

Annual Evaluation of Groundwater Management by the Delano-Earlimart Irrigation District Groundwater Sustainability Agency

Tule Subbasin | March 2026



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EXECUTIVE SUMMARY

The Delano Earlimart Irrigation District (DEID) Groundwater Sustainability Agency (GSA) manages groundwater in a southern portion of the Tule Subbasin. At the September 2024 Tule Subbasin Probationary Hearing, the State Water Resources Control Board (State Water Board, or Board) excluded pumpers managed by DEID from the requirement to report extractions and pay the associated fees to the State Water Board, based on adequate management of groundwater by DEID (referred to as the 2024 Exclusion). Specifically, Board staff found that water users in DEID generally added more water to groundwater than they removed and that DEID had made improvements to its GSP.

In approving the 2024 Exclusion, the Board directed staff to provide an annual evaluation of DEID's actions and progress in determining whether the exclusion should be extended for an additional year. DEID has provided information to support its request for continued exclusion for an additional year. In this evaluation, Board staff considers updated information to determine whether the GSA is still managing groundwater adequately, and recommends that the Board continue the 2024 Exclusion for another year.

For the purposes of this evaluation, staff considers actions and efforts the GSA undertook between September 2024 and September 2025, and also evaluates water budget information from 2019 through September 2024, relative to the historical water budgets from October 1986 through September 2019. The GSA undertook several actions since September 2024 to better understand groundwater pumping and data gaps within the GSA area and prevent undesirable results, including implementing a well registration program to identify domestic wells, creating a well inventory, and developing a mitigation program. However, DEID has not committed to demand management beyond a voluntary fallowing program for agricultural pumpers.

In August 2025, the Department of Water Resources (DWR) released a draft Best Management Practice (BMP) Guidance Document for managing subsidence, which DWR finalized in January 2026 (subsidence BMP). The subsidence BMP provides a useful suite of information for GSAs on how to best manage subsidence, although the timing of the document's release was too late to inform DEID's specific actions when staff began to review their request in September 2025. Significant subsidence occurred in the GSA area over the past decade, especially near the northern and western boundaries. Relatively little subsidence occurred in the central and southeastern portions of the GSA area.

Although DEID's subsidence management does not reflect all of the latest best practices described in the subsidence BMP, such as creating a groundwater pumping reporting system, metering extraction wells, establishing groundwater level sustainable management criteria designed to slow subsidence, and monitoring groundwater levels monthly, DEID has enacted proactive initiatives that align with the guidance of the

document. DEID performed subsidence attribution analyses and asserts that DEID is not responsible for most subsidence occurring in the area DEID manages, given the net recharge of groundwater in that area. The GSA also monitors groundwater levels twice a year, commits to raising its groundwater level management criteria, and has provided funds for subsidence-related repairs to the Friant-Kern Canal and to DEID's own infrastructure within the subbasin.

Staff recommends continuing the exclusion of DEID extractors from reporting and fees for an additional year, with annual evaluations to ensure ongoing progress toward sustainability goals. This approach allows staff to evaluate how much recent projects and management actions affect the GSA's water budget. Staff also recommends DEID make improvements involving monitoring pumping and groundwater levels, updating minimum thresholds, and building out more substantial groundwater demand management by the next annual review.

1.0 BACKGROUND

On September 17, 2024, the State Water Resources Control Board (State Water Board or Board) adopted [Resolution No. 2024-003](#) (Tule Probationary Resolution), which designated the entire Tule Subbasin probationary under the Sustainable Groundwater Management Act (SGMA). Typically, in a probationary groundwater basin, people who extract (pump) groundwater must file an annual [groundwater extraction report](#) with the State Water Board and pay associated fees.

SGMA allows the State Water Board to exclude a class or category of extractions from the probationary requirement for reporting extractions and paying associated fees if 1) they are subject to a local plan or program that adequately manages groundwater or 2) they are likely to have a minimal impact on subbasin withdrawals (Wat. Code, § 10735.2, subd. (c)(1)). In the Tule Probationary Resolution, the State Water Board applied a reporting and fee exclusion to the Delano-Earlimart Irrigation District (DEID) Groundwater Sustainability Agency (GSA). While the exclusion is in place, extractors within the boundaries of DEID are not required to report their extractions or pay fees to the State Water Board. In granting the exclusion, the State Water Board directed its staff to evaluate the continued adequacy of DEID's groundwater management at least annually (Tule Probationary Resolution, p. 12 § 6(c)).

