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2027 Indio Subbasin Water Management Plan Update

Sustainable Groundwater Management Act Alternative Plan



Volume 2: Alternative Plan

www.indiosubbasinsgma.org

Prepared for: Indio Subbasin Groundwater Sustainability Agencies

Public Review Draft, October 2026

WATER DISTRICT

COACHELLA WATER AUTHORITY & SANITARY DISTRICT
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INDIO

Appendix 1-A

Periodic Evaluation

PERIODIC EVALUATION FOR THE INDIO SUBBASIN

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COACHELLA WATER AUTHORITY
DESERT WATER AGENCY
INDIO WATER AUTHORITY

June 24, 2026

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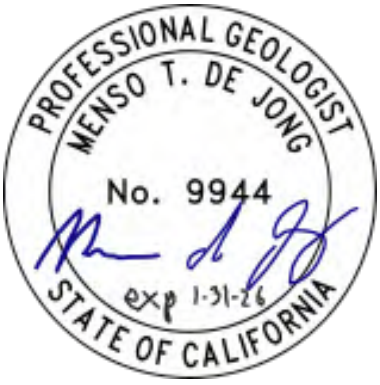
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APPENDIX A: Appendix Contents

1. EXECUTIVE SUMMARY

The Coachella Valley Groundwater Basin (Basin) has been divided into four Subbasins by Department of Water Resources (DWR) as documented in California Bulletin 108 (1964) and Bulletin 118 (2016). The four Subbasins include the Indio, Mission Creek, San Gorgonio Pass, and Desert Hot Springs Subbasins (**Figure 1-1**). The Indio, Mission Creek, and San Gorgonio Pass Subbasins have been designated as medium-priority Subbasins under the Sustainable Groundwater Management Act (SGMA), and the Desert Hot Springs Subbasin has been designated as a very low-priority Subbasin.

The Coachella Valley Water District (CVWD), Coachella Water Authority (CWA), Desert Water Agency (DWA), and Indio Water Authority (IWA) represent the Groundwater Sustainability Agencies (GSAs) responsible for sustainably managing the Indio Subbasin in compliance with the Sustainable Groundwater Management Act (SGMA). The jurisdictional boundaries of the four GSAs are shown on **Figure 1-2**. As discussed in Section 7, GSA authorities and governance are unchanged.

1.1. BACKGROUND

On December 29, 2016, the Indio Subbasin GSAs submitted to DWR the *2010 Coachella Valley Water Management Plan (CVWMP)* (CVWD, 2012a), accompanied by a Bridge Document (Indio Subbasin GSAs, 2016) that describes how the 2010 CVWMP and supporting documents satisfied the requirements of SGMA and should be considered as an acceptable Alternative to a Groundwater Sustainability Plan (GSP) for the Indio Subbasin (Alternative Plan).

On July 17, 2019, DWR approved the *2017 Alternative Plan* with specific recommendations presented in its *Indio Subbasin Alternative Assessment Staff Report* and a requirement to submit an Alternative Plan Update by January 1, 2022. Consistent with SGMA, objectives of the Alternative Plan Update were to assess and report progress toward sustainability of the Indio Subbasin, respond to DWR recommendations and, consistent with the goals of the 2010 CVWMP, make needed updates to ensure that future water demands in the Indio Subbasin are reliably met in a cost-effective and sustainable manner. The Indio GSAs published the update to the Alternative Plan, the *2022 Indio Subbasin Water Management Plan Update: SGMA Alternative Plan* (*2022 Alternative Plan Update*), which was submitted to DWR in December 2021. The *2022 Alternative Plan Update* includes the Indio Subbasin and the areas served by or expected to be served by groundwater from the Subbasin (Plan Area).

On June 27, 2024, DWR approved the *2022 Alternative Plan Update*. In their approval letter, DWR provided a Staff Assessment that included three main recommended corrective actions "to facilitate progress in achieving the Subbasin's sustainability goal". These recommended corrective actions (RCAs) are described in Section 1.3.

This Periodic Evaluation has been prepared to assess progress of the *2022 Alternative Plan Update* in achieving sustainability for the Indio Subbasin.

1.2. EVALUATION PERIOD AND PLAN AMENDMENT

Following the submittal and approval of the *2022 Alternative Plan Update*, the Indio GSAs have continued to manage groundwater sustainability in the Subbasin. Consistent with SGMA, the GSAs prepare and submit Annual Reports that include updates to groundwater conditions and the water balance, document supply and demand, provide comparisons of Sustainable Management Criteria

(SMCs) to recent conditions, summarize implementation progress for Projects and Management Actions (PMAs), and more. The following Annual Reports have been submitted to DWR since the *2022 Alternative Plan Update* (available on www.IndioSubbasinSGMA.org):

- *Indio Subbasin Annual Report for Water Year 2020-2021*, Todd Groundwater, 2022.
- *Indio Subbasin Annual Report for Water Year 2021-2022*, Todd Groundwater, 2023.
- *Indio Subbasin Annual Report for Water Year 2022-2023,* Todd Groundwater, 2024.
- *Indio Subbasin Annual Report for Water Year 2023-2024,* Todd Groundwater, 2025.

In addition, CVWD and the GSAs have completed special studies to assess information documented in the *2022 Alternative Plan Update* including:

- *East Coachella Valley Agricultural Drainage System Flow Study*, Todd Groundwater, July 2023.
- *CVWD Monitoring Audit and Recommendations*, Todd Groundwater, June 2025.

This Periodic Evaluation considers the 2022 Alternative Plan, the subsequent Annual Reports, and additional studies to document the implementation and highlight additional analysis or planning that may be needed. This Periodic Evaluation assesses the need for a Plan Amendment. The updates recommended here are incorporated in the 2027 Alternative Plan Update.

1.3. RECOMMENDED CORRECTIVE ACTIONS

Initial corrective actions were included in DWR's July 17, 2019, *Statement of Findings Regarding the Approval of the Indio Subbasin Alternative.* A subsequent determination letter was provided by DWR on June 27, 2024, *Statement of Findings Regarding the Approval of the Coachella Valley – Indio Subbasin Alternative Groundwater Sustainability Plan*.

1.3.1. Status of Recommended Corrective Actions for *2017 Alternative Plan*

In the determination letter (2024) for the *2022 Alternative Plan Update*, previous corrective actions and the actions taken to satisfy them were summarized. From the *2017 Alternative Plan*, Corrective Actions 1, 2, 3, 5, and 7 were deemed to be sufficiently addressed and are not discussed in this Periodic Evaluation. Corrective Actions 4, 4a, and 6 are noted to be tentatively addressed. These tentatively addressed corrective actions from the past cycle (*2017 Alternative Plan*) were included in the recommendations on the *2022 Alternative Plan Update*.

1.3.2. Recommended Corrective Actions for *2022 Alternative Plan Update* and Work to Address

1.3.2.1. Recommended Corrective Action 1

RCA 1: Provide an explanation in future Alternative updates how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water along basin boundaries have been coordinated.

The *2022 Alternative Plan Update* included close coordination with the neighboring Mission Creek Subbasin. Coordination with the other adjacent major groundwater subbasin, San Gorgonio Pass, began during the preparation of the *2022 Alternative Plan Update* and continues to develop. The GSAs are currently working with the GSAs of San Gorgonio Pass to coordinate boundaries and water budgets. It is anticipated that the Indio Subbasin model will be revised to reflect this water budget coordination. Any updates to the model and water budget will be documented in the Plan Amendment.

1.3.2.2. Recommended Corrective Action 2

RCA 2: Ensure the monitoring network details included in the Alternative are consistent with the information contained in the Department's SGMA Portal Monitoring Network Module.

For each Annual Report, the Indio GSAs submit all water level data and confirm that the Key Well network is up to date on the SGMA Portal. In addition, the GSAs update the water level data for the Key Wells in late spring to meet the bi-annual monitoring requirements. CVWD also plans to upload the existing water quality site information during the next Annual Report cycle. While these monitoring locations are not linked to specific SMCs, they do inform the groundwater management through the *Coachella Valley Salt Nutrient Management Plan (SNMP)*.

1.3.2.3. Recommended Corrective Action 3

RCA 3: Department staff suggest that the GSAs persist with activities related to the tentatively addressed Recommended Actions 4, 4a, and 6, and integrate the outcomes of these activities into future updates to the Alternative.

- ***Recommended Action 4:*** *Staff recommend that the Agencies incorporate an approved Salt and Nutrient Management Plan into future iterations of the Alternative.*
- ***Recommended Action 4A:*** *Staff recommend that the Agencies continue efforts to study the rate and level of increased salt contents in groundwater due to the importation of Colorado River water, identify limits for the Subbasin, and begin to develop and implement plans and management action that will achieve and maintain the Subbasin within those limits.*
- ***Recommended Action 6:*** *Staff recommend that the Agencies clarify whether there is a minimum threshold associated with the amount of flow in the subsurface drains, below which significant and unreasonable undesirable results would occur, and what that quantified minimum threshold is, if applicable, and the implementation horizon for when the goal for the amount of subsurface flow will be achieved, so as to avoid undesirable results.*

The *Coachella Valley SNMP* is still under development and the latest findings from the SNMP process will be incorporated into the Plan Amendment as needed. Additional PMAs will be added to reflect proposed actions from the SNMP.

CVWD prepared a study on the agricultural drain network to determine if SMCs should be developed for the subsurface drains (Todd 2023). A major conclusion of the study was that drain flow is not directly linked to groundwater sustainability and there is no threshold below which significant and unreasonable undesirable results would occur. As a result, SMCs are not recommended for drain flow and will not be included in the Plan Amendment.

1.4. PROGRESS TOWARDS BASIN SUSTAINABILITY

The *2010 CVWMP Update* developed an overarching goal for the Valley "to reliably meet current and future water demands in a cost-effective and sustainable manner." The *2022 Alternative Plan Update* continued these goals with updated objectives as follows:

- Meet current and future water demands with a 10 percent supply buffer
- Avoid chronic groundwater overdraft
- Manage and protect water quality
- Collaborate with tribes and state and federal agencies on shared objectives

- Manage future costs
- Minimize adverse environmental impacts
- Reduce vulnerability to climate change and drought impacts.

The 2022 *Alternative Plan Update* incorporates a comprehensive approach to local groundwater management and has been implemented by the GSAs over the past five years. In the Alternative Plan, sustainability is defined by the goal and objectives stated above and by SGMA definitions of sustainable management and undesirable results. Indicators of undesirable results include chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, land subsidence, degraded water quality, and depletions of interconnected surface water with adverse impacts on beneficial uses of the surface water. All the indicators are addressed in the *2022 Alternative Plan Update* along with documentation of basin conditions, monitoring networks, water demand and supply, PMAs and implementation. Progress toward sustainability is also documented in the subsequent Annual Reports.

Implementation of the Alternative Plan is on track for maintaining the sustainability of the Indio Subbasin groundwater.

1.5. GSA ACTIVITIES IN THE BASIN

The four GSAs—CVWD, CWA, DWA, and IWA—are the designated decision-making entities for the SGMA planning process and in 2016, established a Memorandum of Understanding (MOU) for collaboration and cost-share for management of the Indio Subbasin. Each GSA is responsible for the portion of the Indio Subbasin within their respective jurisdictional area. As documented in Chapter 10 of the *2022 Alternative Plan Update* and subsequent Annual Reports, each GSA conducts groundwater elevation and water quality monitoring in collaboration with the other GSAs. Chapter 11 of the *2022 Alternative Plan Update* presents PMAs that are conducted by the GSAs both individually and collaboratively, and the Annual Reports have summarized the status of PMAs. Similarly, the GSAs have maintained stakeholder outreach and communications in accordance with the Communications Plan developed as part of the *2022 Alternative Plan Update*.

As evaluated herein, GSA activities are progressing in accordance with the adopted and DWR-approved *2022 Alternative Plan Update,* with minor adjustments in response to changing conditions and consistent with adaptive management.

1.6. NEW INFORMATION IN THE BASIN

The Indio GSAs collect, analyze and report data from various reports, investigations, and plans, listed below. Each is summarized in Section 2 in terms of its relevance to the ongoing groundwater sustainability planning and sections of the Alternative Plan that will be changed.. This new information will be incorporated into the Plan Amendment to ensure that this Plan is current and includes all relevant information to support the efforts toward sustainability.

1.7. OUTREACH AND ENGAGEMENT

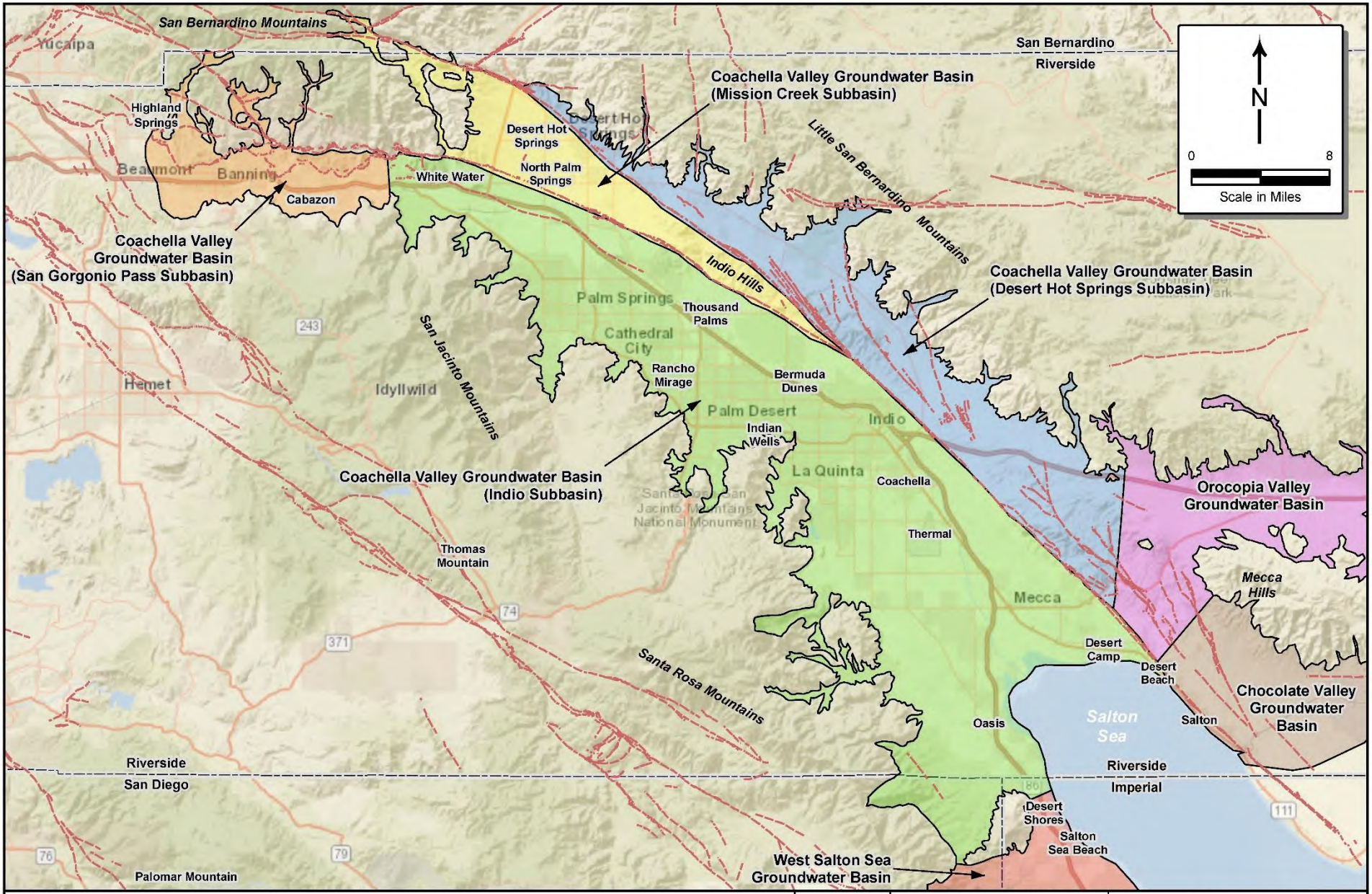
The SGMA process for outreach and engagement includes communication and cooperation among GSAs, California Native American governments, other interested parties, and public involvement. As described in the *2022 Alternative Plan Update*, this process includes maintenance of a program website (www.IndioSubbasinSGMA.org), which provides information to stakeholders about plan development

and implementation. Additionally, a stakeholder email list is maintained and used to communicate with stakeholders. SGMA public meetings and workshops are announced (in both English and Spanish) through the stakeholder email list and the website. Implementation of the Alternative Plan has involved continued outreach and engagement with the following five California Native American Tribes:

- Agua Caliente Band of Cahuilla Indians
- Augustine Band of Mission Indians
- Cabazon Band of Mission Indians
- Torres-Martinez Desert Cahuilla Indians
- Twenty-Nine Palms Band of Mission Indians.

Representatives of the tribal governments and Federal Bureau of Indian Affairs have participated in a SGMA Tribal Workgroup with hosted meetings to discuss the *Annual Reports*.

Public comments have been received during the implementation process, mostly through Annual Report presentations. To summarize, public questions and comments have addressed evaluation of the Subbasin water budget or have been posed about groundwater quality issues. These questions have been answered immediately or with specific reference to text, tables, and graphics in the Alternative Plan, or deferred to upcoming reports such as the SNMP now being developed. This approach will continue to be applied for the Periodic Evaluation and Plan Amendment. As in the *2022 Alternative Plan Update*, new issues can be addressed in the Emerging Issues section of the *2027 Alternative Plan Update*.



January 2026

Figure 1-1
Coachella Valley Groundwater Basin and Subbasins

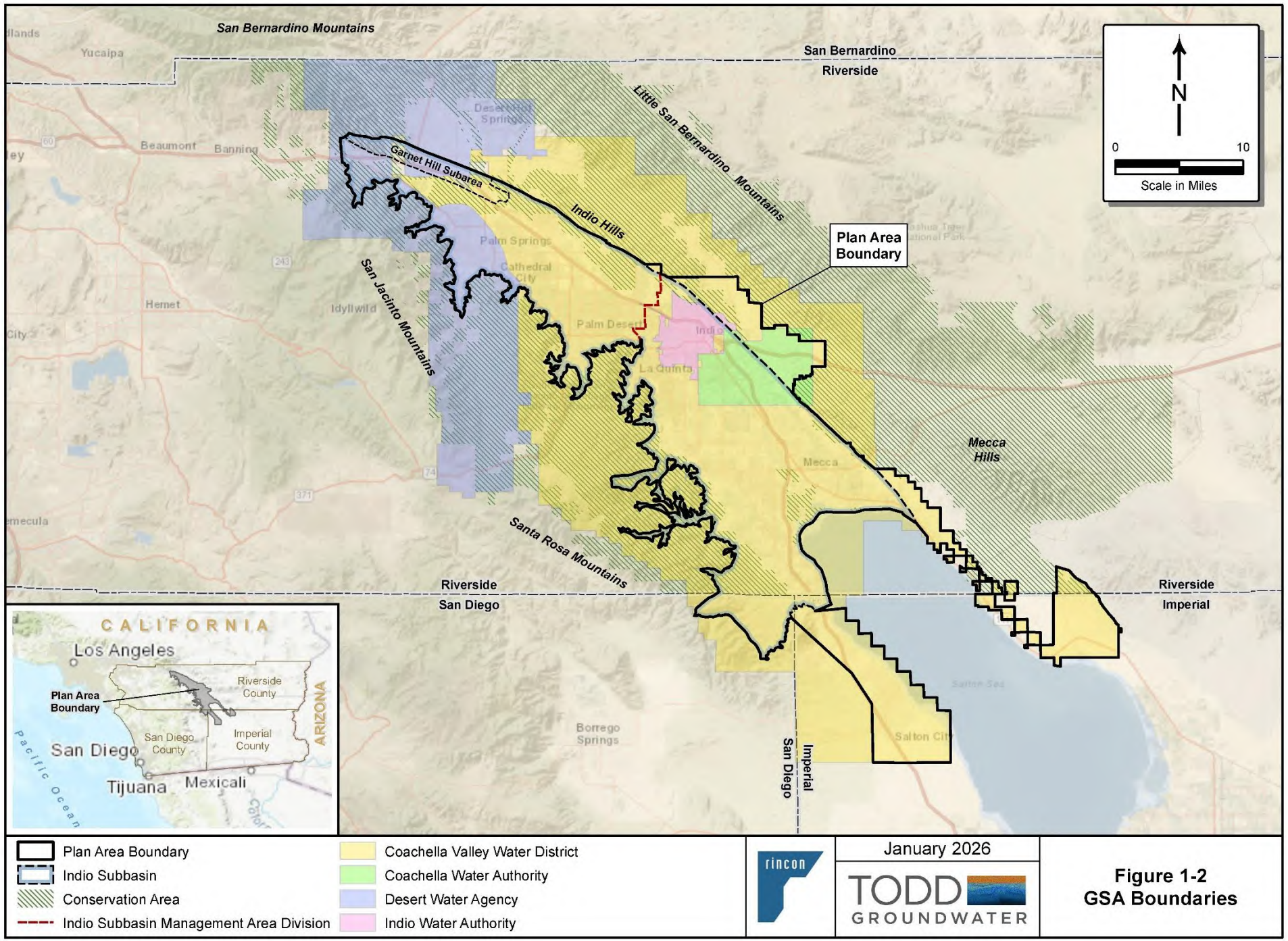


Figure 1-2
GSA Boundaries

2. NEW INFORMATION COLLECTED

The Indio GSAs collect, analyze and report data from various reports, investigations, and plans, listed below. Each is summarized at the end of this section in **Table 2-1** in terms of its relevance to the ongoing groundwater sustainability planning.

- SGMA Annual Reports, Water Years 2020-2025
- Drain Flow Study, August 2023
- Additional Geologic Data including DWR Airborne Electromagnetic (AEM) Survey Area 13, September 2024
- CVWD Monitoring Audit, June 2025
- CVWD Water Reclamation Plant Discharge Evaluation, March 2025
- Coachella Valley Regional Urban Water Management Plan (RUWMP), ongoing to June 2026
- Coachella Valley Regional Water Resilience Plan (CVRWRP), ongoing to August 2026
- Coachella Valley Salt Nutrient Management Plan (SNMP), ongoing to 2027
- Agua Caliente Band of Cahuilla Indians Water Rights Settlement Agreement, May 19, 2025

2.1. SGMA ANNUAL REPORT DATA

Since the *2022 Alternative Plan Update*, the GSAs have collected data annually to prepare the Annual Report and report on progress toward sustainability. These data sets and information are used to regularly update the Alternative Planning process. These data include:

- Groundwater levels
- Pumping volume by well
- Imported water for direct delivery
- Imported water for applied recharge
- Local surface water for direct delivery
- Local surface water for applied recharge
- Recycled water
- Wastewater percolation
- Drain flow
- Stream flow
- Precipitation
- Implementation progress on the PMAs listed in the 2022 Alternative Plan Update

The data are compiled and reported in the Annual Reports. The data will be used throughout the *2027 Alternative Plan Update* to update future water demand calculations and are incorporated into the groundwater model.

2.2. ADDITIONAL GEOLOGIC DATA

Additional geologic data are available from the AEM survey, data sharing along subbasin boundaries (e.g., with San Gorgonio Subbasin) and geologic information gained from well drilling projects. As described in Section 5.1, DWR conducted an Airborne Electromagnetic (AEM) Survey over Indio and Mission Creek Subbasins (see California DWR, 2024). These flight lines are shown on **Figure 2-1**. The

survey data can be used to differentiate silts and clays from sands and gravels. Geologic cross-sections in the Hydrogeologic Conceptual Model (HCM) were reviewed considering the new data. The preliminary analysis shows that the AEM data aligns with the current HCM and no changes are warranted for the Alternative Plan Update. In addition, well logs and well completion reports (WCRs) for 11 new wells drilled in the Subbasin were reviewed for hydrogeologic information. These wells are generally shallow and align with our current HCM. Additional data was received from San Gorgonio Subbasin GSA, including model parameters and bedrock depth estimates. This data does not significantly change our HCM and will be used to develop the model's extended area along the boundary.

2.3. ADDITIONAL WATER QUALITY DATA

As described in the 2022 Alternative Plan Update, water quality sampling and data analysis have involved multiple sources of information on constituents of concern (COC). This data gathering has continued regularly since 2020. New data are evaluated as part of the 2027 Alternative Plan Update including update of water quality maps and trends. Information on new wells will be added to the monitoring network.

2.4. DRAIN FLOW STUDY

The *East Coachella Valley Agricultural Drainage System Flow Study* (Todd, 2023) documents the East Valley's extensive system of subsurface drains and open drainage ditches that discharge into the Coachella Valley Storm Channel (CVSC) or through drainage ditches to the Salton Sea. The study suggests some potential improvements to the drain monitoring network while acknowledging practical limitations to drain monitoring and confirming the efficacy of existing direct groundwater level and quality monitoring. No changes to the monitoring program are warranted for Alternative Plan Update.

As explained in Section 3.9.1, drain flow has been considered as a potential measure of groundwater sustainability. The Drain Flow Study concludes that the drain outflow volumes represent not just groundwater flow, but a mixture of multiple flow sources (variable in time and space), and thus represent an inadequate means of assessing groundwater sustainability. Instead, groundwater levels are directly monitored and already serve as a proxy SMC for groundwater storage changes and outflow. No change to the Alternative Plan SMC is warranted.

2.5. MONITORING AUDIT

As described in Section 6.1.2, an audit was conducted in 2025 of the CVWD water resources monitoring program (Todd 2025). The audit found CVWD's water level network meets all requirements detailed in the DWR BMPs and, in conjunction with other monitoring, satisfies the needs for SGMA implementation and for the other CVWD programs. The audit identified redundant coverage and indicated that redundant wells can be considered for removal while maintaining monitoring effectiveness.

2.6. WATER RECLAMATION PLANT (WRP) DISCHARGE EVALUATION

In March 2025, CVWD completed a *Water Reclamation Plant Discharge Evaluation* for WRP-7 and WRP-10 (Todd and Rincon, 2025). The purpose of this study was to quantify excess wastewater (i.e., potential recycled water supply) during periods of diminished recycled water demands under varying hydrologic conditions (e.g., during wet weather events). This work was used to inform future recycled water system expansion and to assess potential permitting pathways for surplus wastewater at CVWD's WRPs. The

outcomes of this study will inform the recycled water expansion projects identified in the future scenarios simulated for the *2027 Alternative Plan Update*.

2.7. COACHELLA VALLEY REGIONAL URBAN WATER MANAGEMENT PLAN

The *2025 Coachella Valley Regional Urban Water Management Plan* (RUWMP) is currently underway by the six urban water suppliers in the Coachella Valley (CVWD, CWA, DWA, IWA, Mission Springs Water District, and Myoma Dunes Mutual Water Company). The RUWMP will be completed and adopted by all six participating agencies by June 2026. The RUWMP provides regional and individual agency sections describing projected water demands based on an updated demographic forecast through 2050 by the Southern California Association of Governments (SCAG). The RUWMP addresses how those forecasted demands will be met by regional water supplies in normal, single dry, and multiple dry years. The demand and supply forecasts for the Indio Subbasin will be consistent between the *2027 Alternative Plan Update* and the 2025 RUWMP.

2.8. COACHELLA VALLEY REGIONAL WATER RESILIENCE PLAN

The *Coachella Valley Regional Water Resilience Plan (CVRWRP)*, now being developed, is 1) gathering information on existing and potential risks to local communities due to climate change, 2) developing a well inventory of private domestic and small water system wells that could be adversely affected by climate change, and 3) developing a Plan that outlines practical and feasible actions to reduce those risks. Information from the CVRWRP is being used to assess MTs for groundwater levels to account for previously unknown shallow domestic and small water system wells, including consideration of climate change hazards. The data will be incorporated into the *2027 Alternative Plan Update* and may affect the assessment of MTs for water levels.

2.9. COACHELLA VALLEY SALT NUTRIENT MANAGEMENT PLAN

The *Coachella Valley Salt and Nutrient Management Plan (SNMP)* is currently being developed by the GSAs and partner agencies, with completion slated for 2027. Information from the SNMP is relevant to the monitoring network and sampling program, and potentially to the development of SMCs. The SNMP network, designed to cover the Coachella Valley spatially and in terms of vertical depth zones, has been updated as additional wells are drilled to fill data gaps. As described in Section 3.5, the SNMP wells are sampled for numerous water quality constituents of concern, and the data are analyzed quantitatively for potential changes in water quality over time and space. The GSAs plan to document the monitoring network and update groundwater quality conditions. Additional information about the SNMP process and potential SMCs for water quality will be discussed.

2.10. AGUA CALIENTE WATER RIGHTS SETTLEMENT AGREEMENT

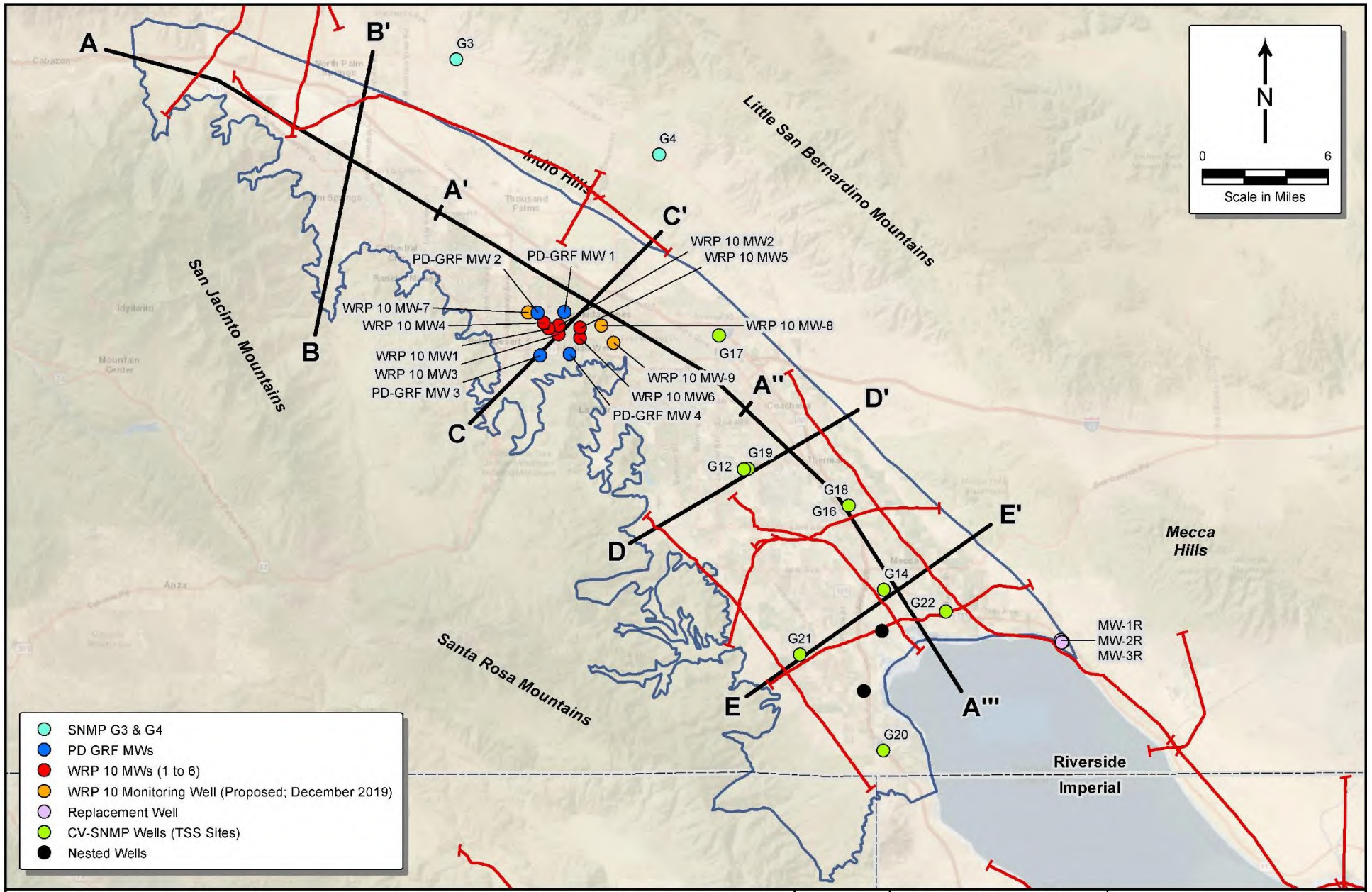
In May 2025, a draft settlement agreement among CVWD, DWA, the Agua Caliente Band of Cahuilla Indians, and the United States provides a framework for the Tribe, CVWD, and DWA to cooperatively manage groundwater underlying the Agua Caliente Indian Reservation through a Memorandum of Cooperation. The Agreement remains draft until signed by the federal government. This Agreement is relevant to ongoing groundwater sustainability planning in establishing a Technical Advisory Committee (TAC) that will guide the cooperative management in the Management Agreement Area and provide

annual reporting. While this annual report will build on the ongoing Alternative Plan annual reporting, it will also be reviewed and acknowledged in each Alternative Plan Annual Report. The agreement states that the parties will "seek to establish 2027 Minimum Thresholds for each Key Well. The 2027 Minimum Thresholds will be up to 10 feet below the 2022 Minimum Thresholds to provide flexibility for the Tribe to exercise the Tribal Water Right (Agua Caliente, 2025)". Such establishment of 2027 Minimum Thresholds in the Agua Caliente Management Area represents a change to the Alternative Plan, as indicated below in **Table 2-1**.

Table 2--1. New Information

Significant New Information	Description	Affected Aspects of Alternative Plan	Changes to Plan? (Note section)
Drain Flow Study review of monitoring	The Study summarizes CVWD monthly drain flow monitoring at 27 sites.	Monitoring	No. While potential improvements are noted, existing groundwater monitoring is effective for SGMA purposes.
Drain Flow Study review of applicability to a potential SMC.	The Study documents drain flow as a mixture of flow sources.	SMC	No. The Study concludes that drain flow is not useful as a sustainability indicator.
Airborne Electromagnetic (AEM)	Multiple AEM flight lines provide subsurface data to assess hydrogeologic properties.	HCM	No. The AEM data align with the HCM and no revision is warranted.
Well Logs for new wells	DWR Well Completion Reports for wells drilled since 2022, and for 11 wells drilled for the SNMP workplan.	HCM	No. The well log data align with the HCM and no revision is warranted.
Monitoring Audit and new monitoring data	The audit addressed CVWD groundwater level and quality monitoring networks.	Monitoring	No. The audit found that the networks meet all requirements and no revisions are needed. Datasets will be updated.
Recycled water connections	Updated timing and volume of recycled water connections at WRP7 and WRP-10.	Water Supply	Yes, update with revised PMAs for recycled water.
Water Demand data and projections	Water use will be updated for WY2020-WY2024; water demand forecast	Water Demands	Yes, update with 2020-2024 actuals and revised forecast.

Significant New Information	Description	Affected Aspects of Alternative Plan	Changes to Plan? (Note section)
	will be updated per SCAG forecast.		
Water Supply data and projections	Water supply will be updated for WY2020-2024; supply forecast will be updated with current assumptions.	Water Supply	Yes, update with 2020-2024 actuals and revised scenario assumptions.
Domestic and small water system well inventory	Inventory of domestic and small water system wells, locations and construction.	Sustainable Management Criteria	Yes. Domestic use will be reviewed and refined. The well inventory may be used when assessing MTs for water levels.
New water quality monitoring wells and data	Data from continued sampling and analysis of groundwater quality; information on new wells.	HCM and Monitoring	Yes, update maps and trends with 2020-2024 data.
Agua Caliente Agreement proposed new MTs in Management Agreement Area	Potential 2027 MTs for that will be up to 10 feet below the 2022 MTs to provide flexibility for the Tribe to exercise the Tribal Water Right.	Sustainable Management Criteria	Yes, MTs will be evaluated for revision.



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January 2026

TODD GROUNDWATER

Figure 2-1
New Geologic Data

3. GROUNDWATER CONDITIONS RELATIVE TO SUSTAINABLE MANAGEMENT CRITERIA (SMC)

SGMA provides a consistent, state-wide definition of sustainable management as the use and management of groundwater in a manner that can be maintained without causing *undesirable results*, which are defined as significant and unreasonable effects caused by groundwater conditions occurring throughout a basin:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The above indicators provide a framework for addressing the multi-faceted and complex nature of sustainability. SGMA also provides the following criteria for quantitative measures that support demonstration of sustainability:

- **Minimum Threshold (MT)** – numeric value used to define undesirable results for each sustainability indicator
- **Measurable Objective (MO)** – specific, quantifiable goal to track the performance of sustainable **management**
- **Interim Milestone** – target value representing measurable groundwater conditions, in increments of 5 years

3.1. CHRONIC LOWERING OF GROUNDWATER LEVELS

This section summarizes groundwater conditions in terms of elevations, flow, trends over time, and artesian conditions.

3.1.1. Monitoring

Groundwater level monitoring data are available for selected wells in the Indio Subbasin dating back to 1910. As summarized in **Table 3-1**, Indio Subbasin groundwater levels were measured in 355 wells in Water Year (WY) 2023-2024, including wells monitored by the Indio GSAs and Mission Springs Water District (MSWD). Of the 355 wells monitored by the GSAs and MSWD, 57 Key Wells were monitored as part of the Sustainable Groundwater Management Act (SGMA) monitoring program and their data were uploaded to Monitoring Network Module (MNM) on the DWR SGMA Portal.

Table 3--1. WY 2023-2024 Wells in the Indio Subbasin Water Level Monitoring Program

Monitoring Agency	Key Wells Monitored	Additional Wells Monitored	Total Wells Monitored
Coachella Valley Water District	52	241	293
Coachella Water Authority	0	7	7
Desert Water Agency	4	29	33
Indio Water Authority	1	21	22
Total	**57**	**298**	**355**

The groundwater elevation monitoring data are used to characterize Subbasin conditions, evaluate pumping and recharge operations, assess minimum thresholds for SGMA indicators, and support groundwater modeling and model calibration. **Figure 3-1** illustrates the distribution of groundwater elevation monitoring wells in the Indio Subbasin monitored by agencies. The 57 Key Wells selected to track SGMA progress are highlighted in green on **Figure 3-1**. The monitoring network is discussed in additional detail in Section 6.

3.1.2. Minimum Thresholds and Measurable Objectives

As part of the *2022 Alternative Plan Update*, the GSAs took the general approach to defining sustainability criteria based on recognition of the following: 1) historical low groundwater levels have occurred relatively recently in the Indio Subbasin, and 2) there has been an absence of reported problems associated with those historical lows. According to the DWR "My Dry Well" tool, no wells have been reported dry in the Indio Subbasin since reporting began in 2014. Accordingly, it is reasonable to assume that maintaining groundwater elevations at or above minimum historical values should not cause undesirable results. This has been substantiated by a review of available information on the location and depths of wells serving both municipal and small water systems, which indicated that historically low groundwater levels were above the shallowest well depths. In addition, as part of the Coachella Valley Regional Water Resilience Plan (CVRWRP), CVWD initiated an inventory of domestic and small water system wells, along with an outreach program to assess vulnerabilities to climate change, including groundwater level declines. The CVRWRP, now underway, will provide information relevant to SMC, including documentation of areas of vulnerable domestic wells and identification of recommendations to reduce vulnerabilities.

The *2022 Alternative Plan Update* identified a network of 57 Key Wells, shown on **Figure 3-1**. These Key Wells were selected through a quantitative approach that considered the wells with long records characteristic of an area and the distribution of wells across the Indio Subbasin. These wells are representative of local groundwater elevation conditions and are appropriate for inclusion in the Key Well groundwater elevation monitoring network (a subset of the overall monitoring program). Each Key Well was assigned a Minimum Threshold (MT) for groundwater levels, recognizing that the chronic lowering of groundwater levels can indicate significant and unreasonable depletion of the groundwater

supply, causing undesirable results to domestic, agricultural, municipal, and other beneficial uses of groundwater.

The MT for chronic lowering of groundwater levels is defined at each Key Well by historically low groundwater levels. Undesirable results are indicated when groundwater levels are below the MT for five consecutive same season monitoring events, in 25 percent or more of the Key Wells in the Indio Subbasin. In addition, the *2022 Alternative Plan Update* demonstrated that the groundwater level MTs are appropriate proxy criteria for other sustainability indicators including groundwater storage and subsidence, given that groundwater levels are linked to these indicators.

Consistent with SGMA, Measurable Objectives (MOs) are specific, quantifiable goals to track management performance relative to sustainability indicators. In the *2022 Alternative Plan Update*, the GSAs define the MOs as maintaining groundwater levels within an operating range above the groundwater level MTs; this represents a sustainable groundwater system.

3.1.3. Sustainability Progress

Since the development of the *2022 Alternative Plan Update*, no Key Well has exceeded its MT and undesirable results have not been identified. Hydrographs for all the Key Wells are available in Appendix A.

3.1.4. Potential Revisions in Plan Amendment

This Periodic Evaluation includes review of the monitoring network and MTs to ensure that monitoring remains comprehensive. In WY2023, one Key Well (KW 002) was not accessible for monitoring and a nearby well (03S04E13N02S) was used as a replacement, with the MT similarly set at that well's historical minimum. The Indio GSAs may consider revising the groundwater Key Wells to find permanent replacement for wells that are inaccessible or are subject to nearby pumping. The GSAs also may choose to incorporate new wells drilled since the *2022 Alternative Plan Update*.

In addition, a recent draft agreement among CVWD, DWA, the Agua Caliente Band of Cahuilla Indians, and the United States sets the stage for the Tribe, CVWD, and DWA to cooperatively manage groundwater underlying the Agua Caliente Indian Reservation through a Memorandum of Cooperation. The agreement states that the parties will "seek to establish 2027 Minimum Thresholds for each Key Well. The 2027 Minimum Thresholds will be up to 10 feet below the 2022 Minimum Thresholds to provide flexibility for the Tribe to exercise the Tribal Water Right." (Agua Caliente, 2025) **Figure 3-2** shows the Agua Caliente Rights Settlement Management Area and the Key Wells where MTs are suggested to be lowered to provide more flexibility for the Tribe.

The Alternative Plan Update includes a comprehensive evaluation of MTs across the Indio Subbasin and identify potential undesirable results that may occur from proposed lower MTs. The analysis will consider water levels near domestic wells, potential for subsidence, and potential impacts from saltwater intrusion and water quality migration.

Recent developments in imported water availability also may warrant a review of SMCs to allow additional operational flexibility. For example, a review of the MTs may indicate that groundwater levels could potentially be lowered without undesirable results to the Subbasin. The current MTs are set at historical lows as no undesirable results were observed at that time. However, additional review and analysis are warranted by new information and changing conditions to evaluate the level at which undesirable results occur.

3.2. REDUCTION OF GROUNDWATER STORAGE

While the *2022 Alternative Plan Update* did not set direct SMCs for the reduction of groundwater storage, groundwater levels have been used as a proxy for groundwater storage. The *2022 Alternative Plan Update* determined that groundwater level sustainability criteria (e.g., MTs and MOs) as a proxy for groundwater storage were acceptable and demonstrated a correlation between groundwater levels and storage. This was accomplished through comparison of groundwater level and storage trends, which reveal similar patterns of historical overdraft, recovery, and response to different water year types including drought, and through review of the relationship of levels and storage reflected in the calibrated groundwater flow model. As groundwater levels have remained above their MTs and have not triggered URs, groundwater storage has also not exceeded its SMCs.

3.2.1. Sustainability Progress

Groundwater conditions with respect to groundwater levels and storage are sustainable. Because no MT has been exceeded since the *2022 Alternative Plan Update* was adopted, it is assumed that groundwater storage is also sustainable. In the Annual Reports, the annual change and cumulative change in storage are reported. Since 2020, the Subbasin has increased groundwater in storage by 216,756 AF. Annual change in storage has ranged from -76,786 AF in 2022 to 184,670 AF in 2024, as shown in **Figure 3-3**.

3.2.2. Potential Revisions in the 2027 Alterative Plan Update

The Indio GSAs have not set a separate SMCs for groundwater storage, and did not include one in their 2027 Alternative Plan Update. No need exists currently to set a separate SMC for storage given that water levels serve as a sufficient proxy and are directly measurable. The Indio GSAs will continue to assess storage in their Annual Reports and use the cumulative change in storage to track overall sustainability.

3.3. SEAWATER INTRUSION

The Indio Subbasin is located over 60 miles from the Pacific Ocean and is not vulnerable to seawater intrusion in the traditional sense. However, it is potentially vulnerable to saltwater intrusion from the Salton Sea. Percolation of high total dissolved solids (TDS) groundwater from the shallow aquifer may also be a source of degradation to the deep aquifer. High rates of production in the lower aquifer near the Salton Sea could pull in dense, saline water, and thus degrade groundwater quality in deep portions of the aquifer. Potential

saltwater intrusion along the Salton Sea northwestern boundary is monitored through two sets of nested monitoring wells, installed and managed by CVWD. Results from these monitoring wells do not suggest current groundwater degradation due to saltwater intrusion.

3.3.1. Sustainability Progress

Regular review of simulated groundwater elevations in the vicinity of the Salton Sea is part of the Annual Reports and 5-Year Updates. The nested wells provide real data on local groundwater quality from discrete depth zones, any of which could potentially be affected by seawater intrusion.

Groundwater elevations can be used as a general indicator of the relative risk of seawater intrusion along the shoreline. Currently, two of the nested wells are part of the Key Wells used to track sustainability. The wells have MTs for groundwater levels set at recent historical lows, a level where seawater intrusion was not observed. Groundwater levels have not exceeded these MTs.

In addition, Salton Sea water levels are currently decreasing, and the shoreline is receding. Accordingly, the risk of seawater intrusion is also diminishing. Groundwater levels relative to the Salton Sea water levels will be monitored and evaluated regularly until the Salton Sea is stabilized.

3.3.2. Potential Revisions in 2027 Alterative Plan Update

The Indio GSAs will further examine the Salton Sea elevations and levels in nearby groundwater wells to confirm that the water level SMCs are protective.

3.4. LAND SUBSIDENCE

Land subsidence is the differential lowering of the ground surface, which can damage structures and facilities. This may be caused by regional tectonism or by declines in groundwater elevations due to pumping. Land subsidence, resulting from aquifer system compaction and groundwater level declines, has been a concern in the Coachella Valley since the mid-1990s and has been investigated since 1996 through an on-going cooperative program between CVWD and the USGS (Sneed and Brandt, 2020). Global Positioning System (GPS) surveying, using GNSS-Inferred Positioning System and Orbit Analysis Simulation Software (GIPSY-OASIS) and interferometric synthetic aperture radar (InSAR) methods, has been used to document the location, extent, and magnitude of the vertical land-surface changes in the Coachella Valley.

The GPS measurements have been used to determine elevation changes at specific locations, while InSAR measurements have documented the geographic extent of elevation changes for the Indio Subbasin. Analysis of InSAR data collected from 1995 to 2017 by the USGS indicates that as much as 2.0 feet of subsidence occurred in the Indio Subbasin from 1995 to 2010 near Palm Desert, Indian Wells, and La Quinta (Sneed and Brandt, 2020).

3.4.1. Sustainability Progress

Since 2010, groundwater levels have stabilized or have partially recovered in response to the implementation of source substitution, conservation, and groundwater replenishment programs. Up to one inch of uplift has been measured since 2011 in the Palm Springs area, corresponding to higher groundwater levels in response to upgradient recharge at the Whitewater River Groundwater Replenishment Facility (WWR-GRF). In the Thermal area, the ground surface has also rebounded by about two inches over the past 10 years, returning to elevations observed in 2001. This rebound roughly coincides with the commencement in 2009 of recharge operations at the Thomas E. Levy Groundwater Replenishment Facility (TEL-GRF).

According to the GSP regulations Section 354.28(c)(5), the MT for land subsidence is defined as the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. However, land subsidence in Indio Subbasin was clearly caused by groundwater level declines, and accordingly, the groundwater level sustainability criteria (MTs and MOs) can be used as a proxy for land subsidence.

Groundwater MTs are currently set at historically low groundwater levels, which generally occurred around 2009-2010. Since that time, groundwater levels have generally increased and subsidence has stopped or slowed, with some variability reflecting different groundwater level trends in specific areas and residual compaction. Maintaining groundwater levels above historically low levels generally is protective against subsidence. Given the mechanics of subsidence, it is unlikely that significant and unreasonable inelastic subsidence would occur with groundwater levels maintained above their MTs. All the Key Wells have had groundwater levels above their MTs since the SMC was developed.

3.4.2. Potential Revisions in the 2027 Alterative Plan Update

The Indio GSAs plan to continue monitoring water levels and subsidence to track the effects of management actions on land subsidence. The GSAs and the USGS have established a partnership and a continuing subsidence monitoring program to collect and evaluate data between 2015 and 2023 with a report to be published by the USGS in Summer 2026 (CVWD, et al., 2022b).

The MT for land subsidence for the Indio Subbasin is addressed through the minimum threshold established for groundwater levels. However, groundwater level MTs that were lowered to create more operational flexibility in the Subbasin considered the potential for subsidence and this analysis is documented in 2027 Alternative Plan Update. The new DWR subsidence guidance will be reviewed in coordination with the USGS study to ensure the best available data and methodologies are used in the 2027 Alternative Plan Update.

3.5. DEGRADATION OF WATER QUALITY

The *2010 CVWMP Update* identified specific water quality issues including salinity, arsenic, perchlorate, hexavalent chromium (chromium-6), uranium, nitrate, carcinogens, and

Endocrine Disrupting Compounds (EDCs). Some of these were regarded as emerging issues, not having violated water quality standards. The *2022 Alternative Plan Update* included identification of Constituents of Concern (COCs), monitoring of groundwater quality, tracking relative to drinking water standards (as relevant), reporting, and management actions. While the *2022 Alternative Plan Update* improved the data compilation and management relative to water quality COCs and the documentation of groundwater quality conditions, it did not set SMCs.

The *2015 Coachella Valley SNMP* was developed by the CVWD, DWA, and IWA and submitted to the Colorado River Regional Water Quality Control Board (RWQCB) in 2015. The *2015 Coachella Valley SNMP* describes hydrogeology, ambient groundwater quality, projected water quality, objectives, management strategies, and a monitoring plan. However, in a letter (RWQCB, February 19, 2020), the RWQCB provided comments and recommendations on the SNMP's compliance with the updated Recycled Water Policy (Colorado River Basin RWQCB, 2020).

The *Salt and Nutrient Management Plan for the Coachella Valley Groundwater Basin* (CV-SNMP) was restarted in 2020 by the CV-SNMP agencies (water and wastewater agencies including CVWD, CWA and Coachella Sanitary District, DWA, IWA, Myoma Dunes Mutual Water Company, Valley Sanitary District, MSWD, and City of Palm Springs) working in cooperation with RWQCB staff. This has involved preparing an *SNMP Development Workplan* to define the approach to be used to update the CV-SNMP in a manner that addresses management of salts and nutrients from all sources in order to protect beneficial uses and comply with the Recycled Water Policy. The GSAs have been implementing the *SNMP Development Workplan* since early 2022. The water quality monitoring network, **Figure 3-4**, has been expanded and new wells have been drilled to fill data gaps.

3.5.1. Sustainability Progress

As of September 2025, the CV-SNMP has progressed with an evaluation of historical and recent TDS and nitrate concentrations in subbasin groundwater, delineation of draft management zones with a description of beneficial uses and methods to assess protection of beneficial uses, and development of TDS and nitrate solute transport models with simulation of historical conditions for validation.

The CV-SNMP and *2027 Alternative Plan Update* are coordinated efforts. Elements of the SGMA program specifically supporting the CV-SNMP include:

- Collection and organization of water quality data into a database
- Evaluation of the sources, spatial extent, vertical distribution, and time trends for TDS and nitrate
- Analysis of the water budget (which supports analysis of TDS and nutrient loading, assimilative capacity, etc.)
- Update and refinement of the numerical model (a potential basis for fate and transport modeling)

- Improvement of the monitoring program relative to TDS, nitrate, and shallow/deep zones
- Identification of projects and actions relevant to water quality management.

The Indio GSAs have not defined sustainability indicators or set specific quantitative thresholds. However, if a COC water quality condition develops or is recognized with significant and unreasonable results and associated with Subbasin management activities, the ongoing monitoring allows detection, analysis, and reporting of the issue. Groundwater quality will continue to be monitored, compiled, and reviewed on a regular schedule to identify emerging issues or potential water quality concerns.

3.5.2. Potential Revisions in the 2027 Alterative Plan Update

The GSAs updated the groundwater conditions (including water quality) and document the monitoring network. Additional information about the CV-SNMP process and potential SMCs for water quality are discussed.

3.6. INTERCONNECTED SURFACE WATER (ISW) DEPLETIONS AND IMPACTS TO GROUNDWATER DEPENDENT ECOSYSTEMS (GDE)

As part of the *2022 Alternative Plan Update* development, an additional study to identify ISWs and GDEs was performed. This study, *Indio Subbasin Groundwater Dependent Ecosystems Study,* prepared by a Professional Wetland Scientist, was summarized in the plan and provided as an Appendix. It included a systematic desktop assessment of the California *Natural Communities Commonly Associated with Groundwater* (NCCAG) database for the Indio Subbasin, a field assessment of 13 selected sites by the wetland scientist and CVWD environmental staff, and identification of probable GDEs, probable non-GDEs, and playa wetland communities.

The study identified selected potential GDEs in upper canyon locations that convey snowmelt and water from cold and hot springs. These locations are outside the Indio Subbasin and unlikely to be impacted by groundwater management.

DWR's staff assessment of the *2022 Alternative Plan Update* recognized that the GSAs had "*shown that surface water and groundwater are not connected in the Subbasin",* and therefore*, "sustainable management criteria for this sustainability indicator are not required." (DWR 2023)*

3.6.1. Potential Revisions in the 2027 Alterative Plan Update

The GSAs did not update the 2027 Alternative Plan to include SMCs for ISWs or GDEs.

3.7. EFFECTS OF HYDROLOGIC OR CLIMATIC EXTREMES

As part of the CVRWRP, CVWD and its partners are preparing a Vulnerability Assessment. This includes development of criteria to assess the vulnerability of domestic and small water system wells to climate change with a focus on groundwater levels. These criteria will be based on the sustainability criteria and climate change analyses from the Indio Subbasin and Mission Creek Subbasin Alternative Plan Updates. The Alternative Plan Updates define MT groundwater elevations for preventing undesirable groundwater levels declines, based on the historical low groundwater elevation. In the Vulnerability Assessment, these MT elevations will be compared with available information on domestic well construction (e.g., elevation of the bottom of the well and/or elevation of the top of well screens). Such a comparison can be used to identify domestic and small water system wells that are most vulnerable to groundwater level declines due to climate change. It is recognized that water quality in domestic wells also can be affected by groundwater level changes.

The Vulnerability Assessment Report will document the areas of vulnerable domestic wells and discuss the criteria and relative vulnerabilities of different areas. Using existing studies and climate data from Cal-Adapt, the report will assess the climate vulnerabilities of communities (focusing on those communities dependent on domestic wells) and will include an evaluation of existing adaptive capacity and the potential for climate hazards to amplify risks to safe and reliable drinking water, especially for vulnerable disadvantaged and Tribal communities that depend on wells for drinking water supply. The CVRWRP includes extensive outreach to and collaboration with disadvantaged and Tribal communities.

Working with project partners, a priority ranked list and set of recommendations will be developed that can serve as a project implementation list. This list is likely to include opportunities for maintenance, system consolidation, well destruction, well redevelopment, well deepening, and other considerations.

This ongoing work will be incorporated into the 2027 Alternative Plan Update.

3.8. EFFECTS OF BASIN CONDITIONS ON BENEFICIAL USERS

As part of the CVRWRP, CVWD has developed a domestic and small water system well inventory. The inventory is a product of a systematic and comprehensive inventory and evaluation of domestic and small water system wells to identify groundwater wells of rural and vulnerable communities. This desktop study is currently being augmented through field surveys to identify active domestic wells and their specific locations. The goal is to identify all domestic wells in the Indio Subbasin to better understand the locations for these beneficial users.

DWR maintains an online database that stores information about beneficial users and potential dry wells. This information can help focus efforts to avoid unreasonable impacts to these sensitive groundwater users. According to the DWR “My Dry Well” tool, no wells have been reported dry in the Indio Subbasin since reporting began in 2014.

3.9. SIGNIFICANT NEW INFORMATION FOR UPDATING SUSTAINABLE MANAGEMENT CRITERIA

3.9.1. Drain Flow Study

The *2019 DWR Staff Report* and *2022 Alternative Plan Update* recommended that CVWD complete a drain study to examine relationships between groundwater levels, current and historical crop water applications, and flows and salt export through the drainage system in the East Valley portion of the Indio Subbasin. The stated objective was to clarify the need, if any, for a MT associated with the amount of flow in the subsurface drains that would be protective of high-quality deep groundwater. The concept of drain flow involved not only discharge from the Subbasin of shallow salty groundwater (agricultural return flows) but also outflow of deep groundwater that would prevent downward migration of salts. Thus, more drain outflow would be representative of protection for deep groundwater.

The resulting study, *East Coachella Valley Agricultural Drainage System Flow Study* (Todd, 2023), documented the East Valley's extensive system of subsurface drains and open drainage ditches. These had been constructed to provide drainage for agricultural fields and to remove salts found in saline soils and shallow groundwater, and to convey salts through the Coachella Valley Storm Channel (CVSC) or through open drainage ditches to the Salton Sea (**Figure 3-5**).

The study documents that the drainage system intercepts not only return flows from agricultural irrigation water but also variable flows from stormwater, wastewater discharges, and deep groundwater. Accordingly, the study concludes that the drain outflow volumes to the Salton Sea represent multiple flows (variable in time and space), cannot serve as an accurate measure of upward groundwater flow, are not representative of protection for deep groundwater quality, and thus represent an inadequate means of assessing groundwater sustainability. Instead, groundwater levels are directly monitored and support reliable and representative SMC. These are already included in the Indio Subbasin's sustainable management criteria. No amendment is warranted.

3.9.2. Ground Surface Elevation Surveys

Ground surface and reference point elevations in the Subbasin were previously reported using the NGVD29 datum. The GSAs estimated a conversion to NAVD88 to be consistent with DWR's guidance. DWA recently conducted a benchmark survey and updated the ground surface elevation for their key wells to determine more accurate elevations in NAVD88. The revised ground surface elevations will also affect the MTs and MOs in these wells. The Monitoring Network Module (MNM) will be updated for these wells using the recent benchmark survey as part of the 2027 Alternative Plan Update. CVWD performed a ground surface survey previously and updated the well information in the MNM in May 2024.

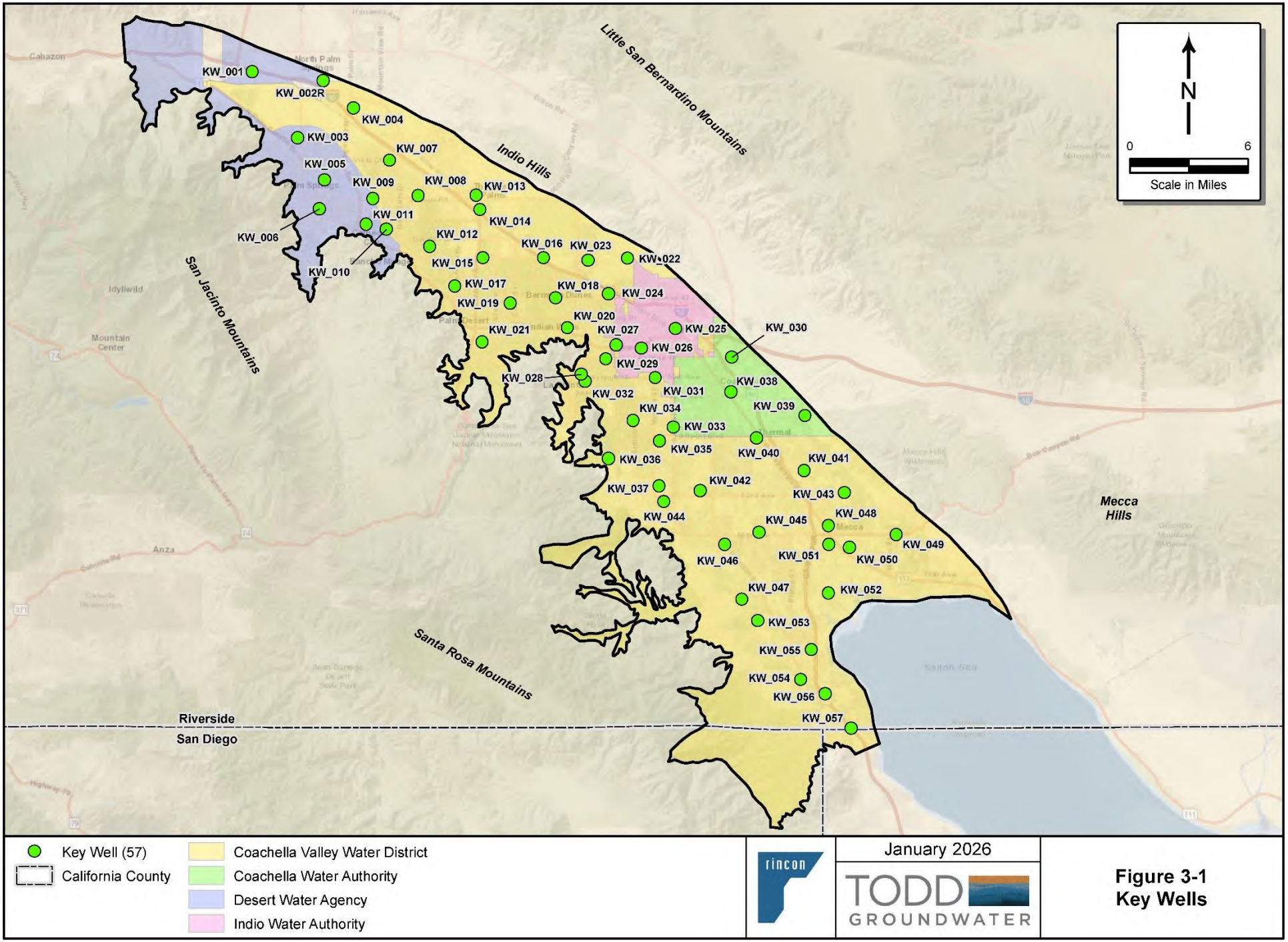


Figure 3-1
Key Wells

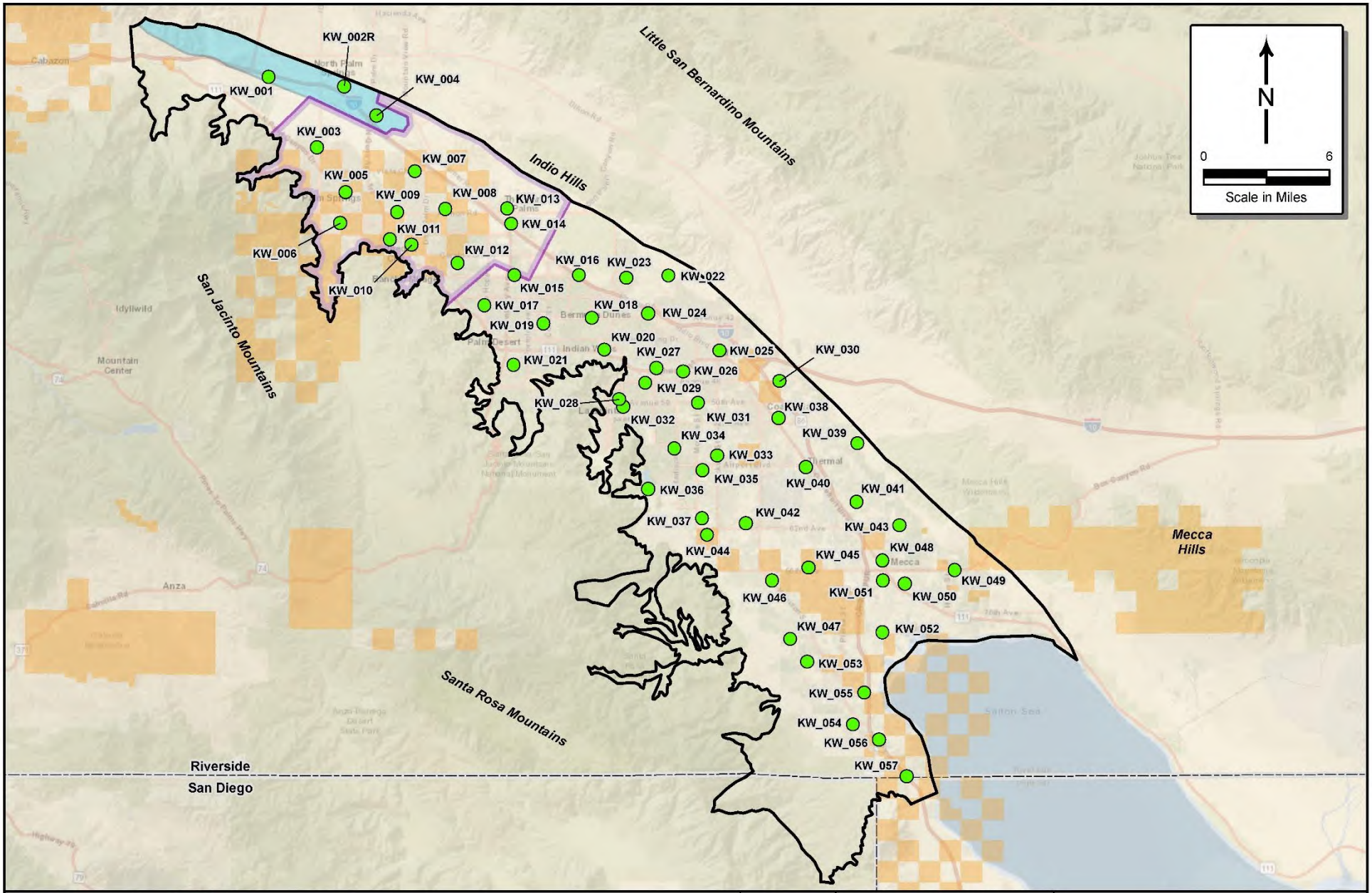
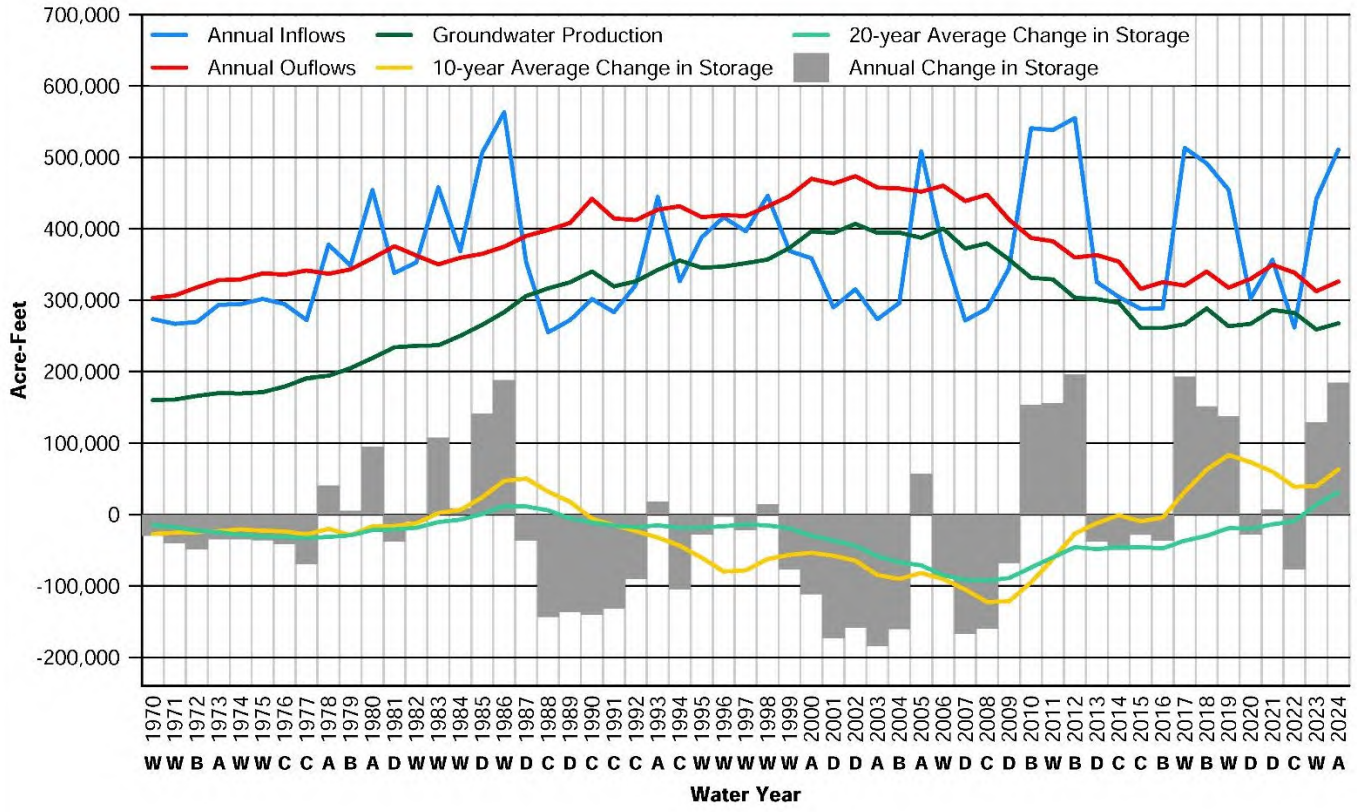
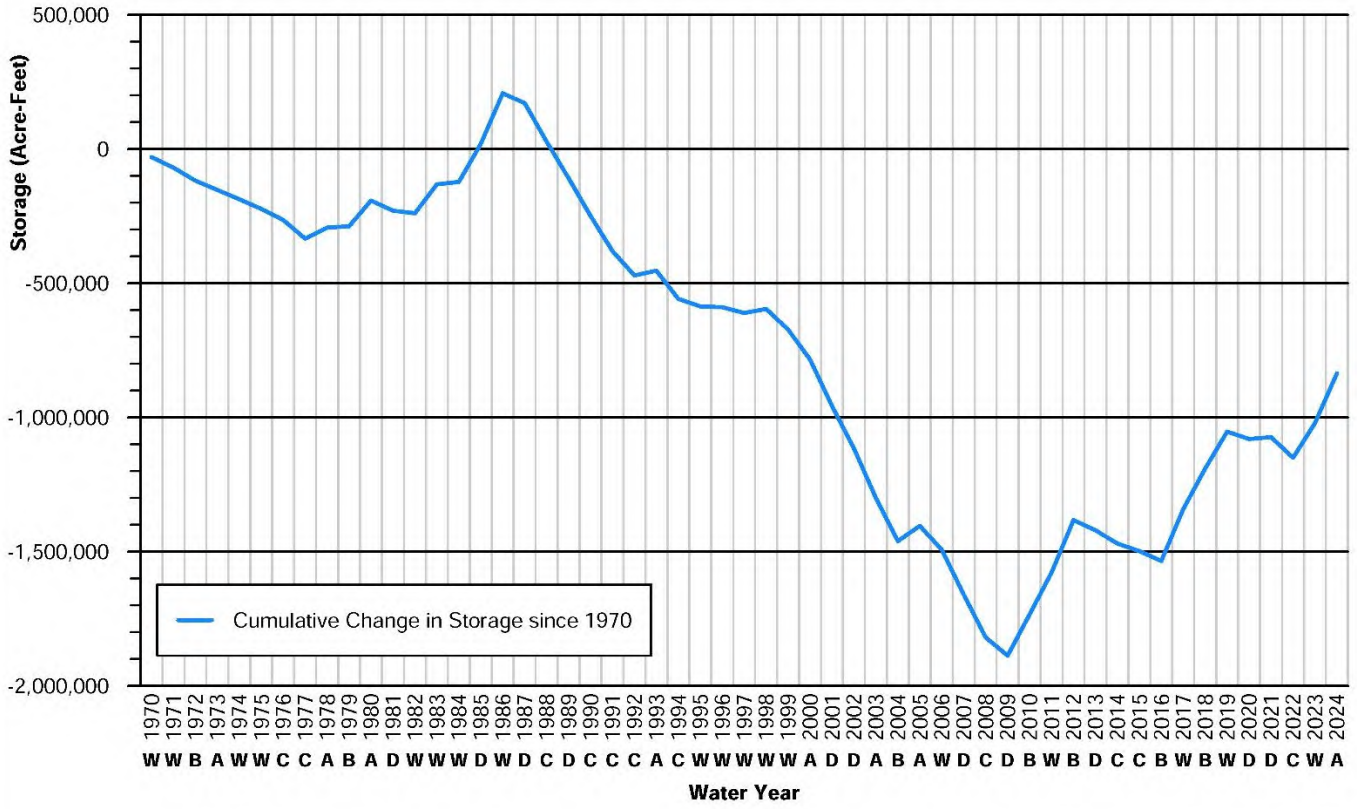


Figure 3-2
Agua Caliente Band of Cahuilla Indians Water Rights Settlement Management Area

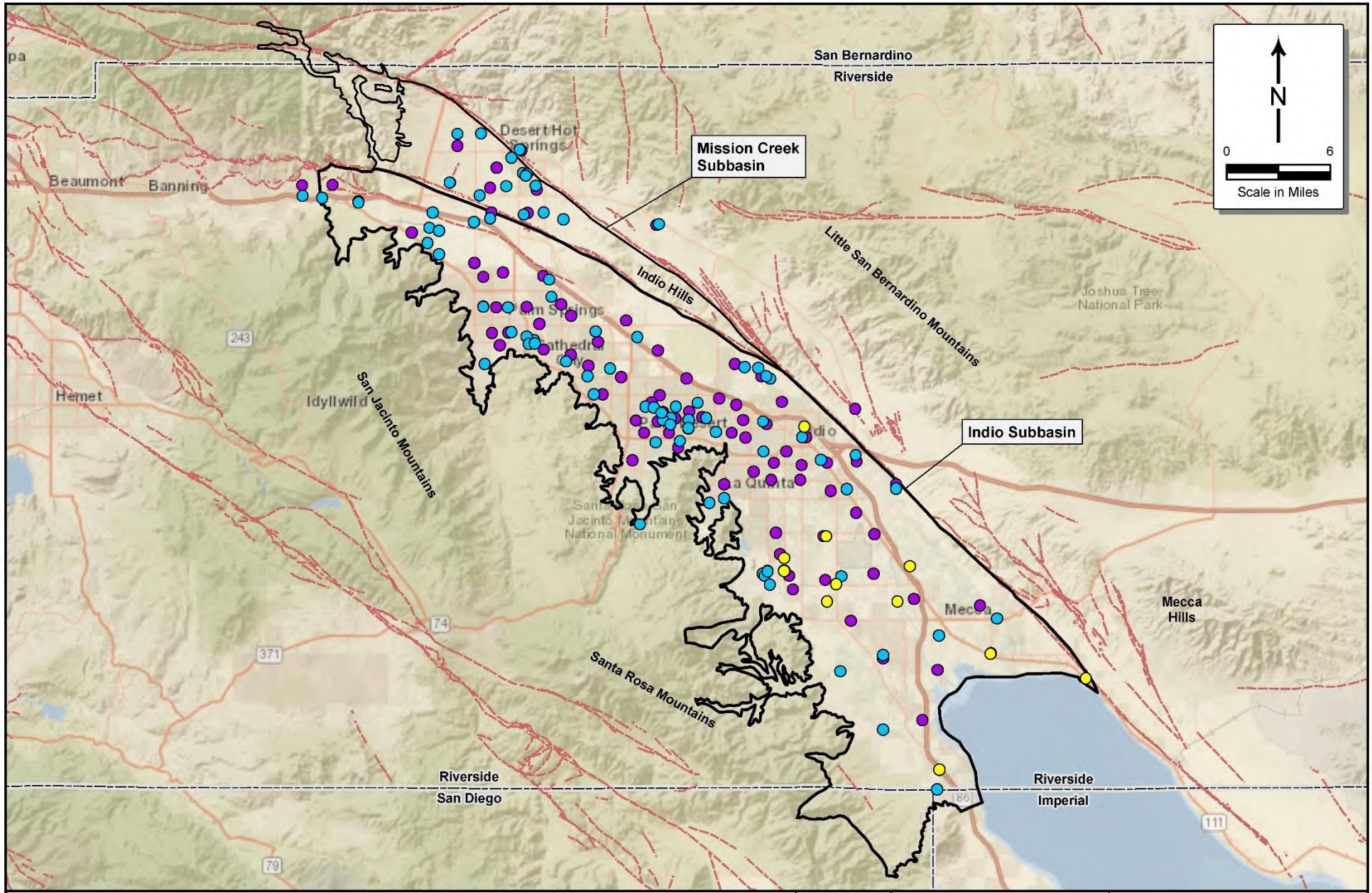




Notes:
Values shown prior to 2017 are on a calendar year basis.
Letters below the years indicate Sacramento Valley Water Year Type:
W = Wet
A = Above Normal
B = Below Normal
D = Dry
C = Critically Dr

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Figure 3-3
Change in Storage



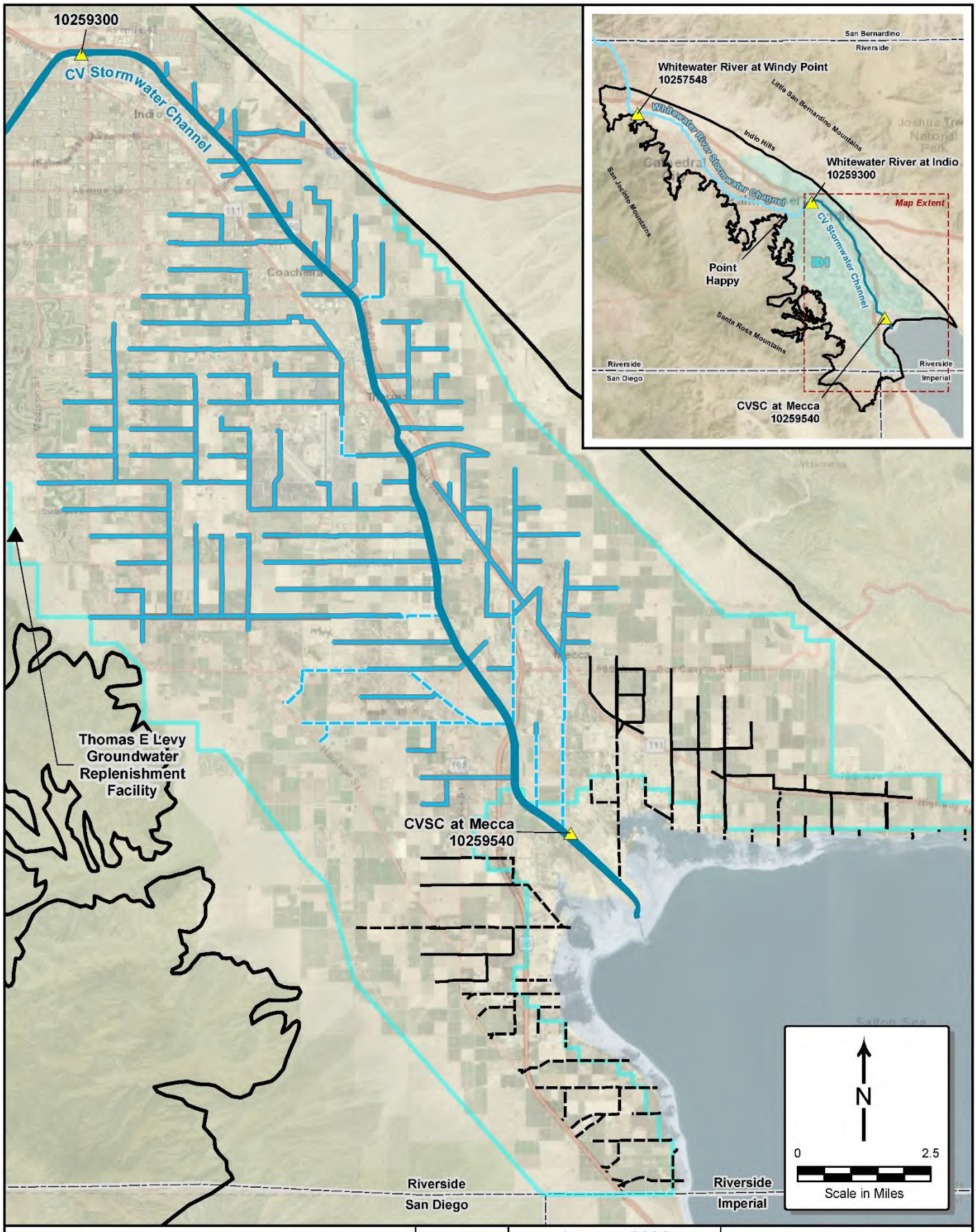
- Monitoring Wells (Perched)
- Monitoring Wells (Shallow)
- Monitoring Wells (Deep)

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January 2026

TODD GROUNDWATER

Figure 3-4
Water Quality Monitoring



January 2026

Figure 3-5
Coachella Drain Network

4. STATUS OF PROJECTS AND MANAGEMENT ACTIONS

The *2022 Alternative Plan Update* identified the following water management strategies to achieve water reliability and resilience through the planning horizon:

- Fully use available Colorado River water supplies
- Support improvement of the long-term reliability of SWP supplies, including participation in the Delta Conveyance Facility (DCF)
- Continue developing recycled water as a reliable local water supply
- Implement source substitution and replenishment for resilience in response to changing conditions and for maintenance of long-term groundwater supply reliability
- Increase water-use efficiency across all sectors
- Participate in the development of the CV-SNMP to address salt and nutrient management in the Indio Subbasin.

To accomplish this, the GSAs updated and expanded the list of PMAs that support water management within the Subbasin. Thirty PMAs were identified based on priorities set by the GSAs and stakeholders; these represent a wide variety of activities by the GSAs. Projects are classified into four categories based on project benefits: water conservation, water supply development, source substitution and replenishment, and water quality protection.

The PMAs are identified and described in **Table 4-1**. These PMAs were first documented in the *2022 Alternative Plan Update* and their status is updated in the Annual Reports. The GSAs have continued efforts to advance the PMAs to maintain groundwater sustainability and meet the Alternative Plan objectives. With continued implementation of these PMAs, the GSAs are anticipated to meet their water management goals and comply effectively with SGMA.

4.1. COMPLETED AND ONGOING PROJECTS AND MANAGEMENT ACTIONS

The following section lists the PMAs included in the *2022 Alternative Plan Update* grouped by category. Please refer to the *2022 Alternative Plan Update* for more detailed information on the PMAs and to **Table 4-1** below for the current status of the PMAs.

4.1.1. Water Conservation

Water conservation is a major component of overall water management in the Indio Subbasin. As a desert community reliant upon imported water supplies, the Coachella Valley has and will continue to use its water resources efficiently. The *2022 Alternative Plan Update* included water conservation efforts for agriculture, urban, and landscaping water demands, and the GSAs continue to expand and strengthen water conservation programs not only through the *2022 Alternative Plan Update*, but also through other efforts, such as the CVRWMG. The water conservation PMAs include:

- PMA 1: Urban Water Conservation
- PMA 2: Golf Water Conservation
- PMA 3: Agricultural Water Conservation

4.1.2. Water Supply Development

CVWD and DWA continue their efforts to increase reliability and obtain additional water supplies, as they become available through SWP-related projects and other exchanges, entitlements, and transfers.

One PMA focuses on local surface water (Snow and Fall Creeks):

- PMA 4: Increased Surface Water Diversion

CVWD and DWA are working with the Metropolitan Water District (MWD) and DWR to both improve the reliability of SWP water and acquire additional supplies. Future SWP projects include:

- PMA 5: Delta Conveyance Facility
- PMA 6: Lake Perris Dam Seepage Recovery Project[1]
- PMA 7: Sites Reservoir Project
- PMA 8: Future Supplemental Water Acquisitions

One potable reuse project was proposed as a new supply source:

- PMA 9: East Valley Reclamation Authority Potable Reuse.

4.1.3. Source Substitution and Replenishment

Source substitution is the delivery of an alternate source of water to users who currently pump groundwater, reducing groundwater extraction and allowing the management of groundwater in storage. The source substitution projects are presented by water source and location within the Coachella Valley.

[1] Lake Perris Dam Seepage Recovery Project has been further evaluated and deemed infeasible. As such, it will be removed from the 2027 Alternative Plan list of PMAs.

4.1.3.1. Colorado River Water – Non-Potable Water (NPW) Deliveries

Historically, Colorado River water (Canal water) was used almost exclusively for agricultural irrigation, with golf course irrigation beginning in 1986. Direct use of Colorado River water now includes agriculture, duck clubs, fish farms, golf courses, and construction water. CVWD is working to expand direct delivery of Colorado River water for agriculture, golf courses, and homeowner's associations. These projects include:

- PMA 10: Mid-Valley Pipeline (Canal Only Customers)
- PMA 11: Mid-Canal Storage Project
- PMA 12: East Golf Expansion
- PMA 13: Oasis Distribution System

4.1.3.2. Recycled Water Deliveries

Currently, recycled water production exceeds existing demand during the winter months, and the remaining recycled water is disposed of through onsite percolation basins. The following is a summary of projects to maximize recycled water use by continuing to expand the NPW system and to eliminate land disposal:

- PMA 14: WRP-10 Recycled Water Delivery
- PMA 15: WRP-7 Tertiary Expansion
- PMA 16: Canal Water Pump Station Upgrade
- PMA 17: WRP-7 Recycled Water Delivery
- PMA 18: WRP-4 Tertiary Expansion & Delivery
- PMA 19: DWA WRP Recycled Water Delivery

4.1.3.3. Groundwater Replenishment

Since 1973, CVWD and DWA have replenished the western portion of the Subbasin at the WWR-GRF with nearly 4 million AF and at the PD-GRF with a total of 61,538 AF since starting operations in February 2019 (through December 2024). CVWD has replenished the eastern portion of the Subbasin at TEL-GRF with about 400,000 AF since full-scale operations commenced in 2009. The following PMAs support continued groundwater replenishment in the Indio Subbasin:

- PMA 20: PD-GRF Expansion
- PMA 21: TEL-GRF Expansion
- PMA 22: WWR-GRF Operation

4.2. WATER QUALITY PROTECTION

The Indio Subbasin has variable concentrations of water quality constituents as documented in the *2022 Alternative Plan Update*. Below are the PMAs related to water quality that will help protect the groundwater basin for beneficial uses and users and avoid undesirable results. The following is a list of water quality policies and programs to help protect the Indio Subbasin:

- PMA 23: Eliminate Wastewater Percolation
- PMA 24: Wellhead Treatment
- PMA 25: Small Water System Consolidations

- PMA 26: Septic to Sewer Conversions

In 2020 and 2021, the CV-SNMP Agencies – which include CVWD, Coachella Sanitary District, City of Palm Springs, CWA, DWA, IWA, MSWD, Myoma Dunes Mutual Water Company, and VSD – prepared a *CV-SNMP Groundwater Monitoring Program Workplan* and a *CV-SNMP Development Workplan* to guide the monitoring and update of the SNMP. The PMAs include:

- PMA 27: Implement CV-SNMP Groundwater Monitoring Program Workplan
- PMA 28: Implement CV-SNMP Development Workplan
- PMA 29: Colorado River Basin Salinity Control Forum
- PMA 30: Source Water Protection

4.3. CHANGES TO PROJECTS AND MANAGEMENT ACTIONS FROM 2022 ALTERNATIVE PLAN

4.3.1. Completed PMAs

PMA 26: Septic to Sewer Conversions. This PMA includes several specific projects. One project, the Monroe Trunk Sewer, has been completed and the project is accruing benefits to the Subbasin.

4.3.2. PMAs Deemed No Longer Necessary

PMA 6: Lake Perris Dam Seepage Recovery Project. This project has been deemed infeasible by Metropolitan (the main project proponent) and removed from the PMA list.

4.4. NEW PROJECTS AND MANAGEMENT ACTIONS

4.4.1. Newly added PMAs

There are no new PMAs at this time, but the GSAs will continue to review plans and add PMAs as needed.

4.5. PENDING PROJECTS AND MANAGEMENT ACTIONS

There are two PMAs from the *2022 Alternative Plan Update* that has not yet started and remains in the conceptual phase, PMA 10: Mid-Valley Pipeline and PMA 21: TEL-GRF Expansion. While there are no immediate plans to expand the GRF or the Mid-Valley Pipeline, they remain on the list because the expansions remain a possibility for future projects.

Several PMAs include some conceptual components given that design has not yet begun (PMA 14: WRP-10 Recycled Water Delivery and PMA 18: WRP-4 Tertiary Expansion & Delivery). Similar to the TEL-GRF expansion, these remain on the PMA list because they represent possibilities for future groundwater management if needed.

Table 4--1. Projects and Management Actions

5. BASIN SETTING BASED ON NEW INFORMATION OR CHANGES IN WATER USE

5.1. HYDROGEOLOGIC CONCEPTUAL MODEL

The HCM is a conceptualization of the Subbasin's surface water hydrology and aquifer systems. It is built on a framework of empirical data and knowledge of water use and management infrastructure, which is analyzed and presented as geologic maps, hydrogeologic cross sections, hydrographs, groundwater elevation contours, and groundwater quality maps and graphs. Newly acquired data may be applied to update these graphics. In the well-characterized Indio Subbasin, such updates would refine the already-established HCM, filling-in areas with limited data, adding resolution, expanding existing times series trends and strengthening causal relationships. Ultimately, the review of new data has not revealed any substantial changes requiring updates to the HCM and supporting graphics.

AEM data collected by DWR since the *2022 Alternative Plan Update* provides spatially extensive, moderate-resolution aquifer property data for a portion of the Indio Subbasin. Subsurface characterization in some areas could be improved potentially with AEM data. Unfortunately, spatial continuity of AEM data is frequently interrupted by powerlines, airport no-fly zones, and similar data acquisition barriers, limiting the utility of AEM data to fill spatial data gaps. The locations of the flight lines are shown in **Figure 2-2**.

The primary outcome of this study as applied to the HCM has been to spot check locations with high-quality borehole log data. This increases confidence in spatial relations extended between datapoints in areas with limited subsurface data from WCRs and geophysical surveys, i.e., on the northwestern edge of the subbasin. The utility of data from WCRs submitted to DWR for wells drilled since the *2022 Alternative Plan Update* is limited; CVWD wells drilled for shallow groundwater quality monitoring purposes are limited to depths of 100 to 300 feet below ground surface. AEM also enables spot checks of the HCM subsurface characterization in areas with higher data density but some uncertainty in quality, such as areas with many domestic wells but limited occurrences of recently drilled wells with lithologic logs completed to modern scientific standards.

Analyses of these new data and expanded sources have not revealed any information that will lead to significant reconfiguration of the HCM. AEM data and new WCRs are largely in agreement with the existing cross sections upon which the HCM relies. Within a reasonable margin of error, considering offsets between data and cross section lines, it does not appear that the HCM will be significantly altered and the conceptual cross sections will not be altered. AEM and well data will be selectively presented to provide confirmation of such agreement.

If new data are acquired that significantly conflicts with our existing conceptual understanding, such as abrupt changes in time series trends and spatial patterns, or identification of previously unknown extensive subsurface features, the HCM would be updated to reflect the new information.

5.2. GROUNDWATER CONDITIONS

5.2.1. Groundwater Levels

Information on groundwater levels is compiled regularly and presented in Annual Report maps and hydrographs. Groundwater levels do not exhibit strong seasonal variations, so average groundwater elevations of the principal aquifer for the water year are used for groundwater level contour maps. As documented in the Annual Reports, groundwater elevations and gradients across the Indio Subbasin vary from year to year, influenced by climate and water supply conditions, pumping and groundwater replenishment activities.

Groundwater level trends are documented in Annual Reports for more than 345 wells, providing comprehensive information on the groundwater level response to historical pumping and water management activities in the Indio Subbasin. A 2025 Monitoring Audit documented that the groundwater level monitoring program meets all requirements and objectives. In addition, groundwater levels are measured in 57 Key Wells distributed across the Subbasin to track and assess sustainability in the Indio Subbasin. Selected hydrographs are shown on **Figure 5-1**.

Groundwater levels show positive responses from the ongoing replenishment and natural recharge, with substantial increases in the northwestern portion of the Indio Subbasin, reflecting historical replenishment activities at the WWR-GRF, and more moderate positive responses or stabilization elsewhere in the Subbasin. Collectively, the hydrographs illustrate the effectiveness of long-term groundwater replenishment, source substitution, and conservation programs in the Indio Subbasin in maintaining and, in some areas, increasing groundwater levels under varying historical climatic and water use conditions.

5.2.2. Water Quality

The *2022 Alternative Plan Update* provided groundwater quality data in the form of maps, tables, and time series trend plots for constituents including salinity, nitrate, fluoride, arsenic, hexavalent chromium(chromium-6), uranium, dibromochloropropane (DBCP), and perchlorate. This Alternative Plan Update will update the maps and timeseries as needed to document any changes or trends in water quality.

Changes to regulatory water quality standards that impact sustainable management criteria will be summarized in the 2027 Alternative Plan Update. The MCL for chromium-6 has been revised to 10 ug/L. CVWD has investigated how they can continue to utilize groundwater while also meeting the new regulatory requirements. CVWD has prepared a Chromium VI Compliance Plan and will submit the Plan to the SWRCB Division of Drinking Water in December 2025.

Sampling specifically for PFAS compounds has been greatly expanded to comply with DWR directives and address newly established or revised MCLs. In the fall of 2025, CVWD initiated an evaluation of treatment and non-treatment options and recommendations for compliance with these new PFAs regulations.

5.3. WATER USE CHANGES AND WATER BUDGETS

This section presents water use and trends compared to the water demand forecast in the *2022 Alternative Plan Update*, along with historical, current, and projected water supplies.

5.3.1. Water Demand

The *2022 Alternative Plan Update* presents a demand forecast for municipal, golf course, agricultural, and other-recreational uses across the Coachella Valley, and then describes and evaluates four water supply planning scenarios using that same demand forecast for three scenarios and increased agricultural demands for the fourth scenario.

5.3.1.1. Demand Forecast Methodology

The *2022 Alternative Plan Update* demand forecast covers a 25-year period from 2020 to 2045 for four major categories: municipal, agricultural, golf, and other. The municipal forecast was based on SCAG's Connect SoCal forecasts for population, housing, and employment. Land use changes associated with planned municipal growth are incorporated into the SCAG forecast. The demand model also reflected conversion of agricultural land to urban uses and development on Tribal/Reservation lands. Adjustments were made to account for part-time residents and short-term rentals. Conservation regulations (AB 1668 and SB 606) were considered, though not fully incorporated due to regulatory uncertainty.

Municipal

Overall, municipal demand was based on historical water use by GSA with 2016 as its base year, using SCAG demographic data. Growth forecasts were based on SCAG projections for 2020, 2035, and 2045, with linear interpolation for intermediate years. Demand factors were derived from customer billing data (averaged across 2014–2019), applied per housing unit and per employee. Water loss estimates were based on validated audits from 2016–2018. Adjustment factors included passive indoor conservation and landscape efficiency per DWR's *2015 Model Water Efficient Landscape Ordinance (MWELO)*.

Golf

Golf water demand was based on historical water use data from golf courses within the Plan Area, adjusted for projected changes in conservation practices. Key factors included number of active golf courses and acreage of turf, implementation of water-efficient irrigation and turf conversion, and seasonal irrigation needs due to climate and tourism patterns. Golf demand is expected to remain relatively stable, with modest reductions due to conservation and turf management.

Agricultural

Agricultural water demand was derived from crop type, irrigated acreage, and historical pumping data. Key factors included conversion of agricultural land to urban development (especially in Coachella and Indio), along with potential increase in cropped acreage due to SGMA-driven shifts in other regions. Agricultural demand is projected to decline over time due to urbanization and land repurposing.

Other

Other water demand includes recreational and miscellaneous uses not captured under the municipal, golf, or agricultural categories. Other demand was calculated based on historical consumption patterns.

Table 5-1 summarizes the water demand projections from the *2022 Alternative Plan Update*. Total water demand projected for 2045 using the assumptions described above is approximately 644,610 AFY. Projected water demand for 2045 is about 240,800 AFY lower than the 885,400 AFY originally projected for 2045 in the *2010 CVWMP Update*. This reduction is a direct result of significantly reduced sociodemographic growth projections, along with conservation savings that have been achieved by Indio Subbasin water users over the last decade and are assumed for the future through passive conservation.

Table 5--1. Total Projected Water Demands in Plan Area (AFY)

Water Demand Type	2022 Alternative Plan Update Forecast						2020-2024 Average
	2020	2025	2030	2035	2040	2045	
Municipal	180,318	192,098	204,163	216,074	225,997	235,148	164,934
Agricultural	290,312	287,092	284,693	283,045	281,644	280,243	268,266
Golf	105,300	106,075	106,850	107,625	107,625	107,625	105,035
Other	18,893	21,593	21,593	21,593	21,593	21,593	15,173
Total Water Demands	**594,823**	**606,858**	**617,299**	**628,337**	**636,859**	**644,610**	**553,367**

5.3.1.2. Comparison to Current Demands

The *2022 Alternative Plan Update* forecasted demand in the Indio Subbasin from 2020 to 2045 based on five-year average water use for WYs 2015-2019, using demographic data from SCAG. In **Table 5-1** above, the five-year average water use for WYs 2020-2024 is presented as a comparison to the forecast. **Figure 5-2** presents the forecasted demand in the *2010 CVWMP Update* (grey line) and *2022 Alternative Plan Update* (green line) to the actual water use in WYs 2010-2024. As shown, the *2010 CVWMP Update* projected substantially higher water demands and even the *2022 Alternative Plan Update*'s forecasted water use was higher than the actuals over the last five years. Water use efficiency efforts, slower than expected development rates, conversion to non-potable and recycled water use, and customer behavioral change have all resulted in reduced water use across the Coachella Valley. The five-year average for WY 2020-2024 is 553,367 AFY, which is lower than the five-year average for the prior WY 2016-2019 of 581,710 AFY. The five-year average actual water use is lower than projected 2025 demands by over 50,000 AF.

5.3.2. Water Supply

The *2022 Alternative Plan Update* presents overall water supply sources and total entitlements in its Supply chapter and then describes and evaluates four water supply planning scenarios based on differing levels of imported and recycled water supply availability.

5.3.2.1. Supply Forecast Methodology

Since 2002, water supply planning efforts have distinguished between direct water deliveries and groundwater replenishment uses. Direct demands are those uses served with surface water, Colorado River water, recycled water, or groundwater. Replenishment water deliveries were considered separately as they supplement the groundwater supplies.

The Indio Subbasin relies on a diverse portfolio of water sources to meet current and future demands. The following summarizes the key assumptions for each supply type.

Local Groundwater

Groundwater is a foundational supply, with sustainability achieved through managed aquifer recharge and reduced pumping. Key groundwater inputs in the *2022 Alternative Plan Update* supply forecast included natural infiltration, return flows, and imported water recharge. The Indio Subbasin has shifted from overdraft (−110,000 AFY in 2000–2009) to positive storage (+49,100 AFY in 2010–2019).

Local Surface Water

Surface water diversions from Snow Creek, Falls Creek, and Chino Creek were forecasted to increase to 6,000 AFY post-2023, with any undiverted flows contributing to groundwater recharge. Under historical hydrologic conditions, infiltration was estimated at 43,300 AFY, while the climate-change scenario reduced estimated infiltration to 29,200 AFY due to decreased runoff.

Colorado River Water

CVWD receives its Colorado River entitlements primarily via the Coachella Canal. The supply forecast assumed full ramp-up of CVWD's 2003 Quantification Settlement Agreement (QSA) entitlements to 459,000 AFY by 2026, with 5% assumed conveyance losses. Climate change adjustments including Lower Basin Drought Contingency Plan (DCP) contributions may reduce available supply by 14,500–24,500 AFY. Supply reliability was assumed to be high due to CVWD's priority status, though subject to drought and legal agreements.

State Water Project (SWP) Exchange Water

CVWD and DWA are State Water Project (SWP) Contractors, who exchange their SWP water with Metropolitan Water District of Southern California (MWD) for Colorado River water delivered via MWD's Colorado River Aqueduct. DWA and CVWD have a combined maximum annual SWP Table A amount of 194,100 AFY. Table A deliveries were assumed at an average 45% reliability through 2045, declining by 1.5% due to climate change. Imported water deliveries vary widely from year to year and were modeled based on forecasted water year conditions.

The supply forecast assumed additional SWP supplies including Yuba Accord (651 AFY), Lake Perris Seepage (2,752 AFY starting 2023), Sites Reservoir (11,550 AFY starting 2035) and increased SWP reliability due to construction of the Delta Conveyance Facility (increase in Table A deliveries by 26,500 AFY starting 2040). SWP exchange supplies were assumed to be delivered 90–92% to WWR-GRF and 8–10% to MC-GRF based on forecast changes in water use across the Subbasins.

Recycled Water
All of the recycled water generated by growth from the CVWD WRP-7, CVWD WRP-10, and the Palm Springs WWTP/DWA WRP was assumed to be available for non-potable reuse. Existing tertiary capacity supports 13,398 AFY; planned expansions could increase reuse to 20,213 AFY by 2045. With future tertiary expansions planned for the CVWD WRP-4, VSD WWTP, and MSWD Regional WRF, up to 62,753 AFY could be recycled with full infrastructure buildout. Recycled water was considered drought-proof and unaffected by climate change.

Other Supplies
The supply forecast assumed CVWD's Rosedale-Rio Bravo Transfer for a limited duration. The remaining transfer would make 10,563 AFY available through 2035; no supply assumed post-2035. Delivery was assumed via MWD exchange, subject to annual variability.

5-2 presents the water supply forecast from the *2022 Alternative Plan Update* for the modeled hydrology that reflects anticipated climate change. The Indio GSAs are committed to achieving sustainability under changing climate conditions and are planning for supply limitations anticipated for both local and imported supplies. Total water supply projected for 2045 is approximately 621,500 AFY for historical hydrology and 581,683 for climate change hydrology. Projected water supply for 2045 is about 62,910 AFY lower than forecasted water demands. The uncertainties surrounding both imported and local water supplies make it critical that the GSAs continue to acquire new supplies and implement conservation programs.

Table 5--2. Total Projected Water Supplies in Plan Area (AFY)

Available Supplies	2022 Alternative Plan Forecast						2020-2024 Average
	2020	2025	2030	2035	2040	2045	
Surface Water	45,953	43,633	35,200	35,200	35,200	35,200	46,474
Colorado River	388,050	411,800	411,550	411,550	411,550	411,550	323,247
SWP Exchange	80,853	80,306	79,795	79,305	78,775	78,248	97,666
Other: Rosedale Rio-Bravo	10,563	10,563	10,563	10,563	0	0	7,700
Delta Conveyance Facility	0	0	0	0	0	23,562	0
Lake Perris Seepage	0	2,519	2,510	2,503	2,493	2,484	0
Sites Reservoir	0	0	0	10,503	10,464	10,426	0
Recycled Water	13,398	17,013	17,813	18,513	19,313	20,213	12,720
Total Supplies under Climate Change	**528,064**	**557,401**	**557,431**	**568,137**	**557,795**	**581,683**	**476,533**
Forecasted Demand	**594,823**	**606,858**	**617,299**	**628,337**	**636,859**	**644,610**	**553,367**
Net Groundwater Production	66,759	49,457	59,868	60,200	79,064	62,927	76,834

5.3.2.2. Comparison to Current Supplies
The *2022 Alternative Plan Update* forecasted water supply in the Indio Subbasin from 2020 to 2045 based on established water rights and agreements, along with capital improvement plans for non-potable and recycled water system expansion. **Figure 5-2** compares the forecasted supply in the *2010 CVWMP Update* (grey line) and *2022 Alternative Plan Update* (green line) to the actual water supply used in WYs 2010-2024. As shown, the *2010 CVWMP Update* projected a higher water supply than was made available through established agreements; for example, average delivery of SWP supply to SWP

Contractors has been approximately 45% of Table A agreements over the last 15 years. Whereas the *2022 Alternative Plan Update's* forecasted water supplies were better aligned with SWP delivery capability and source substitution projects. The variability of SWP exchange water from DWR has a dramatic effect on the supply recharged to the Indio Subbasin, with some years requiring local purveyors to access groundwater in storage to meet local demands. The five-year average for net groundwater production in WY 2020-2024 was 76,834 AFY, with 476,533 AFY in other water supplies.

5.4. UPDATES TO REGIONAL GROUNDWATER MODEL

The groundwater model is updated each year as part of the Annual Report, with individual water budget components updated using the same methodology as documented in the 2022 Alternative Plan Update. While the model developed in the 2022 Alternative Plan Update has been the best available tool to quantify future conditions, additional improvements could be made to improve accuracy and to coordinate with neighboring basins.

5.4.1. Potential improvements to Model Grid

For the upcoming Alternative Plan Update, the existing Indio Subbasin MODFLOW groundwater model will be updated and then used to project future conditions for various plan scenarios. In addition to the planned routine simulation update of the most recent historical period, and development of future plan simulations, there is an opportunity to implement additional upgrades to the existing model. One potential upgrade is expanding the model area to better coincide with the Subbasin boundaries. As shown in **Figure 5-4**, the current Indio model grid doesn't cover the full extent of the Subbasin, with several small areas of the Subbasin extending outside of the model grid, including the northern portion of the Subbasin, northwest of the WWR-GRF and extending to the San Gorgonio Subbasin boundary.

For the northern area, the San Gorgonio-Indio Subbasin boundary is currently about 8,000 to 9,000 feet northwest of the northern model boundary. To extend the model to the Subbasin boundary, 10 model rows will need to be created in this area.

Benefits of model grid extension to the north are:

- More accurate representation of inflow from San Gorgonio at the established Subbasin boundary. Currently, inflow for this boundary condition is provided to the Indio model along Model Low 1. The previous discrepancy in the Subbasin inflows and outflows is currently under evaluation and will be reconciled in the coming months. However, San Gorgonio's MODFLOW model extends slightly beyond Indio's current northern boundary, such that flow from San Gorgonio to Indio can be updated using output from the San Gorgonio's model.
- Improved flow simulation accuracy in currently unmodeled areas. These include several key areas of the Subbasin, including areas along important tributaries such as the Upper Whitewater River and streams west of Palm Desert. Inclusion of these additional areas could improve the Subbasin flow simulation.
- Better consistency between empirical and model water budgets. Several water budget components, including total Subbasin recharge and storage are slightly under-represented in the MODFLOW model as compared with the empirical water budget for the entire Subbasin.

5.4.2. Other Potential Improvements

Other model improvements to be considered include:

- Updated drain elevations to reflect the average elevation of the agricultural drains, as documented in the Drain Study.
- Review and update of the natural infiltration recharge component.
- Update of future demand and water supply conditions based on new information.
- Update of future climate projections to reflect improved climate modeling and to be consistent with neighboring basins.

