having not overdrafted since the 1950s. DEID GSA has also made approximately $44 million in investments towards projects that secure maintaining this sustainable into the future. The potential for individual impacts or significant and unreasonable results within DEID GSA is contingent on neighboring GSAs' groundwater management, projects, and policies.

Subsection 3.5.2.3 Significant and Unreasonable Impacts on Other Beneficial Uses and Users *[§354.26(b)(3)]*

In the case of other beneficial users, uses, and property interests, including agricultural, industrial, municipal, commercial, and other production well types, these wells are generally drilled deeper than domestic in DEID GSA and the Tule Subbasin. Therefore, they are less vulnerable to impacts from the lowering of groundwater levels than domestic wells in DEID GSA. Significant and unreasonable effects on these beneficial uses, users, and property interests include:

- Individual Impact: An agricultural well is unable to meet intended demand due to the lowering of groundwater levels.
    - Significant and Unreasonable Effect: The number of impacted agricultural wells exceeds the capacity of the responsible party's/parties' mitigation budget(s).
- Individual Impact: A municipal or commercial well is unable to supply drinking water to connected households due to the lowering of groundwater levels and cannot use its backup well(s) to supply drinking water.
    - Significant and Unreasonable Effect: The number of impacted municipal or commercial wells exceeds the capacity of the responsible party's/parties' mitigation budget(s).
- Individual Impact: An industrial well is unable to meet the intended demand due to the lowering of groundwater levels.
    - Significant and Unreasonable Effect: The number of impacted industrial wells exceeds the capacity of the responsible party's/parties' mitigation budget(s).

As stated throughout this Plan, DEID GSA has operated sustainably for many decades, having not overdrafted since the 1950s. DEID GSA has also made approximately $44 million in investments towards projects that secure maintaining this sustainable into the future. The potential for individual impacts or significant and unreasonable results within DEID GSA is contingent on neighboring GSAs' groundwater management, projects, and policies.

Subsection 3.5.2.4 Significant and Unreasonable Impacts on Neighboring Subbasins *[§354.26(b)(2)]*

DEID GSA's SMC are more protective than the rest of the Tule Subbasin and neighboring subbasins, including the Kern County Subbasin which border's DEID GSA. Significant and unreasonable effects induced by Tule Subbasin groundwater management on neighboring subbasins include:

- Individual Impact: any drinking water well in a neighboring subbasin unable to supply safe drinking water to a household due to the lowering of groundwater levels induced by Tule Subbasin groundwater management.

   - Significant and Unreasonable Effect: the number of drinking water wells in an adjacent subbasin impacted by Tule Subbasin groundwater management exceeds the responsible party's/parties' mitigation budget(s).

As stated throughout this Plan, DEID GSA has operated sustainably for many decades, having not overdrafted since the 1950s. DEID GSA has also made approximately $44 million in investments towards projects that secure maintaining this sustainable into the future. The potential for individual impacts or significant and unreasonable results within DEID GSA is contingent on neighboring GSAs' groundwater management, projects, and policies.

Subsection 3.5.2.5 Criteria for Defining Chronic Lowering of Groundwater Levels Undesirable Results

By regulation, the undesirable result for the chronic lowering of groundwater levels is a quantitative combination of groundwater level MT exceedances. As per California Water Code §354.26(c), multiple combinations of potential MTs were evaluated to assess whether undesirable results would occur based on different groundwater conditions.

The primary criteria and metric to determine if undesirable results occur in the Subbasin is if the count of impacted domestic wells exceeds the GSAs' ability to mitigate those impacts. Domestic wells are the most vulnerable to groundwater level impacts because they are generally drilled shallower than other well types in the Tule Subbasin. Also, the loss of water in domestic wells results in homes that do not have potable water leaving homeowners without reliable water supplies. Therefore, by defining undesirable results to be protective of impacts on domestic wells, other beneficial users, uses, and property interests are also protected. An undesirable result in DEID GSA pertaining to groundwater levels are as follows:

A single exceedance of an upper aquifer RMS MT.

or

A single exceedance of a lower aquifer RMS MT.

These quantitative definitions of undesirable result are aligned with DEID GSA's mission of continued sustainability and zero tolerance for continued overdraft activities by neighboring GSAs. By establishing the definition of undesirable result at a single minimum threshold exceedance in either aquifer, all beneficial users, uses, and property interests are protected, including the most vulnerable (domestic wells in the upper aquifer and critical infrastructure in the lower aquifer).