Even with the exclusion, the portions of the Tule Subbasin managed by DEID are still on probation and the GSA must continue to address deficiencies in its Groundwater Sustainability Plan (GSP).

1.1 OVERVIEW OF THE STATE WATER BOARD'S 2024 EVALUATION

At the September 17, 2024, Probationary Hearing for the Tule Subbasin, the State Water Board granted DEID an exclusion from reporting and fees based on its status as a net-neutral or a net-recharger in the subbasin. Board staff evaluated water budget

data from October 1986 to September 2019, provided in 2024 Tule Subbasin Coordination Agreement (Tule Subbasin Groundwater Sustainability Plan Coordination Agreement, 2024, pp. Chp. 2, Appendix G), and summarized groundwater storage change data for water year 2024 and calendar year 2025 through August. DEID demonstrated a generally balanced water budget in 2024 and described an overall goal to develop demand management actions. DEID’s conjunctive use of surface water and groundwater resulted in a balanced water budget, and staff noted future development of actions to reduce demand would help maintain this balance into the future (2024 Tule Subbasin Probationary Hearing Final Staff Report, pp. 142-144).

Staff’s recommendation was contingent on 1) ongoing adequate groundwater management and 2) adequate progress towards fully developed groundwater demand management (2024 Tule Subbasin Probationary Hearing Final Staff Report, p. 143) .

2.0 GSA 2025 DATA SUBMITTAL

In August 2025, the State Water Board requested DEID to submit any relevant information to substantiate continued adequate management of groundwater in the GSA’s management area. In response, DEID provided the following information in September, October, and December 2025 (Quinley, 2025a; Quinley, 2025b; Quinley, 2025c):

- Data from a generalized water budget only for Water Year (WY) 2024 and calendar year 2025. These showed imported surface water and cumulative change in groundwater storage exclusive to DEID.
- Additional water budgets for WYs 2020-2024, including information on groundwater pumping and surface water deliveries.
- Updates on projects and management actions relevant to maintaining a balanced or net-positive water budget.
- Updates on efforts to fill data gaps, including well inventory, well registration, and monitoring network improvements.
- Updates on DEID’s participation in subbasin-wide mitigation plans, its domestic well registration program, and execution of a domestic well mitigation agreement with Self-Help Enterprises.
- Other information relevant to DEID’s subsidence management.

3.0 GROUNDWATER MANAGEMENT EVALUATION

Board staff focuses on three key components in evaluating the ongoing adequacy of DEID’s groundwater management.

First, staff compares recent water budgets to historic data starting in WY 1987 to determine if the GSA is still net-neutral or a net-recharger of groundwater.

Second, staff assesses the progress of DEID’s demand management program, well inventory, and mitigation program. Evaluation of the first two programs aims to determine whether these measures will be effective in encouraging reduction in groundwater pumping and thus support preventing overdraft in DEID’s area of the Tule Subbasin. Staff considers whether the mitigation program would likely address pumping impacts not otherwise avoided by DEID projects and management actions.

Third, Board staff evaluates whether DEID’s groundwater management is still adequate, given the groundwater storage deficit in the basin, ongoing substantial land subsidence in parts of the Tule subbasin, and DEID’s overall management actions and efforts. Staff provides recommendations for DEID to develop improvements for groundwater management in light of new best available data and information; specifically, the Department of Water Resources’ new subsidence Best Management Practices (subsidence BMP) notes that avoiding significant and unreasonable subsidence in some areas may require bringing groundwater levels up, rather than just preventing further decline (Land Subsidence BMP, 2026, p. 1-1).

3.1 GROUNDWATER BUDGET

In this section, staff evaluates DEID’s reported new groundwater budgets for WYs 2020 – 2024,¹ relative to the full record starting in WY 1987, and considers whether the new information indicates continued adequate management to avoid overdraft. The review focuses on the completeness and implications of the budget components, including inflows, outflows, storage change, historical comparison, and the overall water budget balance.

Overall groundwater storage in DEID decreased in most years since approximately WY 2013 but rebounded during wet years so that the overall trend is neutral (balanced) (Quinley, 2025a). For WYs 2020 through 2024, water budgets varied from year to year, likely influenced by hydrologic water year type, surface and groundwater fees, and other factors. These data show that gains in storage in wetter years offset losses in storage in drier years, and the cumulative increase in groundwater in storage since 1987 remains 299,000 AF (see Figure 1).