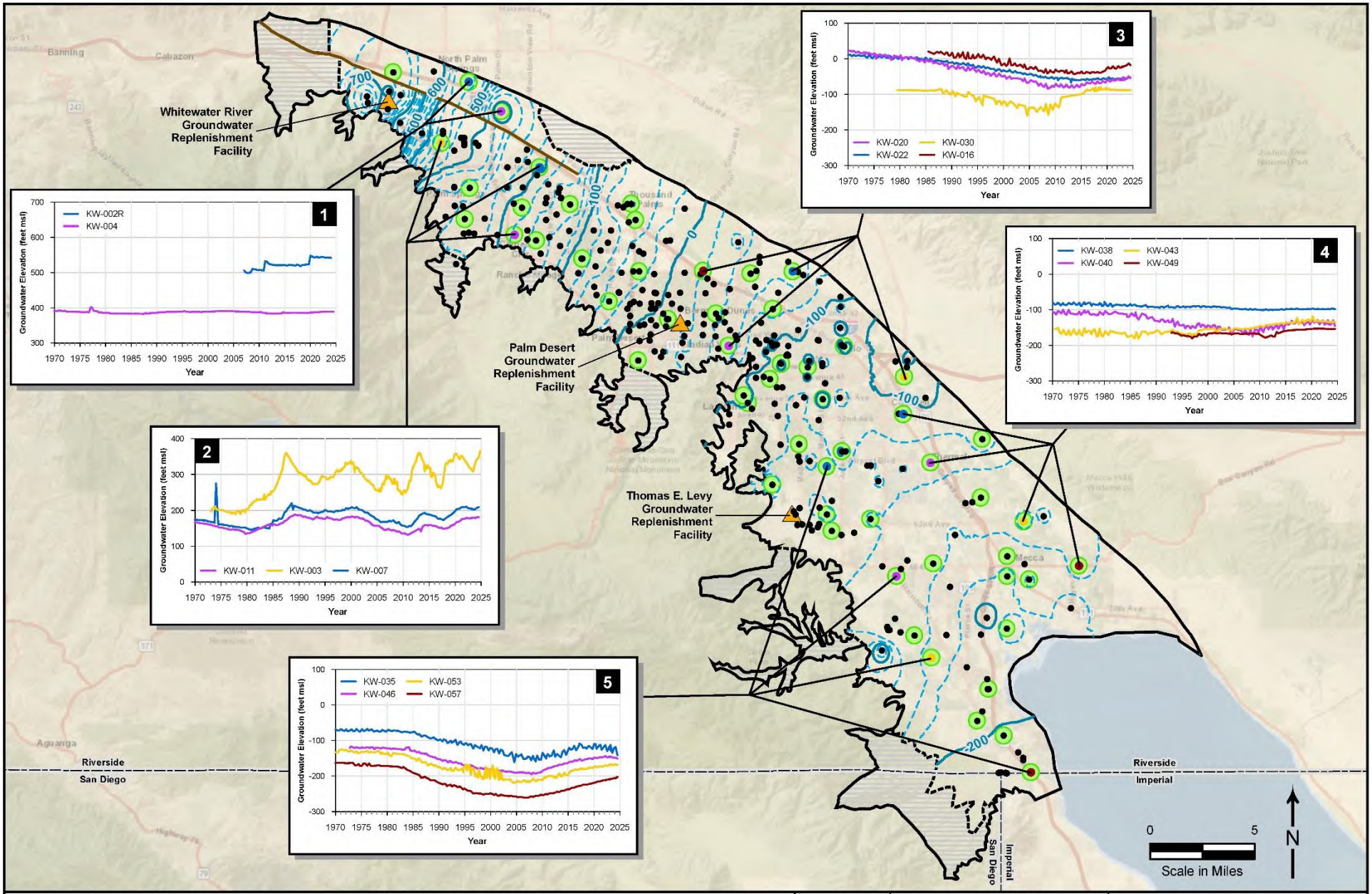

Whitewater River Groundwater Replenishment Facility
Palm Desert Groundwater Replenishment Facility
Thomas E. Levy Groundwater Replenishment Facility
1
KW-002R
KW-004
2
KW-011
KW-003
KW-007
3
KW-020
KW-030
KW-022
KW-016
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KW-035
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KW-046
KW-057
Groundwater Elevation (feet msl)
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Riverside
San Diego
Imperial
Scale in Miles
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Well Location
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Replenishment Facilities
Hydrograph of Key Well Location
Garnet Hill Fault Trace
Indio Subbasin
California County
Water Level Data Not Available
January 2026
Figure 5-1
Groundwater Elevation

Figure 5--2. Historical Water Use, 2010-2024

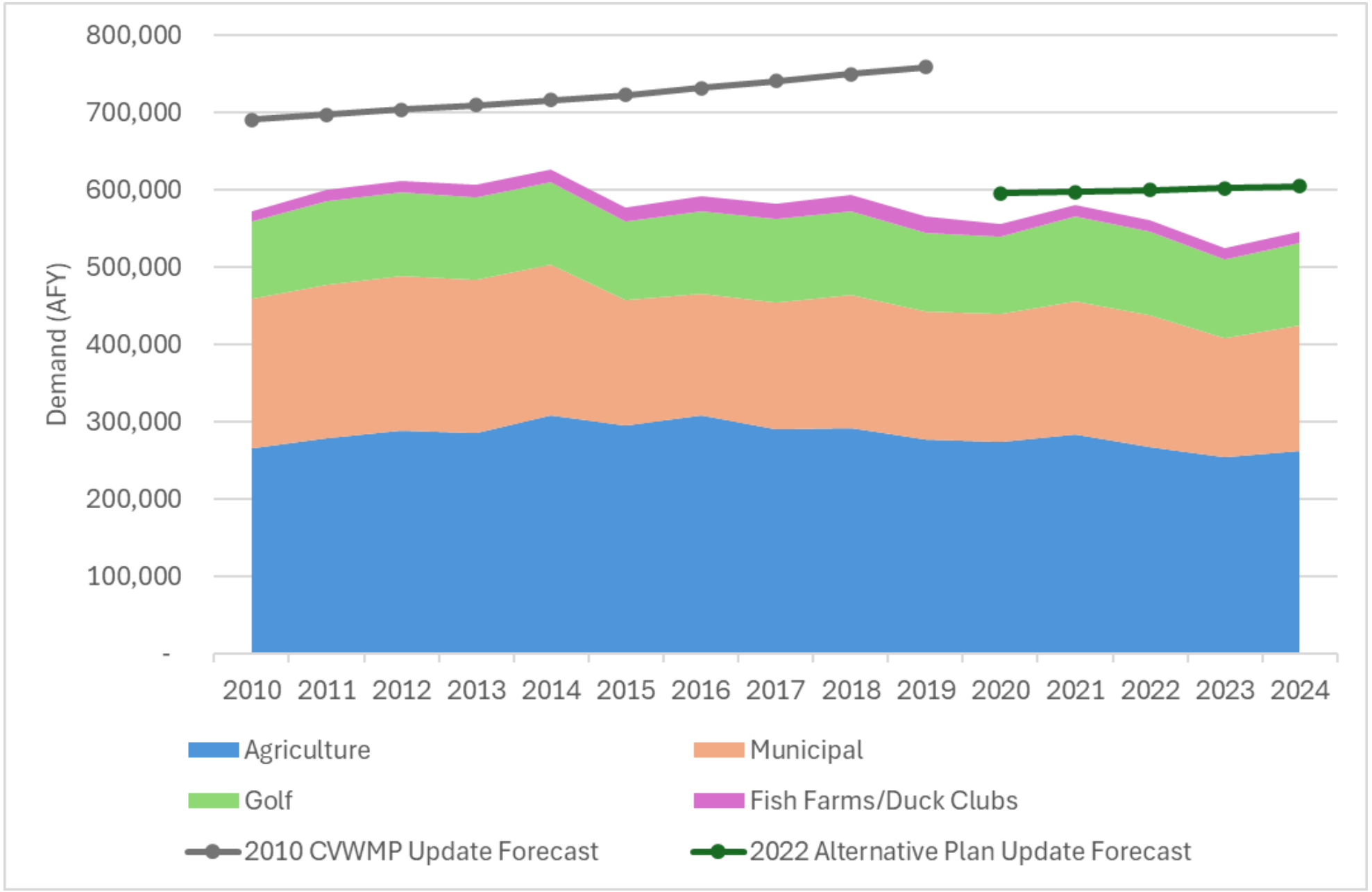
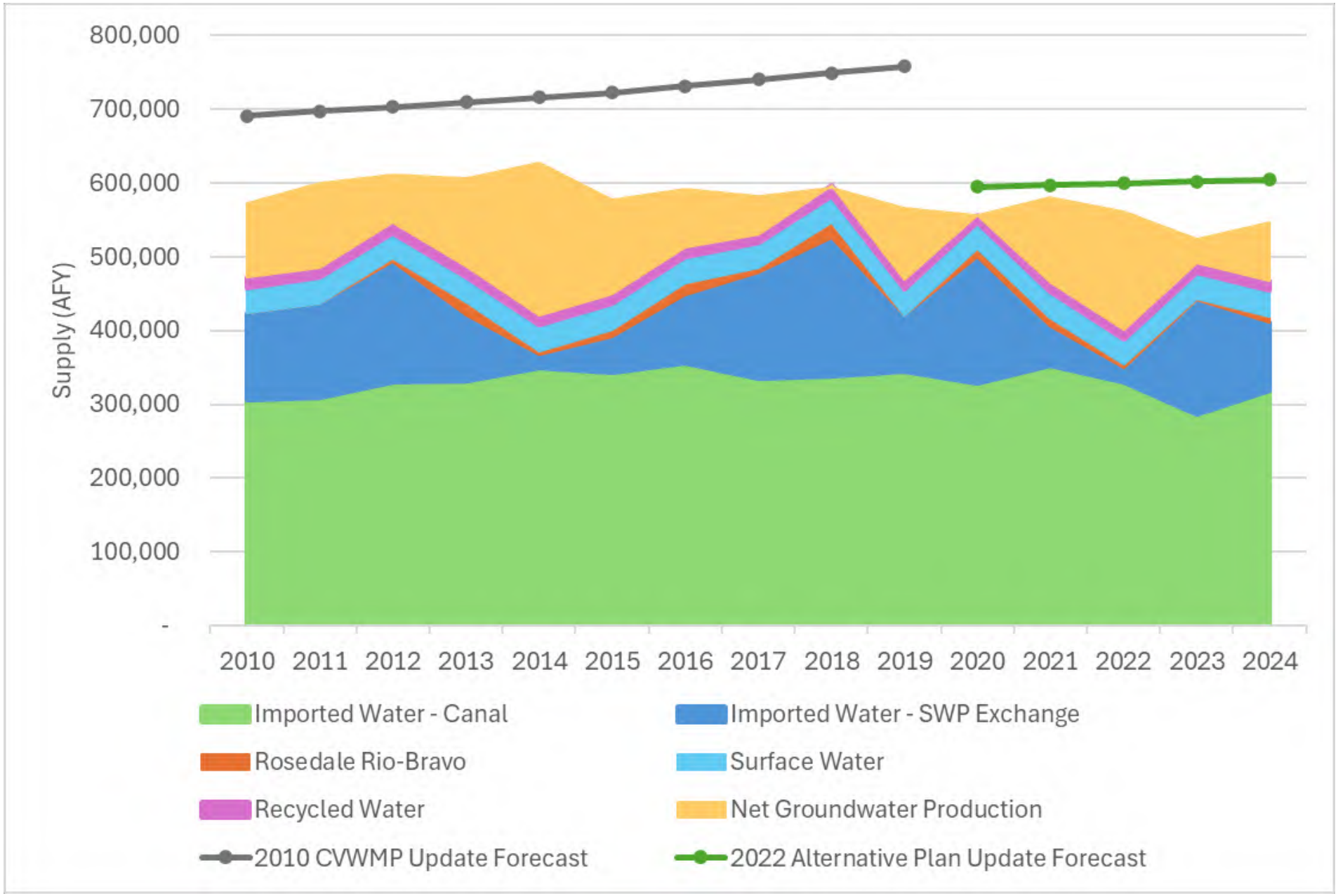
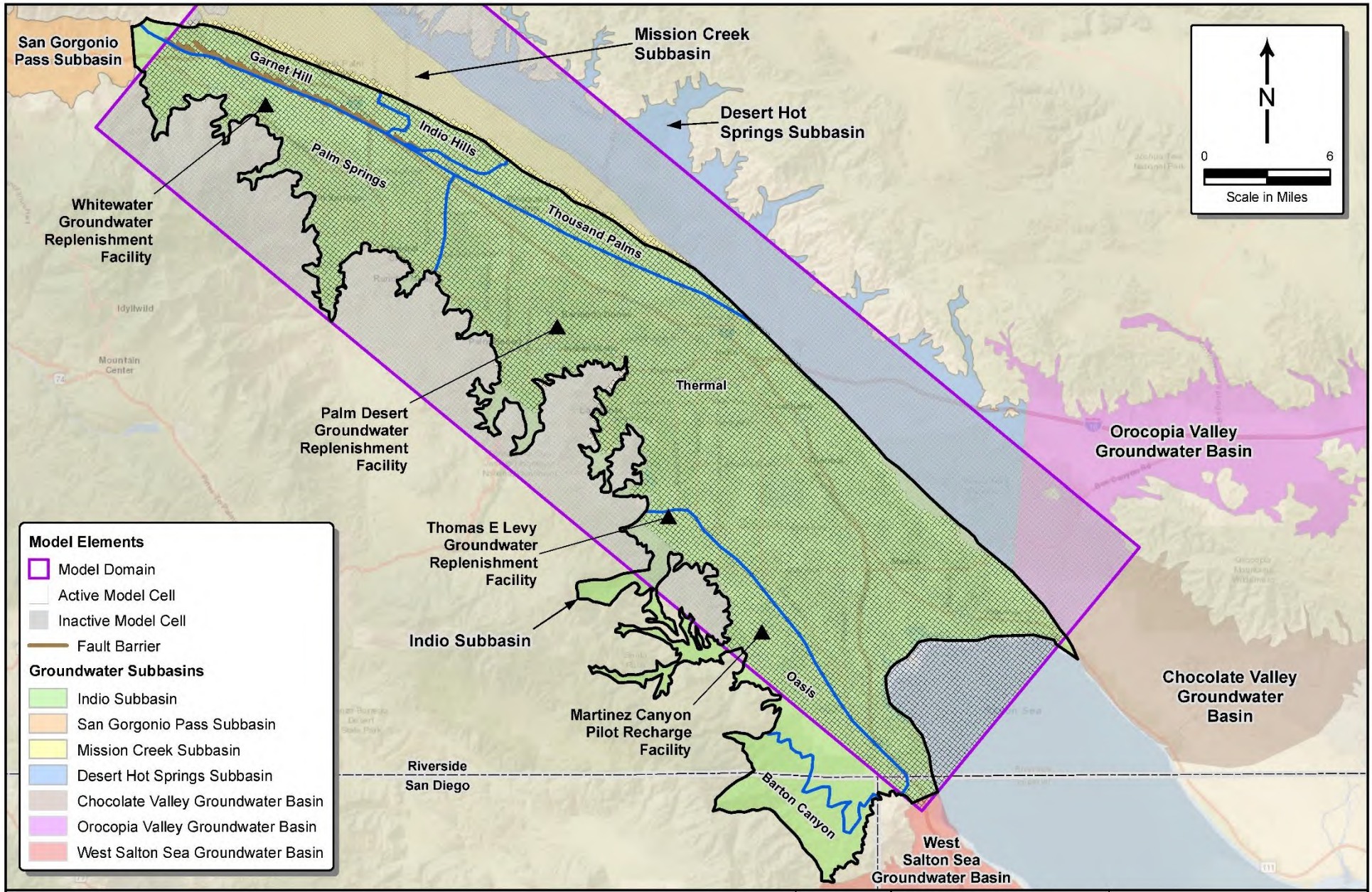


Figure 5--3. Historical Water Supplies, 2010-2024





January 2026

Figure 5-3
Model Expansion

6. MONITORING NETWORKS

The Indio Subbasin has been extensively monitored by the GSAs for decades, guided by the primary objective to evaluate the effectiveness of water management programs and projects and to modify actions and plans based on factual data. The 2022 *Alternative Plan Update* documented existing monitoring programs and included descriptions of the monitoring network, methods and protocols for data collection, and development and maintenance of the data management system (DMS). The monitoring program has been assessed with reference to the sustainability goal and objectives, data gaps have been reviewed, and improvements have been identified for implementation.
The monitoring program includes the following networks: climate, streamflow, subsidence, groundwater elevations, surface and groundwater quality, pumping, and drain flow.

6.1. IMPROVEMENTS TO MONITORING NETWORK

6.1.1. Replacement Well

The *2022 Alternative Plan Update* identified a network of 57 Key Wells, shown on **Figure 3-1**. These Key Wells were selected through a quantitative approach that considered the wells with long records characteristic of an area and distribution of wells across the Indio Subbasin. These wells are representative of local groundwater elevation conditions and are appropriate for inclusion in the Key Well groundwater elevation monitoring network (a subset of the overall monitoring program).

In WY2023, one Key Well (KW 002) was not accessible for monitoring and a nearby well (03S04E13N02S) was used as a replacement well and the MT was similarly set at that well's historical minimum.

6.1.2. Monitoring Network Audit

In June 2025, an audit was conducted of the CVWD water resources monitoring program. The purpose was to review, update and document the monitoring programs (levels and quality) and provide recommendations on the water level monitoring needed to continue cost-effective groundwater management in the Indio Subbasin (Todd 2025).

The audit found CVWD's water level network meets all requirements detailed in the DWR BMPs and, in conjunction with other monitoring (e.g., by USGS), satisfies the needs for SGMA implementation, GRF monitoring, and other ongoing CVWD programs. The audit identified redundant coverage and the water level network was reviewed to ensure that the highest priority wells are retained while redundant wells are considered for removal to maintain monitoring effectiveness.

6.2. MONITORING NETWORK DATA GAPS

Several new monitoring wells have been drilled in the Indio Subbasin since 2020, **Table 6-1**. In December 2020, the CV-SNMP Workplan identified several data gaps in the water quality network. CVWD and partners have been drilling new wells in the suggested locations. To date, 20 wells were drilled for the SNMP monitoring network (G wells in **Table 6-1**) and 3 wells for WRP2.

Table 6-1. Wells Drilled for the SNMP Data Gaps

Well Name	State Well Number	Well Depth (ft)	Screened Interval (ft)	Completion Date	Well Location	Lat	Long	Agency
G2	03S04E14R01S	225	120-220	4/12/2022	Desert Hot Springs	33.90338	-116.529	MSWD
G3	03S05E11L04S	305	100-300	9/5/2023	Desert Hot Springs	33.92206	-116.433	CVWD
G4	NA	410	100-400					CVWD
G5	03S04E36E02S	550	300-500	4/21/2025	Palm Springs	33.86769	-116.528	DWA
G6	04S05E08N02S	405	275-395	7/28/2024	Palm Springs	33.83051	-116.49	DWA
G9	06S07E04B02S	305	150-300	7/11/2024	La Quinta	33.685	-116.256	CVWD
G10	06S08E22D03S	285	120-280	11/5/2025	Thermal	33.64045	-116.143	CVWD
G12	06S08E19C04S	250	100-240	7/23/2022	Thermal	33.63883	-116.191	CVWD
G13	06S07E34R02S	155	90-150	3/25/2025	La Quinta	33.59848	-116.234	CVWD
G14	07S09E17N01S	190	80-180	9/6/2022	Mecca	33.55517	-116.078	CVWD
G15	07S08E02D02S	195	90-190	4/3/2025	La Quinta	33.59817	-116.129	CVWD
G16	06S08E25N05S	260	150-250	9/14/2022	Mecca	33.61337	-116.107	CVWD
G17	05S07E13N04S	110	40-110	9/26/2022	Indio	33.73067	-116.213	CVWD
G18	06S08E25N06S	110	30-100	9/20/2022	Mecca	33.61336	-116.107	CVWD
G19	06S08E19C05S	110	40-100	8/29/2022	Thermal	33.63883	-116.191	CVWD
G20	08S09E29N02S	110	40-60,80-100	7/27/2022	Thermal	33.44298	-116.079	CVWD
G21	08S08E04A03S	85	45-75	########	Mecca	33.5105	-116.148	CVWD
G22	07S09E27A03S	105	45-55,75-85,95-105	7/11/2022	Mecca	33.53983	-116.027	CVWD
G23	04S06E35M01S	275	110-140, 230-270	########	Palm Desert	33.77703	-116.333	CVWD
WRP 2 MW1R	07S10E34F01S	110	55-95	6/29/2022	Mecca	33.51994	-115.932	CVWD
WRP 2 MW2R	07S10E34G05S	110	55-95	6/22/2022	Mecca	33.51854	-115.93	CVWD
WRP 2 MW3R	07S10E34F03S	110	55-95	6/16/2022	Mecca	33.51822	-115.931	CVWD
MC-2	03S05E10L08S	435	170-430	5/26/2025	Desert Hot Springs	33.92149	-116.45	CVWD

6.3. MONITORING NETWORK FUNCTIONALITY

The Indio Subbasin has been extensively monitored by the GSAs for decades, guided by the primary objective to evaluate the effectiveness of water management programs and projects and to modify actions and plans based on factual data. The 2022 *Alternative Plan Update* documented the existing monitoring programs and included description of the monitoring network, methods and protocols for data collection, and development and maintenance of the data management system (DMS).

There have been no significant changes to the monitoring network, other than adding wells, and details can be found in the 2022 Alternative Plan. The general information provided by these networks is summarized below.

6.3.1. Climate

Climate data are available from four active DWR California Irrigation Management Information System (CIMIS) for four active CIMIS stations in the Indio Subbasin and 12 Riverside County Flood Control and Water Conservation District precipitation monitoring stations. Data are used to support characterization of groundwater conditions and evaluation of irrigation water demands (agricultural and golf course).

6.3.2. Streamflow

Stream flow is measured by the United States Geological Survey (USGS) at 19 locations within the Indio Subbasin. Surface water diversions are measured by DWA from Snow, Falls, Whitewater, and Chino watersheds. Streamflow data are compiled annually to support tracking of basin conditions as part of the Indio Subbasin Annual Reports.

6.3.3. Subsidence

Subsidence is documented in a comprehensive USGS report of findings (Sneed and Brandt, 2020). The USGS, in cooperation with the GSAs, continues to study land subsidence in the Coachella Valley through the USGS land-subsidence monitoring network, which currently includes 24 stations. InSAR (Interferometric Synthetic Aperture Radar) data are also available that provide broad spatial mapping of vertical displacement of the land surface.

6.3.4. Groundwater Elevations

Water level data are available for selected wells in the Indio Subbasin dating back to 1910. Over 355 wells are currently monitored by the GSAs as part of their respective groundwater level monitoring programs. The data are used to characterize Subbasin conditions, evaluate pumping and recharge operations, and support groundwater modeling and model calibration. As part of this *Alternative Plan Update*, 57 Key Wells were selected to assess sustainability in the Indio Subbasin.

6.3.5. Water Quality

Surface Water and Groundwater Quality monitoring is performed by multiple agencies in the Alternative Plan Area. For example, water purveyors are required by State law to monitor and report the quality of their water sources. These data are publicly available on the SWRCB's Groundwater Ambient Monitoring and Assessment Program (GAMA) website. In addition, California Native American Tribes monitor the quality of their wells and maintain records; not all these data are publicly available.

6.3.6. Groundwater Production

Pumping is recognized as critical to Subbasin management. Accordingly, Division 2 Part 5 of the California Water Code requires each person (i.e., well owner/operator) within the counties of Riverside, San Bernardino, Los Angeles, and Ventura extracting more than 25 AFY of groundwater to file a "Notice of Extraction and Diversion of Water" with the SWRCB. In addition, the enabling legislation of CVWD and DWA respectively require that all production subject to replenishment assessment be reported monthly. The reporting threshold for pumpers within the CVWD boundary is 25 AFY, while the threshold for DWA is 10 AFY; 550 wells are metered. Groundwater pumpers who pump less than these thresholds are designated as minimal pumpers.

6.3.7. Agricultural Drain Flows

CVWS Agricultural drain flow and the Coachella Valley Stormwater Channel (CVSC) receive intercepted shallow groundwater from agricultural areas and convey the flow to the Salton Sea. A USGS gage station measures flow in the lower CVSC near the Salton Sea, while CVWD measures drain flows at 27 sites on a monthly basis. The CVSC and agricultural drain system also receive flows from CVWD's irrigation system in excess of requested deliveries (regulatory water), treated wastewater, and fish farm effluent. The drain flow data have been used to track groundwater outflow and to calibrate the numerical groundwater flow model.

6.3.8. Salt Water Intrusion

In addition to tracking groundwater elevations relative to Salton Sea levels, saline water intrusion can be detected specifically through two sets of dedicated nested monitoring wells operated by CVWD. One set of four wells is located about 2.1 miles north of the Salton Sea, and the other set is about one mile west of the Salton Sea and north of Oasis.

6.3.9. Potential Revisions in the 2027 Alterative Plan Update

The GSAs have updated their ongoing monitoring programs in the 2027 Alternative Plan Update.

7. GSA AUTHORITIES AND ENFORCEMENT ACTIONS

During the implementation period, the Indio Subbasin GSAs have established no new authorities, such as regulations or ordinances.

In a separate but relevant legal matter, CVWD, DWA, and the Agua Caliente Band of Cahuilla Indians recently entered into a Water Rights Settlement Agreement (Agua Caliente, 2025). Through this cooperative Agreement, the parties seek to promote sustainable water management in the Coachella Valley and provide Agua Caliente, CVWD, DWA, and all residents of the Coachella Valley with greater certainty regarding water rights, water management, and administration. The Agreement includes a Memorandum of Cooperation (MOC) regarding water management. This MOC details obligations of the Parties to guide implementation relative to monitoring, information sharing, and establishment of a Technical Advisory Committee. The MOC also defines a series of management actions that are triggered if groundwater levels measured in selected wells decrease below defined levels (consultation level and expected minimum thresholds). These management actions include:

- Documentation in the Annual Report required in the MOC
- Voluntary mitigation actions that may include those in the Regional Urban Water Management Plan (RUWMP) and Water Shortage Contingency Plan (WSCP)
- Mandatory mitigation actions that may include those in the Regional Urban Water Management Plan (RUWMP) and Water Shortage Contingency Plan (WSCP)
- Groundwater production reductions that are targeted as needed.

There have been no changes to the other GSA authorities. The GSAs have had no need for any enforcement actions.

8. OUTREACH, ENGAGEMENT, AND COORDINATION WITH OTHER AGENCIES

8.1. INTERNAL BASIN COORDINATION

The four GSAs—CVWD, CWA, DWA, and IWA—are the designated decision-making entities for the *Alternative Plan Update* process. On October 5, 2016, the GSAs entered into a Memorandum of Understanding (MOU) to establish an agreement for collaboration and share management costs of the Indio Subbasin under SGMA. Each GSA is responsible for the portion of the Indio Subbasin within their respective jurisdictional area (see **Figure 1-2**). The MOU establishes that it intends to foster cooperation, coordination, and communication among the GSAs regarding management of the Indio Subbasin.

The 2016 MOU established the GSAs' intent to develop and submit the Alternative Plan to DWR. On April 3, 2018, the GSAs approved a Supplement to the MOU that outlined the GSAs' intent to prepare an Annual Report for Water Year 2017. On October 29, 2018, the GSAs approved a Second Supplement to the MOU that allowed for ongoing preparation of Annual Reports by April 1 of each water year, along with preparation of a *2022 Indio Subbasin Alternative Plan Update*. The Second Supplement directs CVWD to serve as the managing entity for selected consultants but allows for input and review of all SGMA-related deliverables and transmittal of all data and files to each of the four GSAs.

The GSAs meet monthly to discuss *Alternative Plan Update* development and implementation activities, assignments and consultant management, milestones, and ongoing work progress. The GSAs participated in all public workshops and directed outreach meetings. Public input, no matter the method received (e.g., phone, email, public meeting), was shared with all the GSAs for consideration throughout the planning process.

8.2. OUTREACH AND ENGAGEMENT

The public outreach and engagement activities are ongoing, providing broad information on the state of the Indio Subbasin and its management. As specific projects and management actions are initiated, GSA staff and consultants apply their knowledge of stakeholders to reach out to them, inform them of activities, and invite them to workshops or meetings. Such meetings are informative about how stakeholders/beneficial users might be affected and allow the GSAs to adjust or provide better explanation.

8.2.1. Tribal Engagement and Coordination

The GSAs continue to be engaged with the Indio Subbasin tribal governments, namely the Agua Caliente Band of Cahuilla Indians, the Augustine Band of Cahuilla Indians, the Cabazon Band of Mission Indians, the Torres Martinez Desert Cahuilla Indians, and the Twenty-Nine Palms Band of Mission Indians, each of which has provided representatives to the SGMA Tribal Workgroup meetings. The SGMA Tribal Workgroup, established in 2017, has been active for several years through submittal and DWR approval of the Alternative Plan and the

Alternative Plan Update implementation process. The SGMA Tribal Workgroup continued to discuss major water-related concerns facing the tribes and ensuring regional water management efforts, such as the long-term implementation of the *Alternative Plan Update*, are responsive to those needs. During these meetings, the GSAs present work in progress and request data from the tribes to support the planning process (e.g., land use plans, water demands).

The GSAs have continued to engage with the tribes through quarterly SGMA Tribal Workgroup meetings. At the Workgroup meetings, the GSAs will present monitoring data, Annual Report findings, and the status of project implementation to support Indio Subbasin sustainability.

An important step toward coordination is the recent draft interagency agreement among CVWD, DWA, the Agua Caliente Band of Cahuilla Indians, and the United States (see Section 7). This Agreement sets the stage for the Tribe, CVWD, and DWA to cooperatively manage groundwater underlying the Agua Caliente Indian Reservation through a Memorandum of Cooperation.

8.2.2. Public Engagement

The GSAs have conducted stakeholder outreach to identify and obtain input from groups that may be otherwise limited from participating in the *Alternative Plan Update* implementation. The GSAs have used a variety of outreach methods to coordinate among local stakeholders and communicate SGMA-related information to interested parties during Plan development. The GSAs continue collaboration and public outreach during Plan implementation. This includes providing opportunities for stakeholder participation at public workshops and providing access to Plan information through email announcements and online (see project website: www.indiosubbasinsgma.org). Annual Reports provide general information, documentation of Subbasin conditions, and description of plan implementation progress.

8.2.2.1. Stakeholder Workshops and Board Meetings

During preparation of the *Alternative Plan Update*, the GSAs hosted seven public workshops to share information, present work in progress, and request feedback from stakeholders. The GSAs have continued to host stakeholder workshops once a year to support participation in Plan implementation by members of the public and interested parties and to receive stakeholder input. Stakeholder workshops are anticipated to be held annually to present the findings of the Annual Reports and to support public engagement. The Indio Subbasin website will be updated as needed to feature meeting agendas and materials, so that stakeholders have access to past and current materials related to Plan implementation. Additionally, the GSA staff will continue to report to their Boards of Directors annually, at a minimum, for review and discussion of the Annual Reports. Board meetings are publicly-noticed and open to all stakeholders to participate.

8.2.2.2. Outreach and Website Maintenance

The GSAs have used an email list to communicate with stakeholders and interested parties. Announcements related to Plan implementation – such as availability of new data, release of Annual Reports, and scheduling of public workshops – will continue to be distributed via email. Prior to stakeholder workshops or meetings, email announcements will be circulated with access to meeting materials via the website. Emails will also be distributed as specific deliverables are finalized, when opportunities are available for stakeholder input, or when items of interest to the stakeholder group arise, such as relevant funding opportunities. The Indio Subbasin email list and website is updated as needed to feature meeting agendas and materials, Annual Reports, and other program information as applicable.

8.2.3. Annual Reports

Annual Reports have been submitted by April 1 of each year since 2018, following the Alternative Plan adoption. As summarized below, Annual Reports provide general information, documentation of Subbasin conditions, and description of plan implementation progress.

8.2.4. Public Comments

Public comments have been received during the implementation process, mostly through Annual Report presentations. To summarize, public questions and comments have addressed evaluation of the Subbasin water budget, mostly asking for clarification of the assessment of specific water budget components (e.g., agricultural return flows, agricultural leaching requirements, industrial uses). These questions have been answered on the spot, and no edits to the report have been needed. Questions also have been posed about groundwater quality issues (e.g., arsenic, CrVI). Other questions have been answered with specific reference to text, tables, and graphics in the Alternative Plan or referred to upcoming reports, such as the SNMP now being developed.

This approach is being maintained for the Periodic Evaluation and the 2027 Alterative Plan Update. As another example, current implementation of the RWRP includes a survey of groundwater and climate change concerns in the East Valley; responses will be incorporated into this Periodic Evaluation, along with comments on the Periodic Evaluation yet to be received.

8.3. COORDINATION WITH OTHER AGENCIES

The Indio Subbasin GSAs continually coordinate among themselves; with GSAs in the neighboring San Gorgonio and Mission Creek subbasins; with land use planning, well permitting and regulatory agencies, and with wholesalers such as the Metropolitan Water District.

8.3.1. San Gorgonio Subbasin GSAs

As described in Section 5.4, natural inflow to the Indio Subbasin includes subsurface inflow from the San Gorgonio Pass Subbasin through a constriction in the bedrock. The Indio Subbasin GSAs are currently working with San Gorgonio Subbasin GSAs to further refine the hydrogeology of the shared basin boundary. The San Gorgonio Basin is located to the northwest of the Indio Subbasin, **Figure 1-1**. DWR has indicated that Indio GSAs should coordinate with San Gorgonio GSAs toward mutual sustainability. Specifically, Recommended Corrective Action 1 states that the GSAs should describe inter-basin issues and coordination efforts regarding thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water.

The Indio GSAs, San Gorgonio Pass Water District, and their respective consultants met during the development of the 2022 Alternative Plan Update and again on August 21, 2024. Representatives of the two basins are focused on understanding how the boundary was simulated in the respective models and on defining the next steps to coordinate modeling such that the outflow estimated from the San Gorgonio Model is similar to the inflow estimated in the Indio Model. This interflow is the key issue to be addressed.

The Indio GSAs are preparing a technical memorandum to provide the scientific justification and background for updates to both models (but focused on the Indio Subbasin model). The memo will provide recommendations for subsequent tasks for the update of the Indio Subbasin numerical model, presumably as part of the 2027 Alternative Plan. At this time, it is assumed that collaboration with the San Gorgonio GSAs would lead to coordinated update of the San Gorgonio model, such that interflow is quantified to the mutual satisfaction of the Indio and San Gorgonio GSAs.

8.3.2. Mission Creek Subbasin Management Agencies

Subsurface inflow to the Indio Subbasin occurs from the Mission Creek Subbasin across the Banning Fault, The Mission Creek Subbasin of the Coachella Valley Groundwater Basin is coordinated by a management committee made up of: CVWD, DWA, and Mission Springs Water District (MSWD). CVWD and MSWD have public water systems that rely on groundwater from the Mission Creek Subbasin. CVWD and DWA are GSAs with groundwater replenishment authority for this region and conduct an active recharge program utilizing SWP exchange water. The General Managers of MSWD, CVWD, and DWA met quaterly to discuss development of the *Mission Creek-Garnet Hill WMP* and continue to meet to discuss plan implementation and other water management issues associated with the Mission Creek Subbasin and Garnet Hill Subarea. CVWD and DWA coordinated the planning efforts to ensure consistency in SGMA implementation.

Indio and Mission Creek Subbasins continue to coordinate on the model development and update. Local adjustments for fault conductance and inflow rates from the Mission Creek Subbasin were made to ensure consistency in inter basin flow. Future climate change

scenarios used the same climate projections to further coordinate the models. Communication continues as both Subbasin prepare the next Alternative Plan Update.

9. SUMMARY OF PROPOSED OR COMPLETED REVISIONS TO PLAN ELEMENTS

In the 2022 Alternative Plan Update, the GSAs committed to updating the *Alternative Plan* every five years to assess progress toward meeting sustainability, incorporate changes in conditions such as water demand and supply availability, evaluate PMAs, and assess projected groundwater conditions using the numerical model. This Periodic Evaluation of the 2022 Alternative Plan confirms the groundwater subbasin is managed sustainably but also notes the work that has continued in the Subbasin. In addition, the 2022 Alternative Plan identified several continued efforts and studies needed for implementation. The identified projects and the Subbasin's continued implementation efforts are described below.

9.1. ALTERNATIVE PLAN UPDATE

The GSAs will evaluate the *Alternative Plan Update* every 5 years. At that time, the GSAs will report on whether any *Alternative Plan Update* sustainability criteria (e.g., minimum thresholds or measurable objectives established by the GSAs) should be revised, based on any significant changes and outcomes of the monitoring programs. The 5-year Update will include the following description of the current Subbasin conditions with reference to Alternative Plan objectives and any sustainability indicators established by the GSAs. New information and significant changes will be identified and discussed.

9.1.1. Alternative Plan Update Status

The GSAs are committed to updating the Alternative Plan. More information on the recommended improvements are available in Section 10.

9.2. INDIO SUBBASIN GROUNDWATER MODEL UPDATE

In the 2022 Alternative Plan, the GSAs acknowledge that the Indio Subbasin groundwater model would be updated annually to evaluate changes in groundwater storage and comprehensively reviewed and updated every five years based on additional information provided by GSAs. Once the model has been updated and re-calibrated, the future scenarios will be designed and simulated. Associated water budget and model outputs will be evaluated considering project implementation.

9.2.1. Groundwater Model Update

The model has been updated every year for the Annual Report as planned. As discussed in Section 5.4, the numerical model will be updated for the 2027 Alternative Plan. The GSAs are currently working with San Gorgonio to coordinate model simulations on both sides of the boundary. The recommended model enlargement to the San Gorgonio basin Boundary is also underway.

9.3. MONITORING NETWORK IMPROVEMENTS

The groundwater monitoring networks have abundant historical data that meet or exceed data density requirements outlined in DWR's *Monitoring Networks and Identification of Data Gaps, Best Management Practices for Sustainable Management of Groundwater* (DWR, 2016) in the deeper zones. The GSAs are pursuing additional dedicated shallow monitoring wells to help monitor shallow and perched areas of the Indio Subbasin for both water levels and water quality.

To better understand the basin in general and vertical gradients specifically, the GSAs committed to implementing groundwater monitoring improvements. The GSAs regularly assess the monitoring network and install additional and/or replacement monitoring wells. This effort is being coordinated with the Coachella Valley SNMP monitoring networks to achieve the overall goal of groundwater quality protection.

9.3.1. Monitoring Update

A Monitoring Audit was conducted in June 2025. The audit concluded that the current network adequately meets the needs of SGMA for both water levels and water quality. In addition, the data gaps identified in the SNMP Workplan have been actively filled through new wells drilled.

9.4. SUBBASIN WELL INVENTORY

Unlike many other groundwater basins in California, the Indio Subbasin has an extensive well inventory that has been compiled by CVWD and DWA in order to implement the Replenishment Assessment Charge (RAC) Programs for assessable groundwater production. CVWD levies and collects the RAC from groundwater producers that benefit from the Groundwater Replenishment Programs (GRPs) and extract more than 25 acre-feet per year (AFY) within the CVWD's West Whitewater River Subbasin Area of Benefit (AOB) and East Whitewater River Subbasin AOB in the Indio Subbasin. DWA levies and collects the RAC from groundwater producers that benefit from the GRPs and extract more than 10 AFY within DWA's West Whitewater River Subbasin AOB. However, there is incomplete data on minimal pumpers who do not meet these criteria. The GSAs do not have a complete list of minimal pumpers and approximations of unreported production are best estimates.

9.4.1. Well Inventory Update

As part of the CVRWMP, the GSAs and their partners conducted a domestic well survey. The well inventory supports the understanding of how private wells may affect Indio Subbasin conditions and how Indio Subbasin management may affect private wells. The well inventory provides documentation of well locations and well construction relative to the Key Wells and Minimum Thresholds identified for managing groundwater levels (see Section 9.3.3, Sustainability Criteria for Groundwater Levels). This will help substantiate the current effectiveness of the groundwater level MTs in protecting wells or identify as-yet unknown

shallow wells. The comprehensive well inventory also provides a basis for cooperating with well permitting agencies (e.g., County of Riverside) to ensure that new wells are constructed with appropriate construction and depth to provide reliable water supply despite reasonably anticipated and managed changes in groundwater levels. Compilation of the well inventory included the following activities:

- Review and organization of the Data Management System (DMS) to incorporate well inventory component
- Compilation of water well drillers reports, including well construction information
- Coordination with well owners to identify wells and obtain relevant information on location, construction, use, status, and and monitoring activities
- Field visits to verify well location, use, and status
- Developlment of a comprehensive well inventory to share with GSAs

9.5. EXPAND GROUNDWATER PRODUCTION REPORTING

SGMA (Section 10725.8) authorizes GSAs to require that the use of every groundwater extraction facility (production well) be measured with a water-measuring device (meter) with the exception of de minimis extractors (domestic users extracting 2 AFY or less). As explained in Section 12.10.2, both CVWD and DWA already require metering and extraction reporting by groundwater producers using more than 25 and 10 AFY, respectively, based on their respective water management authorities. CVWD and DWA separately author an *Engineer's Report on Water Supply and Replenishment Assessment* annually to assess the groundwater supply conditions and the need for continued replenishment within their AOBs, to provide a description of the current GRF operations, and to recommend adjustments to the RAC that is levied on groundwater production (see CVWDs website: https://cvwd.org/Archive.aspx?AMID=43 and DWA's website: https://dwa.org/about-us/documents/library/).

9.5.1. Production Reporting Update

The GSAs have decided to not expand groundwater extraction reporting to include de minimis groundwater pumpers.

9.6. REFINE SUBBASIN CHARACTERIZATION

The 2022 Alternative Plan suggested additional Subbasin characterization focusing on areas with limited data to improve the GSAs ability to manage the Indio Subbasin.

9.6.1. Basin Characterization Status

As documented in Section 3, the newly available geologic data has been compiled and will be used to update the HCM in the next Alternative Plan Update.

9.7. DRAIN FLOW STUDY

There are 27 agricultural drains where CVWD collects flow measurements and water quality data. The agricultural drain system was designed to intercept shallow, higher salinity groundwater (from return flows and rising groundwater) and convey it to the Salton Sea. The suggested study should be designed to contribute to an improved understanding of the relationship between groundwater levels in the various aquifers, protection of water quality in the deep aquifer, drain flow volumes and salt export, which may result in refinement of this groundwater model element.

9.7.1. Drain Flow Study Update

As documented in Section 3.10.1, CVWD prepared a study to directly respond to the recommended implementation action. The "East Coachella Valley Agricultural Drainage System Flow Study" (Todd, 2023) documented the extensive system of open drainage ditches and subsurface drains has been constructed to provide drainage for agricultural fields and to remove and convey the salts found naturally in saline soils and shallow groundwater through the Coachella Valley Storm Channel (CVSC) or directly through open drainage ditches to the Salton Sea. The Study found that drain flow was not a suitable sustainability indicator and recommended continued use of water level measurement as a proxy.

9.8. SUBSIDENCE STUDY

CVWD has an ongoing partnership with USGS and the 2022 Alternative Plan documented the continued collaboration with USGS and the other GSAs on the most recent study (July 1, 2021, through June 30, 2025), whose objectives are to (1) detect and quantify land subsidence using GPS methods (2015–22) and InSAR methods (2017–23), (2) evaluate the relation between changes in land-surface elevation and groundwater levels at selected sites during 2015–23, and (3) provide technical assistance to CVWD and their contractors in the potential development of subsidence simulation capabilities for the existing numerical groundwater flow model.

9.8.1. Subsidence Study Update

The USGS is currently working on an updated subsidence study building on their previous work. The latest findings will be released in final form in the summer 2026. The GSAs are working with the USGS to see if preliminary information can be released and incorporated into the Alternative Plan Update earlier.

9.9. SUBSURFACE FLOW STUDY

The GSAs will conduct analyses of the San Gorgonio and Mission Creek Subbasin boundaries to better estimate subsurface inflows from adjacent Subbasins. The study will consider subsurface flow at faults and to the Garnet Hill Subarea and will be used to update and improve the numerical model. This effort will include coordination with the GSAs of adjacent groundwater Subbasins and their numerical models.

9.9.1. Subsurface Flow Study Status

CVWD and DWA are working with San Gorgonio Subbasin to investigate the shared boundary. A technical memorandum documenting the geology, groundwater conditions, and suggested model improvements is expected in Fall 2025.

9.10. PURSUE GRANT PROGRAMS

The 2022 Alternative Plan recommended pursuing external grant funding to reduce implementation costs for participating agencies and the communities of the Indio Subbasin. Financing options under consideration include loans and grants for projects and management actions, as well as monitoring network improvements and other planning or feasibility analyses needed to support Plan implementation.

9.10.1. Grant Updates

GSAs continue to pursue and secure grant funding for projects such as the Coachella Valley Regional Water Resilience Plan (CVRWRP). Funded through a grant by the Governor's Office and Planning and Research (OPR), this project is developing a Coachella Valley Regional Water Resilience Plan (CVRWRP) that outlines practical and feasible water resilience actions. The GSAs have also partnered to win several turf replacement grants including:

- Prop 1 Round 1 and 2 IRWM from CA DWR (Term 6/3/2020 – 3/31/2024)
- Urban & Multiple Benefit benefit Drought Relief Grant Program from CA DWR Urban Community Drought Relief Grant Program
- USBR WaterSMART Water and Energy Efficiency Grants (WEEG)

9.11. CONSIDER GROUNDWATER MANAGEMENT FEE

Additional funding was considered to sustainably manage the Indio Subbasin. SGMA (Section 10725.8) authorizes GSAs to collect a groundwater management fee in order to effectively manage the groundwater balance.

9.11.1. Groundwater Management Fee Status

Individual GSAs have not changed their groundwater management fee strategy. CVWD is currently in the process of updating the cost of service and has no updates to share at this time.

9.12. IMPLEMENTATION OF PMAS

Projects and Management Actions, documented in Section 4, include projects and programs that have been identified to protect and improve groundwater levels and quality. Some of the PMAs are ongoing programs, some are in the planning and design phases, and others are still conceptual. PMAs have moved forward as needed to maintain the Indio Subbasin in sustainable conditions, and able to meet Plan Area water demands, and groundwater levels and quality that avoid undesirable results.

9.12.1. PMA Implementation Status

The ongoing work on the PMAs is outlined in Table 4-1.

10. 2027 ALTERNATIVE PLAN UPDATE

This Periodic Evaluation details the implementation of the 2022 Alternative Plan Update and that the Indio Subbasin continues to be managed sustainably. However, because of updates to the water demand and water supply projections, the GSAs have committed to preparing a Plan Amendment by preparing the 2027 Alternative Plan Update. New data and studies documented in this Periodic Evaluation served as the basis for the suggested revisions to the 2022 Alternative Plan Update.

10.1. UPDATE HYDROGEOLOGIC CONCEPTUAL MODEL (HCM)

The process of improving the HCM includes as-needed investigations and reevaluation of all available data together to provide the next cohesive representation of the Subbasin. The HCM in the 2022 Alternative Plan Update effectively represents the Subbasin's geologic framework and the occurrence and flow of groundwater; however,uncertainties persist, such as those revealed in cross sections by limitations in well spacing and depth. Based on the new data available, documented Section 2.2, we will better understand the area near the San Gorgonio boundary or the extent of confining clays in the southeastern subbasin.

As demonstrated in the 2022 Update, detailed cross-sections provide important insight into the regional structural and geologic setting of the Indio Subbasin, regional and local groundwater flow, groundwater quality distribution (spatial and vertical), and groundwater/surface water interactions. The detailed hydrogeologic cross-sections of the Indio Subbasin have been reviewed and updated using new information from the AEM surveys and recent well construction, monitoring, and sampling.

10.2. GROUNDWATER CONDITIONS

The groundwater elevation data, hydrographs, and water quality data will be updated through current groundwater conditions. Consistent with DWR regulations, groundwater recharge and discharge areas will be delineated. Maps and figures will be used to describe (1) groundwater response to groundwater management, including groundwater recharge, source substitution, water conservation, and other programs over time and (2) interactions between surface and groundwater.

10.3. WATER DEMAND UPDATE

The GSAs will update and expand the water demand forecast that was developed for the 2022 Alternative Plan. Water production and billing data will be compiled for the water agencies within the Indio Subbasin. Water demands will then be calculated based on unit factors for each use sector, assuming both active and passive conservation savings. This proposal assumes data available through the end of WY 2024 (September). The demand forecast will be updated as follows:

- Update population and housing growth forecast from Southern California Association of Governments (SCAG)
- Refine seasonal population inputs and assumptions
- Reflect recent land use planning decisions on increased housing density (and surf parks)
- Incorporate demands associated with large landscape irrigation and agriculture
- Leverage recent water meter data for GSA service areas to update demand factors
- Consider indoor and outdoor water use standards from the adopted Making Conservation a California Way of Life regulation
- Facilitate use of the demand model for wastewater and recycled water flow estimates
- Allow for the use and display of spatial data for demand forecast.

10.4. WATER SUPPLY UPDATE

For the 2027 Alternative Plan Update, the future water supply availability for current and future conditions will be revised including:

Imported water – Rincon will evaluate State Water Project (SWP) and Colorado River reliability, and coordinate with Todd Groundeater to establish an updated projected water supply based on available imported water for recharge and direct delivery.

Local surface water – Rincon will evaluate projected supply from local surface water diversions and other supplies such as water purchases or transfers from water agencies in the Central Valley.

Recycled water – Rincon will document recycled water supply from local water reclamation plants, including the uses of recycled water for irrigation of landscaped areas and for replenishment. Future potential water recycling (for example from the City of Coachella and Valley Sanitary District) will be discussed.

10.5. GROUNDWATER FLOW MODELING

Based on the discussion of Section 5.4, the Indio Subbasin groundwater flow model (model) will be updated to simulate groundwater response to historical, current, and future conditions, to evaluate the impacts to groundwater from changing land use, projects, and management actions, and to support the establishment of sustainability criteria. The model updates include:

- Expansion of the model grid
- Updated drain elevations to reflect the average elevation of the agricultural drains, as documented in the Drain Study
- Review and update the natural infiltration recharge component.
- Future demand and water supply conditions have been updated based on new information.

- Updated climate change forecasts for future conditions.

10.6. SUSTAINABLE MANAGEMENT

Groundwater conditions with respect to previously set SMCs will be discussed. New SMCs for indicators such as saltwater intrusion may also be considered. Another consideration will be given to SMCs for water levels to allow for more operational flexibility in parts of the basin. Recent settlement agreements over groundwater pumping in the West Valley may result in short term increases in groundwater pumping. An analysis will be conducted to confirm if lower MTs in this area still serve to protect the basin for any undesirable results (URs).

10.7. MONITORING NETWORK UPDATE

The 2022 Plan's monitoring programs will be updated to reflect progress toward filling data gaps. This update of the monitoring network (including the Key Wells for groundwater levels) with the collection of data of sufficient quality, distribution, and frequency to characterize groundwater and related surface water conditions and to track changes, including short-term, seasonal, and long-term trends. We will also review and update monitoring protocols. Existing monitoring networks and protocols used by the GSAs provide a strong starting point for the Plan Update. To respond to the DWR Recommended Corrective Action 2 (to be consistent with the SGMA Portal Monitoring Network Module), the SGMA portal will be updated to reflect any changes in the water level and water quality representative networks.

10.8. REGULATORY OR POLICY ISSUES

The 2027 Alternative Plan will include a summary of new regulatory or policy issues relevant to water resources management of the Indio Subbasin. Potential challenges to water management in the Indio Subbasin were identified in the 2010 WMP and 2022 Alternative Plan. These include water quality challenges (salinity management and new COCs), Salton Sea restoration, climate change, and subsidence, among others. This section will include review of previously identified emerging issues and new issues with the GSAs and development of approaches and narratives to address these concerns, including:

- Assessment of SNMP status
- Discussion of Drain Flow is not a reasonable Sustainability Indicator
- Identification of additional emerging concerns

10.9. PLAN IMPLEMENTATION PROGRESS

PMAs from the 2022 Alternative Plan or new PMAs from the GSAs that are deemed as sustainable and reliable sources of water will be updated. Analyses will include updates to water supplies added (average yield, reliability, and variability), estimated project and unit water costs, project schedule, potential challenges, and water quality components. This

section will evalutate up to 30 potential projects aimed at providing long-term water supply solution for the Indio Subbasin.

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Appendix 1-B

2027 Indio Subbasin Alternative Plan Outreach and Engagement Plan



Indio Subbasin Water Management Plan Update: SGMA Alternative Plan

Outreach and Engagement Plan

Indio Subbasin Groundwater Sustainability Agencies
CVWD, CWA, DWA, IWA
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October 2026

RINCON CONSULTANTS

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1 Introduction

In 2014, the California Legislature enacted the Sustainable Groundwater Management Act (SGMA) to provide a framework for sustainable groundwater management. To implement SGMA in the Indio Subbasin of the Coachella Valley Groundwater Basin, four local water agencies formed Groundwater Sustainability Agencies (GSAs): Coachella Valley Water District (CVWD), Coachella Water Authority (CWA), Desert Water Agency (DWA), and Indio Water Authority (IWA). In 2016, the Indio Subbasin GSAs entered into a Memorandum of Understanding for collaborative management of the Indio Subbasin under SGMA. As required by SGMA, the GSAs are preparing a five-year update of the groundwater management plan for the Indio Subbasin. Outreach and engagement is a required element SGMA and thus is conducted as part of the current plan update. This Outreach and Engagement Plan describes the strategies and activities used to support meaningful participation in the current effort.

In December 2016, CVWD, CWA, DWA, and IWA submitted to the California Department of Water Resources (DWR) a *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin (Bridge Document)* (Indio Subbasin GSAs, 2016), which included submittal of the *2010 Coachella Valley Water Management Plan Update* (*2010 CVWMP Update*) (CVWD, 2010). *The Bridge Document* explained to DWR how the *2010 CVWMP Update* was functionally equivalent to a Groundwater Sustainability Plan (GSP) and meets the requirements of SGMA. In its review and subsequent approval of the *Bridge Document*, DWR provided an *Alternative Assessment Staff Report* (DWR, 2019) for the Indio Subbasin. This DWR Assessment summarized the principles of its review, the materials submitted as the Alternative Plan, and the required conditions for approval. The DWR Assessment also provided detailed description and evaluation of the Alternative Plan contents as a functional equivalent to a GSP.

SGMA also requires five-year updates for all GSPs and Alternative Plans that assess the plan's implementation status and ensure groundwater is being managed in a sustainable manner. In December 2021, the *2022 Indio Subbasin Water Management Plan Update: SGMA Alternative Plan (2022 Alternative Plan Update)* was submitted to DWR (Indio Subbasin GSAs, 2021). The *2022 Alternative Plan Update* approved by DWR in June 2024 with several recommended corrective actions to be addressed in the next periodic evaluation, to be submitted by December 29, 2026.

As required under SGMA, the GSAs are preparing a *2027 Indio Subbasin Water Management Plan Update: SGMA Alternative Plan* (*2027 Alternative Plan Update)* addressing DWR's recommended corrective actions and evaluating plan implementation for submittal to DWR in December 2026. This appendix summarizes outreach and engagement activities conducted by the Indio Subbasin GSAs to inform and support development of the *2027 Alternative Plan Update*.

2 Interest-Holder Identification

The interest-holder contact list developed for the *2022 Alternative Plan Update* served as the basis for outreach and engagement during the current planning cycle. The contact list was reviewed and updated to reflect current organizations, representatives, and contact information and to remove contacts that were no longer applicable or could not be verified.

The updated Interest-holder contact list includes local, regional, state, and federal agencies; water and wastewater agencies; neighboring groundwater management entities; Tribal governments and representatives; cities and Riverside County departments; community councils; community-based and environmental justice organizations; business, agricultural, recreational, and industry interests; academic institutions; consultants; and Interest individuals. The contact list was updated throughout preparation of the *2027 Alternative Plan Update* as additional or revised contact information became available.

Targeted outreach was conducted with Tribal governments and representatives in the region through the Indio Subbasin SGMA Tribal Workgroup. At each quarterly meeting of the SGMA Tribal Workgroup, progress on the planning process was presented to the Agua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Cabazon Band of Mission Indians, Morongo Band of Mission Indians, Torres-Martinez Desert Cahuilla Indians, Twenty-Nine Palms Band of Mission Indians, and the U.S. Bureau of Indian Affairs, as applicable.

The organizations that are currently a part of the interest holder list are found in Table B-1.

3 Outreach and Engagement Activities

Outreach and engagement activities were conducted to facilitate meaningful participation by Interest holders, Tribal representatives, and the general public throughout preparation of the *2027 Alternative Plan Update*. Activities were designed to build awareness and understanding of SGMA and groundwater sustainability, share technical information, solicit data and input, and provide opportunities to ask questions and discuss groundwater management priorities with the GSAs.

Questions and comments could be provided verbally during meetings or submitted in writing at any time during the planning process. The project team conducted targeted follow-up, as appropriate, to respond to questions and provide additional information. An outreach letter was also distributed to land use agencies to describe the *2027 Alternative Plan Update*, explain coordination responsibilities under SGMA, request review of demographic and growth information, and invite agency representatives to participate in workshops and join the Interest-holder email list.

3.1 Alternative Plan Update Website

The Indio Subbasin SGMA website (https://www.indiosubbasinsgma.org/) was maintained and updated throughout preparation of the *2027 Alternative Plan Update* to provide a centralized source of project information and document outreach and engagement activities. The website provides information about SGMA, the planning process, the GSA partners, public meetings, project materials, and groundwater data and information.

The website allows Interest persons to subscribe to a mailing list for project news and announcements. This feature supplements direct distribution to the maintained Interest-holder contact list and provides another means of notifying the broader public about workshops, meetings, newly available materials, and other engagement opportunities. Outreach materials and announcements were provided in English and Spanish, as appropriate, and translation support was made available to support participation.

3.2 Community Workshops

Four community workshops were conducted for the *2027 Alternative Plan Update*. The workshops informed Interest holders and the general public about project progress, presented technical information, solicited data and input, and provided opportunities to ask questions and comment on key planning topics. The October 2025 workshop was conducted in a hybrid format with both in-person and virtual participation. Based on feedback from participants, the April, September, and November 2026 workshops were held virtually via Zoom. Meeting materials and recordings are available on the Indio Subbasin SGMA website (https://www.indiosubbasinsgma.org/).

1. **Monday, October 20, 2025** (hybrid)
2. **Wednesday, April 29, 2026** (virtual via Zoom)
3. **Thursday, September 17, 2026** (virtual via Zoom)
4. **Tuesday, November 3, 2026** (virtual via Zoom)

In addition, two further outreach presentations were conducted to solicit additional feedback and provide increased opportunity for engagement, described in Section 2.4 below.

3.3 Tribal Workshops

Four separate workshops were conducted with Tribal governments and representatives through the Indio Subbasin SGMA Tribal Workgroup. These meetings supported focused discussion of water-resource issues and needs and provided opportunities to review information associated with the *2027 Alternative Plan Update*. With the exception of the fourth workshop, SGMA Tribal Workgroup meetings were held on the same days as the general community workshops later in the day.

1. **Monday, October 20, 2025** (hybrid)
2. **Wednesday, April 29, 2026** (virtual via Zoom)
3. **Thursday, September 17, 2026** (virtual via Zoom)
4. **Monday, November 2, 2026** (virtual via Zoom)

3.4 Additional Outreach

In addition to the Community and Tribal Workshops, two further outreach presentations were conducted to solicit additional feedback and provide increased opportunity for engagement.

To receive local input on the agricultural demand forecast, the GSAs conducted outreach to Coachella Valley Irrigated Lands Coalition, a membership-based organization of local farmers. The Agricultural demand methodology and projection was presented at a membership meeting on **Wednesday, January 28, 2026**. No comments were received during the outreach process.

A community meeting was held on **Wednesday, March 11, 2026** to discuss the *Indio Subbasin Annual Report for Water Year 2024-2025*. This meeting provided an additional opportunity for public participation related to the *2027 Alternative Plan Update*.

4 Public Workshop Summaries

The following sections provide brief summaries of the three public community workshops held to support development of the *2027 Alternative Plan Update*. The same materials were presented at the corresponding Community and Tribal workshops. Details regarding questions raised during the workshops are noted in the workshop-specific summaries below.

4.1 October 20, 2025- Hybrid Meeting

The first public workshop for the *2027 Alternative Plan Update* was held on Monday October 20, 2025 in a hybrid format (Zoom and in-person). The session introduced SGMA, reviewed the Indio Subbasin's water management history, and outlined the scope and timeline for updating the Alternative Plan, which is due to DWR by January 2027. Key topics included groundwater sustainability goals, demand and supply projections through 2050, and planned projects and management actions such as groundwater replenishment, source substitution, and conservation programs.

Interactive polls revealed a mixed level of familiarity of groundwater management with 50% reporting very familiar, 30% unfamiliar, and 20% somewhat familiar and highlighted public interest in desert landscaping, turf replacement, and water recycling as preferred conservation measures. Participants expressed particular interest in modeling, scenario planning, and tribal outreach components of the plan.

Questions and comments during the meeting raised concerns about paused replenishment at the Thomas E. Levy facility and concerns about how evaporation rates are calculated. Additional comments emphasized the impact of short-term vacation rentals on water demand, and the importance of Colorado River water replenishment in maintaining basin sustainability. These concerns will be considered as the plan update progresses. To review the workshop materials or view the workshop recording please visit https://www.indiosubbasinsgma.org/get-involved-faq/. No questions or discussion were raised during the corresponding Tribal workshop.

4.2 April 29, 2026- Virtual Meeting

The second public workshop for the *2027 Alternative Plan Update* was held on Wednesday, April 29, 2026, in a virtual format (Zoom). The session reviewed groundwater recharge modeling and model calibration, the basin demand forecast, and available water supply sources. Presenters explained that overall demand is projected to remain relatively stable through 2050, with increases in urban and golf course demand largely offset by declines in agricultural demand. The workshop also outlined upcoming project tasks, including future conditions modeling, evaluation of sustainable management criteria, scenario development, and preparation of the Alternative Plan for public review.

Interactive polls highlighted strong participant interest in the demand forecast. When asked about the factors likely to have the greatest influence on future water use, participants most frequently identified climate change and population growth. Participants also indicated that email updates were their preferred method for staying informed about the project, followed by the project website, social media, and community meetings.

Questions and comments raised during the meeting included questions about how Tribal communities and reservation lands are represented in demand forecasts, whether the projected supply-demand difference is significant, how written comments can be submitted, and where airborne electromagnetic (AEM) survey data can be accessed. In response, the project team stated that it would explore opportunities to separately present projections for reservation lands, explained that the basin water balance incorporates additional groundwater inflows beyond local supplies, encouraged stakeholders to submit written comments by email, and noted that raw AEM data is available through DWR. To review

workshop materials or view the workshop recording, please visit https://www.indiosubbasinsgma.org/get-involved-faq/.

4.3 September 17, 2026- Virtual Meeting

The third public workshop for the *2027 Alternative Plan Update* was held on September 17, 2026, in a virtual format (Zoom). The session provided an update on the Indio Subbasin groundwater model, reviewed planned projects and management actions, and discussed how the *2027 Alternative Plan Update* will be implemented. Presenters described refinements to the historical groundwater model, including improved coordination with the neighboring San Gorgonio Pass Subbasin, incorporation of quarterly stress periods to better represent seasonal conditions, and enhanced representation of groundwater pumping. The historical water budget showed an overall increase in groundwater storage between 2010 and 2025, with storage declines during the dry conditions of 2022 offset by recovery during wetter years, including 2023 and 2024.

The workshop also presented preliminary results from future-condition modeling through 2085. The project team explained that six future scenarios are being evaluated using two climate projections and three project implementation scenarios to assess a range of potential groundwater conditions. Participants learned about the four primary categories of projects and management actions (PMAs), including water conservation, water supply development, source substitution and groundwater replenishment, and water quality protection. Presenters emphasized that PMAs will continue to be adapted as monitoring data and new information become available. The session concluded with a discussion of implementation priorities, including maximizing available Colorado River supplies, improving State Water Project reliability, expanding recycled water and other non-potable uses, continuing replenishment and source substitution programs, and managing salt and nutrient impacts. The team also outlined next steps, including refining the groundwater model, releasing the draft Alternative Plan Update for public review, and holding a final public workshop to discuss model results and the draft plan.

Interactive polls asked participants whether they had attended previous workshops, what groundwater information they found most valuable, which PMAs they would prioritize, how they preferred to receive project updates, and what groundwater management issues were most important to them. Responses indicated strong interest in future groundwater conditions and a balanced approach to groundwater management, with maintaining a reliable water supply identified as a key priority.

Questions and comments raised during the meeting focused on groundwater modeling assumptions, future water supplies, and project implementation. Participants asked how Colorado River reliability was incorporated into the model, how groundwater storage can increase despite reduced replenishment at the Thomas E. Levy facility, how evaporation and future development projects are reflected in water-demand forecasts, and whether project diagrams would ultimately show the amount of water associated with each project. Additional questions addressed whether results were reported by calendar year or water year, whether the latest Colorado River operating guidelines were incorporated into the analysis, and whether an evaporation-reducing product had previously been used at recharge facilities. The project team explained that the modeling incorporates assumptions regarding Colorado River and State Water Project supplies, accounts for evapotranspiration and groundwater recharge across the basin, and uses water-year reporting consistent with SGMA planning and annual reporting. They also noted that the draft plan will include modeled quantities and committed to follow up on questions that could not be addressed during the workshop. To review workshop materials or view the workshop recording, please visit https://www.indiosubbasinsgma.org/get-involved-faq/.

4.4 November 2 and November 3, 2026- Virtual Meeting

This section will be updated following the completion of the final Community and Tribal workshops.

5 Implementation Timeline

The following timeline summarizes communications and engagement activities conducted for the *2027 Alternative Plan Update*.

- **Fall 2025** – The *2027 Alternative Plan Update* was initiated. Outreach and engagement planning began, the interest-holder contact list was reviewed and updated, and the land use agency outreach letter was distributed. Initial outreach also included project email updates and a SGMA fact sheet describing the planning background and project timeline.
- **October 20, 2025** – Community Workshop #1 and a separate SGMA Tribal Workshop were held in a hybrid format with in-person and virtual participation. The workshop introduced the *2027 Alternative Plan Update*, described the project objectives, and outlined the anticipated schedule.
- **January 28, 2026**– A presentation on agricultural demand methodology was given at the Coachella Valley Irrigated Lands Coalition membership meeting.
- **March 11, 2026** – An community meeting on the *Indio Subbasin Annual Report for Water Year 2024-2025* was held, including a separate meeting with Tribal governments and representatives.
- **April 29, 2026** – Community Workshop #2 was held virtually via Zoom, and a separate SGMA Tribal Workshop was conducted.
- **September 17, 2026** – Community Workshop #3 was held virtually via Zoom, and a separate SGMA Tribal Workshop was conducted.
- **November 2, 2026** – Final SGMA Tribal Workshop will be held virtually via Zoom.
- **November 3, 2026** – Final Community workshop will be held via Zoom.
- **November 2026** – The Indio GSAs will hold study sessions with their Boards to review the *2027 Alternative Plan Update* findings.
- **December 2026** – The Indio GSAs will hold public hearings with their Boards to consider adoption of the *2027 Alternative Plan Update*.

Throughout 2025 and 2026, ongoing stakeholder engagement activities included website maintenance, Interest-holder e-mail notifications, bilingual outreach efforts, disadvantaged community outreach, tribal coordination, and GSA meetings.

Table B-1 Interest Holders Invited to Participate in 2027 Alternative Plan Update

Organization
Academia
California State University, San Bernardino
Center for Collaborative Policy
Deep Canyon Desert Research
Loma Linda University
University of California, Irvine School of Law's Community & Economic Development Clinic
Cities
Cathedral City
City of Cathedral City
City of Coachella
City of Desert Hot Springs
City of Indian Wells
City of Indio
City of La Quinta
City of Palm Desert
City of Palm Springs
City of Rancho Mirage
Community Councils
Bermuda Dunes Community Council
Desert Edge Community Council
Desert Palms Community Council
Indio Hills Community Council
Mecca Community Council
North Shore Community Council
Oasis Community Council
Sky Valley Community Council
Thermal Community Council
Thousand Palms Community Council
Vista Santa Rosa Community Council
County of Riverside
Coachella Valley Economic Partnership
County of Riverside
County of Riverside Economic Development Agency
Riverside County Flood Control and Water Conservation District
Riverside County Office of Economic Development
Riverside County Transportation
Riverside County Transportation and Land Management Agency
Supervisor Chuck Washington's Office
Supervisor Marion Ashley's Office
Supervisor V. Manuel Perez’s Office

Organization
County of San Bernadino
Big Morongo Preserve
Coachella Valley Regional Water Management Group
Coachella Valley Water District
Coachella Water Authority
Desert Water Agency
Indio Water Authority
Mission Springs Water District
Valley Sanitary District
Disadvantaged Community Organizations
Building Healthy Communities
Clean Water Action
Desert Alliance for Community Empowerment
El Sol Neighborhood Educational Center
Environmental Justice Coalition for Water
Inland Congregations United for Change
Leadership Counsel for Justice & Accountability
Poder Popular
Pueblo Unido Community Development Corporation
Rural Community Assistance Corporation
Elected Officials
Congressman Raul Ruiz (36th Dist.)
Federal Agencies
Bureau of Indian Affairs
Indian Health Service
United States Bureau of Land Management
United States Department of Agriculture
United States Geological Survey
Local Government Agencies
Coachella Valley Association of Governments
Coachella Valley Association of Governments / Coachella Valley MSHCP
Coachella Valley Conservation Commission
Coachella Valley Mosquito and Vector Control District
Coachella Valley Mountains Conservancy
Coachella Valley Parks and Recreation District
Coachella Valley Resource Conservation District
Coachella Valley Unified School District
Desert Healthcare District
Desert Sands Unified School District
East Valley Housing Review Committee
Palm Springs Unified School District

Organization
Other Water/Wastewater Entities
Myoma Dunes Mutual Water Company
Salton Community Services District
Private Pumpers and Large Irrigators
Agricultural Pumpers
Homeowner Associations
Golf Courses
Nurseries
Special Interest Groups
Bighorn Research Institute
Building Industry Association
California Rural Legal Assistance
Catholic Charities San Bernadino & Riverside Counties
Center for Natural Land Management
Clinicas de Salud del Pueblo
Coachella Valley Archaeological Society
Coachella Valley Housing Coalition
Coast Keeper
Community Water Center
Council of Mexican Federations in North America
Desert Eco Tours
Desert Highland Gateway Health & Wellness
Friends of the Desert Mountains
Greener Golf
Groundwater Guardians
Hi-Lo Golf Course Superintendents Association
Inter-Tribal Council of California
League of Women Voters
Lideres Campesinas
Salton Sea Coalition Water
Sierra Club
South Coast Air Quality Management District Environmental Justice Advisory Group
Southern California Golf Association
The Nature Conservancy in California
The Wildlands Conservancy
State of California
California Department of Fish and Wildlife
California Department of Housing and Community Development
California Department of Water Resources
Regional Water Quality Control Board, Colorado River Region

Organization
Tribes
Agua Caliente Band of Cahuilla Indians
Augustine Band of Cahuilla Indians
Cabazon Band of Mission Indians
Morongo Band of Mission Indians
Torres Martinez Desert Cahuilla Indians
Twenty-Nine Palms Band of Mission Indians

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Appendix 1-C

Memorandum of Understanding Regarding Governance of the Indio Sub-Basin Under the Sustainable Groundwater Management Act

MEMORANDUM OF UNDERSTANDING
REGARDING GOVERNANCE OF THE INDIO SUB-BASIN
UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

This memorandum of understanding (MOU) is entered into among the City of Coachella, a municipal corporation acting through, and on behalf of, the Coachella Water Authority (CWA), the Coachella Valley Water District (CVWD), the Desert Water Agency (DWA), and the City of Indio, a municipal corporation acting through, and on behalf of, the Indio Water Authority (IWA) for the purpose of developing a common understanding among the Partners regarding the governance structures applicable to implementation of the Sustainable Groundwater Management Act (Water Code, Part 2.74, Section 10720 et seq.) (SGMA) in the Indio Sub-Basin of the Coachella Valley Groundwater Basin. The Partners to this MOU shall be collectively referred to herein as "Partners" and individually as "Partner".

WHEREAS, SGMA requires all groundwater basins designated as high or medium priority to be managed under a groundwater sustainability plan (GSP), under coordinated GSP's, or under an approved "alternative";

WHEREAS, the California Department of Water Resources (DWR) has designated the Coachella Valley Groundwater Basin, Indio Sub-Basin (Bulletin 118, No. 7-21.01) ("Indio Sub-Basin" or the "Sub-Basin") as a medium priority basin; and,

WHEREAS, the service area of each of the Partners overlies over a portion of the Indio-Sub-Basin;

WHEREAS, SGMA provides that "any local agency or combination of local agencies overlying a groundwater basin may elect to be a groundwater sustainability agency [GSA] for that basin" and that GSA's are to be formed no later than June 30, 2017;

WHEREAS, under SGMA, DWA has been deemed the exclusive local agency with the power to implement SGMA within DWA's statutory boundaries, unless DWA elects to "opt out of being the exclusive groundwater management agency within its statutory boundaries" (Water Code, § 10723(c)(2));

WHEREAS, each of the Partners plans to become a separate GSA or groundwater management agency for portions of the Indio Sub-Basin: and

WHEREAS the Partners desire to reach a common understanding with respect to the future SGMA governance structure of the Indio Sub-Basin to maximize coordination and minimize potential areas of disagreement.

NOW, THEREFORE, it is mutually understood and agreed as follows:

SECTION 1:

AUTHORITY OF THE PARTNERS

1.1 Coachella Water Authority is a joint powers authority formed as a component of the City of Coachella and the Housing Authority of the City of Coachella and has statutory authority over water supply.

1.2 Coachella Valley Water District is a public agency of the State of California organized and operating under the County Water District Law, California Water Code section 30000, et seq, and the Coachella Valley Water District Merger Law, Water Code section 33100, et seq. Coachella Valley Water District has groundwater management powers under its enabling legislation and other applicable law.

1.3 Desert Water Agency is an independent special district created by a special act of the State Legislature contained in chapter 100 of the appendix of the California Water Code. Desert Water Agency is empowered to replenish local groundwater supplies and collect assessments necessary to support a groundwater replenishment program as provided for in the Desert Water Agency Law, and has statutory authority over water supply.

1.4 Indio Water Authority is a joint powers authority formed as a component of the City of Indio and Housing Authority of the City of Indio and has statutory authority over water supply.

SECTION 2:

PURPOSES AND GOALS OF THIS MOU

2.1. This MOU is to memorialize the intent of the Partners to coordinate and cooperate regarding implementation of SGMA within their respective jurisdictions to ensure that the sustainability goals of SGMA are met within the Indio Sub-Basin. This MOU is intended to encourage cooperation and coordination regarding management of the Indio Sub-Basin, and to improve and maintain overall communication between the Partners involved. It is anticipated that coordination and information sharing among the Partners will assist in achieving their respective missions to the overall well-being of the Sub-Basin.

2. 2 Each Partner shall have the sole and exclusive right to determine whether, and if so when, it will elect to be a GSA or, in the case of DWA, the exclusive local agency with powers to implement SGMA for the portion of the Indio Sub-Basin underlying its statutory boundaries.

2. 3 Subject to SGMA and any other applicable laws, the Partners agree that if a Partner elects not to become a GSA for the portion of the Sub-Basin underlying its service area by June 30, 2017, the other Partners will not object should such Partner later seek to become a GSA on or after July 1, 2017.

2. 4 The Partners agree to coordinate to ensure, to the greatest extent feasible, that there are no overlapping boundaries among the recognized GSA's governing the Sub-Basin. The Partners further agree to cooperate regarding any contemplated Sub-Basin boundary modification requests that may be pursued that affect their respective GSA boundaries or groundwater management service areas.

2. 5 Should any Partner withdraw or cease being a GSA, the other Partners shall have the first opportunity to become the GSA for the abandoned area of the Sub-Basin before such area would potentially fall under the groundwater management jurisdiction of the County of Riverside, the State of California, or other entity pursuant to SGMA; provided that the service area of the abandoned area is within the service area of the Partner seeking to become the new GSA for the abandoned area.

2. 6 Nothing in this MOU is intended to affect the statutory powers granted under SGMA or any other law to any of the Partners, or to a GSA or local agency duly formed by any Partner. Nothing in this MOU shall affect any existing authorities or powers of the Partners existing under each Partner's enabling legislation or otherwise.

2. 7 Each Partner shall be responsible for the adoption and enforcement of any ordinances, bylaws or other legally enforceable action taken by any GSA it forms or local agency with authority to implement SGMA. None of the actions or decisions of one Partner shall be attributable to the other Partners.

2. 8 The Partners acknowledge and agree that a pre-existing, approved water management plan or plans (WMP) has been prepared and adopted that covers the Indio Sub-Basin. The Partners acknowledge and agree that CVWD individually or with Partners has the right to submit the WMP(s) as a potential "alternative" to a GSP for the portion of the Sub-Basin within their respective GSA boundaries or local agency boundaries. (See Water Code, section 10733.6.) The Partners agree to support, and not object, to the submission of the currently approved WMP(s) as an alternative to a GSP. Should modifications or amendments to the WMP(s) become necessary to meet the alternative compliance procedures outlined in SGMA or for other reasons, the Partners agree to the following:

2.8.1 MWH America's Inc. (MWH), the consultant who completed the pre-existing, approved water management plan is the most qualified consultant to complete an alternative GSP.

2.8.2 MWH has provided a scope of work, fees that have been agreed to by the Partners.

2.8.3 CVWD shall retain MWH to prepare an alternative Plan for an amount not to exceed $112,723, without prior authorization.

2.8.4 CVWD shall invoice each Partner for reimbursement of one-fourth (1/4) of the cost of GSP alternative Preparation which is an amount equal to $28,180.75.

2.8.5 The Partners agree to coordinate their implementation of SGMA in the Sub-Basin whether or not DWR approves the alternative, in whole or in part.

2.8.6 The Partners acknowledge that by virtue of commitments and intentions stated within this MOU, the need to share additional costs shall be addressed in future amendments to this MOU.

2. 9 Unless otherwise agreed to by the Partners in the future, each Partner shall absorb its own costs related to implementation of this MOU.

2. 10 By signing this MOU each of the Partners commits to sharing the responsibility and the resources necessary to comply with SGMA in the Sub-Basin under the statutory, regulatory and other applicable timelines, including but not limited to attending scheduled meetings, providing comments and other deliverables on time, and otherwise fully participating in the process.

2. 11 The Partners acknowledge that SGMA may require the Partners to enter into future agreements, including a coordination agreement, to fully implement SGMA in the Indio Sub-Basin.

SECTION 3:

JOINT PLANNING FOR SGMA IMPLEMENTATION

3.1 It is the intent of the Partners that they coordinate and collaborate to address the common issues identified in this MOU. The Partners may develop and implement governance objectives, projects and programs under SGMA individually or jointly, or enter into additional agreements in furthering those goals.

3.2 It is the intent of the Partners to meet on at least a quarterly basis in order to carry out the purposes and goals of this MOU. The frequency and location of meetings are subject to the discretion of the Partners and may be changed whenever appropriate.

SECTION 4:

GENERAL PROVISIONS GOVERNING MOU

4.1 Term: The term of this MOU shall be from the date the second Partner signs this MOU ("Effective Date"). This MOU shall be effective as to any Partners that execute it, whether or not all named Partners execute it.

4.2 Termination. Any Partner may terminate its participation in this MOU upon thirty (30) days prior written notice to the other Partners for any reason or no reason. Any Partner terminating or otherwise ceasing its participation in this MOU shall be responsible for its share of the costs, as set forth herein, which are incurred on or before the effective date of said termination.

4.3 Construction of Terms: This MOU is for the sole benefit of the Partners and shall not be construed as granting rights to any person other than the Partners or imposing obligations on a Partner to any person other than another Partner.

4.4 Good Faith: Each Partner shall use its best efforts and work wholeheartedly and in good faith for the expeditious completion of the objectives of this MOU and the satisfactory performance of its terms.

4.5 Rights of the Partners and Constituencies: This MOU does not contemplate the Partners taking any action that would adversely affect the rights of any Partners, or adversely affect the customers or constituencies of any Partners.

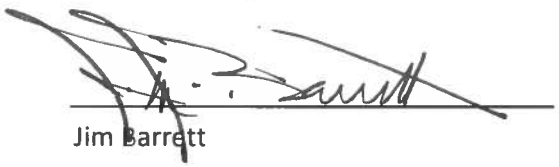
4.6 Partner Discretion. Participation in this MOU shall not restrict any Partner's authority and discretion to continue its own planning and undertake its own efforts to secure SGMA, Proposition 1 or other funding from any other source.

4.7 Necessary Actions. Each Partner agrees to execute and deliver additional documents and instruments and to take any additional actions as may be required to carry out the purposes of this MOU.

4.8 Third Party Beneficiaries. This MOU shall not create any right or interest in any non-Partner or in any member of the public as a third-party beneficiary.

4.9 Counterparts. This MOU may be executed in one or more counterparts, each of which shall be deemed to be an original

IN WITNESS WHEREOF, the Partners have executed this MOU as of the day and year indicated on the first page of this MOU.



Jim Barrett

Coachella Valley Water District

David Garcia

Coachella Water Authority

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

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Jim Barrett	David Garcia
Coachella Valley Water District	Coachella Water Authority
Mark Krause	Brian Macy
Desert Water Agency	Indio Water Authority

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Jim Barrett	David Garcia
Coachella Valley Water District	Coachella Water Authority
Mark Krause	Brian Macy
Desert Water Agency	Indio Water Authority

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4.9 Counterparts. This MOU may be executed in one or more counterparts, each of which shall be deemed to be an original

IN WITNESS WHEREOF, the Partners have executed this MOU as of the day and year indicated on the first page of this MOU.

Jim Barrett	David Garcia
Coachella Valley Water District	Coachella Water Authority
Mark Krause	Brian Macy
Desert Water Agency	Indio Water Authority

SUPPLEMENT TO
MEMORANDUM OF UNDERSTANDING
REGARDING GOVERNANCE OF THE INDIO SUB-BASIN
UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

This SUPPLEMENT dated April 3, 2018 is entered into among the City of Coachella, a municipal corporation acting through, and on behalf of, the Coachella Water Authority (CWA), the Coachella Valley Water District (CVWD), the Desert Water Agency (DWA), and the City of Indio, a municipal corporation acting through, and on behalf of, the Indio Water Authority (IWA) for the purpose of developing a common understanding among the Partners regarding the governance structures applicable to implementation of the Sustainable Groundwater Management Act (Water Code, Part 2.74, Section 10720 et seq.) (SGMA) in the Indio Sub-Basin of the Coachella Valley Groundwater Basin. The Partners to this MOU shall be collectively referred to herein as "Partners" and individually as "Partner".

WHEREAS, each Partner is a party to a Memorandum of Understanding (MOU) regarding governance of the Indio Sub-basin under SGMA; and

WHEREAS, the Partners wish to supplement the MOU for the purpose of retaining consultants to assist in the preparation of Groundwater Sustainability Agency (GSA) annual reports by water year for the Indio Sub-basin for submission to the California Department of Water Resources (DWR) by April 1 of each year to satisfy SGMA requirements;

NOW, THEREFORE, it is mutually understood and agreed as follows:

SECTION 1:

RETENTION OF CONSULTANTS AND AGREEMENTS

1.1 The Partners acknowledge and agree that DWR has required that all GSAs who have submitted an Alternative Groundwater Sustainability Plan (Alternative GSP) prepare and submit an Annual Report for Water Year 2017 (October 1, 2016 – September 30, 2017) to DWR by April 1, 2018 in accordance with SGMA. The Partners agree to the following:

1.1.1 Stantec Consulting Services Inc. (Stantec, formerly MWH America's Inc.), the consultant who completed work needed to submit the Indio Sub-basin Alternative GSP, has provided the scope of work and fee schedule included in Exhibit 1 for the preparation of the GSAs Annual Report for the Indio Sub-basin for Water Year 2017.

1.1.2 The Partners have agreed to have CVWD retain Stantec to prepare the GSAs Annual Report for the Indio Sub-basin for Water Year 2017 for an amount not to exceed $63,260, without prior authorization of the Partners.

1.1.3 CVWD shall invoice each Partner for reimbursement of one-fourth (1/4) of the cost of the preparation of the Annual Report for the Indio Sub-basin for Water Year 2017 which is an amount equal to $15,815.

SECTION 2:

INVOICING AND PAYMENT

2.1. CVWD shall administer Agreements and pay consultants per the terms of the Agreements as approved by the Partners, and then invoice each Partner for reimbursement of one-fourth (1/4) of the payment that has been made to the consultants.

2. 2 Each Partner shall pay the invoice within 30 days of receipt of the invoice.

SECTION 3:

MISCELLANEOUS

3.1 Abbreviations, capitalized words, and phrases used in this supplement shall have the same meaning as in the MOU.

3.2 All terms of the MOU remain unchanged, except, as supplemented herein.

3.3 This Supplement may be executed in any number of counterparts, each of which shall be deemed original, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, the Partners have executed this Supplement as of the day and year indicated on the first page of this MOU.

J. M. Barrett 6/27/18

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

J.M. Barrett

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark A. Krause

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

J.M. Barrett

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

J.M. Barrett

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

SECOND SUPPLEMENT TO
MEMORANDUM OF UNDERSTANDING
REGARDING GOVERNANCE OF THE INDIO SUB-BASIN
UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

This SECOND SUPPLEMENT dated October 29, 2018 is entered into among the City of Coachella, a municipal corporation acting through, and on behalf of, the Coachella Water Authority (CWA), the Coachella Valley Water District (CVWD), the Desert Water Agency (DWA), and the City of Indio, a municipal corporation acting through, and on behalf of, the Indio Water Authority (IWA) for the purpose of developing a common understanding among the Partners regarding the governance structures applicable to implementation of the Sustainable Groundwater Management Act (Water Code, Part 2.74, Section 10720 et seq.) (SGMA) in the Indio Sub-Basin of the Coachella Valley Groundwater Basin. The Partners to this MOU shall be collectively referred to herein as "Partners" and individually as "Partner".

WHEREAS, each Partner is a party to a Memorandum of Understanding (MOU) dated October 5, 2016 regarding governance of the Indio Sub-basin under SGMA; and

WHEREAS, each Partner is a party to a Supplement to MOU dated April 3, 2018 for the purpose of retaining a consultant to assist in preparing the Groundwater Sustainability Agency's (GSA's) Indio Sub-basin Annual Report for Water Year 2016-2017 in accordance with SGMA; and

WHEREAS, the Partners wish to supplement the MOU a second time for the purpose of retaining consultants to assist in the preparation of the GSA's Indio Sub-basin Annual Reports by Water Year for submission to the California Department of Water Resources (DWR) by April 1 of each year to satisfy SGMA requirements; and

WHEREAS, the Partners wish to supplement the MOU a second time for the purpose of retaining consultants to assist in updates and revisions identified and required by the DWR of the Alternative Groundwater Sustainability Plan (Alternative GSP) for the Indio Sub-basin to satisfy SGMA requirements;

NOW, THEREFORE, it is mutually understood and agreed as follows:

SECTION 1:

RETENTION OF CONSULTANTS AND EXECUTION OF AGREEMENTS

1.1 The Partners acknowledge and agree that DWR has required that the GSAs prepare and submit an annual report by April 1 of each year for the previous Water Year (October 1 through September 30) to DWR in accordance with SGMA. The Partners therefore agree to the following:

1.1.1 The Partners agree to have CVWD develop a scope of work by the end of each Water Year for the preparation of the GSA's Indio Sub-basin Annual Report for the previous Water Year.

1.1.1.1 Each Partner shall have the opportunity to review the scope of work and provide comments for inclusion prior to release in a Request for Proposals (RFP) or Bid Package.

1.1.2 The Partners agree to have CVWD release an RFP or Bid Package in accordance with all Procurement Policies of the CVWD to solicit proposals from qualified consultants for the preparation of the GSA's Indio Sub-basin Annual Report for the previous Water Year. For the purposes of this Second Supplement to the MOU, qualified consultants consist of firms competitively selected and contracted by CVWD for on-call hydrogeological services.

1.1.2.1 Each Partner shall have the opportunity to review and score the proposals received from each respondent to the RFP or Bid Package for the selection of the consultant.

1.1.3 The Partners agree to have CVWD enter into Agreements with selected consultants in accordance with all Procurement Policies of the CVWD to prepare the GSA's Indio Sub-basin Annual Report for each Water Year.

1.1.3.1 Each Partner shall have the opportunity to review and comment on the Draft Annual Report and the Draft Final Annual Report.

1.1.3.2 Each Partner shall be provided one electronic and one hard copy of the Final Annual Report.

1.1.3.3 Each Partner shall be provided electronic copies of all data and files used to create report graphics and tables.

1.2 The Partners acknowledge and agree that DWR may periodically notify the GSAs to perform updates, revisions, or modifications to the Alternative GSP in accordance with SGMA. The Partners therefore agree to the following:

1.2.1 The Partners agree to have the CVWD develop a scope of work to perform required updates, revisions, or modifications to the Alternative GSP.

1.2.1.1 Each Partner shall have the opportunity to review the scope of work and provide comments for inclusion prior to release in a Request for Proposals (RFP) or Bid Package.

1.2.2 The Partners agree to have CVWD release an RFP or Bid Package in accordance with all Procurement Policies of the CVWD to solicit proposals from qualified consultants to perform updates, revisions, or modifications to the Alternative GSP. For the purposes of

this Second Supplement to the MOU, qualified consultants consist of firms competitively selected and contracted by CVWD for on-call hydrogeological services.

1.2.2.1 Each Partner shall have the opportunity to review and score the proposals received from each respondent to the RFP or Bid Package for the selection of the consultant.

1.2.3 The Partners agree to have CVWD enter into Agreements with selected consultants in accordance with all Procurement Policies of the CVWD to perform updates and revisions to the Alternative GSP.

1.2.3.1 Each Partner shall have the opportunity to review and comment on the Draft Alternative GSP and Draft Final Alternative GSP.

1.2.3.2 Each Partner shall be provided one electronic and one hard copy of the Final Alternative GSP.

1.2.3.3 Each Partner shall be provided electronic copies of all data and files used to create report graphics and tables.

SECTION 2:

INVOICING AND PAYMENT

2.1 CVWD shall administer the Agreements with the consultants and pay the consultants per the terms of the Agreement.

2.2 CVWD shall invoice each Partner for reimbursement of one-fourth (1/4) of the payment that has been made to the consultants.

2.3 Each Partner shall pay invoices within 30 days of receipt of the invoice.

SECTION 3:

MISCELLANEOUS

3.1 Abbreviations, capitalized words, and phrases used in this Second Supplement shall have the same meaning as in the MOU.

3.2 All terms of the MOU remain unchanged, except, as supplemented herein.

3.3 This Second Supplement may be executed in any number of counterparts, each of which shall be deemed original, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, the Partners have executed this Second Supplement to the MOU as of the day and year indicated on the first page of this Second Supplement to the MOU.

J. M. Barrett 10.31.2018

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark Krause

Desert Water Agency

Mark Scott

Indio Water Authority

IN WITNESS WHEREOF, the Partners have executed this Second Supplement to the MOU as of the day and year indicated on the first page of this Second Supplement to the MOU.

J. M. Barrett	William B. Pattison, Jr.
Coachella Valley Water District	Coachella Water Authority
Mark Krause	Brian Macy
Desert Water Agency	Indio Water Authority

IN WITNESS WHEREOF, the Partners have executed this Second Supplement to the MOU as of the day and year indicated on the first page of this Second Supplement to the MOU.

J. M. Barrett

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

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J. M. Barrett

Coachella Valley Water District

William B. Pattison, Jr.

Coachella Water Authority

Mark Krause

Desert Water Agency

Brian Macy

Indio Water Authority

Appendix 1-D

Public Comments Received and Response to Public Comments

Appendix 1-E

Letters of Support

Appendix 1-F

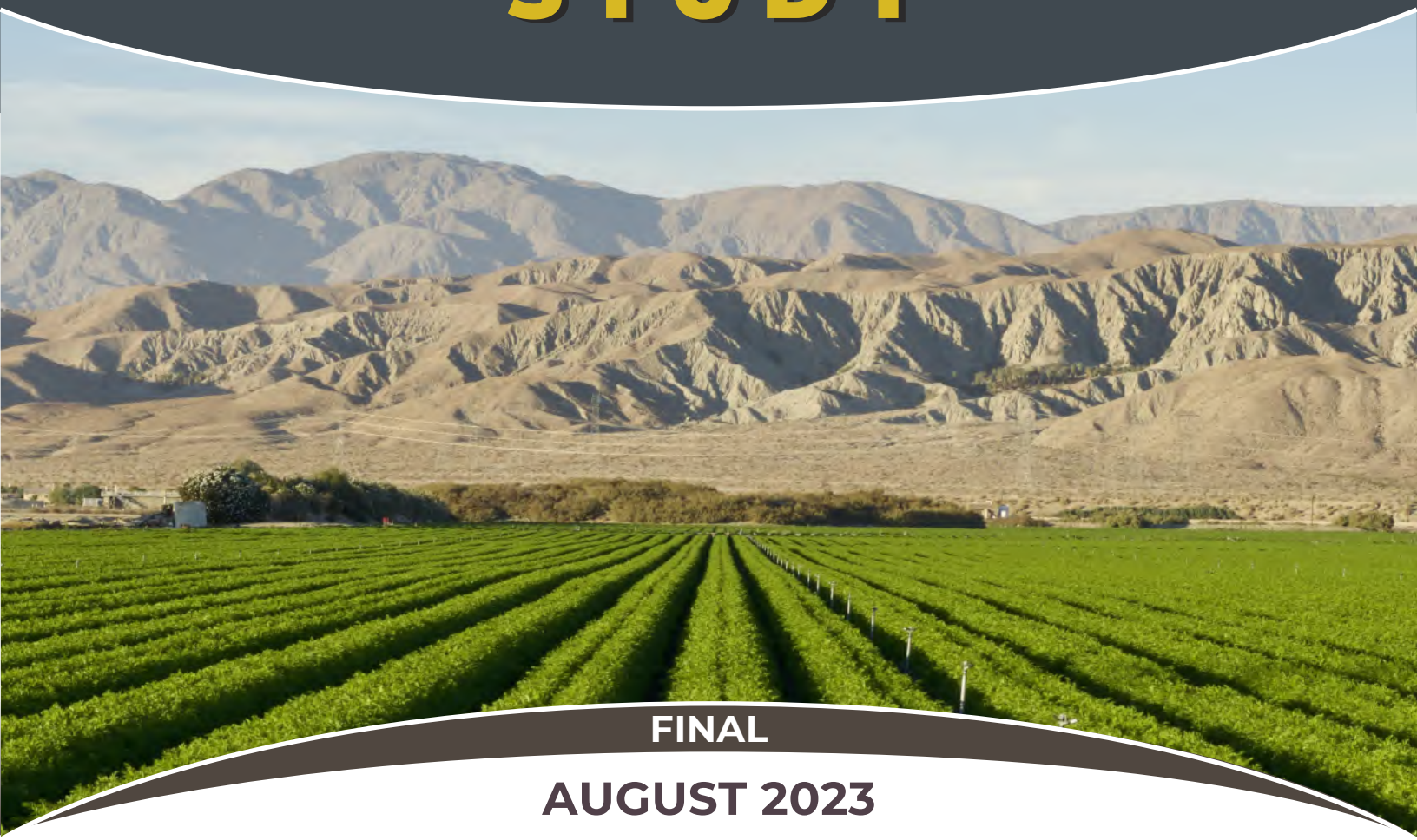
Adoption Resolutions

Appendix 2-A

East Coachella Valley Agricultural Drainage System Flow Study

INDIO SUBBASIN

DRAIN FLOW STUDY



FINAL

AUGUST 2023

Prepared for: Indio Subbasin Groundwater Sustainability Agencies

WATER DISTRICT

COACHELLA WATER AUTHORITY & SANITARY DISTRICT
SERVICE. VALUE. QUALITY.

DESERT WATER

Indio Water Authority
Your Water. Our Responsibility.

EAST COACHELLA VALLEY AGRICULTURAL DRAINAGE SYSTEM FLOW STUDY

COACHELLA VALLEY WATER DISTRICT
COACHELLA WATER AUTHORITY
DESERT WATER AGENCY
INDIO WATER AUTHORITY

August 2023

TODD GROUNDWATER

2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
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www.toddgroundwater.com

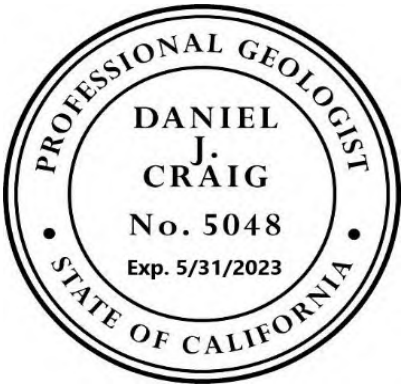
In cooperation with:

Woodard & Curran

SIGNATURE PAGE







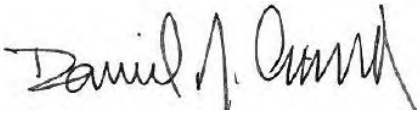


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APPENDIX A: CVWD Drawing No. 46, Coachella Valley Drainage and Stormwater Outlet System

1. INTRODUCTION

This Drain Flow Study, identified for implementation in the Indio Subbasin *2022 Water Management Plan Update* (*2022 Update*), examines relationships between groundwater levels, current and historical crop water application, and flows and salt export through the drainage system in the East Valley portion of the Indio Subbasin.

As described in the *2022 Update,* an extensive system of open drainage ditches and subsurface drains has been constructed to provide drainage for agricultural fields and to remove and convey the salts found naturally in saline soils and shallow groundwater through the Coachella Valley Storm Channel (CVSC) or directly through open drainage ditches to the Salton Sea. This general drainage area is characterized by multiple aquifers (deep confined and semi-confined, shallow water table, and perched) and potential upward flow of deep groundwater. The agricultural subsurface drainage system, initially designed to lower groundwater below the root zone, may now drain some groundwater in addition to agricultural return flows. The open drainage ditches and CVSC may additionally drain other permitted flows (treated wastewater and fish farm effluent, as well as small amounts of irrigation water exceeding requested deliveries (i.e., regulatory water).

Drain flow data have been used to evaluate groundwater outflow and to calibrate the Indio Subbasin numerical groundwater flow model, which includes simulation of drains. Most notably, the *Coachella Valley Water Management Plan 2010 Update* presented simulated drain flows based on modeling of future water management scenarios at the time. The 2010 model simulations provided a range of potential drain flows and predicted that drain flows would increase. The 2010 Update assumed that higher drain flows are beneficial because they are a response to higher groundwater levels in the East Valley, which promote removal of salt present in shallow groundwater and thus are generally protective of the deep aquifer. The subsequent *2022 Update* model simulations addressed projects to benefit groundwater storage in the context of climate change. Except for the baseline climate change scenario (no new projects scenario), the future scenario simulations predict increased storage relative to 2020 conditions. The scenarios also indicate that drain flows would increase as an outflow from the Subbasin.

The *2022 Update* recommended this Drain Flow Study, recognizing that drain flows are an outflow from the water budget and a source of salt outflow, and acknowledging that the 2019 Department of Water Resources (DWR) Alternative Assessment Staff Report recommended clarification of whether there is a minimum threshold for groundwater sustainability associated with the amount of subsurface drain flow. However, the drainage system intercepts and conveys water from multiple sources including return flows from agricultural irrigation water applied to soils. This study examines the inflows and outflows of the drainage system. It provides an improved basis for understanding the various water sources (including any groundwater) that the drain flow represents, and its usefulness as an indicator for protection of deep groundwater and for overall sustainability of the groundwater system.

1.1. STUDY OBJECTIVES

The purpose of this study is to document the drainage and groundwater systems, provide a conceptual model for drain-groundwater interactions, and assess the role of drain flow monitoring in groundwater management. The drainage system itself (both the master drainage system and on-farm drainage) is documented using readily available information. Sources of drain inflow are identified and quantified to the extent data are available. The geologic setting is described, and groundwater levels are mapped spatially and assessed vertically to discern possible flow into the drainage system. Water quality data are examined to identify possible geochemical signatures for surface water, drainage water, and groundwater. An important objective is to elucidate what we know and don't know, to clearly state uncertainties, and to identify areas and topics where additional information would help understand and manage groundwater/drain interactions.

The CVSC, subsurface pipes, and open ditches receive inflow from multiple sources, each with different water quality. These include shallow groundwater drainage from on-farm drains in agricultural fields, treated wastewater, fish farm effluent, stormwater, and small amounts of irrigation water exceeding requested deliveries (i.e., regulatory water). This study documents and, to the extent possible, quantifies these other sources of flow; identifies data gaps, recommends monitoring program improvements, and provides observations on the usefulness of drain flow data in assessing groundwater sustainability.

1.2. DRAIN FLOW STUDY AREA, DATA SOURCES, AND STUDY PERIODS

As shown on **Figure 1-1**, the Drain Flow study area is within the East Valley portion of the Indio Subbasin and within CVWD Improvement District No. 1 (ID1). ID1 is the portion of the CVWD service area formed for the purpose of constructing or improving Canal Irrigation and Drainage Water Service. Its full extent is indicated with shading on the inset map. The study area is focused on the extent of the drainage system and on-farm drains but includes adjacent irrigated agriculture areas. The study area extends to the west to include the Thomas E. Levy Groundwater Replenishment Facility (TEL GRF), recognizing that local groundwater conditions are affected by groundwater replenishment.

Figure 1-1 shows the boundaries of the Indio Subbasin, ID1, and the main components of the master drainage system (as termed here). These include the Coachella Valley Storm Channel (CVSC) and its tributary network of drainpipes and ditches plus the drainpipes and ditches that convey outflow directly toward the Salton Sea.

Figure 1-2 shows the extent of cropland (green area), the area where agricultural return flows or shallow groundwater are expected to enter the drainage system through on-farm drains (hatched area), and the locations of drain flow monitoring. The extent of active and idle cropland is mapped as of 2022. While idle land may not actively contribute drain flow, these parcels have been in production recently and are likely to be in production again in the near future. The on-farm drain area is reproduced from CVWD Drawing No. 46, Coachella Valley Drainage and Stormwater Outlet System, as mapped in 1966 with periodic revisions through

1984. The original drawing is included as **Appendix A**. The study area includes not only drain monitoring stations, but also the groundwater monitoring well network for levels and quality (discussed further in Section 3).

This study contributes a compilation, organization, and detailed review of available information related to the East Valley drainage system. **Table 1-1** shows the major sources of data, the available timeframe, and the agency responsible for collecting the data. As indicated, the beginning dates are variable, but most data are currently being collected and this report relies on data through 2022. Given that one of the purposes of this study is to compile and review available data, graphs have been prepared showing data for the respective full time periods. For analyses involving multiple sets of data with variable time periods, the overlapping period is used. For example, comparison of cumulative drain flow volumes with return flow estimates is provided for the years 2009 through 2021. Such an analytical period represents recent conditions and includes reasonable variation in conditions affecting drain flows.

1.3. HISTORY OF DRAINS IN COACHELLA VALLEY

The Coachella Valley has a long history of irrigated agriculture that initially relied on artesian wells in the East Valley. Agriculture expanded significantly with the development of economical well drilling and groundwater pumping technology in the early 1900s and with Colorado River imports after the completion of the Coachella Canal in 1947. Early crops included grapes, lemons, grapefruit, other citrus, and dates.

Drainage and alkali salt problems were first identified in the Coachella Valley in a 1927 soil study and a systematic community drainage solution was recommended (Kocher, 1927). The drainage and salinity issues increased with importation of Colorado River water supplies. In 1946, a drain study was initiated by CVWD with the University of California Berkeley, the Bureau of Reclamation, and Agricultural Research Service. The study recommended installation of on-farm drains consisting of five lines of tile drains on every 40-acre parcel. By June 1962, 1,124 miles of tile drains serving 25,812 acres had been installed by local farmers. Tile drains were installed at an average depth of 7 feet with drawdown maintained at 4.5 to 5.5 feet. The CVWD Drawing No. 46 indicates that about 45,000 acres where all or part of the Township Range section has on-farm drainage systems.

Depicted on **Figure 1-1**, a master drainage system was developed at the same time including 26 miles of open drains, 127 miles of drainpipe, and 2.5 miles of concrete lined drains, serving 53,000 acres. The lower portion of the Whitewater River storm channel historically has been the central part of the drainage system. In the late 1960s, CVWD significantly improved the lower 50 miles of the channel (southeast of Point Happy) as the Coachella Valley Stormwater Channel (CVSC) (CVWD, 2018). Changes are continuing to the drainage system; the Eastern Coachella Valley Stormwater Master Plan (ECVSMP) was completed in 2018 and proposes additional stormwater channels through the East Valley to control stormwater flow for a 100-year storm.

1.4. CURRENT DRAINAGE SYSTEM IN COACHELLA VALLEY

1.4.1. Master Drainage System

Figure 1-1 differentiates drainpipes and ditches and indicates whether outflow is to the CVSC. The CVSC not only receives on-farm drainage but also Whitewater River flow, treated wastewater effluent, fish farm discharge, regulatory water outflow, and stormwater. The sources and volumes of each of these components are discussed in Section 3.

1.4.2. On-Farm Drainage

Individual landowners design and construct their on-farm drainage, with guidance from CVWD. On-farm drainage is provided by tile drains or corrugated plastic drains that convey excess water from the field to the master drainage system. CVWD maintains guidelines for on-farm sub-surface artificial drainage systems. These guidelines help a grower to design the optimum drainage system based on soil type, crop type, and irrigation water quality. As illustrated in conceptual **Figures 1-3** and **1-4**, on-farm drains function as uncontrolled structures where water is removed when perched water or groundwater reaches the level of the drain.

CVWD works with growers to connect to the larger drainage system. While older on-farm drain systems were installed as clay tile drains, most new drains on farms are constructed using corrugated plastic materials. CVWD reports that most tile drain systems are installed at the recommended seven feet below ground surface, but tile drain systems can range from three to eight feet below ground surface.

Figure 1-2 shows active and idle cropland (shaded green) as of 2022, from the CVWD Crop Census. As shown, some areas have active agriculture (green) but do not have on-farm drains as recorded on the 1984 map (hatched). Such areas on the west and east margin of the valley are characterized by higher topographic elevations and greater depths to groundwater. In addition, the edges of the basin may be unconfined and less subject to shallow groundwater in the root zone. Some new drain systems may have been installed but not mapped on the drainage system Drawing No. 46.

Figure 1-2 also shows areas indicated as having on-farm drainage systems (hatched) but no active agriculture (green). While these areas have not been systematically surveyed, these areas are likely where cropland has been developed for other purposes. A major example is the Jacqueline Cochran Regional Airport near Thermal. In such cases, it is assumed that on-farm drains have been removed. While golf courses may represent former croplands and may be located near the master drainage system, no golf-courses have on-site subsurface drain systems that directly drain into the CVWD master system.

1.5. DRAIN MONITORING NETWORK AND AVAILABLE DRAIN DATA

Figure 1-5 shows the locations of the 28 current drain flow monitoring sites. The USGS measures flow at the CVSC at Mecca gage station near the Salton Sea, and CVWD measures drain flows at 27 sites monthly.

As shown on the map, all monitoring sites are located downstream of all flow outputs within about 2.5 miles of the terminus of the system, the Salton Sea. This distribution of monitoring sites generally can capture the total outflow amount, which is one of the primary objectives of the monitoring system. However, it is important to note the limitations of the monitoring network for more detailed investigations. The drain monitoring network is not evenly distributed across the master drainage system either geographically or relative to drain flow amounts. There are 28 drain monitoring locations that are monitored for flow, located at open ditches that drain outflow to the Salton Sea, and one gaged location at the CVSC that represents 60 to 80 percent of all the drainage outflow. The CVSC monitoring area includes three drain systems (Thermal Drain/Stormwater Channel, Avenue 60, and Avenue 64) that drain a major portion of the northwestern study area.

The monitoring network does not support distinction of non-farm flows such as stormwater inflow or wastewater discharges from the on-farm subsurface drainage. Review of the map indicates that most of the drainage outflow is measured at the CVSC gage, while the remaining monitoring locations represent a small portion of the master drainage system outflow. In addition, the CVSC gage measures not only the combined flows of numerous drains and stormwater channels (30+) for most of the study area, but also stormwater flow from upstream of the study area and wastewater plant discharges.

Flow data for the CVSC gage are available from the U.S. Geological Survey's National Water Information System (NWIS), station 10259540 Whitewater River at Mecca since 1960. Daily flow measurements from this location are available from October 1988. The gage records on a 15-minute interval and can measure up to 200 cfs; therefore, it likely under-reports peak flows during storm events. The USGS also measures the Whitewater River upgradient of the CVSC at Windy Point and at Indio (see **Figure 1-1** inset map for locations).

CVWD currently monitors their 27 drainage outflow sites monthly for flow and electrical conductivity (EC). Monthly data are available for 25 of these sites from January 1985 to the present. Additional earlier data may exist but were not readily available for compilation in this study. Two additional sites (Ave 78 and McKinley 0.5) were added to the program in 2020. Twelve of these drains have sump pumps installed to assist flow to the Salton Sea and at seven sites, the drain flow measurement is taken at the sump pump meter. These sump pumps are shown in **Figure 1-5**.

CVWD monitors water quality at the 28 drain outflow sites annually (27 CVWD locations and the CVSC gage location). McKinley 0.5 was added to the water quality monitoring program in 2020 and limited data are available at this time. TDS, pH, Temperature, and EC are monitored in February and general minerals, TDS, metals, pH, temperature, and EC are measured in

August. Water quality data are available for most locations from 1999 to 2022. Additional earlier data may be available but were not compiled for this study. Ave 78 has data available from 2003 and two drain outflows (Lincoln-Oasis and F Channel) lack data from 2021 and 2016 respectively, noting that now there is typically no subsurface outflow to these drains.

Figure 1-6 shows the available monthly flow data combined from all 28 monitoring locations. The combined total outflow shows an overall pattern of decreases until about 2010 and then general stability.