Subsection 3.5.2.6 Potential Causes of Undesirable Results

Potential causes of URs in the Tule Subbasin as they pertain to the chronic lowering of groundwater levels include the following:

- Unsustainable groundwater management from neighboring subbasins leads to excessive groundwater outflow from the Tule Subbasin.
- Prolonged periods of extracting groundwater in excess of sustainable yield can lead to regional declines in groundwater levels in the Subbasin.

- Localized over-pumping of groundwater can lead to declining groundwater levels in a subarea of the Subbasin, even if regional pumping is maintained within the sustainable yield. For example, a cluster (or pumping center) of high-capacity wells may cause excessive localized drawdown, leading to significant and unreasonable effects on neighboring wells.
- Extreme drought (such as the 5-year drought observed in 2012-2016) and associated impacts on groundwater conditions due to (a) curtailments of imported surface water supplies, (b) reduction in natural recharge, and (c) increased pumping to meet demands can lead to excessively low groundwater elevations and undesirable results. This becomes especially significant if groundwater levels do not rebound after the drought period or excessive subsidence occurs.
- Unsustainable groundwater management from neighboring subbasins leads to excessive underflow losses.

Subsection 3.5.2.7 Effects on Beneficial Users and Land Uses *[§354.26(b)(3)]*

URs occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the Subbasin. The primary significant and unreasonable effects related to the chronic lowering of groundwater levels on beneficial users include significant loss of well capacity, increased costs due to higher pumping lifts, lack of groundwater extraction due to the groundwater levels declining below the pump setting depth or the bottom of the well, drying of domestic wells, significant reductions in GDEs as a result of declines in interconnected surface water due to nearby pumping in areas of the Tule Subbasin in which interconnected surface waters are present, or subsidence impacts on well structures and above ground infrastructure (in the case of lower aquifer groundwater level decline). A breakdown of potential effects to beneficial uses and users in DEID GSA by applicable sustainability indicator is available in **Figure 3-4**.

Subsection 3.5.3 Chronic Lowering of Groundwater Levels MTs *[§354.28(c)(1)(A)]*

> *§354.28 Minimum Thresholds.*
>
> *(a) Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*
>
> *(b) The description of minimum thresholds shall include the following:*
>
> *(1) The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.*
>
> *(2) The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*
>
> *(3) How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*
>
> *(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*
>
> *(5) How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*
>
> *(6) How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*
>
> *(c) Minimum thresholds for each sustainability indicator shall be defined as follows:*
>
> *(1) Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:*
>
> *(A) The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.*
>
> *(B) Potential effects on other sustainability indicators.*
>
> *(2) Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin*

The minimum thresholds for the RMS locations associated with the Chronic Lowering of Groundwater Levels sustainability indicator deviate from the Tule Subbasin in an effort to protect all beneficial users, uses, and property interests within and surrounding DEID GSA. The most vulnerable of which are groundwater dependent drinking water users.

Subsection 3.5.3.1 Process for Determining Minimum Threshold *[§354.28(a),(b)(1)]*

The following five steps detail the process for setting the minimum threshold at each RMS well with upper/composite aquifer type.

Step 1: Utilize the hydrograph created for each RMS well which assumes average hydrology (see **Exhibit 3-1**).

Step 2: Evaluate representative (i.e., fall 2022) groundwater levels for each RMS location using the best available data.

Step 3*: Deduct the modeled change in groundwater elevation during the 20-year plan implementation period (2022-2040) from the representative groundwater levels (i.e., fall 2022) at each RMS location.

Step 4: Establish the minimum threshold for the chronic lowering of groundwater elevation sustainability indicator for the entire plan implementation period as a single value at each RMS location. The difference between the minimum threshold and measurable objective is the operational flexibility established at each RMS well.

Step 5:** Create an interpolated surface of the minimum threshold values established at each RMS well and compare the interpolated surface to existing well depth and screen interval information of potentially active pumping wells throughout the DEID GSA management areas to determine if protective of beneficial uses and users (see **Exhibit 3-3**). If necessary, minimum threshold values were adjusted to avoid significant and unreasonable conditions that may lead to undesirable results or provide appropriate mitigation.

*Step 3 describes the process for establishing minimum thresholds at RMS locations for the Chronic Lowering of Groundwater Levels sustainability indicator that DEID GSA will utilize to quantify this GSP's effectiveness for achieving its sustainability goal and incorporates projects and management actions proposed by all GSAs in the Tule Subbasin, specifically transitional pumping.