The period from WYs 2013 through 2024 included the unprecedented 2012-2016 drought. Surface water availability decreased sharply during the 2012-2016 drought, so groundwater demand likely increased during that same time period. Land subsidence, exacerbated by increased pumping during the drought, may have also played a significant role in the decreased surface water use during drought as subsidence along part of the Friant-Kern Canal resulted in reduced delivery capacity in the canal and the need for canal repairs. This lost capacity led to reduced surface water deliveries for

¹ DEID provided water budgets based on the Tule subbasin’s coordinated water budget methodology as well as its own GSA-specific methodology. Board staff focuses its evaluation on the coordinated water budget to ensure consistency across GSA exclusion evaluations, but both sets of water budgets indicate increases in groundwater storage in DEID.

some Friant Division contractors, including DEID (United States Bureau of Reclamation, 2020), although repairs completed in 2024 on segments of the Friant-Kern Canal restored some conveyance capacity. Full restoration to the canal’s original design capacity is expected following completion of all phases of the repair project (United States Bureau of Reclamation, 2026).

Even with two significant drought periods (2012-2016 and 2020-2022), average surface water use has increased since WY 2013 (Quinley, 2025c). However, the increase in groundwater pumping since WY 2013 is greater in magnitude than the increase in surface water use, indicating increased groundwater usage and overlapping dry periods may largely be responsible for periods when groundwater storage declines. Despite some declines in groundwater storage subsequent to WY 2013, DEID maintained a net positive account of groundwater in storage of 299,000 AF (Quinley, 2025c).

3.2 OTHER MANAGEMENT CONSIDERATIONS

3.2.1 Demand Management

DEID expressed in its 2024 GSP that “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” (2024 Draft DEID GSP, p, ES-18). However, staff analysis shows that groundwater elevations have dipped below established minimum thresholds (MTs; see Table 1, below), though DEID has asserted in the past that water level declines are due to overdraft in adjacent GSAs (ibid, p, ES-13). Regardless, with observed groundwater elevations dropping below MTs, staff analysis shows that pumping information is needed to attribute the cause of the MT exceedances and suggests that demand management may be needed in the future, particularly during periods of extended drought.

DEID took steps to develop demand management within the GSA over the last year, with current proposals focused on potential voluntary land fallowing in the event of surface water shortages (2024 Draft DEID GSP, p, 5-54). While this initial step satisfies the direction of the Board’s 2024 Exclusion, it is not clear whether DEID’s voluntary demand management actions will be sufficient to prevent future groundwater level MT exceedances. Staff recommends that future exclusion requests be contingent on DEID development of a more robust demand management strategy, even if that strategy may only be implemented during severe drought.

3.2.2 Groundwater Well Data Gaps and Mitigation

DEID continues to fill data gaps regarding the number and construction of groundwater wells in DEID. DEID is developing a well inventory database based on desktop and field-based reviews of wells within GSA boundaries. DEID stated that this effort identified several previously unknown domestic wells and increased the GSA’s understanding of well depths and aquifer pumping (Quinley, 2025a, p. 8). The GSA also

identified opportunities for additional monitoring points at existing wells in the three main aquifer systems, and plans to include new domestic well water level information in future monitoring efforts (ibid., p. 9). DEID estimates approximately 200 wells use meters within the GSA (~35-40% of wells).

Since the 2024 GSP release, DEID has begun building a domestic well registration program that includes outreach efforts and identification of possible domestic wells (ibid., p. 8). Door-to-door outreach and well assessments are currently ongoing.

DEID also continues to implement its domestic well mitigation program in partnership with Self-Help Enterprises. The program has a \$1,000,000 reserve to provide interim potable water and emergency supplies to beneficial users of groundwater (ibid., p. 7). According to DEID, the updated well inventory improved the GSA's impact analysis and understanding of potential mitigation needs since the release of the 2024 GSPs. DEID has not received any mitigation claims as of December 2025 (Quinley, 2025c).

3.3 CHANGES AND DEVELOPMENTS SINCE PRIOR EVALUATION

State Water Board staff also evaluates whether other new information or science was available to help inform whether the GSA is continuing to adequately manage groundwater. Staff reviews and considers new subsidence-related best management practice (BMP)² guidance released by the Department of Water Resources (DWR) and compares DEID's subsidence management efforts to the BMP.

3.3.1 Draft Land Subsidence Best Management Practices

DWR released a draft BMP document for land subsidence in July 2025 and finalized the BMP document in January 2026. According to DWR, the subsidence BMP "... provides information to assist GSAs with developing appropriate approaches to avoid subsidence in areas that are vulnerable to pumping-induced subsidence, and to minimize subsidence in areas that have or currently are experiencing subsidence" (Land Subsidence BMP, 2026).