1.6. RECENT MONITORING IMPROVEMENTS

In 2020, CWE with Todd Groundwater prepared a technical memorandum on Agricultural Drain Flow Monitoring Network Assessment Recommendations. This memo described the drain monitoring network and provided recommendations to improve the quality of data collected. An issue was the effect on drain flow monitoring at the open ditches near the Salton Sea due to the falling Sea levels and receding shoreline over the previous decade. In 2020, 46 percent of these drain flow measurement locations could not be read consistently. In response, CVWD updated procedures for monitoring, improved equipment and maintenance at these locations, and stabilized monitoring locations. By April 2021, all but one drain measurement location was consistently monitored and that drain (Lincoln-Oasis Drain) has since been improved.

Nonetheless, monitoring inconsistencies existed and averaged values were used instead of observed measurements for a period. This was corrected in 2021 but the historical record must be considered approximate for 12 locations: Lincoln-Oasis, Ave 74, Grant St, Grant 0.5, Hayes, Hayes 0.5, Garfield, Garfield 0.5, Arthur 0.5, Cleveland East, Cleveland West, and McKinley.

2. GROUNDWATER – DRAIN RELATIONSHIPS

As described in the *2022 Update,* the drainage system was constructed to provide drainage for agricultural fields and to remove and convey the salts found naturally in saline soils and shallow groundwater. However, the East Valley is characterized by a substantial depth of unconsolidated deposits—reflecting alluvial fan, stream-laid, and lacustrine depositional environments—that compose the Principal Aquifer and include multiple aquifer zones of variable extent. While the drainage system was constructed to remove and convey the salts found naturally in saline soils and shallow groundwater from agricultural fields, the system may now drain some groundwater in addition to agricultural return flows. It is recognized that the drain system likely drains some groundwater, including shallow groundwater and upward vertical flow from different aquifers in addition to agricultural return flows.

2.1. GEOLOGIC SETTING

In its Bulletin 108 DWR (1964) presented a hydrogeologic conceptual model that identified four groundwater zones for the Thermal Subarea, which encompasses most of the study area. The zones include semi-perched, Upper Aquifer, Regional Aquitard, and Lower Aquifer (see **Figure 2-1**). The Upper Aquifer zone was described as similar in lithology to the Lower Aquifer, while the intervening fine-grained Regional Aquitard was described as a semi-continuous aquitard that retards but does not completely restrict vertical flow of water. The top of the Lower Aquifer was described as present at a depth ranging from 300 to 600 feet below ground surface. Bulletin 108 described unconfined conditions as present in the alluvial fans and confined or semiconfined conditions in the major portion of the Thermal Subarea. This section describes the geologic setting for the soils and surficial geology, aquifer units, and groundwater flow.

2.1.1. Surficial Geology

USGS mapping of the surficial geology of the Indio Subbasin (USGS, 2007; see **Figure 2-2**) indicates the prevalence of alluvium across the Indio Subbasin. **Figure 2-3** is a map of soil associations that provides additional information on the geographic distribution of soil types, geomorphic setting, and underlying geology. As indicated, the valley includes four soil associations (numbered 2 through 5) as summarized below:

- No. 2 soil association along the valley margins includes relatively coarse-grained sands on nearly level valley fill to steep alluvial fans.
- No. 3 soil association is in the northwest and consists of fine-grained dune sands on nearly level to rolling alluvial fans.
- No. 4 is the most extensive soil association across the study area and includes finer-grained sands, loamy sands, sandy, and silt loams on the lower portions of alluvial fans and on alluvial (stream-laid) deposits.
- No. 5 soil association occurs in the trough of the valley and consists of relatively fine-grained soils (silty clay loams, sandy loams, and silt loams) developed on nearly level lacustrine (lakebed) deposits.

The pattern of soil associations in **Figure 2-3** illustrates recent depositional environments. These include alluvial fans extending from the valley margins toward the valley center (e.g., associated with Soil Association No. 2). Lacustrine deposits (No. 5) occur in the valley trough with overlying sands and silt loams (No. 4) associated with the recent channel of the Whitewater River/CVSC and a possible ancestral channel to the west. **Figure 2-3** also shows the drainpipes and ditches of the master drainage system. As indicated, the system has been developed almost exclusively on lower alluvial fan and lacustrine basin areas.

2.1.2. Geologic Cross-Sections

The master drainage system is underlain by geologic deposits composed of interbedded alluvial fan, stream, and lacustrine sediments including sand, silt, and clay. Sedimentary infill in the Indio Subbasin thickens from north to south, and depending on location within the Subbasin, is thousands of feet thick. The upper approximately 2,000 feet constitute the principal aquifer system that is the primary source of groundwater supply (DWR, 1979).

Figures 2-4 through **2-6** show three regional-scale geologic cross-sections from the 2022 Alternative Plan Update. These cross-sections illustrate the inter-layered coarse-grained and finer-grained stratigraphy with depth that is the context for the groundwater conditions ranging from artesian and confined and semi-confined to unconfined and perched.

Figure 2-4 shows cross-section A”-A”’ trending through the study area and along the axis of the Subbasin. This is the distal segment of the longitudinal cross section (A-A’’’) presented in the 2022 Alternative Plan Update that depicts the down-valley progression of alluvial sediment from predominantly course-grained to fine-grained for the entire subbasin.

Figure 2-4 illustrates that down-valley progression within the study area from mostly sand in the northwest to mostly clay in the southeast. While recognizing that the stratigraphy is based on interpolation between wells (sometimes across more than one mile), **Figure 2-4** does depict the lenticular nature of sediments, including the multiple sand (aquifer) units near the Salton Sea. Note that most of the wells are screened against multiple units and thus provide composite groundwater data. In contrast, the nested CVWD Well (nearest the Sea) has four separate screened intervals and thus provides discrete data for each of the aquifer units.

The approximate boundary between the Upper and Lower Aquifer is depicted on **Figure 2-4** and generally corresponds with a thick (at least 100 feet thick) relatively continuous clay layer at about -500 feet msl (mean sea level) or about 400 feet (feet) below ground surface (bgs) on the northwestern end of the cross-section. The interpretation of the boundary is less distinct to the southeast where thicker and more prevalent clay layers predominate. The cross-section also indicates the general water table elevation (as of water year 2018-2019) and the extent of artesian conditions near the Salton Sea. As indicated on the inset map, the master drainage system is present along the entire length of this cross-section. Surficial and shallow sediments indicated on **Figure 2-4** are mostly silt, fine sand, and clay.

Figure 2-5 shows cross-section D-D' from southwest to northeast across the northern study area. The cross-section shows the boundary between the Upper and Lower Aquifer, which generally corresponds with the thick clay layer/aquitard at about -400 feet msl. This regional clay layer is associated with the ancient Lake Cahuilla that extended periodically across the East Valley in Pleistocene and prehistoric times. Although the stratigraphy is interpolated over relatively long distances on the cross-section, available data suggest that the clay layer is not continuous in the valley center and does not extend to the margins of the subbasin. This indicates the existence of unconfined conditions with natural recharge and groundwater flow pathways through the sand/gravel units to the Lower Aquifer, especially along the western side of the valley.

The Thomas E. Levy Groundwater Replenishment Facility (TEL GRF), located on the southwest side of the cross-section, has been a focus of hydrogeologic study and monitoring. Existing shallow and deep monitoring wells and construction of six new shallow monitoring wells for the facility has yielded information on the local shallow geology (Todd Groundwater, 2020). The six wells were installed across a 10 square-mile area east of TEL-GRF with drilling depths of about 50 feet. Geologic logging indicates permeable sand, silty sand, and clayey sand layers interbedded with some lower permeability silts and clays. The regional clay aquitard, separating shallow alluvial deposits from the deeper alluvial aquifer zone, is present to the east (see **Figure 2-5**). However, the depth to the top of the regional aquitard is approximately 100 to 150 feet to the east, deeper than and thus not encountered in the shallow monitoring wells.

Additional information on shallow geology of the East Valley is also available from the recent drilling in 2022 of twelve monitoring wells (Todd Groundwater, 2023). Nine of the new wells were located and designed to provide monitoring data for the Coachella Valley Salt Nutrient Management Plan (CV-SNMP). The remaining three wells were replacement monitoring wells at Water Reclamation Plant 2 (WRP 2) at the southeastern tip of the Subbasin, beyond the drain system. Two of the new monitoring wells, G-12 and G-19, are located on a parcel near cross-section D-D' where it crosses Airport Boulevard (see locations on **Figure 2-5**). Monitoring Well G-12 was installed to monitor the shallow zone with a drilled depth of 255 feet, while G-19 was designed to monitor the perched zone with a drilled depth of 110 feet. Drilling of both wells indicated predominant clay to depths of 40 to 55 feet, underlain mostly by sandy sediments. This is consistent with the regional cross-section. The master drainage system, as indicated on the inset map to **Figure 2-5**, is present along the center of this cross-section, but not beyond about 60th Avenue on the west and Highway 86 on the east. As indicated on the cross-section, shallow sediments underlying the drain system are mostly silt, fine sand, and clay.

Figure 2-5 shows cross-section E-E' trending southwest to northeast in the southern study area, just north of the Salton Sea. As shown, the western side of the valley is characterized by relatively thick sand/gravel sequences that are characteristic of alluvial fans and indicate the unconfined groundwater conditions and the potential for natural groundwater recharge and flow pathways toward the axis of the valley. While the recent 2022 monitoring wells are shallow relative to the cross-section, the geologic log of one well, G-21 (located near the cross-

section west of Harrison Street), shows a similar predominance of sand and sandy gravel to a depth of 110 feet (Todd Groundwater, 2023). Similarly, the geologic log of well G-20 (located in the southwestern study area) suggests permeable alluvial fan deposits with mostly sand and sandy gravel to a depth of 110 feet.

The boundary between the Upper and Lower Aquifers is indicated in the valley axis area, as is the extent of artesian conditions. In the valley axis, this cross-section shows multiple clay zones that thicken toward the valley axis and are interlayered with sand aquifer units. This heterogeneity indicates the presence of multiple aquifer units with distinct degrees of hydraulic confinement. The heterogeneity in this area is also expressed in the geologic log of one of the recent 2022 monitoring wells, G-14, located near the cross-section west of Highway 111. The geologic log of G-14 shows numerous, relatively thin layers including sand, silty and clayey sand, sandy silt, and clay to a depth of 150 feet and underlain by mostly clay to 275 feet deep.

As shown on the inset map, the master drainage system is present along the center of this cross-section, but not beyond Harrison Street on the west and 66th Avenue on the east. As indicated on the cross-section, shallow sediments underlying the drain system are mostly silt and fine sand.

2.1.3. Definition of Well Depth Zones

The soil association patterns in **Figure 2-3** and stratigraphy in **Figures 2-4** through **2-6** illustrate the depositional environments that have existed over geologic time in the East Valley, including alluvial fans extending from the valley margins, stream-laid deposits associated with the ancestral Whitewater River, and lacustrine deposits associated with transgressions of ancient Lake Cahuilla. These shifting environments over time have resulted in a hydrogeologic system that includes unconfined areas along the valley margins and along the axis of the valley areas and zones with variable degrees of confinement: unconfined, semi-confined, confined/artesian conditions that vary geographically, vertically, and over time.

As noted previously, this heterogenous system has been generalized into major zones for study purposes, including the DWR Bulletin 108 conceptualization of semi-perched, Upper Aquifer, Aquitard, and Lower Aquifer zones. The 2022 Alternative Plan Update also utilized *well depths* as a means of generalizing groundwater zones, noting that production wells typically are greater than 300 feet deep and produce groundwater from the Lower Aquifer. In most areas, wells completed above 300 feet bgs reflect water levels in the unconfined Upper Aquifer. Wells deeper than 500 feet bgs represent the Lower Aquifer with semi-confined to confined conditions.

These assumptions are generally consistent with the definition in DWR Bulletin 108 that describes the top of the Lower Aquifer at a depth ranging from 300 to 600 feet bgs. However, it is important to note that the Aquitard is not continuous throughout the study area, such that the deep aquifer may be locally unconfined. Moreover, a sequence of clay layers (especially toward the south) can result in variable degrees of confinement with different

groundwater levels and vertical gradients and different potential effects on the master drainage system.

2.2. GROUNDWATER LEVELS AND FLOWS

Groundwater level data were reviewed to better understand the relationships between drain flow and groundwater in different aquifer zones. Data availability was reviewed, and groundwater level contour maps were created to examine groundwater flow patterns at different depths in the drain area. Maps showing depth to water were also prepared to identify areas where groundwater may reach less than 7 feet bgs (the depth of drains in agricultural areas) excluding areas with artesian conditions.

2.2.1. Types of Aquifers

As shown in **Section 2.1,** the geology of the study area is characterized by a complexity of inter-layered coarse-grained and finer-grained deposits. The Principal Aquifer is characterized by multiple aquifer types that show various degrees of confinement from confined/artesian to semi-confined, and unconfined water table and local perched units. The distinctions between confined, semi-confined, unconfined, and perched aquifer types are important when evaluating if groundwater from different zones is contributing to drain flow.

When groundwater in deeper zones is confined by an overlying thick clay layer, it may be under pressure. Wells drilled into the confined aquifer may show water level elevations that are higher than the top confining layer. The water levels recorded from wells screened in confined aquifers delineate the potentiometric surface, the upper surface that water would rise to if a well were drilled into the confined aquifer. Artesian conditions are defined here as occurring when the potentiometric surface elevation is higher than the ground surface elevation.

Depth-to-water readings from wells screened in a confined aquifer may be less than 7 feet bgs or even above ground surface (negative). However, this does not necessarily indicate that shallow groundwater is at the same elevation or that deep groundwater is contributing to drain flow. For that to happen, at least one of two basic processes would be occurring. One possibility is that deep groundwater would be flowing upward through permeable sediments and causing increased heads in overlying shallow groundwater. A second possibility is groundwater flowing upward to the near-surface through a specific conduit such as a flowing artesian well, a well screened in both the confined aquifer and near-surface, or a fault (for natural springs).

For aquifers with semi-confined conditions (where the overlying clay layers are thin or non-continuous) upward vertical movement of deeper water may occur through the sediments. Measurement of near-surface depth-to-water readings from a well screened in a semi-confined aquifer could suggest an upward flow of groundwater that could interact with drains.

For shallow wells or wells screened in an unconfined aquifer, depth-to-water readings that show near-surface conditions (7 feet bgs deep or less) suggest that groundwater is contributing to drain flow.

For the groundwater elevation and depth-to-water analyses, wells were grouped by depths. Wells with known screen interval depths grouped by the bottom screen depths. Wells with unknown screened interval depths were classified by their total well depths. Initially, a depth of 500 feet bgs, the approximate bottom depth of the regional clay aquitard, was used as the boundary between shallow and deep wells. Wells with a total depth or bottom screen depth equal to or less than 500 feet bgs were considered "shallow" and wells with a total depth greater than 500 feet were considered "deep." These depth zones are roughly analogous to aquifer zones described by DWR (DWR, 1964) and summarized in the 2022 Alternative Plan Update (see **Figure 2-1**). The shallow wells would penetrate portions of the unconfined semi-perched zone, Upper Aquifer, and underlying aquitard. The deep wells would penetrate portions of the aquitard and underlying Lower Aquifer.

However, some wells between 300-500 feet bgs deep were reported to have artesian conditions and other wells in this depth range showed shallower groundwater levels than nearby wells that were less than 300 feet bgs deep. This suggests that some wells with a maximum screen depth (or total well depth if screened interval depths were unknown) between 300 and 500 feet are screened in confined or semi-confined aquifers. Accordingly, the wells were classified into three groups for analyses: deep (>500 feet bgs) wells, 300-500 feet bgs wells, and shallow/perched wells (<300 feet bgs). Wells with unknown depths were classified as "deep" wells if their water level readings were consistent with surrounding deep wells. Wells with reported artesian conditions during the past ten years were excluded from the deep category because they represent highly confined conditions that would not interact with drain flow. In addition, data from these wells were often outliers compared to nearby, non-artesian wells.

2.2.2. Groundwater Elevations

Groundwater elevation contours for the shallow/perched, 300-500 feet, and deep wells are shown in **Figures 2-7** through **2-9**. The average water level reading in 2022 was used to create the contours for the shallow/perched wells and the 300-500 feet bgs wells in **Figures 2-7** and **2-8**. As explained in the 2022 Plan Update, use of averaged elevations over a year is representative because local groundwater levels do not exhibit strong seasonal trends. For the deep wells in **Figure 2-9,** water levels were used only from Spring 2022 because more data were available at that time than would be available as averages. Groundwater levels were calculated using a 30-meter ground surface elevation digital elevation model (DEM) both for consistency and because this DEM was used to calculate the depth to water contours. Dashed contour lines show areas with little data and a higher level of uncertainty.

Figure 2-7 shows the groundwater elevated contours for wells that are shallower than 300 feet bgs deep. Most of the wells used to create these contours were drilled in 2022 for Salt and Nutrient Management Plan monitoring. These wells are most likely screened in unconfined or perched aquifers. Pairs of shallow and perched wells (275 and 110 feet bgs

deep, respectively), marked by two measurements at one well location, show similar or equal depth-to-water measurements, suggesting that there may not be a discrete perched zone in this area.

These shallow wells represent the groundwater depths that could most easily contribute to drain flow or receive recharge from irrigation return flow. In **Figure 2-7**, the contours indicate groundwater flowing from north to south and toward the center of the Subbasin. Data are limited in the western portion of the study area and are insufficient to represent the relationship between the shallow groundwater and the Salton Sea, which had a surface elevation of -240 feet msl in 2022. However, the Indio Subbasin groundwater flow model simulations performed as a part of the 2022 Alternative Plan Update indicated local discharge of groundwater from the shallow aquifer to the Sea.

Figure 2-8 shows the 2022 groundwater elevation contours for wells with screens between 300 and 500 feet bgs (medium zone). Most of these wells are in the northwestern portion of the drain area, and two wells are near the Salton Sea. The contours suggest that water is flowing southeast toward the Salton Sea, acknowledging that there are no monitored wells for this depth zone in the center of the study area.

Figure 2-9 shows the groundwater elevation contours for deep wells (greater than 500 feet deep). Artesian wells are shown in gray. Some of the deep artesian wells are nested wells, showing different groundwater elevations at different depths. In the southeastern area, groundwater elevations in the deep wells are similar to those of the 300-500 feet bgs wells, with elevations decreasing gradually toward the Salton Sea.

In the northwest portion of the study area, the deep zone elevation map indicates a less steep gradient than in the corresponding 300-500 feet bgs zone. In this area, groundwater elevations in the deeper wells are about 30 to 40 feet lower than the corresponding 300-500 feet wells. The difference in groundwater level elevations of wells in this area suggests that the wells are in distinguishable aquifers, separated by an aquitard, with the deep aquifer groundwater levels influenced (lowered) by significant pumping. Review of the D-D' cross-section (**Figure 2-5**) indicates that this area is marked by the thick clay layer/aquitard that locally separates the Upper and Lower Aquifers.

2.2.3. Depth to Water

To interpolate the depth-to-water contours in areas with limited data, the groundwater elevation contour surface was subtracted from the DEM ground surface elevation surface. In areas with steep ground surface elevations or limited groundwater level data, the depth-to-water contours may reflect the ground surface elevations more prominently than actual depth-to-water conditions.

Depths to groundwater are shown for 2022 on **Figures 2-10, 2-12, and 2-14.** Are contoured for the three well depth zones (shallow and perched wells less than 300 feet bgs deep, medium zone with wells 300-500 feet bgs deep, and deep wells over 500 feet bgs deep). The depth to water contours used data from the same wells used to create groundwater elevation

contours. **Figures 2-11 and 2-13** show the minimum depth to water between 2012 and 2022 for shallow/perched wells and 300-500 feet bgs deep wells, respectively. These provided further insight into areas where historical water levels have been shallow and may contribute to drain flow.

Figure 2-10 shows the depth to groundwater for the shallow/perched well zone (less than 300 feet deep). As indicated, groundwater becomes shallower toward the south and the center of the subbasin, where the ground surface elevation is lowest. Areas of greater depth to water reflect higher topography, for example, the Martinez Canyon alluvial fan is marked by convex contours on the southwest side of the valley. Purple contours represent areas with a calculated depth to water between 0 (ground surface) and 20 feet bgs. These are areas that may have shallow groundwater. A gap in the contouring exists in the south-central portion of the drain area, north of the Salton Sea. In this area, the groundwater elevation surface was interpolated above the relatively low ground surface elevations. This is an artifact of the inherent inaccuracies of interpolation but also suggests shallow depths to water.

Figure 2-11 shows the minimum depth-to-water measurement from 2012 to 2022 for all wells in the perched/shallow zone. No wells have depth to water levels of less than 7 feet bgs (that would be indicated by red dots), but some are close to 7 feet bgs (marked by orange dots). One pair of wells showed water levels as shallow as 8 feet bgs and another pair showed groundwater levels at 11 and 12 feet bgs. Both pairs were drilled in 2022.

Figure 2-12 shows depth-to-water contours for wells screened between 300 and 500 feet bgs (medium zone). The wells in the northwestern portion of the study area show depth to water measurements ranging from -2.08 (artesian conditions) to 29.9 feet bgs. The artesian well depth-to-water values indicate confined conditions between 300 and 500 feet at the artesian wells; accordingly, this map represents the depth to the potentiometric surface. Some wells in the 300 to 500 feet bgs depth may have confined conditions and some may have unconfined conditions. Artesian conditions are observed in the southwest area of the drains. The well with a 5.5 feet bgs depth-to-water in the southern portion of the drain area is most likely representing confined aquifer conditions.

In **Figure 2-13**, the minimum depth-to-water from 2012 to 2022 shows a wide range of depth-to water readings. Depth-to-water readings in the northwest were the largest. Cross-section A”-A”’ in **Figure 2-6** shows that the confining layer is deepest and discontinuous in the north, so these 300-500 feet bgs wells in the north are likely representing unconfined conditions. South of these wells, groundwater is artesian or shallow. These wells are screened under the clay layer shown in **Figure 2-4**, on the western side of cross-section D-D’. While these groundwater levels appear to be shallow, they are likely confined (potentiometric) and not expected to contribute to the drains or receive direct recharge from irrigation return flow that is not captured by the drains.

Figure 2-14 shows the general area where artesian conditions were present in Spring 2022. A groundwater elevation surface was interpolated from the Spring 2022 groundwater levels for wells that have reported artesian conditions since 1990. This groundwater elevation surface was subtracted from the ground surface elevation to calculate the extent where artesian

conditions are expected to occur. This area is approximated and indeterminate to the northeast. The artesian pressure varies with depth, most notably observed in nested wells (marked by multiple measurements at one well location). Some of the wells shown have potentiometric surface levels below ground surface; these are wells that have recently been artesian but were not artesian in Spring 2022.

2.3. VERTICAL GRADIENTS

Vertical gradients were examined through comparison of groundwater elevations between the shallow zone (as shown in **Figure 2-7**) and the medium and deep zones (respectively shown in **Figures 2-8** and **2-9**). It should be noted that all uncertainties inherent in groundwater level monitoring, defining well depth zones, and mapping groundwater elevations are carried forward into this evaluation, which should be regarded as illustrative. Nonetheless, it is consistent with available data and the hydrogeologic conceptual model.

Figure 2-15 is a map illustrating the difference in groundwater elevations between the shallow zone (wells with depths <300 feet) and medium zone with well depths between 300-500 feet bgs. This map is based on comparison of elevation contours on the two maps; where identical contours cross, the difference in elevation is zero.

This estimated zero contours shown on the map indicates an interjacent valley axis area where groundwater elevations in the 300-500 bgs zone are equal to or greater than the groundwater elevations in the shallow zone. This in turn suggests no substantial vertical gradient or the potential for small upward vertical gradients through the shallow semi-confined and unconfined units.

A 20-foot contour also is shown indicating that groundwater elevations in the 300-500 bgs zone are 20 feet higher than the groundwater elevations in the shallow zone. This suggests two areas with potential upward groundwater flow, one near the Salton Sea (Johnson drain area) and another farther inland (in the areas of the Avenue 60 and 64 drains, see **Figure 1-2**). Review of geologic cross-section D-D' (**Figure 2-5**) indicates that this area is marked by an apparent absence of thick clay layers and thus would provide potential vertical pathways for groundwater flow, as suggested on **Figure 2-15.**

Figure 2-15 also indicates the areas outside the zero contours where groundwater elevations in the 300-500 bgs zone are equal to or less than the groundwater elevations in the shallow zone. This in turn suggests the potential for downward vertical gradients through the semi-confined and unconfined units above 500 feet bgs. These general areas include the eastern and western sides of the valley and an unknown area up the valley to the northwest. These areas have been characterized in the geologic cross-sections (**Figures 2-4, 2-5, 2-6)** by the absence of thick continuous clay layers and the presence of unconfined conditions with potential natural recharge pathways to lower aquifer units.

Figure 2-16 is a map illustrating the difference in groundwater elevations between the shallow zone (wells with depths <300 feet) and the deep zone with well depths more than 500 feet deep. This estimated zero contour shown on the map indicates an area along the axis of the

valley where groundwater elevations in the >500 bgs zone are equal to or slightly greater than the groundwater elevations in the shallow zone. This in turn suggests no significant vertical gradient or the potential for small upward vertical gradients through the semi-confined and unconfined units above 500 feet bgs. Review of **Figure 2-15** and **Figure 2-16** indicates that the respective areas of potential zero to upward flow and potential downward flow are similar and consistent with the hydrogeologic conceptual model.

Both **Figure 2-15** and **Figure 2-16** show the master drainage system. As indicated, the valley axis portion of the drain system is generally underlain by the areas of potential zero to upward gradients. These gradients are significant because they suggest the *absence* of downward vertical gradients and downward groundwater flow that could convey poor quality shallow water to the deeper zones that are used for groundwater production. The deeper zones in this area are protected not only by the drain system itself, but also by the maintenance of zero to upward groundwater gradients.

The gradients in the valley axis area also suggest that some (probably minor) groundwater flow could be currently contributing to drain flow.

2.4. GROUNDWATER HYDROGRAPHS AND LEVEL TRENDS

As shown in the most recent Annual Report (Todd Groundwater, 2023), groundwater levels in the study area have risen 10 to 60 feet since 2008-2009, generally the historical low. Increases exceeding 100 feet have occurred in the vicinity of TEL-GRF where groundwater replenishment commenced in 2009. This indicates that the potential interaction of groundwater with the master drainage system has changed and likely has increased.

Numerous hydrographs of groundwater levels are presented in the 2022 Alternative Plan Update and the Annual Reports. Hydrographs of wells in the master drainage area were reviewed with monthly flow values at nearby drain outlets to identify comparable trends of groundwater levels and flow. In general, for the smaller drain watersheds near the Salton Sea, no correlation between groundwater levels and drain flow could be identified. Specifically, rising groundwater levels since about 2009 were not apparently accompanied by flow increases in nearby drains. It is acknowledged that this review was limited by the historical lack of dedicated or known shallow monitoring wells and uncertainty with historical drain monitoring data. Available groundwater elevation data at the time were more likely representative of the entire depth of the aquifer and not solely shallow water levels contributing to drain flow.

Shallow wells across the extensive CVSC drain area indicated relatively low water levels in about 2008-2009 and subsequent increasing water levels. A corresponding pattern is noticeable in CVSC flow (see Figure 1-6). This suggests an increasing potential for groundwater flow into the drain system as measured at the CVSC gage. This trend is consistent with the geographic pattern of potential upward vertical flow shown in **Figures 2-15 and 2-16.** However, it must be recognized that the CVSC is characterized by multiple sources of inflow that would need to be accounted before identifying groundwater as the source of the increase

since 2009. As discussed in Section 3.7, other inflows have also increased over the same period.

Figures 2-15 and 2-16, showing elevation differences between well depth zones, were prepared using data from 2020 when groundwater levels were relatively high. Both maps indicate areas along the axis of the valley where upward vertical gradients may occur with flow from the 300-500 bgs and >500 bgs well depth zones up into shallow aquifer zones. It is reasonable to infer that in 2009, when groundwater levels generally were at historical lows, the valley axis zone of upward vertical gradients did not exist or was substantially smaller. It is also reasonable that the area of downward vertical gradients was larger and possibly extended across the study area in 2009. Analysis of 2009 conditions, similar to the 2020 analysis summarized in **Figures 2-15 and 2-16,** is not possible because most shallow monitoring wells had not yet been installed.

2.5. WATER QUALITY

Available water quality data were assessed 1) to generally characterize drain water relative to groundwater and 2) to provide an initial identification of potential geochemical signatures for selected surface water (e.g., CRW), shallow and deep groundwater, and drain flows.

2.5.1. General Water Quality Characteristics

Table 2-1 shows average concentrations of water quality for all wells from 1999, while **Table 2-2** documents average concentrations for shallow wells (here defined as less than 500 feet deep), and average concentrations by general drain areas are shown in **Table 2-3**.

Groundwater quality is variable across the study area and with depth. As shown in **Table 2-1**, averages are categorized by general geographic area and indicate some differences in concentrations. For example, wells located in areas that drain to the CVSC generally have a lower average concentration of Total Dissolved Solids (TDS). Wells located in the area that drains to the southwest and southeast edges of the basin have slightly higher concentrations of TDS (largely from chloride and magnesium). **Table 2-2** for shallow wells (less than 500 feet) shows that shallow groundwater quality has slightly elevated concentrations relative to deeper wells especially for nitrate and boron.

Drain water quality has been monitored at each monitoring location since 1999. Drains receive water from agricultural return flows, and depending on the drain, from other sources (wastewater, fish farm effluent, stormwater, regulatory discharges, etc.). The water quality of the specific drains would reflect a mixture of some or all sources.

In general, agricultural drain flows are expected to have higher concentrations of nutrients (nitrate and phosphates), trace elements (metals), and salts (FAO, 1997). The composition of the drain water is affected by local soil and sediment characteristics and trace metals potentially in drain water include arsenic, cadmium, mercury, lead, boron, chromium, and selenium.

As expected, the drain water quality in the study area shows elevated nitrate, TDS, and metals (aluminum, arsenic, selenium, and iron). Compared to groundwater, drain water quality generally shows higher concentrations of TDS, nitrate, alkalinity, iron, selenium, and aluminum. While arsenic is elevated in drain flow concentrations, concentrations are generally higher in groundwater (both shallow and deep). Groundwater also shows significantly higher concentrations of boron and chromium than drain flow.

2.5.2. Geochemical Signatures

For this analysis, recent water quality data from the drains and from selected groundwater monitoring wells were to define geochemical signatures. In addition, recent water quality data for Coachella Valley Canal/Colorado River water were included for reference. A recent Salton Sea sample was also included for reference purposes. **Figure 2-17** shows the locations of the drain and selected groundwater sources used in this analysis.

Identification of geochemical signatures for the selected surface water, groundwater, and drain water qualities was based on a geochemical plotting technique to graphically represent inorganic chemistry and general water quality (Hem, 1989). The selected technique is referred to as a Trilinear diagram, or Piper diagram after the developer of the technique (Piper, 1944). For this evaluation, water quality from drains, shallow groundwater, and deeper groundwater (as represented in two nested wells) were plotted on four Piper diagrams to identify geochemical signatures. For example, **Figure 2-18** is the Piper diagram developed for drain water quality samples.

A Piper diagram (such as Figure 2-18) illustrates the relative proportions of the major cations and anions in water. The major cations are magnesium, calcium, sodium/potassium and the major anions are chloride, sulfate, and bicarbonate/carbonate. The concentrations of these are generally reported in milligrams per liter but are converted to chemical equivalent values (milliequivalents/liter) reflecting the content as a proportion of TDS. The milliequivalent units are plotted in two respective triangular-shaped diagrams for cations and anions. The apex of a triangle represents a proportion of 100% and the opposite side represents 0%. The plots are then straight-line projected onto the diamond-shaped diagram to indicate general water type and water quality.

For each water source, the most recent available water sample was selected, provided that the data were consistent with historical water quality and included the required cations and anions to plot on the Piper diagram. The necessary balance between cations and anions was checked for each sample used in this evaluation, with the recognition that some water samples may include other constituents, such as nitrate, that are not included in the geochemical plotting.

Figure 2-18 shows the geochemical plots for water samples collected in August 2022 at each drain monitoring location (see **Figure 2-17**). Water quality plots also are shown for reference from respective samples from the CVSC (August 2022), Colorado River water from the canal (August 2022), and the Salton Sea (1999 average water quality). The drain water samples

show similar geochemical signatures, as indicated by the clustering of data points on the Piper diagram. In general, drain water has a similar geochemical signature to the Colorado River water. This suggests that most of the drain water is currently related to agricultural return flows. The variation among drain samples (for example, between the relative proportions of calcium and sodium/potassium) may reflect geochemical reactions of Colorado River water with clay minerals in different soils or the effects of agricultural soil amendments.
To aid comparison among diagrams, a general field is outlined of plots for other water sources. **Figure 2-18** indicates the general field for Shallow Groundwater, which overlaps the drain plots but encompasses a broader range of water quality.

Figure 2-19 shows the geochemical plots for selected shallow groundwater samples from across the study area (see Figure 217 for locations). The groundwater samples were collected in 2022 from shallow wells drilled for the SNMP monitoring program. The plots show a wider range of geochemical signatures than drain water, as indicated by the Drain Water field shown on **Figure 2-19**. This wider range of water quality suggests multiple factors affecting water quality in the shallow aquifer zone, which likely include agricultural return flow and upward flow of deeper groundwater. Conversely, the close clustering of the drain plots around the Colorado River water plot suggests Colorado River irrigation water as a primary factor affecting the drain water quality signature.

Figures 2-20 and **2-21** are the geochemical plots of deep groundwater samples collected from the two sets of nested wells. These wells have discrete screened intervals at various depths and thus can illustrate how groundwater quality changes with depth. Water samples from 2019 were used, unless the dataset was incomplete.

Figure 2-20 shows the northeastern nested well group, located near the CVSC (see **Figure 2-17**). The four wells show two strongly differentiated geochemical signatures. The two shallower wells, at 390 and 770 feet bgs depths, have geochemical signatures with predominant sodium/potassium and calcium-bicarbonate. The two deep wells, at 1,260 and 1,470 feet bgs depths, have geochemical signatures in the sodium-chloride group. It is beyond the scope of this study to analyze these quality characteristics, which may reflect long residence deep in the subbasin, connate water from ancient lakes, and hydrothermal sources among others. It is noteworthy that these groundwater samples present distinct geochemical signatures that are distinguishable from those of drains, the Salton Sea, or the Colorado River.

Figure 2-21 shows groundwater samples from the southwestern nested wells. Each depth shows a different geochemical signature, varying mostly with the relative proportions of bicarbonate/carbonate and sulfate. The shallower wells from the northeastern nested well group (at 390 and 770 feet bgs depths) have similar quality characteristics.

The Piper diagrams show that, in general, drain water has a similar geochemical signature to Colorado River water. The geochemical signature of shallow groundwater is relatively variable, likely reflecting multiple factors. Although targeted deep water sampling is limited, it suggests the possibility of distinct geochemical signatures for deep water.

3. SURFACE SOURCES TO THE MASTER DRAINAGE SYSTEM

As described in Section 1, the master drainage system is composed of open ditches and drainpipes that move water from on-farm drains in agricultural areas toward the Salton Sea. The flow from on-farm drains may be excess irrigation water or local shallow groundwater originating from a perched aquifer or rainfall infiltration. Other major sources of surface water flow to the master drainage system include:

- Regulatory water flows
- Treated point source wastewater flows
- Fish farm effluent
- Unauthorized discharges
- Stormwater runoff

This section describes each of these surface sources and the flow contribution to the master drainage system.

3.1. REGULATORY WATER FLOWS

Colorado River water is the major source of irrigation water for the Study Area. It is provided by CVWD from the Coachella Canal and through an extensive pipeline irrigation distribution system. Operation of this pipeline system involves a component of water flow that is discharged from the end of the distribution laterals into the master drainage system. This Regulatory Water is a necessary component that ensures proper pressure and flow throughout the gravity flow system.

Regulatory water is measured at 40 metered locations. Thirty of these meters measure flow into the CVSC, one measures flow into an on-farm reservoirs, and the remaining nine measure flow into seven separate drain channels: A Channel, D Channel, E Channel, Ave 76, Grant, Hayes, Hayes 0.5, and Garfield. Monitoring regulatory volumes that flow to drains is complicated by the system of metering (automated and handheld) that calculates regulatory flow and drain flow. Improved information since 2020 on which drains receive regulatory flows and the operation during drain flow measurements has improved the accuracy of flow measurements.

Figure 3-1 shows reported regulatory water flows by month to the CVSC and seven specific drains. Regulatory water data are available monthly from August 2008 through December 2022. The locations and volumes of regulatory water that flows into drains have changed over time as the metering system has been expanded and improved through robust maintenance. Monitoring has improved over time as more meters measuring regulatory flow have been added.

3.2. WASTEWATER EFFLUENT

As indicated on **Figure 3-2**, three water reclamation plants (WRPs) discharge treated wastewater effluent to the CVSC and thus contribute flow to the master drainage system. These plants include Valley Sanitation District (VSD), City of Coachella Sanitation District (CSD), and CVWD's WRP-4. These flows may percolate within the unlined channel and may contribute to recorded flow volumes at the USGS gage on the CVSC. **Figure 3-3** shows the monthly flows from these from 2011 through 2022.

3.3. FISH FARM EFFLUENT

There is one major private discharger to the CVSC, Kent SeaTech, which is a 160-acre aquaculture operation (fish farm) located near Mecca, shown on **Figure 3-2**. Kent SeaTech reportedly utilizes deep (artesian) groundwater for its fishponds and then discharges water directly into the CVSC. Kent SeaTech reports their quarterly discharge to CVWD, with data available from 1996 to 2022. The fish farm operation was not at full capacity from 2008 to 2015 and, while discharge was monitored, it was minimal over these years. The monthly volumes of discharge are shown on **Figure 3-4**.

3.4. UNAUTHORIZED DISCHARGES

It is recognized that other private properties have illegally discharged to the master drainage system. The specific source, timing, location, and volume of such discharges are not well known but CVWD continues to pursue these property owners to stop their unauthorized activities. Drains outflows that may be impacted by such additional flows include Ave 79, Oasis-Grant, F Channel, Lincoln-Oasis, and CVSC. While such unauthorized discharges may be locally important, they are assumed insignificant for this study of the entire master drainage system.

3.5. STORMWATER RUNOFF

While the CVSC represents the central conveyance of the drain system, its main purpose is to convey stormwater through the East Valley to the Salton Sea and prevent large scale flooding. More than 400 inlets convey storm flows to the CVSC. These are not monitored and the stormwater flow into the CVSC has not been estimated beyond isolated storm events.

The CVSC is the continuation of the Whitewater River through the eastern portion of the basin. During wet periods, flow from the Whitewater River and other tributaries flow from the larger watershed down the Whitewater River into the CVSC. As noted previously, the USGS measures flow in the Whitewater River at Windy Point and Indio, and the CVSC at Mecca (see **Figure 1-1)**. **Figure 3-5** compares the Whitewater River flows at Indio (blue) and at the CVSC flows at Mecca (red).

In most years, the Whitewater River is dry at the USGS gage at Indio but in wet years or during peak events, flows passing the Indio gage contribute to the flow reading on the CVSC at its

Salton Sea outflow. No studies are available on the flow percolated between Windy Point and Indio gage on the Whitewater River, or along the CVSC. The volume of flow from the Whitewater River that contributes to the total flow observed at the CVSC at Mecca is considered stormwater runoff but limited estimates are available to quantify the volume. In addition, some of the surface water storm flow measured at Indio may infiltrate in the channel before reaching the downstream gage.

As indicated previously, the Eastern Coachella Valley Stormwater Master Plan (ECVSMP) proposes additional stormwater channels through the East Valley. **Figure 3-6** shows the two ECVSMP study areas (Oasis/Valley Floor and Mecca/North Shore) and proposed facilities. A peak drainage flow capacity analysis was conducted as part of ECVSMP, indicating that flow volumes in 100-year, 1-hour storms could exceed 15,000 AF and 10,000 AF for the Oasis/Valley Floor and Mecca/North Shore areas, respectively. The average annual drain flow is currently around 84,000 AFY. In a very wet year, storm water could represent 29 percent of total flow.

An estimate has been developed of the portion of CVSC flow that could derive from large storm events (Dave Ringel, personal communication, 2019). This estimate was based on hydrograph separation to analyze daily flow data (2016-2019) from the CVSC and to estimate the portion of flow that is stormwater entering the CVSC above the gage at Mecca, and not flow from wastewater discharge, or on-farm drainage. This method was expanded in this study to include data from 1960 to 2022. The rainfall records from Jacqueline Cochran Regional Airport near Thermal were compared to the daily flow at the USGS gage on the CVSC at Mecca, and if the daily records showed a short term increase in flow, the difference between the peak flow and the expected flow (average of before and after the short term peak) was assumed to be stormwater.

While this method can estimate some of the stormwater that flows in the CVSC after peak events, it is not designed to quantify all stormwater flows that are included in the drain flow volumes and actual volumes are likely higher than calculated using this method. In addition, drain flows from on-farm drainage are also expected to have increased flow during these rainfall events. Additional storm water may be included in drain base flow, making it difficult to separate out the source of water in drain flow volumes. In the other drains where volumes are only measured monthly, a detailed stormwater analysis for peak events is not possible due to the lack of available daily flow measurements.

3.6. IRRIGATION WATER APPLICATION AND RETURN FLOWS

This section provides an evaluation of irrigation water application and the resulting return flows (agricultural return flows) that represent a major flow to the master drainage system. This water source includes direct inflows from on-farm drains or indirect return flows that recharge shallow groundwater and then flow into the system.

3.6.1. Factors in Agricultural Return Flow

The total amount of flow from on-farm drainage systems is affected by geographic factors including local soil characteristics and the extent, distribution, and layout of on-farm drain systems, and by factors that also are more likely to change over time, including crop type and irrigation method and practices.

For this analysis, the soil conditions and the extent, distribution and layout of drain systems are assumed generally constant. As noted in Section 1.2, mapping of the master drainage system was last updated in 1984 and changes are known to have occurred since then. These mostly involved a decrease in drains due to redevelopment of cropland.

Crop acreages by crop category are mapped and measured by CVWD on a triannual basis. **Figure 3-7** shows distribution of general crop categories in ID-1 from the most recent crop census (2022)**.** Major crops include citrus/deciduous and grapes that generally are located on the alluvial fans, while other crops such as truck and pasture also occupy the central trough of the valley. The Miscellaneous category includes polo fields, duck ponds and fishponds. Idle land (not cropped) is also shown.

Annual acreages for the general categories of crops are shown on **Table 3-1** and **Figure 3-8** for the period 2010 through 2021, as provided in USBR Crop Reports. As indicated, the acreages of crop categories since 2010 are relatively steady. Truck crops (including crops like carrots, peppers, and lettuce/greens) represent the largest acreage (averaging 46 percent) of cropped land since 2010. Deciduous and citrus orchards (including date palms, figs, lemons, limes) account for an average 25 percent of the cropped area. Turf and grapes are also crops with large areas, both representing about 12 and 11 percent of the cropped area respectively.

The irrigation methods vary across the valley. According to CVWD reports to USBR, in 2021 about 13 percent of cropland in the Coachella Valley used flood irrigation, about 32 percent used sprinklers, and the remaining 55 percent used drip irrigation. **Table 3-2** documents the irrigation by year from 2010 through 2021 and indicates a general increase in sprinkler use and decrease in flood irrigation. Based on the CVWD Crop Census, there is a correlation between crop type and irrigation method. Pasture (alfalfa), date palms, and some vegetables continue to use flood irrigation (although some date palms are being switched to drip irrigation). Crops like wheat, lettuce, potatoes, carrots, onions, and turf are more likely to use sprinklers. Most other crops rely on drip irrigation including grapes, olives, melons, cabbage, broccoli, tomatoes, and peppers. The type of irrigation method affects the irrigation efficiency, namely the amount of irrigation water applied in excess of the evapotranspiration (ET) needs of the crop. In general, flood irrigation would result in relatively high return flows, followed by sprinkler irrigation and then drip irrigation with lowest return flows.

3.6.2. Evaluation of Agricultural Return Flows

Agricultural return flows were evaluated on a Township Range Section basis in the 2022 Alternative Plan Update. As detailed below, this involved estimating potential agricultural

water demand by crop type and area and comparing the demand with the agricultural water supply delivered over the same time period.

Figure 3-9 illustrates the results of this analysis. The color ramp indicates estimated return flows in AFY from relatively low (<250 AFY) in yellow to relatively high (>1,000 AFY) in dark blue. This map reveals a general pattern of relatively low agricultural return flows along the central axis of the valley (reflecting in part the extent of idle land) and along the margins, with relatively high return flows in between.

The basic methodology used to develop agricultural demand was to calculate crop consumptive use and compare that with total agricultural water use from 2009 through 2021. Land use maps from DWR, annual conservation reports, as well as the trimester CVWD Crop Censuses and interviews with larger growers in the area were used to develop monthly crop acreages. Crop consumptive use was calculated from the ET needs of the specific crops, accounting for irrigation efficiency and effective precipitation in order to estimate applied water per acre. The ET needs of a crop can be estimated as Etc = Kc * Eto, where Etc is the ET demand of the crop, Kc is the crop coefficient, and Eto is the reference ET of the geographic area. The daily reference ET and precipitation were downloaded from the California Irrigation Management Information System (CIMIS) for the local Thermal Springs station.

Monthly crop coefficients (Kc) and growing season information for over 63 crops have been derived from the DWR irrigation estimation tool CPU M+ version 6.9 (DWR 2021). The ET needs of bare soil are accounted in the DWR crop coefficient estimate; if the ET demands of bare soil are higher than those for the crop during a growing season, then the applied water would need to meet the bare soil demand. According to interviews with local growers, the growing season for each crop type was applied to the CPU crop coefficients (DWR, 2021). In addition, many growers apply irrigation for certain crops in non-growing seasons for climate modification (e.g., frost protection) and/or leaching. The crop coefficient was used to account for some but not all ET, and the remainder of total agricultural use is assumed to be surplus supply beyond crop demand, thus increasing the return flow volumes. The Etc values were similar to previous values used in CVWD planning (Stantec, 2019), but the DWR method allows for more flexibility in the specific growing seasons and irrigation practices of the Subbasin.

The monthly ET needs of a crop can be satisfied by either applied Irrigation or through natural precipitation. Total irrigation was estimated to be the ET demand of the crop minus the precipitation. Although the amounts in the Indio Subbasin are small, precipitation that exceeds the daily ET demand of a crop is assumed to percolate and is also included in the agricultural return flow estimate.

The next step was to compare crop consumptive use and delivered agricultural supply to calculate an annual return flow percentage. Agricultural supply totals are available for groundwater and surface water deliveries and were aggregated on a Township Range Section basis for this comparison with crop consumptive use.

The resulting difference between supply and demand was assumed to be excess irrigation water. Irrigation efficiency, the percentage of applied water needed beyond the ET demand

of the crop, can vary significantly depending on factors including geographic setting, irrigation method, and crop types. The Conservation Reports estimated an irrigation efficiency of 72 percent each year (Stantec, 2019), while the annual supply and demand analysis indicates that annual irrigation efficiency varies from 67 to 74 percent, with an average irrigation efficiency of 71 percent of water supply for the period 2009-2019. The remaining agricultural irrigation use (29 percent) becomes return flow. The return flows were distributed throughout the model area based on the crop demand and applied by Township Range, with color ramping as shown in **Figure 3-9.**

In summary, agricultural deliveries of imported water and groundwater pumping are accounted for and compared with the total crop consumptive use on an annual basis to estimate the irrigation return flows. Assuming zero surface water runoff (i.e., tailwater), this excess irrigation could migrate through the vadose zone or perched zones and contribute to the drain system, or percolate to groundwater with potential indirect contribution to the drain system.

3.7. WATER BALANCE EVALUATION

A water balance evaluation involves measurement or independent estimation of the various components of inflow and outflow. The difference (inflow minus outflow) is change in storage and net error. In the case of the drain system, the change in storage is essentially zero given the rapid flows through the system relative to the monthly or annual time step of the study, (i.e., water is not stored in the drain system). Accordingly, the difference of inflows and outflows is net error. Net error includes data gaps and errors in measurements and inaccuracies and assumptions in estimated values.

For this drain study, the outflows are the drain flows, as measured at the CVSC and 27 CVWD-monitored locations. The specific surface water inflows are identified with description of the measurements (e.g., wastewater discharge, regulatory flows) or independent estimation methods (e.g., return flows, stormwater), all with sources of uncertainty. Groundwater is distinguished conceptually from return flows and is assumed to represent an inflow to the drain system (from on-farm tile drains). It is the component with the least certainty. If the other water balance components (inflow, outflow, change in storage) could be evaluated with acceptable error, then the water balance equation could be solved for groundwater. For the drain system, this is not possible because of the significant uncertainties. Nonetheless, the components can be tallied for relative comparison and qualitative evaluation.

One revealing comparison is between total drain outflow and agricultural return flow (which is the flow on-farm drains were designed to remove). An important uncertainty in this comparison is the fact that the drains convey other flows; **Table 3-3** lists each drain monitoring location along with the respective possible inflows. (See **Figure 1-5** for monitoring locations and the approximate master drainage system that flows into each monitoring station.) As indicated, all drains likely receive some inflow from stormwater and irrigation return flows, as well as shallow groundwater. CVSC receives the most different sources of inflow including regulatory flows, wastewater effluent, fish farm discharge, unregulated

discharges, streamflow, stormwater, irrigation return flows, and shallow groundwater. Other drains also receive regulatory flows and may receive unregulated discharges.

Another major uncertainty is that irrigation return flow is not directly measured. For the 2022 Alternative Plan Update, the volume of irrigation return flow was estimated and simulated as a recharge into the groundwater model. To estimate the potential volume of agricultural return flows that could flow to each drain outflow, the agricultural areas that flow into the specific drain outflows were identified. Return flows from areas that are not likely to have on-farm drains (i.e., no hatching on **Figure 1-2**) were not included in the potential agricultural return flows to drains.

Figure 3-10 provides the comparison of drain flow and agricultural return flow for the years 2009 through 2021. The measured drain flows were grouped into five areas based on drain locations (CVSC, Southeast drains, etc.) and the agricultural return flows were grouped accordingly by drain area. In all but the southeast drain area, the potential irrigation return flows exceed the measured drain flow by 10 to 40 percent. In the southeast, the relatively low drain flow may be attributed to the area having less tributary watershed. Even so, the agricultural return flow in the southeast area averages 75 percent of total drain flow.

CVSC is the largest drain outflow, on average 56 percent of all measured drain outflow by volume. It not only serves as the main outflow for the agricultural drainage system but also for wastewater discharge, stormwater outflow, and is the continuation of the Whitewater River. Baseflow for the CVSC is defined herein as the portion of drain flow that is not from a measured source (wastewater, fish farm, peak storm flow) and is likely made up of ag return flows or shallow groundwater.

The portion of the total flow that can be measured or estimated from each surface water inflow is broken out for the CVSC in **Figure 3-11** (monthly) and **Figure 3-12** (annually). The total flow is based on the USGS gage at Mecca and the remaining baseflow would include the non-measured inflows from agricultural return flows, shallow groundwater, flow along the Whitewater River, and unregulated flows.

The breakdown for the drain network measured totals and the measured sources of surface water inflow is shown in **Table 3-4**. The table shows total measured drain flow; the volume of known surface water discharges including wastewater, fish farm effluent, estimated stormwater, and regulatory flow; and the remaining 'Other' non-measured inflows which include agricultural return flow, groundwater discharge, unauthorized discharge, and unmonitored stormwater. On average only 31 percent of the CVSC flow measured at Mecca is from these non-measured inflows. The other drains average around 98 percent flow from non-measured inflows. Overall, 59 percent of all drain flow is from un-monitored sources including agricultural return flows, shallow groundwater, stormwater, and unregulated discharges. Based on the relative volumes of agricultural return flow, it is likely that drain base flow is largely made up of water that was applied as irrigation and flows to the drain system directly or after first reaching shallow groundwater.

3.7.1. Changes over time

Figure 1-6 shows that the total volume of water in the master drainage system has declined from 1985 to 2022. Total drain flow in 2022 (59,757 AF) was about half the drain flow in 1985 (118,566 AF). During this same period, the total imported Colorado River water also declined. In 1980, Colorado River deliveries (almost all were delivered to agricultural users) totaled 531,791 AF and by 1985 this had decreased to 337,002 AF, reflecting agreements for conservation. The Colorado River deliveries for agricultural users were 229,097 AF (43 percent and 68 percent of the 1980 and 1985 deliveries respectively).

As expected, the decrease in total imported water was reflected in the decrease of agricultural return flows over the time period. **Figure 3-13** shows agricultural return flows from 1970 through 2020 as estimated for previous Annual Reports (Stantec, 2019). These estimates indicate a steady decrease in the volume of return flow over this period. Meanwhile, hydrographs of groundwater levels over the same period show that groundwater levels across the basin have remained steady or increased. Thus, the change in drain flow is likely related to changes in agricultural practices rather than the changes in the groundwater system. As an important perspective, it is unlikely that agricultural users will return to the less-water-conserving irrigation practices of the past. Accordingly, it is unlikely that the volume of drain flows will return (or should return) to 1980s volumes.

4. RECOMMENDATIONS

4.1. DRAIN FLOWS AND GROUNDWATER MANAGEMENT

The 2010 Water Management Plan assumed that higher drain flows are beneficial because they are a response to higher groundwater levels in the East Valley, which promote export of salt from the Subbasin and are generally protective of the deep aquifer water quality. The Plan hypothesized that drain flow volumes could be used as an indicator for sustainability. Based on the mechanics of on-farm drainage, local geology, and existing groundwater levels, at this time drains are likely to only remove agricultural return flows and very shallow groundwater that may be disconnected from the principal aquifer.

The hydrogeologic conceptual model is not detailed about the flow paths of agricultural drain flow within and just below the soil zone. Drainage of surplus applied irrigation water may reach the drain system by flowing through temporarily/locally saturated areas in the soil/ vadose zone or very shallow perched zones. Alternatively, irrigation return flow may reach the water table and recharge the regional shallow groundwater before flowing into the drain. The actual flow paths are likely to be highly variable both geographically (even within one field) and temporally as groundwater levels change and essentially unknowable.

As shown in this study, drain flows include multiple sources (return flows, stormwater, treated wastewater, fish farm effluent, regulatory water). Groundwater flow is likely to occur (with local and temporal variations) but is not a major component. Accordingly, drain outflow volumes to the Salton Sea are an indirect and inaccurate measure of upward groundwater flow that is protective of deep groundwater quality and thus is an inadequate means of assessing groundwater sustainability.

Moreover, groundwater levels and quality are directly monitored. Groundwater levels are already included in the Indio Subbasin's sustainable management criteria. Water quality is monitored directly and the sources and mitigation of loading is currently being studied in the Salt Nutrient Management Plan. Significant improvements to the groundwater monitoring network have been made since the 2010 Water Management Plan, most notably installation and monitoring of dedicated nested wells and shallow wells that allow tracking of groundwater levels and quality in the complexity of aquifer units within the principal aquifer of the Indio Subbasin.

4.2. INCREASED MONITORING

Additional measurements upgradient in the drainage system may help isolate the area or identify sources of water inflow. The drain network covers a large area (about 45,000 acres) and includes both on-farm tile drainage systems and a master network of ditches and drainpipes. Additional groundwater monitoring, especially in the area indicated as potentially contributing to upward groundwater flow into the drainage system (e.g., along the Salton Sea) may help improve the quantification of groundwater inflow into the system.

Shallow groundwater should be monitored with dedicated shallow monitoring wells to help differentiate flows into the drains. The contour maps can be used to find areas that likely contribute flow.

A basic issue is that all drain monitoring occurs at the end-of-system drain outflows near the Salton Sea. Flow measurements are often miles from the point of use and include inflow from a variety of sources. While recognizing that monitoring intermediate locations near the on-farm irrigation could be infeasible, it would help distinguish the various sources of drain flow.

Another basic issue is related to the frequency of flow measurements. A single monthly flowrate observation is highly unlikely to correlate to the average flowrate for the entire month as agricultural drains have inconsistent flows (dependent on irrigation water use, rainfall runoff, or illicit discharges, for example). To understand a monthly average flowrate or a total flow volume, remotely monitored flowrates every fifteen minutes are the industry standard to accurately portray peak flows, low flows and averages. Agricultural flows may be captured in a snapshot of time with accuracy, but the application of those snapshots to predict an average flow over a large period, like monthly, entails inaccuracies.

4.3. Additional Information For On-Farm Drainage

When excess irrigation is applied to fields it percolates to the aquifer. However, the percolation could be intercepted by the tile drain system or low permeability units and not directly recharge the regional groundwater aquifer. The portion that leaves the farm via the drainage system is likely dependent on the location, antecedent soil moisture, irrigation method, and local geology. Pilot studies could include field-specific water application and crop consumptive use tracking on individual farms plus tracking of groundwater levels in nearby shallow monitoring wells. These could be supplemented with geochemical and isotope studies of applied water and shallow groundwater. These may provide additional understanding on the occurrence/amount of return flows and return flow transport directly to drains or indirectly through groundwater flow.

4.4. Model Improvements

The 2022 Alternative Plan Update simulated historical and future groundwater conditions using a numerical model. The numerical model simplifies the flow paths of agricultural return flows and assumes that all return flow will directly recharge the aquifer. Drain outflow is simulated through drain cells in the East Valley, shown as pale yellow on **Figure 4-1**. These areas closely follow the drain area delineated in the 1984 Engineering drawing, shown as the hatched areas. The model simulates drain flow using the MODFLOW drain package; where water leaves the aquifer if water levels in a drain cell reach the elevation set at the drain. The rate is adjusted using a conductance; for the 2022 Alternative Plan model, a constant 10,000 ft^2/day conductance was used for all drains. The modeled drain elevations were originally set at the top of the simulated model, which was 10 feet below ground surface.

Reality is more complicated, but the effect may be similar. Draining agricultural return flows into the drainage system before it can percolate to the aquifer would minimize salt loading to the basin. Similarly, draining shallow groundwater that has received agricultural return flow would have the same protective effect. Additional model scenarios could help illustrate the flow path of return flows applied to agricultural areas.

If the numerical model is updated and recalibrated in the future, the conductance and depths of the drains could be improved to simulate the portion of drain flow from agricultural return flows and groundwater discharge.

The model is a critical tool for management of the Indio Subbasin. In light of changing conditions, sustainable management of the Indio Subbasin requires strategic use of imported water for replenishment to adapt to changing conditions. Further investigations and model scenarios can be applied to optimize replenishment of imported water in the East Valley to protect groundwater levels, storage, and water quality.

5. CONCLUSIONS

This study documents the drain system and identifies sources of inflow to it. This study provides a conceptual hydrogeologic model, and documents groundwater levels spatially and vertically to discern interactions with the on- drain system. Water quality data are examined to identify possible geochemical signatures for surface water, drain water and groundwater. This study has been conducted using readily available information. It acknowledges uncertainties and identifies areas and topics where additional information would help understand and manage groundwater/drain interactions.

Major conclusions include the following:

1. The master drainage system was constructed to provide drainage for agricultural fields and to remove and convey the salts found naturally in saline soils and shallow groundwater.
2. Drainage flow data have been used to evaluate groundwater outflow and have been used as an indicator for protection of deep groundwater and basin sustainability.
3. CVWD has significantly improved monitoring of drains, shallow groundwater, and deep groundwater.
4. The Principal Aquifer is characterized by multiple aquifer types that show various degrees of confinement from confined/artesian to semi-confined, and unconfined water table and local perched units.
5. Depth to water maps generally show shallow depths to water along the axis of the valley. Areas with likely artesian conditions are also delineated along the valley axis.
6. Groundwater elevations were compared between medium and shallow zones and between deep and shallow zones. This comparison indicates areas along the valley axis with no vertical groundwater gradient or upward flow. Areas along the valley sides are indicated to have no vertical gradient to downward flow.
7. Evaluation of water quality has identified potential geochemical signatures for selected surface water (e.g., CRW), shallow and deep groundwater, and drain flows.
8. Drain water quality samples show similar geochemical signatures to the Colorado River water, suggesting most of the drain flow is related to agricultural return flows. Shallow groundwater quality samples show a range of signatures that indicate multiple factors. Select deep groundwater quality samples present distinct geochemical signatures.
9. Major sources of surface water flow to the master outflow drainage include:
    a. Regulatory water flows
    b. Treated point source wastewater flows
    c. Fish farm effluent
    d. Unauthorized discharges
    e. Stormwater runoff
    f. Irrigation water return flows
    g. Shallow groundwater

10. Agricultural return flow volumes can account for most of the drain flow volumes.
11. Vertical groundwater gradients suggest that along the axis of the Valley there is little to no vertical groundwater flow due to confining or semi-confining units, along the western and eastern edges of the valley there is slight downward flow due to the lack of confining units, and along the southern boundary with the Salton Sea there is a slight upward flow.
12. Drain outflow volumes to the Salton Sea are an indirect and inaccurate measure of upward groundwater flow that is protective of deep groundwater quality and thus represent an inadequate means of assessing groundwater sustainability.
13. Drain flow is not needed as a criterion for Sustainable Management. The drain flow volumes represent multiple sources and do not adequately indicate changes in water levels, water quality, or interconnected surface water.
14. Groundwater levels and quality are directly monitored. The monitoring program is generating data that support groundwater management and protection of the deep zone. Groundwater levels are already included in the Indio Subbasin's sustainable management criteria.
15. Sustainable management of the Indio Subbasin requires strategic use of imported water for replenishment to adapt to changing conditions. Further investigations and model simulations can be applied to optimize replenishment of imported water in the East Valley to protect groundwater levels, storage, and water quality.

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Table 1-1. Drain Data Sources Used*

	Beginning	End	Notes	Source
Wastewater (monthly)				
VSD	Nov-10	Apr-23	Annual from 1990-2022	RWQCB
CSD	Nov-10	Apr-23	Annual from 1990-2022	RWQCB
WRP4	May-04	Dec-22	Annual from 1990-2022	CVWD
Other Flows				
Regulatory	Aug-08	Dec-22	Monthly	CVWD
Kent Sea Tech	Jan-96	Sep-22	Quarterly	Kent Sea Tech
Surface Water				
Mecca**	Oct-60	Oct-23	Daily	USGS
Windy Point	Oct-98	May-23	Daily	USGS
Agriculture				
Crop Census	Jan-12	Jan-22	Triennal	CVWD
USBR Crop Reports	Jan-10	Jan-21	Annual	CVWD
Ag Return Flows	Jan-09	Dec-21	Annual	Indio GSAs
Drain Flow				
Drain Flow Volumes	Jan-85	Dec-22	Monthly	CVWD
Drain Water Quality	Feb-99	Aug-23	Annually	CVWD
Groundwater				
Water Levels	Jul-04	Mar-23	Triennal	CVWD
GW Quality	Sep-71	Dec-22	Typically Triennal	CVWD

* Additional historical data may be available but were not compiled for this study.

** The CVSC at the Mecca gage is listed as Surface Water but represents a blend of various flows.

Table 2-1. Average Water Quality of All Groundwater by General Location (ug/L unless noted)

All GW	Al	As	Ba	Bicarbonate (mg/L)	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Cr	Cu	TDS (mg/L)	Fe	EC (umhos/cm)	Field pH (H+)	Fluoride (mg/L)	Mg (mg/L)	Mn	Mo	Nitrate (mg/L)	Potassium (mg/L)	Se	Sodium (mg/L)	Sulfate (mg/L)	Temperature (°F)	Total Alkalinity (mg/L)	Total Hardness (mg/L)	V	Zn
CVSC	271	10	38	161	9	69	91	11	20	669	6,069	1,117	9	1	15	142	15	4	6	2	192	240	61	115	325	18	29
East	24	23	5	119	5	11	151	2	2	307	22	1,522	9	2	3	1	16	9	2	2	154	120	55	102	9	4	4
SE		5		110	0	53	237	7		1,087			8	2	19			4	4		270	345		92	875		
SW	321	5	22	152	61	56	248	4	16	1,143	48	1,809	8	1	21	30	22	3	10	4	208	240	63	126	278	20	10
West	53	34	31	153	13	53	68	26	1	503	46	1,423	9	2	16	41	28	9	8	3	98	157	49	104	242	9	65

Table 2-2. Average Water Quality of Shallow Groundwater by General Location (ug/L)

Shallow GW	Al	As	Ba	Bicarbonate (mg/L)	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Cr	Cu	TDS (mg/L)	Fe	EC (umhos/cm)	Field pH (H+)	Fluoride (mg/L)	Mg (mg/L)	Mn	Mo	Nitrate (mg/L)	Potassium (mg/L)	Se	Sodium (mg/L)	Sulfate (mg/L)	Temperature (°F)	Total Alkalinity (mg/L)	Total Hardness (mg/L)	V	Zn
CVSC	400	17	60	97	18	56	100	13	34	708		1,741	8	1	11	329	26	6	6	5	110	243	47	211	314	5	36
West		60		100	57	2	10	1		230	22		10	2	0			0	10		75	39	50		7		

Table 2-3. Average Water Quality of Drain Flow by General Location (ug/L)

Drains	Al	As	Ba	Bicarbonate (mg/L)	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Cr	Cu	TDS (mg/L)	Fe	EC (umhos/cm)	Field pH (H+)	Fluoride (mg/L)	Mg (mg/L)	Mn	Mo	Nitrate (mg/L)	Potassium (mg/L)	Se	Sodium (mg/L)	Sulfate (mg/L)	Temperature (°F)	Total Alkalinity (mg/L)	Total Hardness (mg/L)	V	Zn
CVSC	3,086	8	82	214	1	98	185	4	10	1,174	3,786	1,623	8	2	31	105	36	57	10	2	225	408	73	176	375	18	23
East	794	6	42	347	1	189	496	2	10	2,457	729	3,324	8	3	62	103	94	120	14	7	523	850	75	301	728	8	11
SE	231	4	31	333	1	141	423	2	10	1,994	277	2,824	8	3	57	165	24	64	15	8	431	672	76	275	590	6	21
SW	688	28	58	304	1	160	447	2	35	2,049	779	2,520	8	3	60	142	20	56	16	14	399	649	74	251	647	50	26
West	1,834	20	108	246	0	120	208	3	33	1,384	2,189	1,885	8	2	45	93	14	74	11	5	244	504	77	204	480	91	25

Table 3-1. Crop Acreage - USBR Reports (Acres)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Truck	27,632	27,870	29,671	29,650	28,511	27,866	28,940	29,532	26,023	27,553	26,319	26,681
Deciduous	8,806	8,051	7,958	7,999	8,159	8,608	8,274	8,666	8,922	9,040	9,762	10,020
Citrus	8,037	7,676	7,240	7,087	7,021	6,220	5,892	5,851	6,044	6,234	6,442	6,792
Grapes	8,387	8,208	7,497	7,992	7,802	7,592	7,379	7,129	6,283	5,965	5,511	4,572
Turf	6,686	6,658	7,041	7,057	7,462	7,527	7,434	7,534	7,586	7,645	7,757	7,679
Pasture	2,763	2,720	2,369	2,466	2,199	2,245	2,695	2,209	2,066	2,680	2,182	2,186
Field	146	-	869	80	-	-	235	155	187	142	337	812
Grain	-	-	91	-	-	-	-	-	-	-	-	-
Misc	162	124	701	914	927	940	940	1,040	1,040	1,040	1,040	1,012
TOTAL	**26,181**	**25,386**	**25,808**	**25,596**	**25,411**	**24,524**	**24,575**	**23,918**	**23,206**	**23,706**	**23,269**	**23,053**

Source: USBR Crop Reports

Table 3-2. Irrigation Method

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sprinkler	24%	20%	25%	29%	30%	30%	30%	32%	31%	31%	31%	32%
Drip	57%	58%	54%	54%	54%	55%	57%	54%	56%	55%	56%	55%
Flood	19%	22%	21%	17%	16%	15%	14%	14%	14%	13%	13%	13%

Table 3-3. List of Drain Monitoring Locations with Potential Inflows

Drain	Latitude	Longitude	Regulatory Flows	Wastewater Effluent	Fish Farm Discharge	Unauthorized Discharges*	Streamflow	Stormwater	Irrigation Return Flows	Notes
A Channel	33.480778	-116.090443	Y					Y	Y	
Arthur 0.5	33.525354	-115.982758						Y	Y	
Arthur St.	33.525179	-115.991458						Y	Y	
Ave 74	33.510518	-116.095115						Y	Y	
Ave 76	33.498940	-116.095136	Y					Y	Y	
Ave 78	33.484573	-116.090725						Y	Y	
Ave 79	33.477131	-116.087085				Y		Y	Y	
Ave 83	33.448136	-116.056845						Y	Y	
C Channel	33.462538	-116.061009						Y	Y	
Caleb Channel	33.525776	-115.973846						Y	Y	
Cleveland 0.5	33.525260	-115.965385						Y	Y	
Cleveland East	33.525452	-115.973574						Y	Y	Previously had issues with monitoring
Cleveland West	33.525546	-115.973958						Y	Y	Previously had issues with monitoring
D Channel	33.455221	-116.060151	Y					Y	Y	
E Channel	33.440797	-116.044922	Y					Y	Y	
F Channel	33.429665	-116.043973				Y		Y	Y	
Garfield 0.5	33.525640	-116.000381						Y	Y	
Garfield St.	33.528820	-116.00907	Y					Y	Y	Previously had issues with monitoring
Grant 0.5	33.528786	-116.035044						Y	Y	Previously had issues with monitoring
Grant St.	33.532762	-116.043288	Y					Y	Y	Previously had issues with monitoring
Hayes	33.525618	-116.026303	Y					Y	Y	Previously had issues with monitoring
Hayes 0.5	33.525457	-116.017807						Y	Y	Previously had issues with monitoring
Johnson St.	33.539998	-116.061475						Y	Y	
Lincoln-Oasis	33.466329	-116.078678				Y		Y	Y	Previously had issues with monitoring
Mckinley	33.525616	-115.956799						Y	Y	Previously had issues with monitoring
Mckinley 0.5	33.525286	-115.948258						Y	Y	
Oasis-Grant	33.437785	-116.040743				Y		Y	Y	
CVSC	33.524722	-116.0766667	Y	Y	Y	Y	Y	Y	Y	

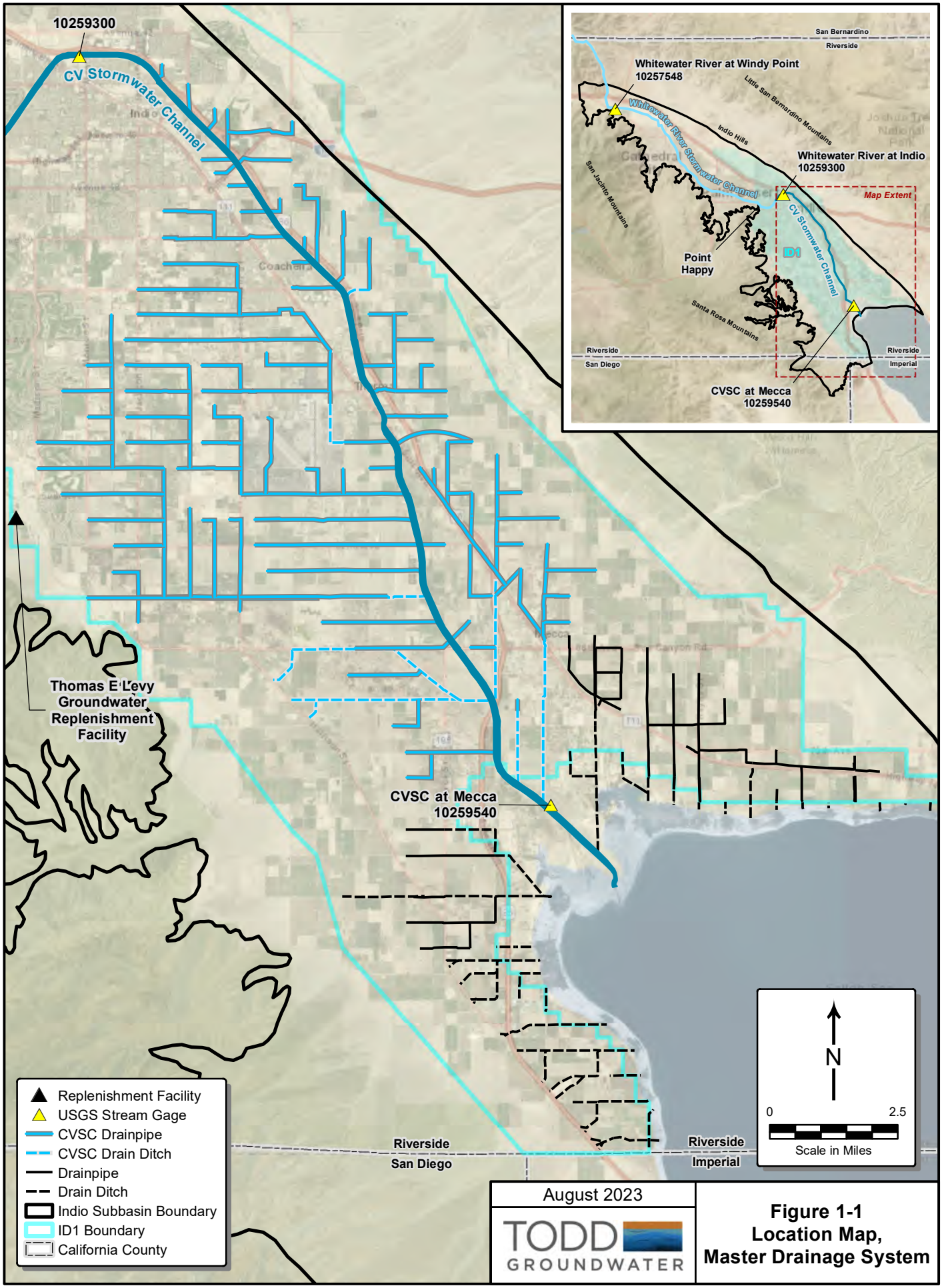
* Some unathorized discharges may have ceased

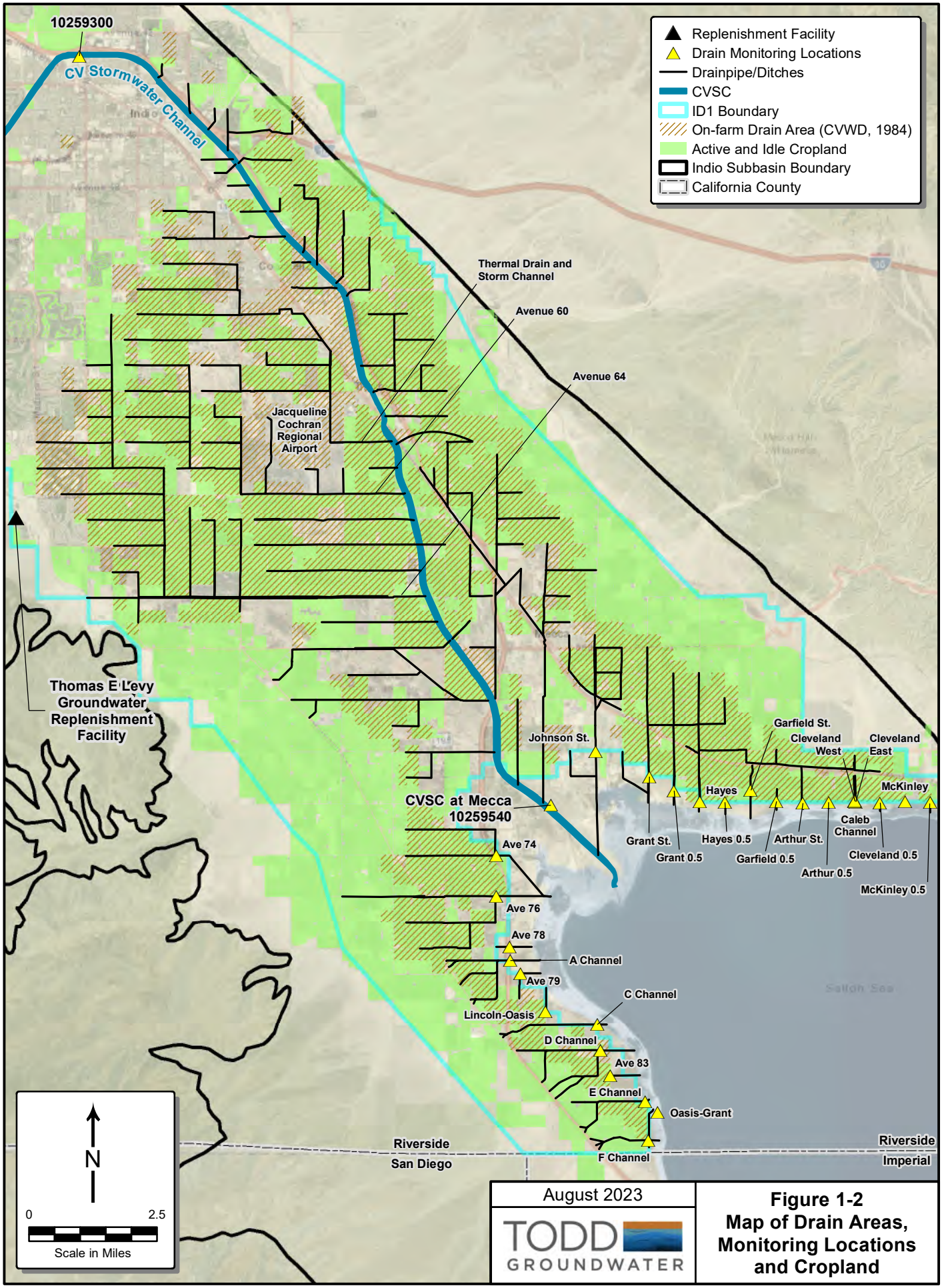
Table 3-4. Sources of Inflow for Drains

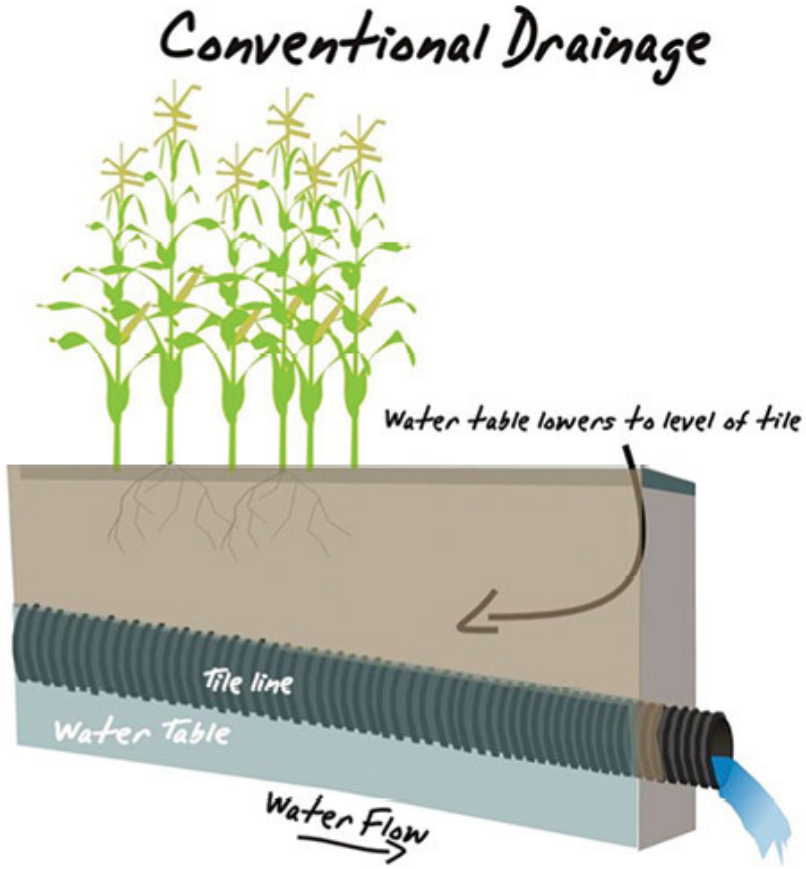
	Total Drain Flow			Known Surface Water Inputs*			Other**			% Other Inflows		
Year	CVSC	Other Drains	Total	CVSC	Other Drains	Total	CVSC	Other Drains	Total	CVSC	Other Drains	Total
2008	49,214	38,304	87,517	23,667	86	23,753	25,546	38,218	63,764	52%	100%	73%
2009	36,258	33,933	70,192	16,707	246	16,953	19,551	33,688	53,238	54%	99%	76%
2010	26,038	37,862	63,900	16,812	397	17,208	9,226	37,466	46,691	35%	99%	73%
2011	30,197	35,699	65,896	19,829	446	20,274	10,369	35,254	45,622	34%	99%	69%
2012	30,583	37,745	68,329	22,433	425	22,858	8,150	37,321	45,471	27%	99%	67%
2013	31,670	35,535	67,205	21,555	497	22,051	10,115	35,039	45,154	32%	99%	67%
2014	31,181	31,906	63,087	20,778	633	21,411	10,403	31,273	41,676	33%	98%	66%
2015	35,642	29,536	65,179	22,734	489	23,222	12,909	29,048	41,957	36%	98%	64%
2016	42,090	32,786	74,876	27,681	710	28,392	14,409	32,076	46,485	34%	98%	62%
2017	33,578	30,866	64,444	29,902	571	30,473	3,676	30,295	33,971	11%	98%	53%
2018	45,012	29,133	74,145	30,136	700	30,836	14,876	28,434	43,309	33%	98%	58%
2019	47,970	29,009	76,979	31,763	718	32,482	16,207	28,291	44,498	34%	98%	58%
2020	46,515	31,138	77,653	32,087	1,418	33,506	14,428	29,720	44,147	31%	95%	57%
2021	46,594	33,240	79,834	30,744	1,966	32,710	15,849	31,274	47,123	34%	94%	59%

* Includes wastewater, fish farm effluent, estimated stormwater, and regulatory flow

** Includes ag return flow, groundwater discharge, unauthorized discharge, and unmonitored stormwater


10259300
CV Stormwater Channel
Thomas E Levy Groundwater Replenishment Facility
CVSC at Mecca
10259540
Riverside
San Diego
Riverside
Imperial
San Bernardino
Riverside
Whitewater River at Windy Point
10257548
Little San Bernardino Mountains
Whitewater River Stormwater Channel
Indio Hills
Whitewater River at Indio
10259300
Map Extent
San Jacinto Mountains
Point Happy
ID1
CV Stormwater Channel
Santa Rosa Mountains
Riverside
San Diego
Riverside
Imperial
CVSC at Mecca
10259540
Replenishment Facility
USGS Stream Gage
CVSC Drainpipe
CVSC Drain Ditch
Drainpipe
Drain Ditch
Indio Subbasin Boundary
ID1 Boundary
California County
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 1-1
Location Map,
Master Drainage System


10259300
CV Stormwater Channel
Replenishment Facility
Drain Monitoring Locations
Drainpipe/Ditches
CVSC
ID1 Boundary
On-farm Drain Area (CVWD, 1984)
Active and Idle Cropland
Indio Subbasin Boundary
California County
Thermal Drain and Storm Channel
Avenue 60
Avenue 64
Jacqueline Cochran Regional Airport
Thomas E Levy Groundwater Replenishment Facility
Johnson St.
CVSC at Mecca 10259540
Garfield St.
Cleveland West
Cleveland East
Hayes
McKinley
Caleb Channel
Grant St.
Grant 0.5
Hayes 0.5
Garfield 0.5
Arthur St.
Arthur 0.5
Cleveland 0.5
McKinley 0.5
Ave 74
Ave 76
Ave 78
A Channel
Ave 79
C Channel
Lincoln-Oasis
D Channel
Ave 83
E Channel
Oasis-Grant
F Channel
Salton Sea
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 1-2
Map of Drain Areas, Monitoring Locations and Cropland

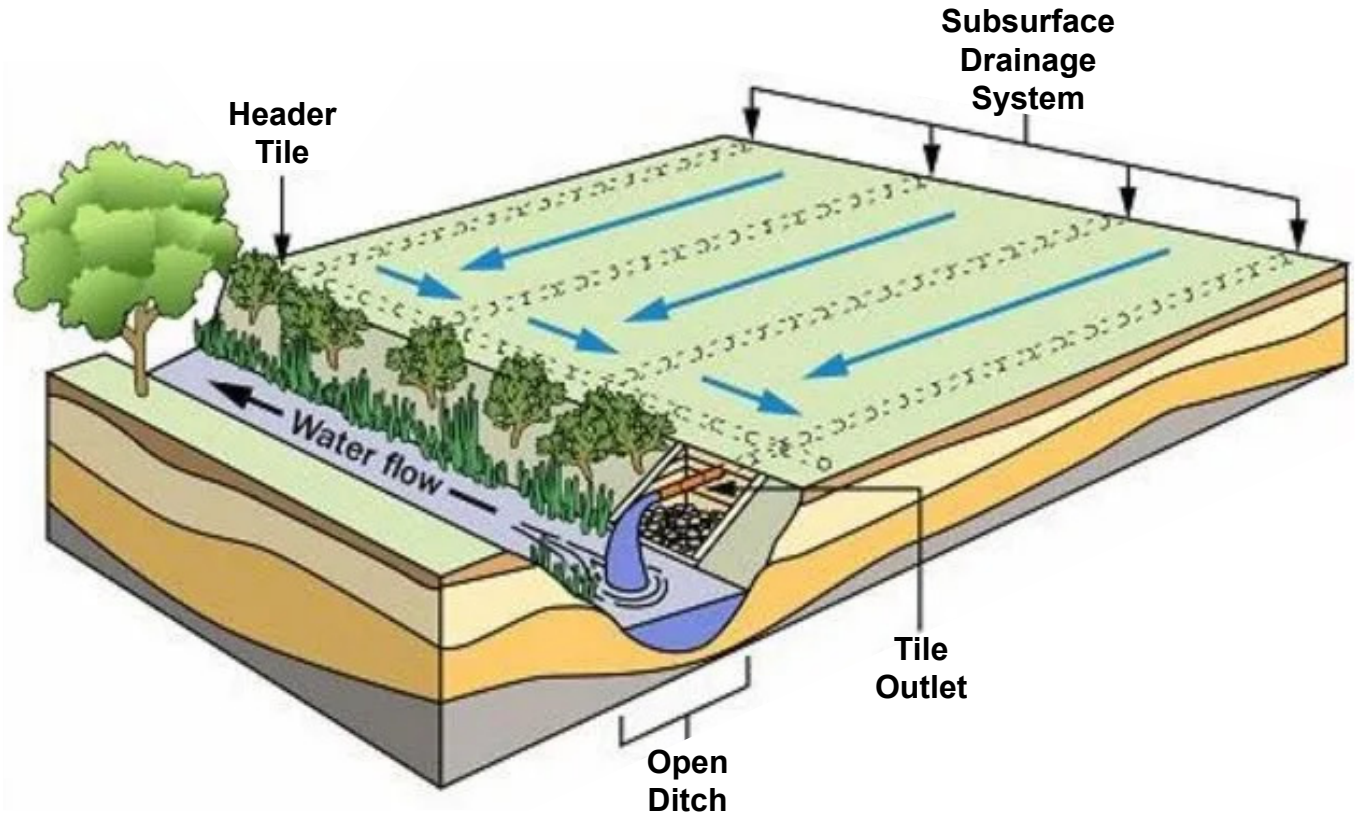


Source: ...

August 2023

TODD GROUNDWATER

Figure 1-3
Diagram Of Drains To Outflow

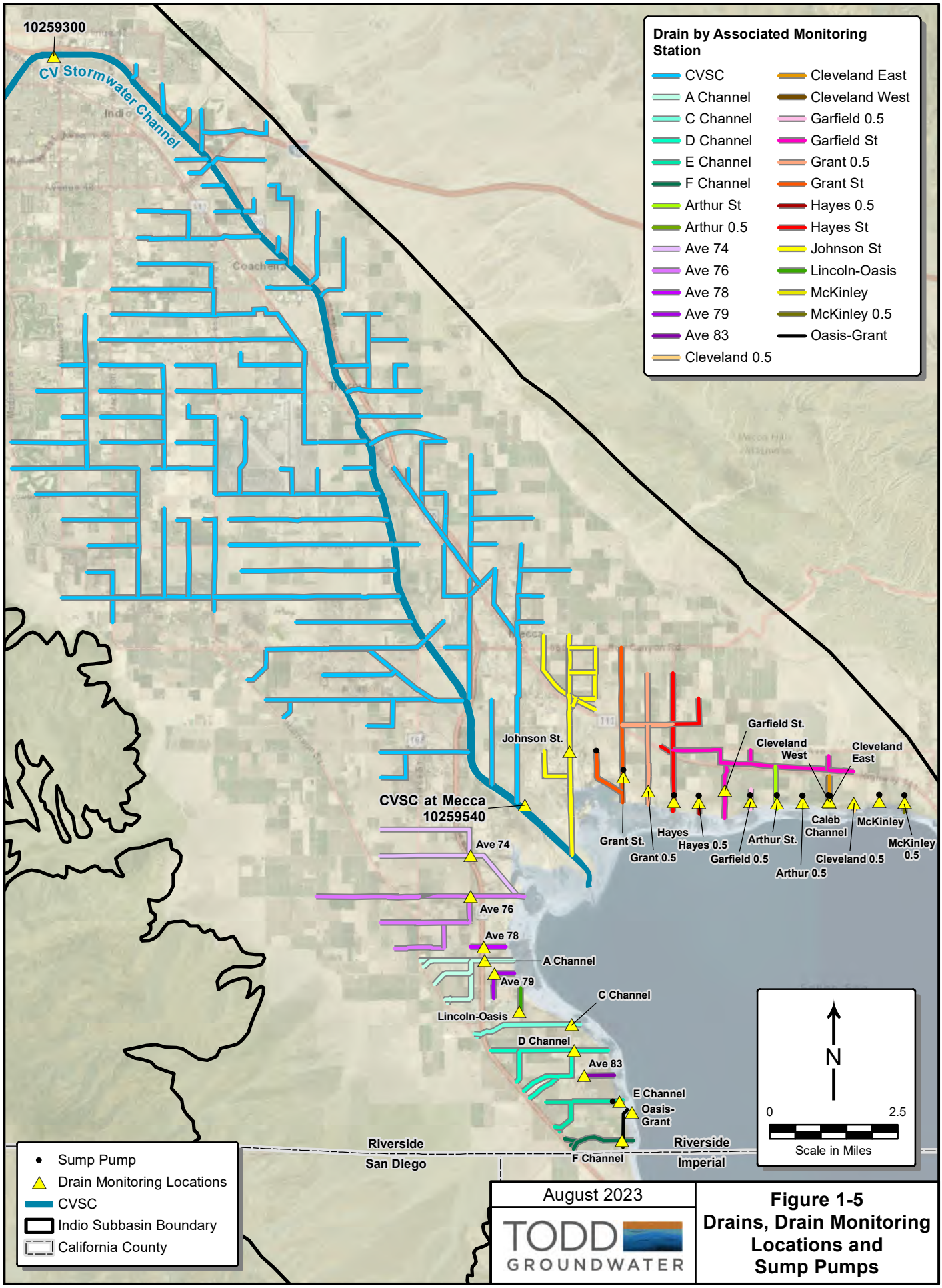


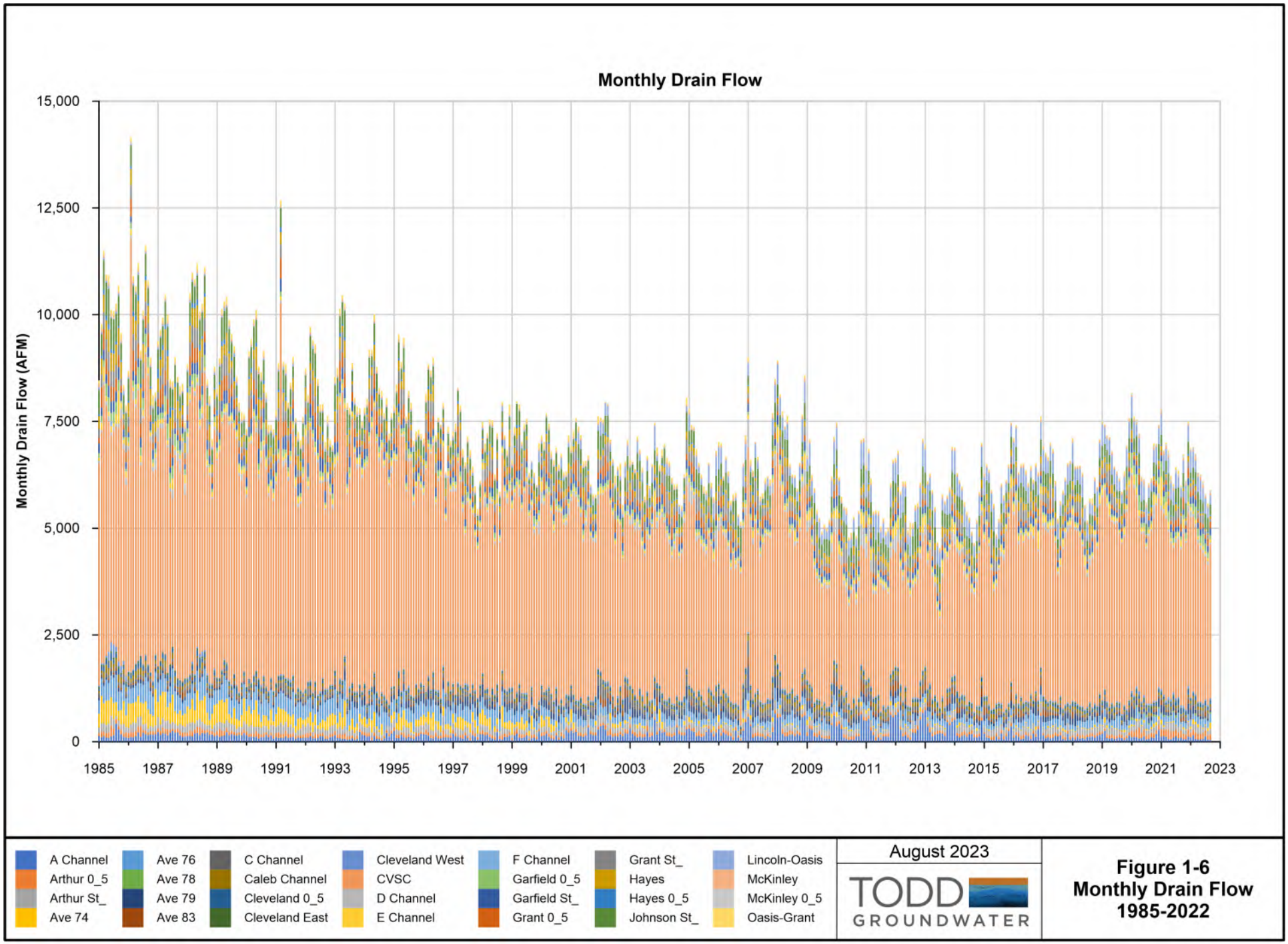
Source: ...