**Step 5 describes the process for evaluating beneficial uses and users for existing wells in the DEID GSA. For this analysis, the representative groundwater water levels (i.e., fall 2022) and projected groundwater levels for 2040, assuming projects and management actions are implemented, were evaluated to (1) identify existing pumping wells that may be currently impacted and (2) identify additional wells that may be affected in 2040. This analysis assumed that a minimum 30 ft of saturated screen interval[1] is required to maintain groundwater production rates taking into account well inefficiency (well losses), pumping water levels and sufficient submergence of the pump to avoid cavitation (entrainment of air in the pumped water).

For the lower aquifer RMS wells, the minimum threshold was set to be equal to the most recent groundwater low measurement (i.e., 2023) to maintain consistency with the land subsidence minimum threshold (see **SECTION 3.6**), which is set at zero additional subsidence for the DEID GSA area.

[1] The minimum 30 ft of saturated screen interval is established based on the following criteria: 10 ft for well sump, and 20 ft for sufficient pump submergence and pumping well losses.

Table 3-2: Chronic Lowering of Groundwater Levels MTs, MOs, and IMs

RMS Well	Aquifer	Groundwater Level SMC (ft-amsl)				
		2025 Interim Milestone	2030 Interim Milestone	2035 Interim Milestone	Measurable Objective	Minimum Threshold
24S/25E-35H01	Upper	144	151	153	154	144
24S/26E-04P01	Upper	58	66	69	70	58
24S/26E-11	Upper	126	138	142	144	126
24S/26E-32G01	Upper	129	138	141	142	129
M19-U	Upper	147	154	157	158	147
23S/26E-29D01	Upper	54	59	60	61	54
25S/26E-9C01	Lower	62	62	62	62	62
M19-L	Lower	65	65	65	65	65
23S/25E-27	Composite	10	10	10	10	10
24S/27E-31	Composite	99	104	106	107	99

Subsection 3.5.3.2 Minimum Threshold Extent

The lateral extent of MTs for the upper aquifer covers the entire GSA. The presence of the aquitard between the upper and lower aquifers (i.e., the Corcoran Clay) is limited to the western two-thirds of the Subbasin, which delineates the extent of the lower aquifer.

The vertical extent also varies across the Subbasin for both upper and lower aquifers, as reflected in the MTs identified at each RMS location in **Figure 3-7** and **Figure 3-8**.

Subsection 3.5.3.3 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators *[§354.28(b)(2)]*

Reduction in groundwater storage: There is a significant correlation between groundwater levels and aquifer storage for the unconfined upper aquifer; therefore, the DEID GSA utilized groundwater levels as a proxy metric for the reduction in aquifer storage sustainability indicator.

Land Subsidence: For land subsidence, DEID GSA is using a rate of land subsidence that avoids impacts on critical infrastructure, the most vulnerable beneficial user associated with this sustainability indicator. Lower aquifer groundwater management is directly correlated with land subsidence; therefore, lower aquifer SMC is established as the groundwater elevation that is consistent with SMC for land subsidence.

Degraded Groundwater Quality: There is no evidence at this time of groundwater management negatively impacting groundwater quality within DEID GSA; however, the GSA has initiated new activities to fill the groundwater quality data gap. In addition, the groundwater level SMC and water management activities of DEID GSA are protective against increasing groundwater decline gradients that may mobilize contamination, protect against subsidence which could release new contamination and DEID only recharges good quality surface water which introduces improved quality water to the underlying aquifer.

Depletions of Interconnected Surface Water: There are no interconnected surface waters within DEID GSA.

Seawater Intrusion: There is no seawater intrusion within DEID GSA.

Subsection 3.5.3.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins *[§354.28(b)(3)]*

The groundwater level SMC for DEID GSA are more protective than the SMC established in other GSAs and subbasins. Therefore, no negative impacts are expected.

Subsection 3.5.3.5 Relevant Federal, State, or Local Standards *[§354.28(b)(5)]*

There are no federal, state, or local regulations related to groundwater levels outside of SGMA.

Subsection 3.5.3.6 Method for Quantitative Measurement of Minimum Thresholds *[§354.28(b)(6)]*

Groundwater level measurements will continue to be assessed bi-annually using the monitoring network described in Section 4 and will be evaluated in relation to MTs. Groundwater level data will continue to be collected at the RMS sites bi-annually to capture the seasonal high (spring) and seasonal low (fall) water table conditions. This data will be reported to DWR bi-annually via the SGMA Data Portal and reported in the Annual Reports, as has been completed since the submittal of the first GSP in 2020.