The subsidence BMP specifies that the best practice for GSAs to manage and limit subsidence is to raise groundwater levels above the critical head³ in areas experiencing subsidence (Land Subsidence BMP, 2026). Maintaining a balanced water budget may not be enough to adequately manage groundwater in areas with substantial subsidence if groundwater levels remain below critical head and subsidence impacts are not mitigated.

² Best Management Practice "refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science" (Cal. Code Regs., tit. 23, §351, subd. (i)).

³ According to the subsidence BMP, "critical head" is the groundwater level elevation in fine-grained units below which permanent compaction of fine-grained sediments may occur.

Although the draft subsidence BMP was only released in fall 2025 and final version released in January 2026, the document provides helpful information for both the Board’s review as well as DEID’s ongoing management actions in the basin.

3.3.2 Subsidence in DEID

DEID has experienced considerable subsidence (Figure 2) in the decade since the passage of SGMA. Total cumulative subsidence from June 2015 through April 2025 at land subsidence representative monitoring sites (RMSs) ranged from 0.01 to 3.53 ft, with the highest amounts of subsidence in the northern and eastern portion of the GSA. InSAR data (California Department of Water Resources, 2025b) from July 2024 to July 2025 show less than 0.4 feet of subsidence experienced within the GSA.

While DEID experienced considerable subsidence within the last decade, the subsidence may only be partially attributable to pumping in DEID. InSAR data show higher subsidence rates northwest of the GSA, where growers have limited surface water sources and the lower aquifer is more overdrafted. As noted above, DEID’s water budgets indicate that the GSA annually imports and applies enough surface water to generally offset storage losses in dry years.

DEID conducted a subsidence attribution analysis to investigate DEID’s contribution to subsidence from 1986 to 2017 (Figure 3). From that analysis, DEID claims approximately 20 feet of the subsidence in the most impacted areas of the GSA was induced by pumping in neighboring GSAs (2024 Draft GSP, p. ES-19). The analysis concluded that less than 1 foot of subsidence was attributed to pumping within the GSA (ibid, p. ES-16).

DEID also constructed 1D subsidence models to estimate critical head across the subbasin (Quinley, 2025a, p. 13). DEID noted that “critical head is site-specific and varies with the distribution, thickness, and hydraulic properties of fine-grained units, so it must be estimated locally” (Quinley, 2025a). DEID estimated critical head and calibrated models at four locations within the GSA (Table 2), in alignment with the modeling approach for estimating critical head described in the subsidence BMP (Land Subsidence BMP, 2026, pp. 5-16 & 5-17).

The critical head estimates that result from this modeling, current groundwater level MTs, and historical and recent groundwater elevations are shown in Tables 1 and 2 below. Most of DEID’s groundwater level MTs are set below critical head elevations and historic low groundwater levels – meaning that the GSA’s current groundwater level MTs would allow for additional subsidence. The GSA states it will update groundwater level MTs where MTs are lower than estimated critical head, though the GSA does not describe a timeline for these updates. DEID also established subsidence MTs that allow 0 feet of additional subsidence after 2024 to avoid impacts to critical infrastructure (Quinley, 2025a); however, as noted above, DEID claims that they are not a significant contributor to subsidence.

Staff has also identified monitoring frequency as an area for future improvement. Specifically, the current monitoring schedule described in DEID's 2024 GSP may be insufficient to adequately manage subsidence going forward. According to their 2024 GSP, DEID monitors groundwater levels at a minimum of twice a year, in the spring and fall, at 10 monitoring wells. However, semi-annual seasonal water level measurements may miss periods when groundwater levels fall below critical head, causing inelastic subsidence. The subsidence BMP highlights the importance of groundwater level monitoring when characterizing the relationship between groundwater levels and subsidence, and recommends monthly water level measurements or better (Land Subsidence BMP, 2026, p. 5-7). Staff recommends that future continued exclusions be made contingent on improved groundwater monitoring frequency.

Finally, DEID does not propose monitoring pumping with metering, which limits DEID's understanding of how pumping within the GSA area contributes to subsidence. The subsidence BMP recommends establishing groundwater pumping reporting systems that provide timely data to GSAs and DWR, especially in areas experiencing or at risk of land subsidence near infrastructure. According to the subsidence BMP, "groundwater pumping reporting provides spatial and temporal data that groundwater managers may use to better understand the relationship between pumping, groundwater levels, and their effects on land surface conditions," and "the most accurate way to gain local scale understanding of pumping is to use meters" (Land Subsidence BMP, 2026, p. 5-10).