August 2023

TODD GROUNDWATER

Figure 1-4
On-Farm Drainage

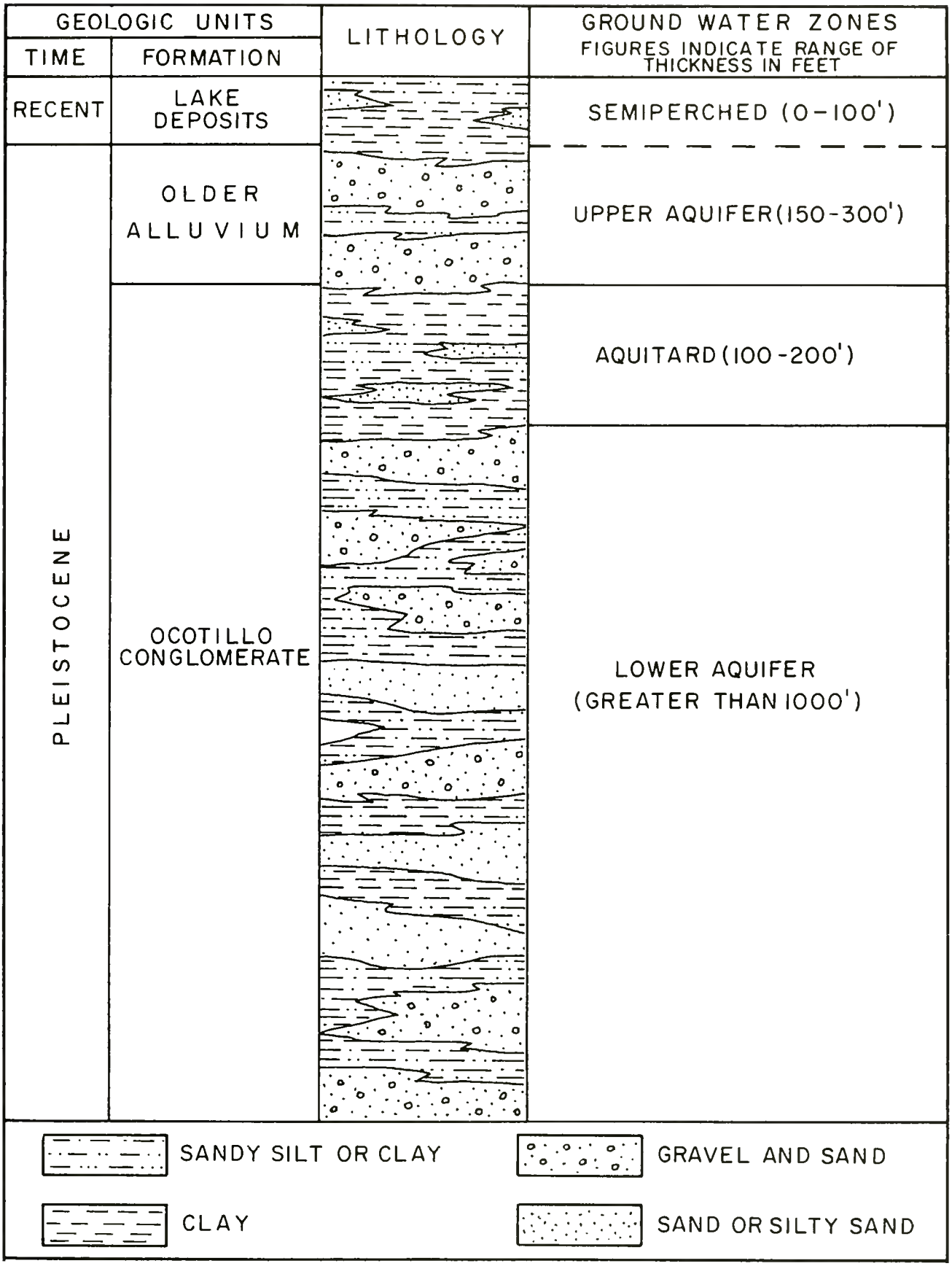

10259300
CV Stormwater Channel
Drain by Associated Monitoring Station
CVSC
A Channel
C Channel
D Channel
E Channel
F Channel
Arthur St
Arthur 0.5
Ave 74
Ave 76
Ave 78
Ave 79
Ave 83
Cleveland 0.5
Cleveland East
Cleveland West
Garfield 0.5
Garfield St
Grant 0.5
Grant St
Hayes 0.5
Hayes St
Johnson St
Lincoln-Oasis
McKinley
McKinley 0.5
Oasis-Grant
CVSC at Mecca
10259540
Johnson St.
Garfield St.
Cleveland West
Cleveland East
Grant St.
Hayes
Hayes 0.5
Grant 0.5
Garfield 0.5
Arthur St.
Caleb Channel
Arthur 0.5
Cleveland 0.5
McKinley
McKinley 0.5
Ave 74
Ave 76
Ave 78
A Channel
Ave 79
C Channel
Lincoln-Oasis
D Channel
Ave 83
E Channel
Oasis-Grant
F Channel
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
Sump Pump
Drain Monitoring Locations
CVSC
Indio Subbasin Boundary
California County
August 2023
TODD GROUNDWATER
Figure 1-5
Drains, Drain Monitoring Locations and Sump Pumps



August 2023

TODD GROUNDWATER

Figure 1-6
Monthly Drain Flow
1985-2022



Source: Bulletin No. 108 (DWR 1964)

August 2023

TODD GROUNDWATER

Figure 2-1
Generalized Stratigraphic Column
Thermal Subbarea

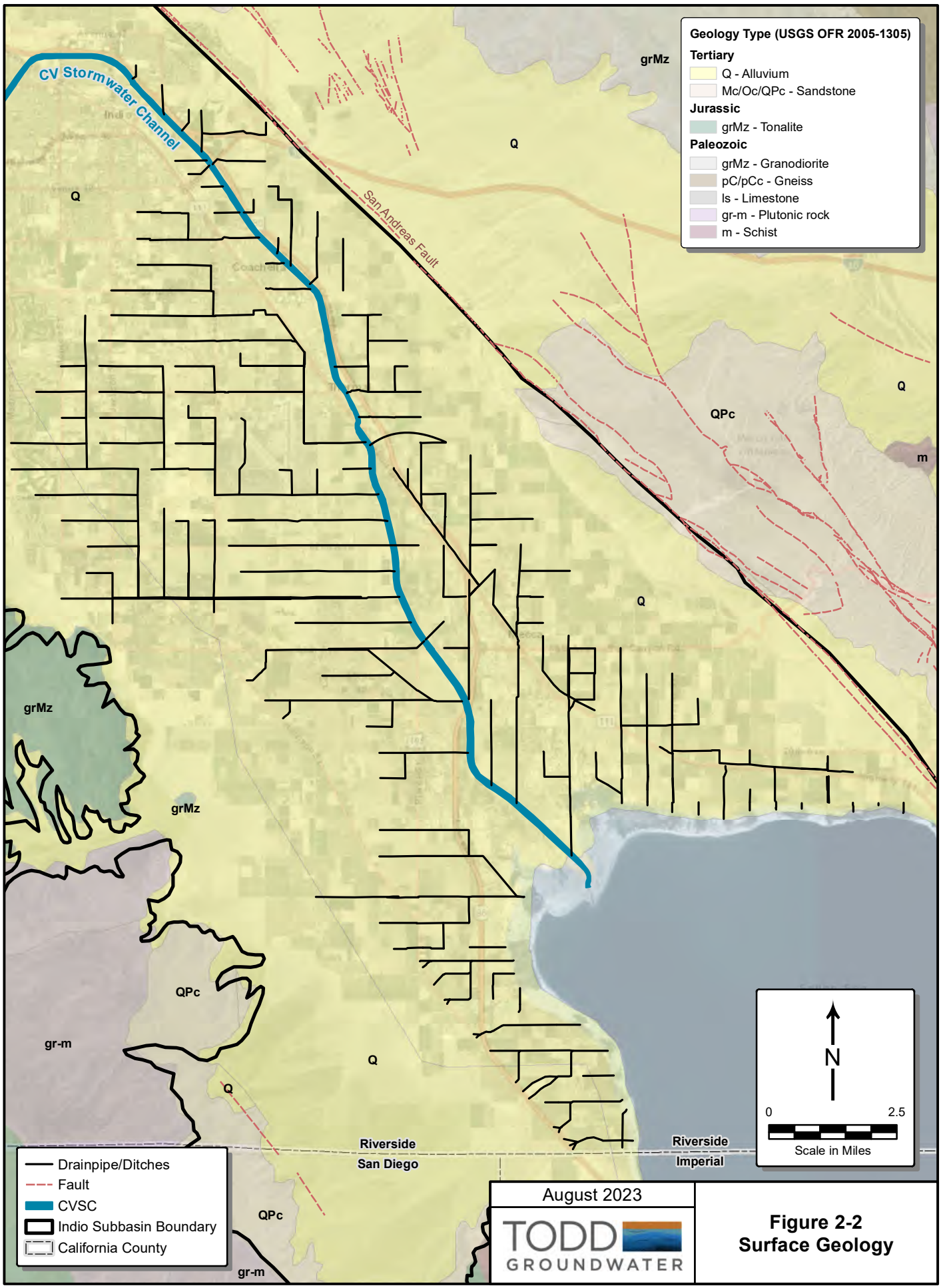


Figure 2-2
Surface Geology

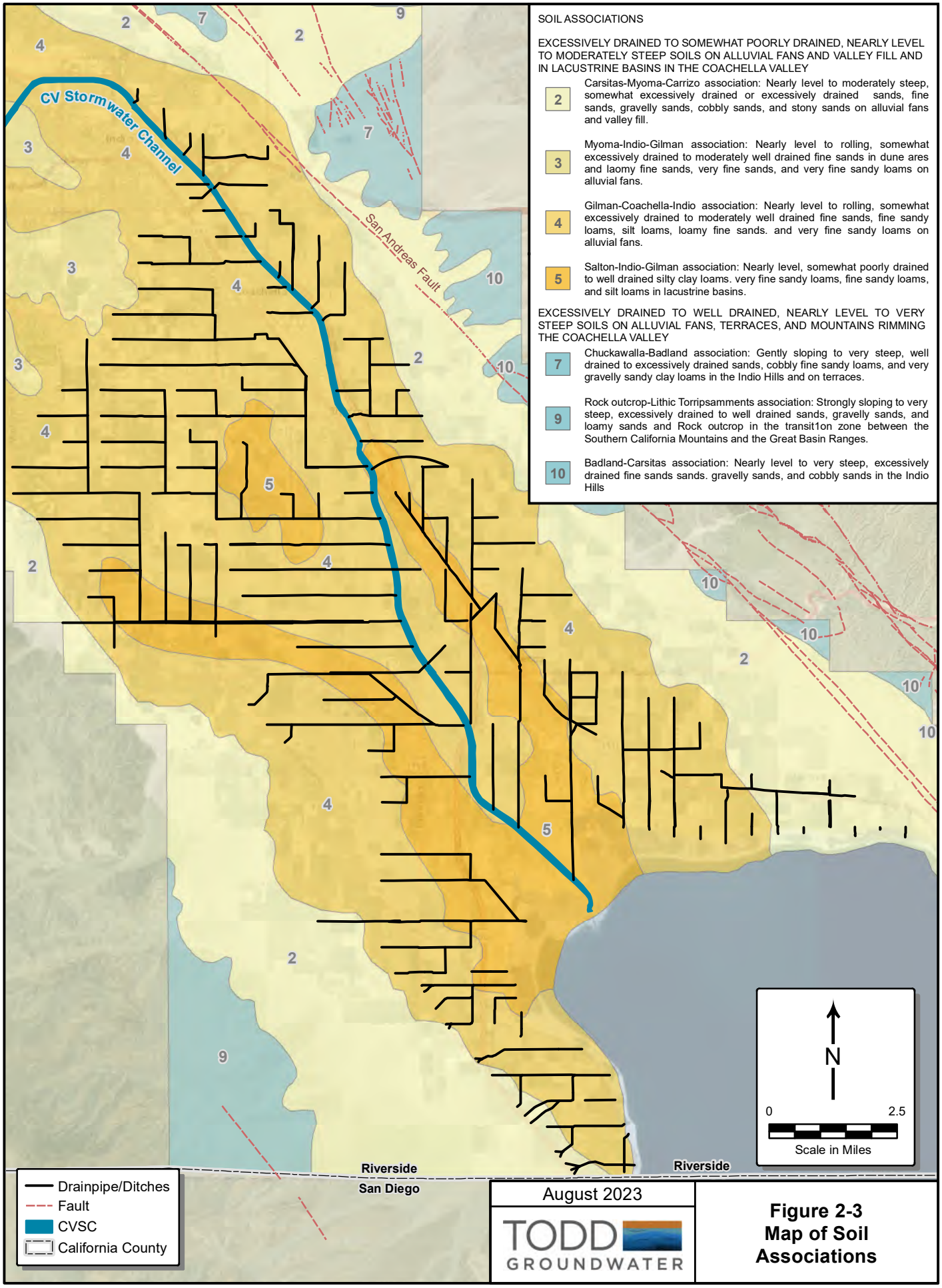


Figure 2-3
Map of Soil Associations

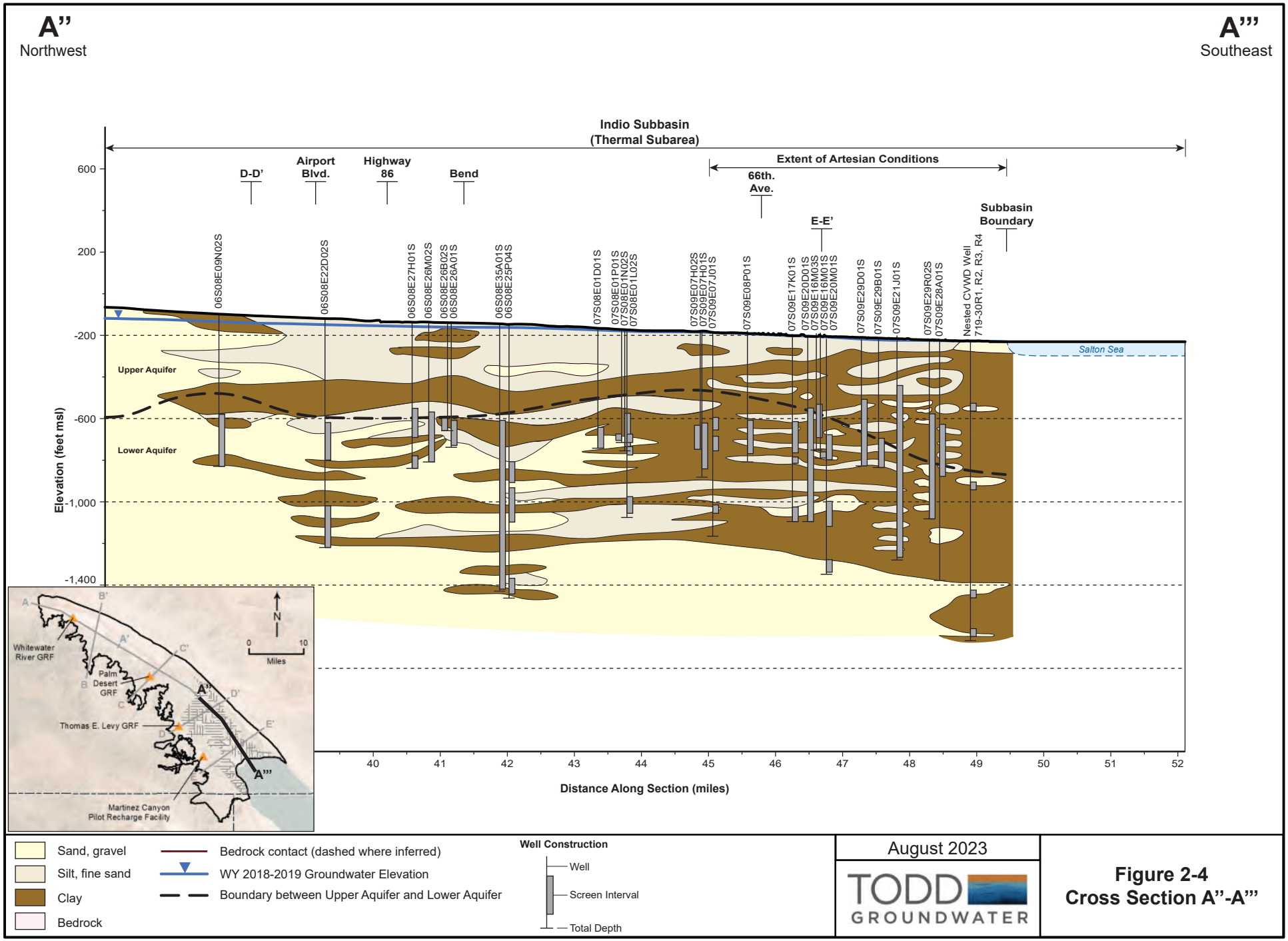
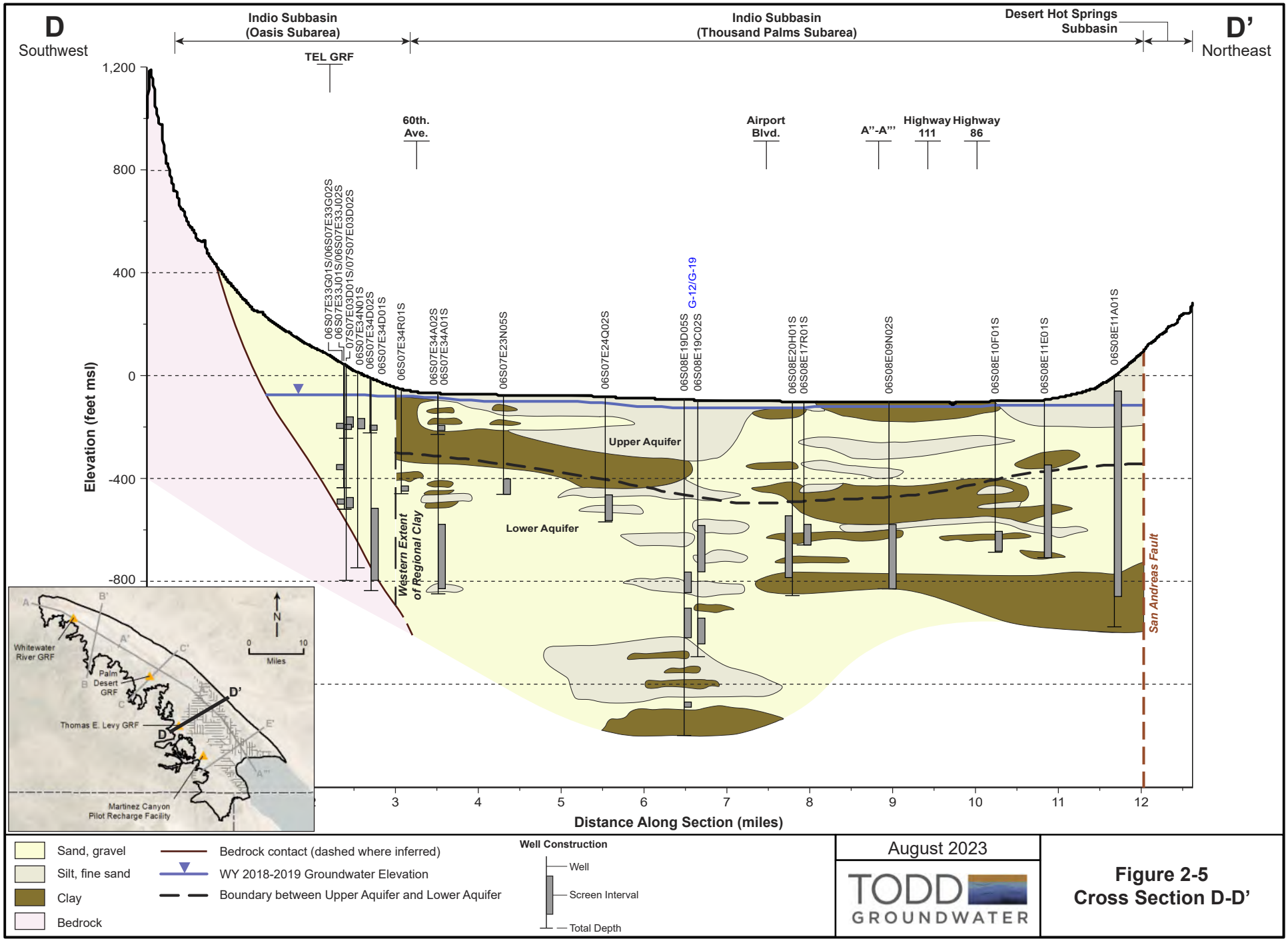


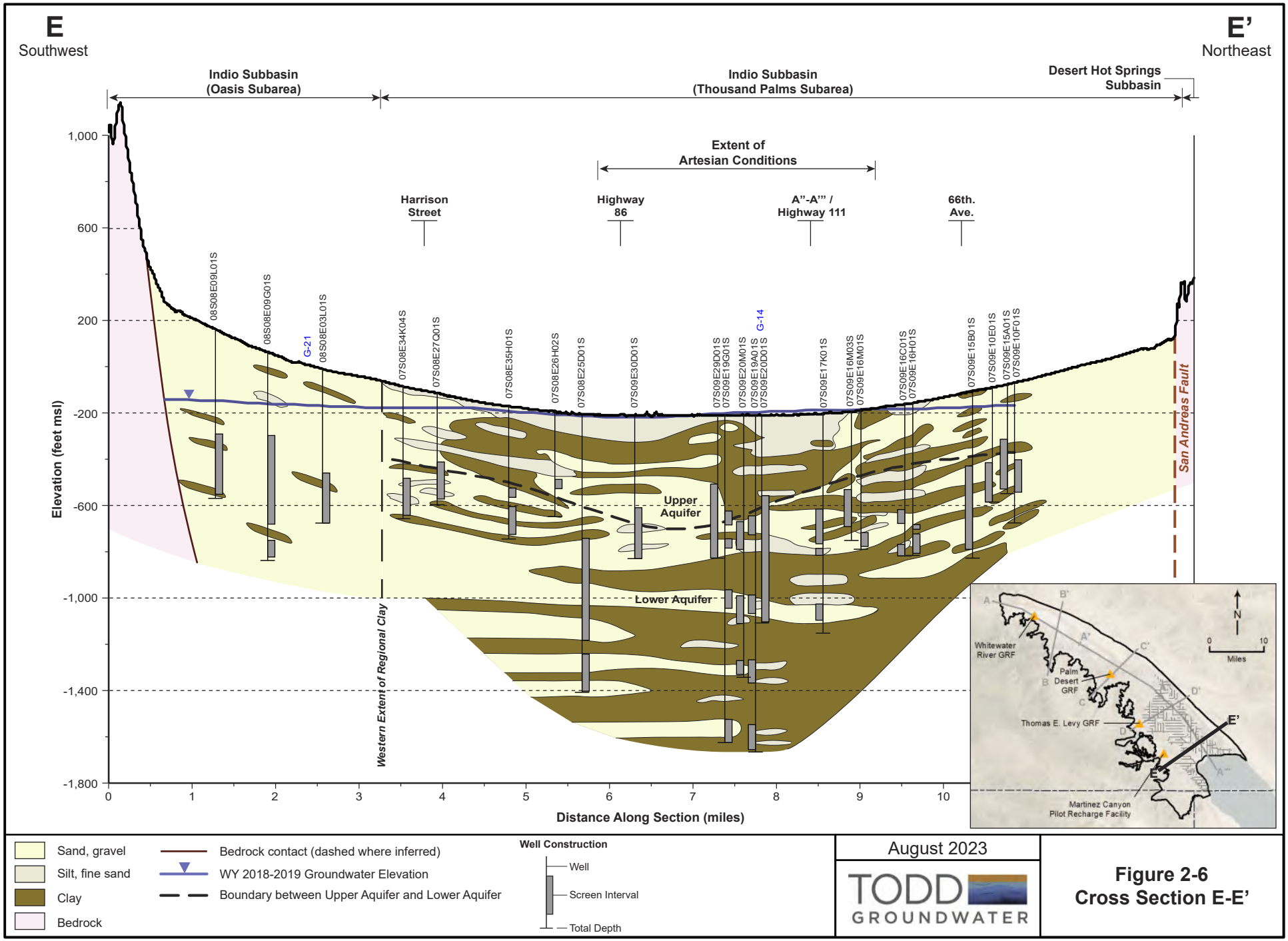
Figure 2-4
Cross Section A”-A”’



August 2023

TODD GROUNDWATER

Figure 2-5
Cross Section D-D'



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TODD GROUNDWATER

Figure 2-6
Cross Section E-E'

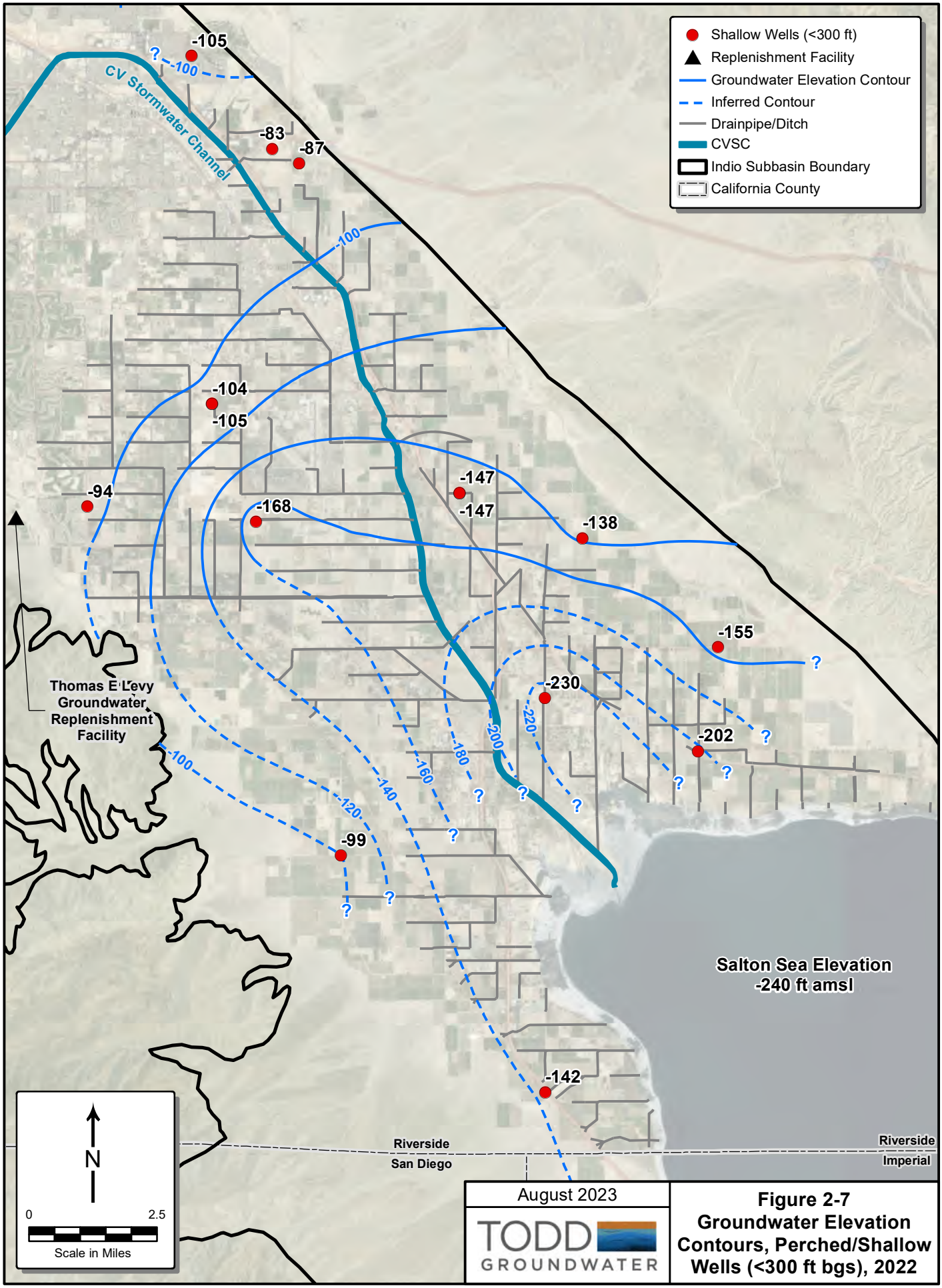
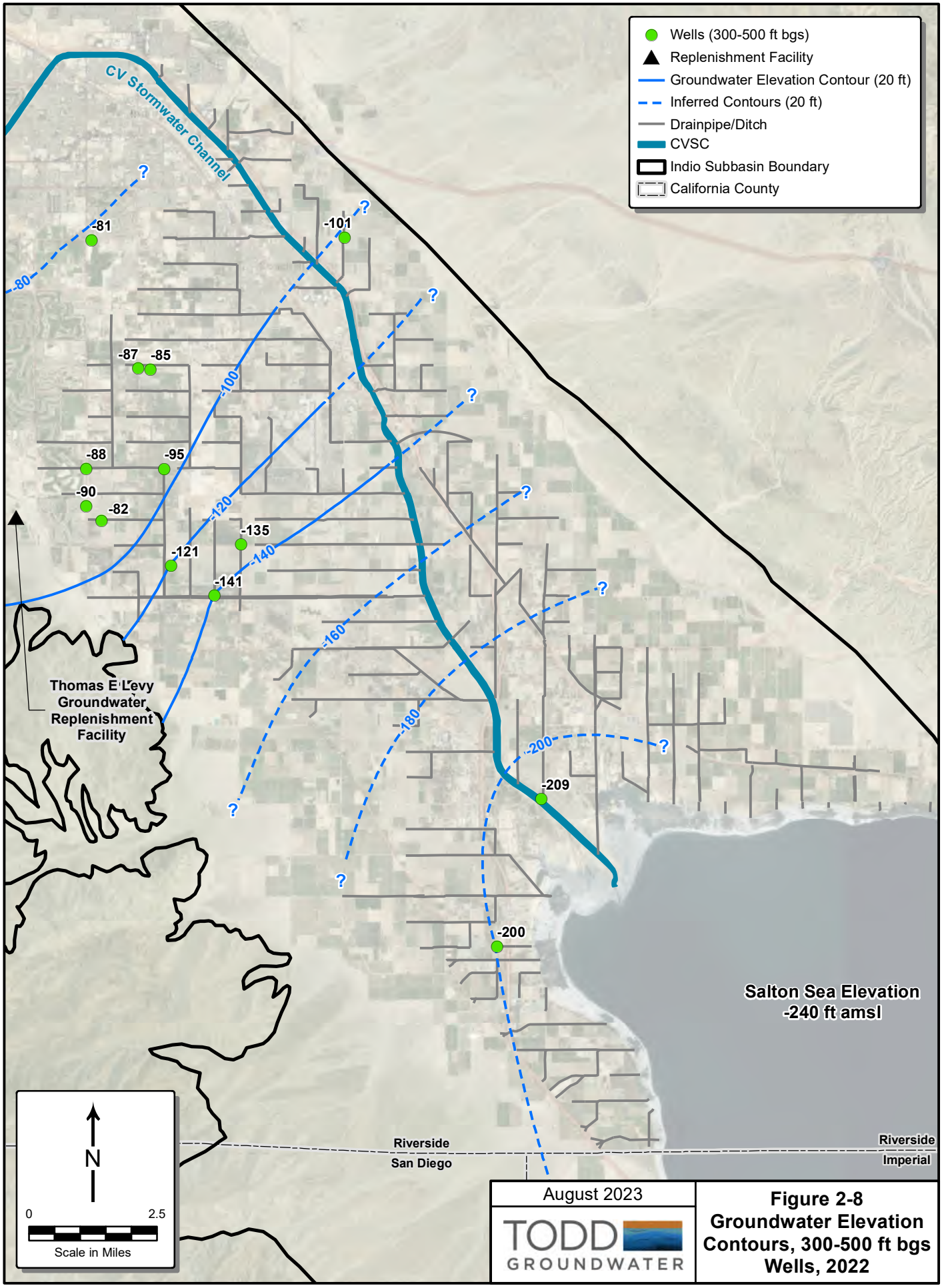
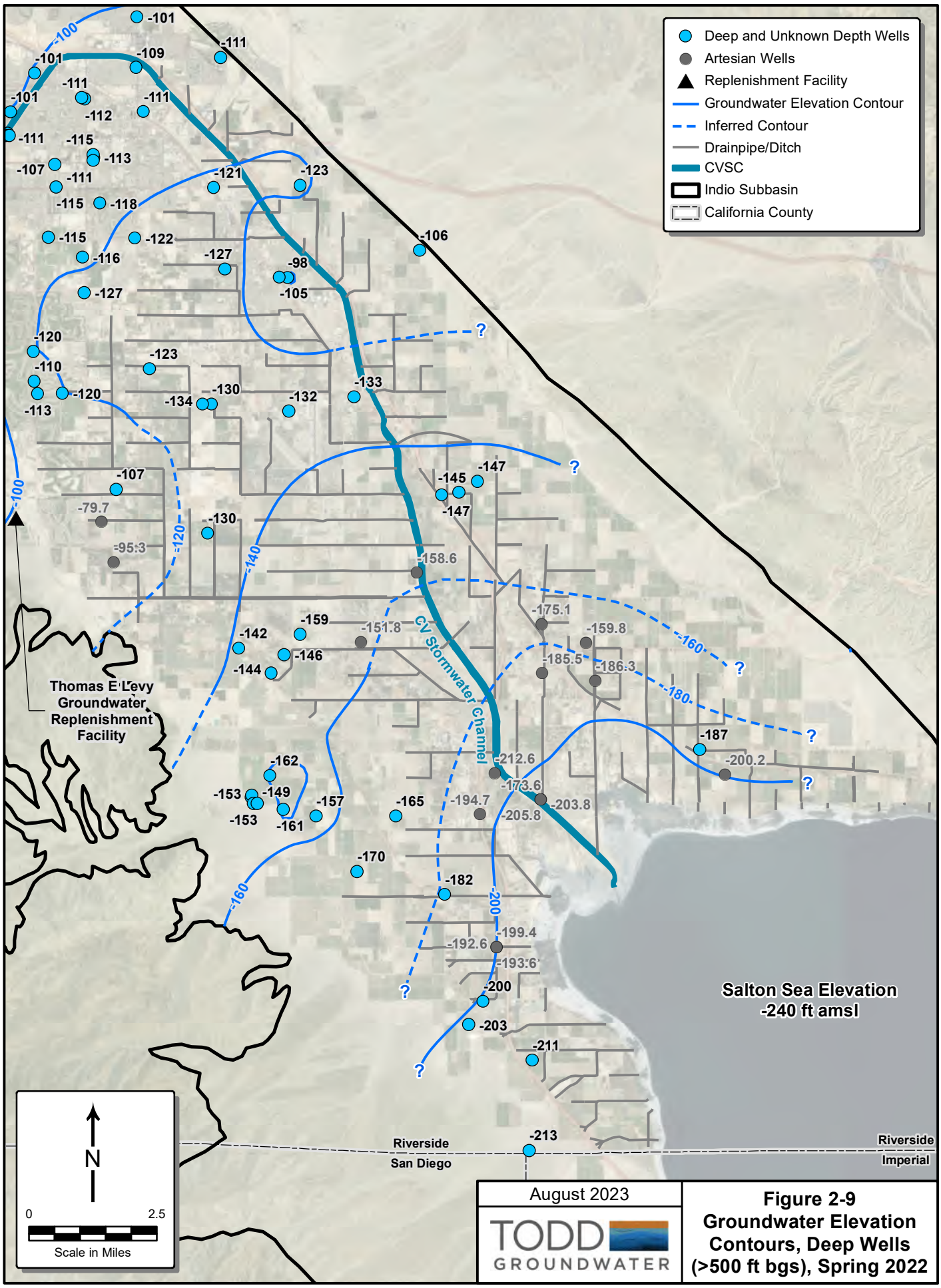
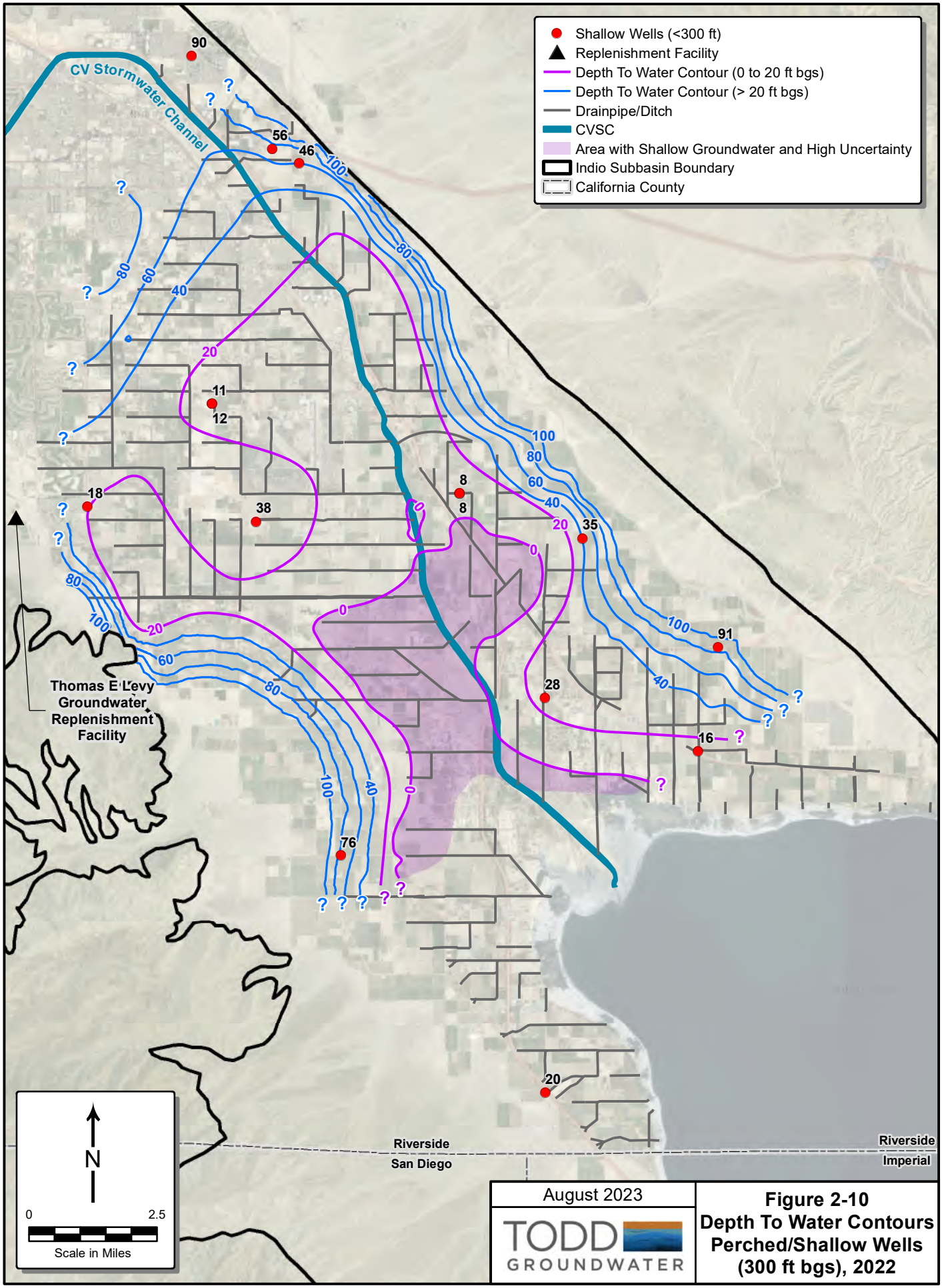
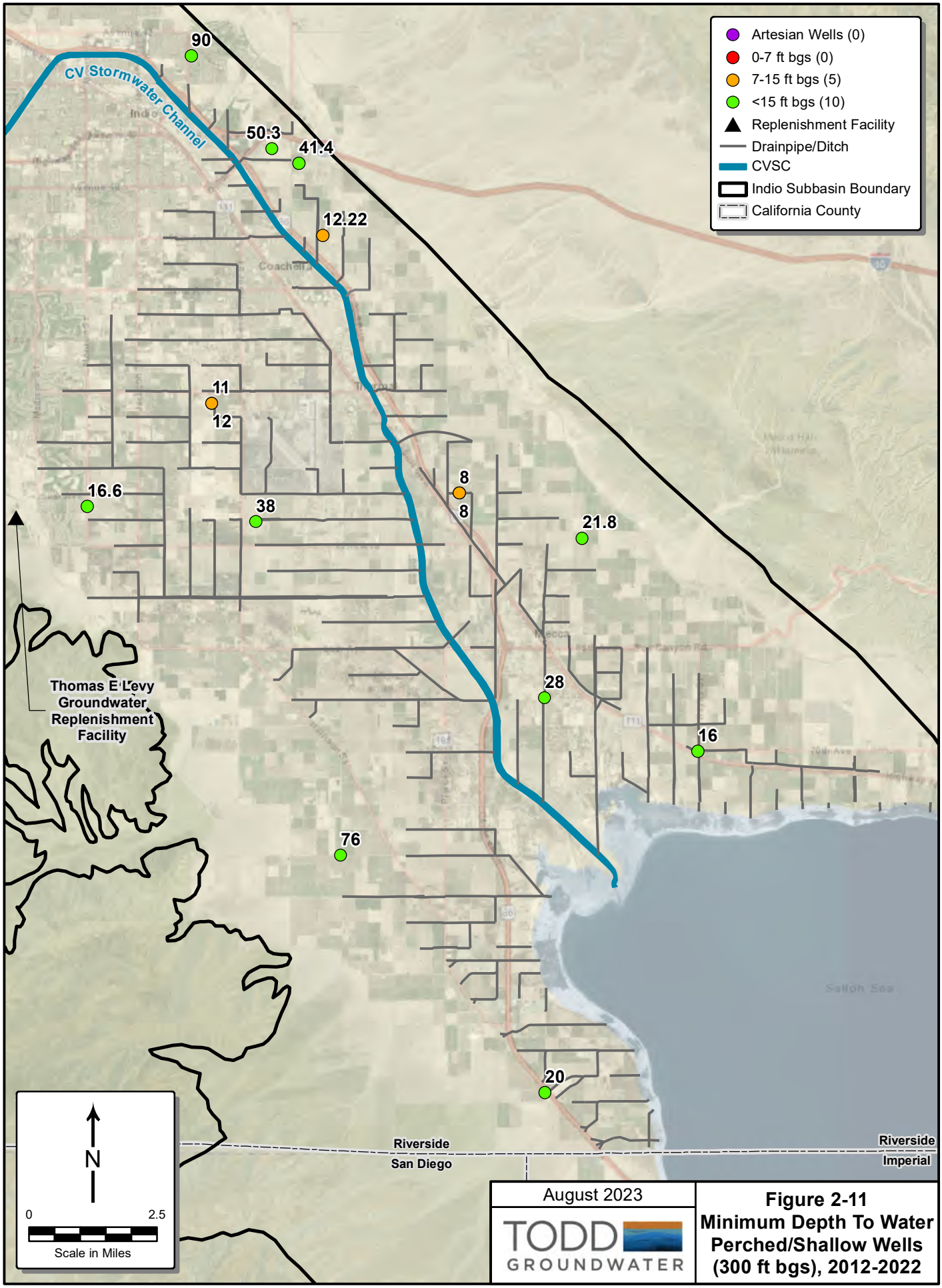


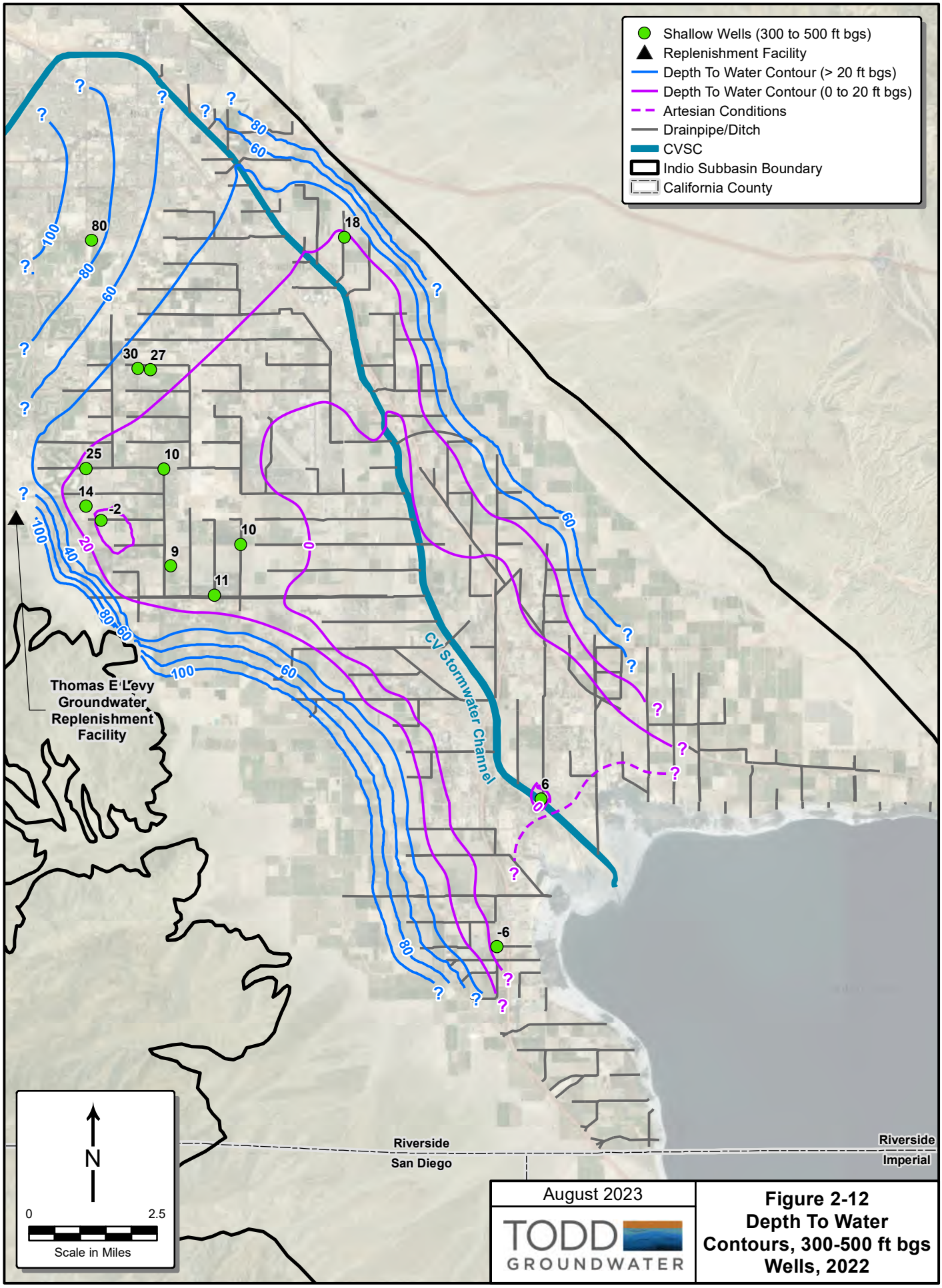
Figure 2-7
Groundwater Elevation Contours, Perched/Shallow Wells (<300 ft bgs), 2022

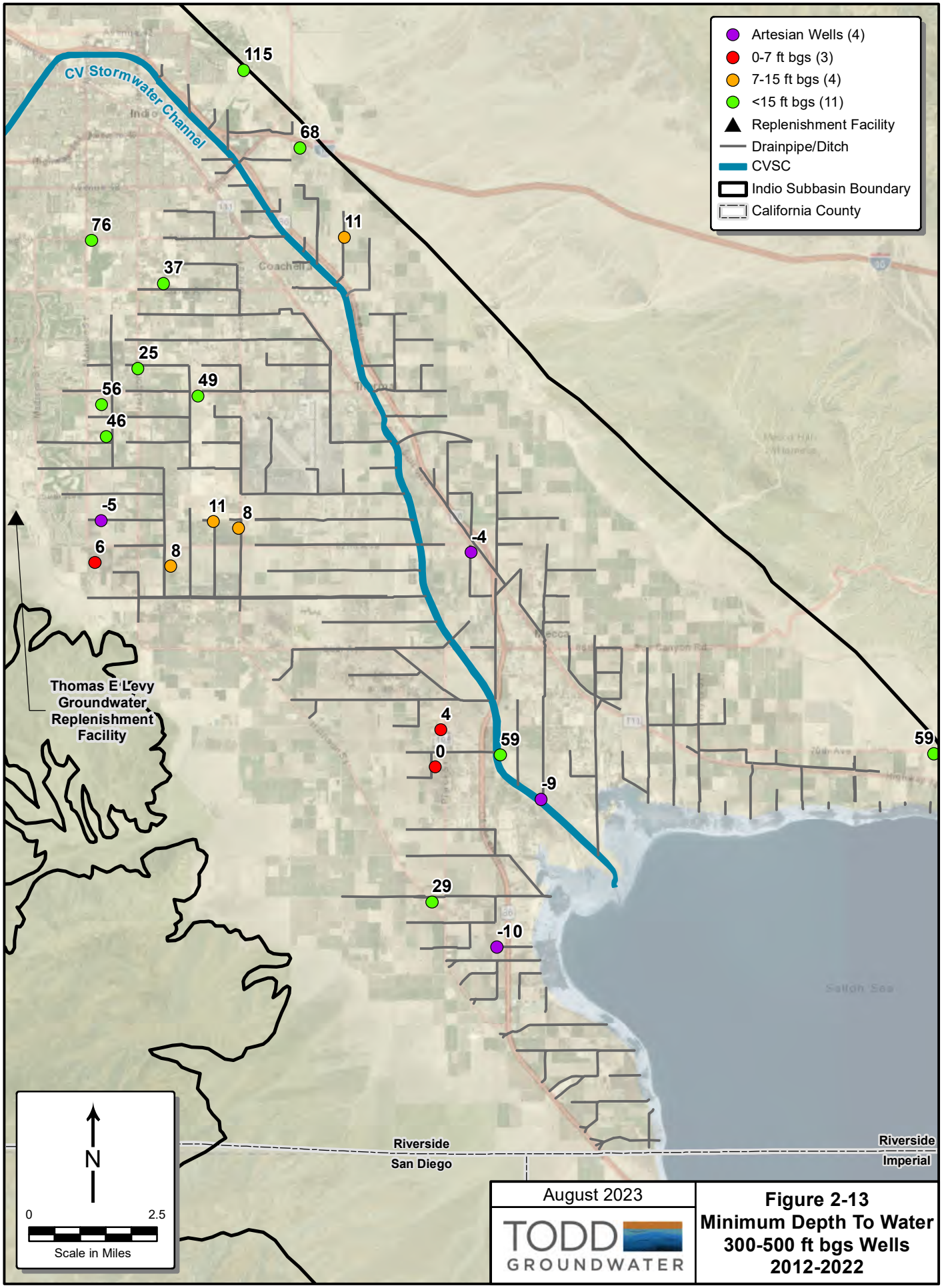

Wells (300-500 ft bgs)
Replenishment Facility
Groundwater Elevation Contour (20 ft)
Inferred Contours (20 ft)
Drainpipe/Ditch
CVSC
Indio Subbasin Boundary
California County
CV Stormwater Channel
-81
-101
-87
-85
-88
-95
-90
-82
-135
-121
-141
-209
-200
-80
-100
-120
-140
-160
-180
-200
Thomas E Levy Groundwater Replenishment Facility
Salton Sea Elevation -240 ft amsl
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-8
Groundwater Elevation Contours, 300-500 ft bgs Wells, 2022


Deep and Unknown Depth Wells
Artesian Wells
Replenishment Facility
Groundwater Elevation Contour
Inferred Contour
Drainpipe/Ditch
CVSC
Indio Subbasin
California County
Thomas E Levy Groundwater Replenishment Facility
CV Stormwater Channel
Salton Sea Elevation -240 ft amsl
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-9
Groundwater Elevation Contours, Deep Wells (>500 ft bgs), Spring 2022


Shallow Wells (<300 ft)
Replenishment Facility
Depth To Water Contour (0 to 20 ft bgs)
Depth To Water Contour (> 20 ft bgs)
Drainpipe/Ditch
CVSC
Area with Shallow Groundwater and High Uncertainty
Indio Subbasin Boundary
California County
CV Stormwater Channel
Thomas E Levy Groundwater Replenishment Facility
90
56
46
11
12
18
38
8
8
35
91
28
16
76
20
0
20
40
60
80
100
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-10
Depth To Water Contours
Perched/Shallow Wells
(300 ft bgs), 2022


Artesian Wells (0)
0-7 ft bgs (0)
7-15 ft bgs (5)
<15 ft bgs (10)
Replenishment Facility
Drainpipe/Ditch
CVSC
Indio Subbasin Boundary
California County
CV Stormwater Channel
90
50.3
41.4
12.22
11
12
16.6
38
8
8
21.8
28
16
76
20
Thomas E Levy Groundwater Replenishment Facility
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-11
Minimum Depth To Water Perched/Shallow Wells (300 ft bgs), 2012-2022


Shallow Wells (300 to 500 ft bgs)
Replenishment Facility
Depth To Water Contour (> 20 ft bgs)
Depth To Water Contour (0 to 20 ft bgs)
Artesian Conditions
Drainpipe/Ditch
CVSC
Indio Subbasin Boundary
California County
80
18
30
27
25
10
14
-2
10
9
11
6
-6
CV Stormwater Channel
Thomas E Levy Groundwater Replenishment Facility
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-12
Depth To Water Contours, 300-500 ft bgs Wells, 2022


Artesian Wells (4)
0-7 ft bgs (3)
7-15 ft bgs (4)
<15 ft bgs (11)
Replenishment Facility
Drainpipe/Ditch
CVSC
Indio Subbasin Boundary
California County
CV Stormwater Channel
115
68
76
11
37
25
49
56
46
-5
11
8
6
8
-4
Thomas E Levy Groundwater Replenishment Facility
4
59
0
-9
59
29
-10
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-13
Minimum Depth To Water
300-500 ft bgs Wells
2012-2022

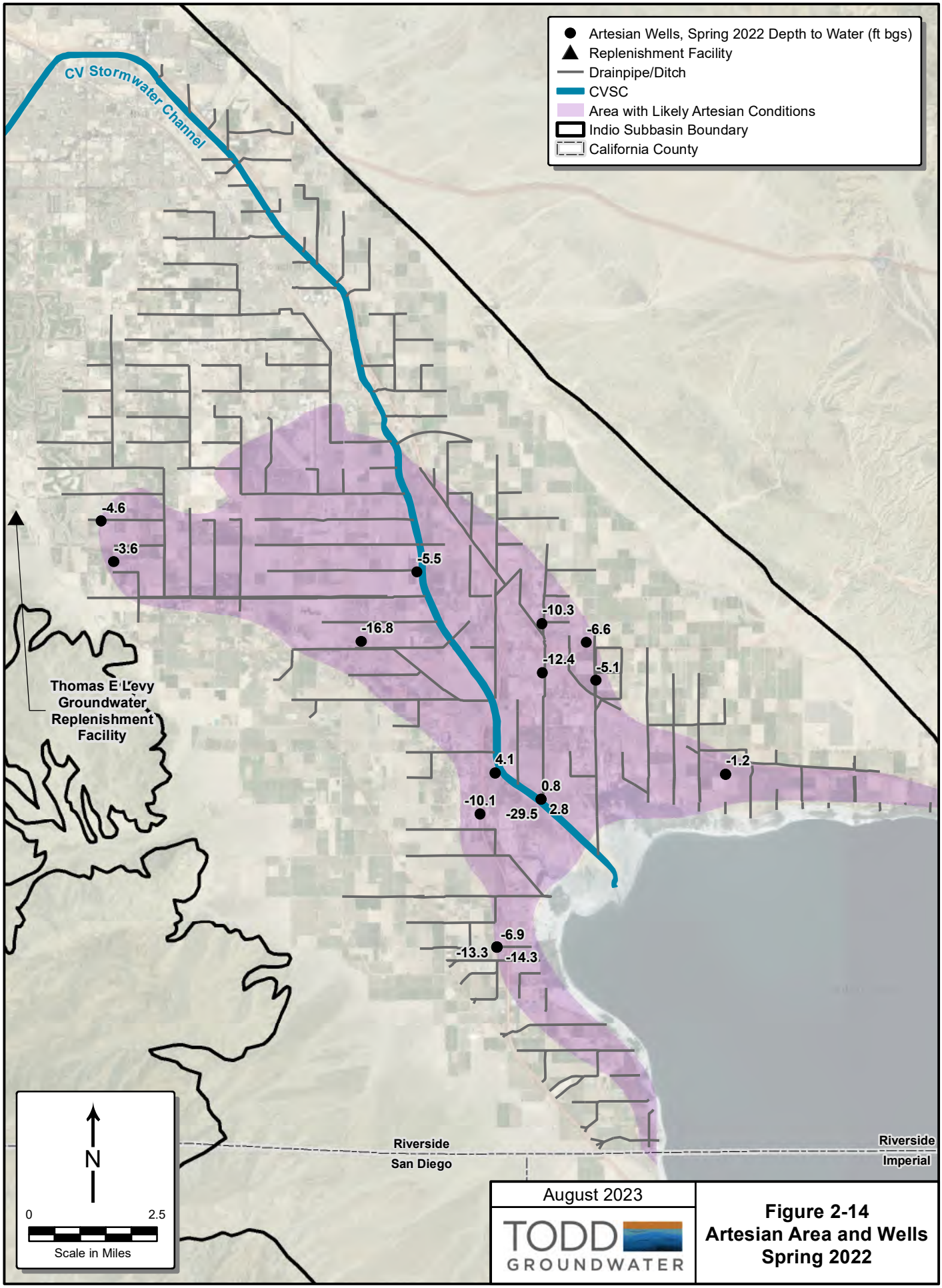
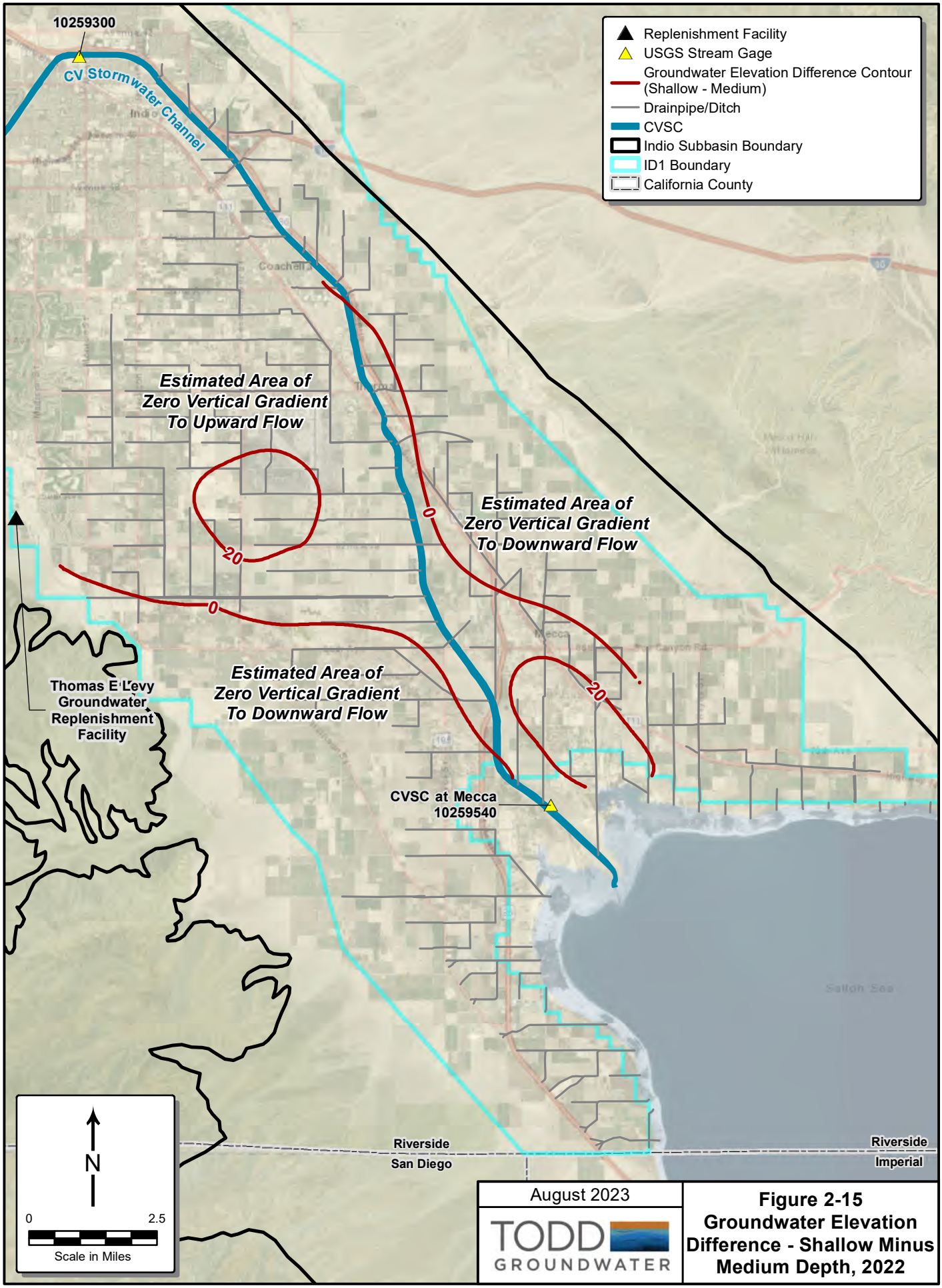
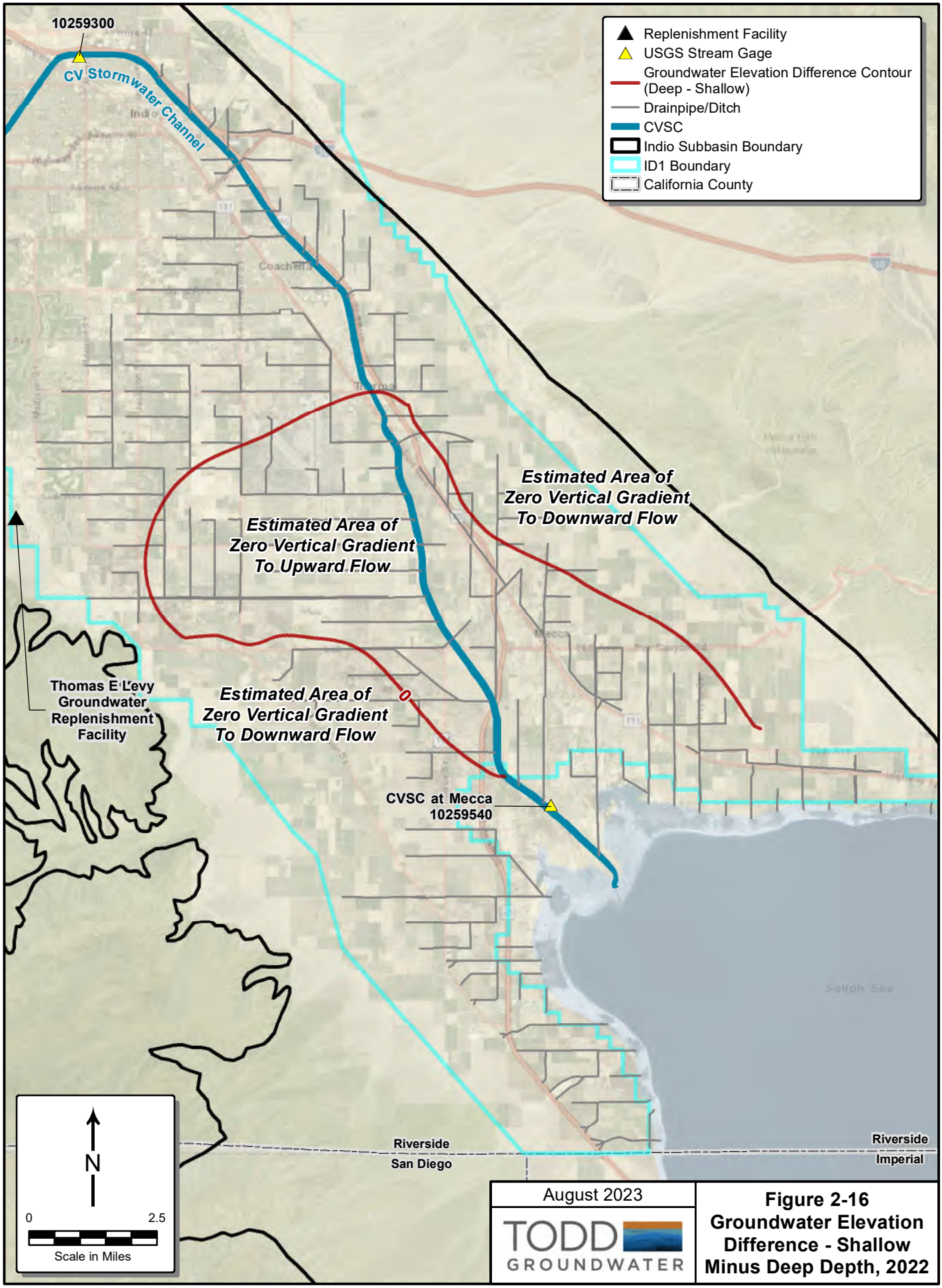


Figure 2-14
Artesian Area and Wells
Spring 2022


10259300
CV Stormwater Channel
Replenishment Facility
USGS Stream Gage
Groundwater Elevation Difference Contour (Shallow - Medium)
Drainpipe/Ditch
CVSC
Indio Subbasin Boundary
ID1 Boundary
California County
Estimated Area of Zero Vertical Gradient To Upward Flow
Estimated Area of Zero Vertical Gradient To Downward Flow
Estimated Area of Zero Vertical Gradient To Downward Flow
0
20
0
20
Thomas E Levy Groundwater Replenishment Facility
CVSC at Mecca 10259540
Riverside
San Diego
Riverside
Imperial
N
0
2.5
Scale in Miles
August 2023
TODD GROUNDWATER
Figure 2-15
Groundwater Elevation Difference - Shallow Minus Medium Depth, 2022



August 2023

TODD GROUNDWATER

Figure 2-16
Groundwater Elevation Difference - Shallow Minus Deep Depth, 2022

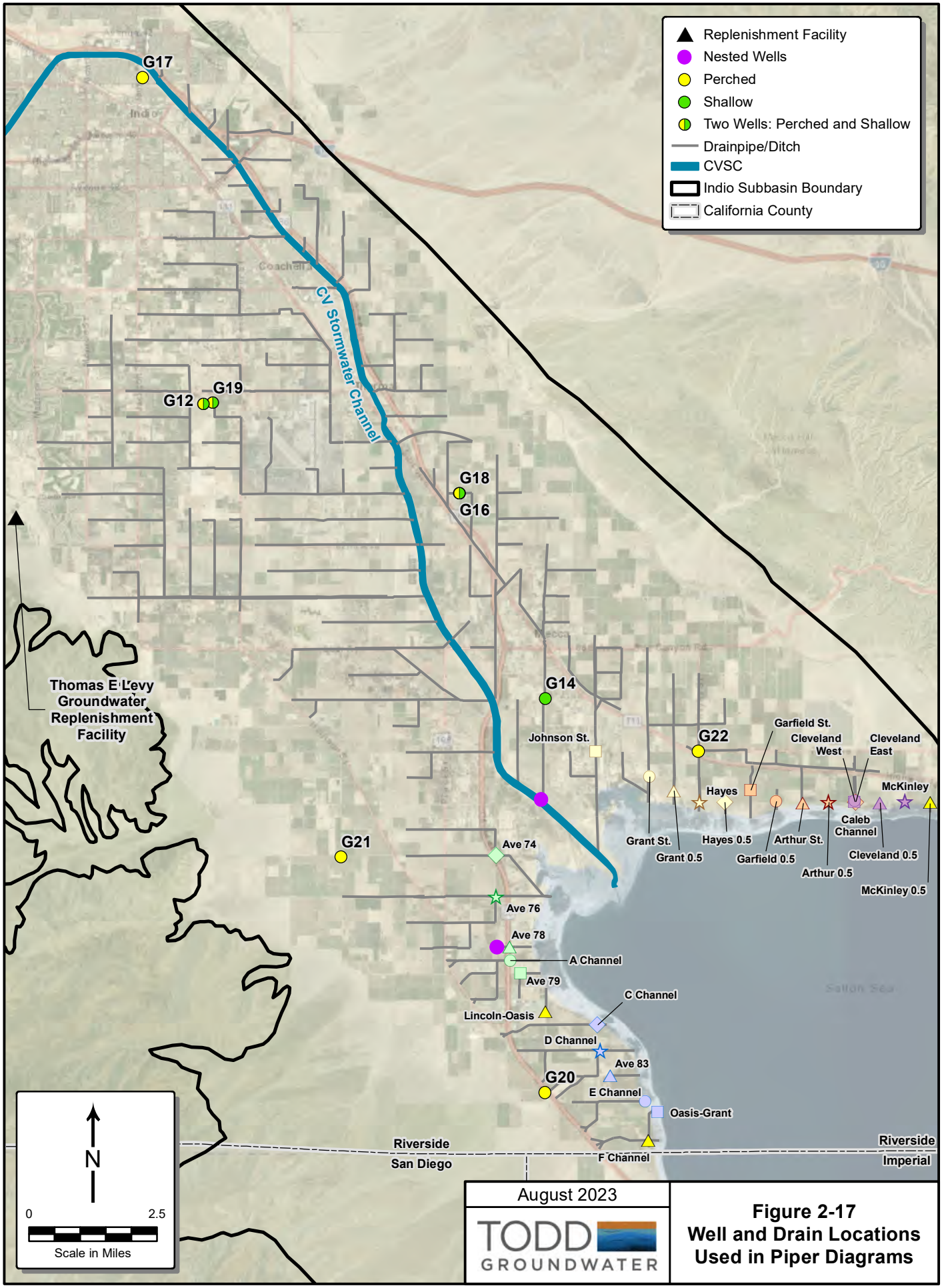
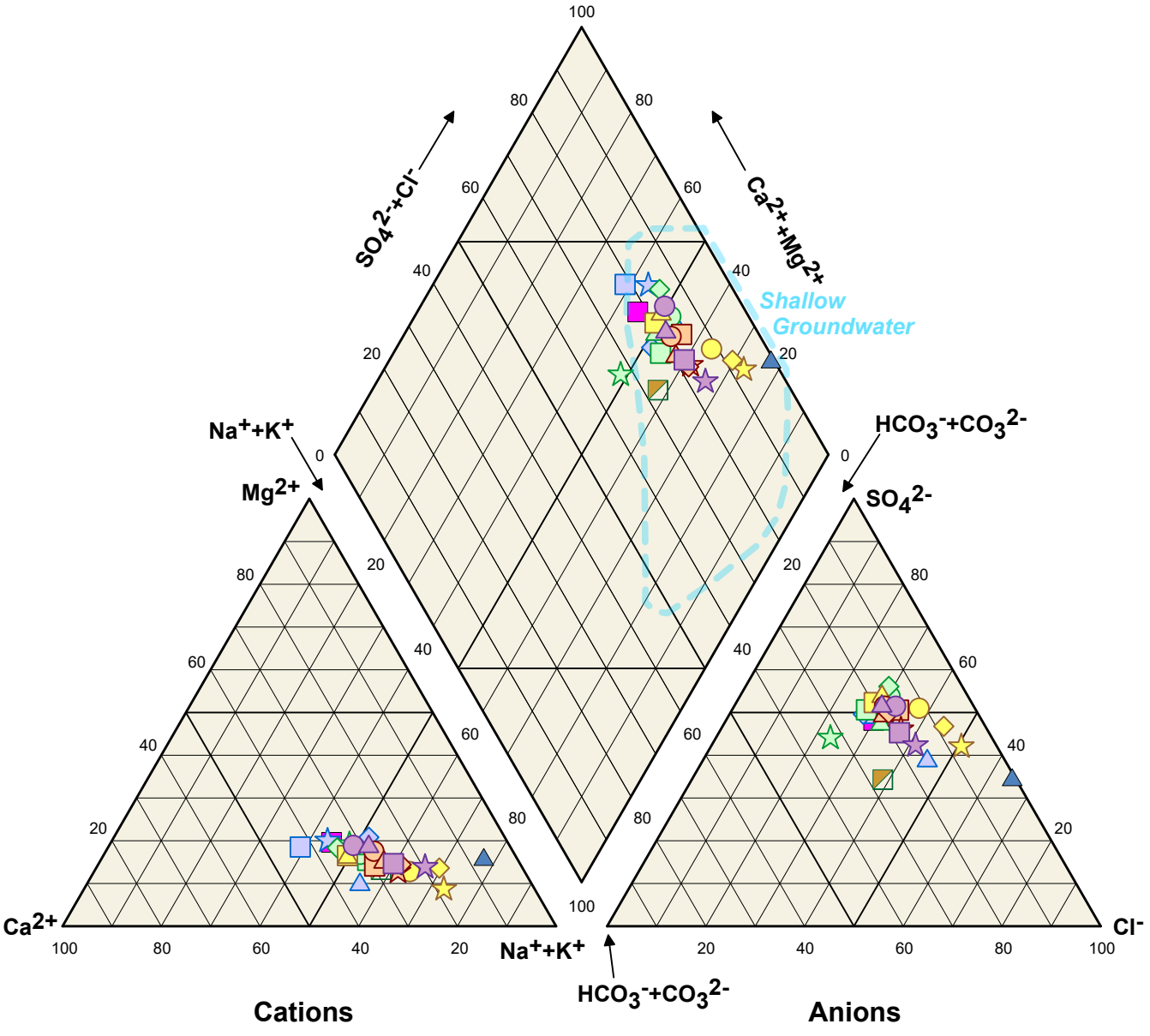


Figure 2-17
Well and Drain Locations Used in Piper Diagrams



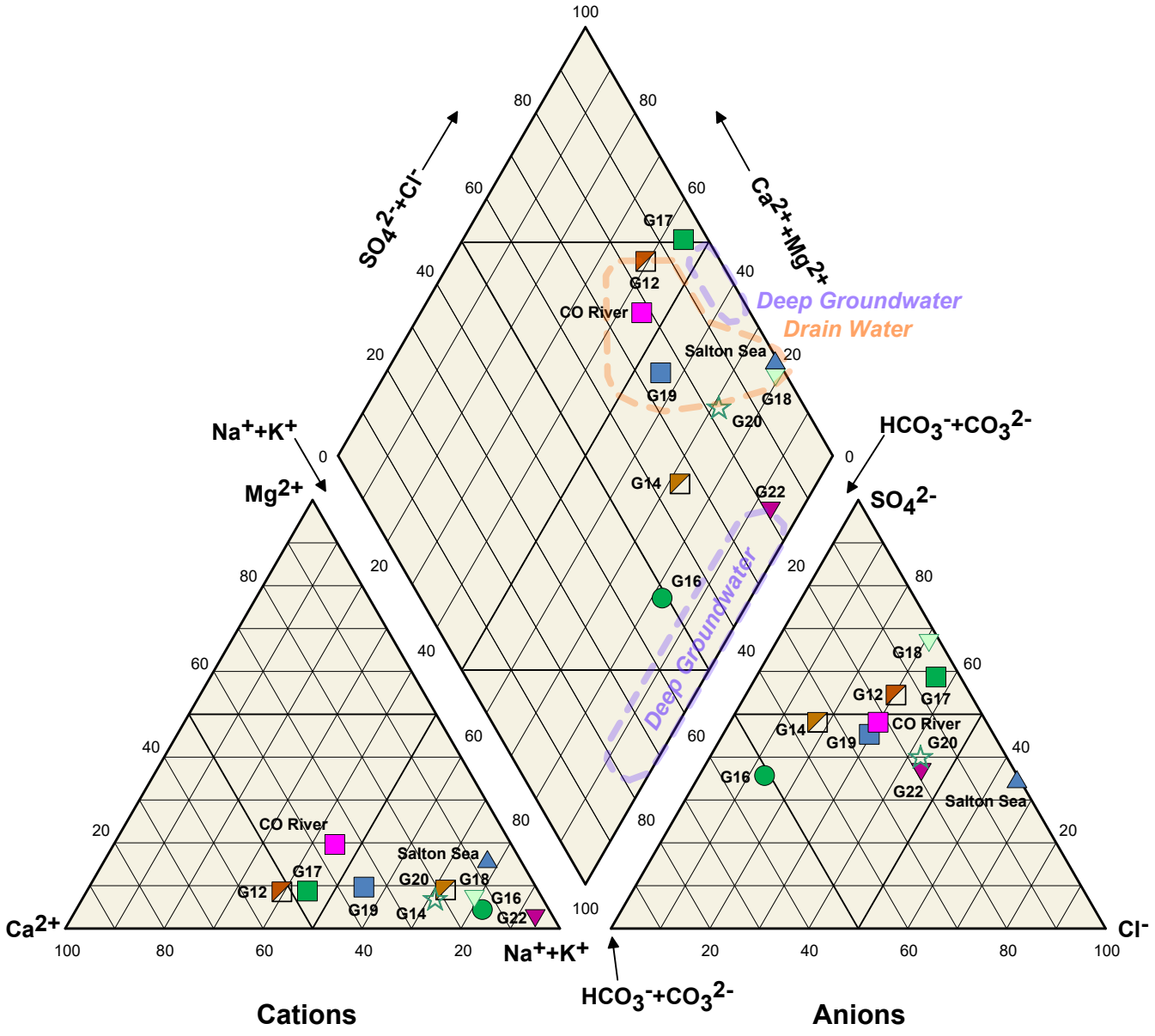
- Oasis-Grant
- E Channel
- Ave 83
- D Channel
- C Channel
- Ave 79
- A Channel
- Ave 78
- Ave 76
- Ave 74
- Johnson St.
- Grant St.
- Grant 0.5
- Hayes
- Hayes 0.5
- Garfield St.
- Garfield 0.5
- Arthur St.
- Arthur 0.5
- Cleveland East
- Cleveland West
- Caleb Channel
- Cleveland 0.5
- Mckinley
- Salton Sea
- CO River
- CVSC

August 2023

TODD GROUNDWATER

Figure 2-18
Drain Water Quality Piper Diagram

P:\Todd Rancho\Projects\Coachella On-Call SOW\Services 2019 - 2000\Task Order 13 - Drain Study\GRAPHICS\Figure 2-18 Drain Water Quality Piper Diagram.ai



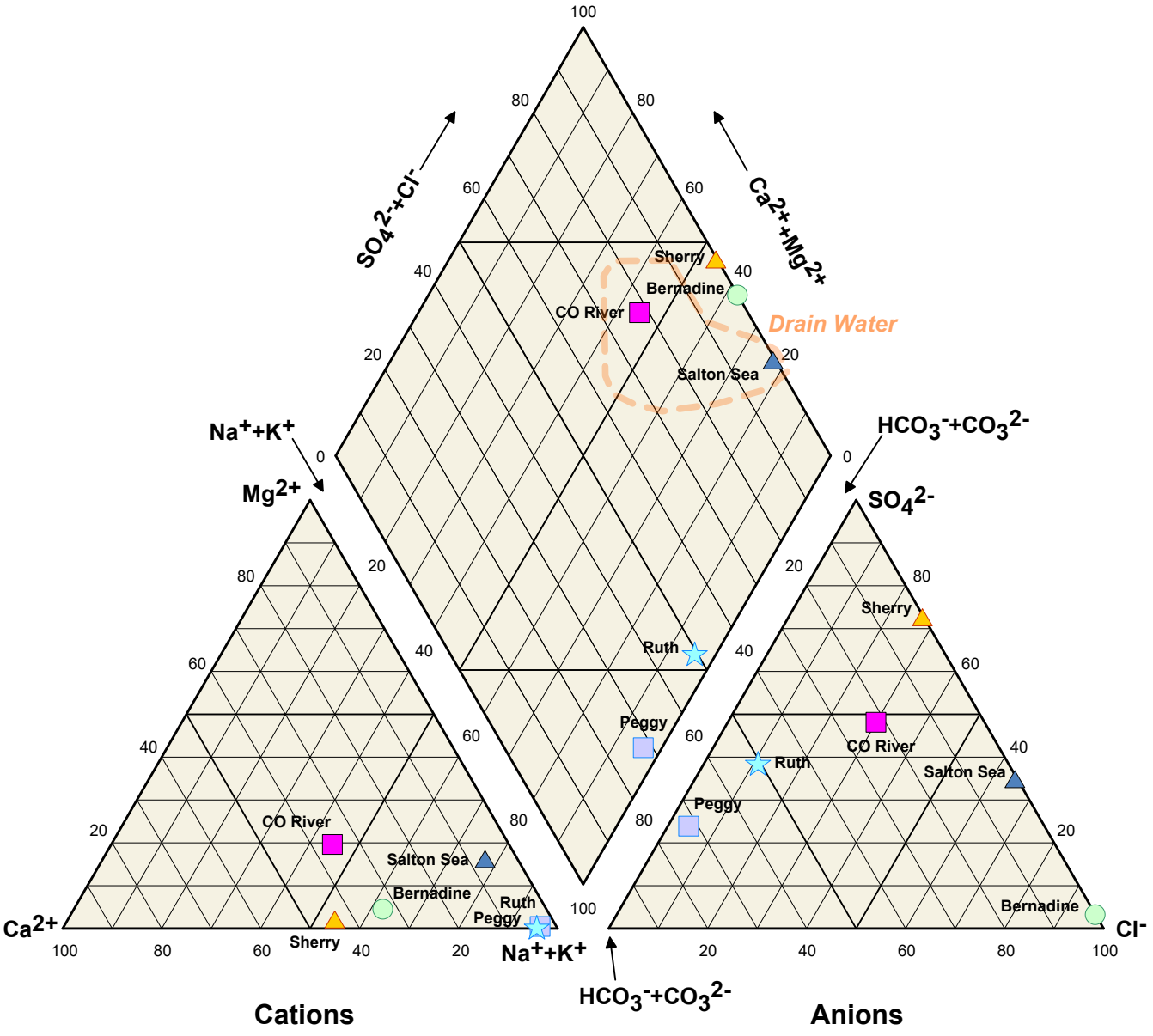
- Groundwater (G12-255 ft bgs)
- Groundwater (G14-275 ft bgs)
- Groundwater (G16-275 ft bgs)
- Groundwater (G17-110 ft bgs)
- Groundwater (G18-110 ft bgs)
- Groundwater (G19-110 ft bgs)
- Groundwater (G20-110 ft bgs)
- Groundwater (G22-110 ft bgs)
- Salton Sea
- CO River

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TODD GROUNDWATER

Figure 2-19
Shallow Groundwater Quality Piper Diagram

P:\Todd Floridan\Projects\Coachella On-Call SOW\A Services 2019 - 2020\Task Order 13 - Drain Study\GRAPHICS\Figure 2-19 Shallow Groundwater Quality Piper Diagram.ppt



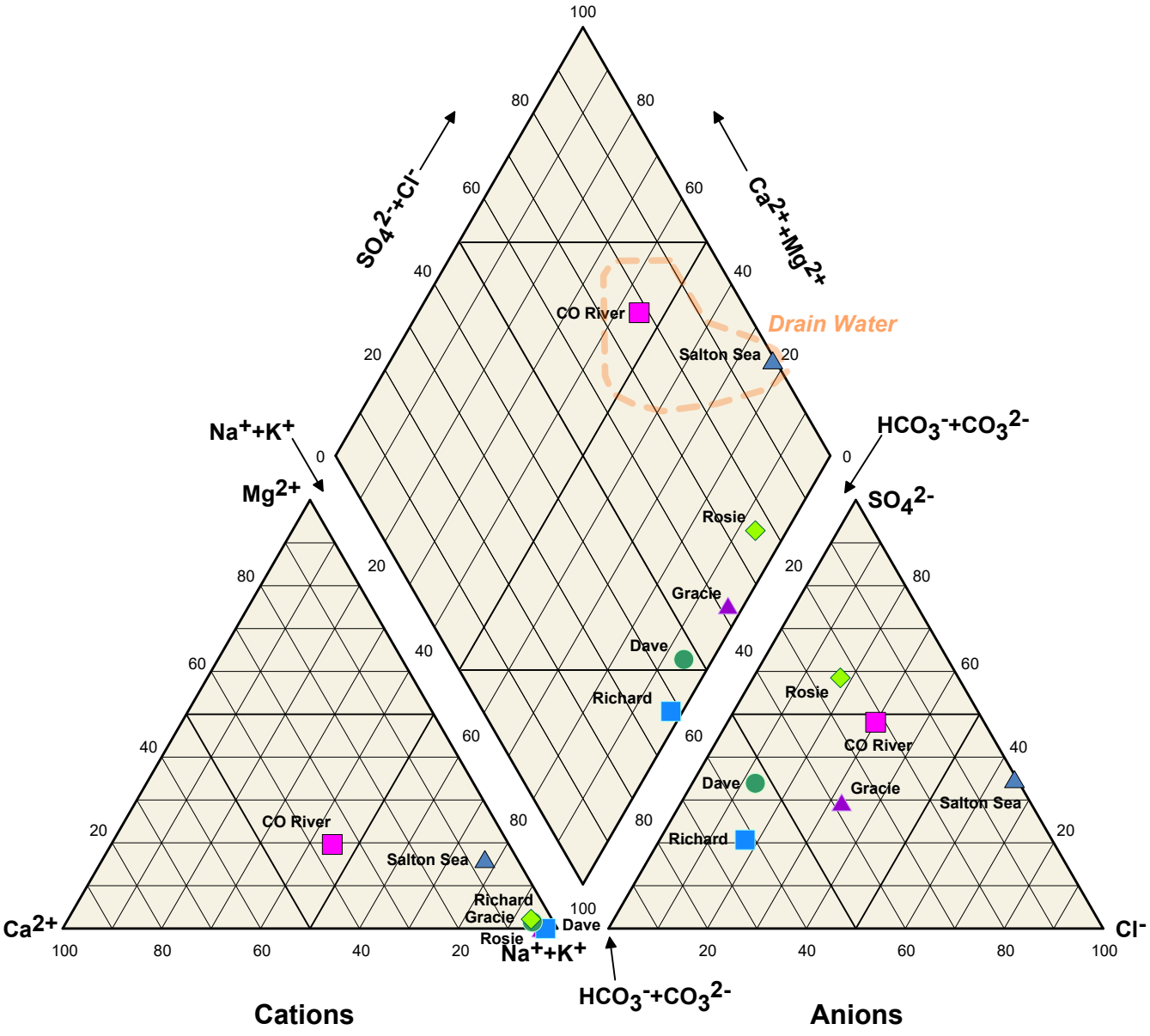
- Groundwater (Ruth, 390 ft bgs)
- Groundwater (Peggy, 770 ft bgs)
- Groundwater (Sherrie, 1260 ft bgs)
- Groundwater (Bernadine, 1470 ft bgs)
- Salton Sea
- CO River

August 2023

TODD GROUNDWATER

Figure 2-20
Northeast Nested Wells Water Quality Piper Diagram

P:\Todd Rendon\Projects\Coachella On-Call SOW\A Services 2019 - 2000\Task Order 13 - Drain Study\GRAPHICS\Figure 2-20 Northeast Nested Wells Water Quality Piper Diagram.ai



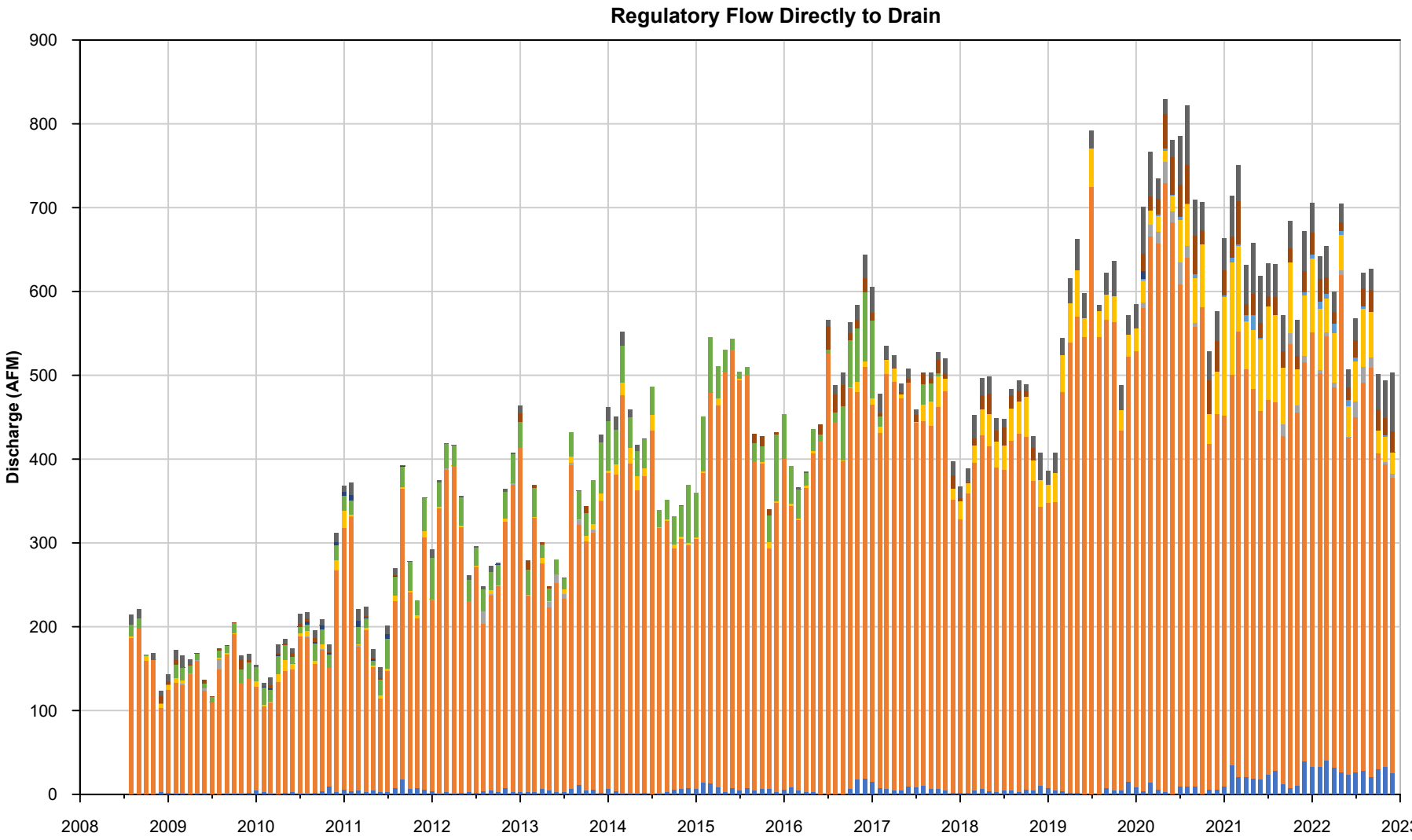
- Groundwater (Dave, 480 ft bgs)
- Groundwater (Rosie, 780 ft bgs)
- Groundwater (Richard, 1095 ft bgs)
- Groundwater (Gracie, 1375 ft bgs)
- Salton Sea
- CO River

August 2023

TODD GROUNDWATER

Figure 2-21
Southwest Nested Wells Water Quality Piper Diagram

P:\Todd\Projects\Coachella On-Call SOW Services 2019 - 2020\Task Order 13 - Drain Study\GRAPHICS\Figure 2-21 Southwest Nested Wells Water Quality Piper Diagram.ai



* Pre-2020 some regulatory flow may not have been measured due to monitoring techniques

Farm Reservoir
CVSC
A Channel
Ave 76
D Channel
E Channel
Garfield St
Grant St
Hayes St

August 2023

TODD GROUNDWATER

Figure 3-1
Regulatory Water Flows to Drains 2008-2023

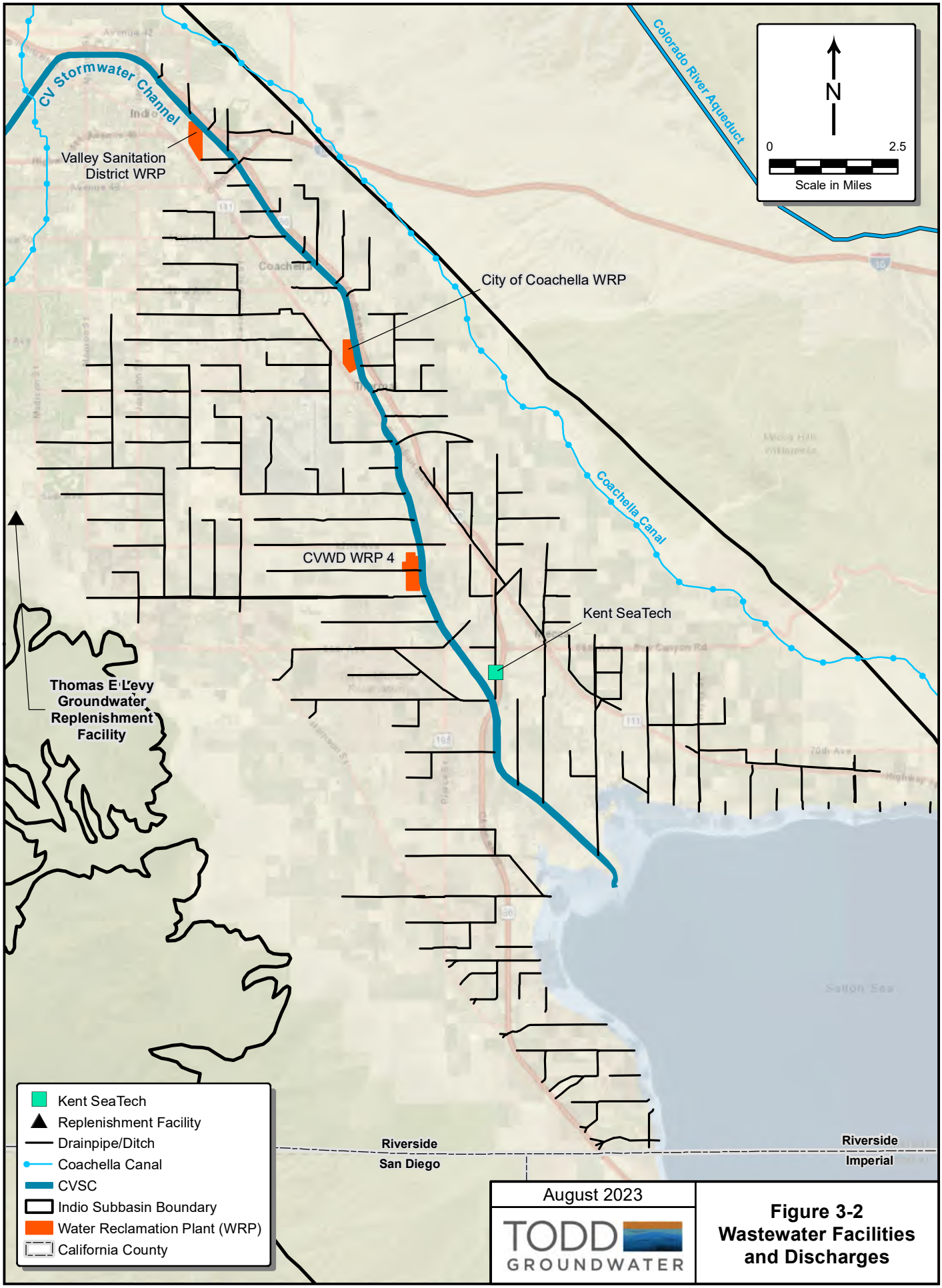
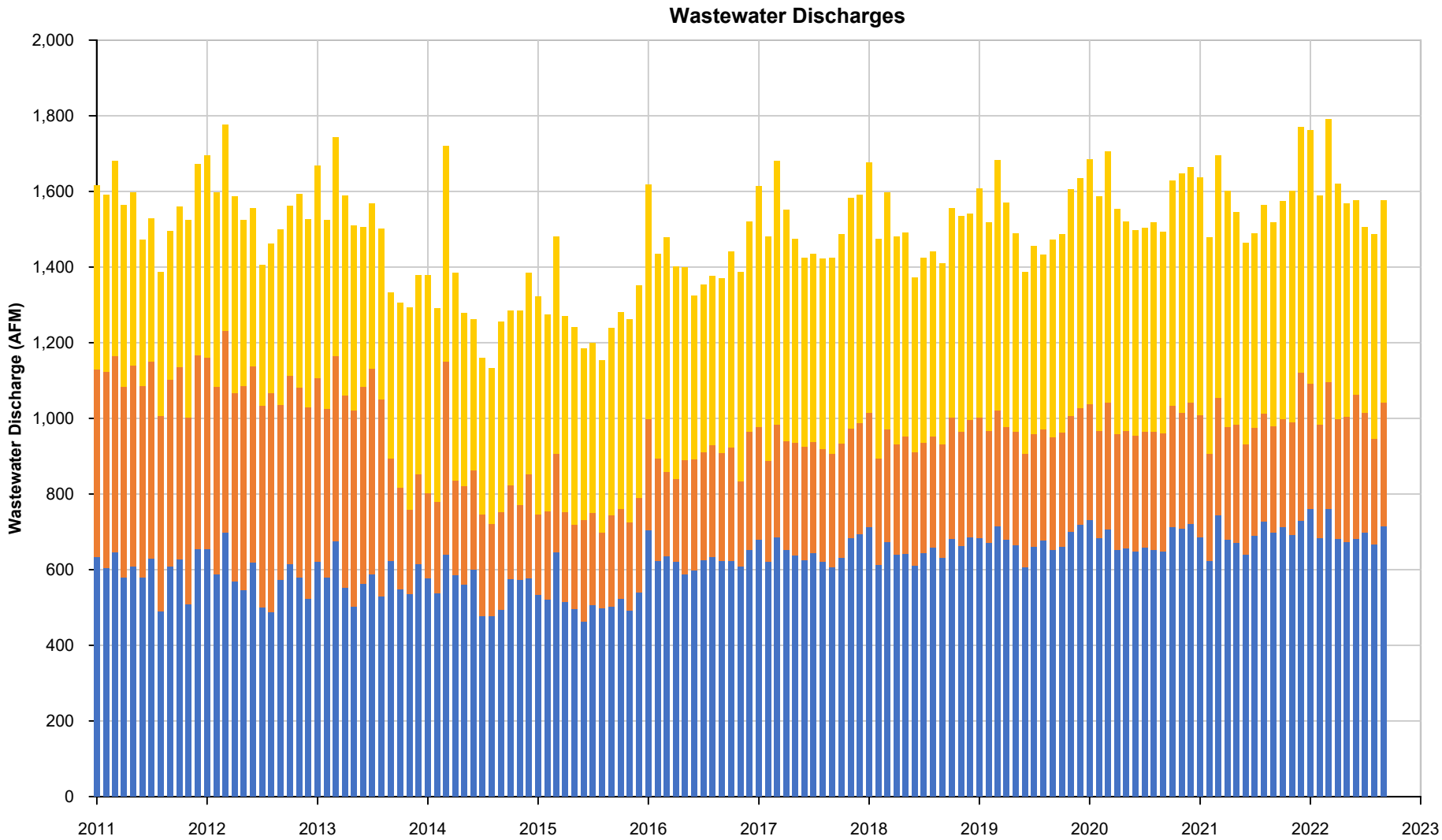


Figure 3-2
Wastewater Facilities and Discharges

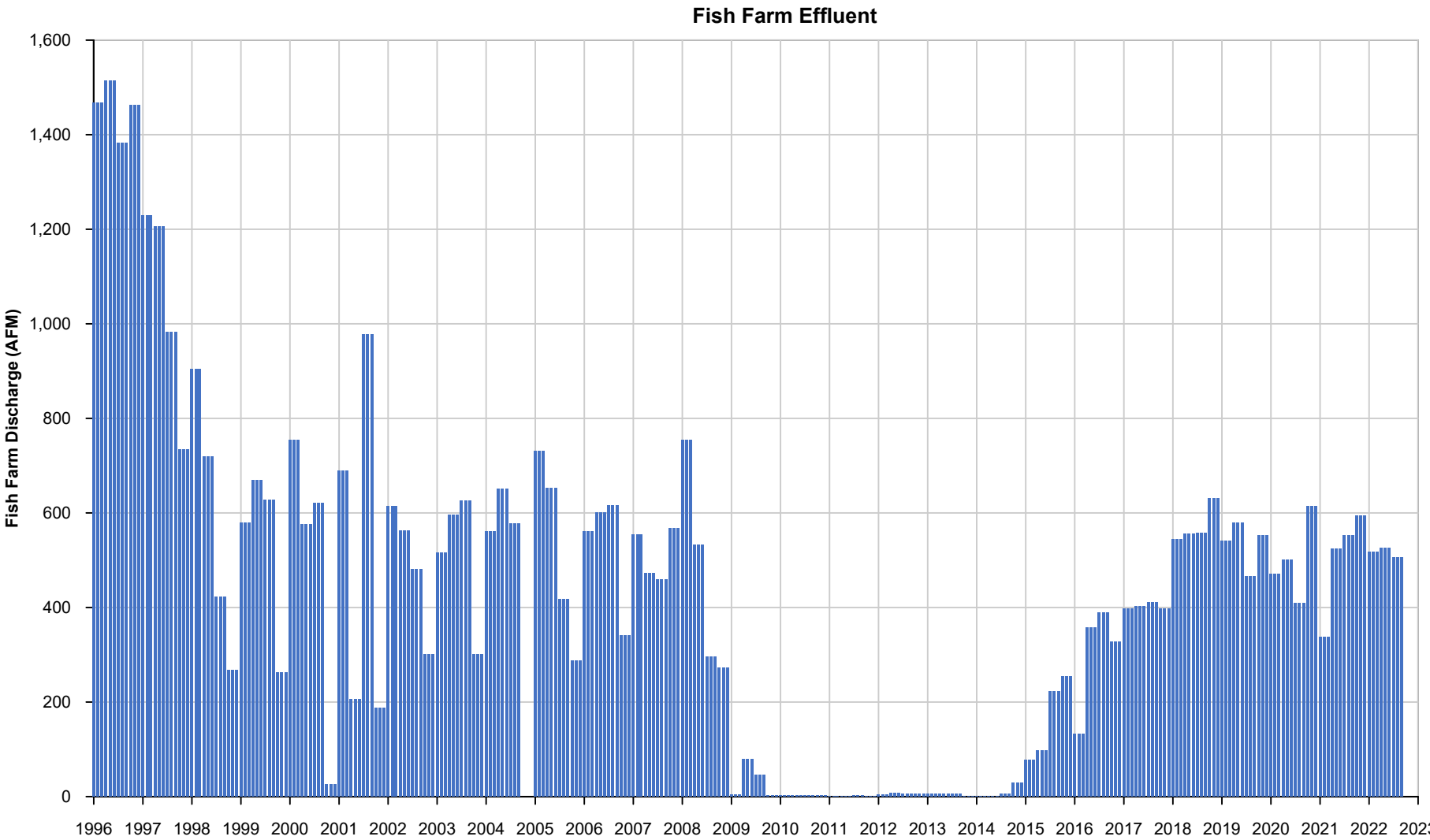


CVWD WRP4
City of Coachella WRP
Valley Sanitation District WRP

August 2023

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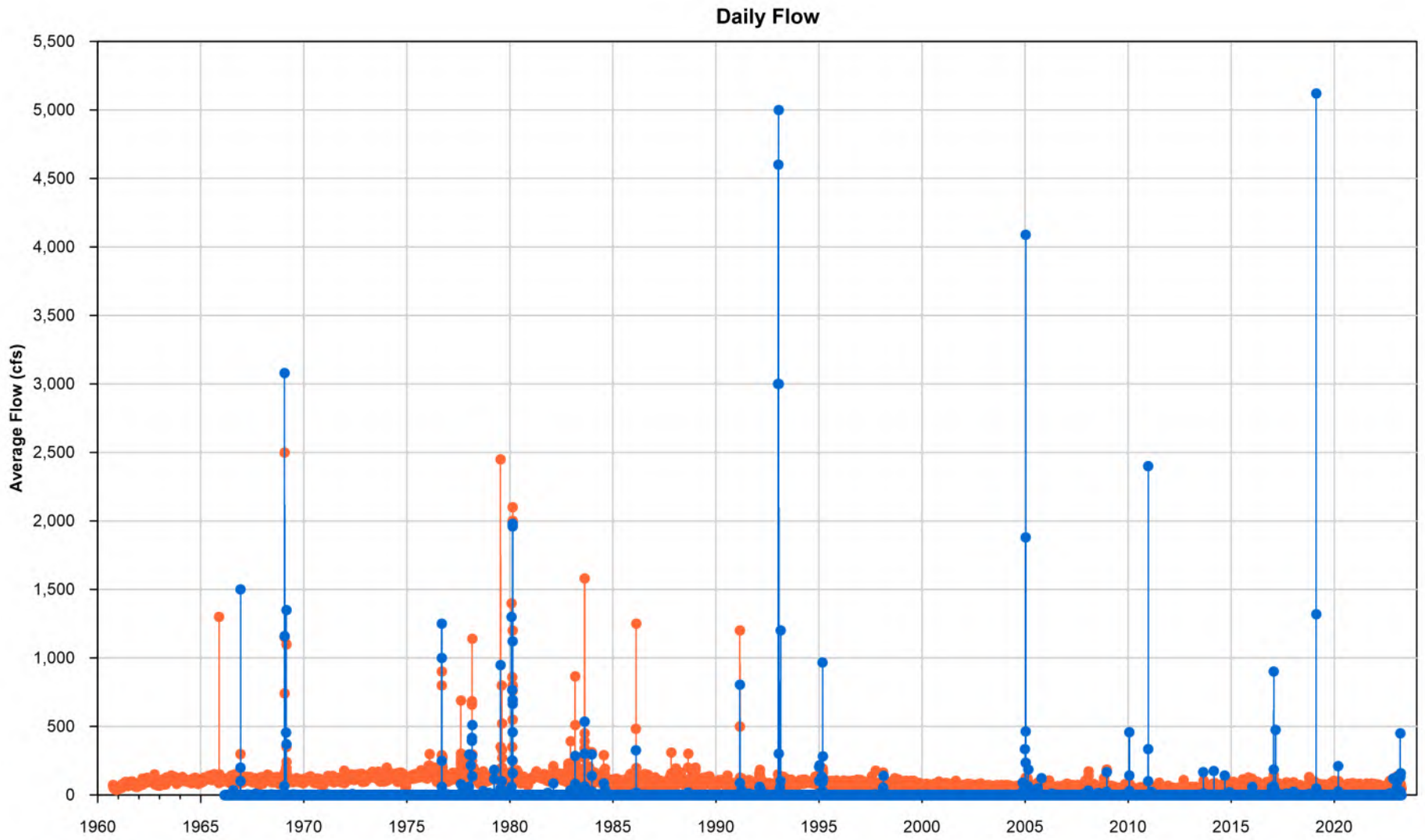
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2011-2022



August 2023

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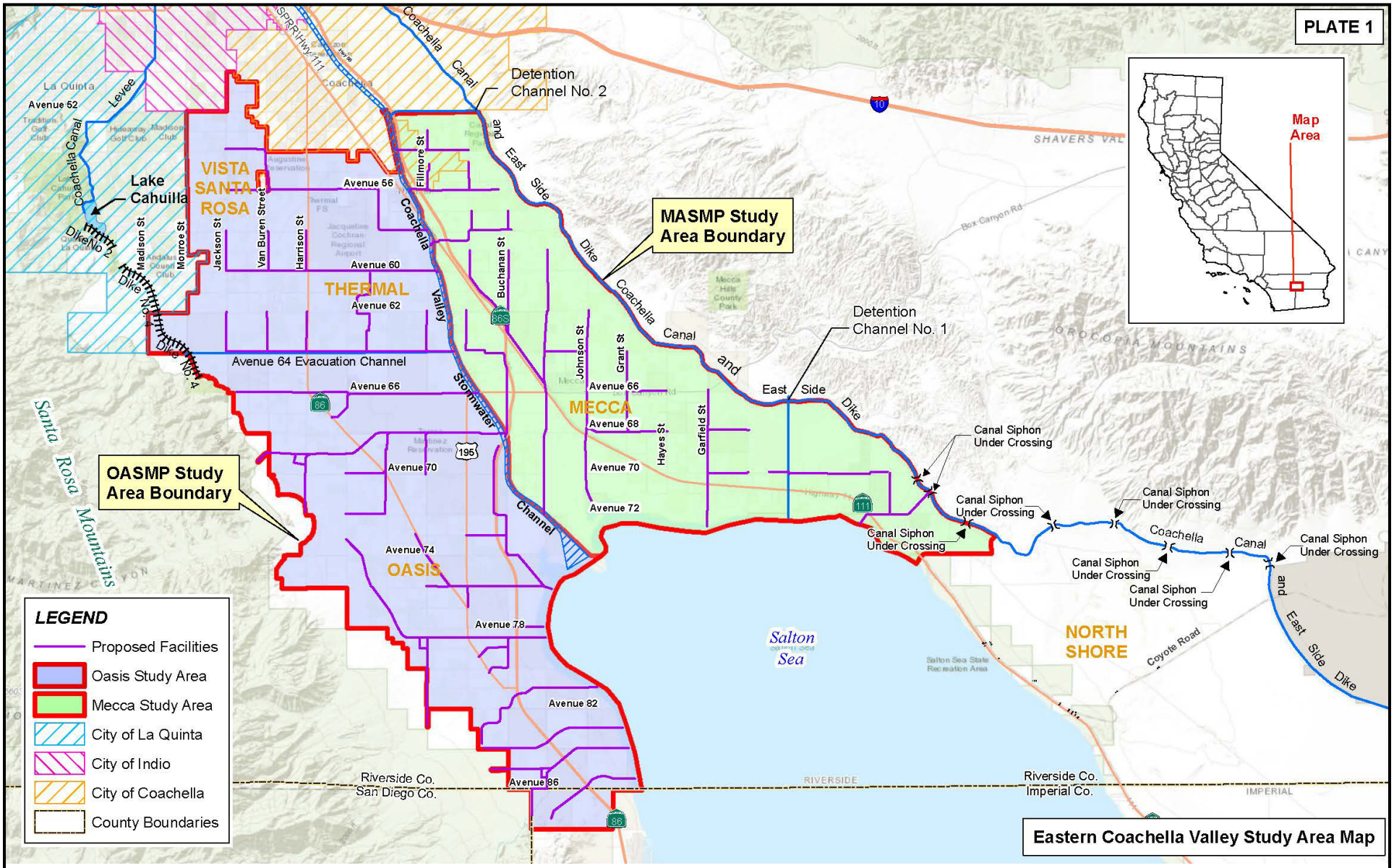
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August 2023

TODD GROUNDWATER

Figure 3-5
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Source: ECVSMP 2018

August 2023

TODD GROUNDWATER

Figure 3-6
Proposed Stormwater System

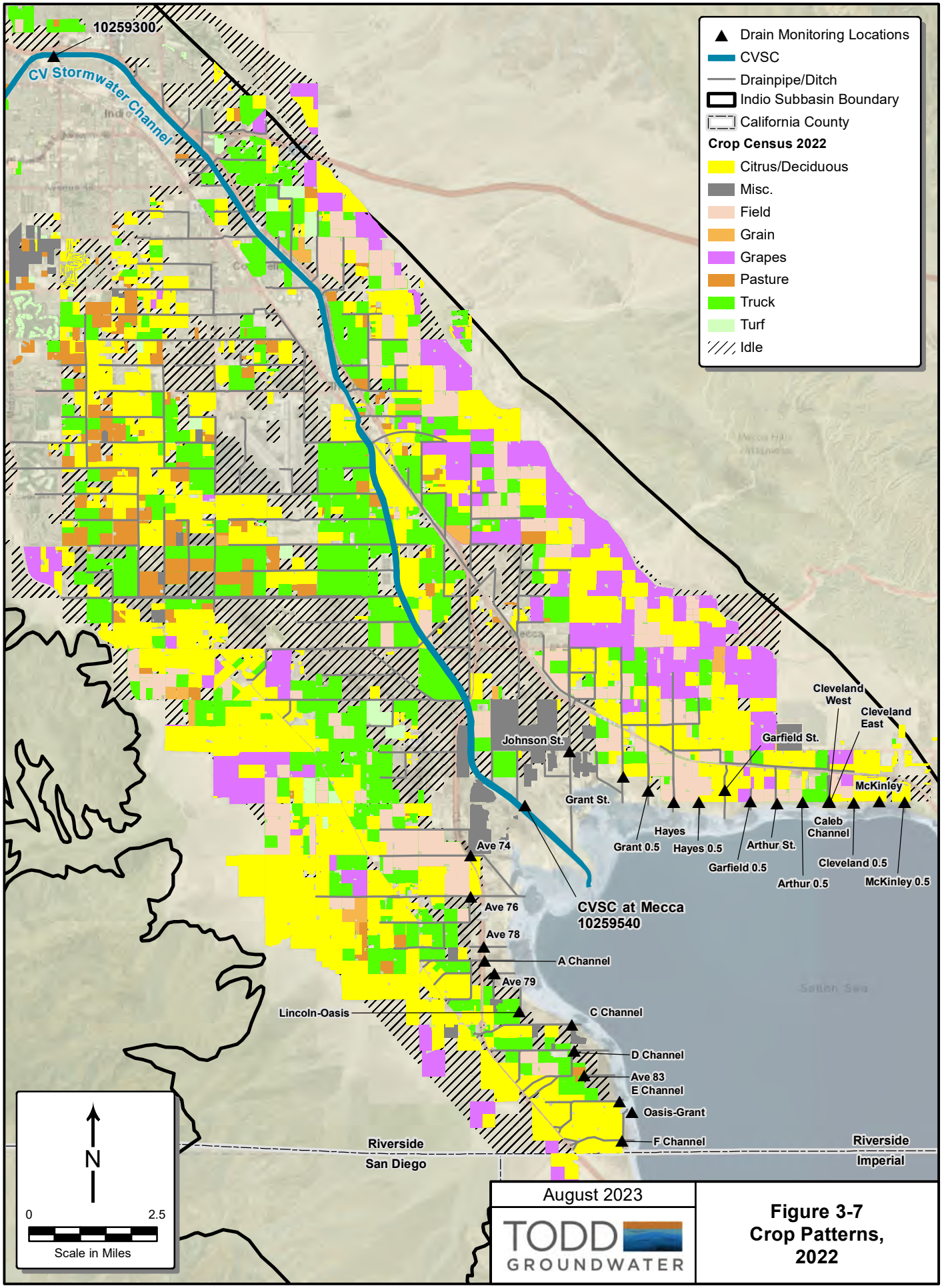
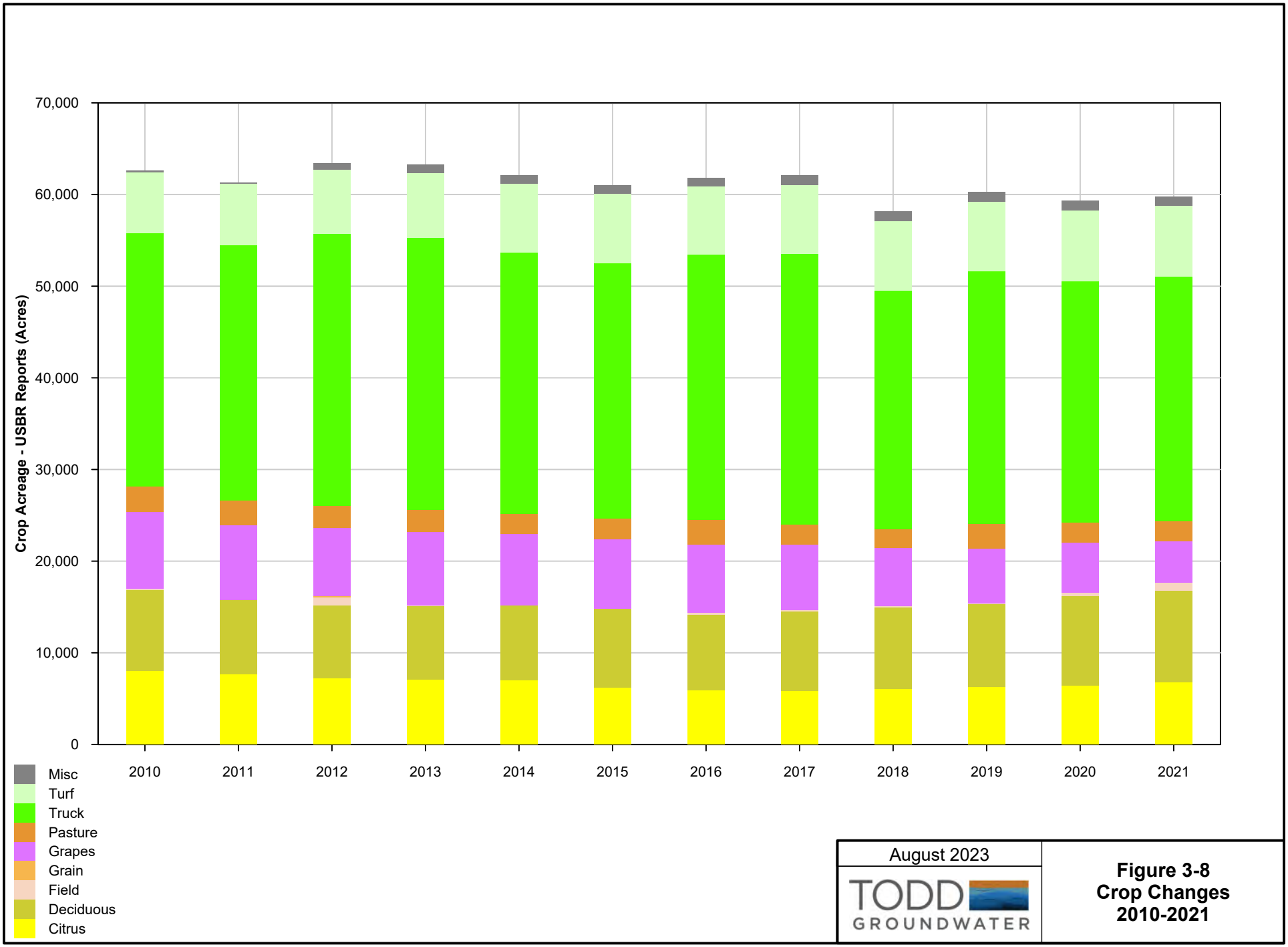


Figure 3-7
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August 2023

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Figure 3-8
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2010-2021

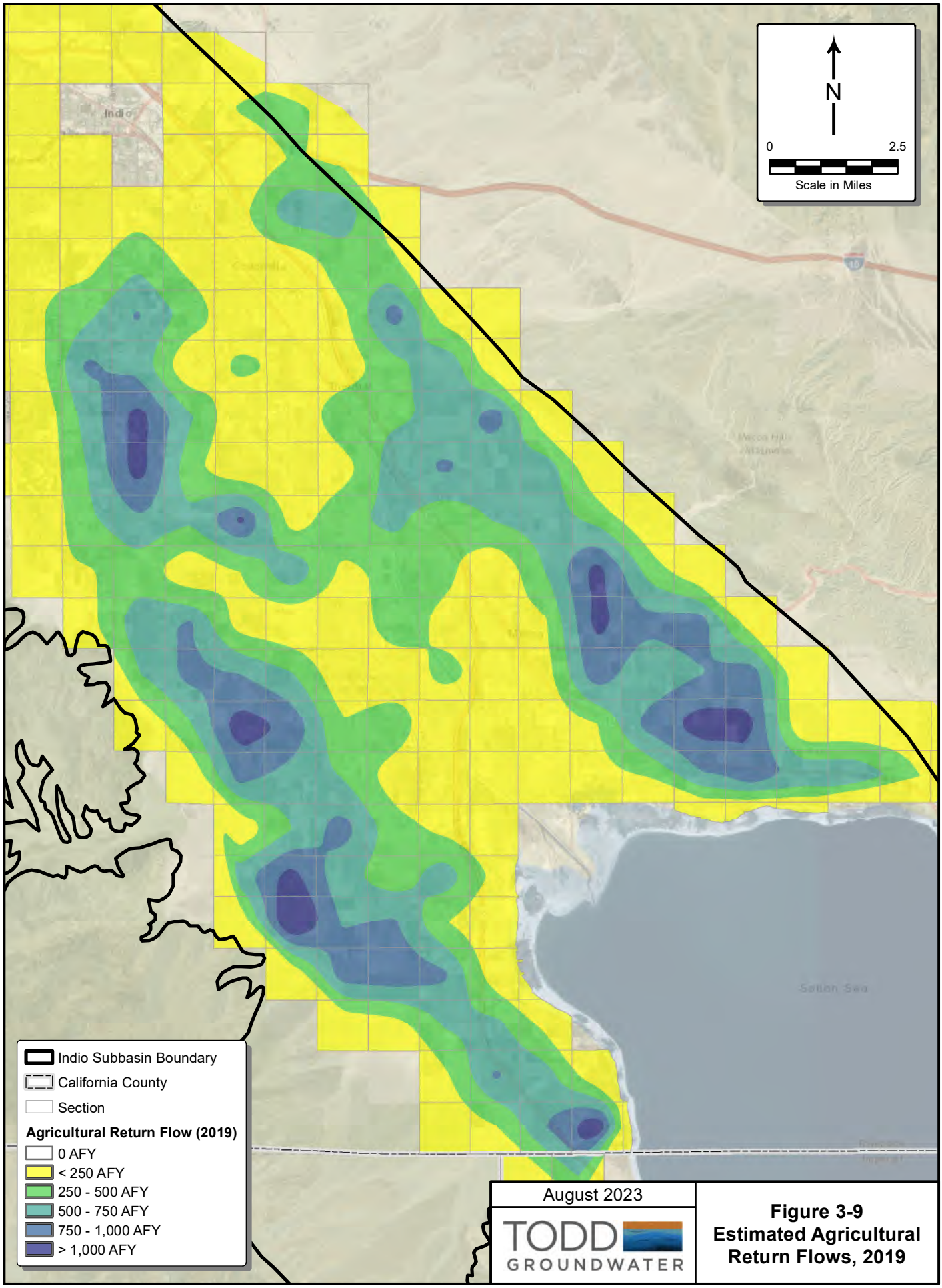
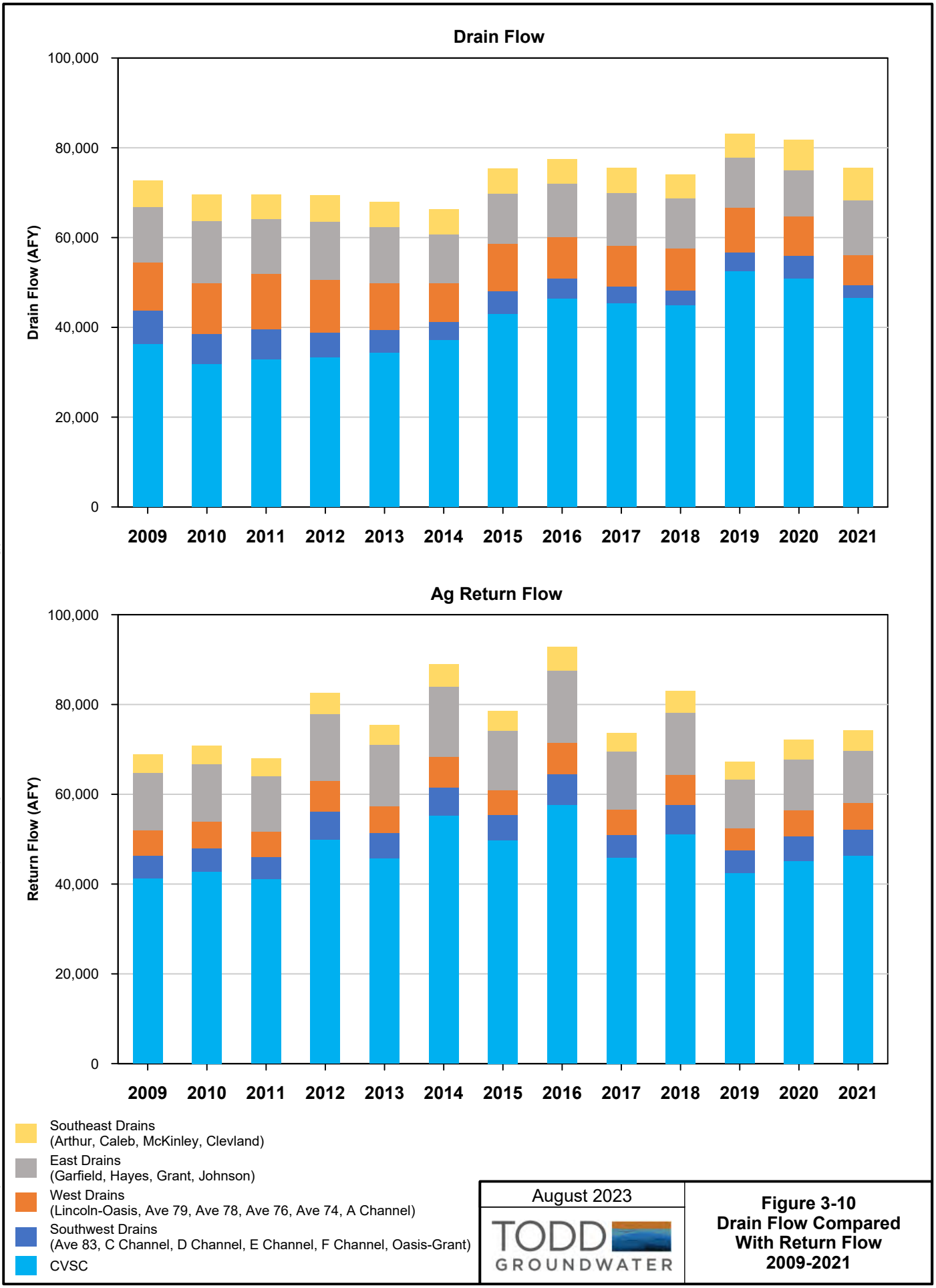