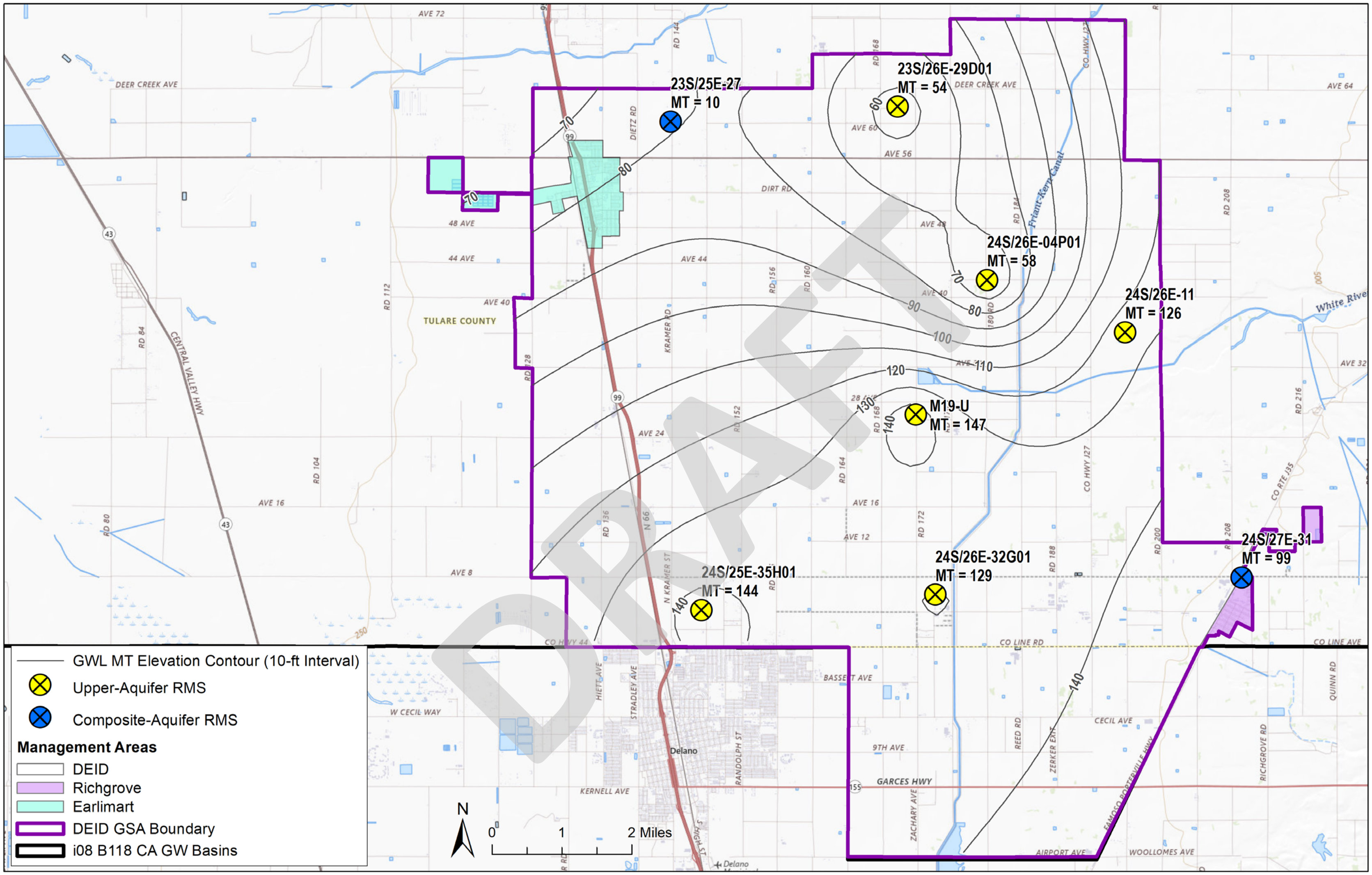


Figure 3-7: Map of Upper Aquifer Groundwater Level MTs

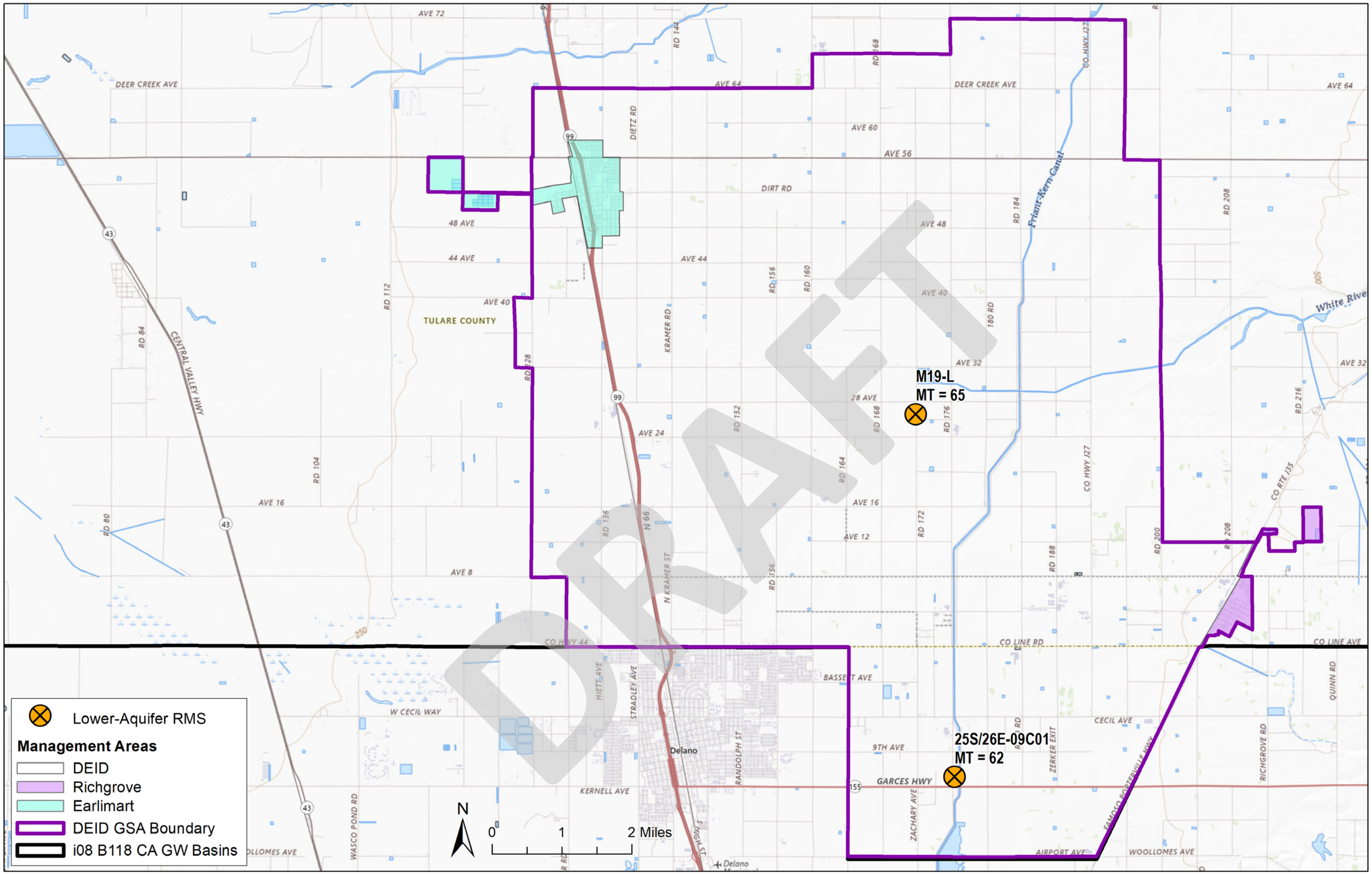


Figure 3-8: Map of Lower Aquifer Groundwater Level MTs

Subsection 3.5.4 Chronic Lowering of Groundwater Levels Measurable Objectives and Interim Milestones *[§354.30(a)(b)(c)(d)(e)(f)(g)]*

§354.30 Measurable Objectives.

1. *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
2. *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
3. *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
4. *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
5. *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
6. *Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.*
7. *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

Subsection 3.5.4.1 Methodology for Setting Measurable Objectives and Interim Milestones

The measurable objective (MO) for the chronic lowering of groundwater level sustainability indicator represents a target groundwater surface elevation that acts as a quantitative measure of the sustainability goal. MOs for the upper aquifer were developed by applying the concept of providing a reasonable margin of operational flexibility under adverse conditions (GSP Emergency Regulations §354.30(c)). Interim milestones (IMs) were developed to illustrate a reasonable path to achieve the sustainability goal for the Subbasin within 20 years of Plan implementation. The MO for each RMS location was quantified as a distance above the MT: 50% the difference between starting point for the transitional pumping model results and the MT. Since the transitional pumping results are modeled as a decline in projected groundwater levels, the MO was developed to ensure a reasonable margin of operational flexibility above the MT. The MOs for each RMS for the upper and lower aquifers are shown on **Figure 3-9** and **Figure 3-10**, respectively.