To staff's knowledge, DEID does not plan to establish groundwater pumping reporting systems. DEID does estimate groundwater use using evapotranspiration (ET) data and information on surface water deliveries; however, ET alone is generally not sufficient for tracking lower aquifer pumping, which has the greatest impact on subsidence – particularly where differences in which aquifer the pumping occurs could affect subsidence in different ways. Without substantial information on what aquifer pumping is occurring in, it will be difficult for DEID to fully evaluate whether pumping within its area is causing or contributing to subsidence. Staff recommends that future continued exclusions be made contingent on establishing the groundwater volume pumped from different aquifers, which may require metering of some (or all) wells.

Well	Aquifer	Site Code	MT (ft msl)	Historic low GW elevation & date it occurred (ft msl)	MT minus historic low (ft msl)	GL elevation (Oct. 2024) (ft msl)	GL elevation (Feb. 2025) (ft msl)
23S/26E-29D01	Upper	359030N1191929W001	54	59.0 (10/4/2023)	-5.0	204.3	99.9
24S/25E-35H01	Upper	357984N1192428W001	144	151.1 (2/13/2024)	-7.1	159.9	161.8
24S/26E-04P01	Upper	358667N1191703W002	58	71.7 (9/29/2014)	-13.7	na	na
24S/26E-11	Upper	358558N1191347W001	126	162.5 (10/6/2022)	-36.5	168.8	173.5
24S/26E-32G01	Upper	358014N1191834W002	129	70.0 (10/15/1946)	59.0	156.3	na
M19-U	Upper	358387N1191880W001	147	170.0 (10/18/2022)	-23.0	232.0	213.0
23S25E27	Composite	358995N1192507W001	10	-16.3 (10/8/2024)	26.3	-16.3	74.7
25S26E09	Lower	357649N1191772W001	60	109.0 (10/9/2024)	-49.0	109.0	140.6
M19-L	Lower	358560N1191882W001	40	65.0 (10/18/2022)	-25.0	105.0	183.0
24S27E31 (Tule_D0051_RMS)	Composite	358051N1191050W001	99	102.5 (2/16/2023)	-3.5	na	na

Table 1. Groundwater level MTs and recent groundwater elevations relative to historical lows experienced mostly between spring 2020 and fall 2025 in Lower Aquifer groundwater level RMS. Data from years prior to 2020 are available at two RMSs, with the longest record dating back to 1932 for Well 24S/26E-32G01. GL = Groundwater Levels; ft msl = feet above mean sea level; MT = minimum threshold

Site	Aquifer	Simulated 2024 avg WL (ft msl)	CH (msl)	MT (ft msl)	CH delta (GWL - CH) ⁴	MT delta (MT - CH) ⁵	Simulated Subsidence in feet (1901 - 2024)
EARLIMART	Lower	14	90	24	-76	-66	19.7
D 454	Lower	120	97	73	23	-24	6.6
U 822	Lower	113	110	137	3	27	7.8
T 88	Lower	109	84	28	25	-56	13.5

Table 2. Modified from Table 5 in DEID Exclusion Continuance Report. Estimated critical head (CH) elevations compared with interpolated MTs at sites within DEID.

⁴ Negative numbers indicate 2024 groundwater levels were below estimated critical head.

⁵ Negative numbers indicate MTs are below critical head.

4.0 CONCLUSION

Staff recommends continued exclusion of extractors in DEID from reporting and fees for Water Year 2026 with ongoing Board oversight and recommends that future exclusions be made contingent on meeting the benchmarks on the items identified below as needing improvement for long-term management success.

The following improvements and actions within DEID since the last exclusion request support continued exclusion for the current reporting period:

- Continued evidence and data showing that DEID has increased groundwater storage in wet years enough to offset reductions in dry years.
- Efforts to locate and characterize domestic wells and other groundwater users within the GSA through domestic well registration and well inventory actions.
- Implementation of a domestic well mitigation program.
- Improved and ongoing data collection related to land subsidence, including a monitoring network of 19 benchmarks, extensometers, and InSAR datapoints.
- Ongoing modeling of critical head and comparison to groundwater elevation MTs and subsidence attribution analysis.