Figure 3-9
Estimated Agricultural Return Flows, 2019

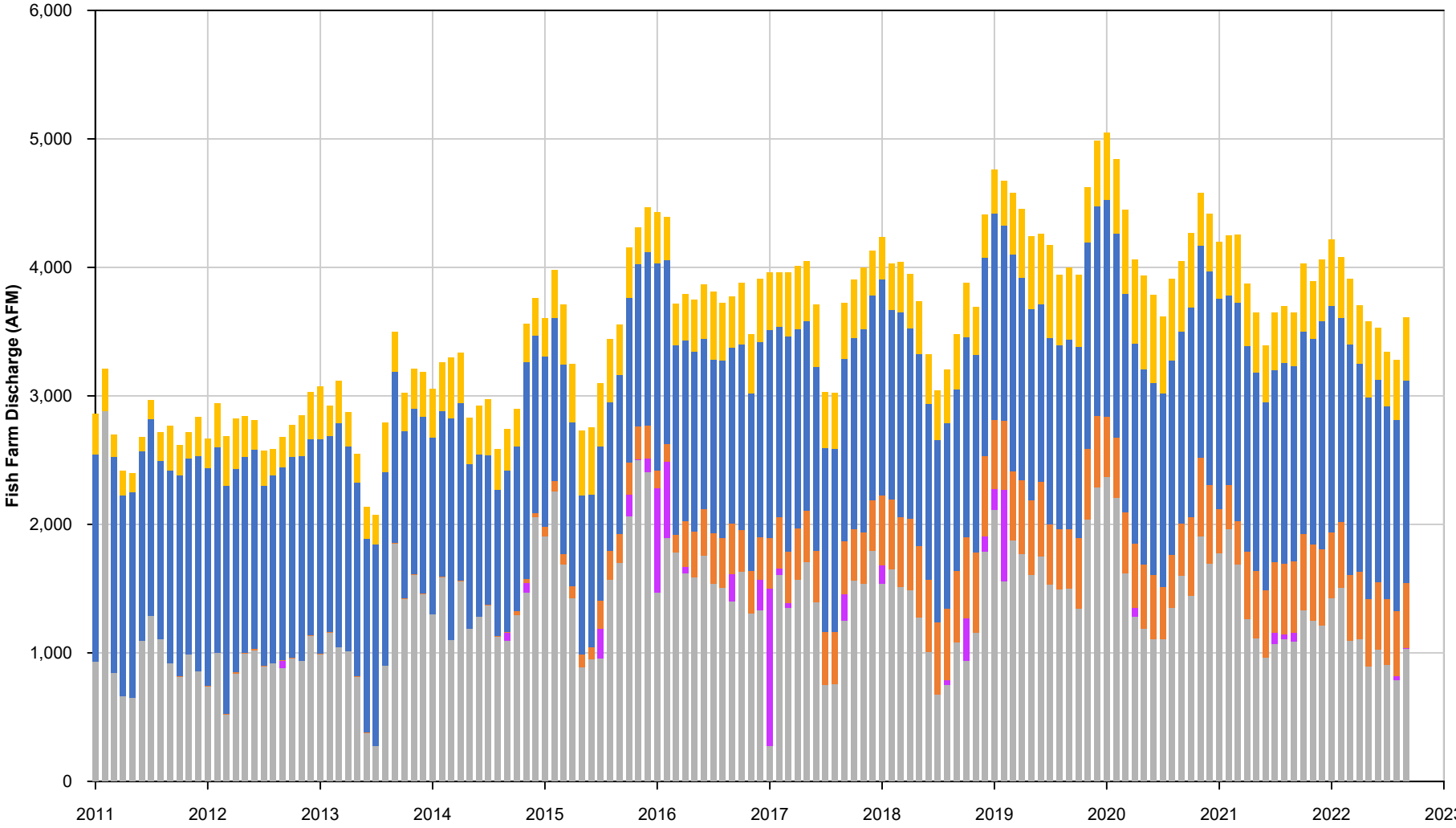


August 2023

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Figure 3-10
Drain Flow Compared With Return Flow 2009-2021

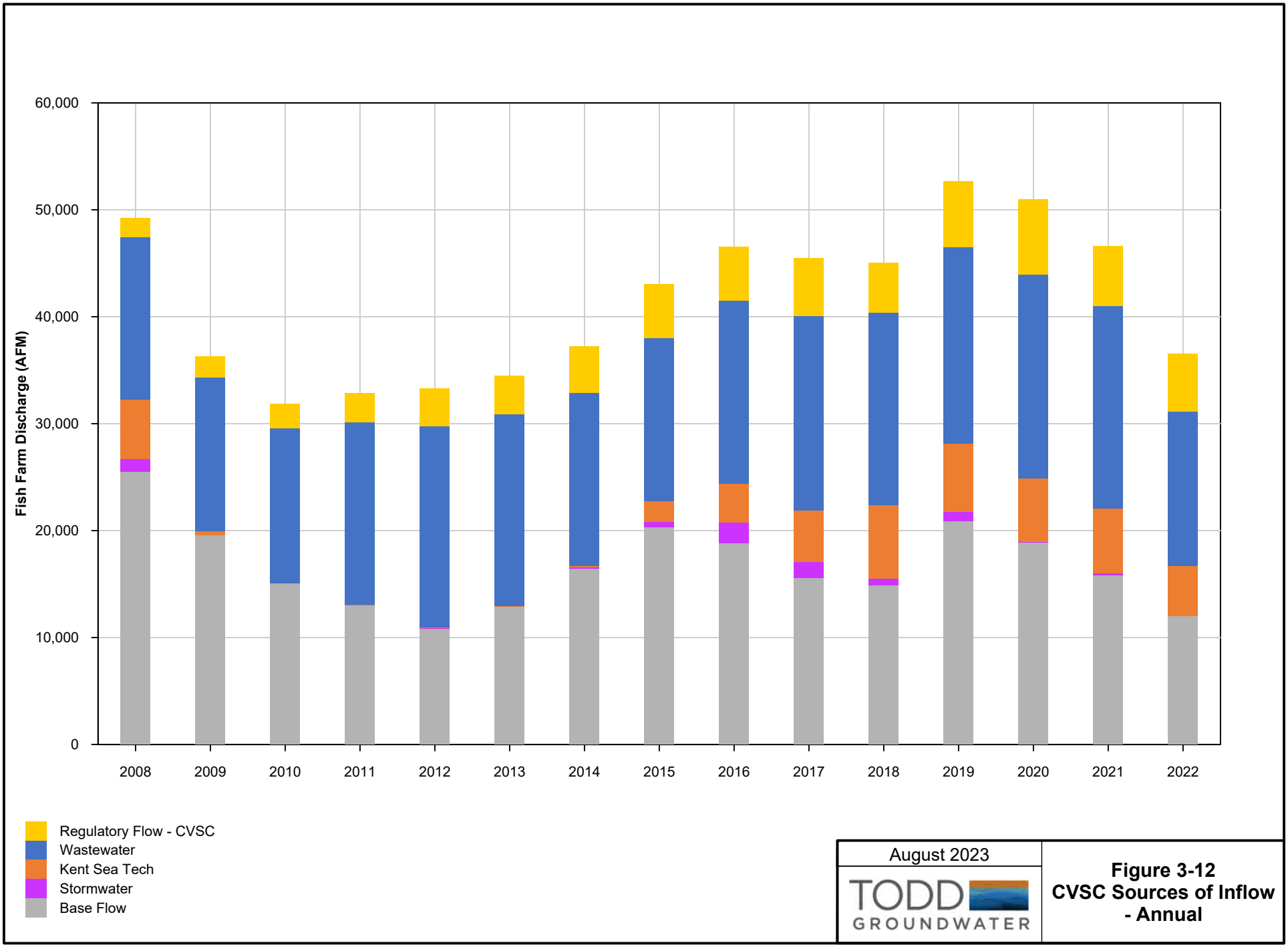
Path: \\todd-file\data\Projects\Coachella On-Call SGMA Services 2019 - 75004\Task Order 13 - Drain Study\GRAPHICS\Figure 3-10 Drain Flow Compared With Return Flow 2009-2021.gpj



August 2023

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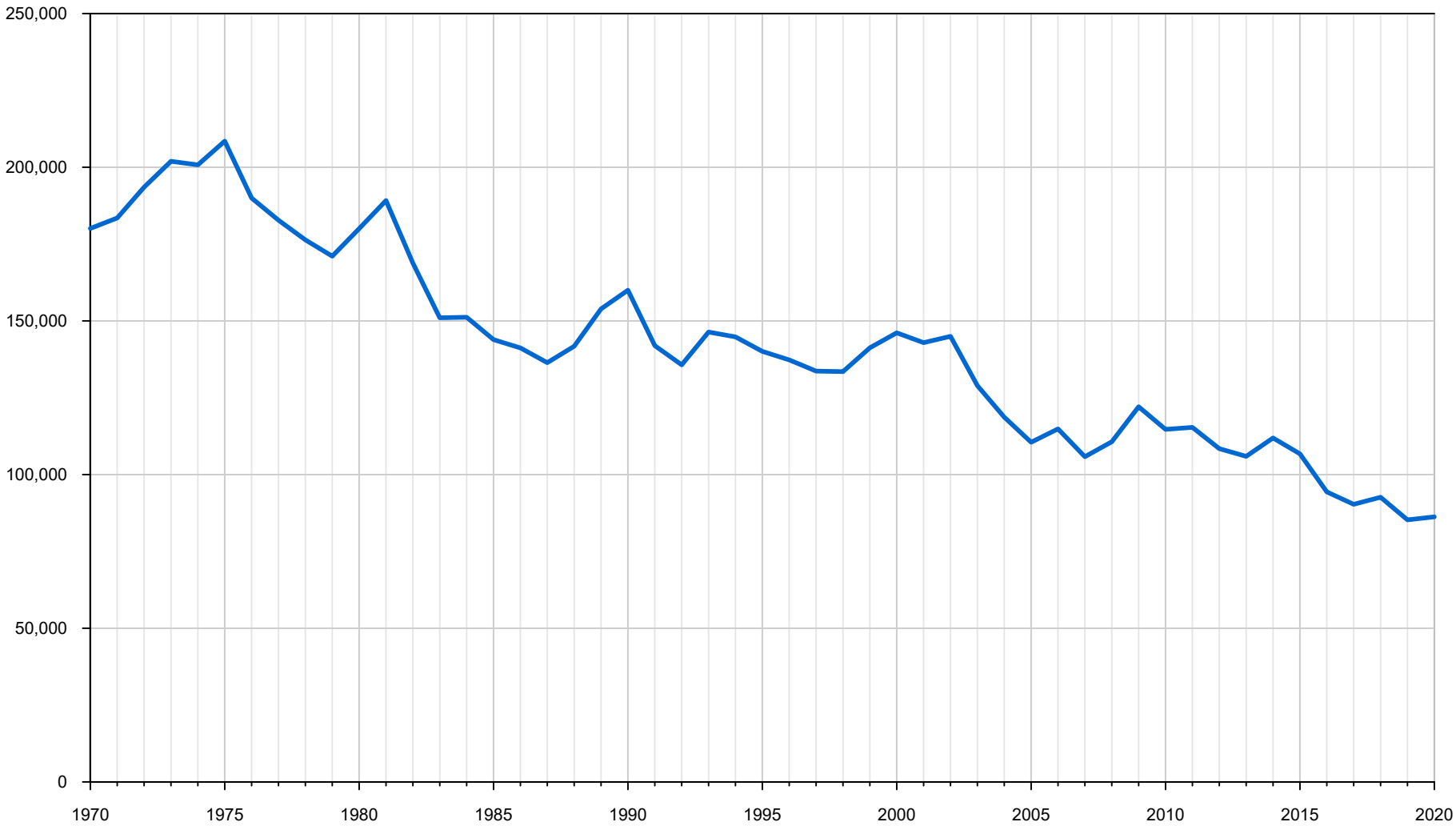
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August 2023

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Figure 3-12
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Source: Stantec, 2019

August 2023

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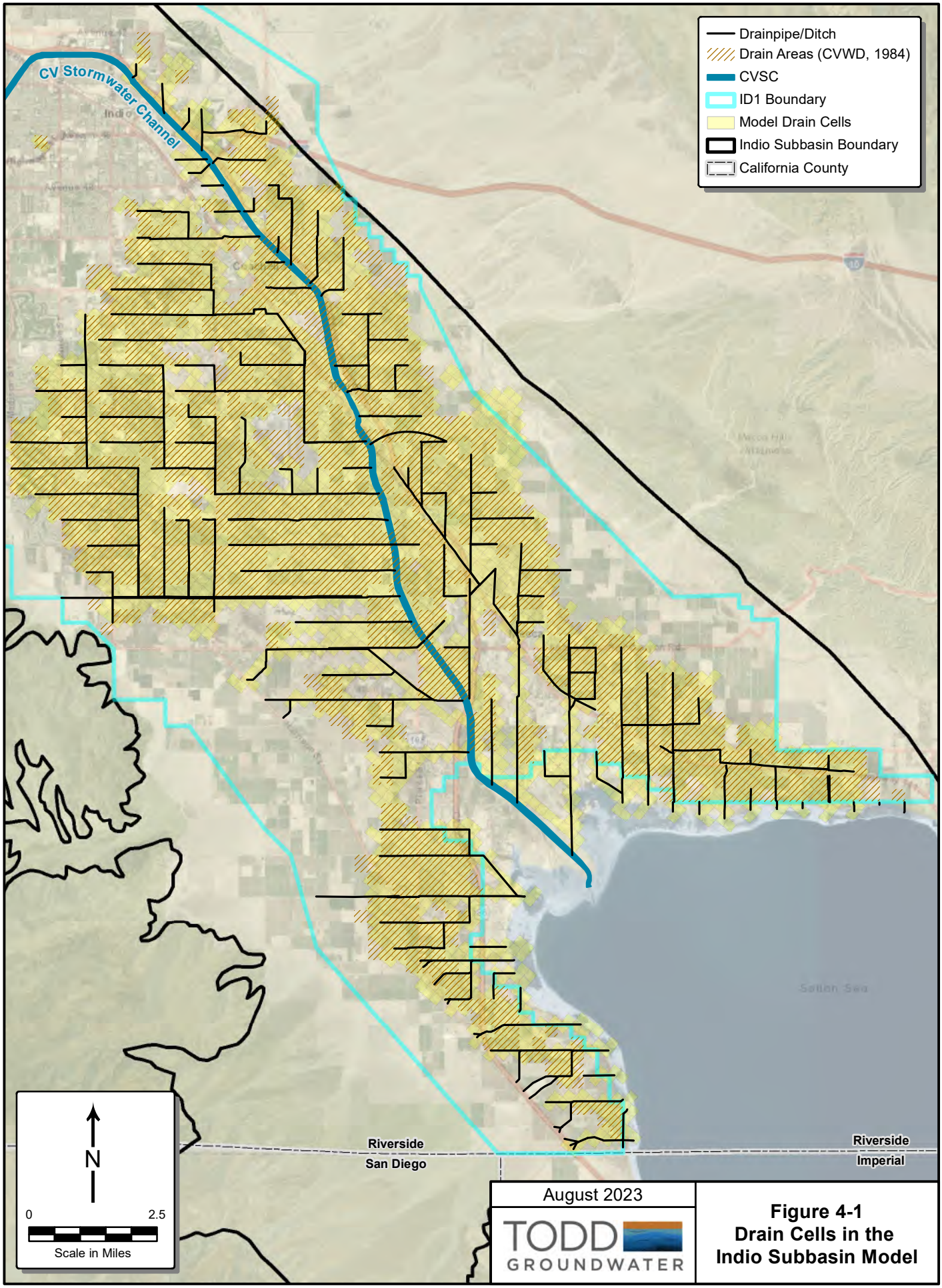


Figure 4-1
Drain Cells in the Indio Subbasin Model



Revisions						
No.	Date	By	Ckd.	Sub.	Appr.
2	28 OCT. 1969				
1	2 FEB. 1967				

COACHELLA VALLEY WATER DISTRICT

COACHELLA CALIFORNIA

COACHELLA VALLEY
DRAINAGE AND STORMWATER
OUTLET SYSTEM

Drawn V. F. Wahlen Submitted [illegible]

Checked E. L. N. Approved [illegible]

Appendix 3-A

Indio and San Gorgonio Pass Subbasin Boundary Flow Reconciliation

INDIO AND SAN GORGONIO PASS SUBBASIN BOUNDARY FLOW RECONCILIATION

COACHELLA VALLEY WATER DISTRICT
COACHELLA WATER AUTHORITY
DESERT WATER AGENCY
INDIO WATER AUTHORITY

November 2025

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1. INTRODUCTION

Coachella Valley Water District (CVWD), Desert Water Agency (DWA), Coachella Water Authority (CWA), and Indio Water Authority (IWA) serve as the Groundwater Sustainability Agencies for the Indio Subbasin (Indio GSAs). The GSAs submitted the 2022 Alternative Plan Update (Indio Alt Plan) to DWR in December 2021. DWR has reviewed and approved the 2022 Indio Alt Plan with corrective actions to be addressed in the 2027 periodic update. Recommended Corrective Action 1 states that the GSAs should describe inter-basin issues and coordination efforts regarding thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water. DWR indicates specifically that Indio GSAs should coordinate with neighboring basins, including San Gorgonio Pass (SGP), toward mutual sustainability.

Likewise, the San Gorgonio Pass Water District (SGPWD), DWA, and Verbenia GSA collectively serve as the SGP Subbasin GSAs (SGP GSAs), and are responsible for groundwater sustainability planning in the SGP. The SGP GSAs submitted their 2022 Groundwater Sustainability Plan (SGP GSP) to DWR on January 25, 2022. The SGP GSP, approved by DWR in 2023, acknowledges some inconsistencies along the shared Indio-San Gorgonia boundary that the SGP GSAs indicate that they will address.

The two subbasins are hydrogeologically interconnected at the boundary with groundwater generally flowing from northwest to southeast, from SGP to Indio. **Figure 1** shows the basin boundaries for Indio and SGP. Local flow reversals at the boundary may occur during periods of very high rates of replenishment at the Whitewater River Groundwater Replenishment Facility (WWR-GRF) in the northwestern Indio Subbasin just southeast of the subbasin boundary. However, previous evaluations indicate that these flow reversals, when present, are transitory in nature and return to the prevailing northwest-to-southeast flow during normal or dry periods.

During development in 2021 of the SGP GSP and Indio Alt Plan, discrepancies were identified in the amounts (and directions) of groundwater flow between the subbasins used in the respective water budgets and groundwater flow models, with SGP using higher average rates of outflow with more annual variability, and Indio using lower, relatively constant average rates of inflow. The Indio and SGP GSAs and their consultants have been working together to develop a shared understanding of the boundary and how it can be simulated in the respective models to improve groundwater management in the region.

Coordination with SGP GSA has included three working meetings with Indio and San Gorgonio GSAs and consultants. In addition, teams from both basins have readily provided model files, additional studies, and discussion on the model development.

This report documents the evaluation of the inter-subbasin flow, and includes:

- A summary of the Hydrogeological Conceptual Models (HCMs) described in the SGP GSP and Indio Alt Plan with a focus on the boundary area
- Assessment of characteristics of the alluvial aquifer in the boundary area, including thickness and geometry of the aquifer and its hydraulic properties
- Documentation of historical and newly available water level data
- Descriptions of how the boundary has been simulated in the Indio and SGP GSP numerical groundwater flow models
- Analytical calculations of subsurface flow across the boundary
- Recommendations on how the boundary should be simulated in groundwater models
- Recommendations for additional hydrogeologic characterizations of boundary area.

2. INDIO AND SGP HYDROGEOLOGIC CONCEPTUAL MODELS

This section summarizes the available information on the Hydrogeologic Conceptual Models (HCMs) of the Indio and SGP subbasins with a focus on the hydrogeology in the boundary area. By documenting and evaluating the HCMs, we can identify the controlling factors that govern flow between the subbasins.

Detailed evaluations and documentation of the HCMs are included in the Indio Subbasin 2022 Alt Plan (Todd Groundwater and Woodard-Curran, 2022) and in the SGP GSP (Provost & Pritchard and INTERA, 2022). Readers are referred to these Plans for additional information on the Subbasin HCMs.

2.1 Subbasin Settings

The aquifers of the Indio and SGP Subbasins comprise generally unconsolidated Holocene-Pleistocene alluvium deposited in the valleys, that is bounded by older lower-permeability rocks of the adjacent mountain ranges and valley basements. The alluvial aquifers are heterogeneous, of variable thickness, with interbedded coarse and fine-grained sediments and non-uniform hydraulic properties.

Figure 1 shows the SGP and Indio Subbasins. The Indio Subbasin encompasses more than 800 square miles and extends from the San Gorgonio Pass area to the northern shore of the Salton Sea. The Indio Subbasin slopes from an approximate elevation of 1,400 feet above mean sea level (ft msl) at the SGP subbasin boundary to about 200 feet below sea level (-200 ft msl) at the Salton Sea. The subbasin is bordered by the San Bernardino Mountains on the north, the San Jacinto and Santa Rosa Mountains on the west, the Little San Bernardino Mountains on the east and Salton Sea on the south. The San Bernardino, San Jacinto, and Santa Rosa Mountains impede eastward movement of storms and create a rain shadow, which results in an arid climate and limits the contribution of direct precipitation as a source of natural recharge to both subbasins.

The SGP Subbasin is approximately 60 square miles, bounded by the San Bernadino Mountains to the north and San Jacinto Mountains to the south. The main valley has an approximate elevation of 2,600 feet on the western side, sloping down to about 1,400 feet at the eastern boundary with the Indio Subbasin. The eastern boundary has a bedrock constriction (see sections below) that creates a groundwater cascade with steep hydraulic gradients into the Indio Subbasin. The SGP Subbasin is divided into four storage units: Cabazon, Banning, Banning Canyon, and Banning Bench. The Cabazon storage unit contains the eastern portion of the basin adjacent to the Indio Subbasin. Water levels in the Cabazon Storage Unit range from 1,700 feet elevation on the western side, down to 1,200 feet for the eastern boundary. This 500 foot difference in water levels occurs over a distance of 10 miles.

2.2 Geology and Aquifer Characteristics

The principal groundwater-bearing units of the Indio and SGP subbasins are unconsolidated to semi-consolidated sedimentary fill deposits, commonly referred to as the alluvial aquifers. The sedimentary fill is generally comprised of extensive Quaternary alluvial fan sediments, Pliocene–Pleistocene siltstone, sandstone, and conglomerate, along with deeper Miocene–Pliocene finer-grained fluvial and shallow-marine deposits. These older formations are typically compacted, consolidated, and in places cemented, which reduces their permeability relative to the younger alluvium.

In the Indio Subbasin the sedimentary fill generally thickens from northwest to southeast and is thinnest along the lateral subbasin boundaries and near the San Gorgonio Pass area. Southeast of the SGP-Indio subbasin boundary the sedimentary fill thickens to at least several thousand feet thick. Using isostatic gravity data, Langenheim et al. (2005) estimated the thickness of sedimentary fill across the subbasin. Their results suggest that the depth to basement ranges from near zero along the basin margins to more than 12,000 feet in southeastern portions of the Indio Subbasin. The upper approximately 2,000 feet constitute the aquifer system that is the primary source of groundwater supply. These permeable sedimentary fill units are laterally bounded and underlain by older lower-permeability crystalline basement rock.

Likewise, the SGP Subbasin sedimentary deposits are primarily coarse-grained sands and gravels, with local fine-grained layers. In the SGP the sedimentary deposits have been divided into three hydrostratigraphic units (HSUs): a perched aquifer, an upper aquifer, and a lower aquifer (Provost & Pritchard, 2021). The isostatic gravity data indicate the thickness of sedimentary fill in the SGP is over 7,000 feet in the Beaumont Storage Unit northwest of Banning, with smaller thicknesses along the basin margins and approaching the subbasin boundary. Like the Indio Subbasin, the sedimentary deposits of the SGP Subbasin vary in character with depth: older deposits are more compacted, consolidated, and cemented compared to younger sediments, resulting in markedly lower permeability (Rewis, 2006).

Figures 2 and **3** are hydrogeologic cross sections of the Indio and SGP subbasins, respectively, that were developed for the 2022 Indio Alt Plan and 2022 SGP GSP. These cross sections illustrate the general geology and structure of the subbasins and show the estimated thickness of the alluvial aquifers and elevations of the underlying bedrock. Note these two longitudinal cross sections are aligned roughly parallel to the regional groundwater flow directions through and between the subbasins. Additional transverse cross sections of each subbasin are included in the Indio Alt Plan and SGP GSP.

Indio Cross Section A-A' (**Figure 2**) is aligned from northwest-to-southeast along the axis of the Indio Subbasin, from the northern edge of the San Gorgonio Pass area to just southeast of Date Palm Drive in Cathedral City in the Palm Springs Subarea. Permeable sands and gravels comprise most of the subbasin deposits with smaller lenses of fine sand and clay, which increase in frequency to the southeast. Depth to bedrock (bottom of subbasin) is near the San Gorgonio Pass area is estimated to be approximately 500 feet and increases to the southeast, where depths to bedrock are greater but known only to the extent that depth to bedrock exceeds the maximum depth of local wells. Based on other data, the bedrock elevations are lower in the center portion of the boundary.

For the SGP GSP, an extension of the cross section from the 2022 Indio Alt Plan was developed (**Figure 3**) using newly acquired data from the San Gorgonio Pass area. This updated section reveals discrepancies in basin bottom depths when compared to the original cross section, which did not incorporate the more recent subsurface information. Note that Figure 2 indicates bedrock elevations as high as 800 feet while Figure 3 shows bedrock as high as about 300 feet. As a result, the older interpretation (**Figure 2**) may not accurately reflect current geological understanding in the extended region. Additionally, the Figure 2 cross section line does not pass directly through the center of the basin, which may result in the basin bottom appearing slightly shallower than its true depth.

Figure 2 also shows groundwater elevations during 2019. Groundwater flow is from northwest to southeast and groundwater elevations range from greater than 1,100 feet (msl) near the San Gorgonio Pass to about 500 feet (msl) near the southeast end of the section. Groundwater elevations and gradients are strongly influenced by groundwater replenishment activities at Whitewater River Groundwater Replenishment Facility (WWR-GRF).

Figure 4 shows the cross section (A-A') presented in the 2022 San Gorgonio Pass GSP, which illustrates bedrock depth estimates derived from Langenheim et al. (2005), utilizing regional-scale gravity data. While this dataset provides valuable insights into broader structural trends, its coarse resolution is not well suited for the finer scale required in this cross-sectional analysis. Most notably, **Figure 4** superimposes the well screens for recently drilled wells 11F1–4, 9E1, and 8M1 onto the Langenheim cross section, which would indicate that these well screens are within the crystalline bedrock (*prb*). This discrepancy is recognized in the San Gorgonio Pass GSP (see Provost & Pritchard et al., p. 3-9), which indicates that the bedrock is deeper than indicated by Langenheim.

The A–A' Indio Cross Section Extension emphasizes Well 8L1 (03S03E08L01S), where the well completion report confirms bedrock at a depth of 913 feet. Other wells along the section range in depth from approximately 600 to 1,200 feet and none show evidence of bedrock. Best available data indicate the estimated maximum thickness of alluvium in the San Gorgonio Pass area is as much as 900 feet. The location of maximum thickness is postulated near the center of the pass and decreases to the north and south towards the

respective bedrock outcrops. Note the saturated thickness of alluvium varies depending on the depths to groundwater, that fluctuates over time (see below) but is lower generally several hundred feet less the total thickness of alluvium.

2.3 Faulting

The boundaries between subbasins and areas within each subbasin are generally defined by faults that form partial barriers to groundwater flow. The eastern side of the Indio Subbasin is separated from the Mission Creek Subbasin by the Banning Fault, and from the Desert Hot Springs Subbasin by the San Andreas Fault (**Figure 5**). Groundwater elevation data on either side of the Garnet Hill Fault shows differences of as much as 220 feet across the Fault; such elevation differences also are illustrated in the SGP GSP for the Banning Fault on the hydrogeologic cross section B-B' (SGP GSP, Figure 3-9).

There is extensive faulting in the SGP Subbasin, defined by the San Andreas Fault system. The east-west trending Banning, Garnet Hill, and San Gorgonio Pass Thrust faults are associated with the San Andreas Fault in the SGP area (**Figure 5**). The San Andreas Fault and associated faults are near-vertical right lateral faults, typically slightly north-dipping in the SGP area. West of the SGP-Indio boundary, the San Andreas Fault system locally functions as reverse, thrust, and tear faults with significant uplift. This SGP Fault Zone represents a major structural knot in the San Andreas Fault system that is situated at the subbasin boundary, indicating its complexity.

Faults can act as barriers to groundwater flow due to several mechanisms. Fault gouge and associated fine-grained materials generated through repeated faulting can reduce permeability along fault planes, impeding lateral flow. Additionally, vertical displacement and juxtaposition of contrasting lithologies, such as low-permeability clays against more transmissive sands and gravels, can compartmentalize aquifers and alter flow paths. Furthermore, uplifted fault blocks may create hydraulic gradients that redirect or isolate groundwater movement. For example, groundwater elevation differences of up to 220 feet across the Garnet Hill Fault indicate that it may act as a partial barrier to flow, likely due to fault gouge and the juxtaposition of contrasting lithologies. Comparable elevation offsets are documented across the Banning Fault, as illustrated in hydrogeologic cross section B-B' of the SGP GSP. Although faulting within the SGP Fault Zone is structurally complex and requires careful interpretation, available evidence suggests that these faults may play a role in influencing groundwater flow and delineating subbasin boundaries. The degree to which transverse faults impede groundwater flow is unknown, but the SGP model simulates a Horizontal Flow Barrier that restricts groundwater flow between the subbasins, and the barrier conductance was adjusted during SGP model calibration to provide a solution calibrated with measured groundwater levels (see Section 3 below).

2.4 Geophysical Surveys

A range of geophysical survey techniques have been employed across California's complex hydrogeologic settings to improve subsurface characterization. In the Indio-SGP boundary area, historical and recent geophysical surveys have included two key methods—gravity studies and more recently Aerial Electromagnetic (AEM) surveys—which have been applied to delineating basin geometry, lithologic variability, and structural controls that influence groundwater flow. Together, these geophysical datasets offer valuable insights into subsurface conditions that inform the hydrogeologic conceptual models (HCMs), support model reconciliation across subbasin boundaries, and help guide coordination of sustainable groundwater management strategies.

2.4.1 Gravity Survey

Gravity surveys, such as the study by Langenheim et al. (2005), measure variations in the Earth's gravitational field to infer subsurface density contrasts. **Figure 8** is a reproduced figure from the Langenheim study illustrating gravity data. These data show basin depth and structure at a regional scale, revealing features like fault zones (shown as red lines) and sediment thicknesses (color ramp). These gravity data have been critical for identifying the wedged structural configuration and illustrating how the sedimentary basin fill thins near the pass.

The gravity data across the pass reveal a broadly symmetrical pattern between the San Gorgonio and Indio subbasins (**Figure 8**). Most of the modeled basin fill across both sides exhibits thicknesses in the range of 0 to 0.5 km (1,640 feet), suggesting relatively shallow structural depressions near the central pass, but the accuracy of individual data points derived from a coarse resolution model is uncertain without nearby control points.

The structural thicknesses derived from gravity data are relatively shallow in the center of the pass, ranging from 0.1 to 0.4 km (328 to 1,312 feet). Toward the eastern and western margins, where each subbasin opens, the thicknesses increase significantly, reaching 0.5 to 1 km (1,640 to 3,281 feet). This gradient indicates a basin floor that slopes away from the pass in both directions, consistent with thickening basin fill toward the subbasin interiors. These observations support the notion of a wedged structural configuration within the complexly faulted San Gorgonio Pass "knot," as described by Langenheim et al., and may help constrain subsurface boundary conditions and inflow/outflow pathways between the two models.

2.4.2 Airborne Electromagnetic (AEM) Survey

The AEM survey, conducted by the California Department of Water Resources (DWR) between 2024 to 2025, utilized airborne sensors to measure subsurface resistivity, which correlates with material type and saturation. High resistivity values typically indicate

coarse-grained, water-saturated sediments such as sands and gravels, while low resistivity values suggest finer-grained (like clays and silts) or unsaturated materials. These surveys were designed to provide a regional scale understanding of aquifer architecture, particularly in areas where borehole data are sparse or unevenly distributed.

Figure 6 shows the locations of the Aerial Electromagnetic (AEM) flight lines near San Gorgonio Pass. Although subbasin flight lines were not made directly over the San Gorgonio Pass or within the San Gorgonio Subbasin, one flight line (201501) intersects the adjacent Indio Subbasin in a SW–NE orientation, passing over the town of Whitewater. This line provides indirect but potentially informative data for coordinating the HCMs between the San Gorgonio and Indio subbasins.

Figure 7 shows the AEM data for flight line 201501, which is the closest available AEM data to the SGP. The southwestern segment of line 201501 (left side of graph), starting in Snow Creek and running through Whitewater, exhibits high resistivity values (50–1000 ohm-m), consistent with water-saturated sands and gravels. These findings align with coarse-grained lithologies identified in the AEM Coarse Fraction (CF) panel, which indicates a dominance of sand, gravel, and cobbles (80-100 percent) in the same area. In contrast, the northeastern portion of the line, within the Mission Creek Subbasin, trends toward lower resistivity values, suggesting finer-grained, less saturated materials such as clays and silty sands. This is consistent with observations of finer-grained sediments in boreholes drilled in this area.

While the absence of direct AEM coverage over the SGP-Indio boundary location limits its utility for model calibration in that zone, the data from line 201501 still inform boundary conditions and subsurface material transitions near the Whitewater area. These insights help constrain inflow/outflow assumptions and improve consistency between the two models, particularly where subsurface connectivity and lithologic continuity are inferred across subbasin boundaries.

2.5 Aquifer Geometry and Thickness

In the SGP-Indio subbasin boundary area, two variables make it difficult to constrain the aquifer geometry. This is especially true at the critical basement inflection point where geophysical data suggest a basement high and water level data indicate a significant steepening of the water table toward Indio.

First, unlike the valley area between Beaumont and Banning and the Coachella Valley to the east, the boundary area has a relative lack of wells and borehole data. Moreover, wells in the boundary area generally are shallow and do not reach the basin bottom.

Second, the boundary area is a narrow pass, so, absent data within the critical boundary area, any interpolation of depth-to-bedrock data is heavily influenced by the nearest

observable control point(s), such as bedrock outcrops, weathered bedrock surface slopes, and borehole lithological log data. In the narrowest part of the boundary area, coincident with the hypothesized bedrock high point, the width of alluvium at ground surface between the bedrock to the south and north is approximately one mile. This establishes the maximum width of alluvium, (excluding the semi-consolidated Cabezon Formation which is jurisdictionally part of the SGP Subbasin but likely does not contribute significantly to the total boundary flux). Because Quaternary alluvium cannot be structurally beneath Mesozoic plutonic bedrock, the saturated width at depth is equal to or less than the width of alluvium at the surface, constrained by the geometry of underlying crystalline basement rock.

2.6 Recharge and Discharge

These are several sources of inflow and recharge contributing to each subbasin, along with multiple discharge points. These sources and sinks are important considerations in determination of inter-subbasin flow amounts, as net recharge in the SGP Subbasin is a control on the amount of subsurface outflow to Indio. In the Indio Subbasin, local recharge and discharge near the subbasin boundary likewise affects groundwater hydraulic gradients and local inflow amounts.

2.6.1 Indio Recharge and Discharge

Sources of inflow (i.e., recharge) to the Indio Subbasin include:

- Subsurface inflows from the SGP and Mission Creek subbasins
- Infiltration of precipitation-derived inflows through mountain-front and stream channel recharge
- Artificial recharge of imported water (e.g., at Whitewater River GRF)
- Wastewater percolation
- Return flows from municipal/domestic use, agriculture, golf courses, and other sources
- Minor inflow from (and outflow to) the Salton Sea.

From 2000 to 2019, total subsurface inflow from adjacent subbasins to the Indio Subbasin averaged 11,800 acre-feet per year (AFY). Total areal recharge to the subbasin averaged 345,000 AFY. Return flows represented the largest source of recharge in the Indio Subbasin (average 204,900 AFY), followed by imported water recharge (average 85,900 AFY) and natural mountain front and stream channel recharge (average 37,500 AFY).

Inflow to Indio from the SGP Subbasin was previously estimated to be approximately 8,200 AFY, with small annual variations (see Section 3). It is important to note that this inflow occurred at the original Indio model boundary shown on **Figure 1** (approximately 1-2 miles from the basin boundary).

Artificial recharge at the WWR-GRF in the western portion of the Indio Subbasin is known to affect groundwater elevations and hydraulic gradients near the subbasin boundary. During periods of high rates of replenishment, groundwater elevations in wells near the WWR-GRF mound several hundred feet beneath and near the replenishment ponds, and the areal extent of mounding may occasionally affect groundwater elevations near the subbasin boundary. This in turn may reduce the horizontal hydraulic gradient and associated rates of subsurface inflow across the boundary.

Indio Subbasin groundwater outflows consist of the following:

- Groundwater pumping
- Subsurface drain flows to Salton Sea
- Evapotranspiration (ET)
- Minor outflow to (and inflow from) the Salton Sea.

From 2000 to 2019, the total combined outflow from the Indio Subbasin averaged 384,000 (AF). Almost all of the Indio Subbasin outflows occur at locations relatively far to the southeast of the subbasin boundary, with essentially no ET and only relatively small amounts of pumping occurring from a few production wells near the boundary.

2.6.2 SGP Recharge and Discharge

Inflows to the SGP Subbasin have been characterized by water source type and include:

- Subsurface groundwater inflow
- Infiltration of precipitation and surface water systems including creeks
- Infiltration of applied water, municipal and industrial (M&I) flows, and septic return flows.

Outflows from the SGP groundwater system include:

- Evapotranspiration
- Groundwater extraction
- Groundwater discharge to surface water sources
- Subsurface groundwater outflow.

As documented in the SGP GSP, SGP Subbasin water budgets have been developed from data and have been incorporated into or extracted from a groundwater model developed for the SGP Subbasin. For recharge, the water budgets also rely on estimates of surface water flow and infiltration that are developed by the San Gorgonio Pass Watershed Model (SGPWM) using the USGS INFIL watershed model.

The historical water budget for the SGP Subbasin was developed for a base period of 1998 through 2019. The SGP GSP notes that for the historical water budget period, precipitation conditions were substantially lower than historical long-term averages and therefore do

not provide the longer analysis period needed to evaluate aquifer responses. From 1998 to 2019, combined total inflow to the SGP Subbasin averaged approximately 35,800 AF. From 1998 to 2019, combined total outflow from the SGP Subbasin averaged 45,800 AF, or more average outflow than inflow (loss of groundwater storage).

Of the total estimated outflow and based on the SGP groundwater model (see Section 3), outflows from the SGP Subbasin to the Indio Subbasin (at the basin boundary) averaged 25,000 AFY, with variations from 21,300 AFY in 2019 to 27,600 AFY in 2004. This amount is around three times greater than the inflow previously estimated in the 2022 Indio Alt Plan. As noted above, the estimates of flow pertain to two different locations, the subbasin boundary for the SGP model and the model boundary for the Indio model, Figure 1.

2.7 Groundwater Elevations and Trends

The SGP and Indio subbasins are monitored for groundwater elevations at wells distributed across each subbasin. Groundwater elevation data measured in the wells are used to estimate hydraulic gradients and volumetric flow rates, to develop consistent inter-basin flow estimates, and to inform and calibrate the subbasin groundwater flow models.

Several wells with water level data are near the subbasin boundary including four sets of nested, continuously monitored wells installed by the USGS in 2018. Groundwater elevations are also routinely measured in several other GSA- and privately-owned production and monitoring wells. **Figure 9** shows the locations and State Well Numbers of monitored wells near and on both sides of the subbasin boundary. Hydrographs of groundwater elevations over time in these wells were prepared for evaluation. **Table 1** includes information about the wells and their well construction.

Table 1. Site Information for USGS Wells near San Gorgonio Pass-Indio Subbasin Boundary

Map Reference	Interval	Site Number	Station Name	Ground Surface Elevation (feet, NAVD88)	Interval Depth (feet)	Total Depth (feet)
07D	N/A	335556116431001	003S003E07D001S	1,641	750	760
08M	N/A	335522116415201	003S003E08M001S	1,350	553	575
07M	N/A	335522116430701	003S003E07M001S	1,480	462	465
09M	Lower	335525116410201	003S003E09M001S	1,339	1,080	1,103
	Lower-mid	335525116410202	003S003E09M002S	1,339	950	1,103
	Upper-mid	335525116410203	003S003E09M003S	1,339	760	1,103
	Upper	335525116410204	003S003E09M004S	1,339	620	1,103
8L	Lower	335530116413701	003S003E08L001S	1,358	890	975
	Lower-mid	335530116413702	003S003E08L002S	1,358	680	975
	Upper-mid	335530116413703	003S003E08L003S	1,358	510	975
	Upper	335530116413704	003S003E08L004S	1,358	410	975
08A	N/A	335557116411901	003S003E08A001S	1,500	600	611
11H	Lower	335534116441501	003S002E11H001S	1,573	880	900
	Mid	335534116441502	003S002E11H002S	1,573	660	900
	Upper	335534116441503	003S002E11H003S	1,573	540	900

Figure 9 shows the hydrographs for seven of the USGS wells and one locally monitored well. Each well provides detailed information about groundwater depths, gradients, and temporal trends in the local area and are described below. From west to east, water levels decline in elevation, with an especially steep gradient just east of the basin boundary (between 8L and 08A/09M). **Figure 9** shows hydrographs for the three wells that have multiple completion, well 11H1, 8L, and 8M.

Wells west of the subbasin boundary (7D, 11H, and 7M) have average water levels around 1,200 ft msl. All three wells show a decline over time, decline of about 50 feet over the past 10 years in 7D and 7M.

The well just east of the subbasin boundary (8M) has average water levels similar to the west boundary wells, 1,200 ft msl. 8M water levels experienced a steady decline of around 50 feet over the last 10 years. Well 8A is located approximately ½ mile east of the basin boundary but on the north portion of the alluvial channel. Water levels are higher than nearby wells 8L and 9M but similar to well 8M located closer to the boundary, with water levels ranging from 1,190 feet around 2012, and as low as 1,150 feet in 2021. The water levels in this area are higher due to being north of faulting associated with the San

Gorgonio Pass Fault Zone. Faults can act as barriers to lateral flow, effectively "trapping" water north of the fault and creating elevated water levels relative to surrounding areas. This local structural control is consistent with the observed hydrograph trends.

As shown in **Figure 10**, well 8L (located approximately ½ mile east of the subbasin boundary), shows water levels of around 1,140 feet in the lower interval, and between 1,050 feet and 1,080 feet in the lower-mid, upper-mid, and upper intervals. This well shows a strong upward gradient, likely due to the bedrock constriction occurring in this area which influences the vertical movement of groundwater. Local bedrock constrictions allow pressure to build in the lower interval and results in upward vertical flow.

Well 9M, located less than a ½ mile east of Well 8L, shows water levels between 830 feet to above 900 feet elevation, a 100-200 foot difference from water levels in 8L. In well 9M, the different intervals show generally similar heads with a downward gradient, compared to upward gradients in nearby Well 8L (**Figure 10**). This well shows water levels substantially lower than 8L, likely due to the plunging bedrock in this area. This well also appears to be strongly influenced by recharge operations at the nearby WR-GRF. The change in water levels and vertical gradient in well 9M and 8L indicate the bedrock structure may increase in elevation here and controls flow.

Based on the hydrographs, there appears to be a boundary condition between 8L and 9M just east of the designated subbasin boundary. Wells west of the boundary condition have higher groundwater elevations, a general decline over time, and an upward vertical gradient, whereas wells east of the boundary condition have lower groundwater elevations, trends that mirror recharge at WWR-GRF, and a downward vertical gradient.

The newly available water level data allow the SGP and Indio models to better simulate and calibrate the flow across the boundary. In the past, SGP used the only two wells available in the area; well 10P had available data only until 1987 and well 20F that is approximately 7 miles from the subbasin boundary and heavily influenced by WWR-GRF operations. More information about model improvements is discussed in Section 6.

2.8 Groundwater Flow Direction

Figures 11 and **12** shows water level contour maps for November 2022 and November 2024, respectively. Generally, groundwater levels in the eastern portion of the SGP and western portion of Indio indicate a hydraulic gradient from west-to-east, with flow from recharge sources in the west towards the outflow boundary with the Indio Subbasin. While limited data exist from the USGS wells drilled in 2018, these two time periods represent years with relatively less recharge at WWR-GRF (**Figure 11**) and comparatively more recharge at WWR-GRF (**Figure 12**). As expected, groundwater elevations are higher on the Indio side during the wetter period but groundwater elevations on the SGP side of the boundary remain fairly stable. Based on measured water level elevations in wells at and

near the boundary and groundwater flow model simulations (see Section 3) the direction of flow remains to the west from SGP to Indio, but inflow rates diminish during wetter periods when replenishment rates at the WW-GRF are high and groundwater mounding reduces the west-to-east hydraulic gradient in the westernmost Indio Subbasin.

3. INDIO AND SGP GROUNDWATER FLOW MODELS

This section describes the groundwater flow models developed for the Indio and SGP subbasins. The models are the basis for the current estimates of the amounts if inter-subbasin flow, and therefore were evaluated to identify the assumptions, input parameter values, and simulated flows at the boundary.

Figure 1 shows the SGP and Indio model areas and **Figure 13** shows a focused area of the subbasin boundary. Note that the original Indio model did not extend to the subbasin boundary, while conversely the SGP model extends several miles into the Indio Subbasin, and overlaps the Indio model grid.

The Indio model specifies the inflow amounts as a boundary condition, while the SGP model calculates the outflow amounts based on overall simulation of recharge, discharge, and aquifer characteristics across the SGP Subbasin in conjunction with a specified head boundary. As described previously, the Indio model uses around 8,200 AFY of inflow from SGP, while the SGP model and water budget averages around 24,000 AFY outflow to Indio. As noted previously, the Indio model outflow represents conditions at the model boundary not the basin boundary, as the original model did not extend to the boundary. We reviewed the input parameters of the two models and assessed the differences to determine their influences on calculated or specified flow amounts.

3.1 Indio Groundwater Model

The 2022 Alternative Plan documents the Indio numerical groundwater flow model. The Indio model uses MODFLOW code and simulates transient three-dimensional groundwater flow within and between the shallow and deep aquifer zones, and includes various sources of subbasin recharge, discharge to production wells, evapotranspiration, flow to drains, and flow to and from the Salton Sea.

The Indio groundwater model area is shown on **Figure 1**. The northwestern boundary of the version of the model used in the 2022 Indio Alt Plan was near the San Gorgonio Pass area in the northwest but did not extend all the way to the subbasin boundary. Note that the Indio GSAs are currently in the process of expanding the model area to the northwest to include the designated subbasin boundary. The southern Indio boundary is the northern portion of the Salton Sea in the southeast, while the western and eastern boundaries correspond with the defined subbasin boundaries at the bases of the San Jacinto/Santa Rosa and San Gabriel Mountains, respectively.

3.1.1 Indio Model Grid and Stratigraphy

The Indio Subbasin model has a node spacing of 1,000 ft in the x-y plane, and variable vertical node spacing representing variable thicknesses of the corresponding aquifer or

aquitard intervals. The grid is oriented from northwest to southeast along the length of the valley, coinciding with the principal direction of regional groundwater.

The MODFLOW model comprises four layers, representing the following hydrostratigraphic units:

- Layer 1 – semi-perched aquifer in East Valley and upper shallow aquifer in West Valley
- Layer 2 – shallow aquifer zone
- Layer 3 – regional aquitard in East Valley and shallow-deep transition zone in West Valley
- Layer 4 – deep aquifer

Figure 14 shows the Indio model grid and elevations of the bottom of Layer 4 (base of alluvium) in the subbasin boundary area. The original Indio model has a base of alluvium elevation of around 150 ft msl at the model boundary, about 2 miles southeast of the designated subbasin boundary. Note that the model bottom elevation does not correspond to the bedrock elevation shown on **Figure 2**, which is based on borehole data on the southern (shallower bedrock) side of San Gorgonio Pass.

3.1.2 Indio Model Aquifer Hydraulic Properties

Distributions of aquifer hydraulic properties including aquifer transmissivity, horizontal and vertical hydraulic conductivity, and unconfined and confined storage coefficients were developed as a part of the original 1936 to 1996 model to simulate the aquifer and aquitard units in the shallow and deep aquifer zones. Initial estimates of transmissivity (T) were obtained in part from previously calibrated values used in an early groundwater model constructed by Reichard and Meadows (1992) for the West Valley, some pumping test results for the East Valley, and abundant specific capacity data for the entire valley. Hydraulic conductivity (K) of the confining bed was then estimated across the model grid based on a sediment texture method (hydraulic conductivity scaled based on percent of coarse material) and heterogeneity. Hydraulic conductivity was treated as a calibration parameter.

Figure 15 shows the K values used in the northern portion of the Indio model near the SGP subbasin boundary. The same values were used in each of the four Indio model layers in the boundary area. In this area, K values range from approximately 0.5 to 100 feet per day (ft/day). A zone of the low values (0.5 ft/day) is simulated in the area near a fault segment of the San Andreas / Banning Fault. Higher values are used south of the fault and increase particularly around the WWR-GRF. Within the alluvial aquifer area immediately south of the subbasin boundary, the Indio model uses a hydraulic conductivity of 4.0 ft/day in all model layers.

The lower K values simulated near the boundary in the original Indio model may have been defined by Fogg, et. al. for model calibration considerations, in other words, to retard inflows coming in from the SGP subbasin boundary. There is a discrepancy between the K values used in the Indio and SGP models in this area, with the SGP model using higher K values in the boundary and overlapped model area, as discussed below.

3.1.3 Indio Model Faults and Flow Barriers

The Indio Model includes the San Andreas / Banning Fault that separates Mission Creek Subbasin from the Garnet Hill Subbasin and the Indio Subbasin. This feature is simulated as a horizontal flow barrier (HFB) in layers 1 through 4 and includes lower K values to adequately restrict the movement of flows across the fault. No HFB is simulated at or south of the subbasin boundary; rather the defined low K zone in this area serves to impede groundwater inflow in this area.

3.1.4 Boundary Condition at SGP Subbasin

in the original Indio Model, developed by Graham Fogg and Associates, the amounts of flow from the SGP Subbasin were computed by the model with a time-dependent specified head boundary using the MODFLOW CHD Package. In the *2010 CVWMP Update* model, the boundary condition was changed from a CHD boundary to a specified flux boundary, which is used to represent the long-term average inflow for each cell. The amount of inflow was based on a running average of the historical fluxes estimated using the CHD boundary and was set to a value of approximately 8,200 AFY in the *2010 CVWMP Update* model, decreasing slightly between 1997 and 2019 (Figure 7-7).

3.1.5 Indio Model Planned Improvements

For the upcoming 2027 Alternative Plan Update, the existing Indio Subbasin MODFLOW groundwater model is being updated then used to project future conditions for various plan scenarios. In addition to the planned routine simulation update of the most recent historical period and development of future plan simulations, there is an opportunity to implement additional upgrades to the existing model. One potential upgrade is expansion of the model area to better coincide with the designated San Gorgonio-Indio Subbasin boundary.

As shown in Figure 13, the San Gorgonio-Indio Subbasin boundary is about 8,000 to 9,000 feet northwest of the northern boundary of the original model. To extend the model to the subbasin boundary, 10 1,000-foot model rows are needed in this area. In addition, estimates on new input parameter values for the expanded model area are needed (i.e., layer elevations, hydraulic conductivity and storage parameters, fault barrier extensions, rechange inputs, wells inputs, etc.). This can be accomplished by simulating the HCM and coordinating with SGP on their model parameters in this area.

3.2 SGP Groundwater Models

The San Gorgonio Pass basin is simulated using three models: a watershed model (SGPWM), a groundwater model for the shallow zone (Upper SGPSGM), and a groundwater model for the deeper zone (Lower SGPSGM). A schematic of the three models is shown in **Figure 16**. For the purposes of this investigation, the Lower SGPSGM is the focus, as it simulates the deep aquifer system and the flow to the Indio Subbasin. These models are described below.

3.2.1 SGP Watershed Model

SGPWM is a watershed model that utilizes the United States Geological Survey (USGS) INFILv3 code (USGS, 2008). The SGPWM is a grid based, distributed parameter, deterministic water-balance model that calculates the temporal and spatial distribution of daily net runoff and infiltration of water across the root zone (INTERA, 2021). The model is used to estimate the spatial and temporal distribution of recharge and runoff for the SGP area and tributary watersheds. This model provides inflows to the upper SGPSGM that in turn contribute to the Lower SGPSGM.

The input parameter assumptions of the SGPWM and accuracy of the estimated inflows were not reviewed as part of this effort. However, the recharge amounts estimated using the SGPWM may indirectly affect the estimated inter-subbasin flow amounts of the lower SGPSGM, because greater inflows ultimately result in higher simulated rates of outflow to Indio.

3.2.2 Upper SGP Model

The upper SGPSGM simulates surface water and shallow/perched groundwater flows in the SGP Subbasin and adjacent areas using MODFLOW-OHWM. Recharge and runoff from the SGPWM are applied as inflows to the Lower SGPSGM. The primary purpose of the Upper SGPSGM is to calculate underflows from the surrounding tributary watersheds and vertical drainage from the shallow/perched groundwater system to the Lower SGPSGM. The model documentation notes that the MODFLOW models (Upper and Lower SGPSGM) are not dynamically connected due to limitations with MODFLOW simulating unsaturated zone conditions between two saturated layers (INTERA, 2021).

3.2.3 Lower SGP Model

The Lower SGPSGM simulates the deep aquifer system using MODFLOW-NWT (Niswonger et al., 2011). Vertical drainage from the Upper SGPSGM as deep percolation is the primary input to the lower model. The aquifers simulated in the Lower SGPSGM are separated from the shallow/perched groundwater above by a thick vadose zone that limits and attenuates deep groundwater recharge.

The Lower SGPSGM provides the amounts of subbasin outflow to Indio. Accordingly, the model was reviewed to document assumptions, input parameter values, calibration results, and validity of the estimated outflows to Indio.

3.2.4 Lower SGP Model Stratigraphy

The Lower SGPSGM includes 3 model layers, the structure of which was based on previous models developed for the region, including a model developed by USGS (2019). **Figure 17** shows an east west cross section of the Lower SGPSGM. On the cross section, note the presence of a bedrock ridge just west of the steep downdip in bedrock depth near the subbasin boundary. This is an important structural feature having significant effect on heads on both sides of the basin boundary and on outflows from the SGP Subbasin to the Indio Subbasin (INTERA, 2021). Near and at the subbasin boundary, areas of Layer 3 in the Lower SGPSGM are inactive, meaning subbasin outflow only occurs through Model Layers 1 and 2 at the boundary.

Figure 18 is a map showing the SGPSGM model layers, including elevation contours of the base of alluvium (Layer 3). Layer 3 exhibits a substantial elevation range, extending from 0 feet to approximately 1,000 feet below sea level. However, as shown on **Figure 3**, lithologic data from wells 03S03E08L01S and 03S03E09M01S indicate that the bedrock surface within the San Gorgonio Pass area is situated significantly higher, at elevations between 200 and 300 feet above sea level. This suggests that the modeled base of Layer 3 may extend below the actual bedrock surface in portions of the Pass area.

3.2.5 Lower SGP Model Aquifer Hydraulic Properties

After development of initial estimates, hydraulic conductivities used in the Lower SGPSGM were adjusted during calibration. Faulting in the Lower SGPGM near the basin boundary has been hypothesized to create partial barriers to flow, and the SGPSGM simulates different K zones that have a range of values, along with HFBs, to control flow and achieve model calibration in the boundary area.

For the Lower SGPSGM, horizontal hydraulic conductivities in Model Layer 1 range from 8 ft/day in the northern part of the boundary, extending east into the Indio Subbasin, 30 ft/day in the central portion of the boundary on the SGP Subbasin side, and 91 ft/day on the southern part of the boundary (**Figure 19**). These values are comparable with the K values used in the northwestern portion of the Indio model. Note horizontal K values in all model layers in the northern Indio Subbasin are 4 ft/day, with a zone of lower K (less than 1 ft/day) along the eastern model margin.

For Layer 2 of the SGP model, a small area of K values of 50 ft/day occurs in the center with a greater extent in the San Gorgonio Pass Subbasin. Layer 3 Horizontal K values

include a central strip of 3 ft/day through the San Gorgonio Pass into the Indio Subbasin, flanked by areas of 0.05 ft/day to the north and south.

Lower SGPSGM storage parameters are uniform across the model domain. For model Layer 1, Sy = 0.07; for model layer 2, Ss = 2.5 x 10-9 per foot; and for model layer 3, Ss = 2.8 x 10-6 per foot.

3.2.6 SGP Model Faults and Flow Barriers

The Lower SGPSGM represents several faults as HFBs, including the Garnet East and West, Cabazon East, Cabazon, Banning-Cabazon, East Banning, West Banning, and South Banning fault systems. The complex faulting in the subbasin has significant impact on flows and groundwater levels in the deeper aquifer system (INTERA, 2021). The study authors note that the simulated groundwater heads were found to be extremely sensitive to HFB conductivities and locations (INTERA, 2021). The HFBs included in the model are illustrated on **Figure 20**.The Garnet East fault extends across the northern side of San Gorgonio Pass (see Figure 5), while the Garnet West is conceptualized as extending southwestward into the SGP-Indio boundary area where it impacts flows and hydraulic gradients (see **Figure 20**).

The Coach Barrier, a north-south HFB indicated on **Figure 20** just east of the boundary, represents a bedrock constriction and is critical to simulating the observed hydraulic gradients across the SGP-Indio boundary (INTERA, 2021). The study authors note that the Coach Barrier, while modeled as an HFB, may represent a structural flow barrier such as a bedrock ridge that restricts lateral flows (INTERA, 2021). Geology and hydrostratigraphy at the basin boundary are noted to be extremely complex with faults and structural features controlling lateral flows (INTERA, 2021) and borehole data are not sufficient to precisely define depth to bedrock (see Section 2.5). The authors note that the conceptualization and numerical representation of this area will be further refined as additional data becomes available from newly installed USGS monitoring wells near the basin boundary (INTERA, 2021).

3.2.7 Boundary Condition at Model Boundary

Underflows across the eastern boundary of the SGP model are simulated with a general head boundary (GHB) that uses a correlation model based on a pair of USGS wells. As shown on **Figure 13**, the model boundary is located in Indio Subbasin and not at the basin boundary. The heads at the GHB are based on the water levels at monitoring well 10P (INTERA, 2021) and are noted to be strongly influenced by recharge at the Whitewater River Groundwater Replenishment Facility (WWR-GRF). It should be noted that data for well 10P are only available through June 1986 and heads for the later period were extrapolated. The correlation model relates groundwater levels between Well 10P at the edge of the SGP Subbasin (10P) and Well 20F at the WWR-GRF (see **Figure 21**).

The correlation model uses the following equation to estimate boundary heads:

$$Head_{Boundary}(Year_i) = 107.84 + 0.51 * Head_{Boundary}(Year_{i-1}) + 0.000143 * Recharge(Year_i)$$

A comparison of the groundwater levels at wells 10P and 20F and representation of boundary heads at the model boundary is shown in **Figure 21**. Due to the intermittently high rates of groundwater replenishment in this area, the flows at the model GHB boundary vary substantially.

Figure 22 shows the model outflow at the model boundary located inside the Indio Subbasin. For the period of WY 1998 to 2019, annual flows range from 87,000 AFY flowing west from Indio towards the SGP; to 50,000 AFY flowing east from SGP Subbasin to Indio Subbasin; with an average flow of 26,000 AFY from east to west (towards SGP) being shown.

3.2.8 Boundary Condition at Indio Subbasin Boundary

Because the basin boundary is a more reasonable boundary to report flows for the GSP, both jurisdictionally and hydrogeologically, the SGP GSP also presents inflows/outflows at this location. As shown on **Figure 23,** the inflows to the Indio Subbasin at the basin boundary are more uniform, with smaller annual variations and continuous outflow across the jurisdictional boundary to Indio. For the period of WY 1998 to 2019, basin outflows range from 21,000 AFY to 28,000 AFY, with an average of 25,000 AFY flowing from SGP to Indio subbasin.

3.2.9 SGP Model Calibration

Calibration of the SGPSGM is described in the modeling appendix of the SGP GSP. Parameters adjusted during calibration included: horizontal and vertical hydraulic conductivities storage parameters, applied recharge, HFB conductivities, drains, and GHB heads. For calibration statistics, the SGPSGM lower model has a scaled root mean square error (RMSE) of 1.8%, which is well within calibration targets for consistency between simulated and observed heads. The residual mean of the difference between observed and simulated heads is 2.2 feet. These statistics indicate that the model is capturing the overall trends observed in the subbasin as defined by the calibration dataset. Calibration hydrographs in the eastern portion of the model, shown in figures 5.1A – 5.1E in the SGP GSP modeling appendix, show the general groundwater level trends being captured, with a slight tendency to simulating higher groundwater levels than observed.

Overall, the calibration is acceptable for the historical SGPSGM with the available data. However, there is a lack of data in the boundary area to sufficiently verify local calibration, and there is uncertainty as to the calibration performance in this area. The SGPSGM report

acknowledges this data gap and a need to review this portion of the model when further data are available from the recently installed USGS nested monitoring wells.

3.3 Comparison of the Two Models

There are several differences between the input parameter values and distributions between the two models, specifically the model layer elevations and hydraulic parameter values.

3.3.1 Model Layer Elevations

Model layer elevations for the Indio and SGP Models are shown in **Figure 14** and **Figure 17**, respectively. The Indio Model area does not cover the westernmost end of the Indio Subbasin, namely the San Gorgonio Pass area. Conversely, the SGP Model area does cover the San Gorgonio Pass area and overlaps into the Indio Subbasin.

In the area where both model areas for San Gorgonio and Indio overlap, the bottom elevations of Layer 1 are comparable and have similar geometry. The bottom of Indio Model Layer 1 varies across the boundary arc and ranges in elevation from around 640 to 860 ft above sea mean level (msl). SGP Model uses different thicknesses, and in the overlapping area within Indio Subbasin, the base of Layer 1 elevations ranges from 300 ft to 600 ft msl. West of the Indio Model area, within the San Gorgonio Pass area, elevations of the SGP Model Layer 1 range from 700 ft to 800 ft msl. Layer 1 in both models dip towards the center of the Indio Subbasin.

The thicknesses of Indio model Layers 2 and 3 are small in the boundary area (about 60 and 40 feet thick, respectively). At the original model boundary, the bottom elevations of Layers 2 and 3 range from about 720 to 820 ft msl in Layer 2 and 680 to 780 ft msl in Layer 3. Elevations for Layer 2 in the SGP Model range from 0 ft to -300 ft msl in the overlapping area with the Indio Model. Within the San Gorgonio Pass area, the elevations range from 0 ft to 200 ft msl. While Layers 2 and 3 of the Indio Model and Layer 2 of the SGP Model, all exhibit a consistent dip toward the center of the Indio Subbasin, their respective depths reveal notable differences in subsurface geometry. The SGP Model features deeper and more varied layers, whereas the Indio Model is characterized by comparatively thinner and shallower layers. The widths of the aquifers as simulated in the SGP and Indio models also are different, with SGP Model Layer 2 locally less than 1 mile wide, while the aquifer width at the original model boundary is wider. However, the Indio model is in the process of being extended to the Subbasin boundary, and the aquifer width in the extended area and at the boundary has a smaller width, and is more consistent with the width simulated in the SGP model.

While both models exhibit a general southeastward dip in their deepest layers toward the center of the Indio Subbasin, the vertical extent and elevation ranges of these layers differ.

For example, the bottom of Layer 4 for the Indio Model at the original model boundary was set at 150 ft msl. Layer 3 of the SGP is inactive at the corresponding location along the subbasin boundary. Farther southeast within the Indio Model extent, the SGP Layer 3 ranges from -500 ft to -1,000 ft msl, deeper than indicated in the Indio Model.

3.3.2 Aquifer Hydraulic Properties

Hydraulic properties of the alluvial aquifer also are different in the two models. Near and at the Subbasin boundary, the SGP model uses hydraulic conductivities in Layers 1 and 2 of about 30 ft/day. Within the alluvial aquifer area south of the Subbasin boundary, the Indio model uses a hydraulic conductivity of 4.0 ft/day in all model layers.

4. ANALYTICAL FLOW ESTIMATES

Both groundwater models estimate the flow between the SGP and Indio subbasins. The SGP model yields a downgradient outflow across the boundary, while Indio's model requires an influx across the same area. The amounts differ, as previously described. The inter-subbasin flux rates used by the two models were independently calculated and calibrated to observation locations and times series within each respective model domain. Due to the existence of multiple calibration parameters in each model and the possibility of non-unique solutions, each model's respective estimate may be validated for each model despite the flux differences.

As an independent check, estimates of groundwater flux rates near the boundary and within each subbasin were made using an analytical approach. This method, based on Darcy's Law of groundwater flow, relies on aquifer width (from mapped surficial geology), hydrogeologic interpretations of aquifer thickness (from borehole lithological logs and geophysics), measured or assumed K values, and measured groundwater elevations and associated hydraulic gradients.

To develop the analytical flow estimates, data were compiled from existing geologic maps, historical well completion reports and recently installed monitoring wells, and USGS-gaged water level time series. These data were used to construct triangle arrays of wells (**Figure 24**) to calculate hydraulic gradient directions and magnitudes, to identify critical cross section locations perpendicular to the apparent gradient, and to estimate subsurface geometry and hydrogeologic properties. The USGS monitoring wells completed in 2019 were critical to these efforts. The resulting ranges of input parameter values were utilized to provide a range of groundwater flow rates across the subbasin boundary.

4.1 Analytical Estimates Methodology

Groundwater flow through porous media is governed by the Darcy Equation, which relates discharge (Q) through a saturated cross-sectional area (A) to the gradient (dh/dl) and hydraulic conductivity (K).

$$Q = A*K*dh/dl$$

The certainty of a calculated Q depends on the level of accuracy in measurement or estimation of each variable, which can be difficult to achieve. For example, the representative hydraulic conductivity of a heterogeneous aquifer system many hundreds of feet in thickness is difficult to measure directly and likely varies with depth. Uncertainty in the width, depth, and three-dimensional geometry of the alluvial aquifer near and at the subbasin boundary is another source of uncertainty. The saturated cross-sectional area also varies as the water level changes. Even so, examining the relatively static geologic conditions and dynamic hydrogeologic observations that are components of each Darcy

Equation variable can yield valuable information as to the range of fluxes over a multiyear period and reasonableness of modeled discharge estimates.

The hydraulic gradient magnitudes and directions were calculated at several locations near the boundary describe, and, where constrained by mapped surficial geology and subsurface observations from borehole lithological logs. The process of estimating each input variable and the temporal variabilities and inherent uncertainties are discussed below.

4.1.1 Analytical Flow Estimate Overview and Inputs

Two areas near the subbasin boundary were identified for development of the analytical estimates (**Figure 24**). In the SGP Subbasin area west of the assumed bedrock ridge, the hydraulic gradient direction is oriented along the valley axis from the southwest to the northeast, and wells 9E, 15P, 7D, and 7M were used to calculate a gradient of approximately 0.004 feet per foot (ft/ft) between 2019 and 2025. In the Indio Subbasin area east of the boundary, gradient calculations incorporated data from existing wells 8M and 8A with recently installed wells 9M1 and 8L4. By using these additional wells, the gradient direction reorients to the southeast in the vicinity of Well 8L and the gradient steepens to approximately 0.09 ft/ft. Based on the average of data available since the wells were drilled in 2019, the gradient direction is oriented to the southeast (azimuth 140°).

This gradient direction was used to define a cross section as the perpendicular plane oriented to the northwest (azimuth 50°). As shown on **Figure 24**, this cross section extends on the southwest from the San Jacinto Mountain basement bedrock, across the recent alluvium for a width of approximately one mile and then crosses into the semi-consolidated and faulted Cabezon Fanglomerate. The highlighted cross section (limited to unconsolidated alluvium) was used for calculation of groundwater flow.

Based on the available data, the area near wells 8L and 9M is the most reasonable to estimate groundwater flow, as shown on **Figure 24**, for the following reasons:

- The location is within SGP's model domain, permitting the calculation to be compared with the SGP model's estimated outflow
- The location is far enough from the Whitewater River GRF to avoid boundary condition uncertainty
- Gradient calculations that include water levels from 8L and/or 8M reveal a transition zone as shown on **Figure** 24, where the gradient steepens slightly and the reorients

- Water level measurements in 8L and 9M indicate that the gradient steepens significantly and reorients down the alignment of the Coachella Valley at this location

- The width of the recent alluvium is minimized by bedrock and faulting to approximately one mile, reducing uncertainty related to cross sectional geometry

- USGS wells 8L and 9M provide high quality water level and lithological data, including a positive identification of crystalline bedrock at 900 feet bgs in 8L

- Only minor contributions from drainages jurisdictionally part of Indio Subbasin are added by moving the functional boundary approximately half a mile east.

Inputs to this estimation of groundwater flow are discussed below, including cross-sectional area, hydraulic conductivity, and hydraulic gradients.

4.1.1.1 Cross-Sectional Area

To delineate a line for calculation of the saturated cross-sectional area *A*, the gradient direction was established through the observation of water levels in at least three representative monitoring wells. The cross section line defining the plane through which groundwater flow is perpendicular to the gradient direction.

The cross-sectional area *A* is defined as the width and saturated thickness of a plane under a given line projected along the ground surface. The saturated thickness varies (increases or decreases) with changes in water level, and changes to the area *A* variable will proportionally impact calculated fluxes. Determination of *A* is inferred from geologic mapping and well logs, and from depth-to-water measurements in monitoring wells, and is uncertain due to limited information on the width, depth, and geometry of the aquifer.

In the SGP boundary area, the *A* is the width and saturated thickness of the alluvial aquifer, which was deposited non-conformably on top of the irregular bedrock surface and is bounded by bedrock that crops out to the north and south. To the north, the surficial bedrock outcrops of San Gabriel Mountains-type rock form the San Bernardino Mountain front. However, linear projection of the above-alluvium mountain slope into the subsurface does not account for bedrock displacement caused by the San Andreas Fault and Garnet Hills Fault, a west-striking, steeply dipping right-lateral subfault of the South San Andreas Fault system. To the south, the basement rock of the San Jacinto Mountains underlies the alluvial aquifer. As on the mountain itself, where domes and other emplacement-derived irregularities exist, the bedrock likely does not form a planar surface under the alluvium. Even so, the interface between bedrock and alluvium can be approximated as a weathered mountain slope that has been buried by late Quaternary

deposition. Borehole data reveal the relatively steep dip of this slope: wells drilled within a mile of the mountain front typically do not reach bedrock unless drilled to depths approaching one thousand feet below ground surface.

The saturated cross-sectional area can thus be approximated most simplistically as a rectangle with a width equivalent to the distance between the bedrock outcrops of Mount San Jacinto to the south and the San Bernardino Mountains to the north. In such a rectangular approximation, changes in saturated thickness do not change the width of the saturated cross section, so changes in saturated thickness have a directly proportional impact on *A*. This simplistic model ignores subsurface observations and inferences based on surface geology and likely overestimates the cross-sectional area.

Figure 25 presents an alternative, likely more realistic cross section geometry in the boundary area. This is an inverted triangle, defined by the width of the water table and the thickness of the saturated zone at the greatest depth to underlying bedrock (i.e., the thickest unconsolidated material). Geometry dictates that a change in triangle height due to water level fluctuation will also result in a change in saturated width. In addition, it is recognized that the water table probably curves upward to the north and south due to mountain front recharge, but data limitations prevent this refinement.

On the north side, the San Bernardino Mountains crystalline bedrock is overlain by the semi-consolidated Cabezon Fanglomerate (Cabezon). The Cabezon is jurisdictionally part of the alluvial aquifer systems of both the San Gorgonio Pass and Indio subbasins, but functionally, most groundwater flow probably occurs within the more recent alluvium, which transmits water one or more orders of magnitude more easily.

As shown on **Figure 25**, the deepest observed bedrock underlying the alluvium in the San Gorgonio Pass area is approximately 900 ft below ground surface (bgs), as logged in USGS Well 8L. Projected from the mapped surface outcrop, this point falls between projected planes following the average and maximum hillslopes of the outcropped formation, supporting the buried weathered slope conceptual model. On the north side, the steeply dipping Garnet Hill Fault forms a functional barrier to flow and the right-lateral movement on the fault has resulted in the presence of hills consisting of translated Cabezon. If the steepest Cabezon weathered slope is projected from the mapped outcrop, it too approximately coincides with the observed bedrock in Well 8L. These angles establish the geometry of the inverted triangle of recent alluvium filling the SGP area. Combined with the observed range of water levels in Well 8L, a saturated cross-sectional area of approximately 1 million square feet is estimated, which varies over a range of approximately 5% as the water table fluctuates between seasons and years.

For the purposes of this analysis, it is assumed that only negligible groundwater discharge occurs through the semi-consolidated Cabazon material, which likely has a hydraulic

conductivity one or more orders of magnitude smaller than the unconsolidated more recent alluvium.

4.1.1.2 Hydraulic Conductivity

Hydraulic conductivity may be measured in situ via single- and multi-well pumping tests, in the laboratory through analysis of samples, or empirically through grain size analyses and comparisons of logged lithology to established ranges of values. In the SGP area, pumping test data are lacking and samples were not submitted for grain size analysis from the many lithological units described on well logs. Hydraulic conductivity estimates are subject to a high level of uncertainty and refining the value form those used in the models is challenging.

Attempts were made to refine estimated *K* values using lithological log descriptions from the newly drilled wells and from established ranges of *K* values adjusted for compaction at depth (Sakata and Ryuji, 2013), but the established ranges for generically described geologic materials often vary by orders magnitude. Estimates, based on a weighted average of lithology reported in the Well 8L completion report, yielded a range of estimates from approximately 1 to 100 feet per day (ft/day). Ultimately, estimating *K* in this manner did not refine the estimate beyond the range of values already utilized in either the SGP or Indio models. Absent extensive pumping test data from the San Gorgonio-Indio boundary area, hydraulic conductivity estimates are subject to a high level of uncertainty. The estimated range supports a finding that the K value of approximately 30 ft/day used in the SGP groundwater model in the boundary area is reasonable to estimate flux rates and that the order of magnitude range used in the Indio model (1 to 100 ft/day) also is reasonable.

4.1.1.3 Hydraulic Gradients

Data from the newly drilled wells has added resolution to the HCM, which describes a groundwater cascade caused by the buried bedrock ridge at the San Gorgonio-Indio subbasin boundary. Water level data collected in the spring and fall from the new wells and adjacent wells were analyzed and compared to data from wells to the west, which revealed the extent to which the groundwater level drops and the gradient steepens over a relatively short distance. Well 8L appears to be the well nearest to the spillover line; inclusion of this well in gradient calculations results in significant changes to the calculated apparent gradient strength and direction. Calculated gradients involving 9M1 are more significantly influenced by the steep decline in water levels and may be impacted by operations at the Whitewater GRF. Over the period 2019 through 2025 when data from 8L and 9M are available, the average gradient in the boundary area is 0.09 ft/ft and ranges from 0.08 ft/ft to 0.13 ft/ft.

4.1.2 Analytical Flow Estimate Results

Table 2 summarizes the calculated minimum, average, and maximum inter-subbasin flux rates based on data collected since wells 8L and 9M were installed in early 2019. These calculations are based on the gradient direction and strength defined by averaged calculations utilizing 2019-2025 data, the subsurface geometry defined by the adjacent bedrock slopes and borehole lithology, and the range of hydraulic conductivity estimates applied in both models and validated by borehole log data analyses.

Table 2. Range of Analytical Flow Estimate Variables and Calculated Fluxes

Variable Range	Water Column in 8L (ft)[a]	Saturated Cross-Sectional Area *A* (ft^2)[b]	Hydraulic Conductivity *K* (ft/day)	Gradient *dh/dl* (ft/ft)[e]	Resultant Calculated Annual Discharge Q (AFY)
Minimum	582	964,000	1[c]	0.08	646
Average	590	991,000	30[d]	0.09	22,420
Average	590	991,000	54[c]	0.09	40,357
Maximum	597	1,014,000	106[c]	0.13	117,083

Notes:
a – Calculated from observed water levels and 900-feet-bgs basin bottom.
b – Estimated based on water column height and geometry constrained by surface and subsurface geologic observations.
c – Range of thickness-weighted unconsolidated alluvium horizontal K values from reference tables applied to reported 8L4 lithology, adjusted for compaction at depth.
d – K value used in SGP MODFLOW model in boundary area.
e – Calculated via three-point-problem solutions for wells arrays including 8L4 and 9M1. Data from 2019 through 2025.

4.1.3 Variability Analysis

Uncertainty in hydraulic conductivity (*K*) prevents refinement of discharge (Q) beyond the range already present between the two modeled fluxes. However, *K* can be back-calculated by using the average *A* and *dh/dl* estimates and the average Q reported in the SGP GSP for 1999 through 2019. This does not increase the accuracy of the model *K* value, but it permits a sensitivity analysis utilizing variables A and *dh/dl* to analyze whether the modeled SGP boundary flux is supported by the observed data. The inputs, calculated variables, and resultant calculated fluxes of this sensitivity analysis are presented in **Table 3**, which compares the range of calculated fluxes to the range of fluxes presented in SGP GSP.

While the observed data period (2019-2025) and modeled output period (1998-2019) do not overlap significantly, both periods include anomalously wet water years (e.g., 2005, 2011, 2019, and 2023) and exceptionally dry water years (e.g., 2013 and 2021). The range of fluxes presented in **Table 3** suggest that the variability in SGP GSP modeled boundary flux to Indio is supported between the minimum and average values. However, the SGP model may underestimate boundary flux during wetter years when both the saturated thickness and gradient strength are maximized. Using the 8,000 AFY influx assumed by the Indio model, the calculated K value is approximately 10 ft/day, which is significantly higher than the present range of values in the model, suggesting that the Indio model may need to be recalibrated with higher K values in the boundary area.

Table 3. Range of Model Flux Estimates and Back-Calculated Hydraulic Conductivity Values

Variable Range	Water Column in 8L (ft)[a]	Saturated Cross-Sectional Area *A* (ft^2)[b]	Hydraulic Conductivity *K* (ft/day)[c]	Gradient *dh/dl* (ft/ft)[d]	Resultant Calculated Annual Flux Q (AFY)[e]	SGP GSP Modeled Fluxes Q (AFY)[f]
Minimizing; K calculated for SGP model average flux	582	964,000	34.09	0.08	22,030	**21,618**
Average; K calculated for SGP model average flux	590	991,000	34.09	0.09	25,478	**25,478**
Maximizing: K calculated for SGP model average flux	597	1,014,000	34.09	0.13	37,655	**28,084**
Average; K calculated for Indio Model Average Flux	590	991,000	10.70	0.09	8,000	**8,000**

Notes:
a – Calculated from observed water levels and 900-feet-bgs basin bottom.
b – Variability due to changes in water column height.
c – Calculated solution to arrive at average modeled boundary fluxes from SGP model (25,478 AFY) and Indio model (8,000 AFY).
d – Calculated via three-point-problem solutions for wells arrays including 8L4 and 9M1. Data from 2019 through 2025.
e,f – **Bolded** range of boundary fluxes from SGP model and average used in Indio model. Other Q values are calculated using the respective Darcy equation variables.

5. ADEQUACY OF EXISTING FLOW ESTIMATES

The ultimate goal of inter-basin flow reconciliation is quantification and agreement on a refined flow estimate(s). Currently, the two groundwater models differ in flow estimates but while the SGP model calculates the fluxes, the Indio model uses an assumed value, which was estimated based on original model calibration.

5.1 SGP Existing Boundary Flows

The SGP model outflows for the period of 1998-2019 range from 21,000 to 28,000 acre-feet per year, with an average of about 25,000 acre-feet per year at the model boundary. The underflows to Indio Subbasin are on average the largest outflow component of the SGP GSP Water Budget. SGP's model outflow amounts are consistent with the independent estimates derived from the analytical flux calculations.

5.2 Indio Existing Boundary Flows

The original versions of the Indio Subbasin Groundwater Model used an estimated inflow from the SGP Subbasin of 8,000 acre-feet per year, along the model boundary 1-2 miles southwest of the basin boundary. This value was derived from a constant-head boundary condition, along with an assumed *K* distribution that includes a low-permeability zone in the northwesternmost portion of the model. The low *K* zone was simulated in the original model near and just downgradient of the boundary, presumably to achieve calibration in the northwestern portion of the model. This low *K* zone may be unrealistic, as alluvial materials in this area are coarse-grained and relatively permeable. It is possible that using a higher rate of inflow and higher *K* values in this area could also achieve calibration; this should be tested during Indio model updates.

5.3 Analytical Flow Estimates

The analytical flow calculations provide independent estimates of inter-subbasin flow and validate groundwater model variables and outputs. The analysis is limited by inherent uncertainties, but indicates the following:

- The new USGS wells (especially 8L) can be utilized to monitor the gradient direction and strength and subsequently delineate the functional boundary for determining boundary fluxes.

- Lithological data from USGS Well 8L indicates that alluvium in the SGP boundary area is at least 900 feet thick at the deepest point of the narrowest part of SGP, which was previously assumed to be underlain by crystalline bedrock at an average depth as shallow as 100 meters (330 feet) bgs. The SGP GSP relies heavily on Langenheim et al. (2005) , which should be interpreted as a regional scale

window into basement structures and sediment thickness, not as a high-resolution tool to cite values from individual data cells.

- The calculated *K* value analytical solutions for groundwater model average boundary fluxes using the analytical solutions for *A* and *dh/dl* values appear to independently validate the range of *K* parameters used in both models.

- Analytical solutions reveal an approximate 3X disagreement factor between *K* in the Indio and SGP models in the SGP region, which results in the 3X difference in modeled boundary fluxes. Aligning *K* values in both models for the SGP boundary area may result in much closer agreement in boundary fluxes.

- The variability presented in the SGP GSP for 1998 through 2019 boundary flows (at the basin boundary) appears to be largely appropriate, especially for the average- to lower-than-average water years. However, the more-variable flows at the GSP model domain boundary to the east are likely also reasonable as they are heavily dependent on WWR-GRF recharge, noting that the SGP GSP did not have that recharge data when estimating boundary conditions. With improved data on the recharge occurring at WWR-GRF the model boundary conditions could be refined.

6. MODEL IMPROVEMENTS

As noted above, the Indio GSAs are currently extending the model area to the basin boundary and will test adjustments to several model parameters, including inflow amounts and aquifer hydraulic conductivity in the boundary area. It is possible that increasing the inflow rate from SGP to the approximately 25,000 AFY values estimated in the SGP GSP will yield an acceptable solution. Adjustment to other input parameters (such as increasing the K values in the northwestern portion of the Indio model) may be appropriate and necessary to achieve acceptable model calibration quality in this northwestern area. The calibration results will be carefully reviewed to validate the reconciled subbasin flow values and other adjustments to the Indio model inputs.

Other potential activities to further refine and validate the inflow amounts could include:

- Geophysics could better delineate the aquifer geometry.
- Pumping (or tracer) tests to refine *K* estimates would be valuable to assign a common *K* value for the boundary region of both models.
- Continued monitoring of the new USGS wells and other nearby wells should be incorporated into calibration of the SGP and Indio model parameters for the boundary area.

Coordination between Indio and SGP GSAs with respect to aquifer conditions, model updates, and water budgets, will continue to occur during the GSP and Periodic Evaluation updates. Indio requests that SGP provide updated model results including updated calibration and simulated outflow amounts (at the boundary, with water budgets provided for the SGP Subbasin area only. Likewise, Indio will provide updated WWR-GRF recharge data to SGP for incorporation in their flow model and water budget updates.

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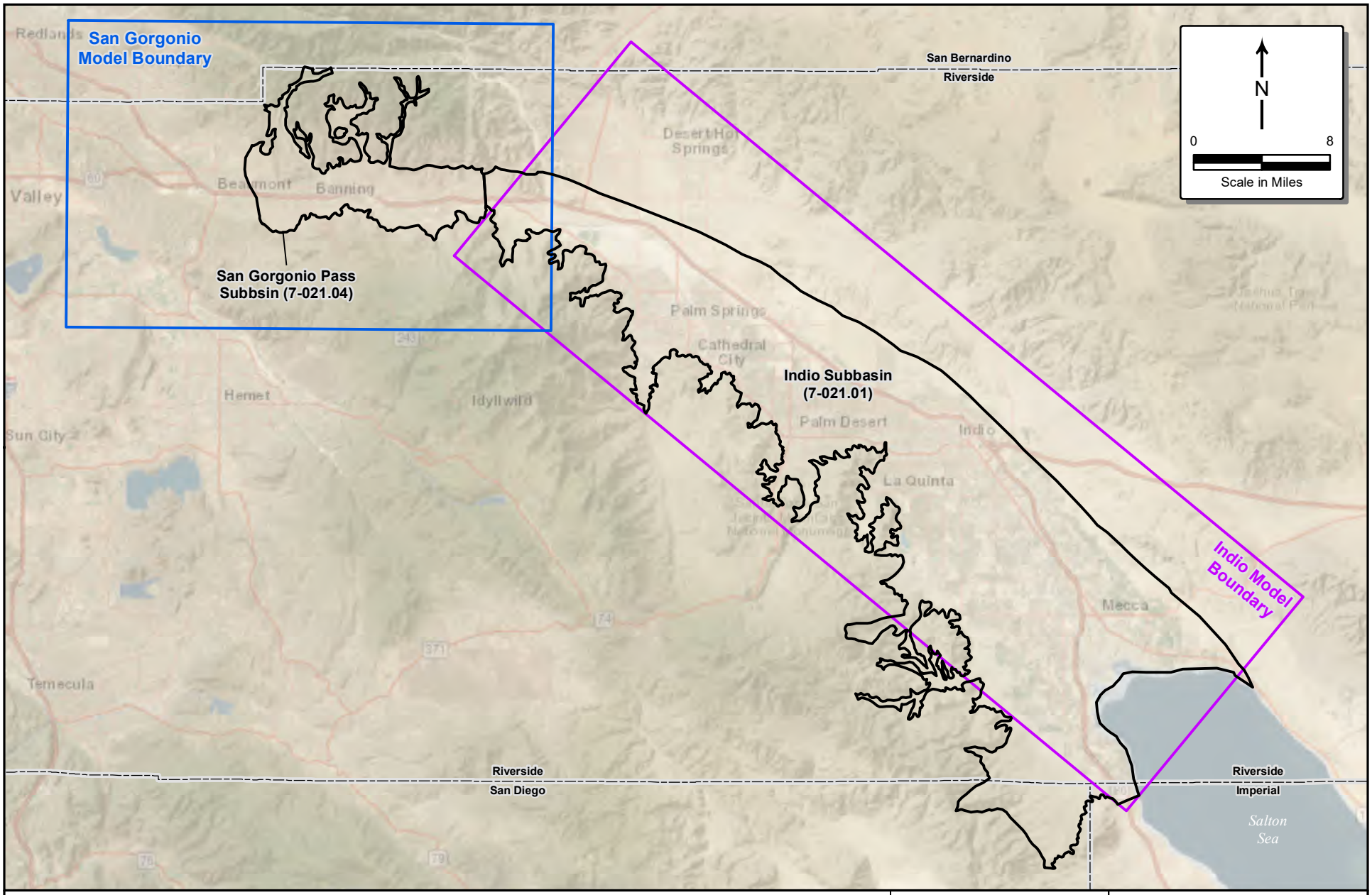
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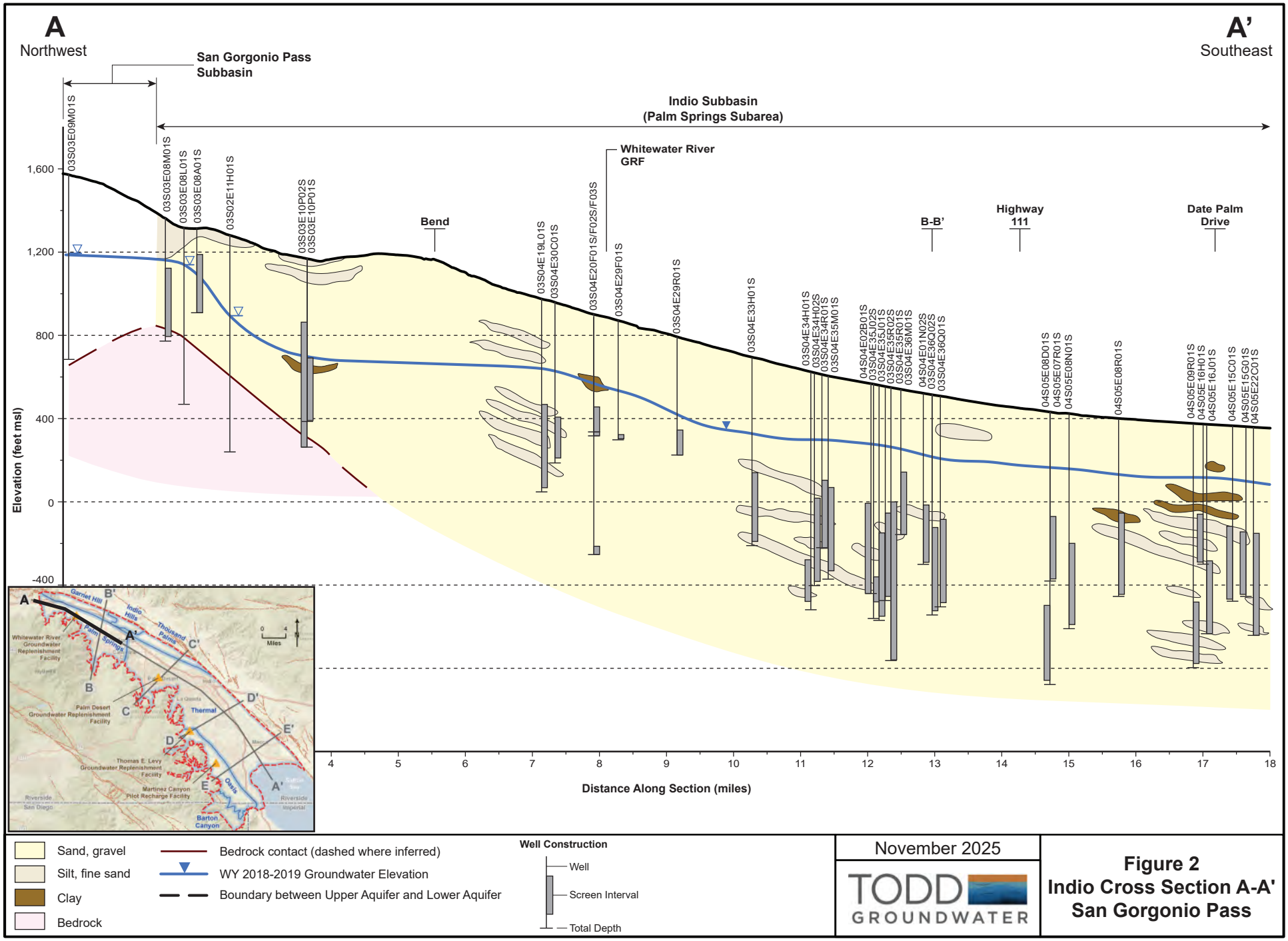


Groundwater Subbasins
Indio Model Boundary
San Gorgonio Model Boundary
California County

November 2025

TODD GROUNDWATER

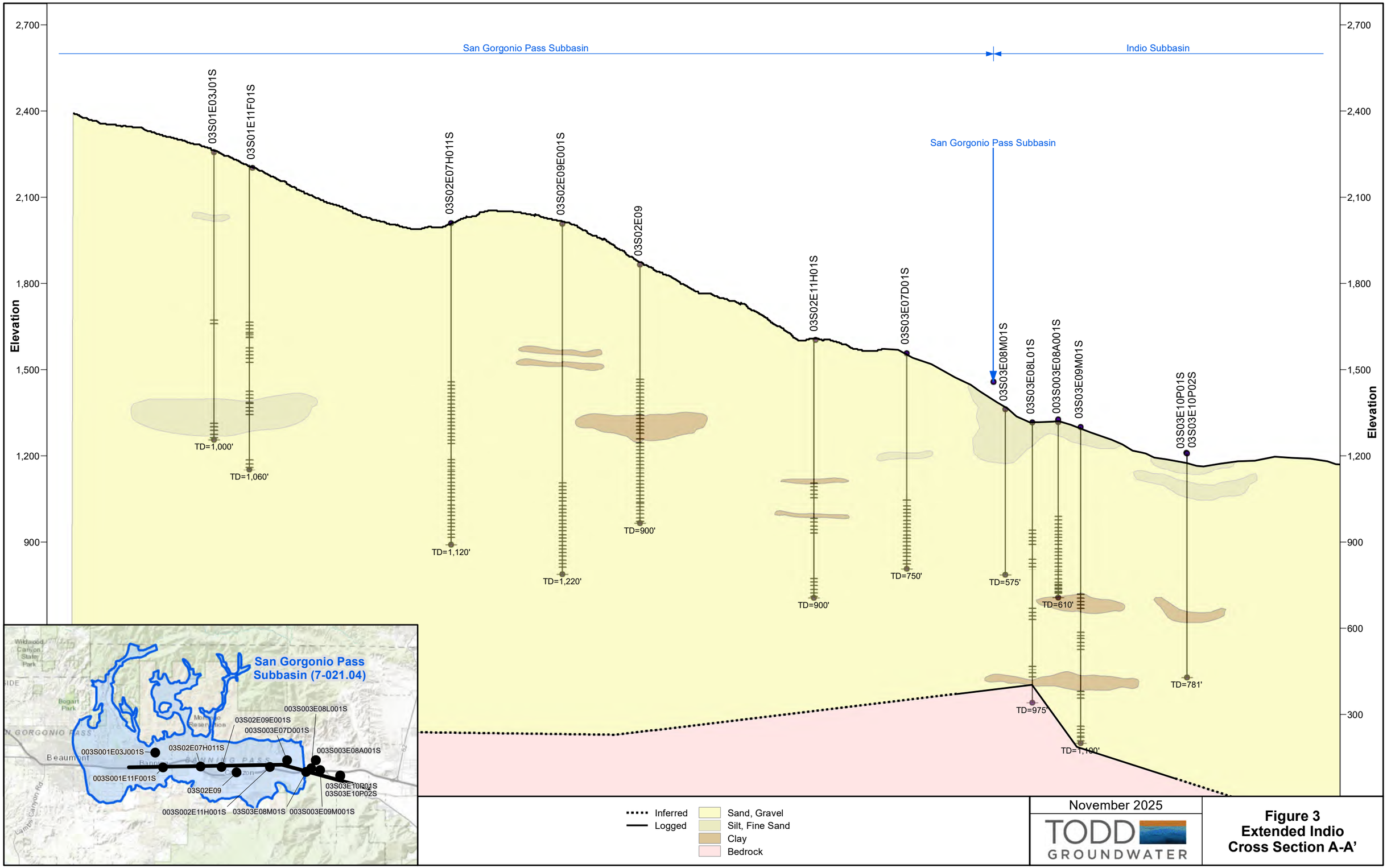
Figure 1
Basin Boundaries with Existing Model Boundaries



November 2025

TODD GROUNDWATER

Figure 2
Indio Cross Section A-A'
San Gorgonio Pass



November 2025

TODD GROUNDWATER

Figure 3
Extended Indio
Cross Section A-A'

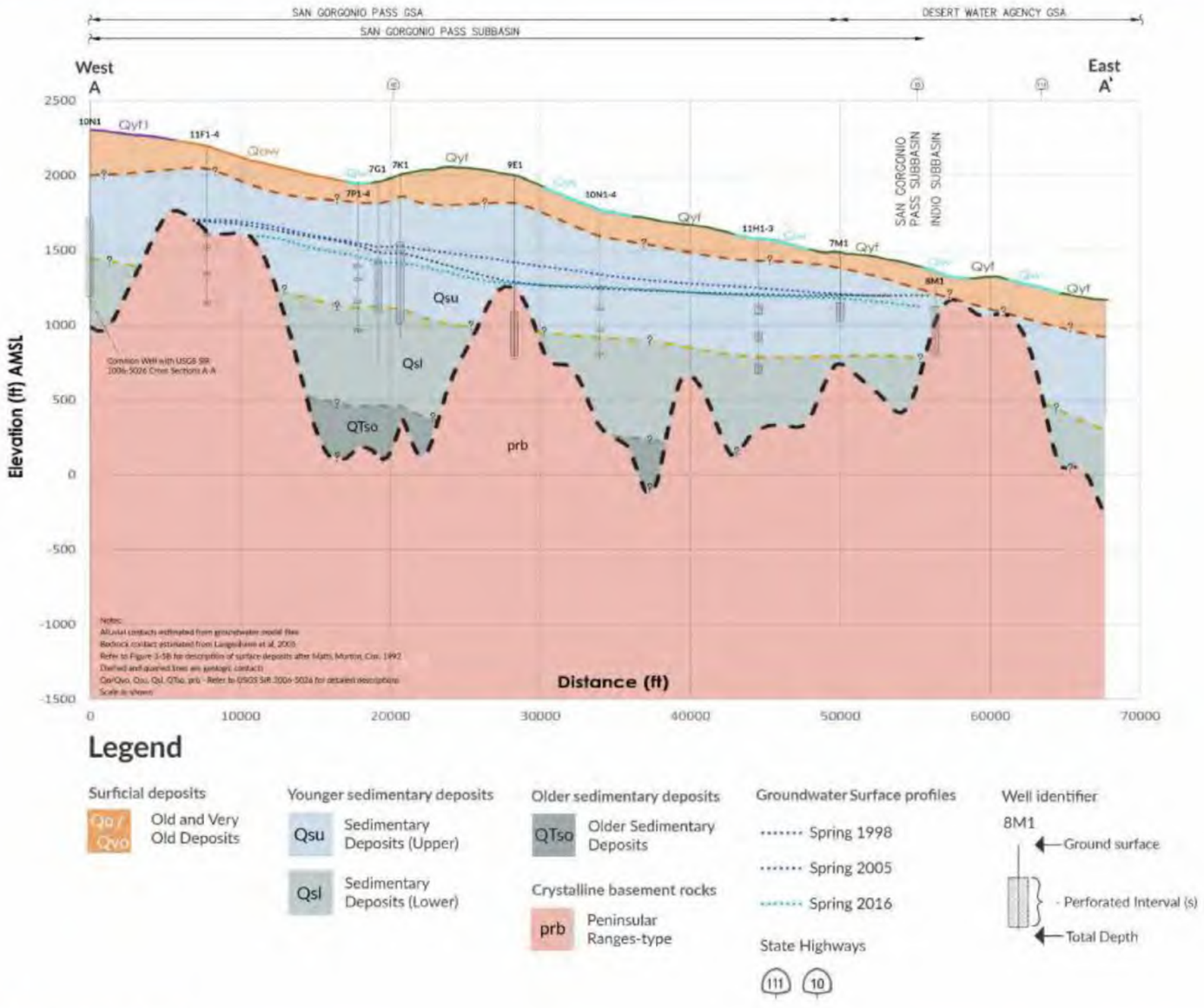
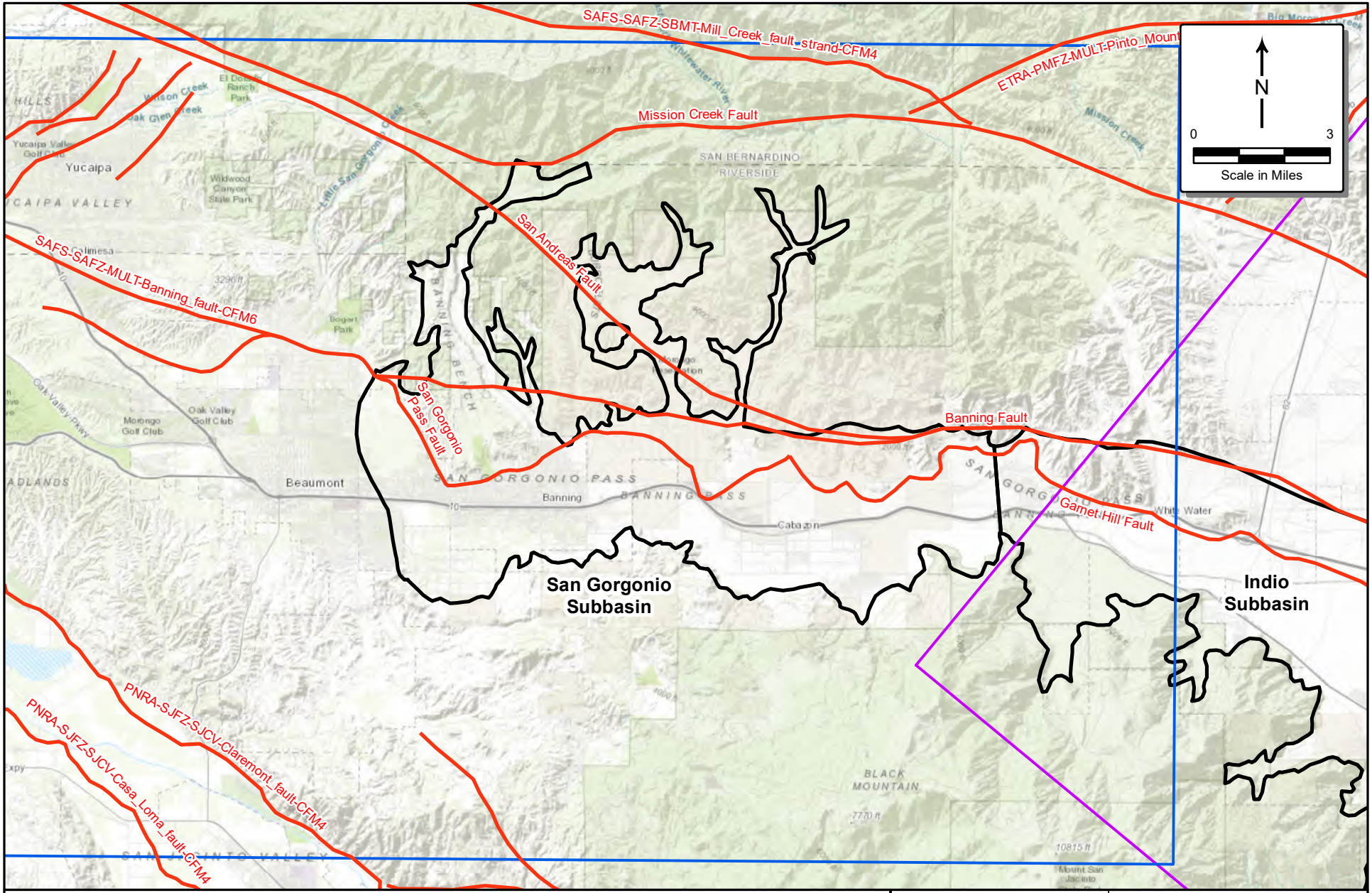


Figure 3-8 Conceptual Geologic Cross-Section A-A'

November 2025

TODD GROUNDWATER

Figure 4
SGP
Conceptual Geologic Cross Section A-A'



Statewide California Earthquake Center Community Fault Model
Indio Model Boundary
San Gorgonio Model Boundary
Groundwater Subbasins

November 2025

TODD GROUNDWATER

Figure 5
Faults Near
San Gorgonio Pass

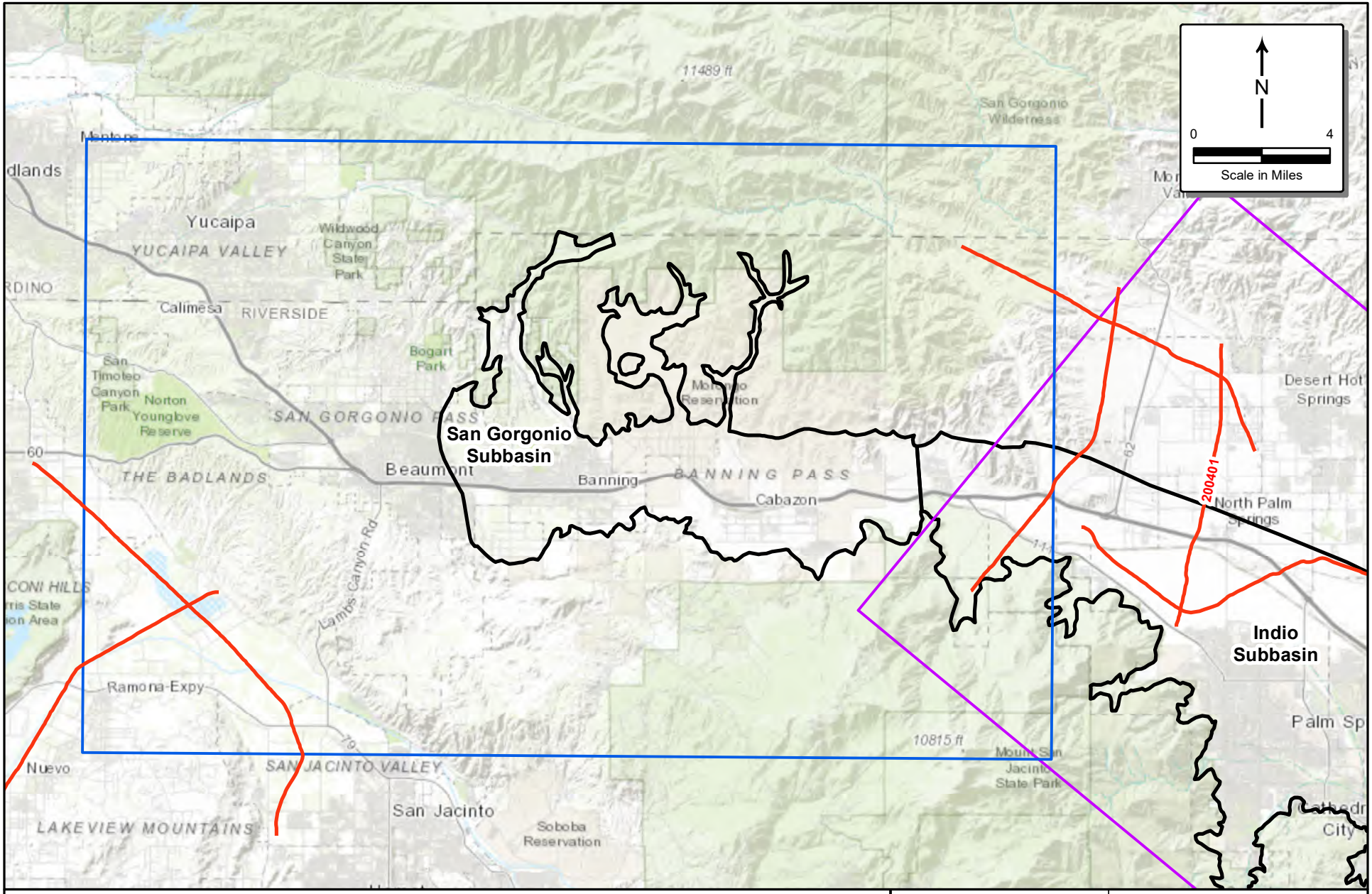
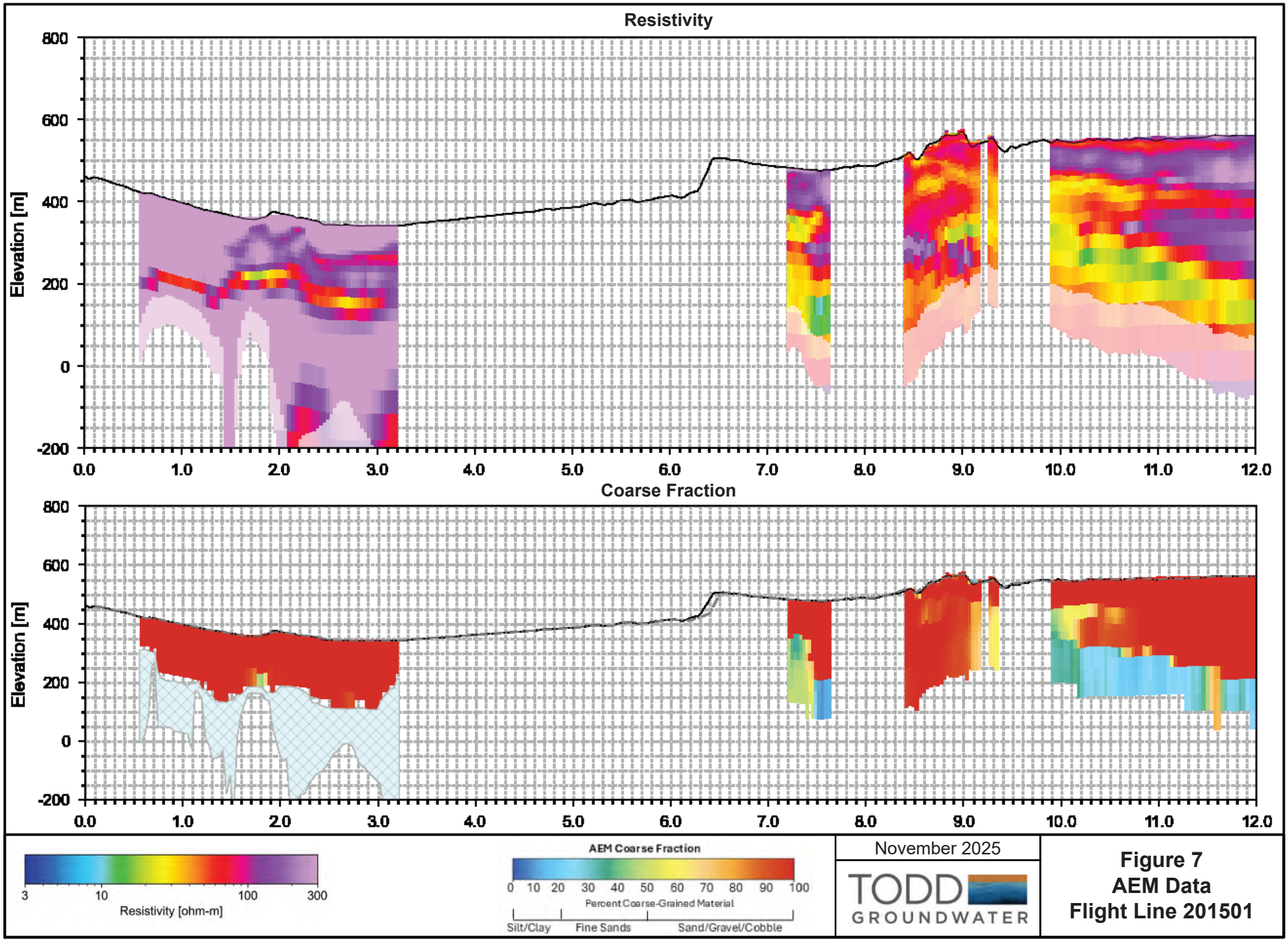


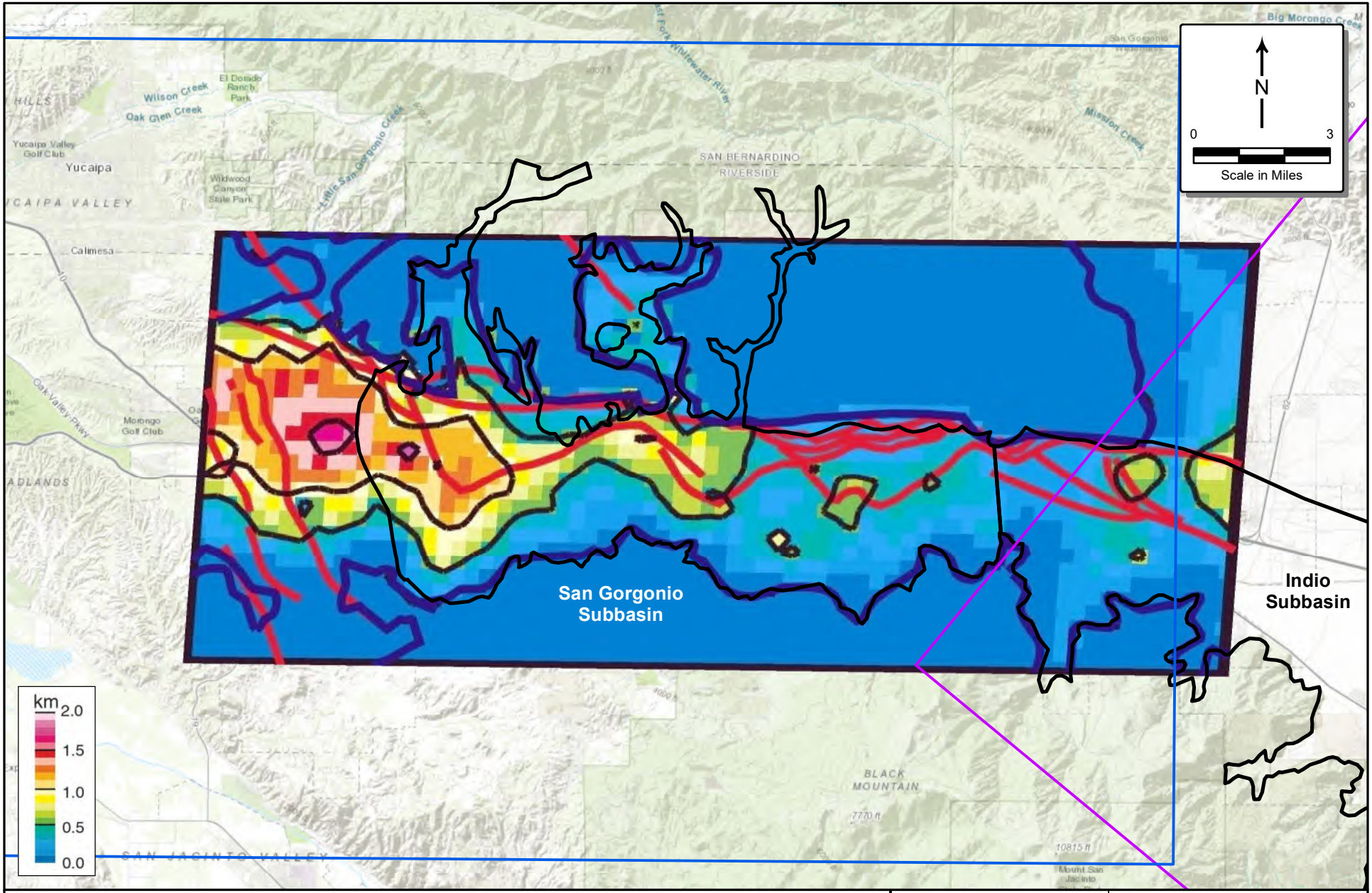
Figure 6
AEM Flight Lines near the San Gorgonio Pass Area



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Figure 7
AEM Data
Flight Line 201501



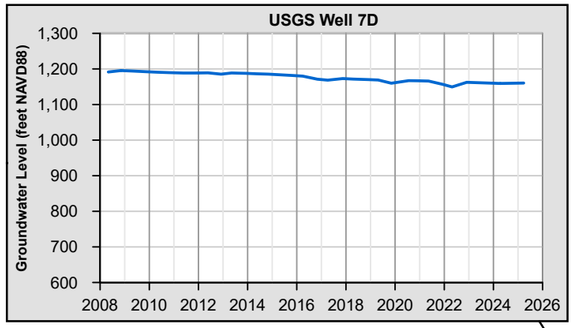
Indio Model Boundary
San Gorgonio Model Boundary
Groundwater Subbasins

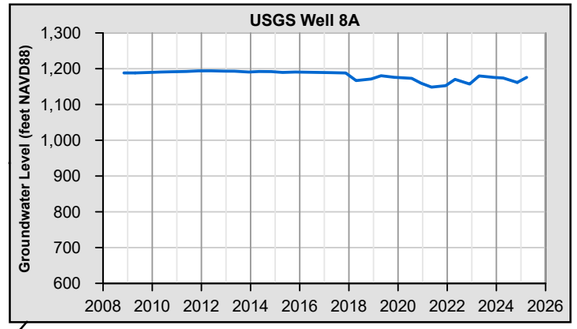
Source:
Langenheim, V. E., Jachens, R. C., Matti, J. C. and Morton, D. M. (2005) Geophysical evidence for wedging in the San Gorgonio Pass structural knot, southern San Andreas fault zone, southern California', Geological Society of America Bulletin, 117(11–12), pp. 1554–1572.