However, the actions above are not sufficient for DEID to maintain its exclusion for future reporting periods. DEID should take steps to implement the improvements described below to demonstrate likely long-term management success. What constitutes “adequate management” may change over time, depending on physical data, progress made by a GSA, and implementation, and during subsequent reviews the Board may determine that ongoing management is insufficient due to other components of groundwater management not listed below. Notably, the need for coordination extends to the GSAs that have already received exclusions from the Board: exclusions based on adequate management may cease to be appropriate if they prevent the basin from achieving sustainable groundwater management and exiting probationary status.

4.1 IMPROVE GROUNDWATER USE DATA AND MONITORING

The GSA’s monitoring of groundwater use does not appear to be sufficient for long-term management: ET data alone does not differentiate aquifer sources for the water, limiting critical information important for avoiding subsidence. Moreover, biannual groundwater elevation monitoring may be insufficient to manage groundwater levels to critical head and to refine models in a basin with ongoing substantial subsidence. Staff recommends that DEID develop a more rigorous measurement and monitoring plan that integrates both evapotranspiration and metering and differentiates among extractions from different aquifers.

- Proposed benchmark: Make reasonable progress on a metering and monitoring plan that adequately captures pumping from both the upper and lower aquifers.

- Proposed benchmark: Increase groundwater level monitoring frequency to at least monthly groundwater measurements.

4.2 DEVELOP A FORMAL DEMAND MANAGEMENT PLAN

A demand management plan will ensure DEID can change management approaches quickly in the event that critical drought conditions return. Demand management would also be important in the event that improved groundwater pumping data suggests that localized or individual wells within the DEID service area have more of an effect on subsidence than originally indicated or are affecting critical infrastructure.

- Proposed benchmark: Make reasonable progress on a demand management program that can address drought conditions or other impacts more effectively than voluntary following.

4.3 UPDATE GROUNDWATER ELEVATION MTs

DEID has already committed to raising groundwater elevation MTs above critical head to minimize subsidence but has not yet provided a timeline.

- Proposed benchmark: Make reasonable progress on developing groundwater elevation MTs informed by estimates of critical head.