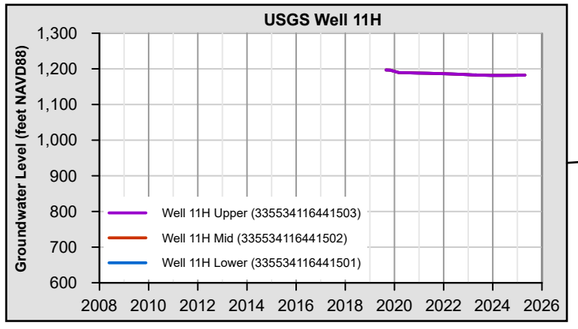
November 2025

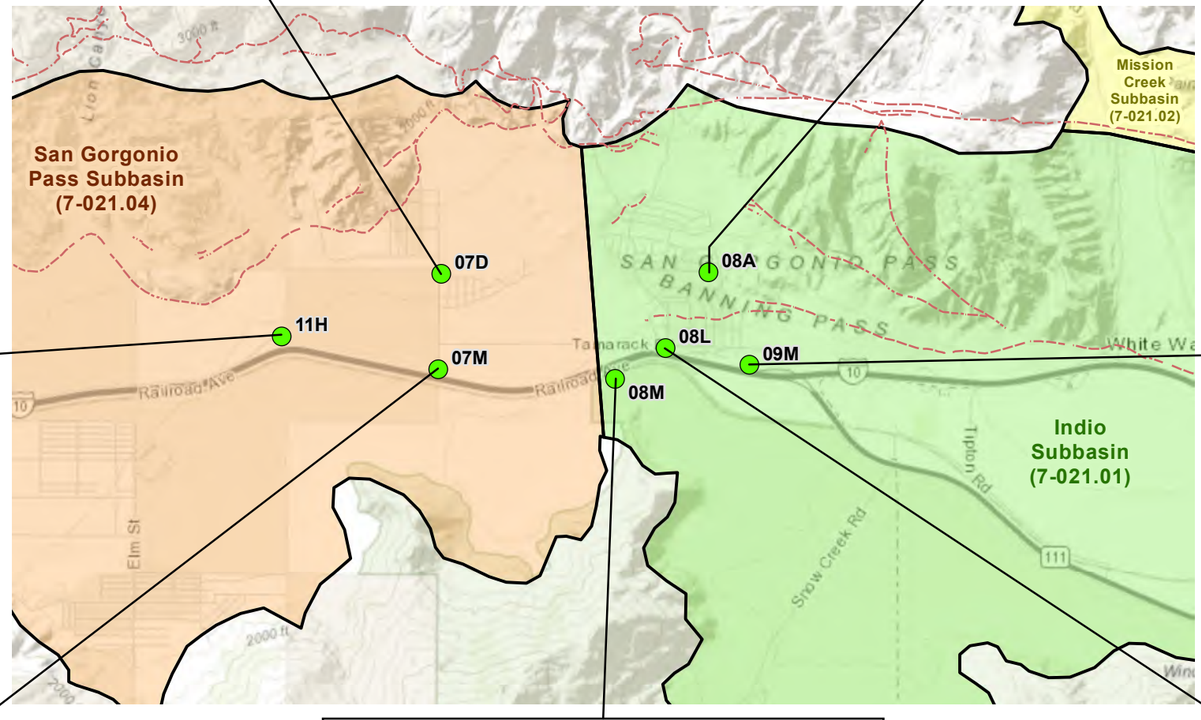
TODD GROUNDWATER

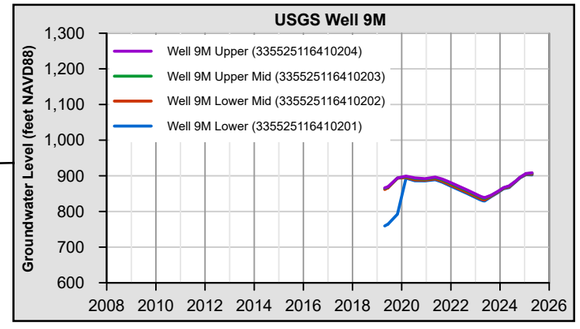
Figure 8
Gravity-Based Estimates of Basin Structure

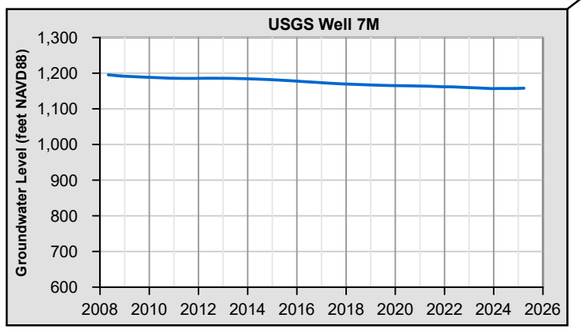


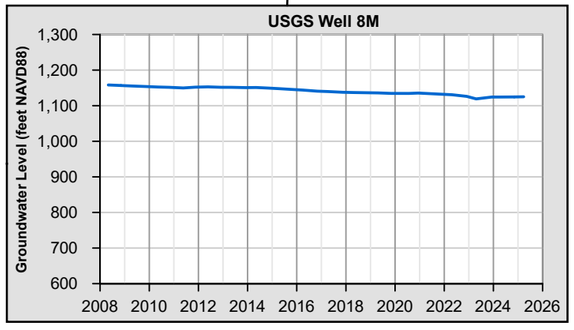


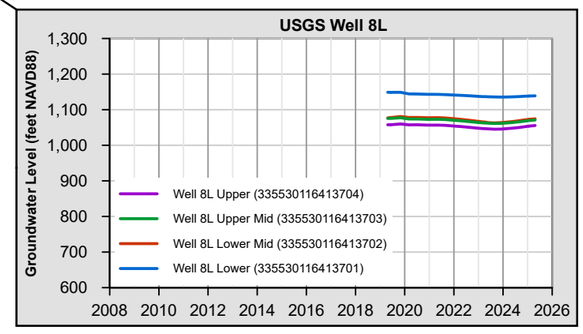












USGS Observation Well
Fault Line
Indio Subbasin
San Gorgonio Pass Subbasin
Mission Creek Subbasin

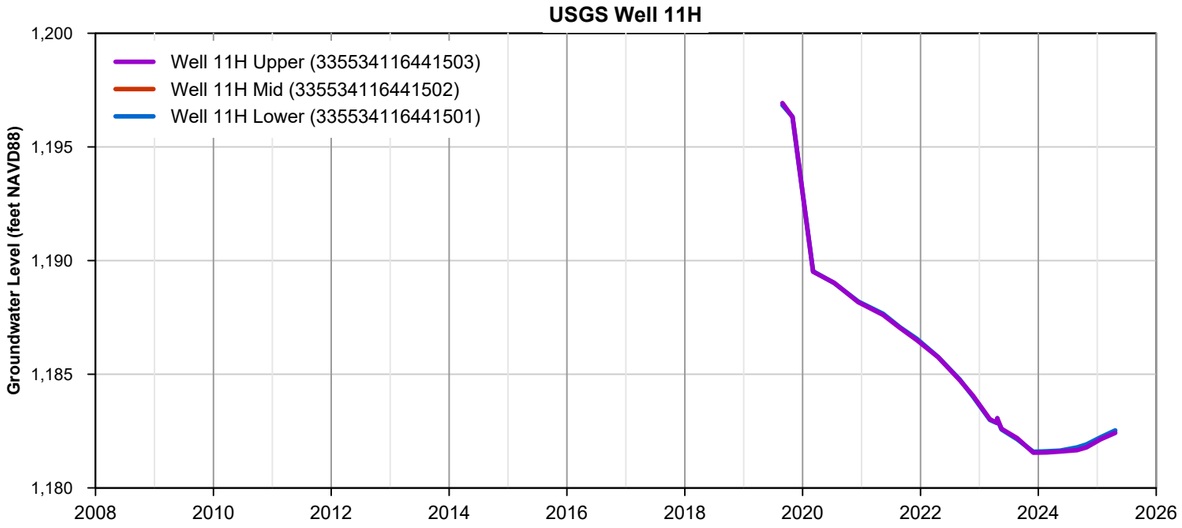
0 1
Scale in Miles

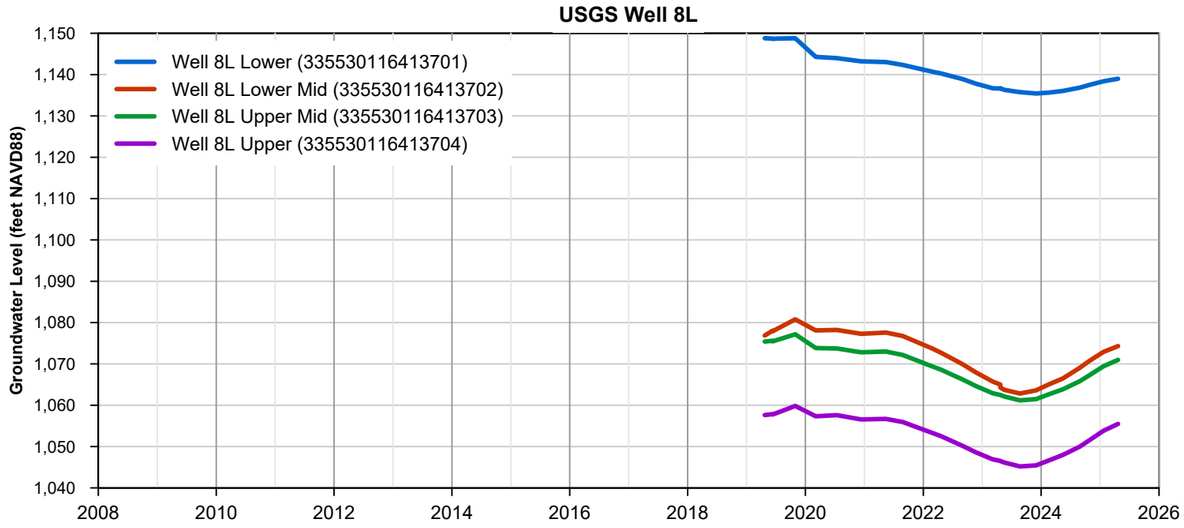
N

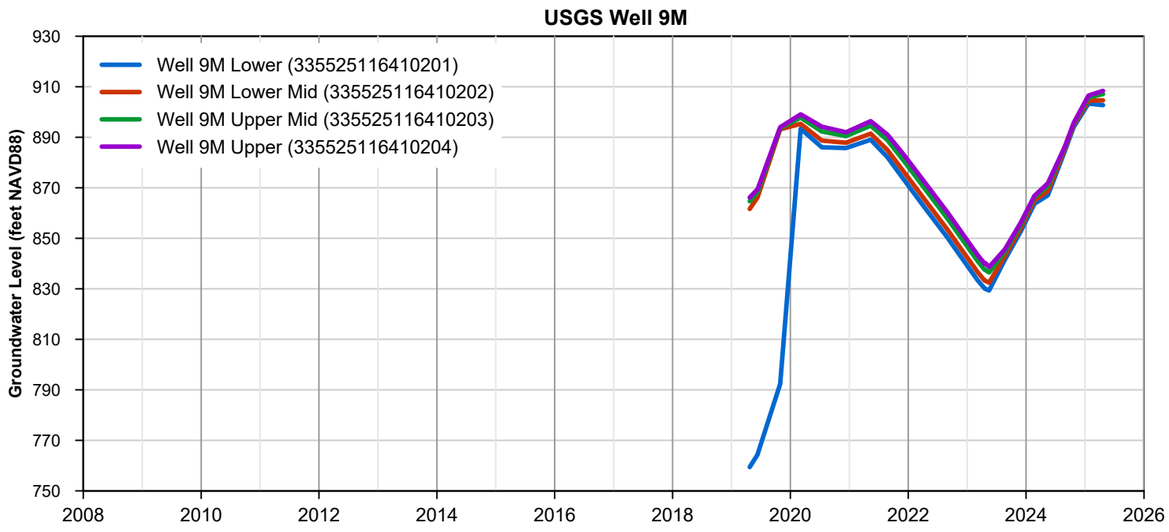
November 2025

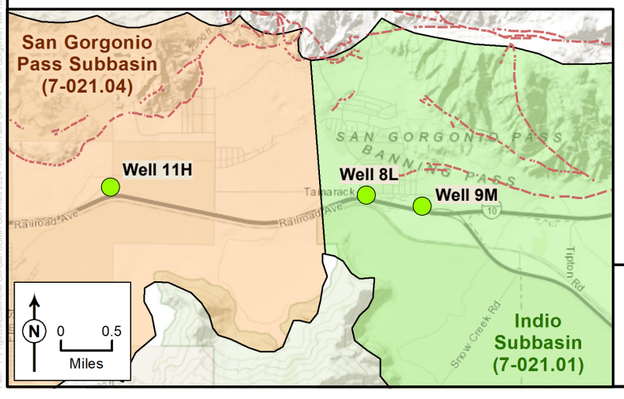
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Figure 9
Monitoring Well Locations and Hydrographs





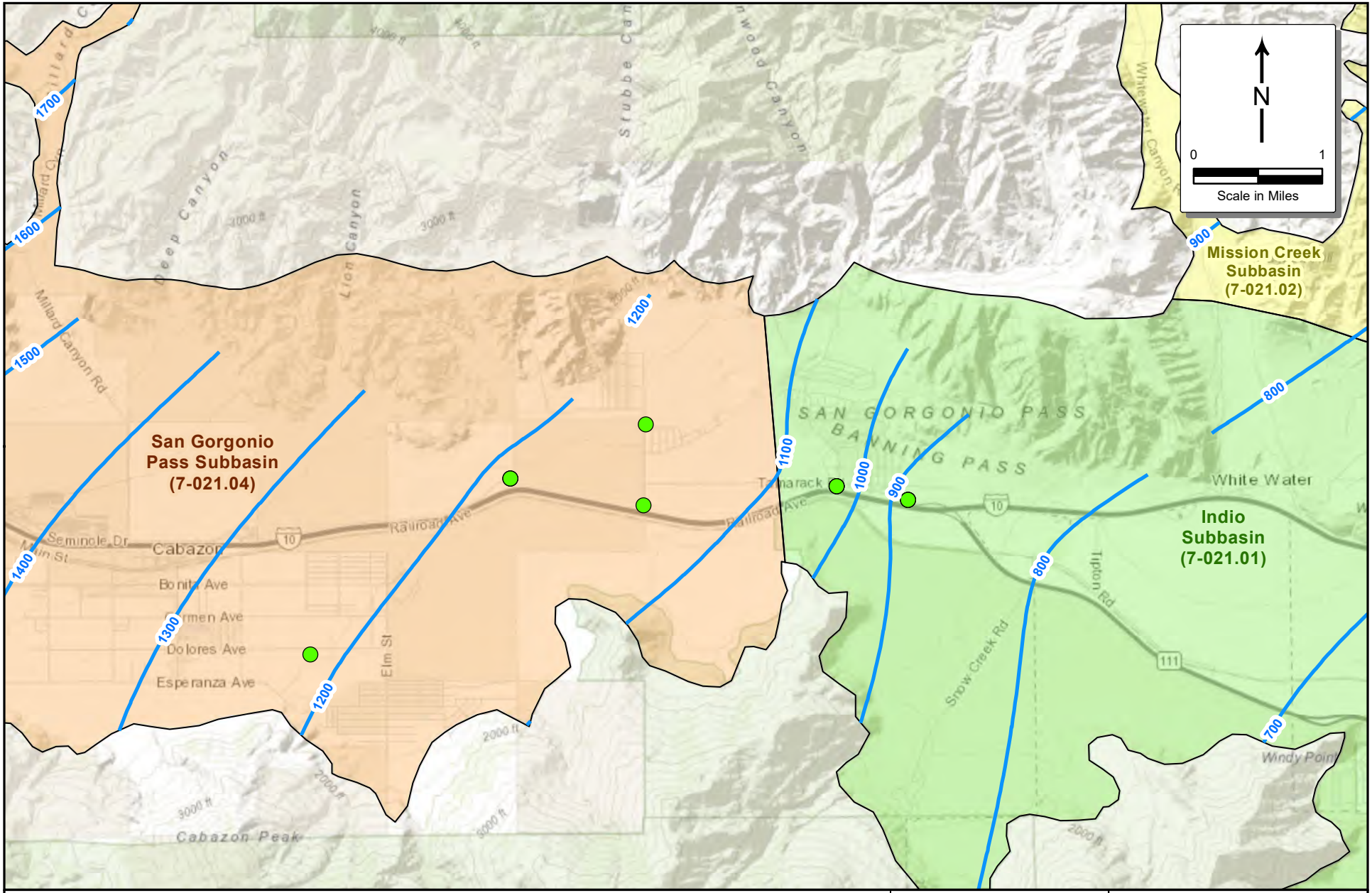


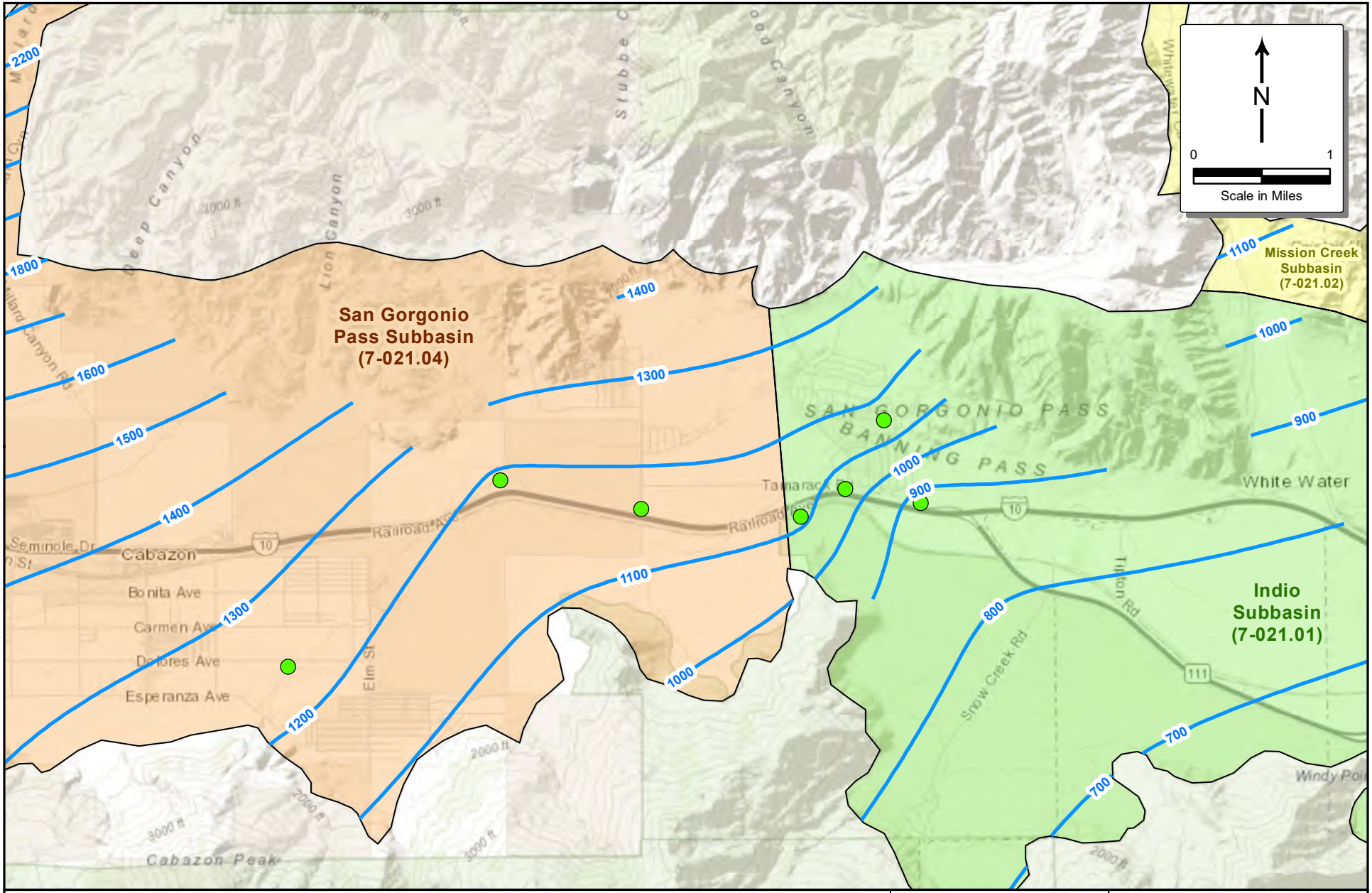


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Figure 10
Hydrographs for USGS Nested Wells


N
0
1
Scale in Miles
Mission Creek Subbasin (7-021.02)
San Gorgonio Pass Subbasin (7-021.04)
Indio Subbasin (7-021.01)
SAN GORGONIO PASS
BANNING PASS
White Water
Cabazon
Seminole Dr
Railroad Ave
Bonita Ave
Carmen Ave
Dolores Ave
Esperanza Ave
Elm St
Millard Canyon Rd
Deep Canyon
Lion Canyon
Stubbe Canyon
Whitewater Canyon
Tipton Rd
Snow Creek Rd
Windy Point
Cabazon Peak
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
November 2022 Wells (USGS, CVWD)
November 2022 Groundwater Elevation Contour
Indio Subbasin
San Gorgonio Pass Subbasin
Mission Creek Subbasin
November 2025
TODD GROUNDWATER
Figure 11
Groundwater Elevation Contour Map
November 2022



November 2023 Wells (USGS, CVWD)

November 2023 Groundwater Elevation Contour

Indio Subbasin

San Gorgonio Pass Subbasin

Mission Creek Subbasin

November 2025

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Figure 12
Groundwater Elevation Contour Map
November 2023

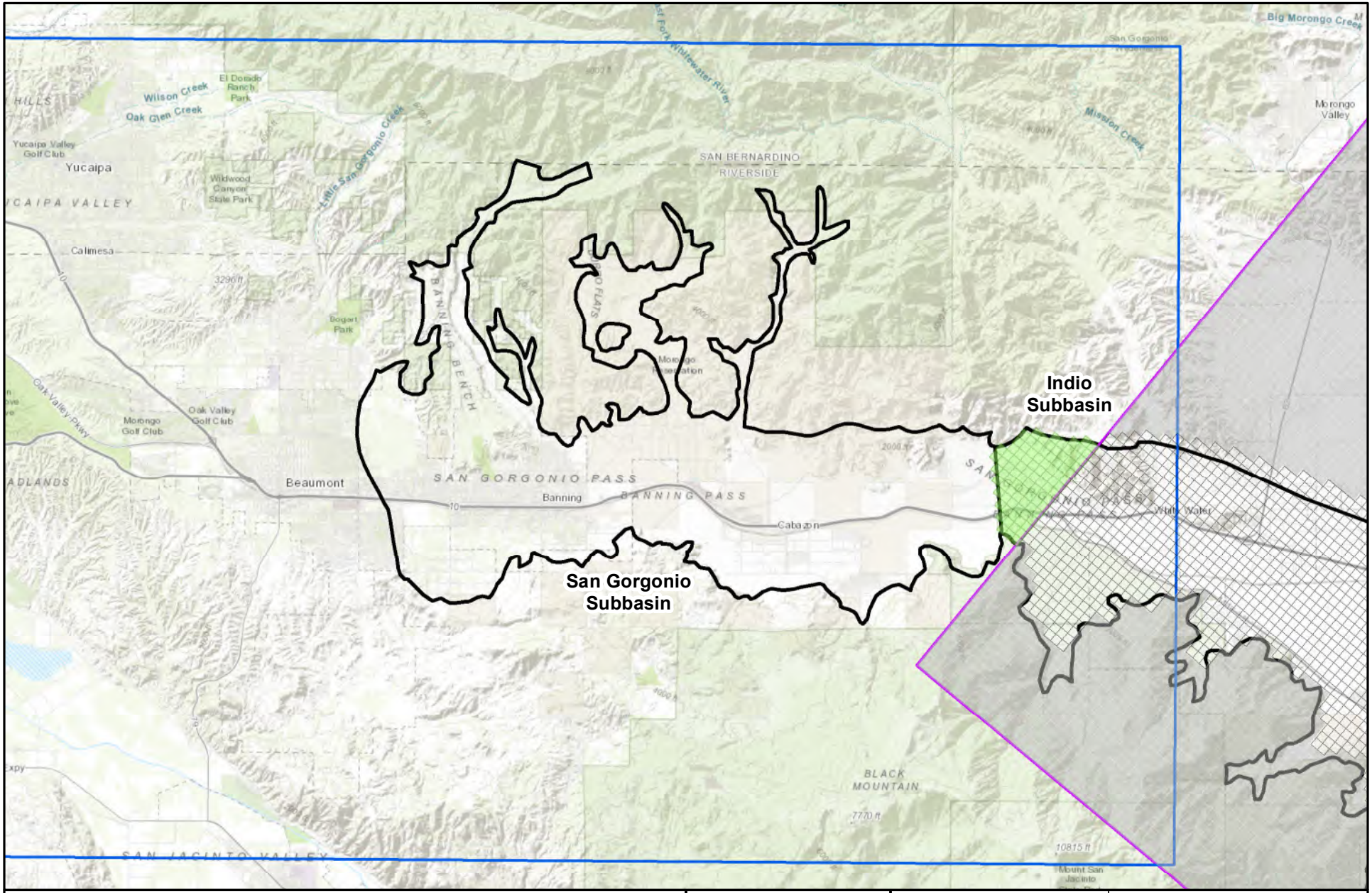


Figure 13
Indio Model Grid with Extension

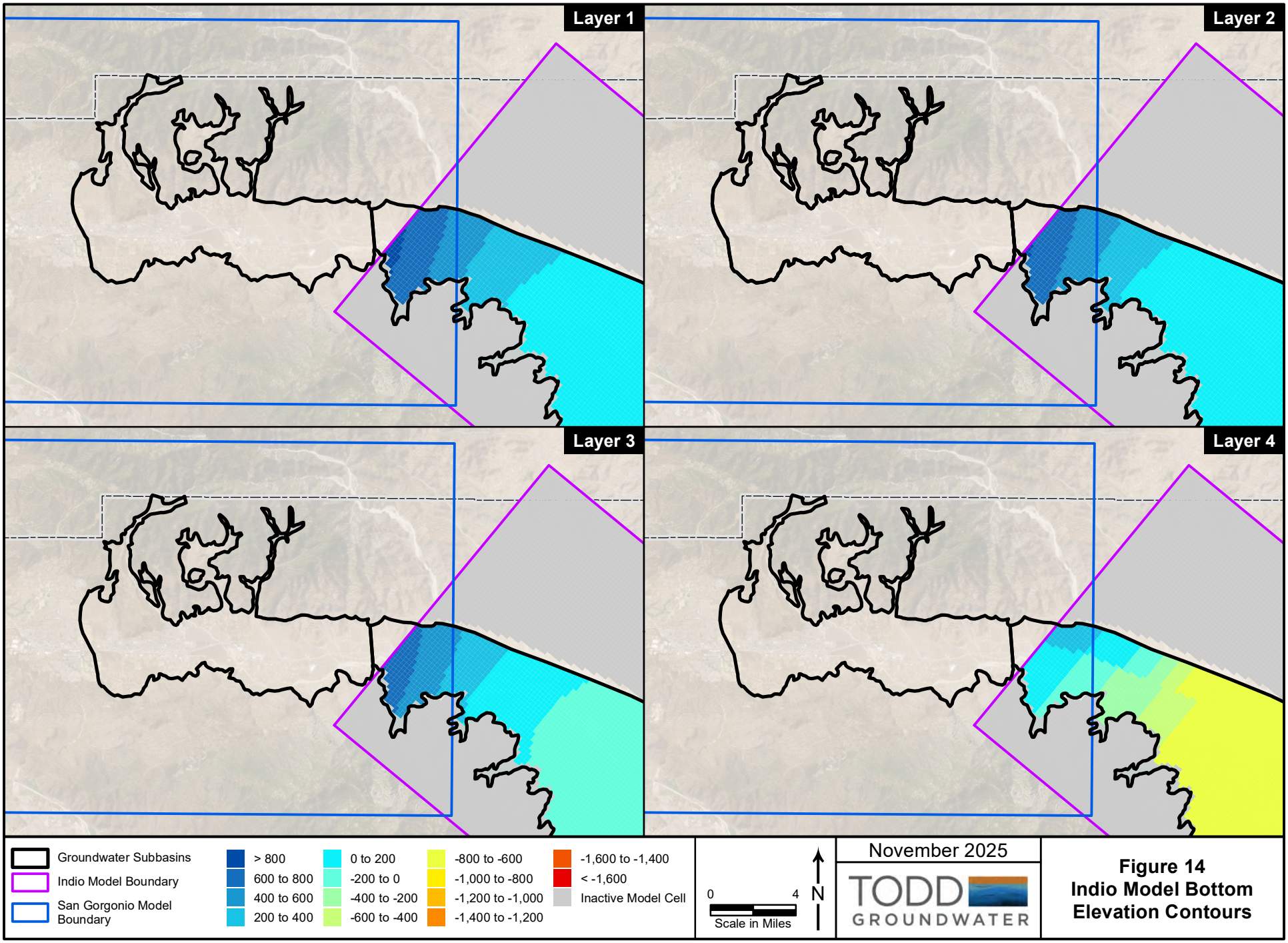


Figure 14
Indio Model Bottom Elevation Contours

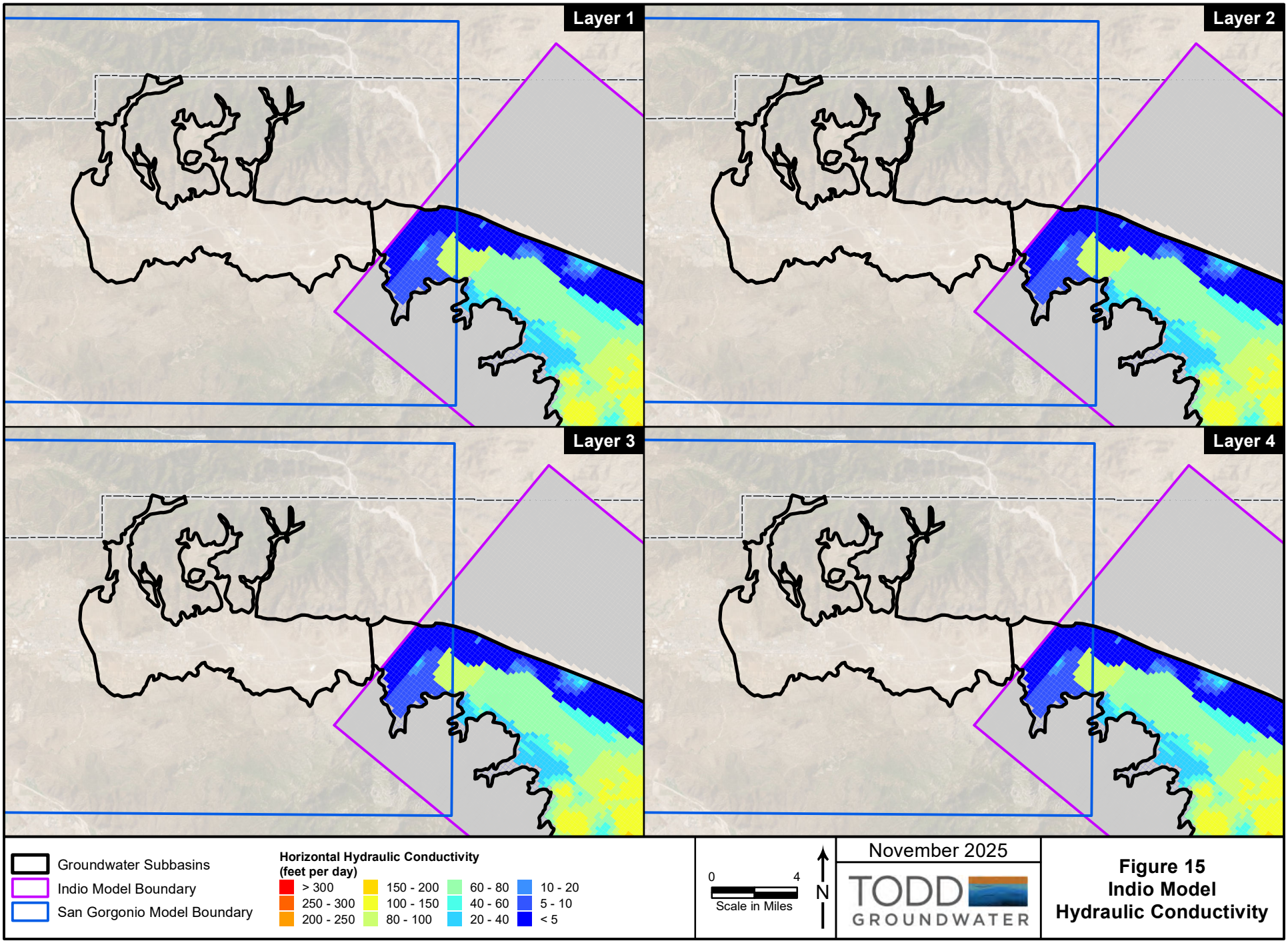
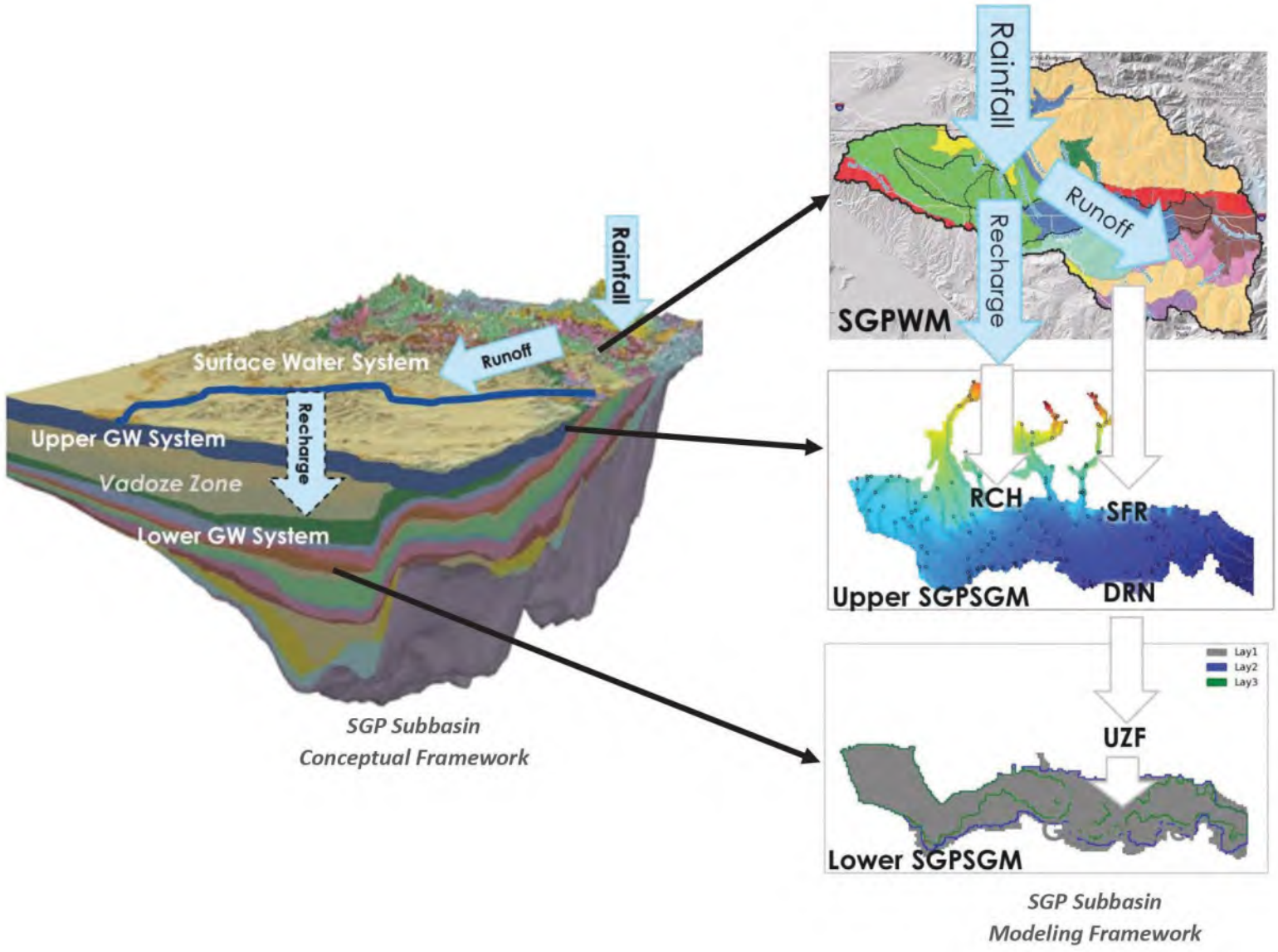


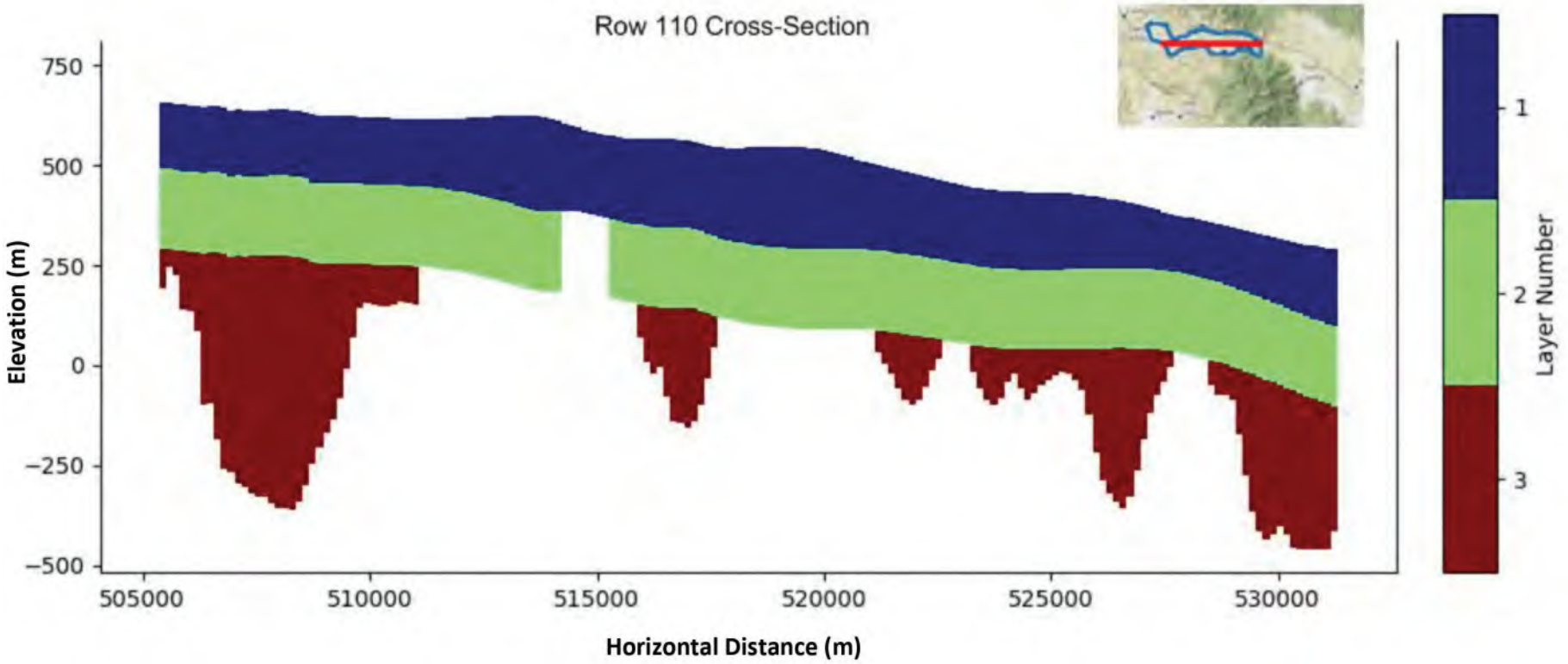
Figure 15
Indio Model
Hydraulic Conductivity



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Figure 16
Schematic Diagram of the San Gorgonio Pass Subbasin Models

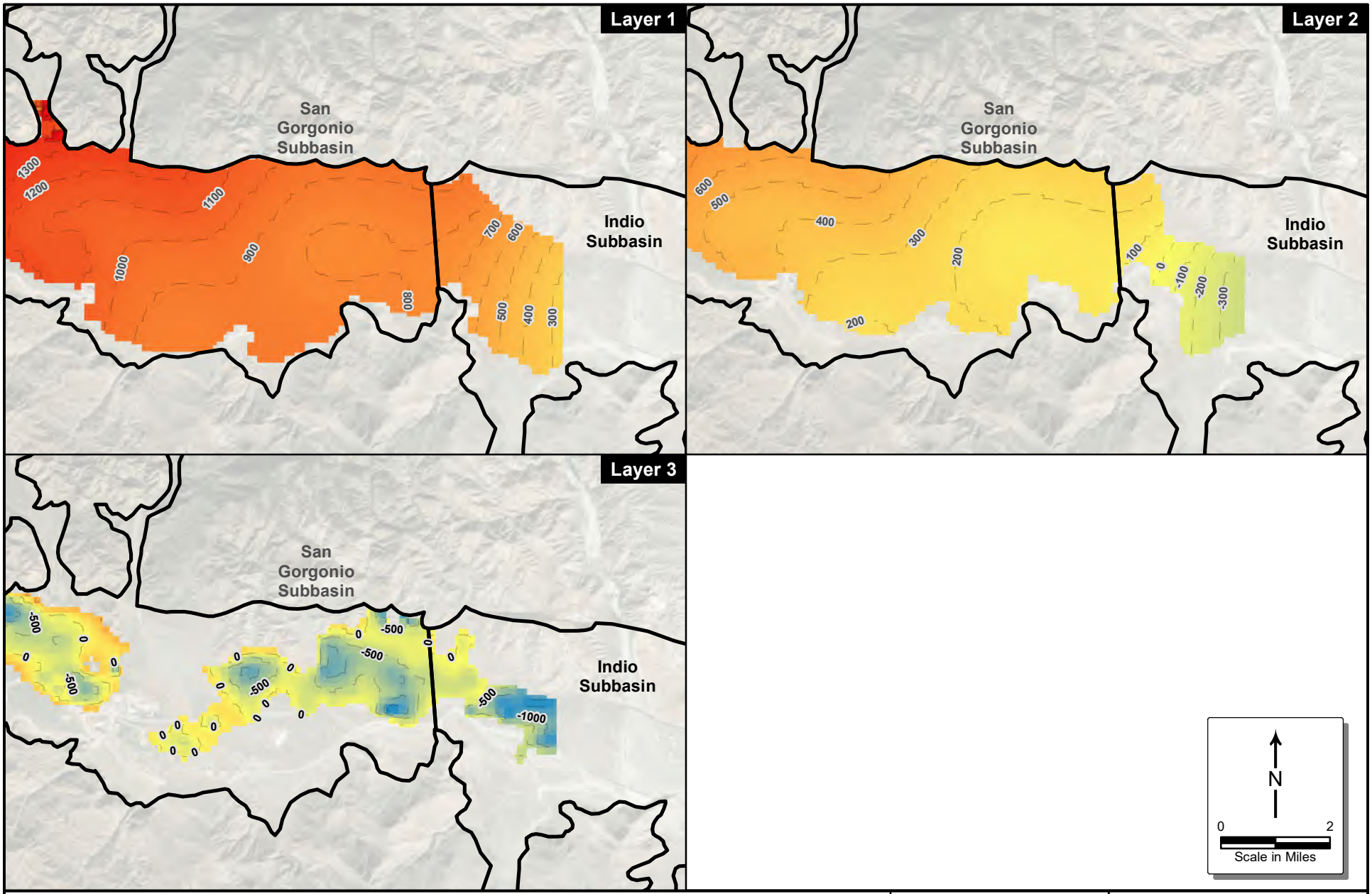


Source:
Desert Water Agency GSA, Verbenia GSA and San Gorgonio Pass GSA (2022)
San Gorgonio Pass Subbasin Groundwater Sustainability Plan. pp. 449
Available at: https://sgma.water.ca.gov/portal/gsp/preview/121

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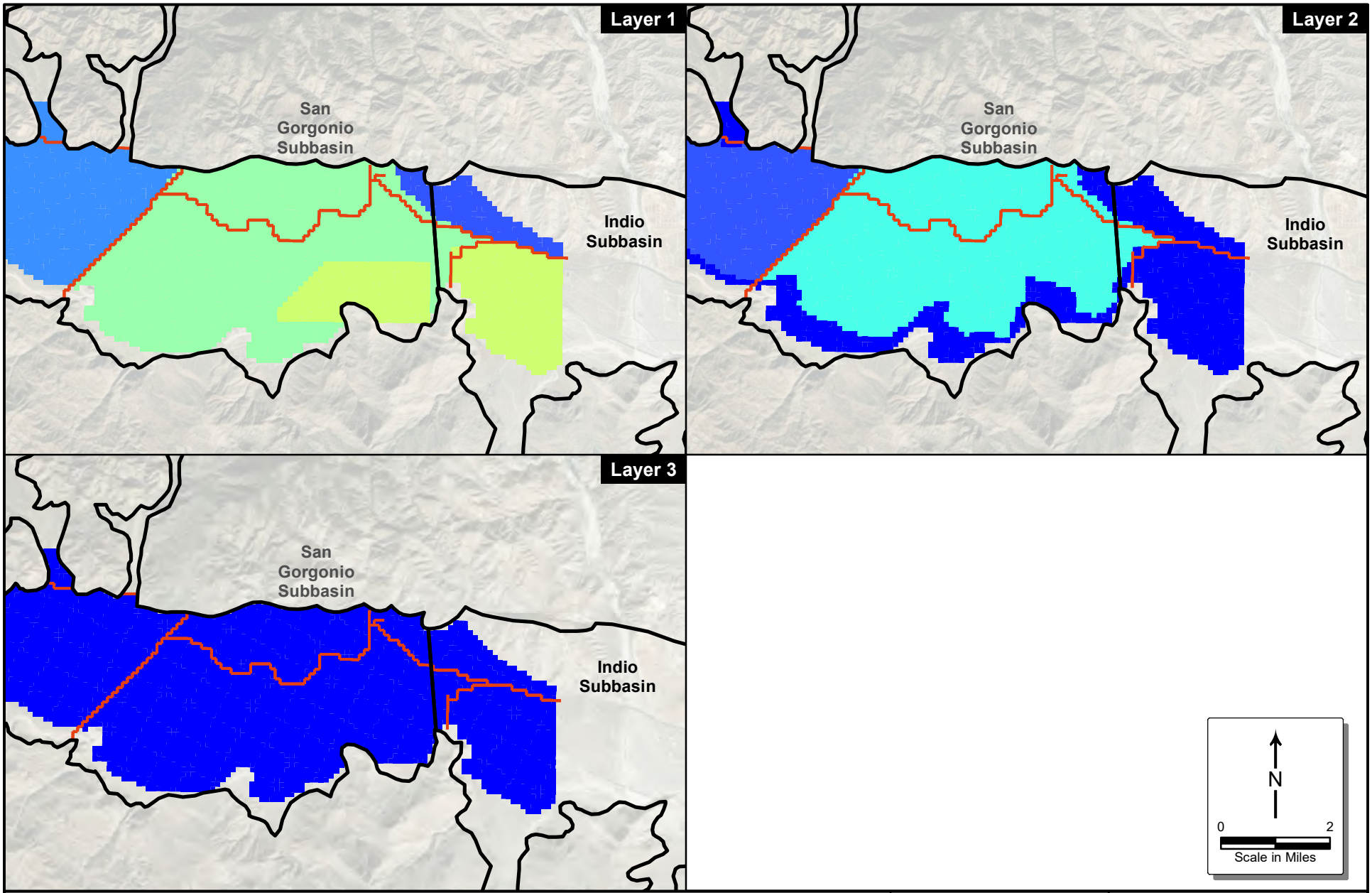
Figure 17
Lower Model Cross Section East-West



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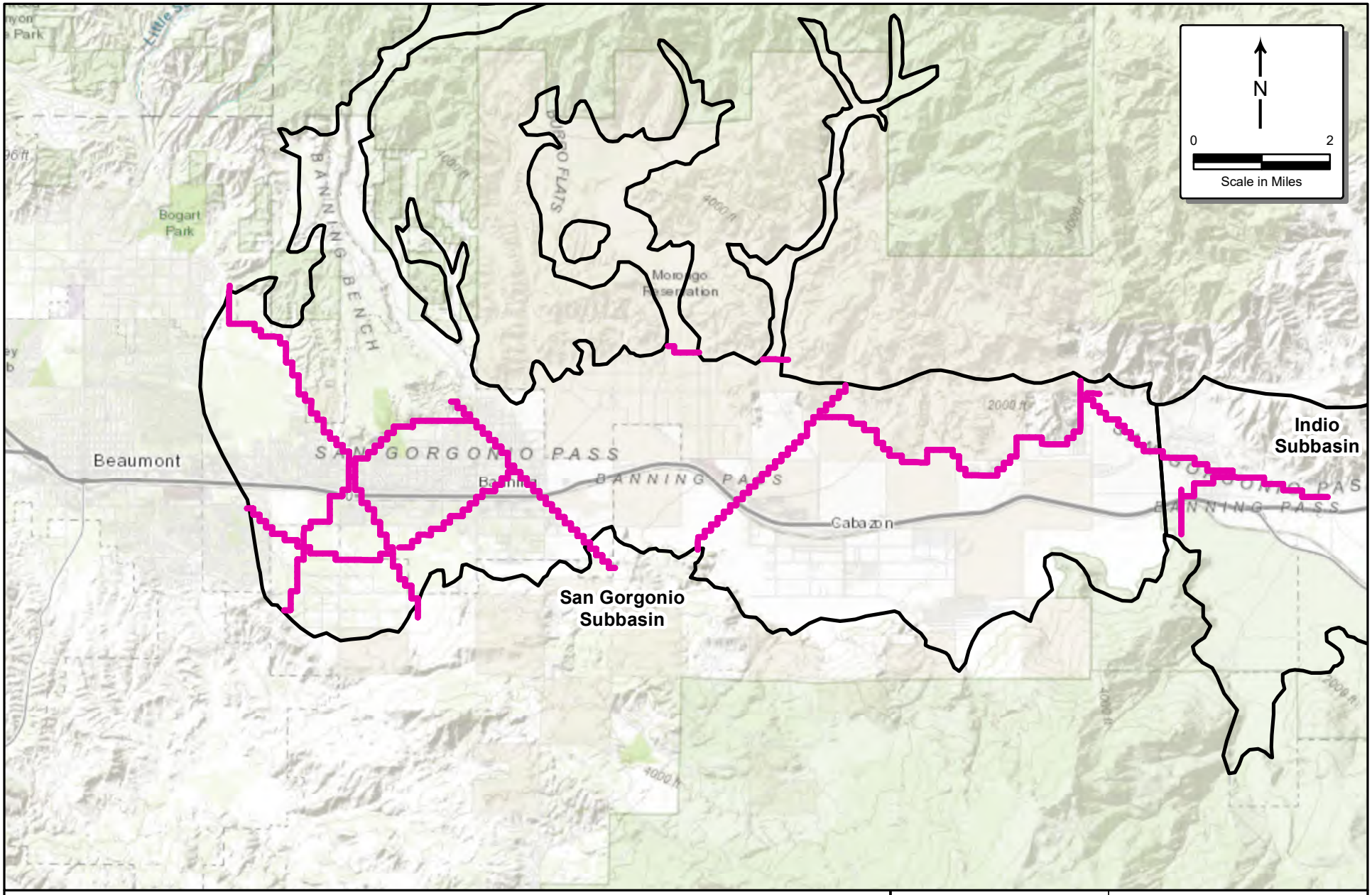
Figure 18
SGP Model Bottom Elevation Contours



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Figure 19
SGP Model Hydraulic Conductivity and HFBs

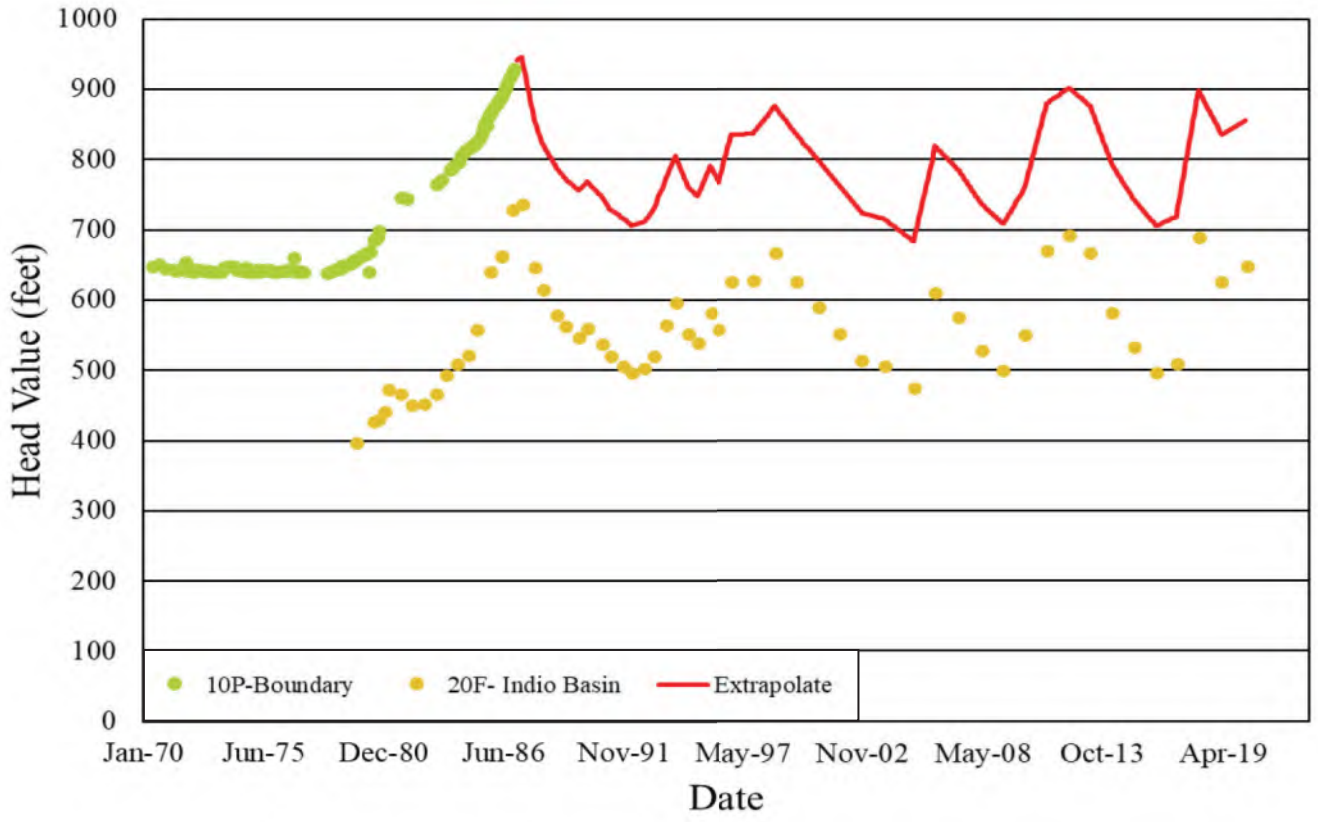


Horizontal Flow Boundary (HFB)
Groundwater Subbasins

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Figure 20
SGP Model HFB



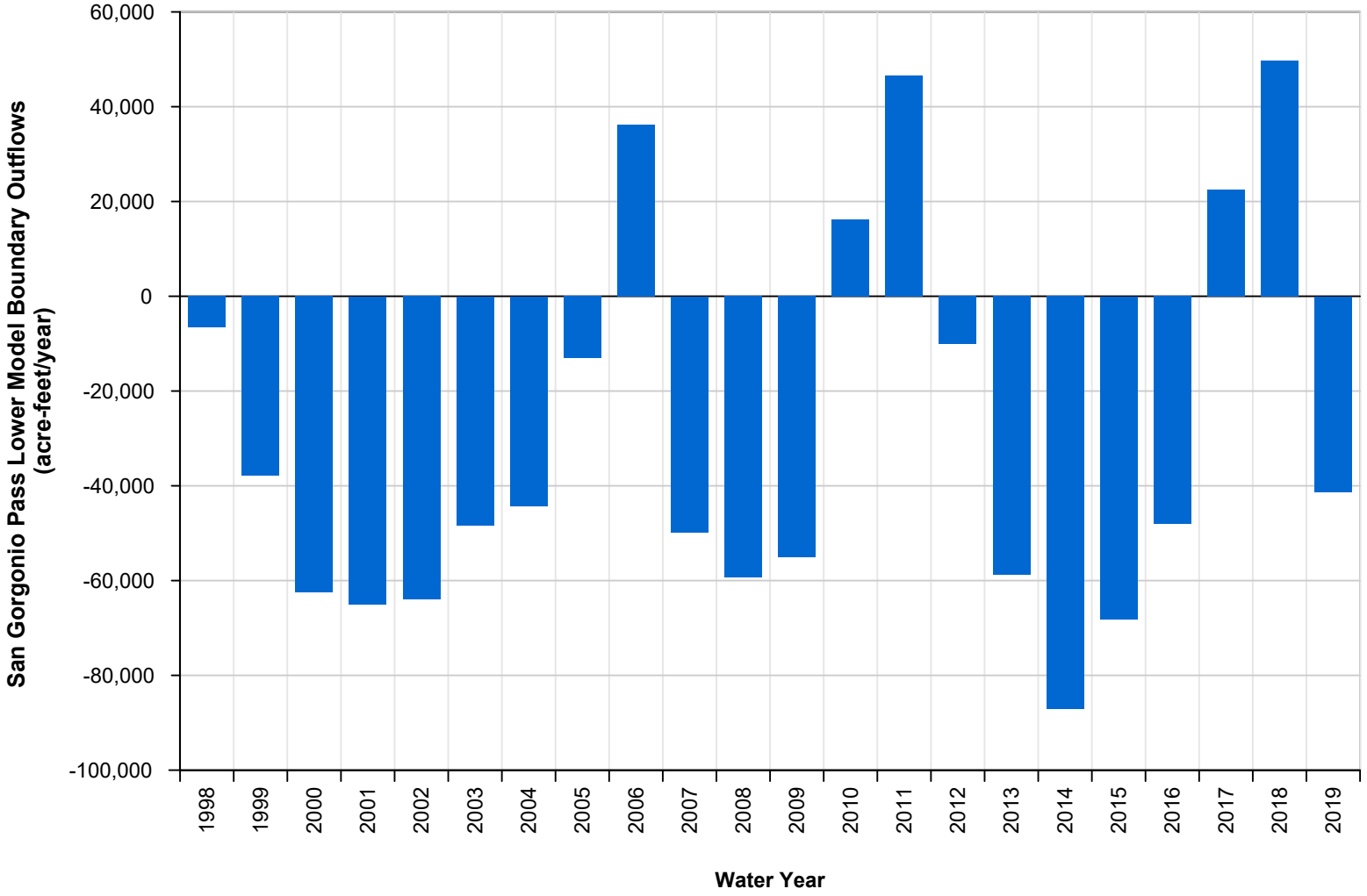


Source:
Desert Water Agency GSA, Verbenia GSA and San Gorgonio Pass GSA (2022)
San Gorgonio Pass Subbasin Groundwater Sustainability Plan. pp. 457
Available at: https://sgma.water.ca.gov/portal/gsp/preview/121

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Figure 21
Correlation Model for SGP Boundary Condition

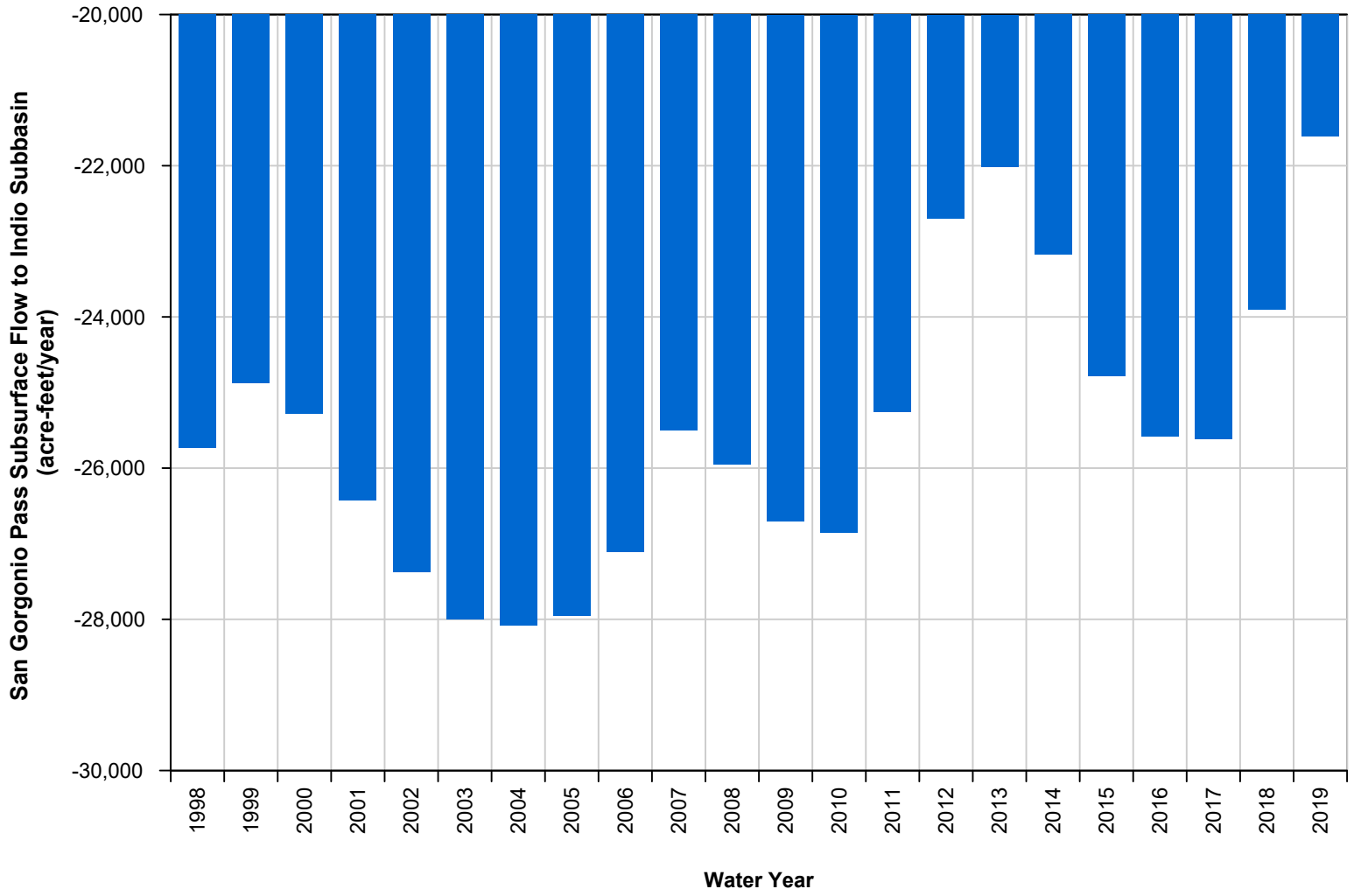


San Gorgonio Subbasin Lower Model Outflows

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Figure 22
SGP Model Inflow-Outflow at Model Boundary

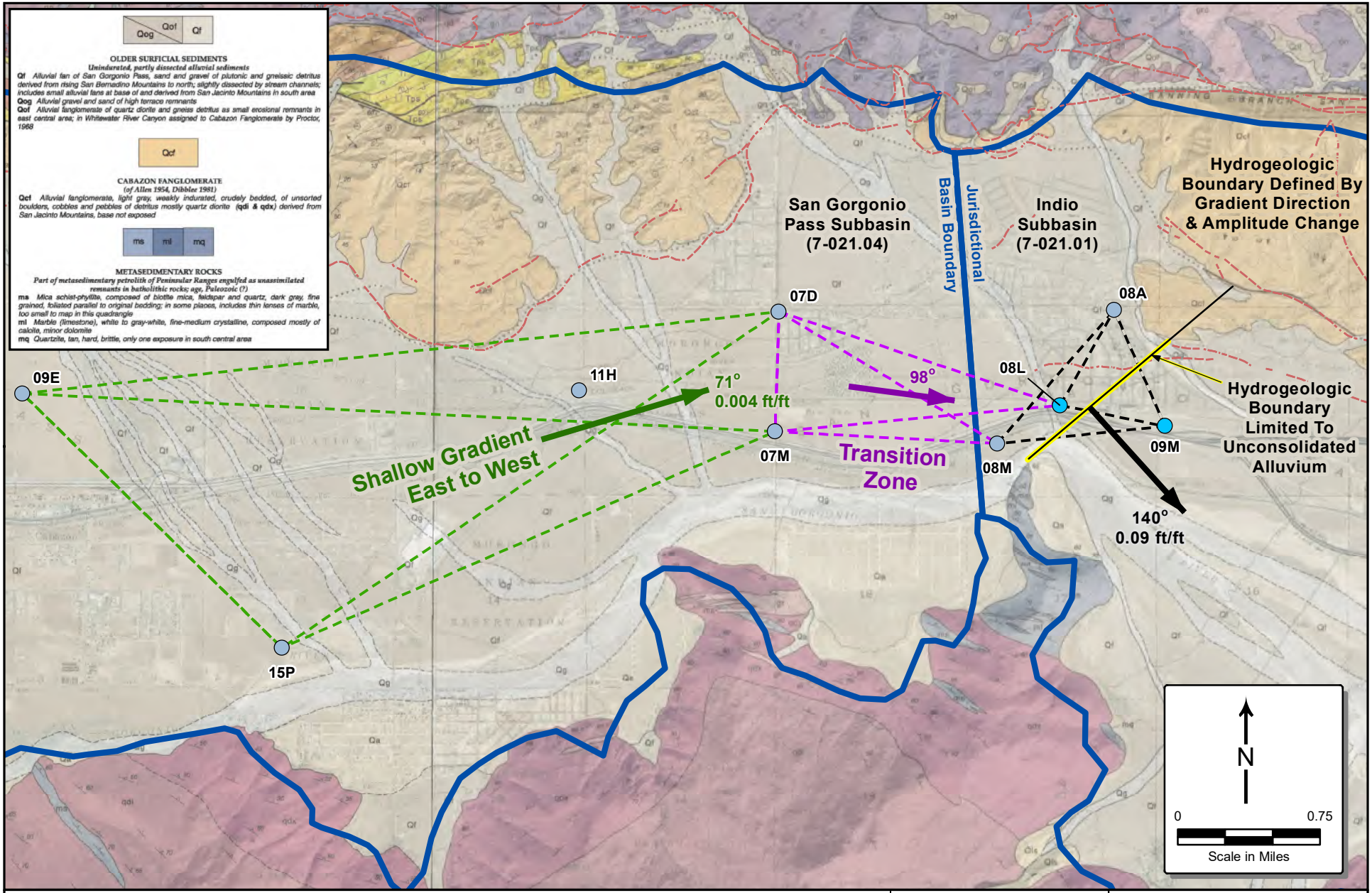


San Gorgonio Subbasin Boundary Flows to Indio Subbasin

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Figure 23
SGP Model Estimated Subbasin Outflow at Basin Boundary



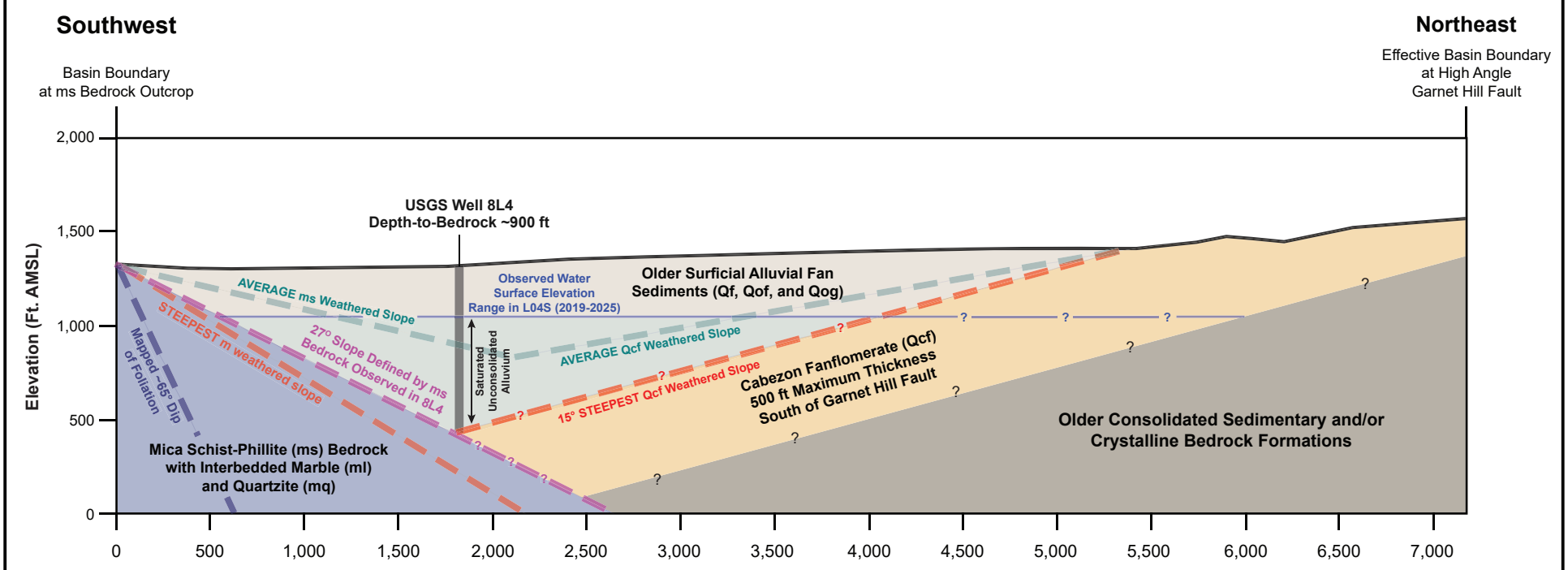
USGS Obervation Well
Key USGS Wells Installed in 2019
Fault Line
Groundwater Subbasin
San Gorgonio Zone
Transition Zone
Key Gradient-Defining Triangles

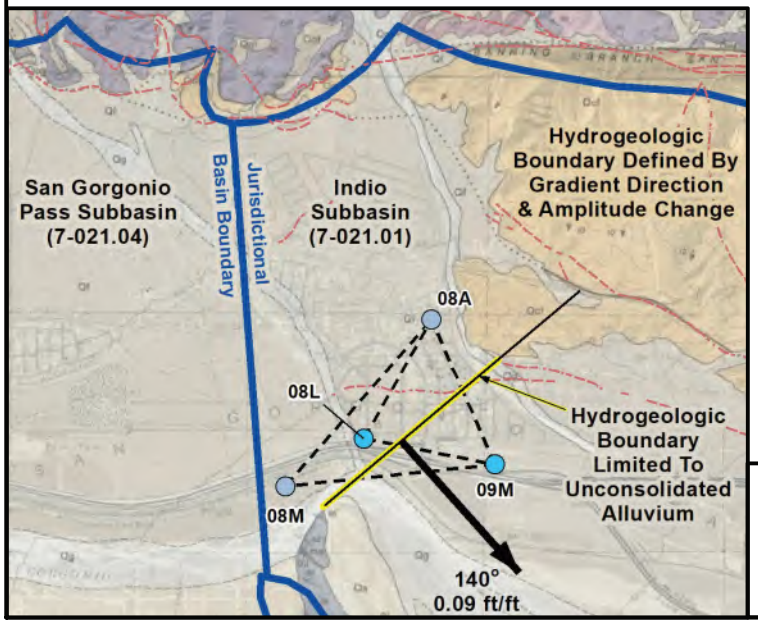
Surficial Geology:
Dibblee Foundation Maps DF-119 & DF-120 (2004)

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Figure 24
Analytical Flow Estimate Cross-Section Locations





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Figure 25
Illustration of Cross-Sectional Area

Appendix 4-A

Groundwater Level Monitoring Well Hydrographs

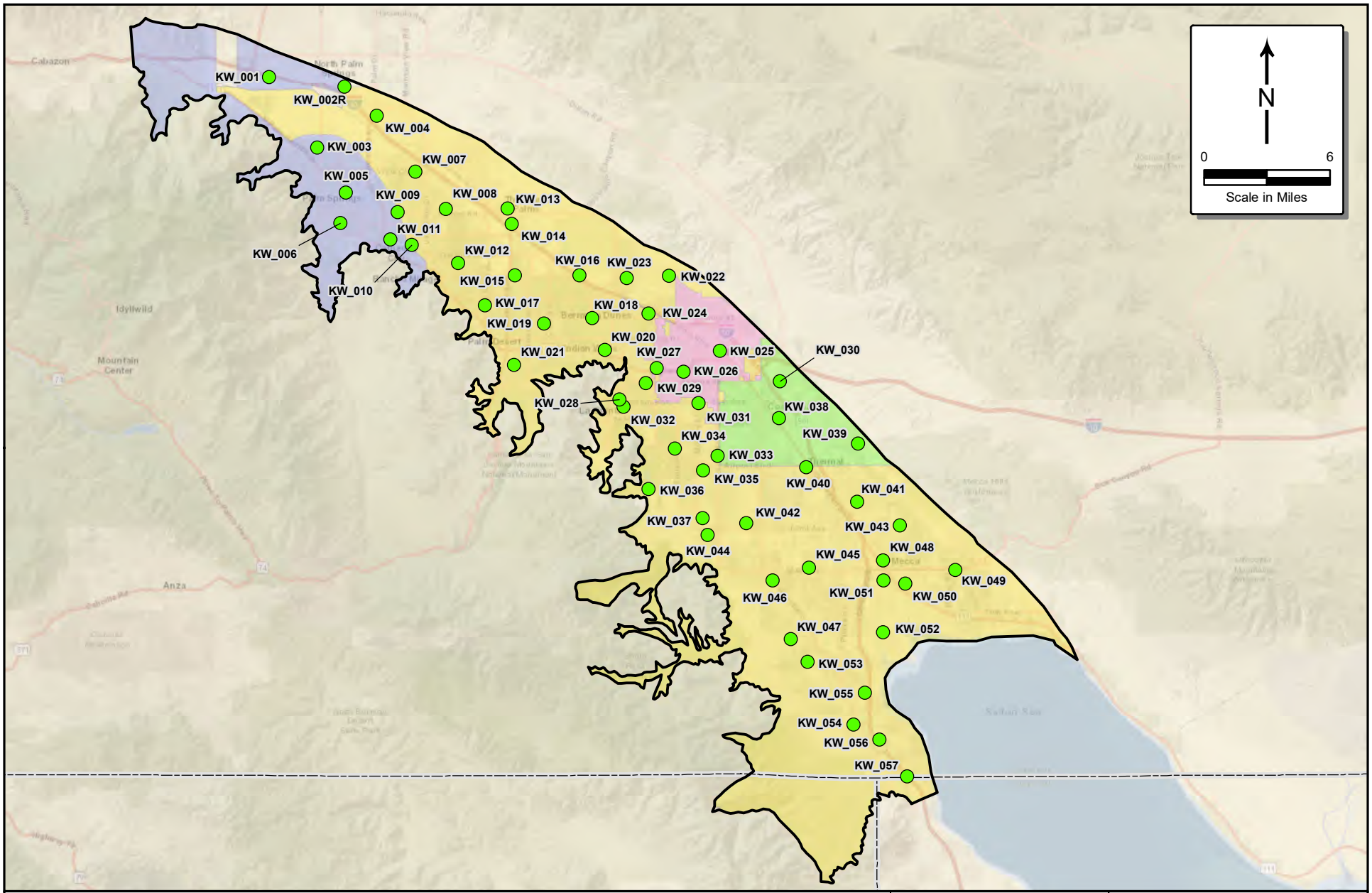
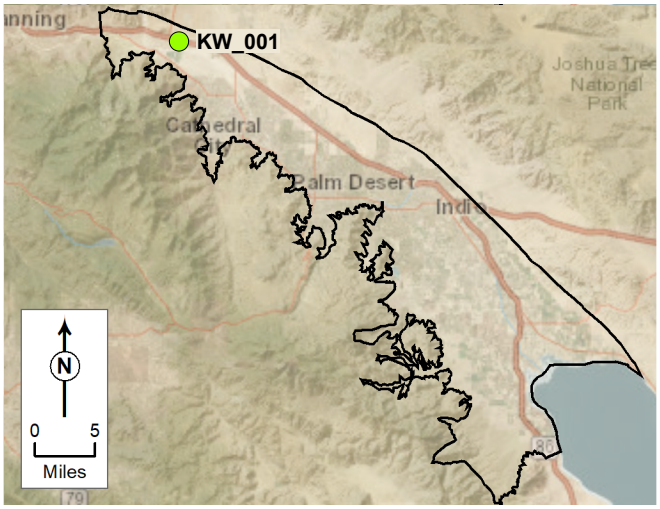
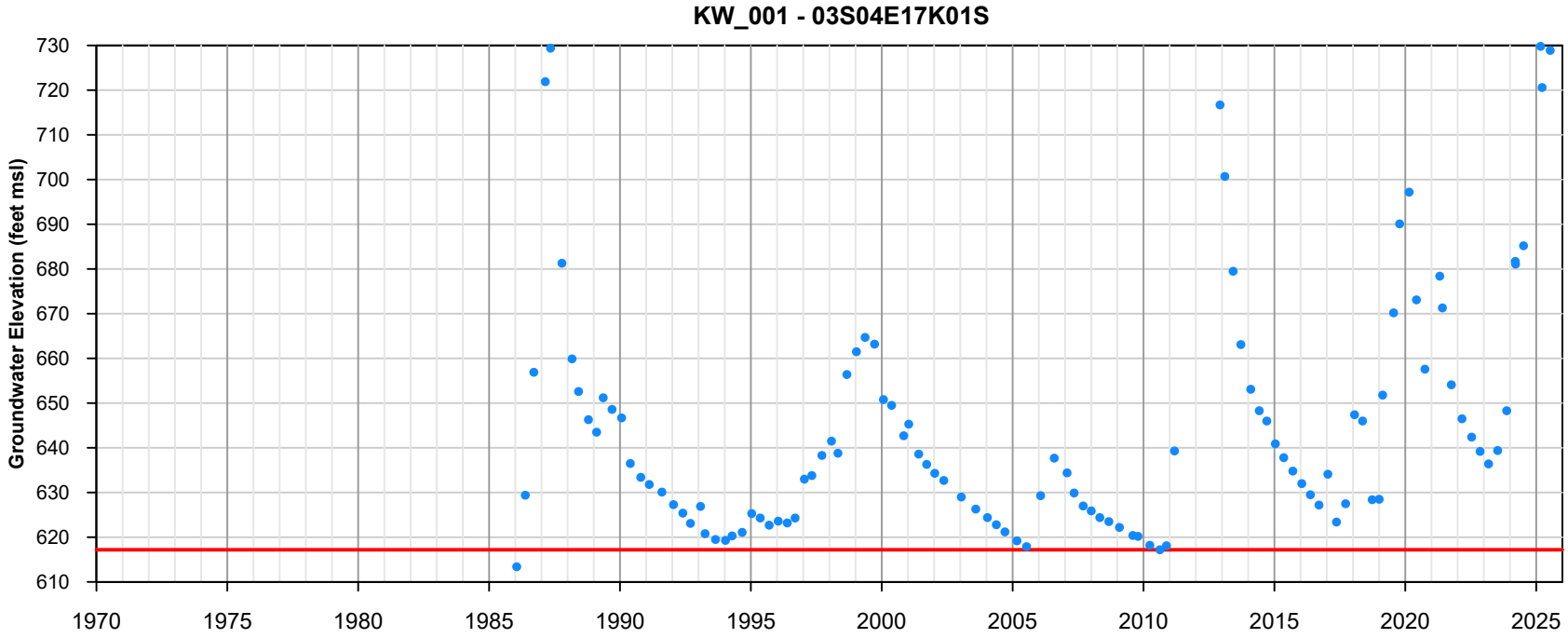


Figure A-1
Selected Key Wells for Groundwater Level Monitoring

Well Information

Site Code:	339100N1165890W001
Local Well Name:	KW_001
State Well Name:	03S04E17K001S
Montoring Network Type:	SGMA Representative
Station ID:	56733
Latitude:	33.91
Longitude:	-116.589
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	<Null>
Bottom Perforation (feet bgs):	<Null>
Ground Surface Elevation:	900.4
Reference Point Elevation:	900.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

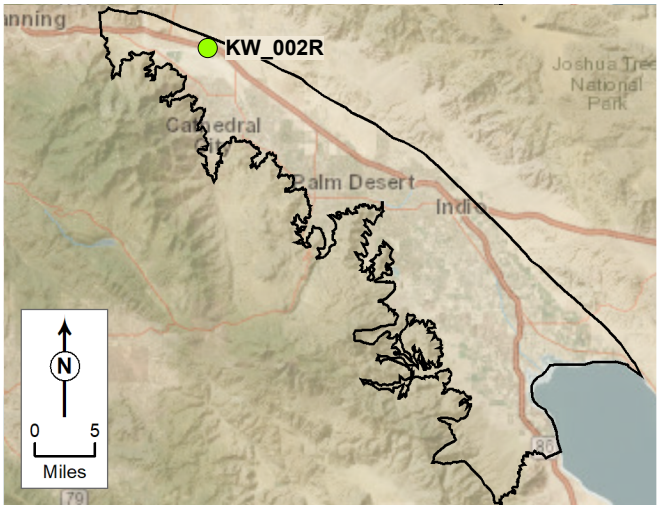
January 2026

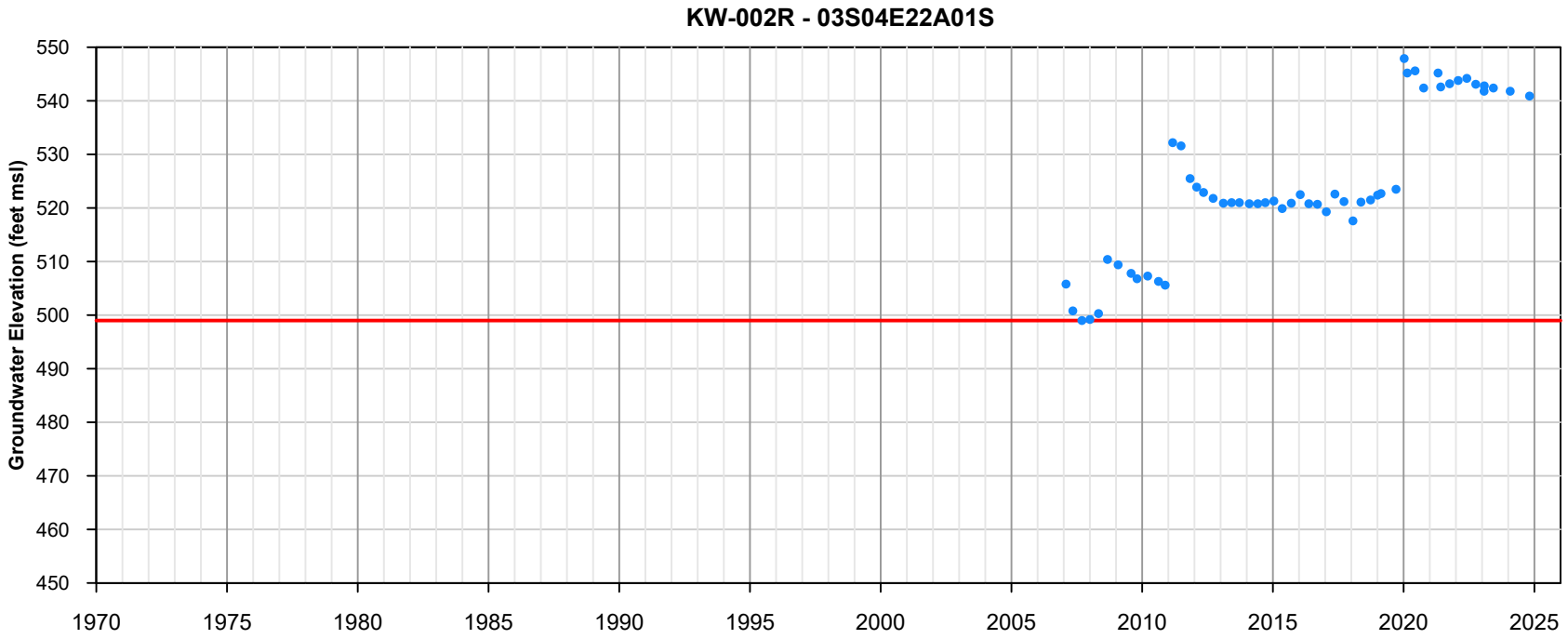
TODD GROUNDWATER

Appendix A-2
Groundwater Elevation Hydrograph
KW_001 - 03S04E17K01S

Well Information

Site Code:	339035N1165248W001
Local Well Name:	KW_002R
State Well Name:	03S04E13N002S
Montoring Network Type:	SGMA Representative
Station ID:	60525
Latitude:	33.9035
Longitude:	-116.525
Well Depth (feet bgs):	<Null>
Top Perforation (feet bgs):	<Null>
Bottom Perforation (feet bgs):	<Null>
Ground Surface Elevation:	710.69
Reference Point Elevation:	710.69
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

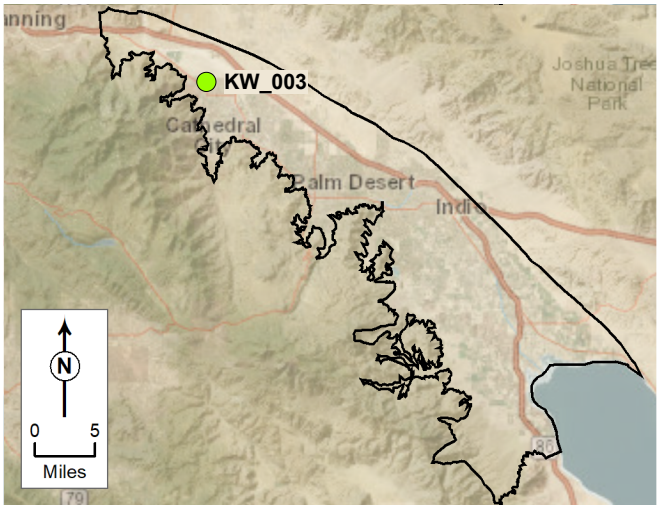
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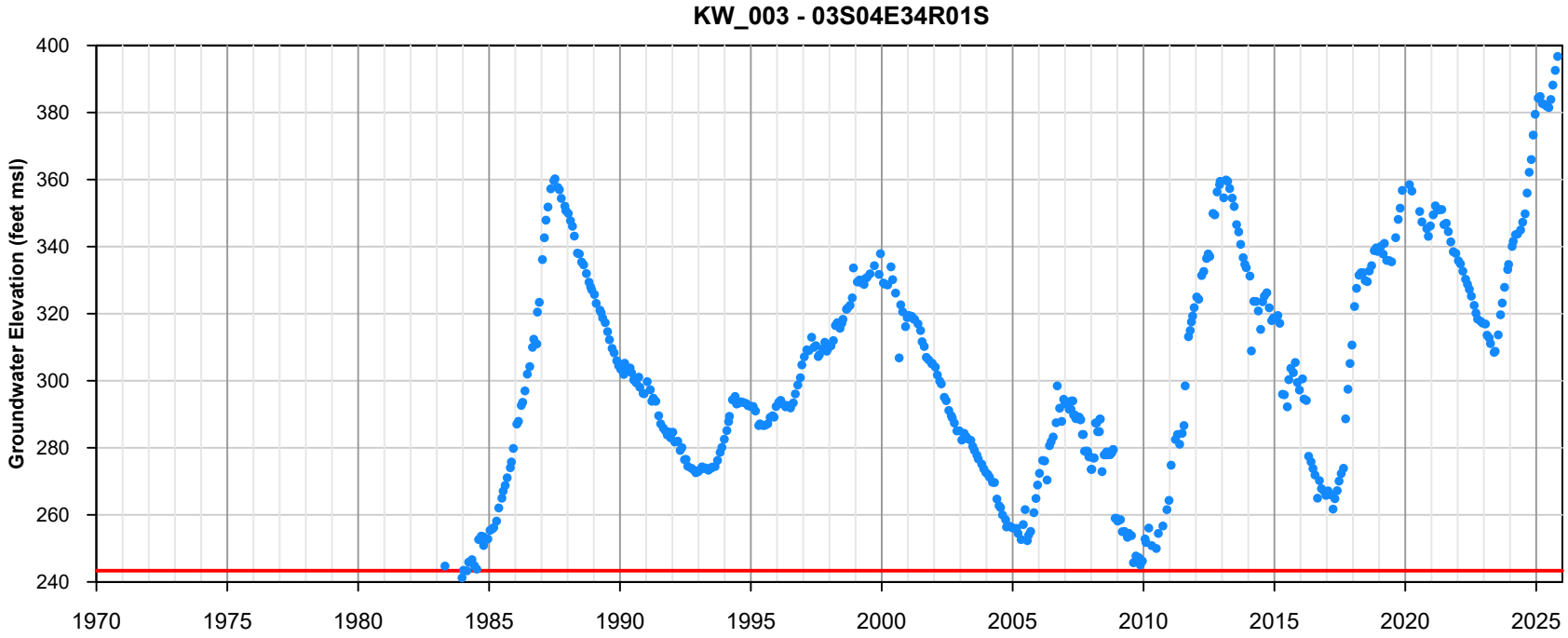
TODD GROUNDWATER

Appendix A-3
Groundwater Elevation Hydrograph
KW-002R - 03S04E22A01S

Well Information

Site Code:	338612N1165483W001
Local Well Name:	KW_003
State Well Name:	03S04E34R001S
Montoring Network Type:	SGMA Representative
Station ID:	56735
Latitude:	33.8612
Longitude:	-116.547
Well Depth (feet bgs):	830
Top Perforation (feet bgs):	506
Bottom Perforation (feet bgs):	830
Ground Surface Elevation:	611.457
Reference Point Elevation:	611.457
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

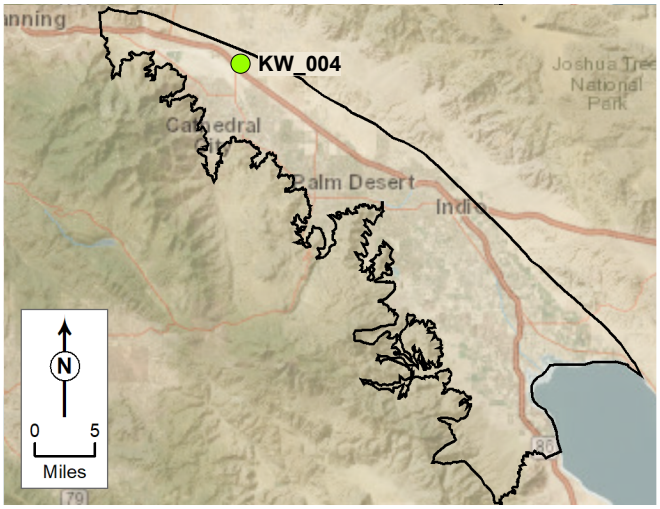
January 2026

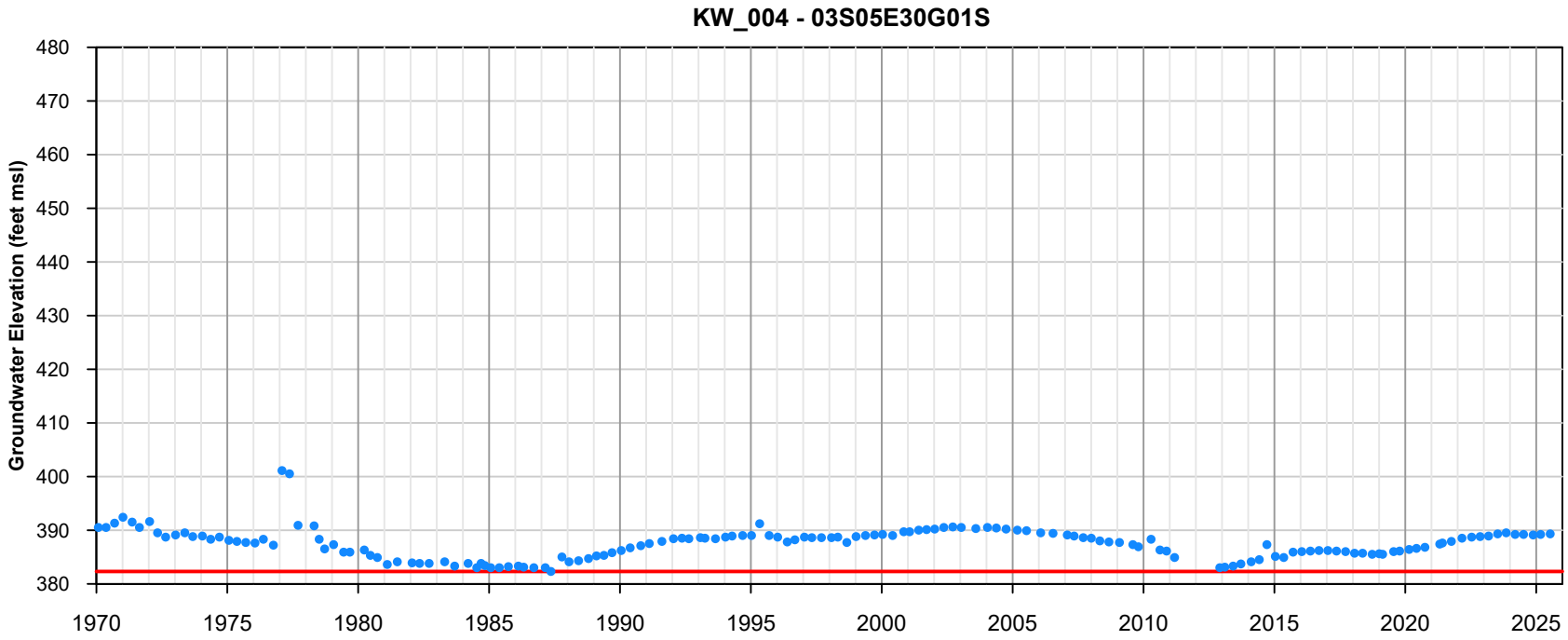
TODD GROUNDWATER

Appendix A-4
Groundwater Elevation Hydrograph
KW_003 - 03S04E34R01S

Well Information

Site Code:	338833N1164996W001
Local Well Name:	KW_004
State Well Name:	03S05E30G001S
Montoring Network Type:	SGMA Representative
Station ID:	56736
Latitude:	33.8834
Longitude:	-116.5
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	344
Bottom Perforation (feet bgs):	644
Ground Surface Elevation:	589.5
Reference Point Elevation:	589.8
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

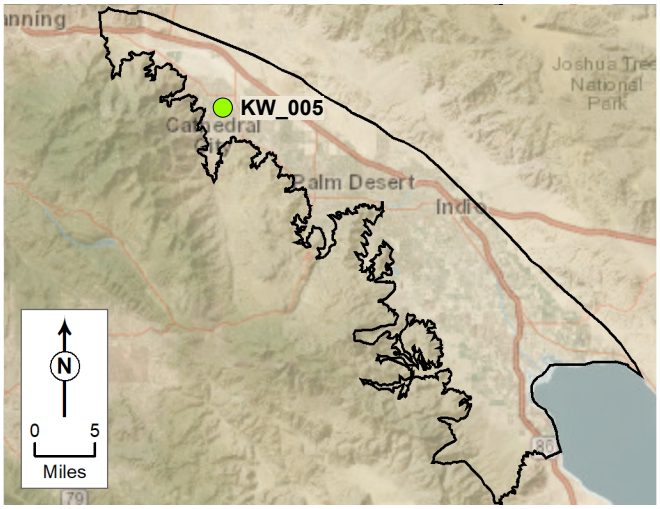
January 2026

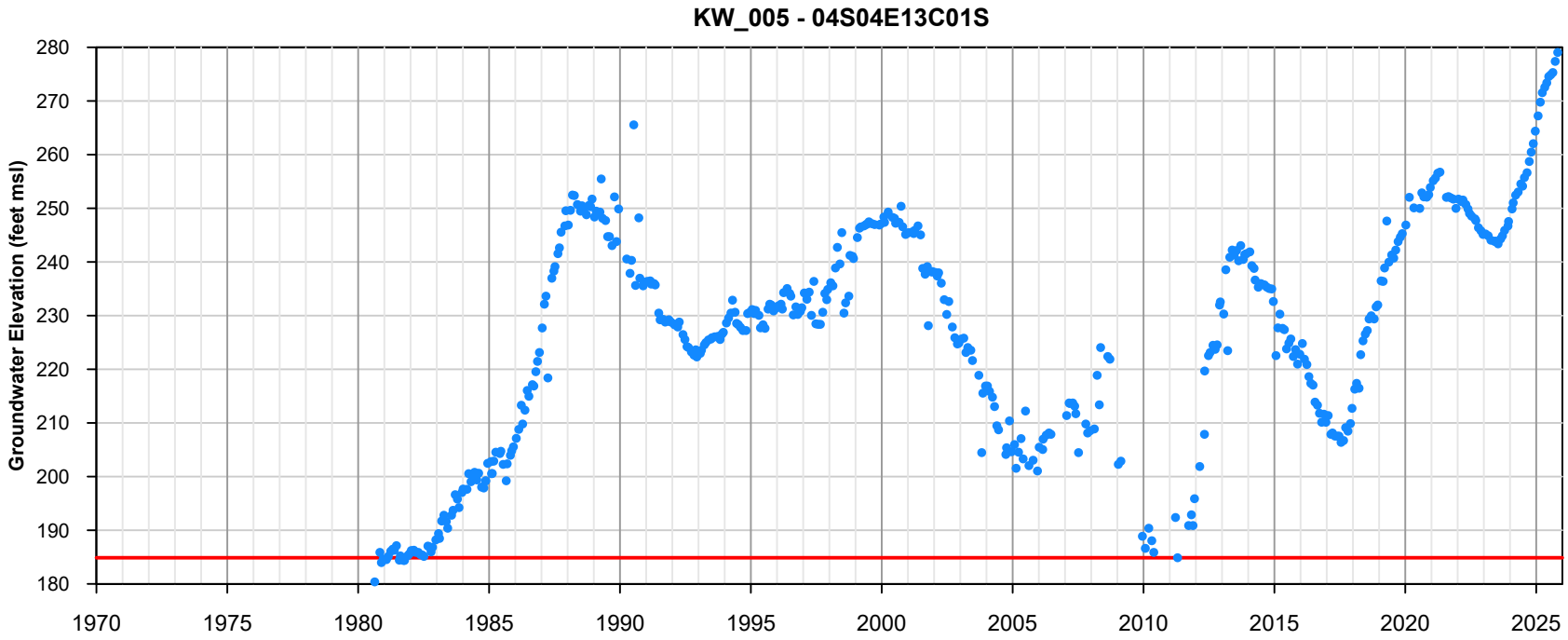
TODD GROUNDWATER

Appendix A-5
Groundwater Elevation Hydrograph
KW_004 - 03S05E30G01S

Well Information

Site Code:	338301N1165244W001
Local Well Name:	KW_005
State Well Name:	04S04E13C001S
Montoring Network Type:	SGMA Representative
Station ID:	56737
Latitude:	33.8302
Longitude:	-116.524
Well Depth (feet bgs):	912
Top Perforation (feet bgs):	512
Bottom Perforation (feet bgs):	912
Ground Surface Elevation:	454.877
Reference Point Elevation:	454.877
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