5.0 FIGURES

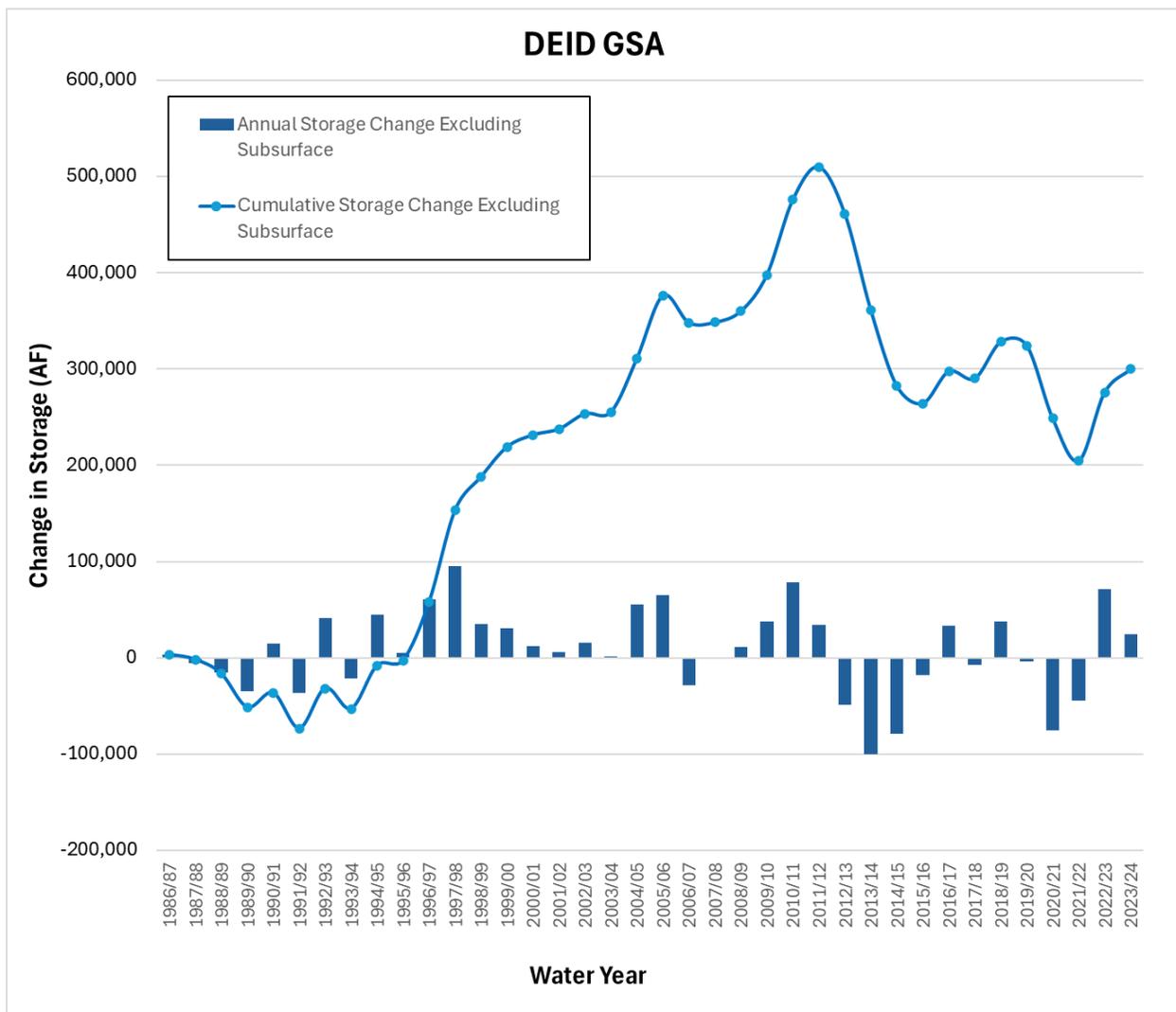


Figure 1. DEID Change in Storage Excluding Subsurface Inflows and Outflows, Water Years 1986-1987 through 2023-2024

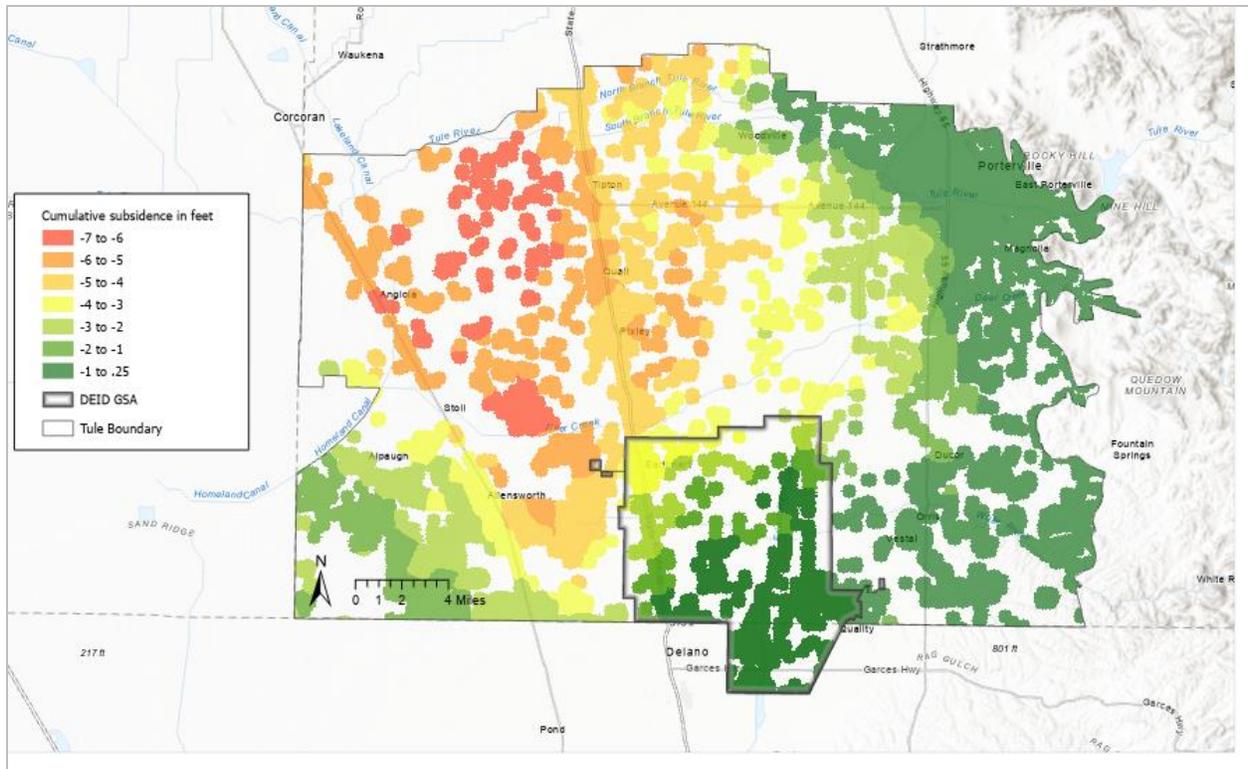


Figure 2. InSAR data showing cumulative subsidence within DEID from June 2015 to July 2025.

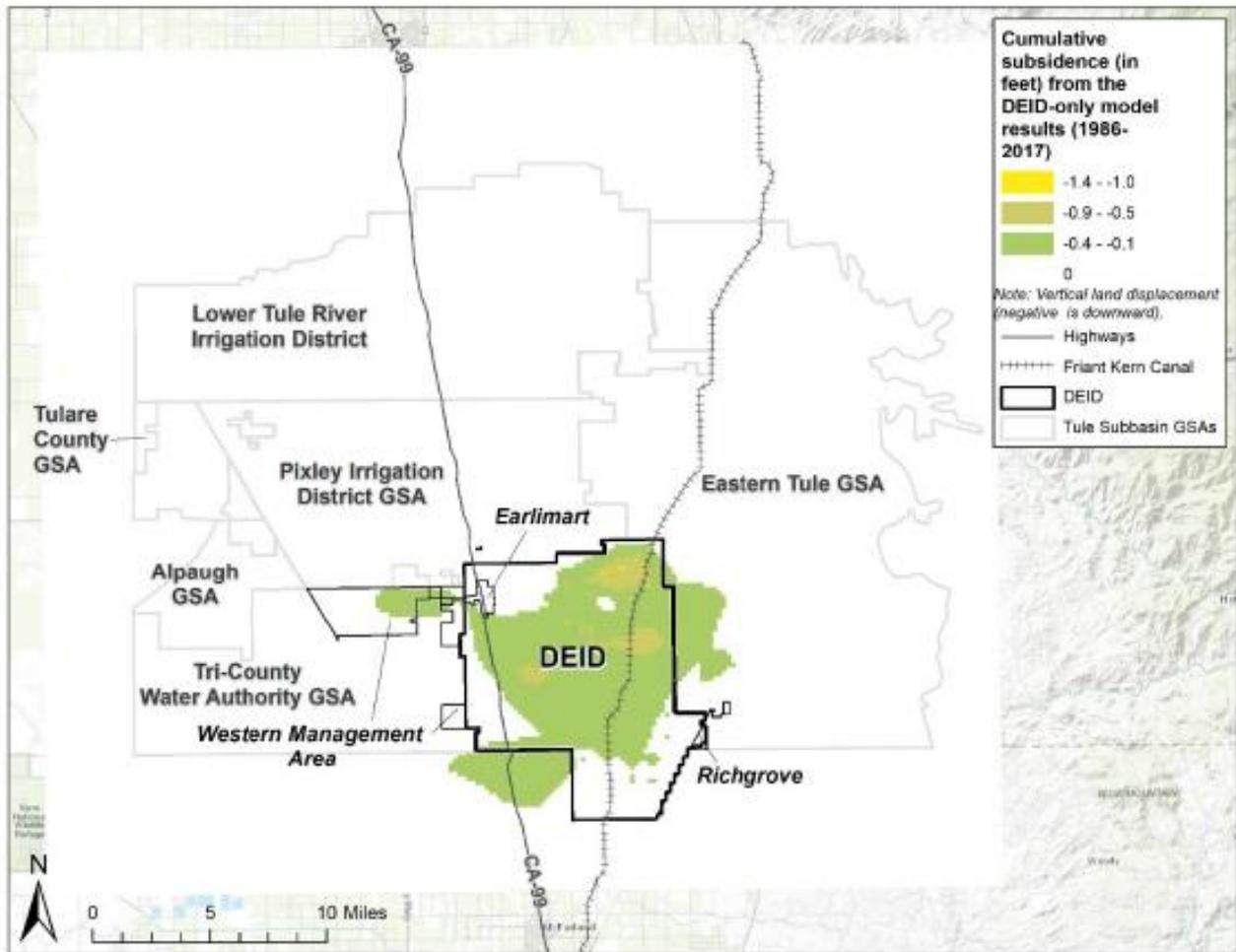


Figure 3. Image taken from DEID’s 2024 GSP (Figure 0-16) showing model results of subsidence attribution analysis. DEID’s analysis concludes DEID was responsible for less than one foot of subsidence during 1986-2017.

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