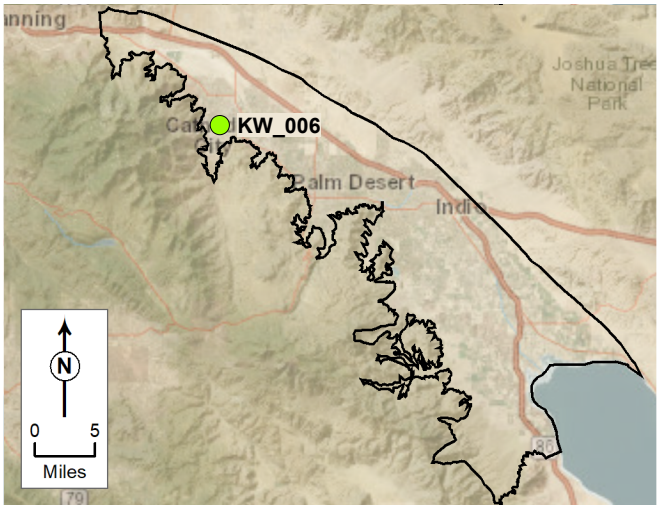
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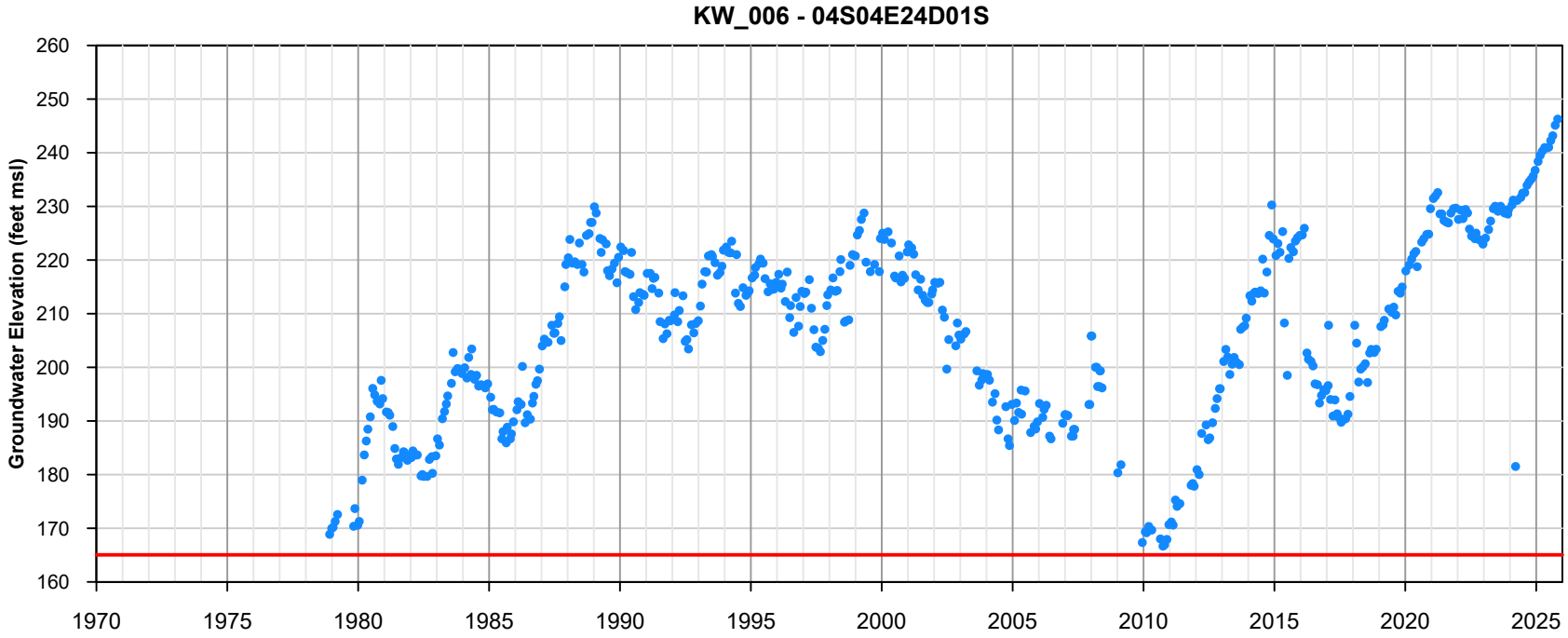
TODD GROUNDWATER

Appendix A-6
Groundwater Elevation Hydrograph
KW_005 - 04S04E13C01S

Well Information

Site Code:	338090N1165286W001
Local Well Name:	KW_006
State Well Name:	04S04E24D001S
Montoring Network Type:	SGMA Representative
Station ID:	56738
Latitude:	33.8125
Longitude:	-116.526
Well Depth (feet bgs):	1010
Top Perforation (feet bgs):	580
Bottom Perforation (feet bgs):	980
Ground Surface Elevation:	401.748
Reference Point Elevation:	401.748
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

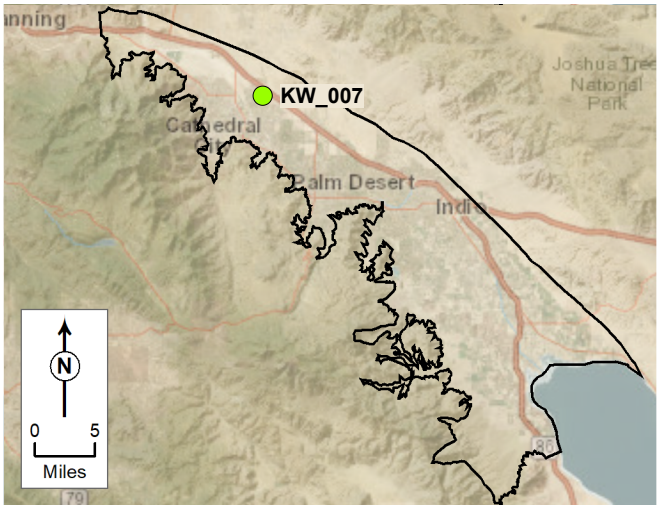
January 2026

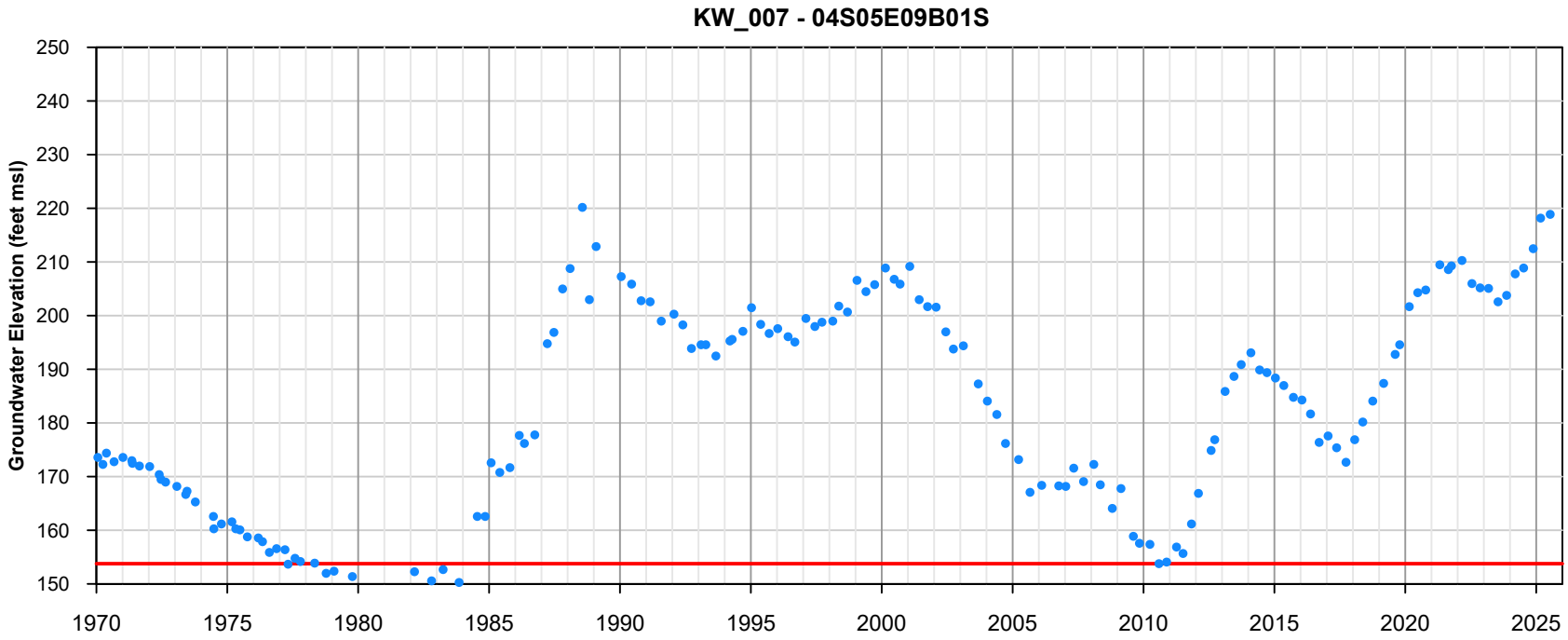
TODD GROUNDWATER

Appendix A-7
Groundwater Elevation Hydrograph
KW_006 - 04S04E24D01S

Well Information

Site Code:	338447N1164665W001
Local Well Name:	KW_007
State Well Name:	04S05E09B001S
Montoring Network Type:	SGMA Representative
Station ID:	47716
Latitude:	33.8447
Longitude:	-116.466
Well Depth (feet bgs):	806
Top Perforation (feet bgs):	398
Bottom Perforation (feet bgs):	806
Ground Surface Elevation:	397.9
Reference Point Elevation:	398
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

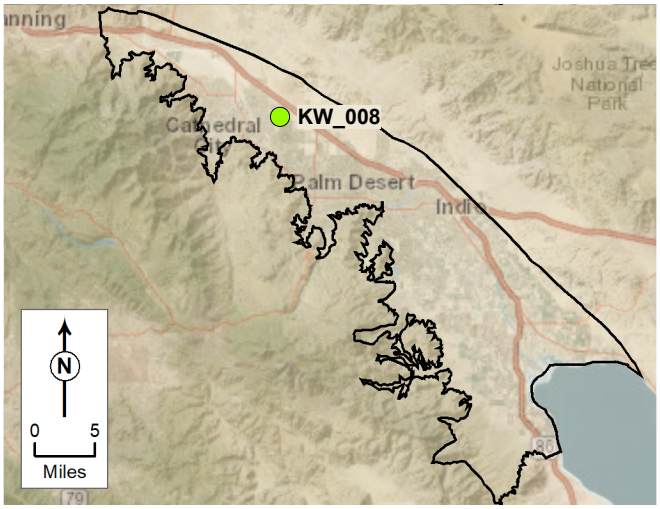
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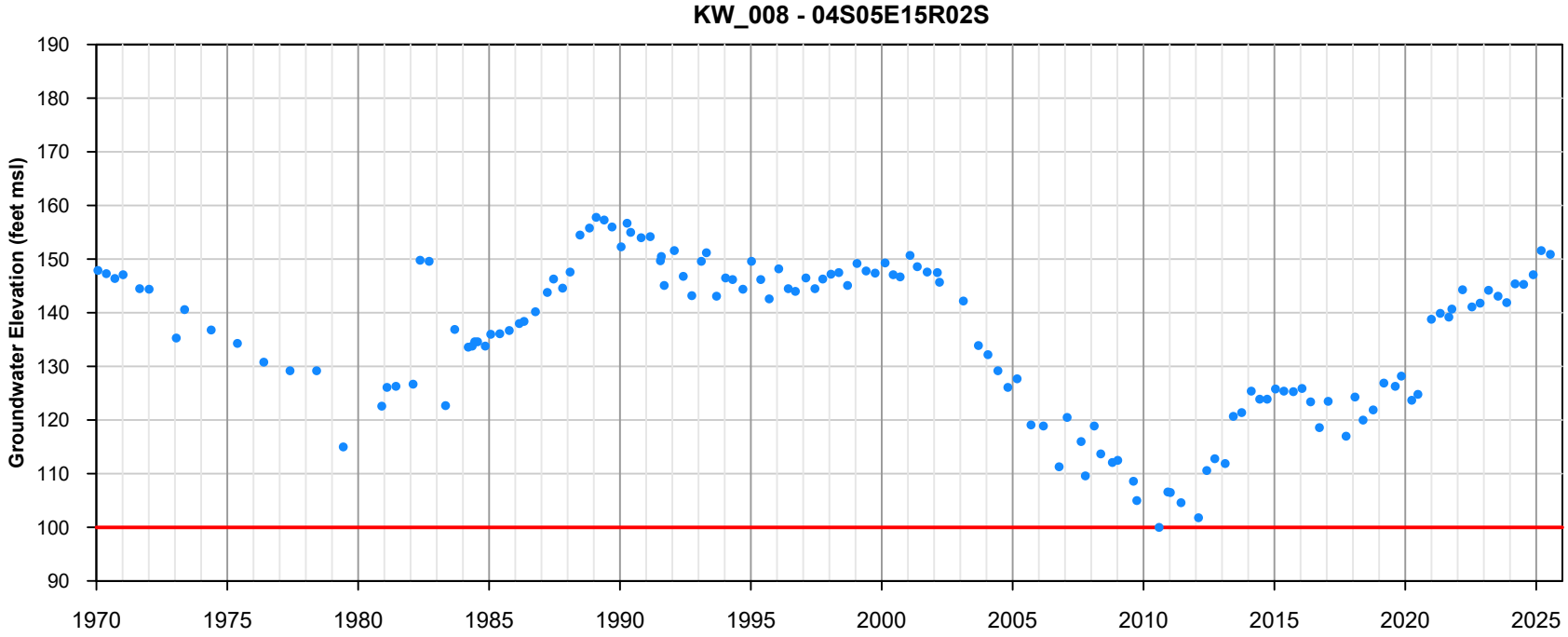
TODD GROUNDWATER

Appendix A-8
Groundwater Elevation Hydrograph
KW_007 - 04S05E09B01S

Well Information

Site Code:	338192N1164415W001
Local Well Name:	KW_008
State Well Name:	04S05E15R002S
Montoring Network Type:	SGMA Representative
Station ID:	47749
Latitude:	33.8192
Longitude:	-116.442
Well Depth (feet bgs):	562
Top Perforation (feet bgs):	400
Bottom Perforation (feet bgs):	560
Ground Surface Elevation:	347.7
Reference Point Elevation:	348
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

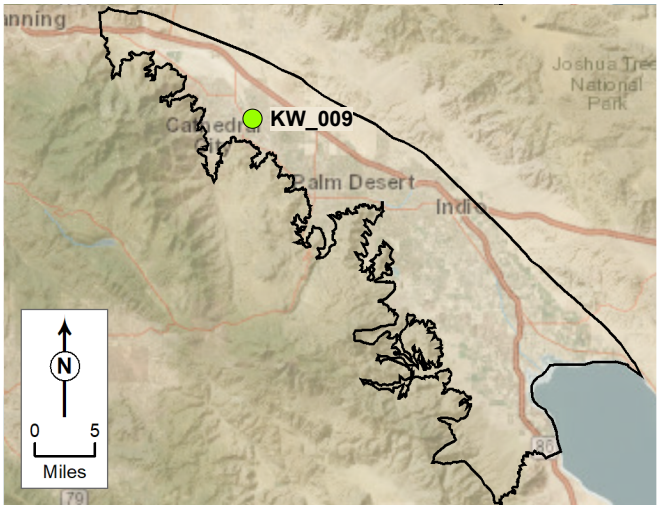
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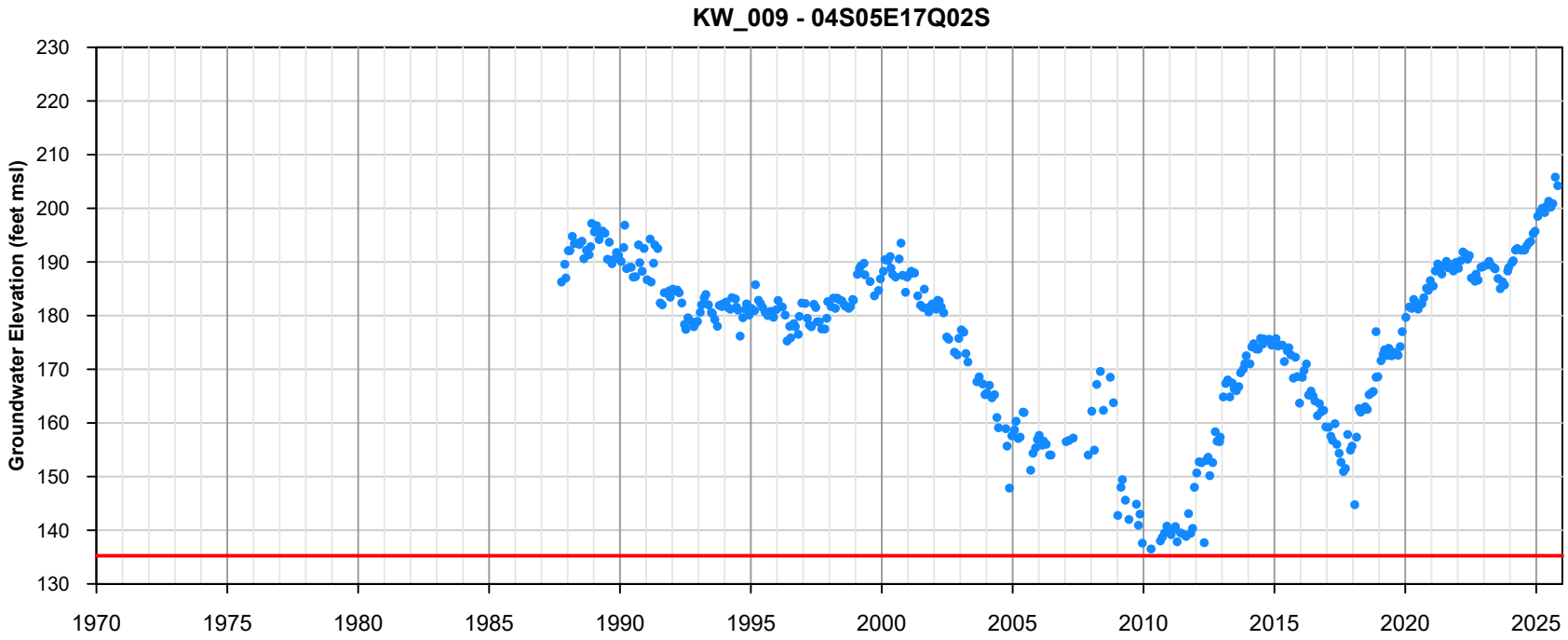
TODD GROUNDWATER

Appendix A-9
Groundwater Elevation Hydrograph
KW_008 - 04S05E15R02S

Well Information

Site Code:	338168N1164813W001
Local Well Name:	KW_009
State Well Name:	04S05E17Q002S
Montoring Network Type:	SGMA Representative
Station ID:	56739
Latitude:	33.8168
Longitude:	-116.48
Well Depth (feet bgs):	1000
Top Perforation (feet bgs):	600
Bottom Perforation (feet bgs):	1000
Ground Surface Elevation:	368.751
Reference Point Elevation:	368.751
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

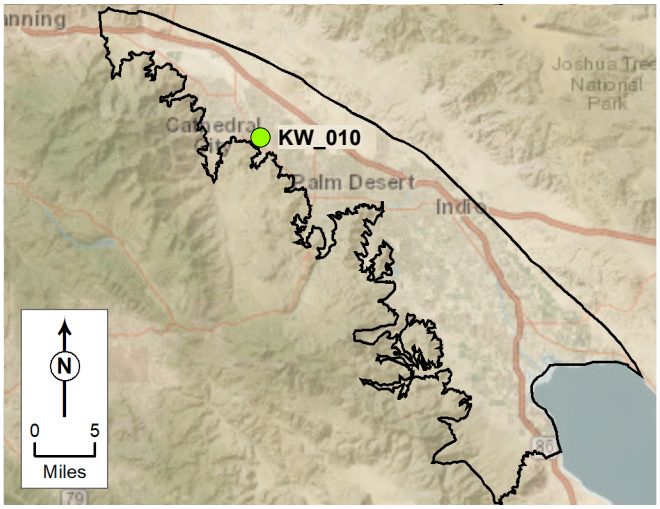
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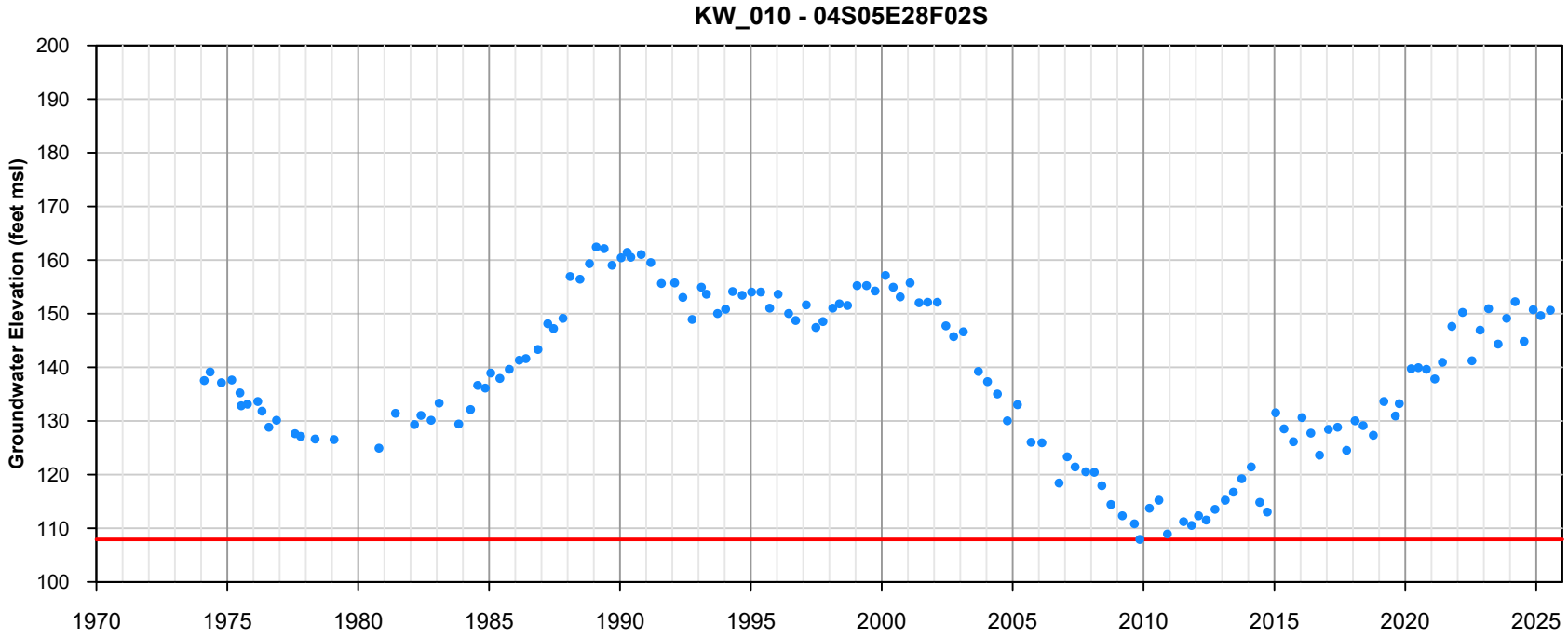
TODD GROUNDWATER

Appendix A-10
Groundwater Elevation Hydrograph
KW_009 - 04S05E17Q02S

Well Information

Site Code:	337941N1164705W001
Local Well Name:	KW_010
State Well Name:	04S05E28F002S
Montoring Network Type:	SGMA Representative
Station ID:	56740
Latitude:	33.7942
Longitude:	-116.471
Well Depth (feet bgs):	956
Top Perforation (feet bgs):	500
Bottom Perforation (feet bgs):	925
Ground Surface Elevation:	320.8
Reference Point Elevation:	322.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

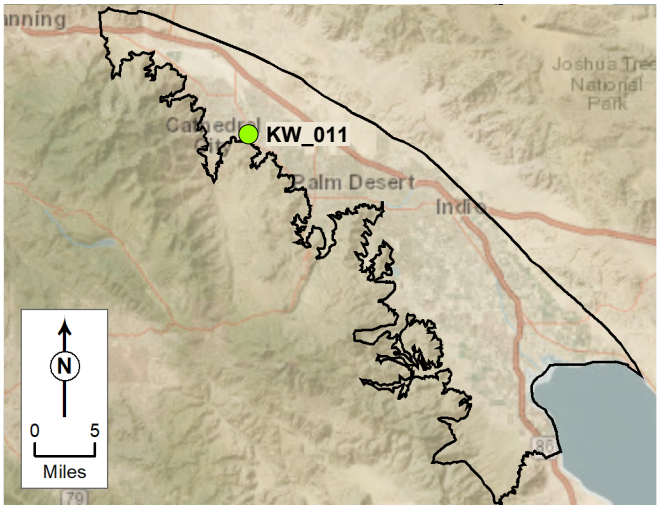
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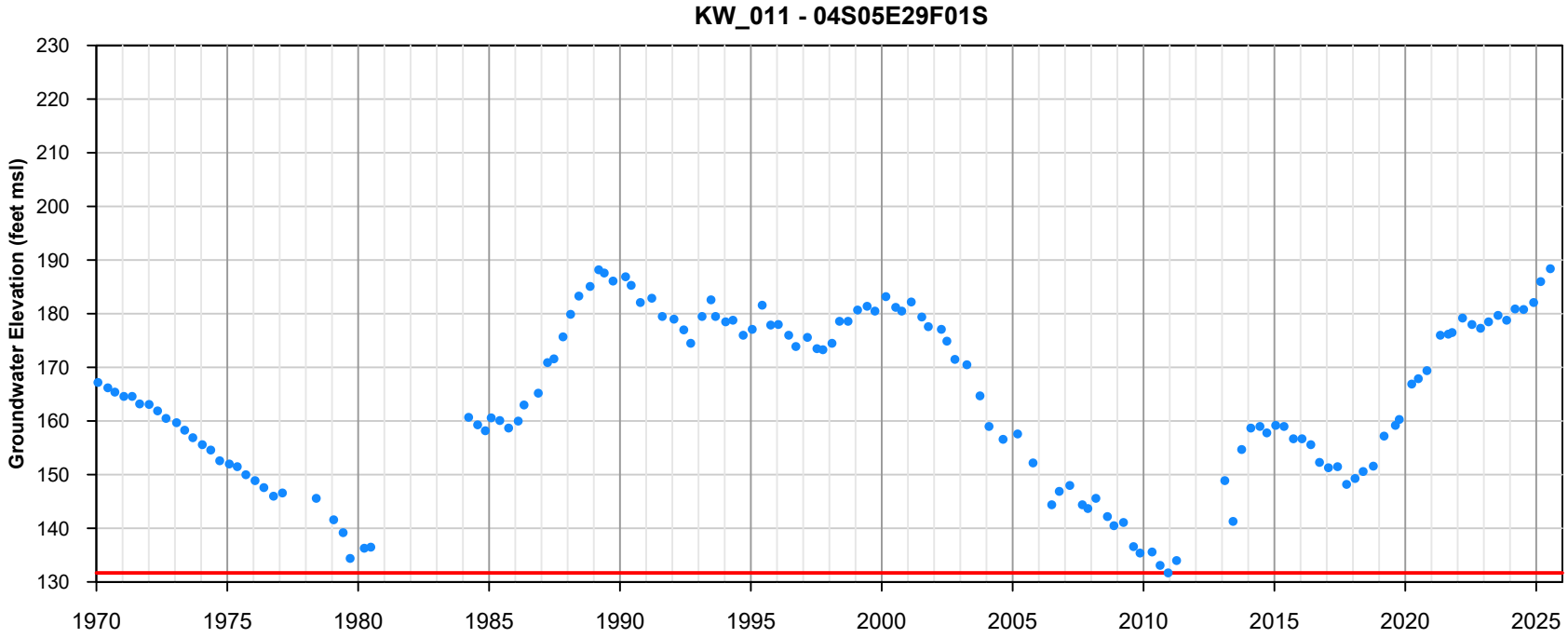
TODD GROUNDWATER

Appendix A-11
Groundwater Elevation Hydrograph
KW_010 - 04S05E28F02S

Well Information

Site Code:	337980N1164880W001
Local Well Name:	KW_011
State Well Name:	04S05E29F001S
Montoring Network Type:	SGMA Representative
Station ID:	56741
Latitude:	33.798
Longitude:	-116.488
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	100
Bottom Perforation (feet bgs):	407
Ground Surface Elevation:	336.3
Reference Point Elevation:	337.6
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

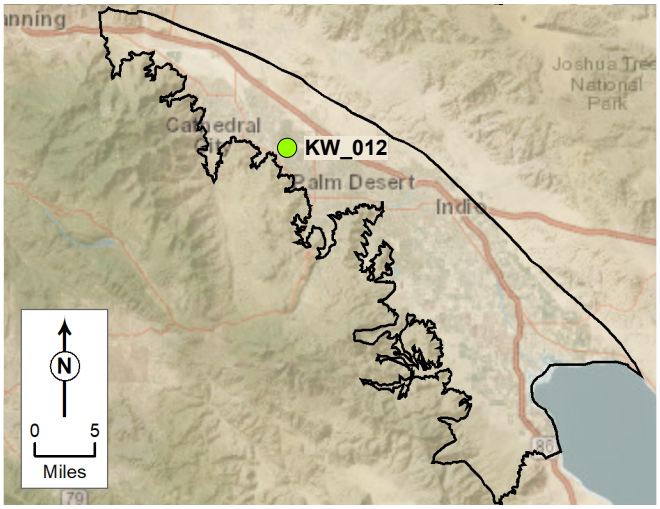
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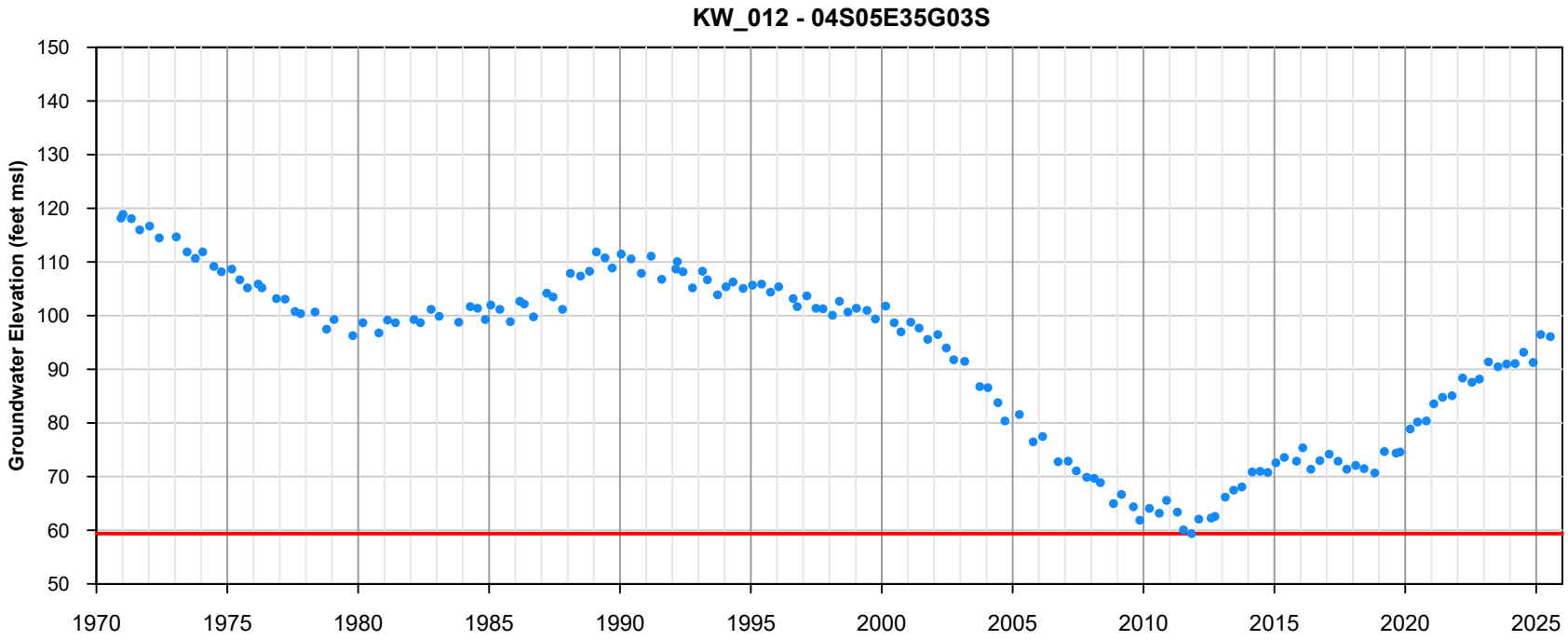
TODD GROUNDWATER

Appendix A-12
Groundwater Elevation Hydrograph
KW_011 - 04S05E29F01S

Well Information

Site Code:	337817N1164312W001
Local Well Name:	KW_012
State Well Name:	04S05E35G003S
Montoring Network Type:	SGMA Representative
Station ID:	47718
Latitude:	33.7817
Longitude:	-116.431
Well Depth (feet bgs):	<Null>
Top Perforation (feet bgs):	267
Bottom Perforation (feet bgs):	268
Ground Surface Elevation:	276.1
Reference Point Elevation:	276.7
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

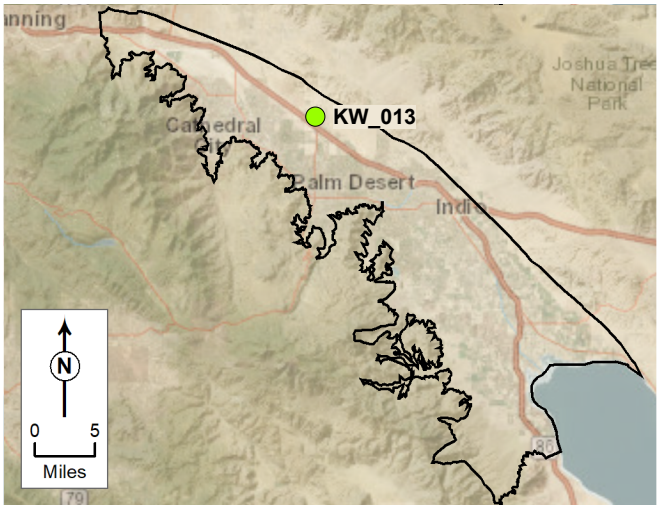
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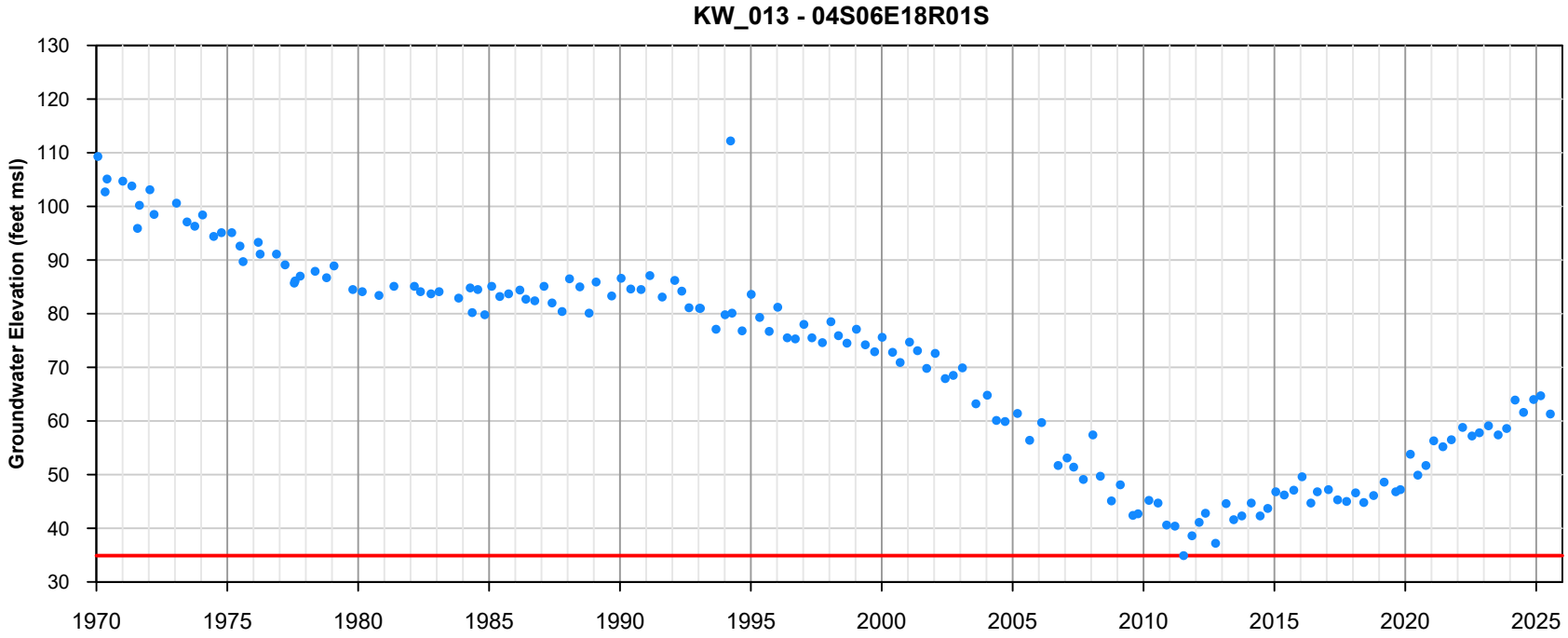
TODD GROUNDWATER

Appendix A-13
Groundwater Elevation Hydrograph
KW_012 - 04S05E35G03S

Well Information

Site Code:	338195N1163903W001
Local Well Name:	KW_013
State Well Name:	04S06E18R001S
Montoring Network Type:	SGMA Representative
Station ID:	47719
Latitude:	33.8195
Longitude:	-116.39
Well Depth (feet bgs):	518
Top Perforation (feet bgs):	479
Bottom Perforation (feet bgs):	518
Ground Surface Elevation:	243.7
Reference Point Elevation:	243.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

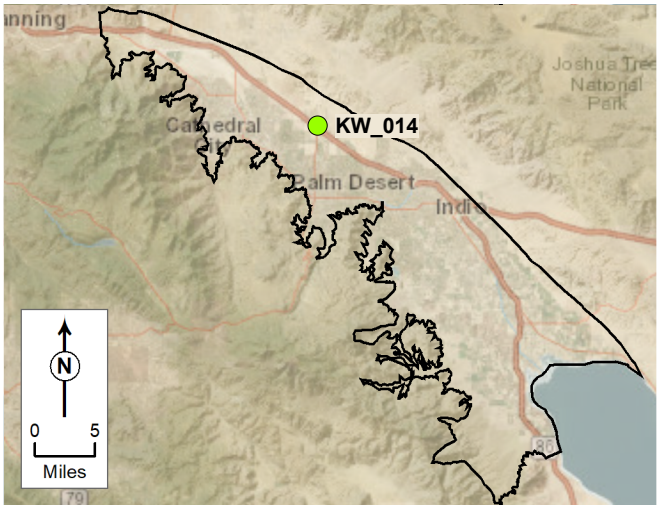
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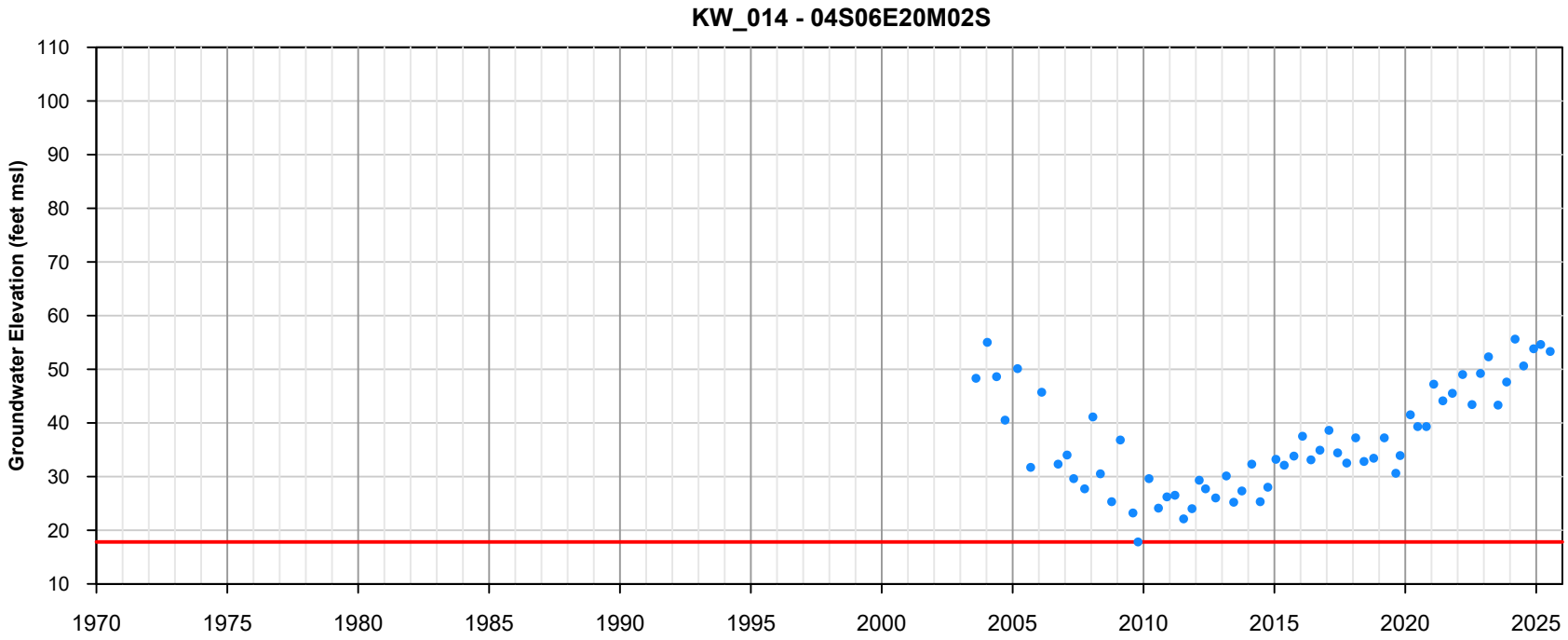
TODD GROUNDWATER

Appendix A-14
Groundwater Elevation Hydrograph
KW_013 - 04S06E18R01S

Well Information

Site Code:	338086N1163878W001
Local Well Name:	KW_014
State Well Name:	04S06E20M002S
Montoring Network Type:	SGMA Representative
Station ID:	56742
Latitude:	33.8087
Longitude:	-116.388
Well Depth (feet bgs):	960
Top Perforation (feet bgs):	460
Bottom Perforation (feet bgs):	960
Ground Surface Elevation:	209.7
Reference Point Elevation:	209.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

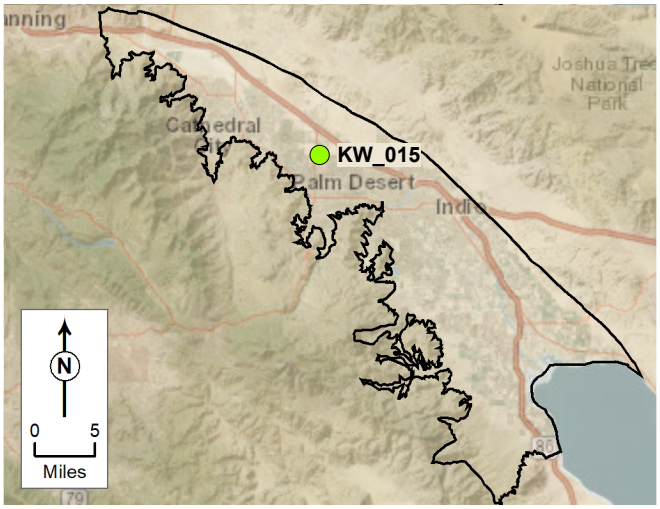
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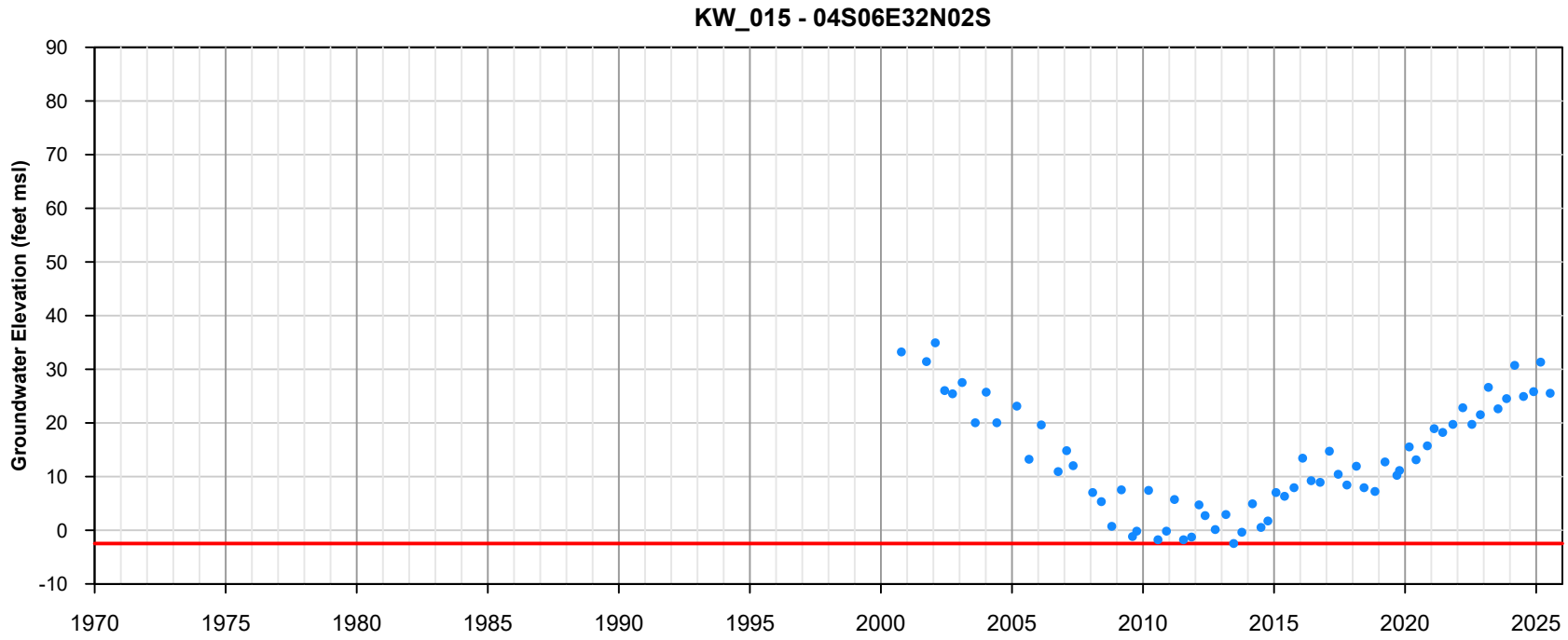
TODD GROUNDWATER

Appendix A-15
Groundwater Elevation Hydrograph
KW_014 - 04S06E20M02S

Well Information

Site Code:	337731N1163848W001
Local Well Name:	KW_015
State Well Name:	04S06E32N002S
Montoring Network Type:	SGMA Representative
Station ID:	56743
Latitude:	33.7732
Longitude:	-116.385
Well Depth (feet bgs):	1320
Top Perforation (feet bgs):	840
Bottom Perforation (feet bgs):	1300
Ground Surface Elevation:	286.1
Reference Point Elevation:	285.8
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

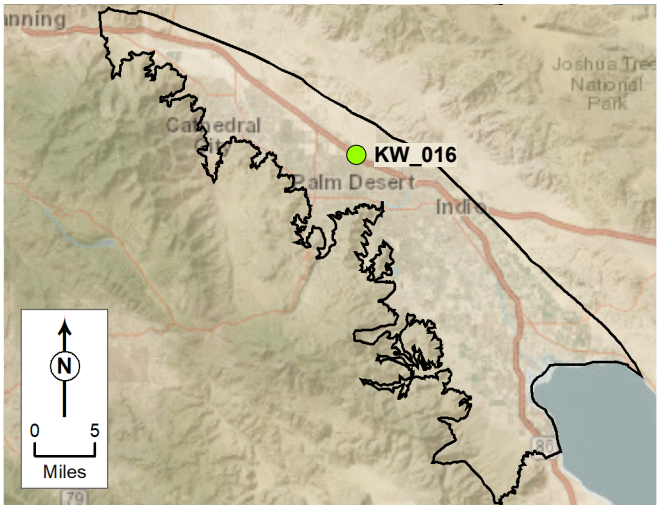
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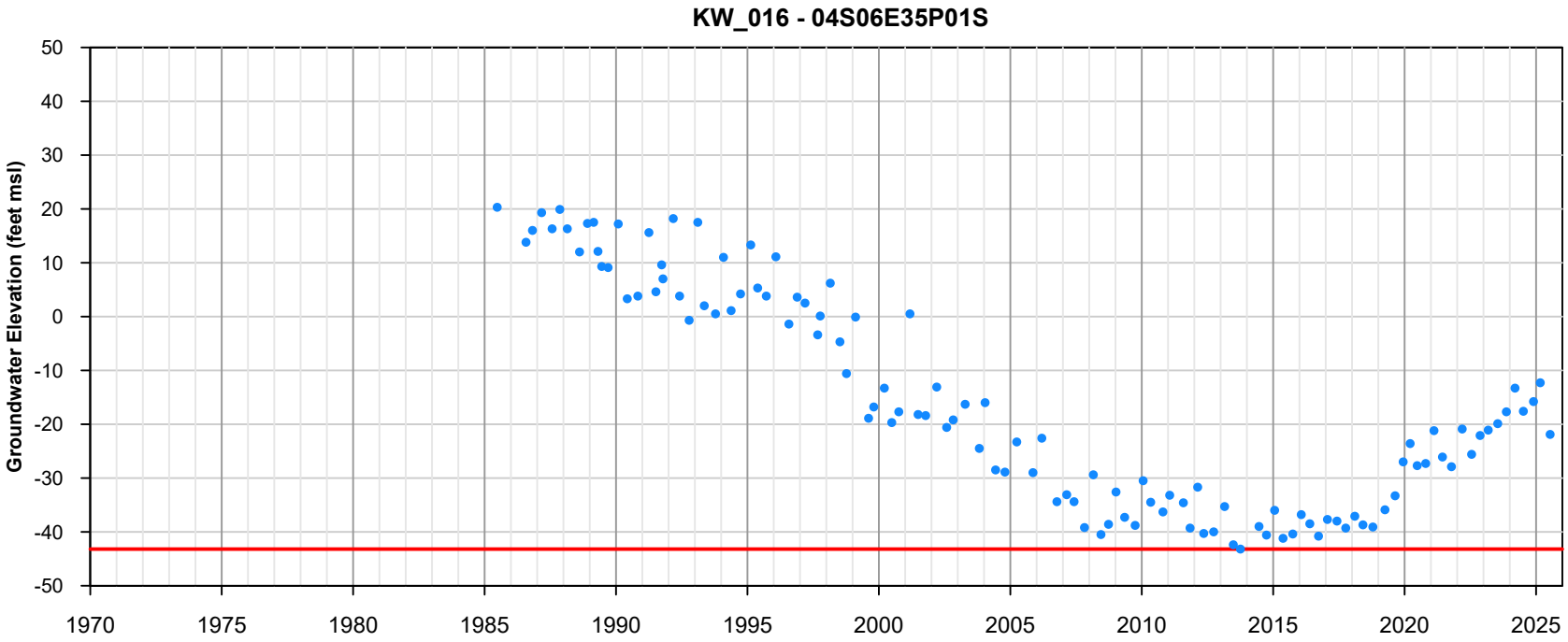
TODD GROUNDWATER

Appendix A-16
Groundwater Elevation Hydrograph
KW_015 - 04S06E32N02S

Well Information

Site Code:	337733N1163308W001
Local Well Name:	KW_016
State Well Name:	04S06E35P001S
Montoring Network Type:	SGMA Representative
Station ID:	47738
Latitude:	33.7733
Longitude:	-116.331
Well Depth (feet bgs):	600
Top Perforation (feet bgs):	500
Bottom Perforation (feet bgs):	600
Ground Surface Elevation:	153.8
Reference Point Elevation:	153.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

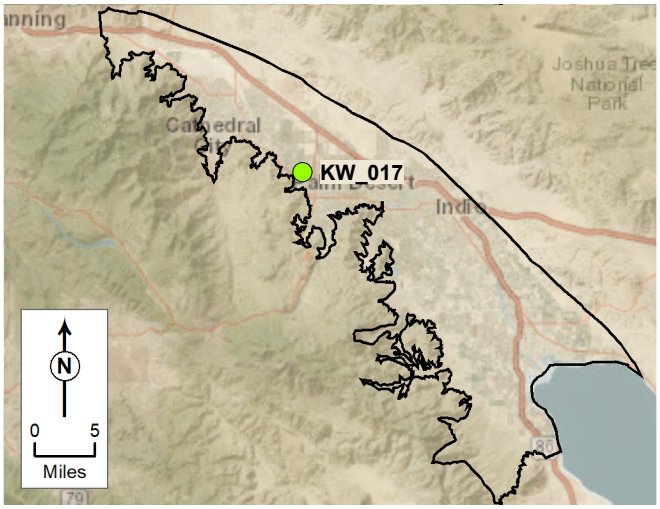
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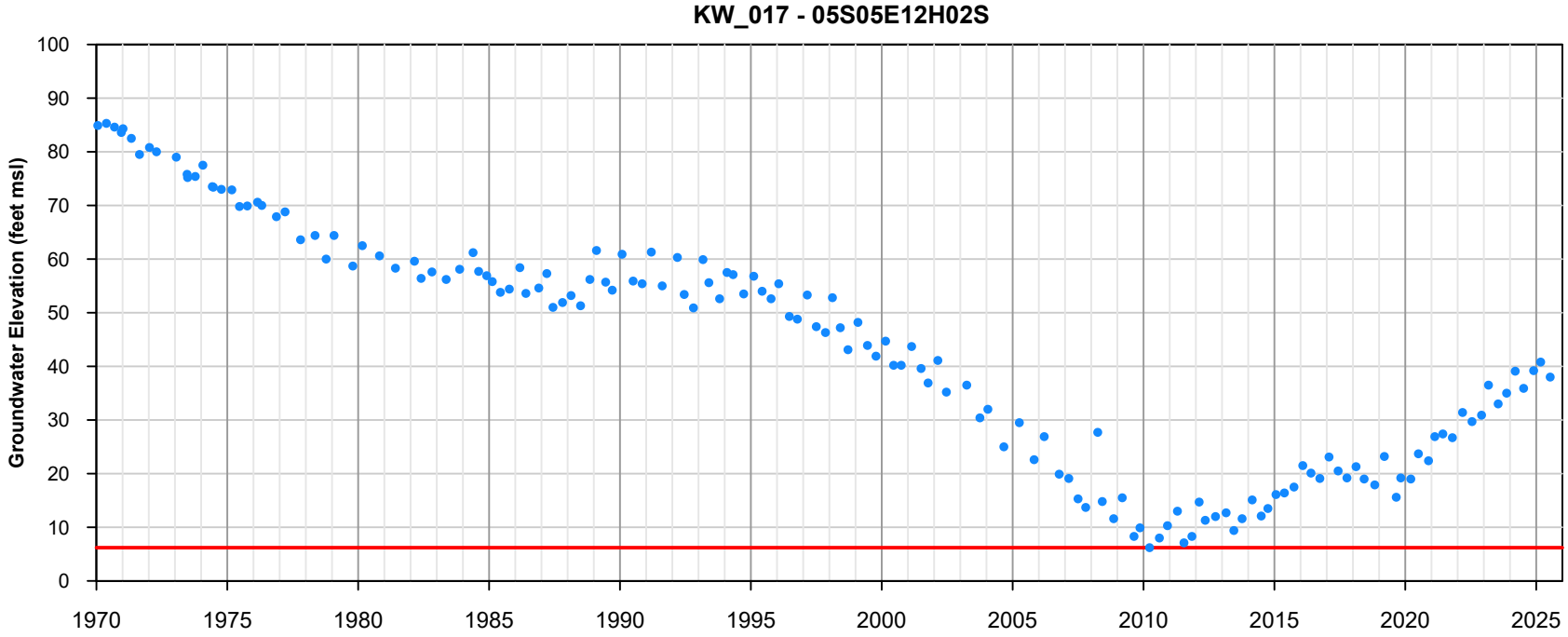
TODD GROUNDWATER

Appendix A-17
Groundwater Elevation Hydrograph
KW_016 - 04S06E35P01S

Well Information

Site Code:	337523N1164096W001
Local Well Name:	KW_017
State Well Name:	05S05E12H002S
Montoring Network Type:	SGMA Representative
Station ID:	56747
Latitude:	33.7524
Longitude:	-116.41
Well Depth (feet bgs):	590
Top Perforation (feet bgs):	432
Bottom Perforation (feet bgs):	590
Ground Surface Elevation:	223.4
Reference Point Elevation:	227.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

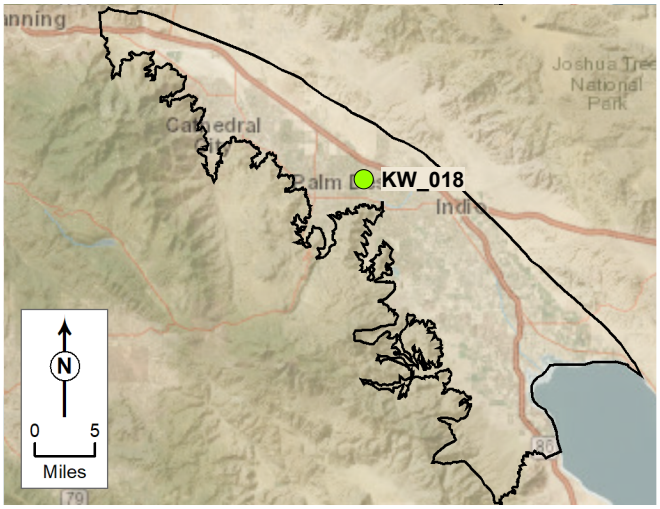
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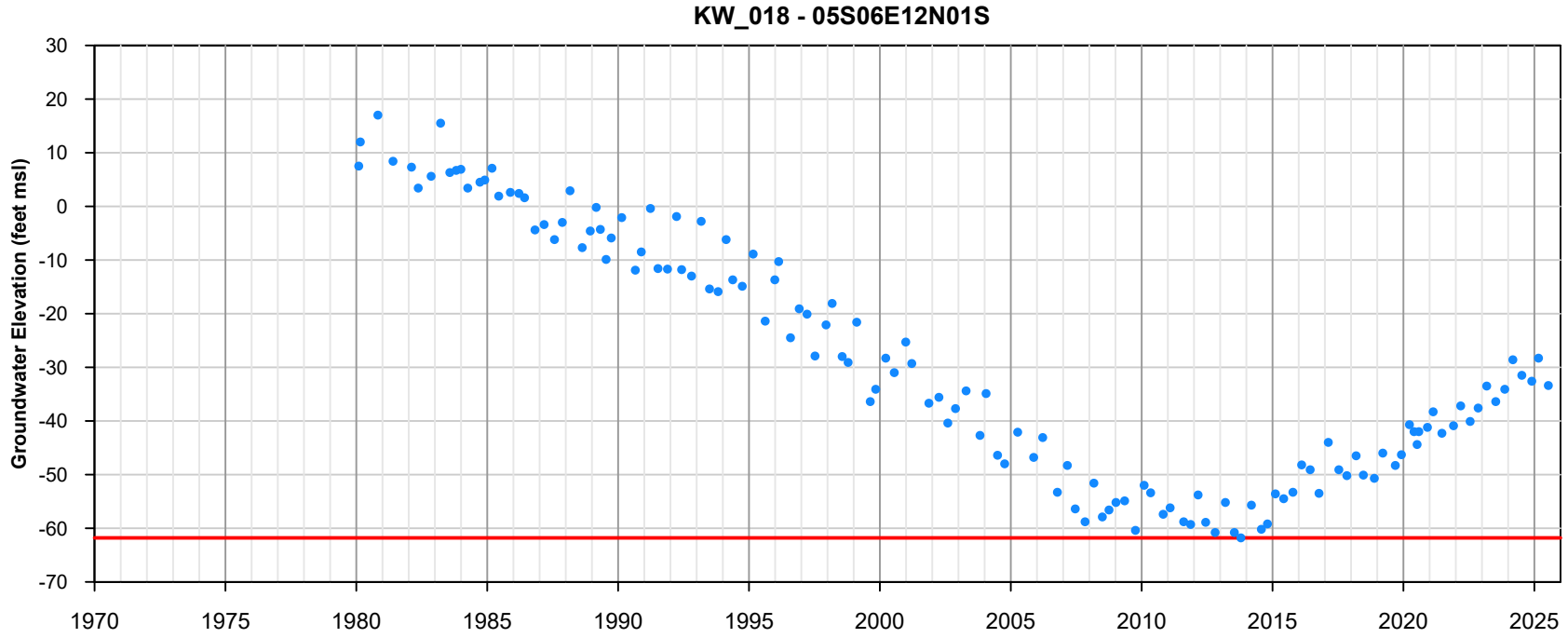
TODD GROUNDWATER

Appendix A-18
Groundwater Elevation Hydrograph
KW_017 - 05S05E12H02S

Well Information

Site Code:	337438N1163210W001
Local Well Name:	KW_018
State Well Name:	05S06E12N001S
Montoring Network Type:	SGMA Representative
Station ID:	56748
Latitude:	33.7439
Longitude:	-116.321
Well Depth (feet bgs):	1010
Top Perforation (feet bgs):	470
Bottom Perforation (feet bgs):	946
Ground Surface Elevation:	181.4
Reference Point Elevation:	182.5
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

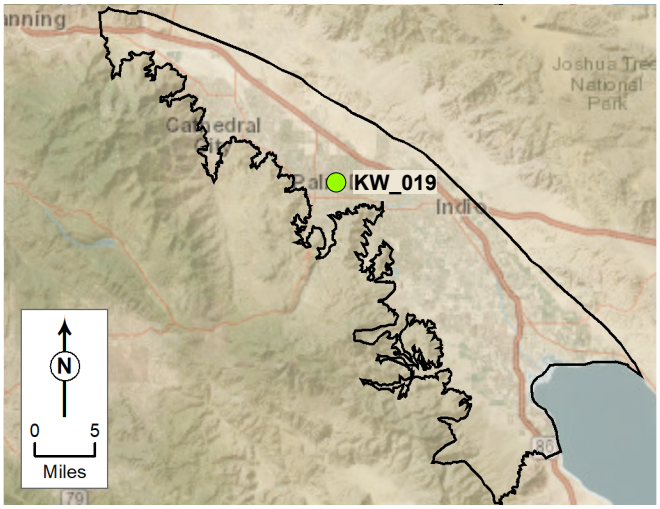
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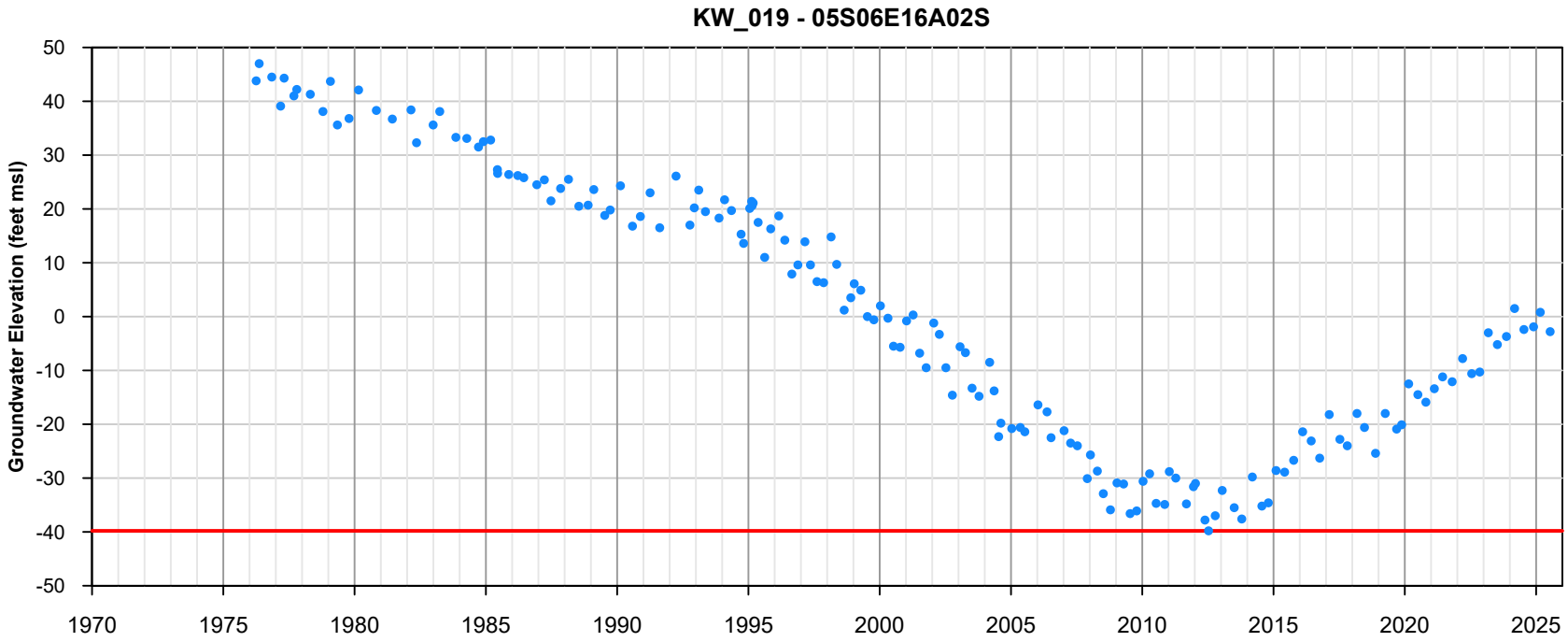
TODD GROUNDWATER

Appendix A-19
Groundwater Elevation Hydrograph
KW_018 - 05S06E12N01S

Well Information

Site Code:	337400N1163608W001
Local Well Name:	KW_019
State Well Name:	05S06E16A002S
Montoring Network Type:	SGMA Representative
Station ID:	56749
Latitude:	33.74
Longitude:	-116.361
Well Depth (feet bgs):	975
Top Perforation (feet bgs):	445
Bottom Perforation (feet bgs):	965
Ground Surface Elevation:	181.8
Reference Point Elevation:	183.3
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

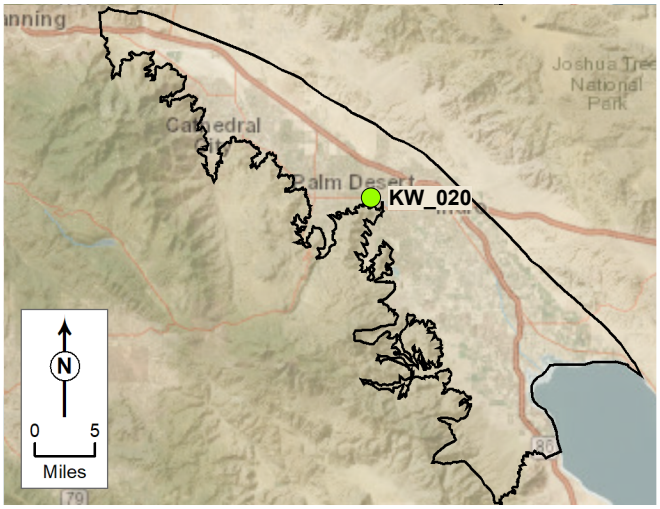
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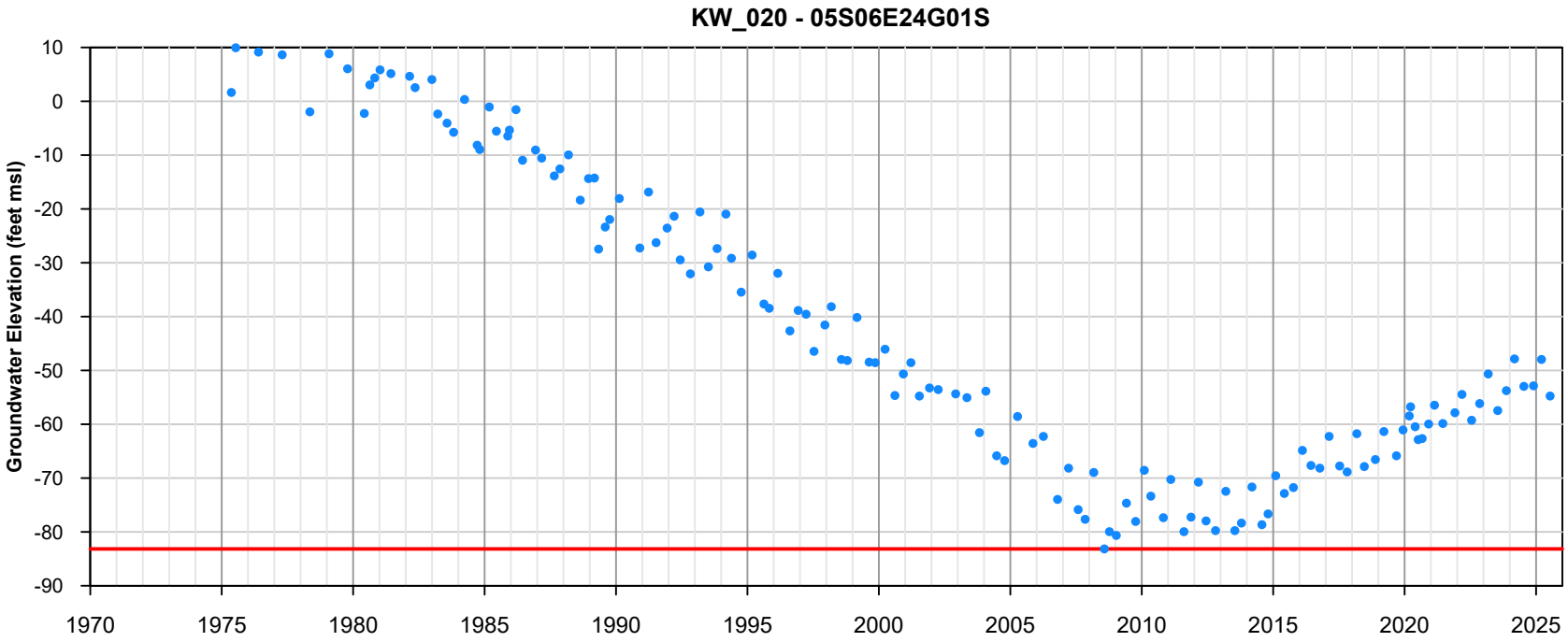
TODD GROUNDWATER

Appendix A-20
Groundwater Elevation Hydrograph
KW_019 - 05S06E16A02S

Well Information

Site Code:	337216N1163105W001
Local Well Name:	KW_020
State Well Name:	05S06E24G001S
Montoring Network Type:	SGMA Representative
Station ID:	56750
Latitude:	33.7217
Longitude:	-116.311
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	480
Bottom Perforation (feet bgs):	930
Ground Surface Elevation:	114.4
Reference Point Elevation:	114.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

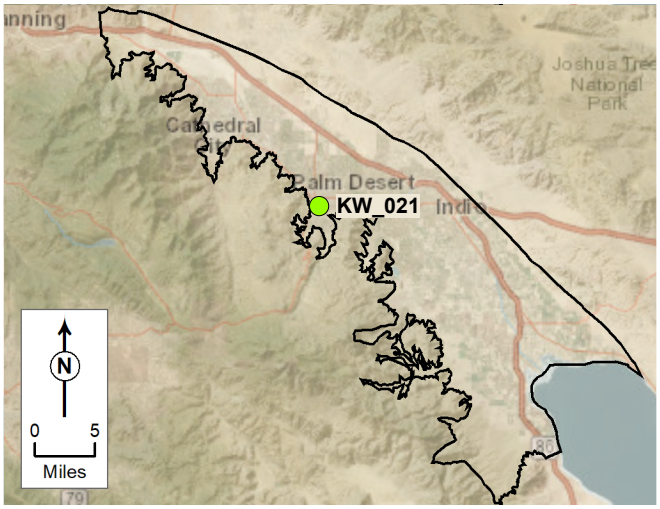
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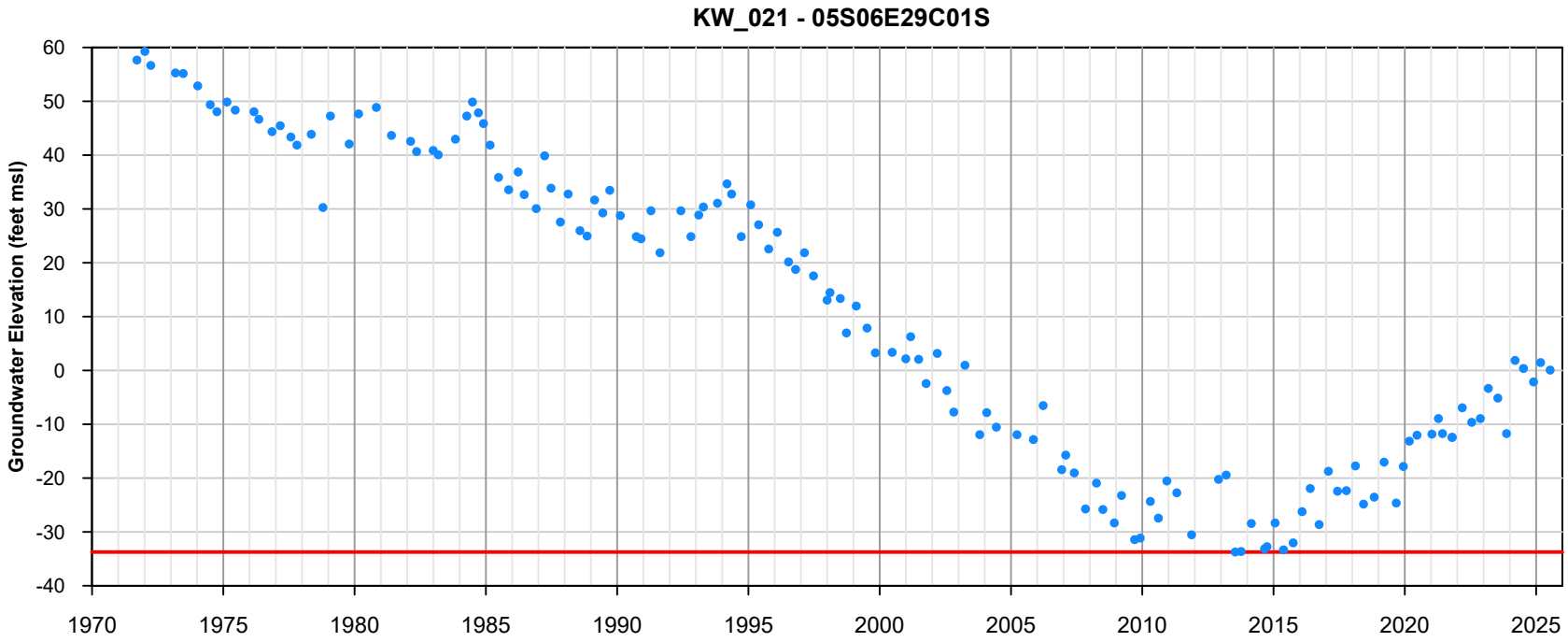
TODD GROUNDWATER

Appendix A-21
Groundwater Elevation Hydrograph
KW_020 - 05S06E24G01S

Well Information

Site Code:	337113N1163847W001
Local Well Name:	KW_021
State Well Name:	05S06E29C001S
Montoring Network Type:	SGMA Representative
Station ID:	50569
Latitude:	33.7113
Longitude:	-116.385
Well Depth (feet bgs):	531
Top Perforation (feet bgs):	243
Bottom Perforation (feet bgs):	531
Ground Surface Elevation:	338.9
Reference Point Elevation:	339.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

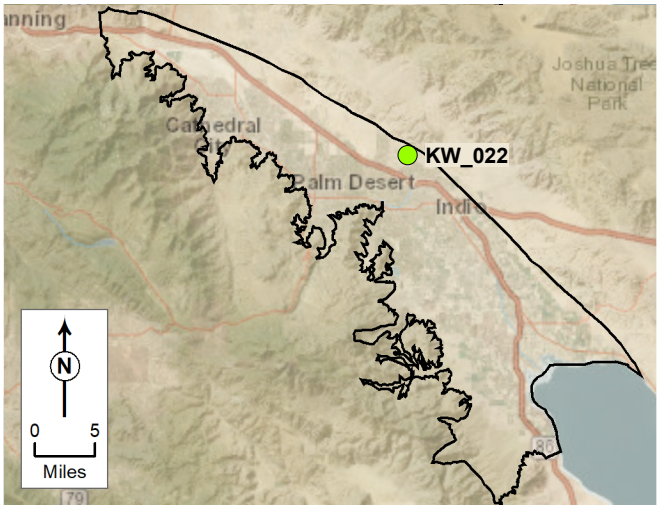
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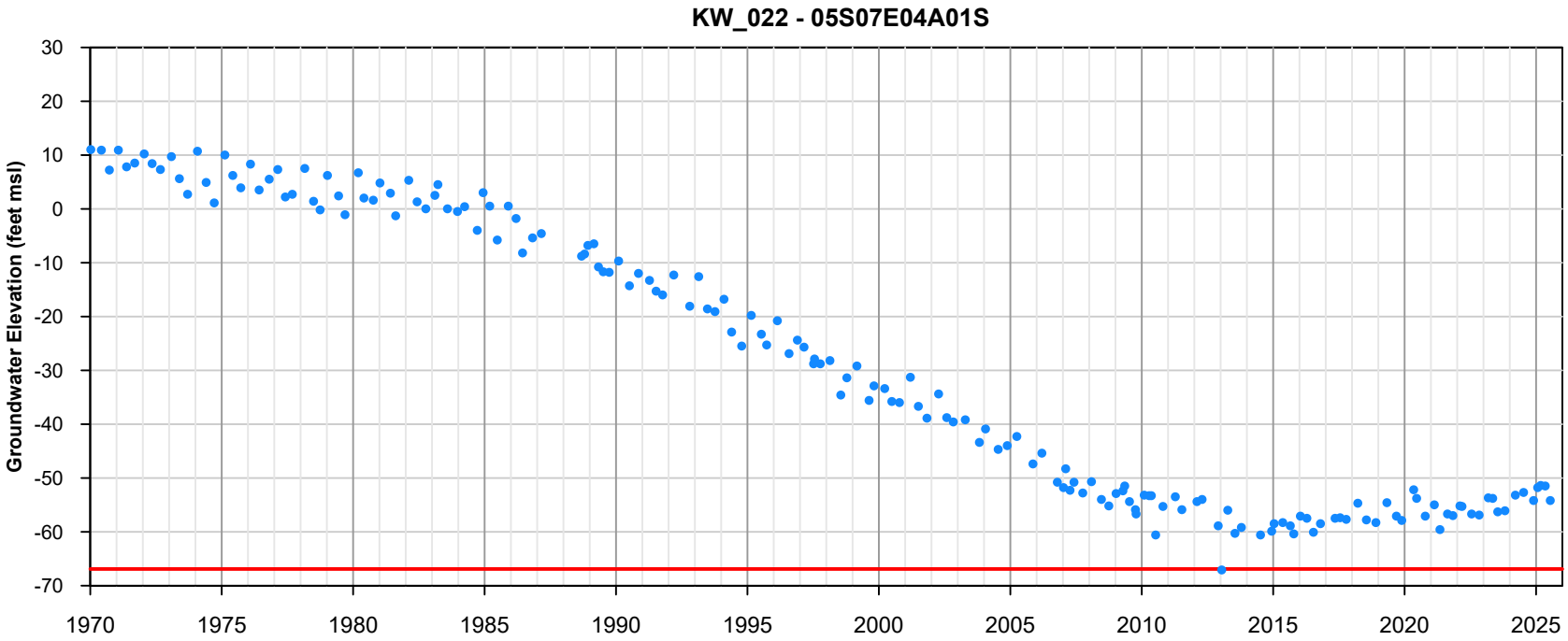
TODD GROUNDWATER

Appendix A-22
Groundwater Elevation Hydrograph
KW_021 - 05S06E29C01S

Well Information

Site Code:	337730N1162575W001
Local Well Name:	KW_022
State Well Name:	05S07E04A001S
Montoring Network Type:	SGMA Representative
Station ID:	56751
Latitude:	33.773
Longitude:	-116.258
Well Depth (feet bgs):	380
Top Perforation (feet bgs):	147
Bottom Perforation (feet bgs):	367
Ground Surface Elevation:	49.9
Reference Point Elevation:	50.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

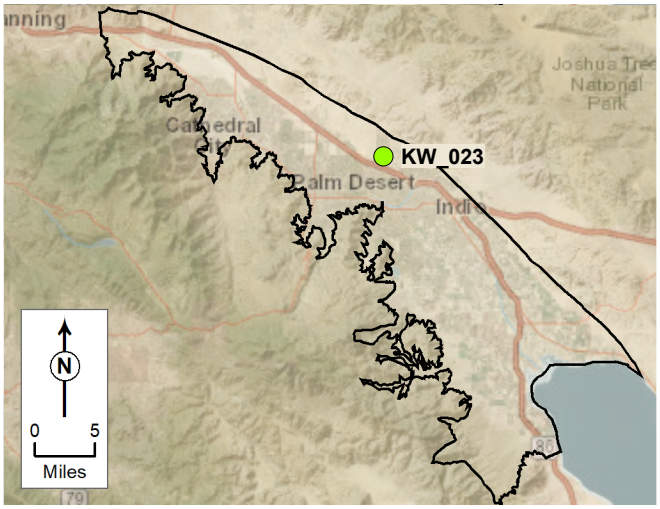
January 2026

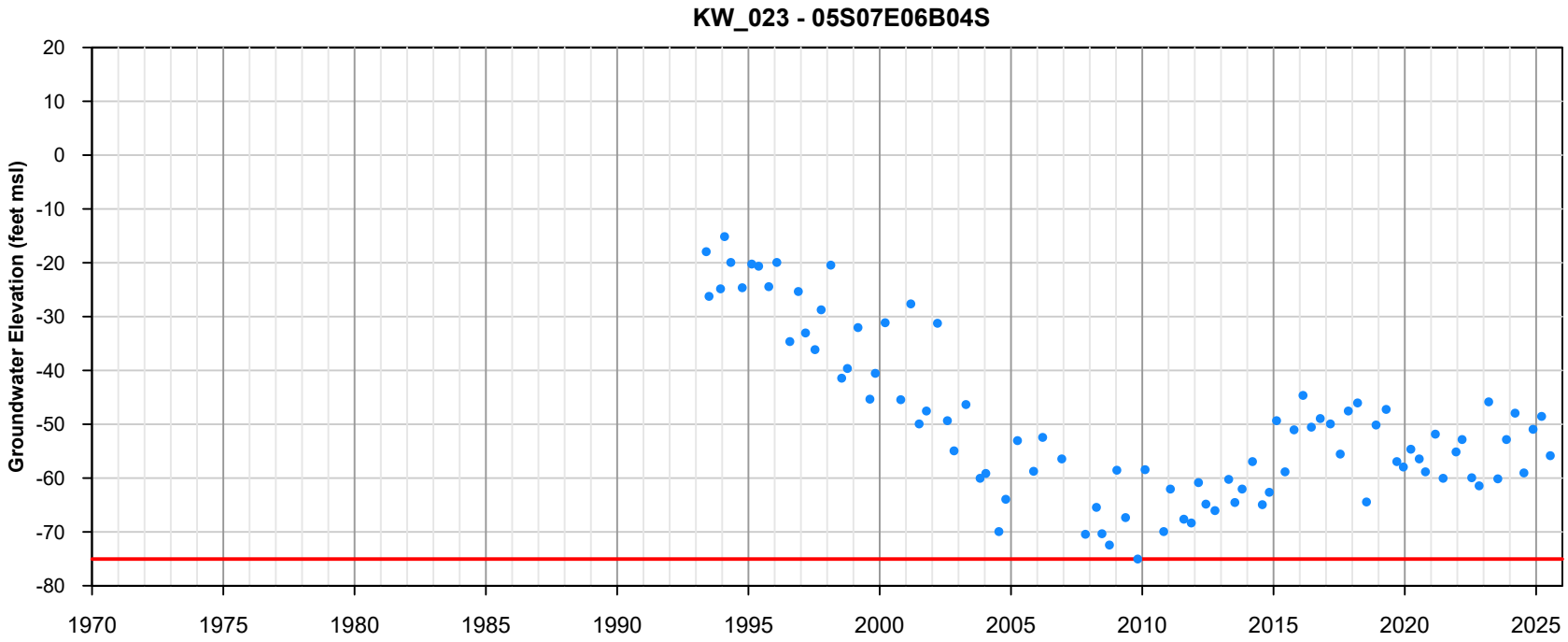
TODD GROUNDWATER

Appendix A-23
Groundwater Elevation Hydrograph
KW_022 - 05S07E04A01S

Well Information

Site Code:	337715N1162925W001
Local Well Name:	KW_023
State Well Name:	05S07E06B004S
Montoring Network Type:	SGMA Representative
Station ID:	56752
Latitude:	33.7715
Longitude:	-116.293
Well Depth (feet bgs):	1015
Top Perforation (feet bgs):	540
Bottom Perforation (feet bgs):	860
Ground Surface Elevation:	113.4
Reference Point Elevation:	114.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

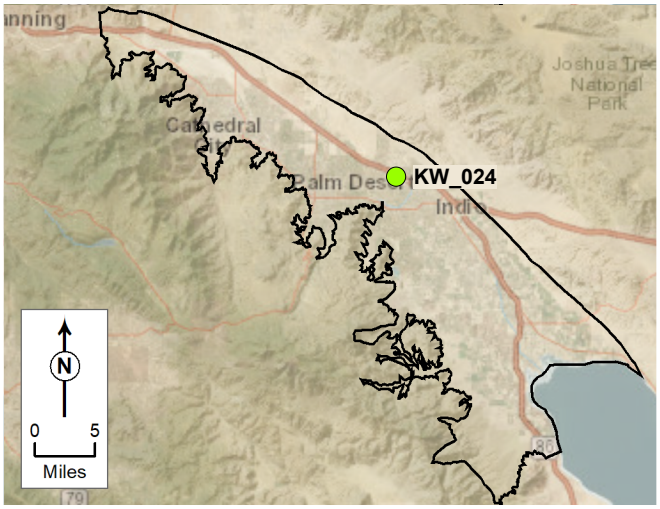
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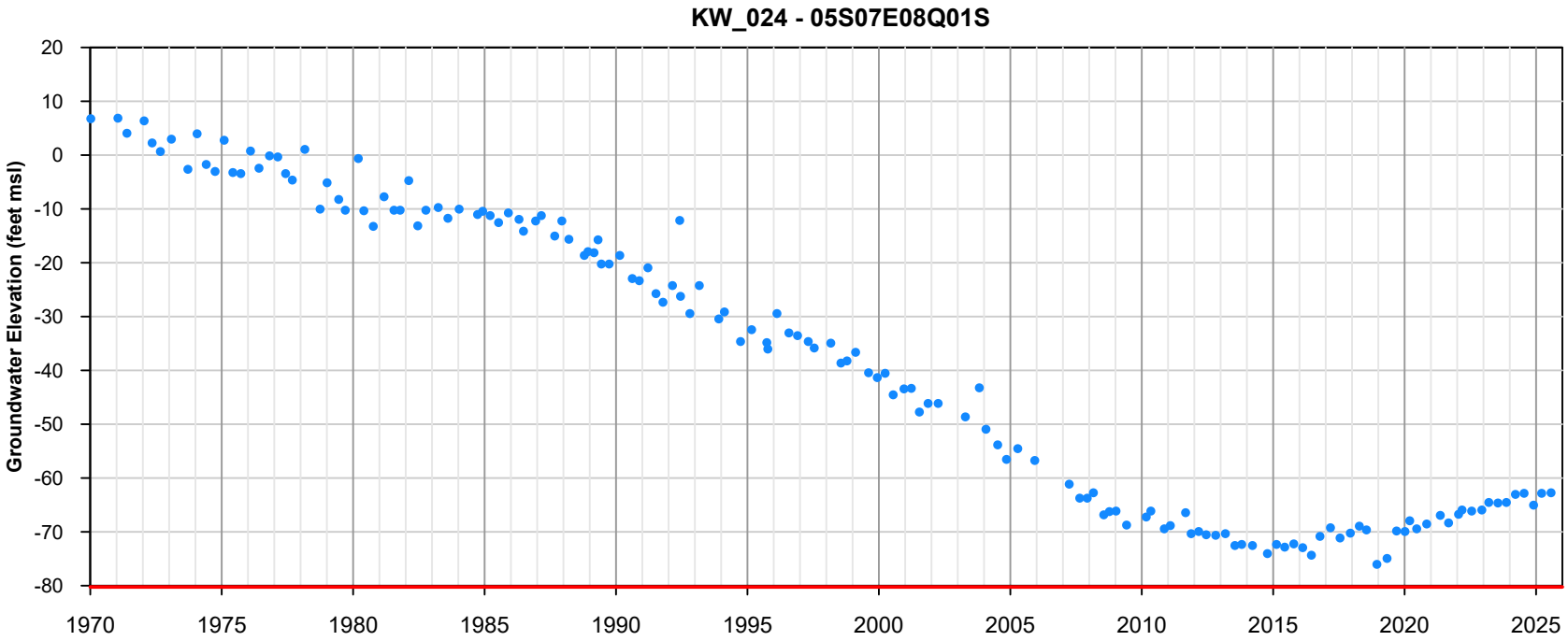
TODD GROUNDWATER

Appendix A-24
Groundwater Elevation Hydrograph
KW_023 - 05S07E06B04S

Well Information

Site Code:	337470N1162733W001
Local Well Name:	KW_024
State Well Name:	05S07E08Q001S
Montoring Network Type:	SGMA Representative
Station ID:	47750
Latitude:	33.747
Longitude:	-116.273
Well Depth (feet bgs):	<Null>
Top Perforation (feet bgs):	203
Bottom Perforation (feet bgs):	654
Ground Surface Elevation:	57.8
Reference Point Elevation:	58.3
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

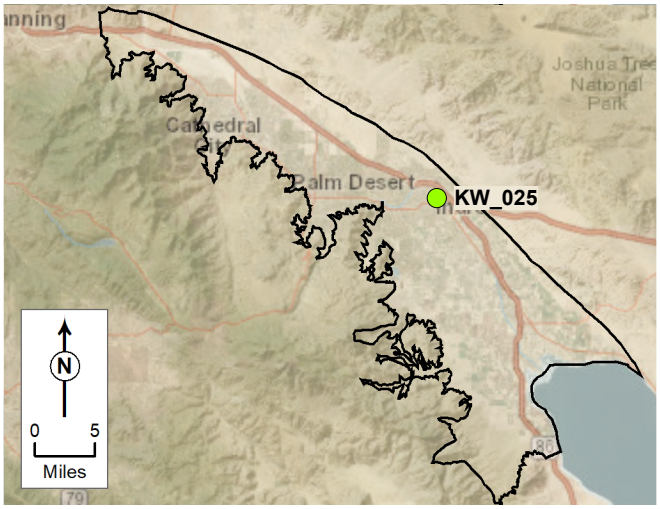
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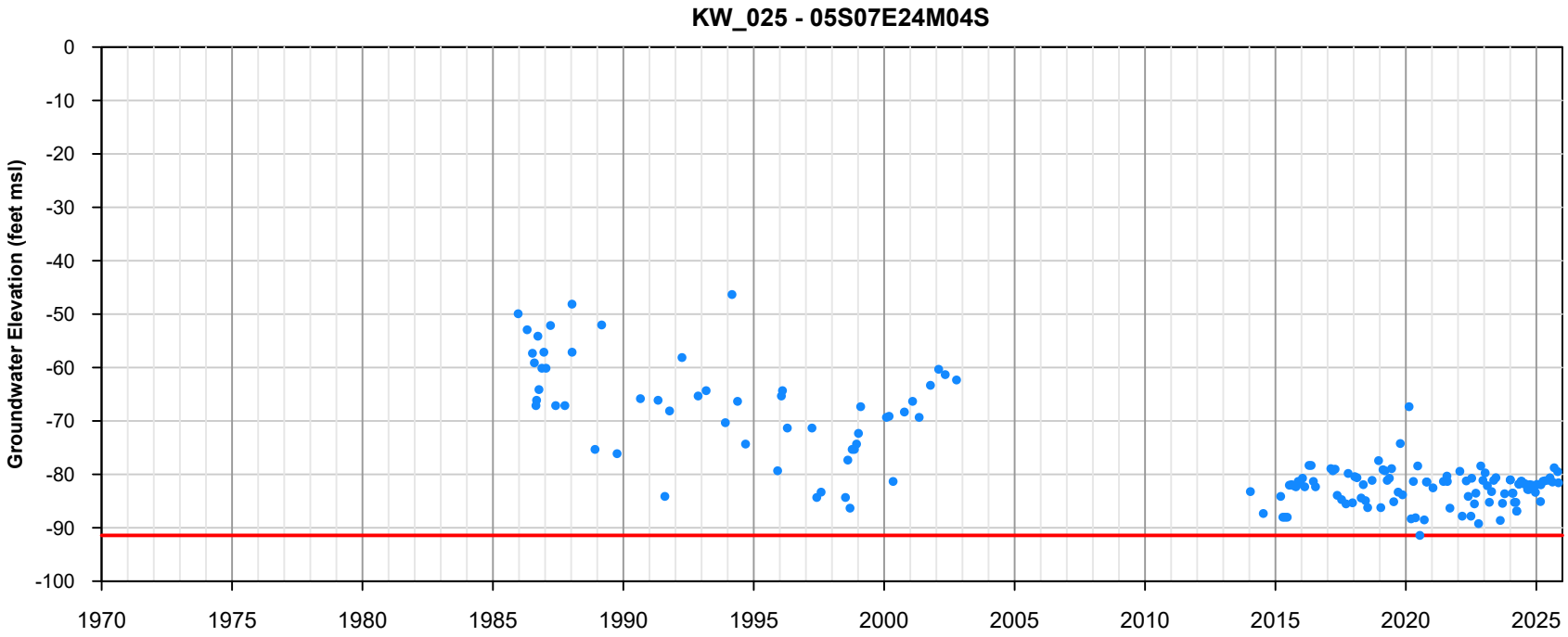
TODD GROUNDWATER

Appendix A-25
Groundwater Elevation Hydrograph
KW_024 - 05S07E08Q01S

Well Information

Site Code:	337210N1162143W001
Local Well Name:	KW_025
State Well Name:	05S07E24M004S
Montoring Network Type:	SGMA Representative
Station ID:	56758
Latitude:	33.7211
Longitude:	-116.214
Well Depth (feet bgs):	660
Top Perforation (feet bgs):	250
Bottom Perforation (feet bgs):	660
Ground Surface Elevation:	-16.328
Reference Point Elevation:	-16.328
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

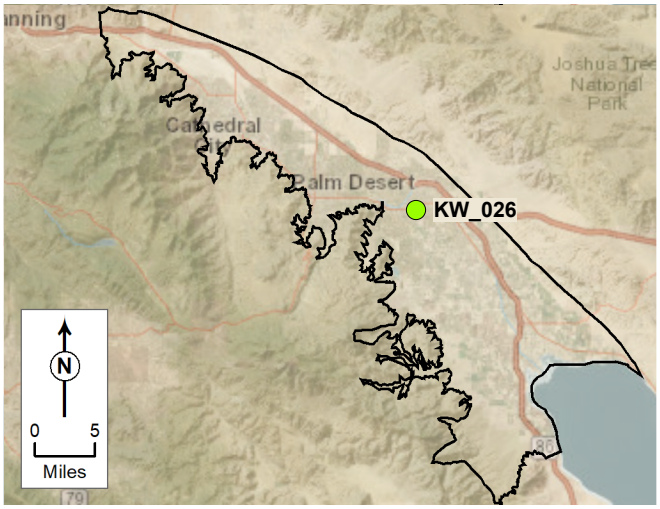
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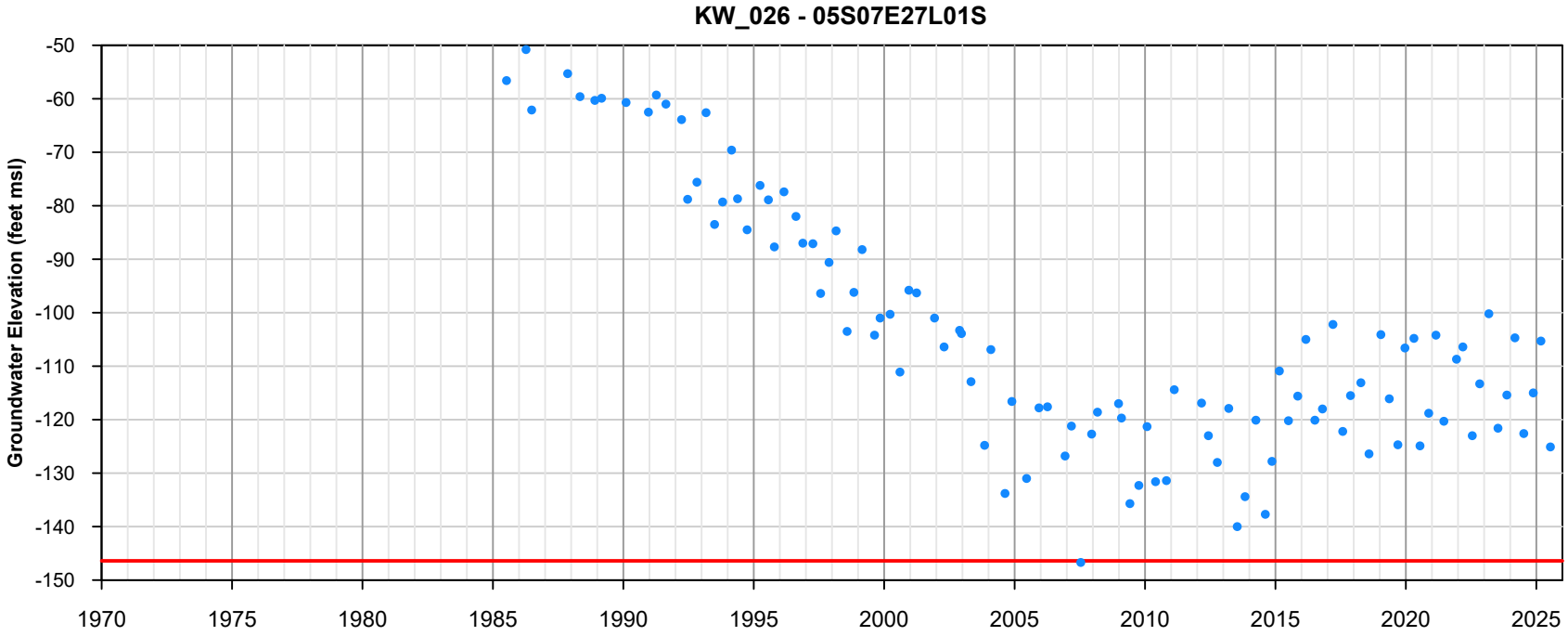
TODD GROUNDWATER

Appendix A-26
Groundwater Elevation Hydrograph
KW_025 - 05S07E24M04S

Well Information

Site Code:	337066N1162453W001
Local Well Name:	KW_026
State Well Name:	05S07E27L001S
Montoring Network Type:	SGMA Representative
Station ID:	56759
Latitude:	33.7067
Longitude:	-116.245
Well Depth (feet bgs):	615
Top Perforation (feet bgs):	516
Bottom Perforation (feet bgs):	600
Ground Surface Elevation:	22.6
Reference Point Elevation:	22.6
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

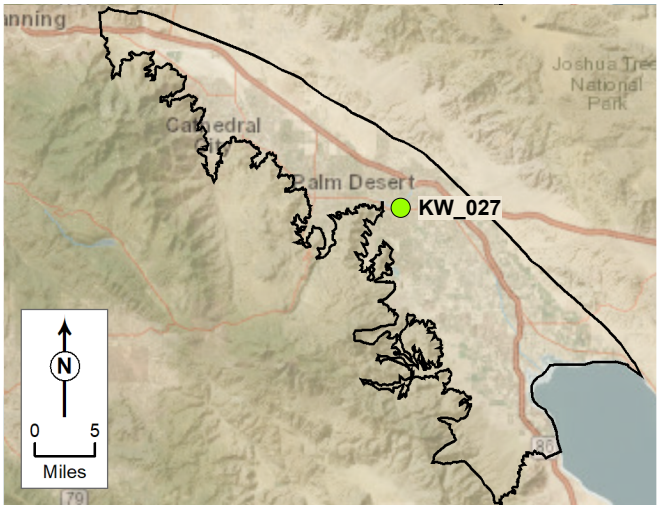
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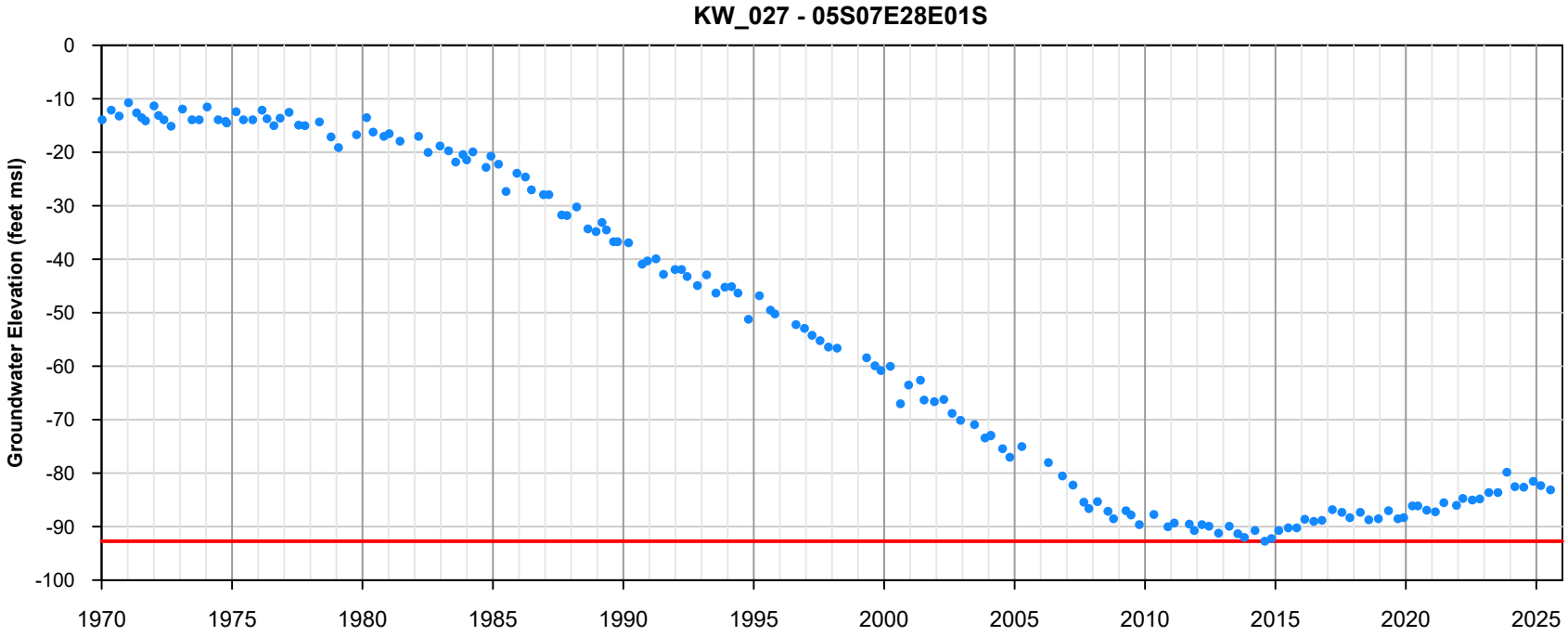
TODD GROUNDWATER

Appendix A-27
Groundwater Elevation Hydrograph
KW_026 - 05S07E27L01S

Well Information

Site Code:	337093N1162675W001
Local Well Name:	KW_027
State Well Name:	05S07E28E001S
Montoring Network Type:	SGMA Representative
Station ID:	56760
Latitude:	33.7094
Longitude:	-116.268
Well Depth (feet bgs):	198
Top Perforation (feet bgs):	128
Bottom Perforation (feet bgs):	192
Ground Surface Elevation:	49.1
Reference Point Elevation:	50.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

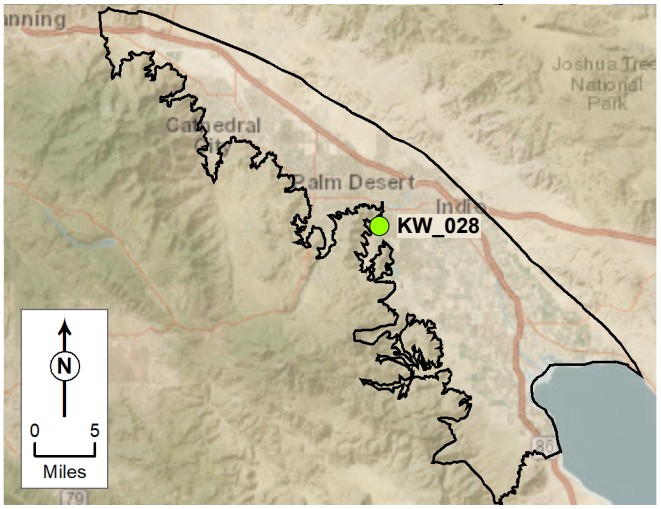
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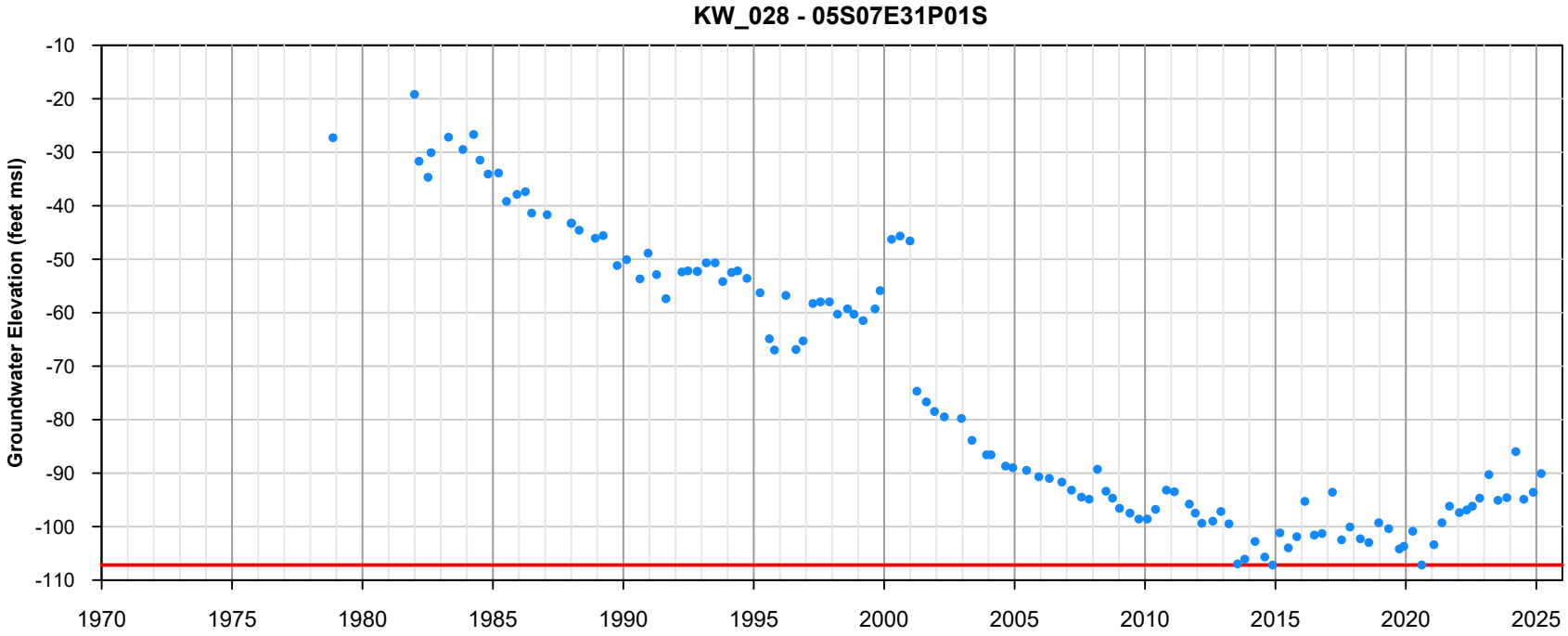
TODD GROUNDWATER

Appendix A-28
Groundwater Elevation Hydrograph
KW_027 - 05S07E28E01S

Well Information

Site Code:	336873N1162983W001
Local Well Name:	KW_028
State Well Name:	05S07E31P001S
Montoring Network Type:	SGMA Representative
Station ID:	56761
Latitude:	33.6874
Longitude:	-116.298
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	110
Bottom Perforation (feet bgs):	680
Ground Surface Elevation:	47.3
Reference Point Elevation:	49.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

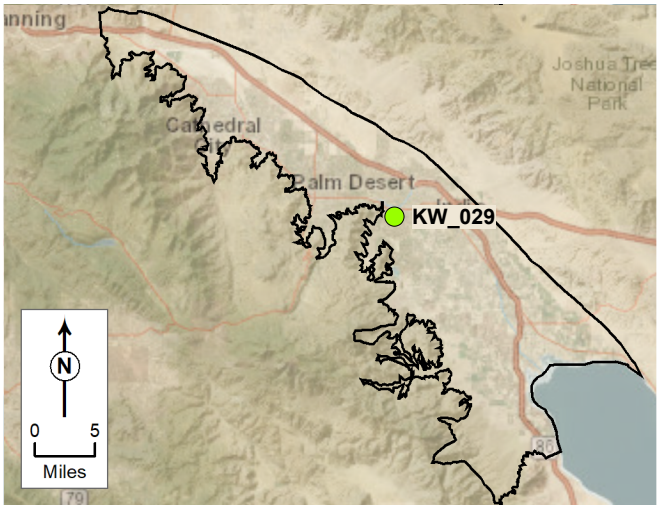
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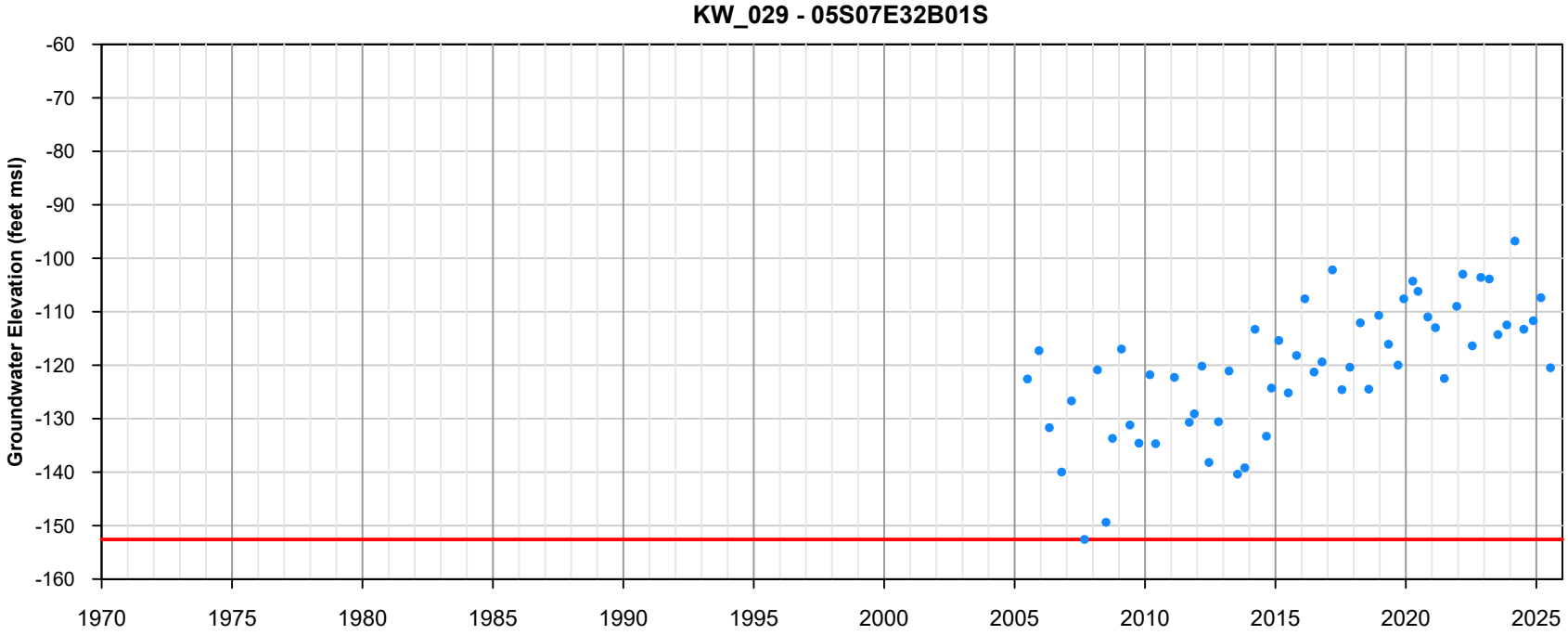
TODD GROUNDWATER

Appendix A-29
Groundwater Elevation Hydrograph
KW_028 - 05S07E31P01S

Well Information

Site Code:	336986N1162765W001
Local Well Name:	KW_029
State Well Name:	05S07E32B001S
Montoring Network Type:	SGMA Representative
Station ID:	56762
Latitude:	33.6987
Longitude:	-116.277
Well Depth (feet bgs):	1450
Top Perforation (feet bgs):	1010
Bottom Perforation (feet bgs):	1430
Ground Surface Elevation:	56.3
Reference Point Elevation:	56
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

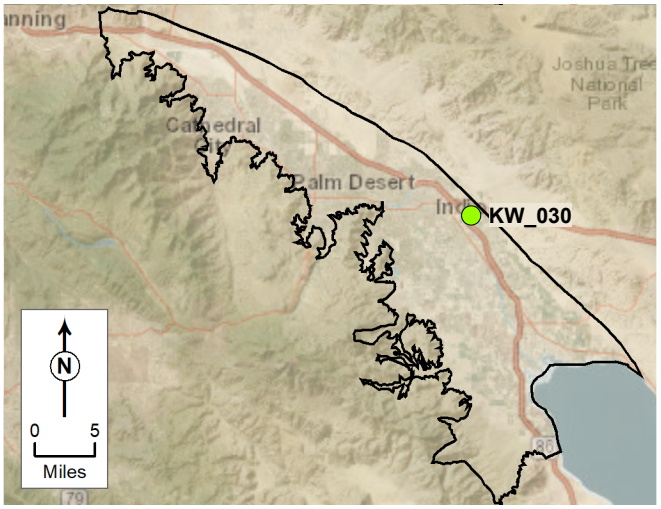
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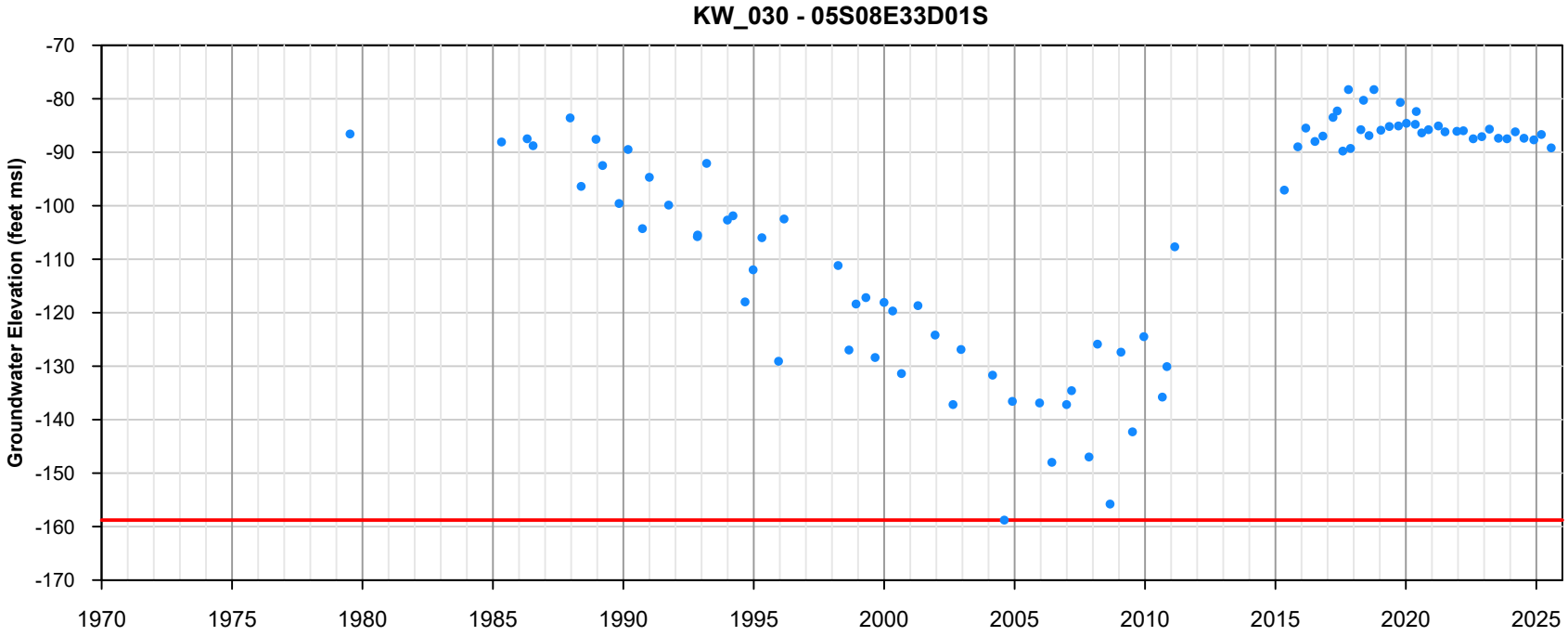
TODD GROUNDWATER

Appendix A-30
Groundwater Elevation Hydrograph
KW_029 - 05S07E32B01S

Well Information

Site Code:	337000N1161646W001
Local Well Name:	KW_030
State Well Name:	05S08E33D001S
Montoring Network Type:	SGMA Representative
Station ID:	56763
Latitude:	33.7
Longitude:	-116.165
Well Depth (feet bgs):	832
Top Perforation (feet bgs):	521
Bottom Perforation (feet bgs):	810
Ground Surface Elevation:	-55.2
Reference Point Elevation:	-55.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

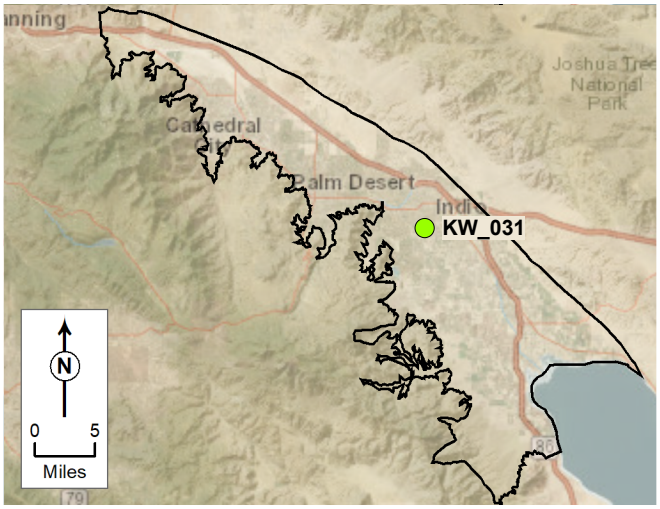
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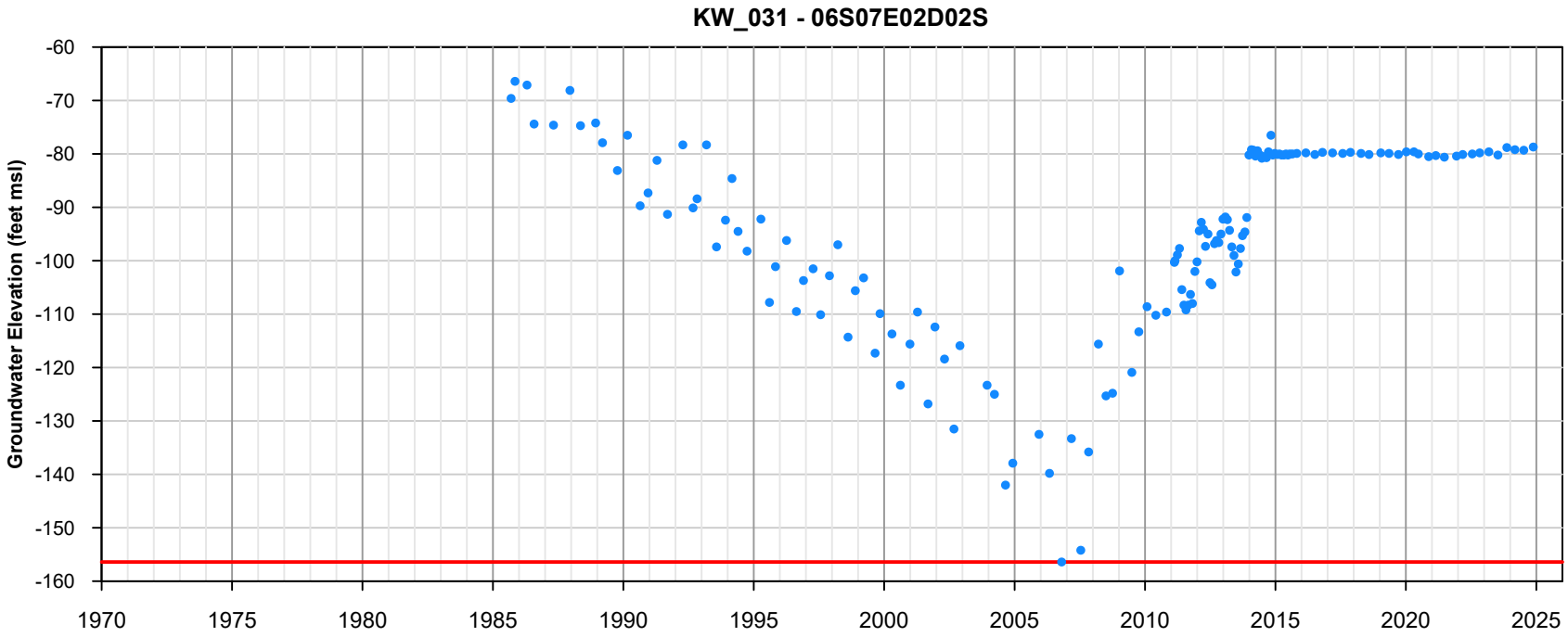
TODD GROUNDWATER

Appendix A-31
Groundwater Elevation Hydrograph
KW_030 - 05S08E33D01S

Well Information

Site Code:	336848N1162328W001
Local Well Name:	KW_031
State Well Name:	06S07E02D002S
Montoring Network Type:	SGMA Representative
Station ID:	56764
Latitude:	33.6849
Longitude:	-116.233
Well Depth (feet bgs):	320
Top Perforation (feet bgs):	<Null>
Bottom Perforation (feet bgs):	<Null>
Ground Surface Elevation:	-0.4
Reference Point Elevation:	-0.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

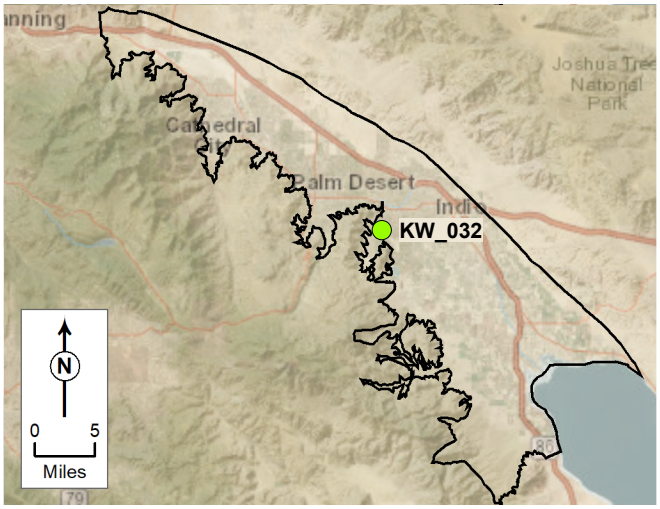
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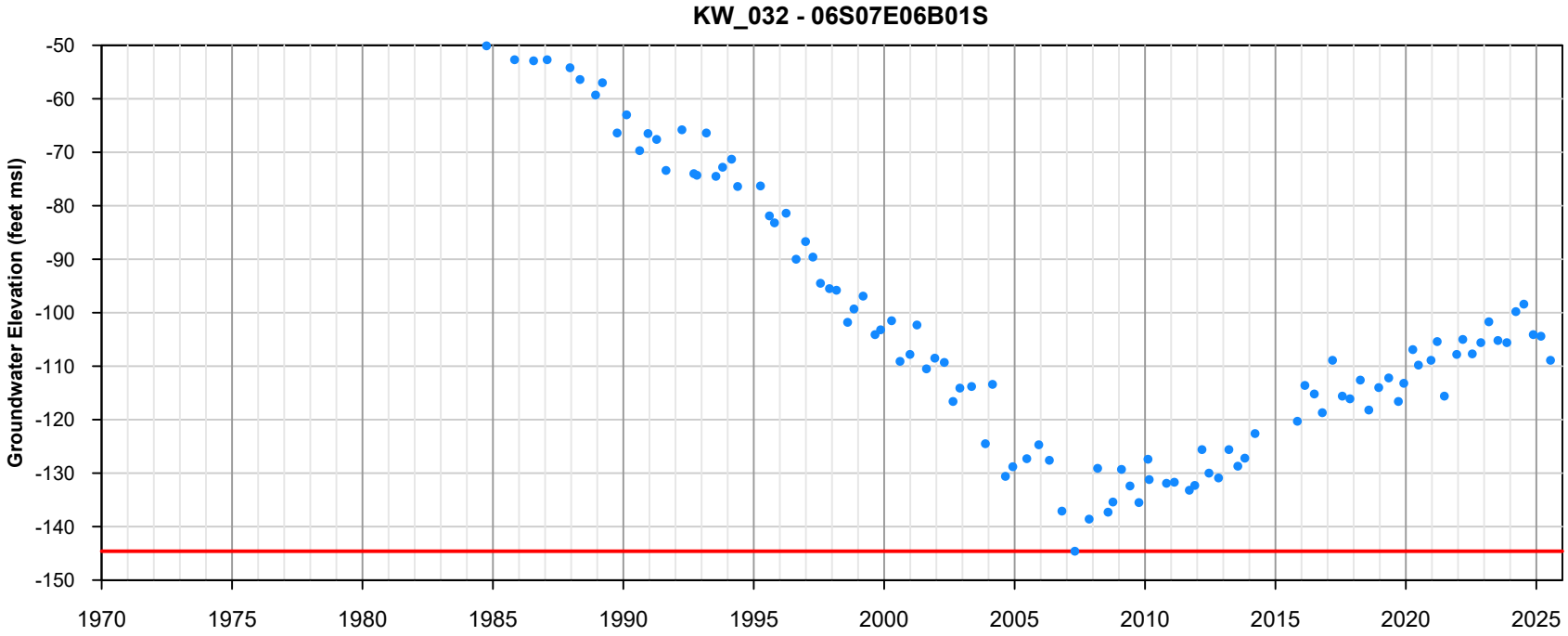
TODD GROUNDWATER

Appendix A-32
Groundwater Elevation Hydrograph
KW_031 - 06S07E02D02S

Well Information

Site Code:	336823N1162948W001
Local Well Name:	KW_032
State Well Name:	06S07E06B001S
Montoring Network Type:	SGMA Representative
Station ID:	56765
Latitude:	33.6824
Longitude:	-116.295
Well Depth (feet bgs):	832
Top Perforation (feet bgs):	580
Bottom Perforation (feet bgs):	800
Ground Surface Elevation:	41.1
Reference Point Elevation:	41.6
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

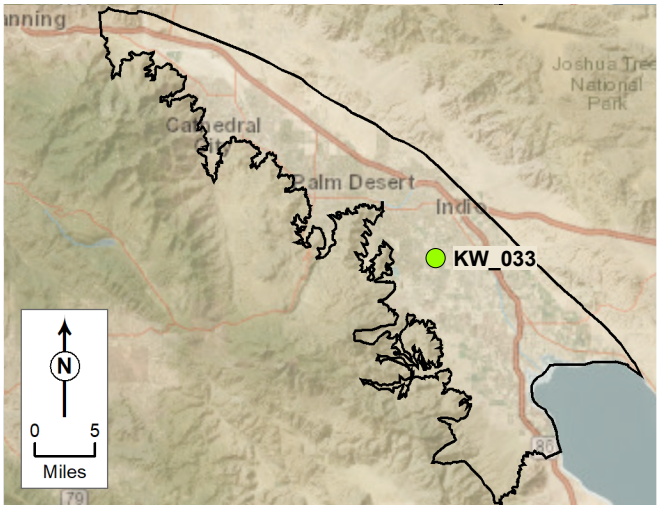
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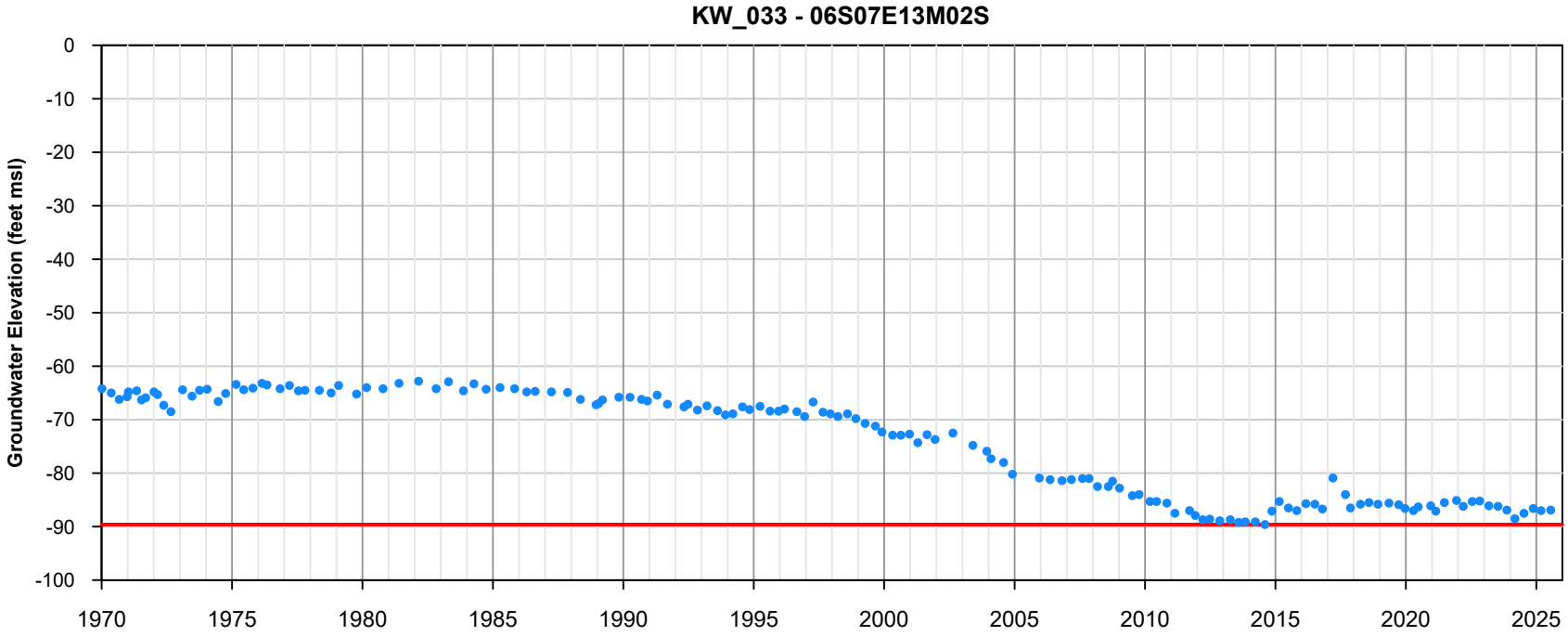
TODD GROUNDWATER

Appendix A-33
Groundwater Elevation Hydrograph
KW_032 - 06S07E06B01S

Well Information

Site Code:	336485N1162162W001
Local Well Name:	KW_033
State Well Name:	06S07E13M002S
Montoring Network Type:	SGMA Representative
Station ID:	47733
Latitude:	33.6485
Longitude:	-116.216
Well Depth (feet bgs):	387
Top Perforation (feet bgs):	146
Bottom Perforation (feet bgs):	386
Ground Surface Elevation:	-55.7
Reference Point Elevation:	-55.7
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

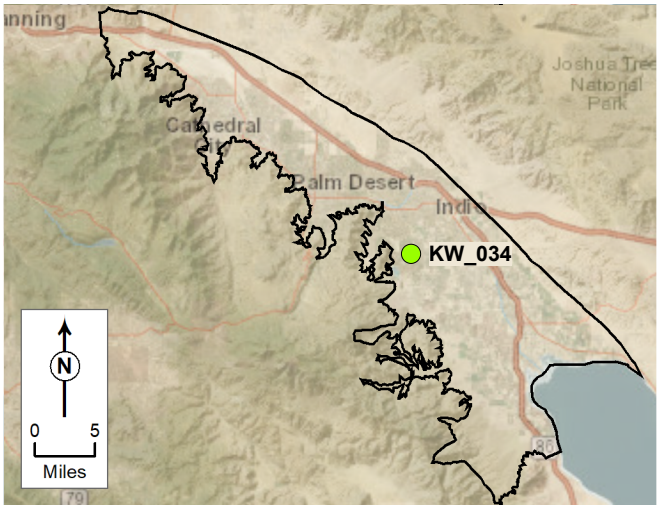
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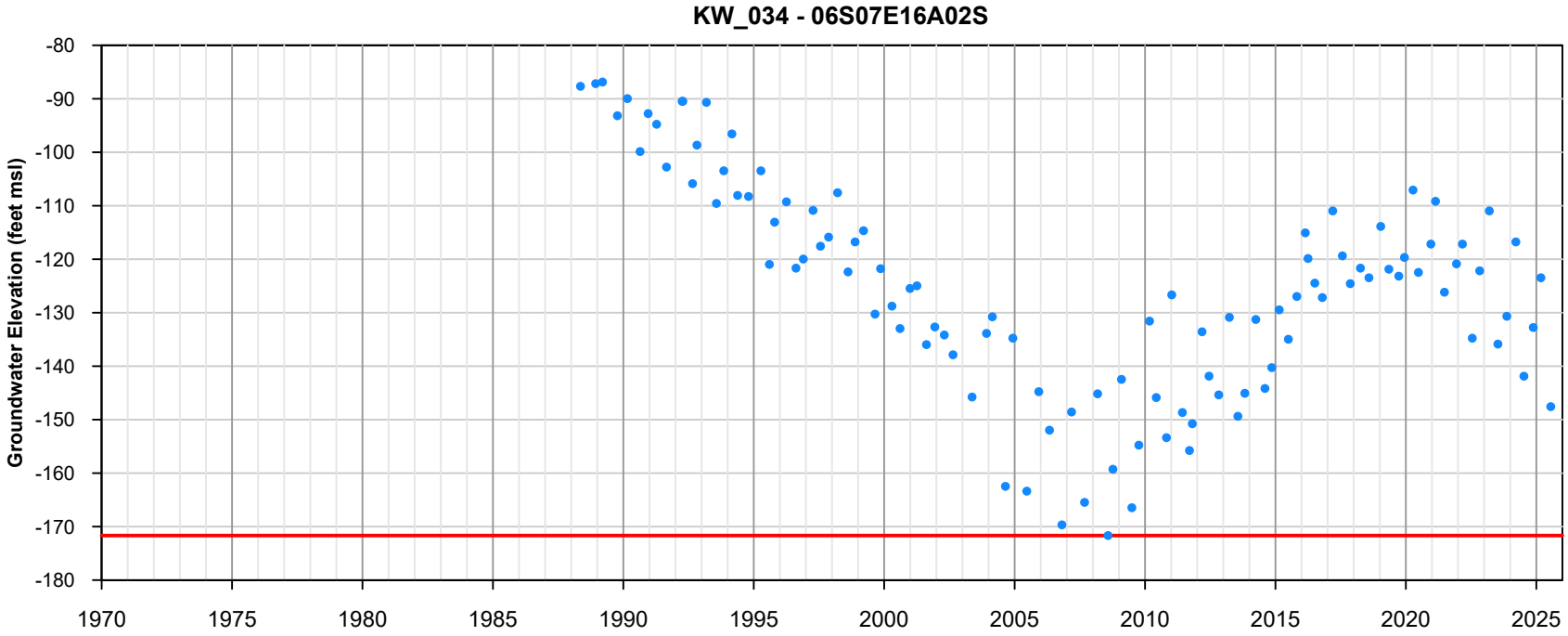
TODD GROUNDWATER

Appendix A-34
Groundwater Elevation Hydrograph
KW_033 - 06S07E13M02S

Well Information

Site Code:	336536N1162525W001
Local Well Name:	KW_034
State Well Name:	06S07E16A002S
Montoring Network Type:	SGMA Representative
Station ID:	56766
Latitude:	33.6537
Longitude:	-116.253
Well Depth (feet bgs):	810
Top Perforation (feet bgs):	350
Bottom Perforation (feet bgs):	800
Ground Surface Elevation:	-4.5
Reference Point Elevation:	-4.2
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

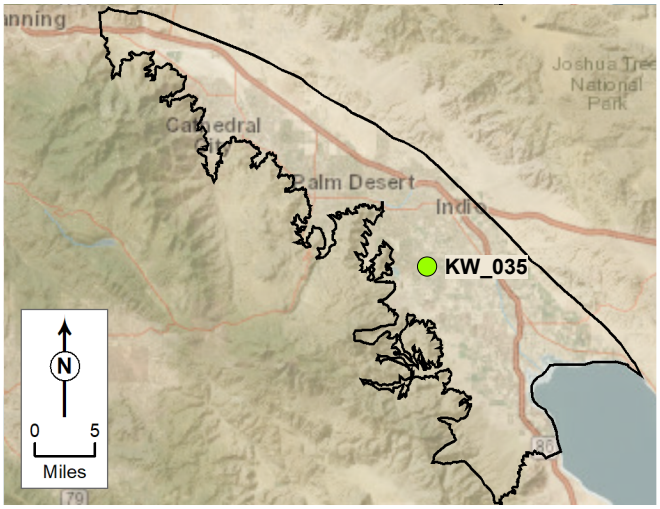
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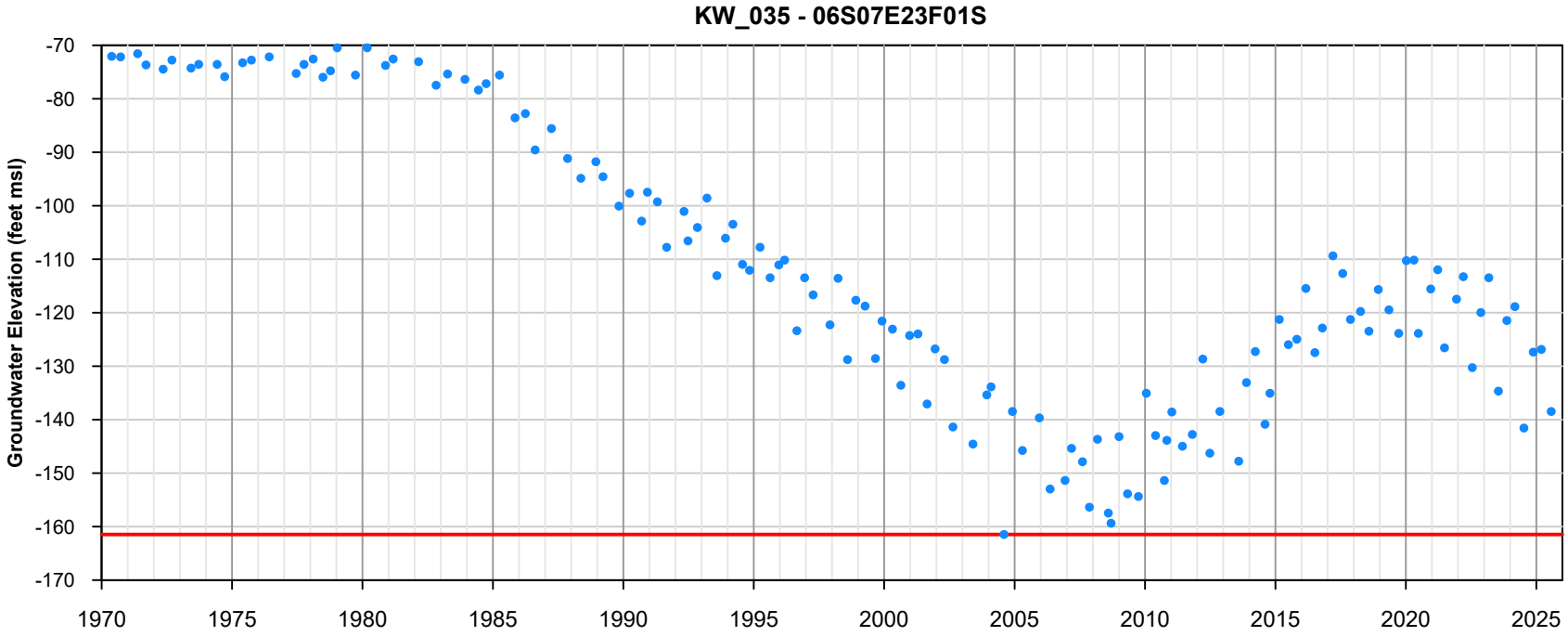
TODD GROUNDWATER

Appendix A-35
Groundwater Elevation Hydrograph
KW_034 - 06S07E16A02S

Well Information

Site Code:	382900N1162285W001
Local Well Name:	KW_035
State Well Name:	06S07E23F001S
Montoring Network Type:	SGMA Representative
Station ID:	47751
Latitude:	33.6386
Longitude:	-116.228
Well Depth (feet bgs):	<Null>
Top Perforation (feet bgs):	312
Bottom Perforation (feet bgs):	375
Ground Surface Elevation:	-53.2
Reference Point Elevation:	-53.2
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

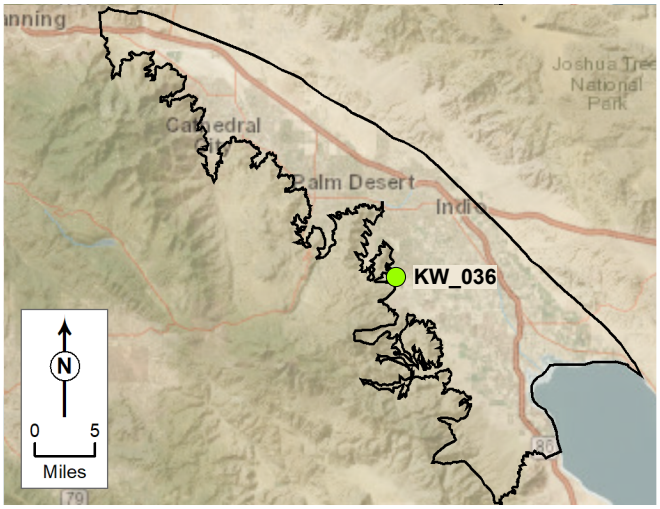
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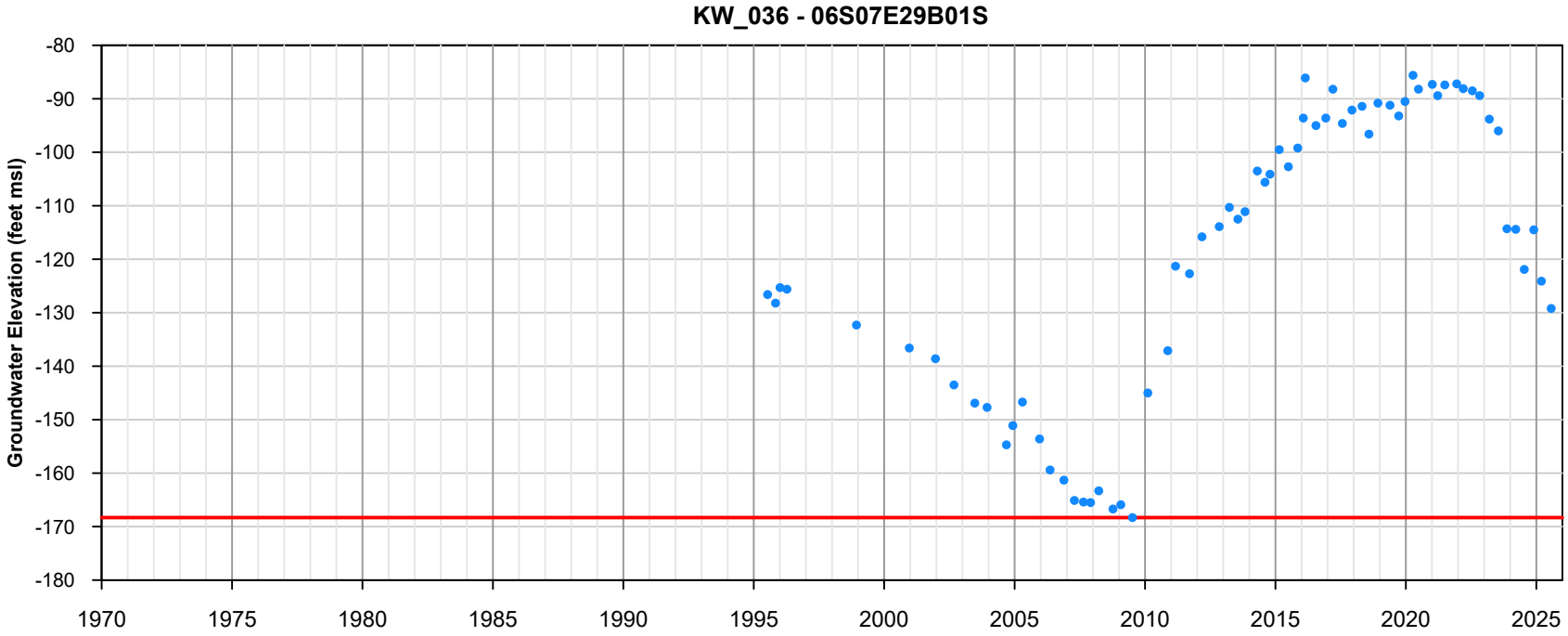
TODD GROUNDWATER

Appendix A-36
Groundwater Elevation Hydrograph
KW_035 - 06S07E23F01S

Well Information

Site Code:	336258N1162737W001
Local Well Name:	KW_036
State Well Name:	06S07E29B001S
Montoring Network Type:	SGMA Representative
Station ID:	47740
Latitude:	33.6258
Longitude:	-116.274
Well Depth (feet bgs):	750
Top Perforation (feet bgs):	300
Bottom Perforation (feet bgs):	740
Ground Surface Elevation:	26.2
Reference Point Elevation:	26.6
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

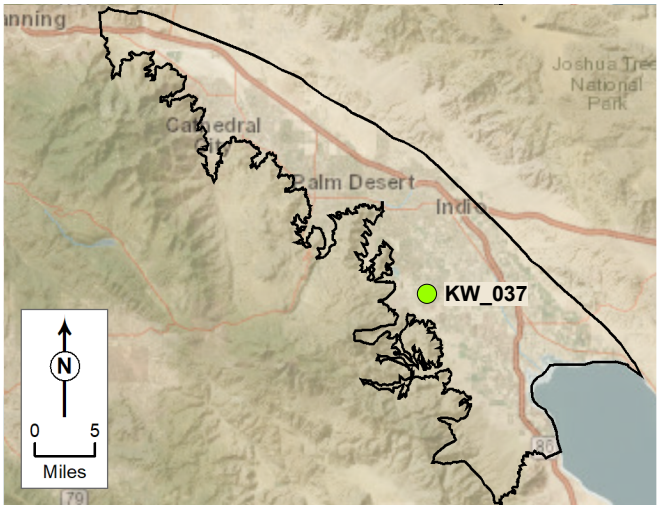
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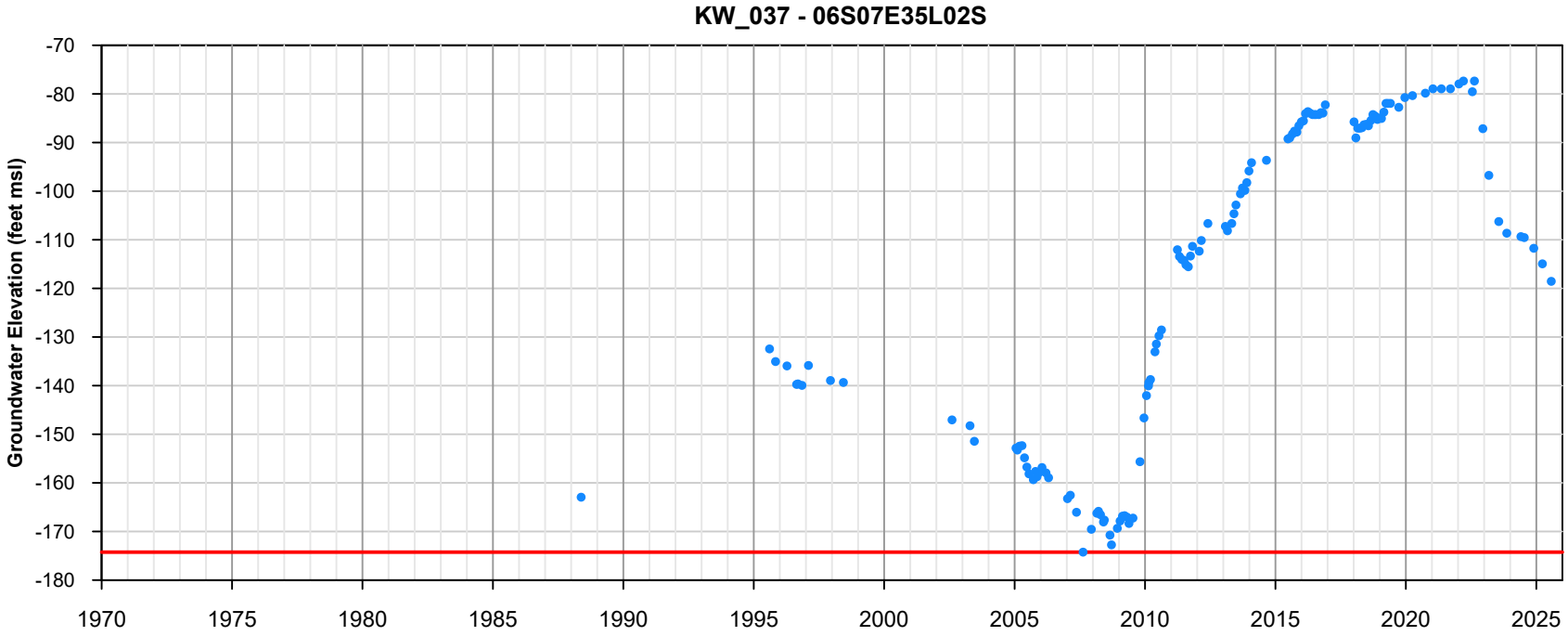
TODD GROUNDWATER

Appendix A-37
Groundwater Elevation Hydrograph
KW_036 - 06S07E29B01S

Well Information

Site Code:	336053N1162295W001
Local Well Name:	KW_037
State Well Name:	06S07E35L002S
Montoring Network Type:	SGMA Representative
Station ID:	56744
Latitude:	33.6054
Longitude:	-116.23
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	300
Bottom Perforation (feet bgs):	400
Ground Surface Elevation:	-82
Reference Point Elevation:	-77.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

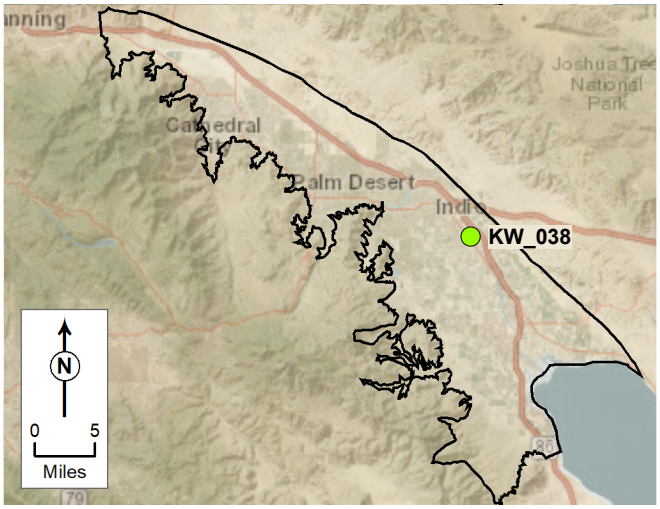
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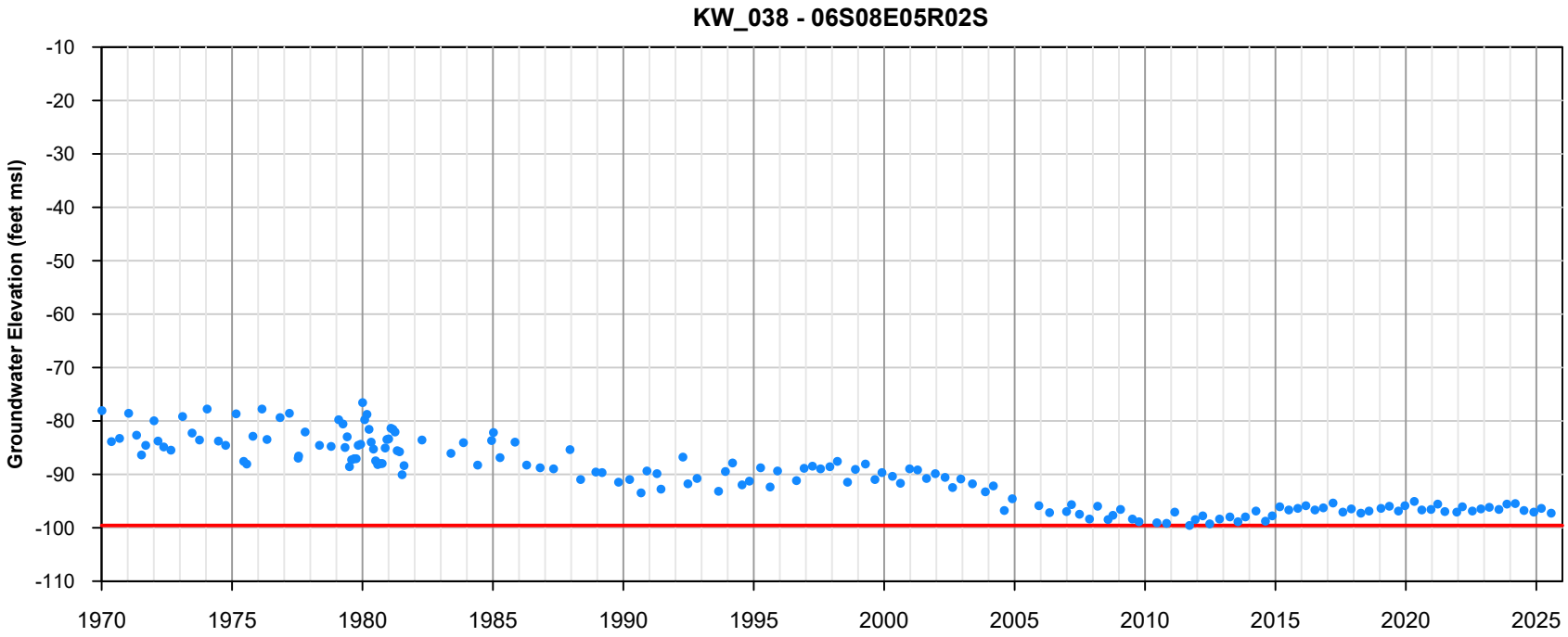
TODD GROUNDWATER

Appendix A-38
Groundwater Elevation Hydrograph
KW_037 - 06S07E35L02S

Well Information

Site Code:	336745N1161663W001
Local Well Name:	KW_038
State Well Name:	06S08E05R002S
Montoring Network Type:	SGMA Representative
Station ID:	56745
Latitude:	33.6745
Longitude:	-116.166
Well Depth (feet bgs):	750
Top Perforation (feet bgs):	540
Bottom Perforation (feet bgs):	750
Ground Surface Elevation:	-78.3
Reference Point Elevation:	-76.6
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

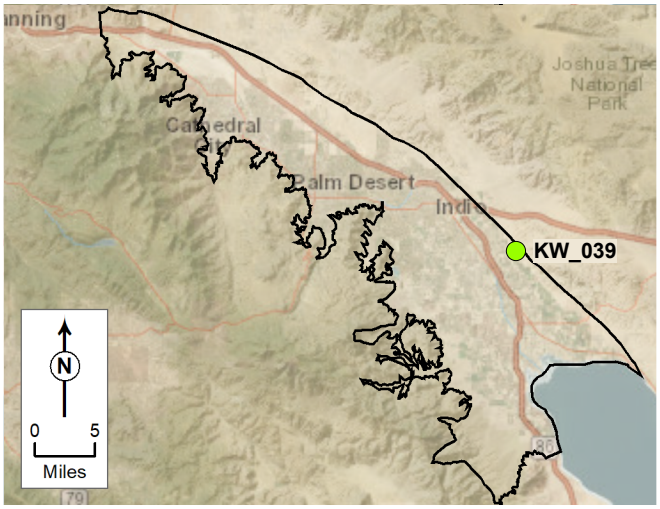
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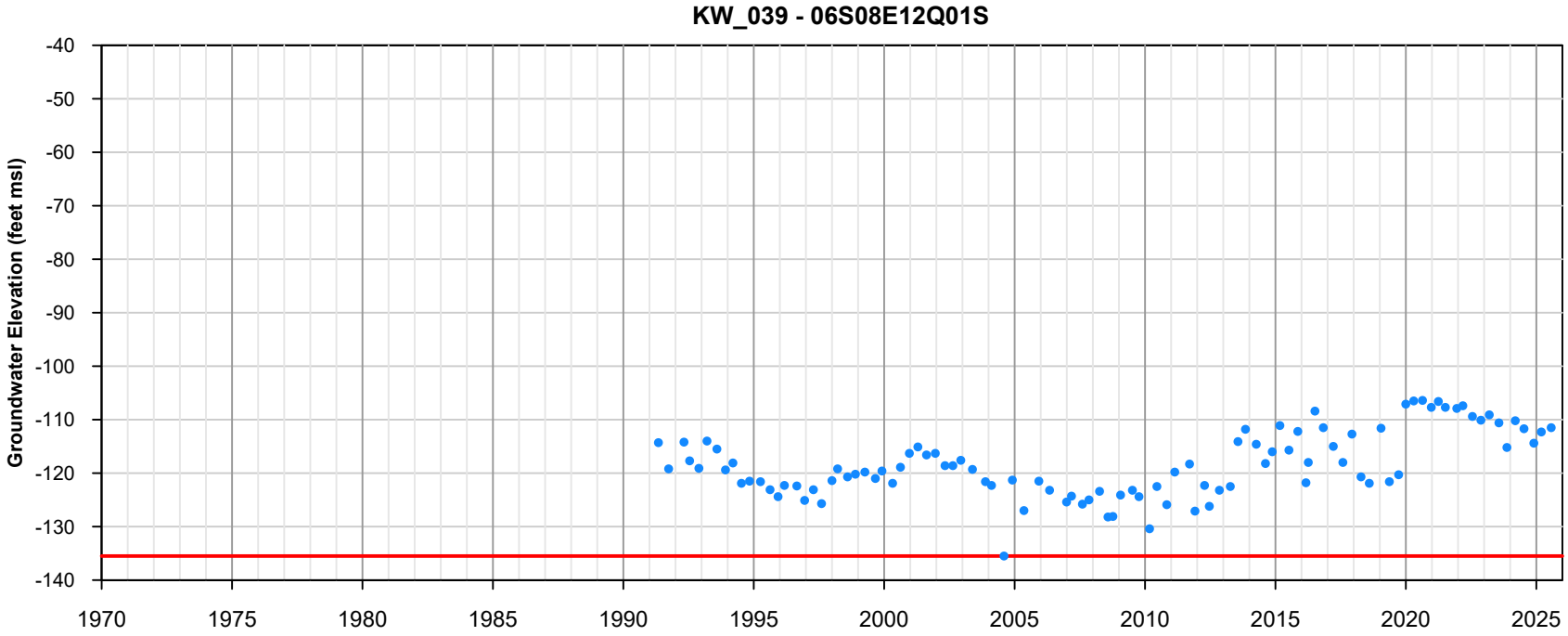
TODD GROUNDWATER

Appendix A-39
Groundwater Elevation Hydrograph
KW_038 - 06S08E05R02S

Well Information

Site Code:	336570N1161008W001
Local Well Name:	KW_039
State Well Name:	06S08E12Q001S
Montoring Network Type:	SGMA Representative
Station ID:	56746
Latitude:	33.657
Longitude:	-116.101
Well Depth (feet bgs):	710
Top Perforation (feet bgs):	170
Bottom Perforation (feet bgs):	380
Ground Surface Elevation:	63.6
Reference Point Elevation:	64.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

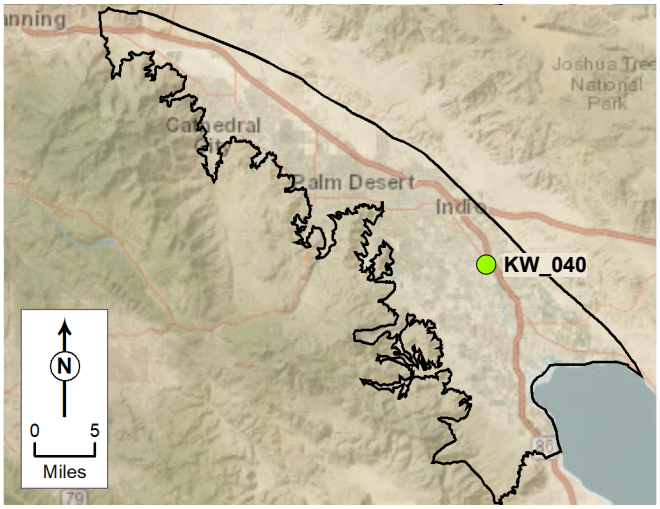
January 2026

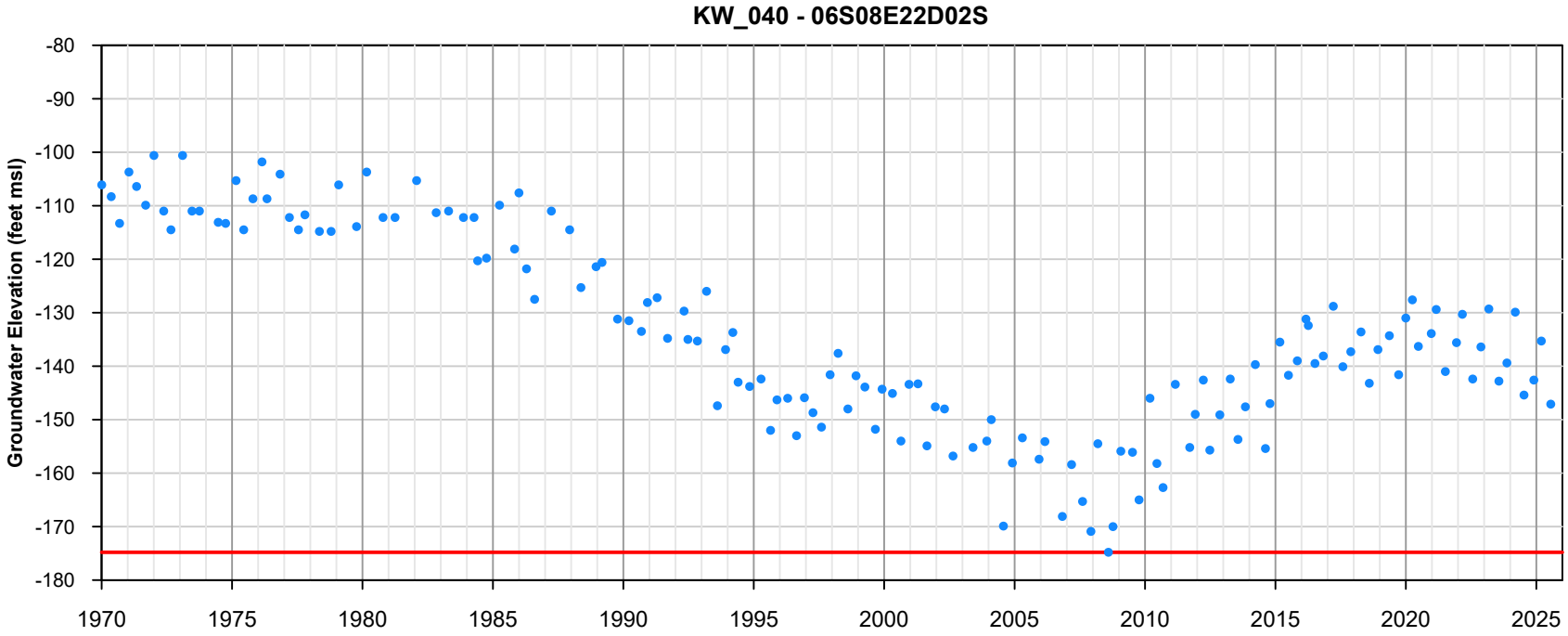
TODD GROUNDWATER

Appendix A-40
Groundwater Elevation Hydrograph
KW_039 - 06S08E12Q01S

Well Information

Site Code:	336407N1161430W001
Local Well Name:	KW_040
State Well Name:	06S08E22D002S
Montoring Network Type:	SGMA Representative
Station ID:	47728
Latitude:	33.6407
Longitude:	-116.143
Well Depth (feet bgs):	1100
Top Perforation (feet bgs):	500
Bottom Perforation (feet bgs):	1100
Ground Surface Elevation:	-117.5
Reference Point Elevation:	-116.8
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

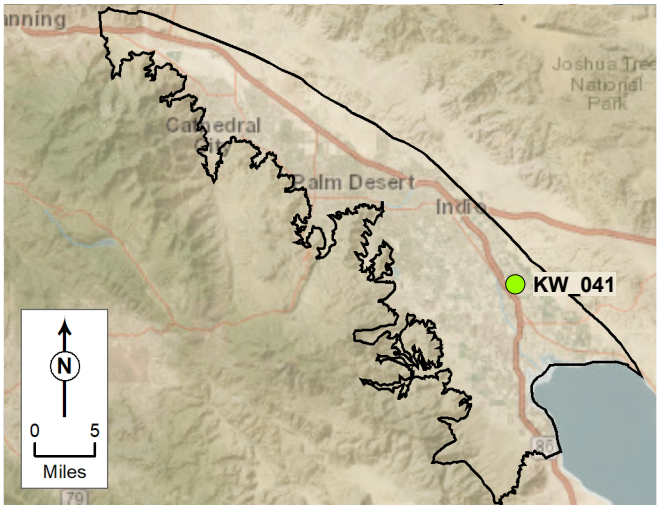
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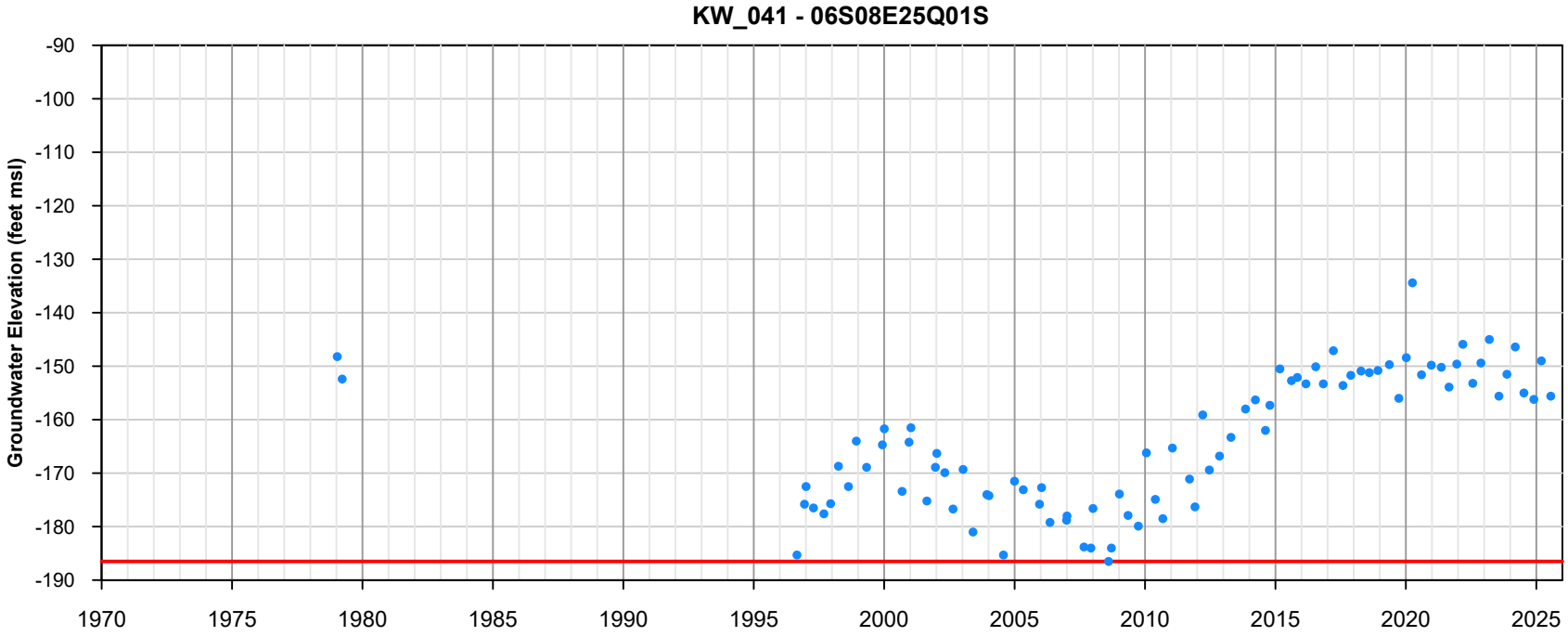
TODD GROUNDWATER

Appendix A-41
Groundwater Elevation Hydrograph
KW_040 - 06S08E22D02S

Well Information

Site Code:	336167N1161008W001
Local Well Name:	KW_041
State Well Name:	06S08E25Q001S
Montoring Network Type:	SGMA Representative
Station ID:	47741
Latitude:	33.6167
Longitude:	-116.101
Well Depth (feet bgs):	648
Top Perforation (feet bgs):	400
Bottom Perforation (feet bgs):	648
Ground Surface Elevation:	-123.8
Reference Point Elevation:	-123.2
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

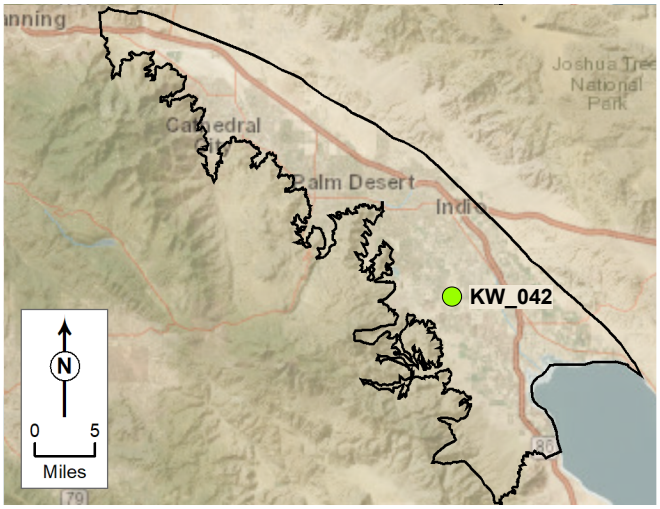
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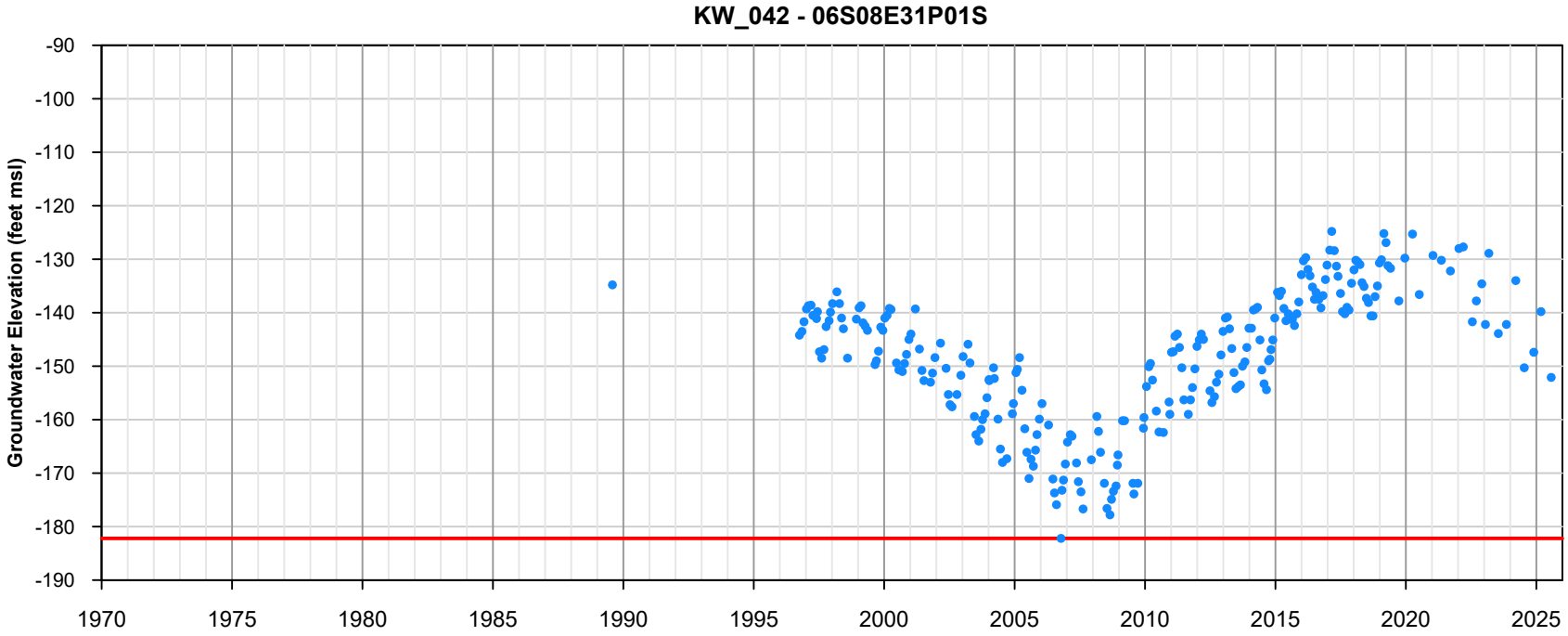
TODD GROUNDWATER

Appendix A-42
Groundwater Elevation Hydrograph
KW_041 - 06S08E25Q01S

Well Information

Site Code:	336020N1161925W001
Local Well Name:	KW_042
State Well Name:	06S08E31P001S
Montoring Network Type:	SGMA Representative
Station ID:	47748
Latitude:	33.602
Longitude:	-116.192
Well Depth (feet bgs):	575
Top Perforation (feet bgs):	400
Bottom Perforation (feet bgs):	550
Ground Surface Elevation:	-114.8
Reference Point Elevation:	-114.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

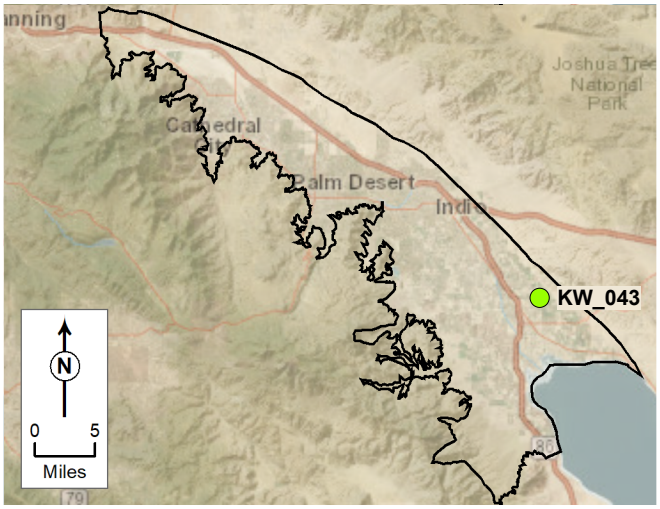
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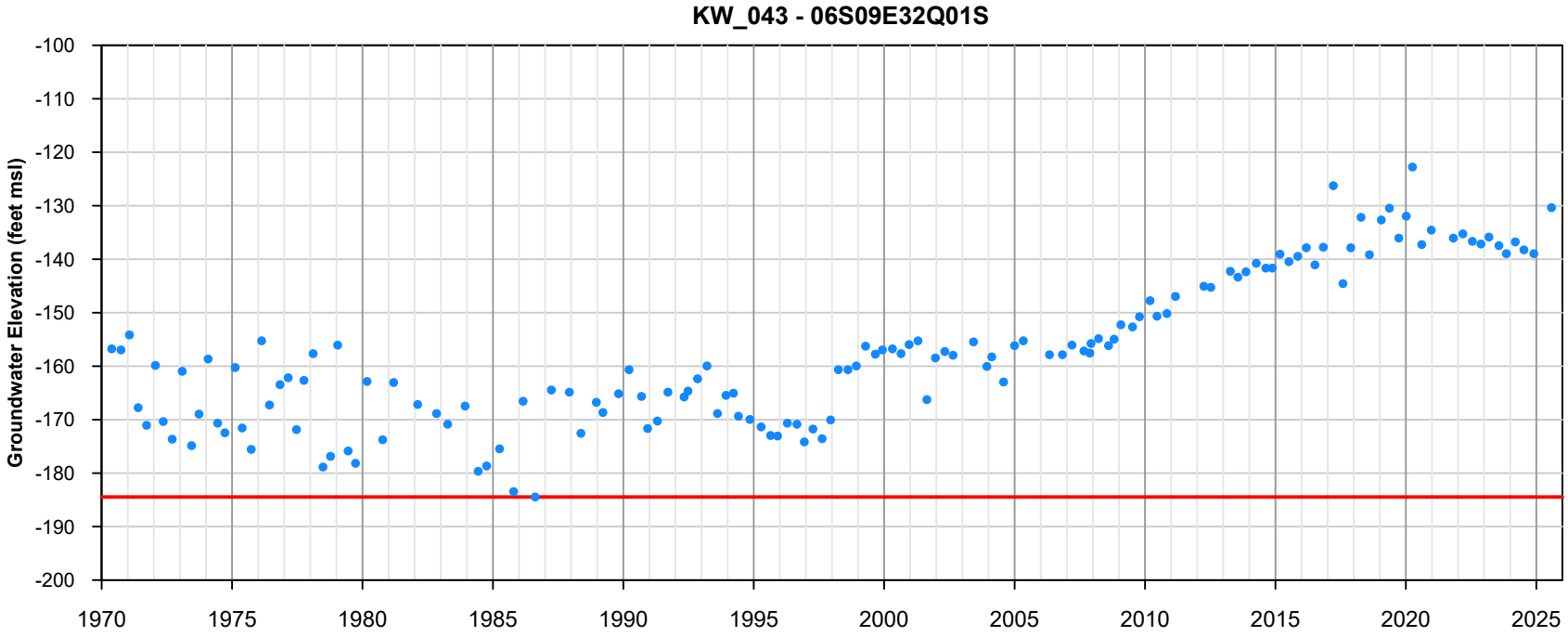
TODD GROUNDWATER

Appendix A-43
Groundwater Elevation Hydrograph
KW_042 - 06S08E31P01S

Well Information

Site Code:	336003N1160666W001
Local Well Name:	KW_043
State Well Name:	06S09E32Q001S
Montoring Network Type:	SGMA Representative
Station ID:	56753
Latitude:	33.6004
Longitude:	-116.067
Well Depth (feet bgs):	284
Top Perforation (feet bgs):	244
Bottom Perforation (feet bgs):	284
Ground Surface Elevation:	-101.1
Reference Point Elevation:	-100.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

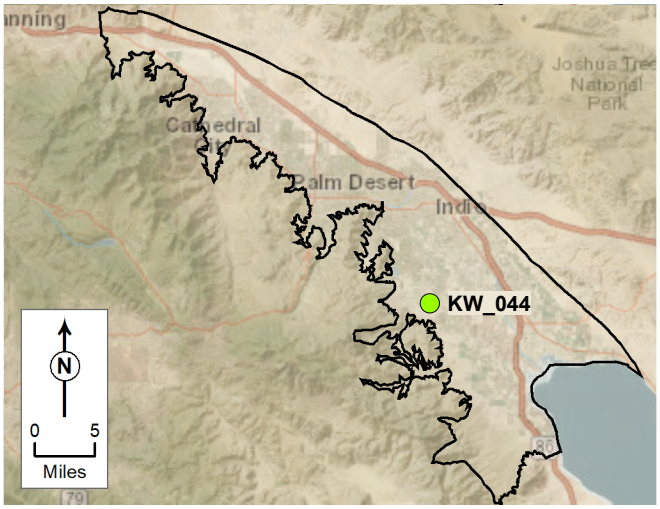
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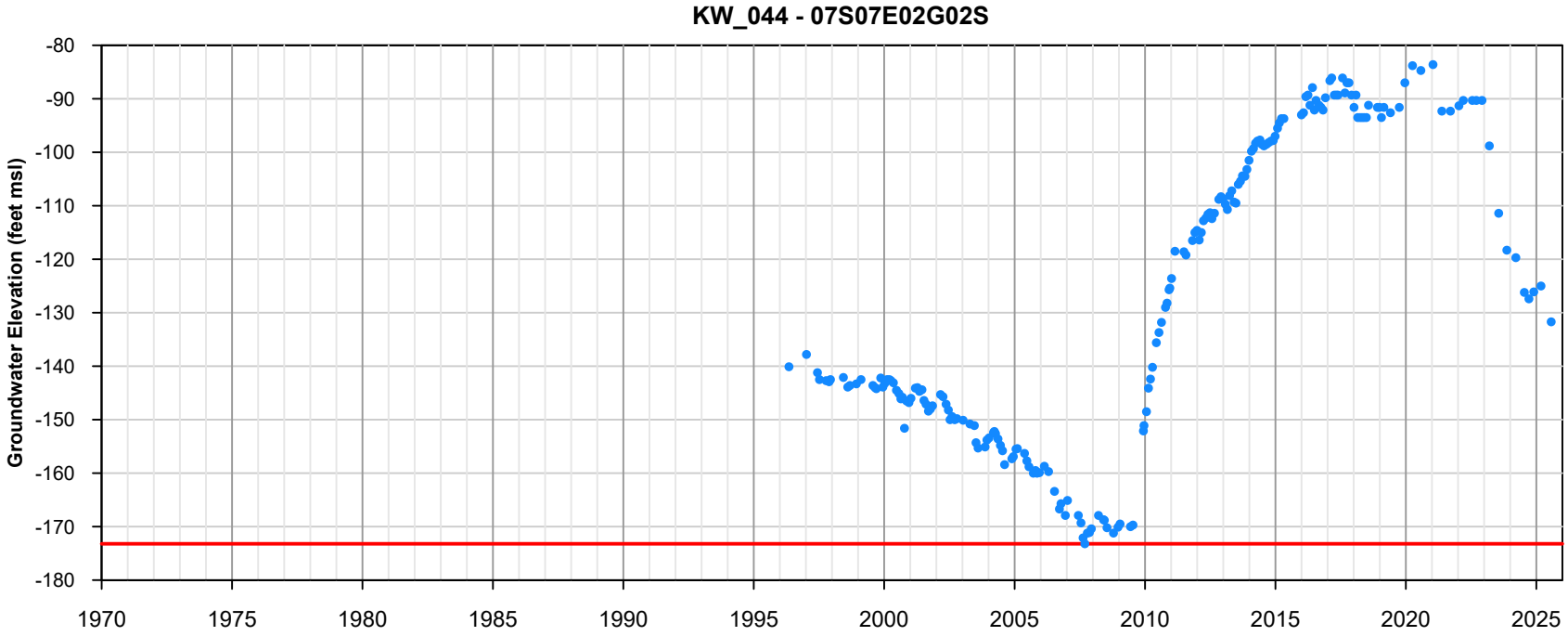
TODD GROUNDWATER

Appendix A-44
Groundwater Elevation Hydrograph
KW_043 - 06S09E32Q01S

Well Information

Site Code:	335938N1162253W001
Local Well Name:	KW_044
State Well Name:	07S07E02G002S
Montoring Network Type:	SGMA Representative
Station ID:	56754
Latitude:	33.5939
Longitude:	-116.225
Well Depth (feet bgs):	700
Top Perforation (feet bgs):	380
Bottom Perforation (feet bgs):	700
Ground Surface Elevation:	-93.9
Reference Point Elevation:	-93.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

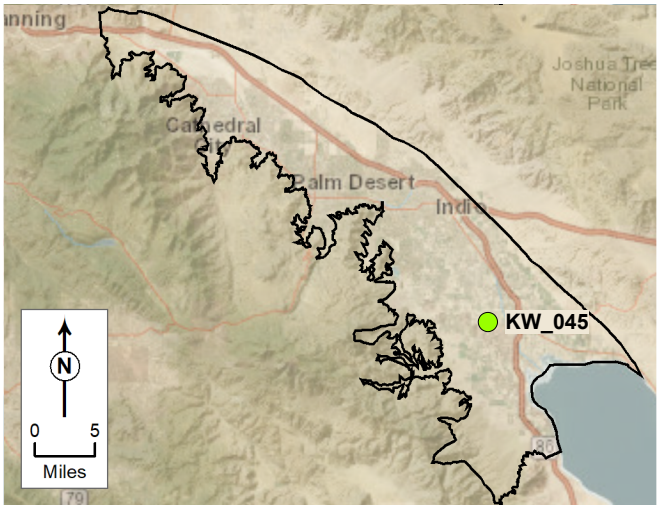
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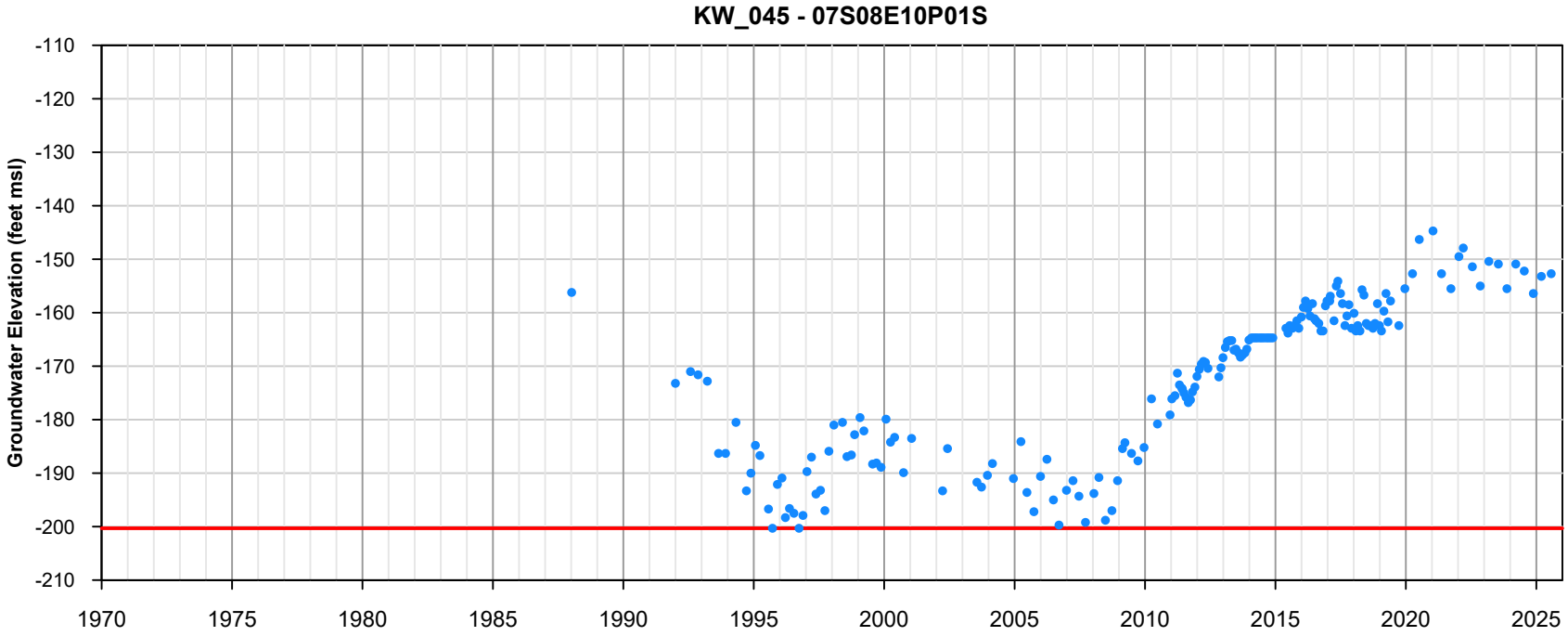
TODD GROUNDWATER

Appendix A-45
Groundwater Elevation Hydrograph
KW_044 - 07S07E02G02S

Well Information

Site Code:	335711N1161415W001
Local Well Name:	KW_045
State Well Name:	07S08E10P001S
Montoring Network Type:	SGMA Representative
Station ID:	56755
Latitude:	33.5712
Longitude:	-116.141
Well Depth (feet bgs):	900
Top Perforation (feet bgs):	250
Bottom Perforation (feet bgs):	900
Ground Surface Elevation:	-164.7
Reference Point Elevation:	-164.7
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

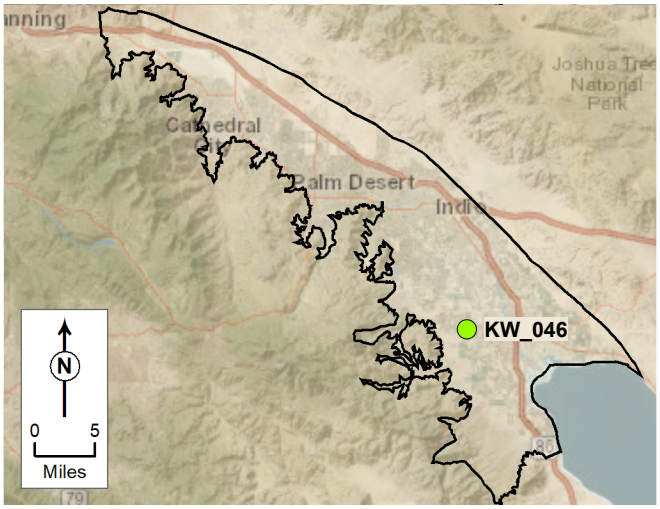
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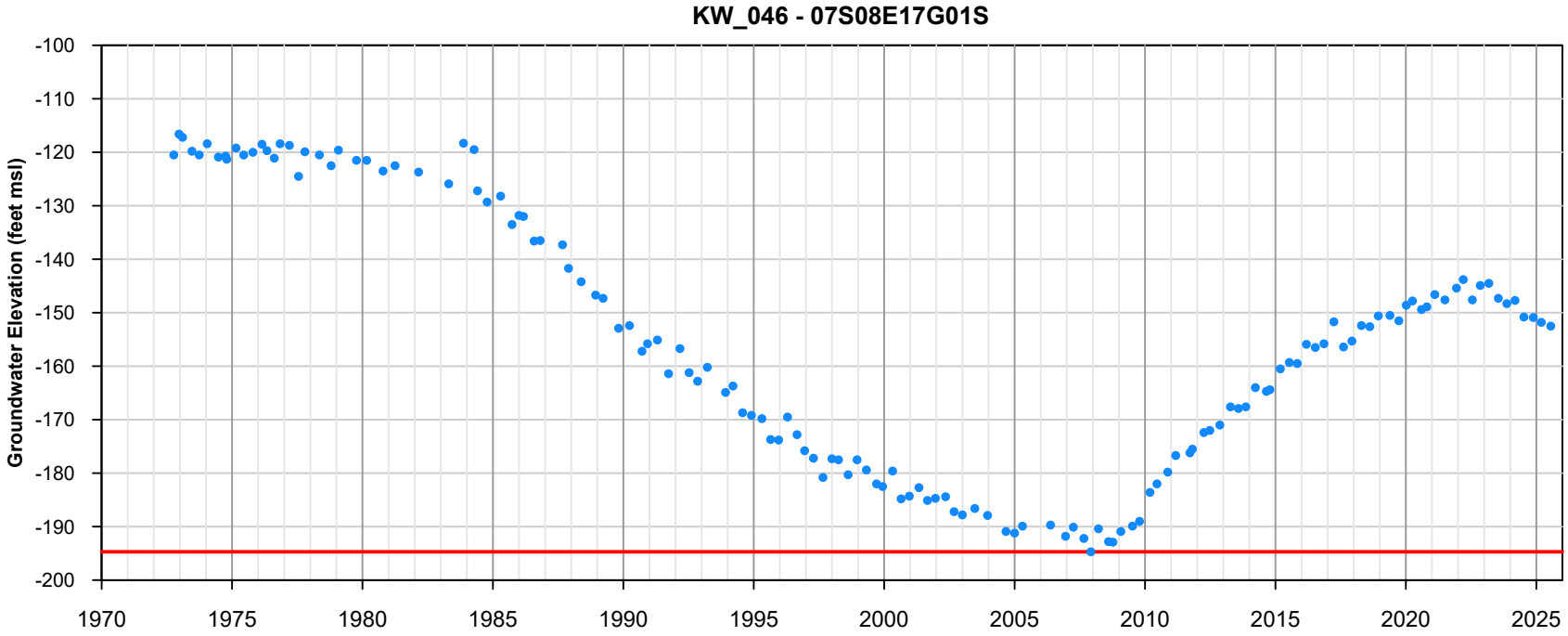
TODD GROUNDWATER

Appendix A-46
Groundwater Elevation Hydrograph
KW_045 - 07S08E10P01S

Well Information

Site Code:	335578N1161700W001
Local Well Name:	KW_046
State Well Name:	07S08E17G001S
Montoring Network Type:	SGMA Representative
Station ID:	47729
Latitude:	33.5578
Longitude:	-116.17
Well Depth (feet bgs):	750
Top Perforation (feet bgs):	400
Bottom Perforation (feet bgs):	750
Ground Surface Elevation:	-78.5
Reference Point Elevation:	-77.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

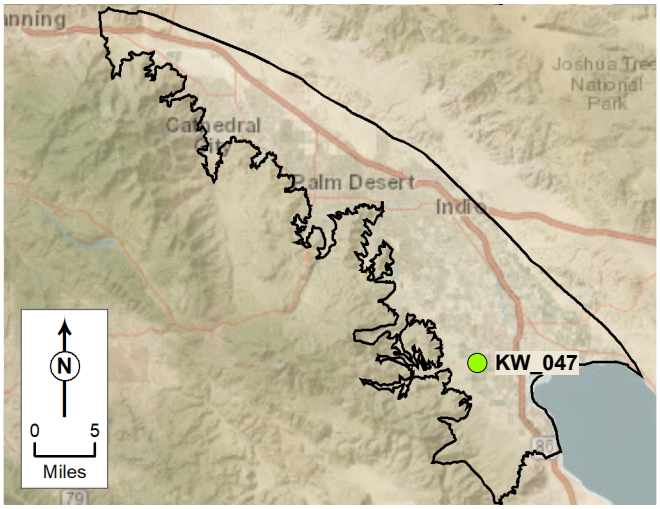
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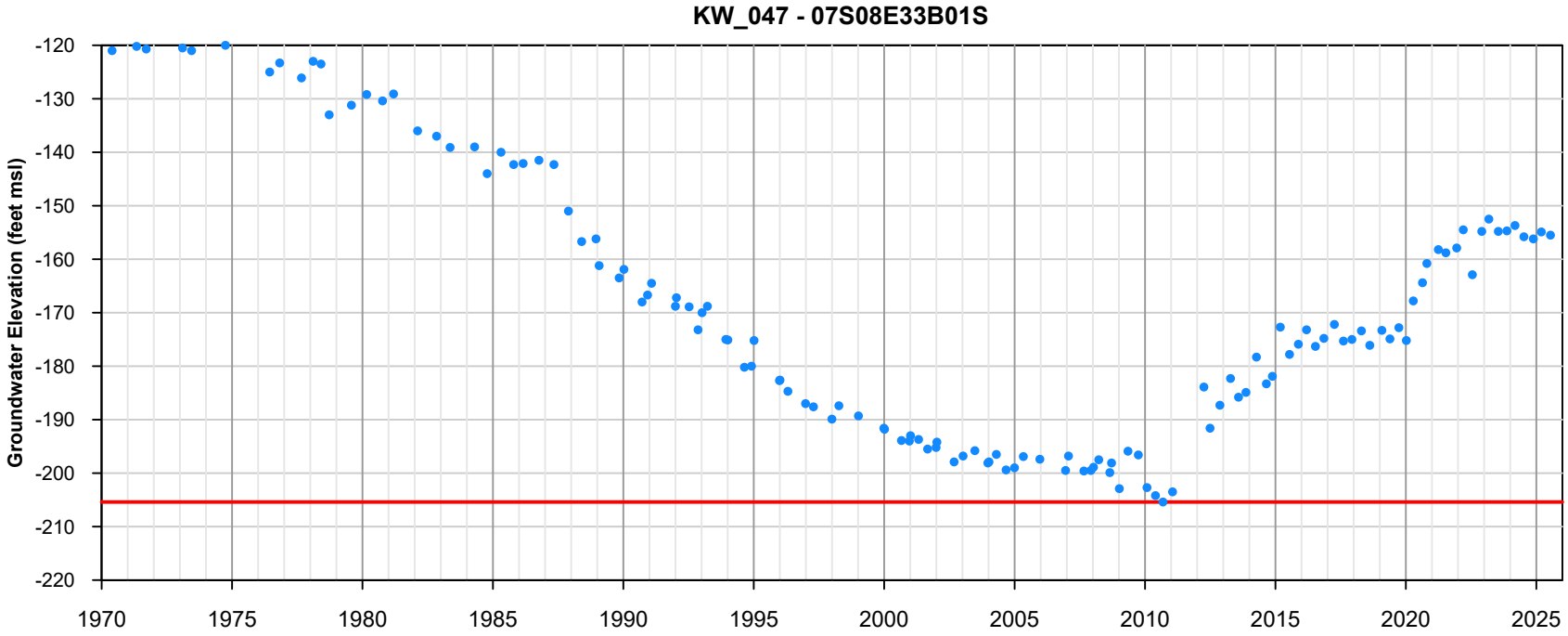
TODD GROUNDWATER

Appendix A-47
Groundwater Elevation Hydrograph
KW_046 - 07S08E17G01S

Well Information

Site Code:	335216N1161568W001
Local Well Name:	KW_047
State Well Name:	07S08E33B001S
Montoring Network Type:	SGMA Representative
Station ID:	56757
Latitude:	33.5217
Longitude:	-116.157
Well Depth (feet bgs):	522
Top Perforation (feet bgs):	243
Bottom Perforation (feet bgs):	522
Ground Surface Elevation:	27.8
Reference Point Elevation:	32
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

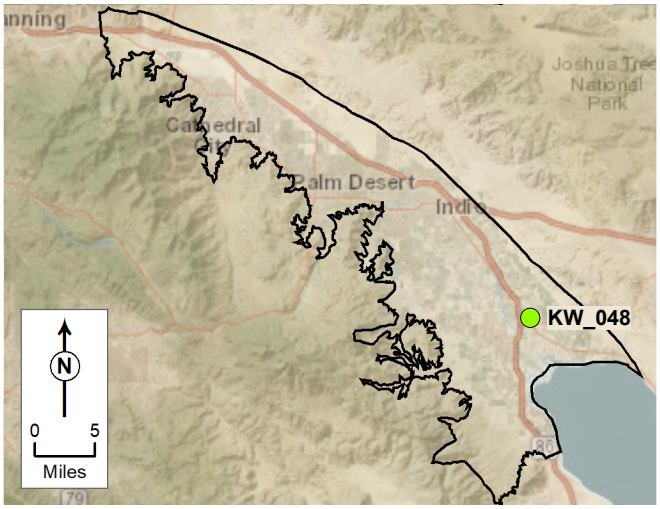
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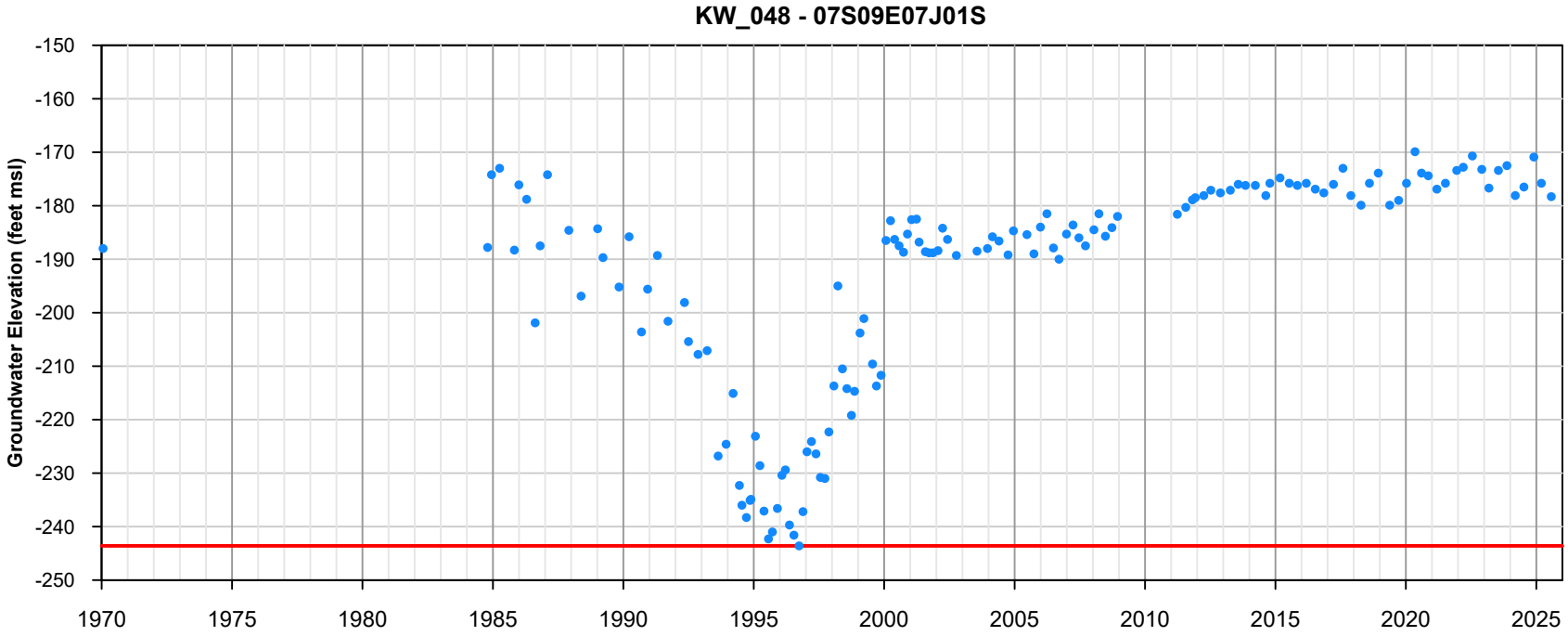
TODD GROUNDWATER

Appendix A-48
Groundwater Elevation Hydrograph
KW_047 - 07S08E33B01S

Well Information

Site Code:	335763N1160795W001
Local Well Name:	KW_048
State Well Name:	07S09E07J001S
Montoring Network Type:	SGMA Representative
Station ID:	47735
Latitude:	33.5763
Longitude:	-116.079
Well Depth (feet bgs):	880
Top Perforation (feet bgs):	410
Bottom Perforation (feet bgs):	870
Ground Surface Elevation:	-183.1
Reference Point Elevation:	-183.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

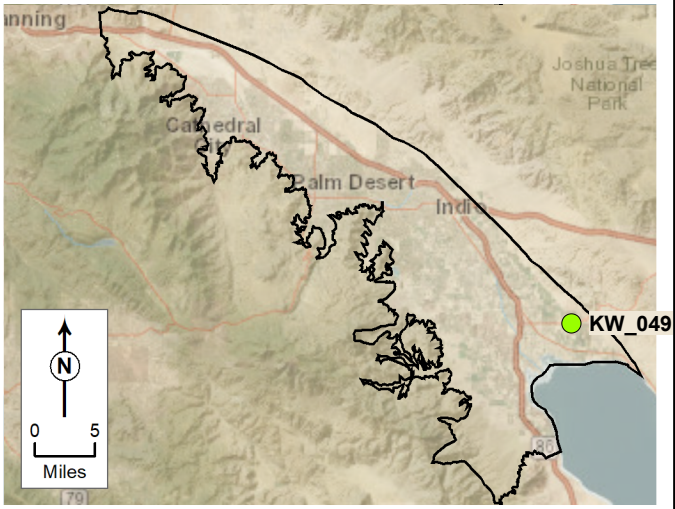
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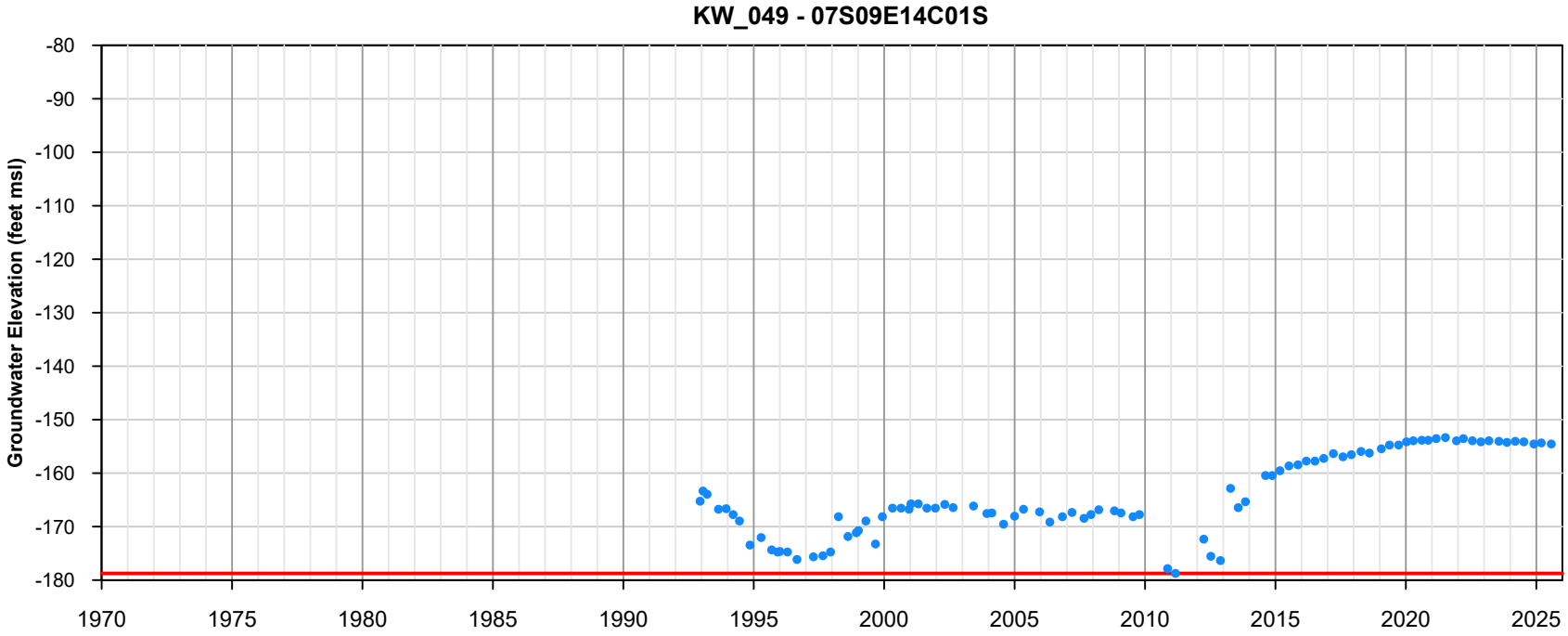
TODD GROUNDWATER

Appendix A-49
Groundwater Elevation Hydrograph
KW_048 - 07S09E07J01S

Well Information

Site Code:	335693N1160208W001
Local Well Name:	KW_049
State Well Name:	07S09E14C001S
Montoring Network Type:	SGMA Representative
Station ID:	56767
Latitude:	33.5694
Longitude:	-116.021
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	93
Bottom Perforation (feet bgs):	290
Ground Surface Elevation:	-62.8
Reference Point Elevation:	-63
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

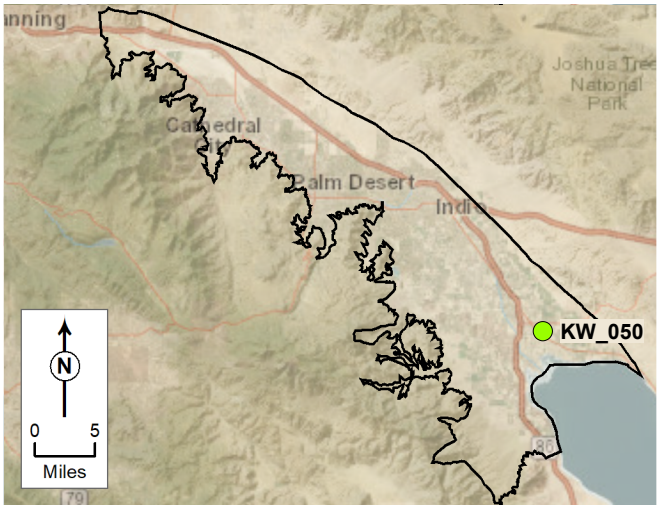
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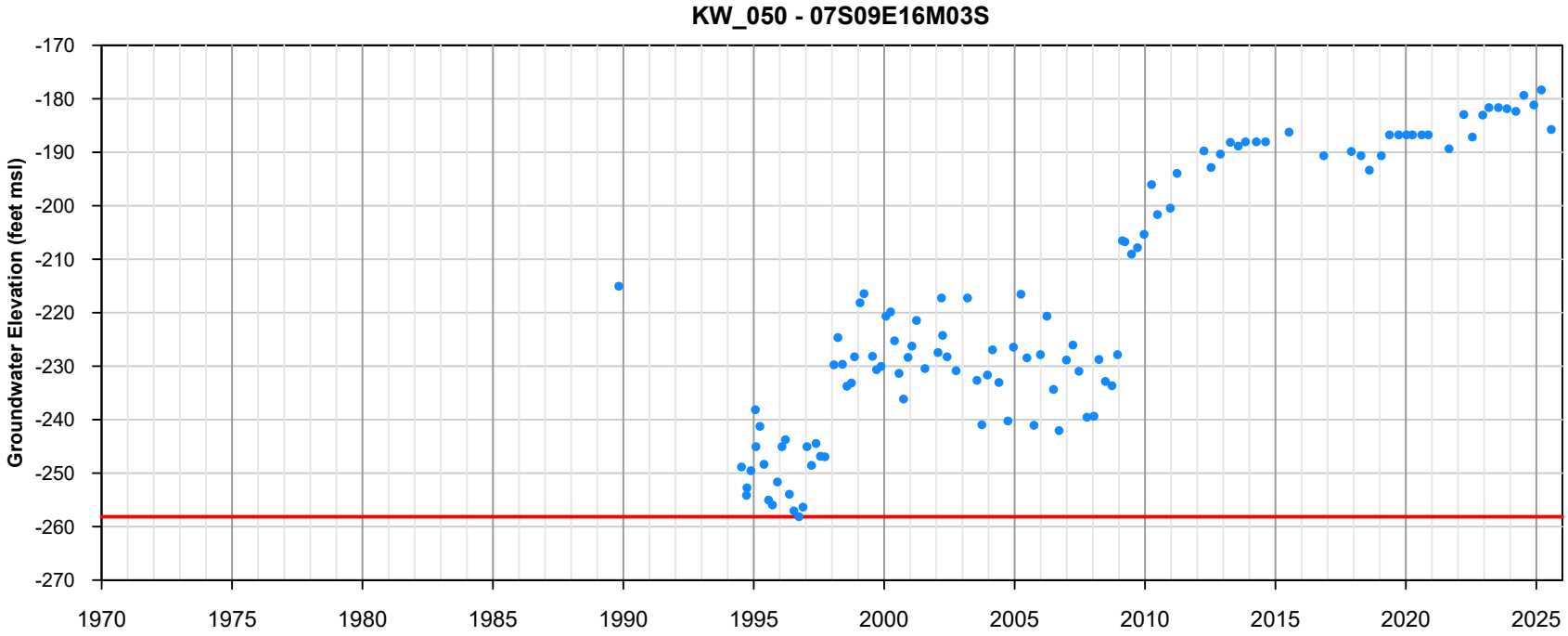
TODD GROUNDWATER

Appendix A-50
Groundwater Elevation Hydrograph
KW_049 - 07S09E14C01S

Well Information

Site Code:	335600N1160621W001
Local Well Name:	KW_050
State Well Name:	07S09E16M003S
Montoring Network Type:	SGMA Representative
Station ID:	56768
Latitude:	33.56
Longitude:	-116.062
Well Depth (feet bgs):	560
Top Perforation (feet bgs):	340
Bottom Perforation (feet bgs):	500
Ground Surface Elevation:	-188.1
Reference Point Elevation:	-188.1
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

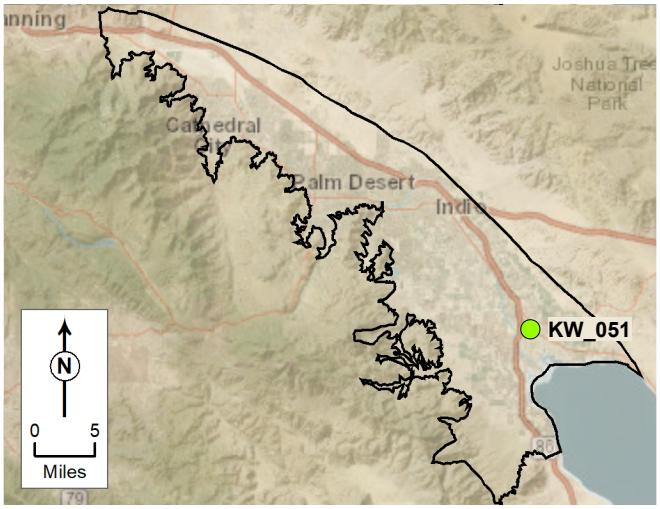
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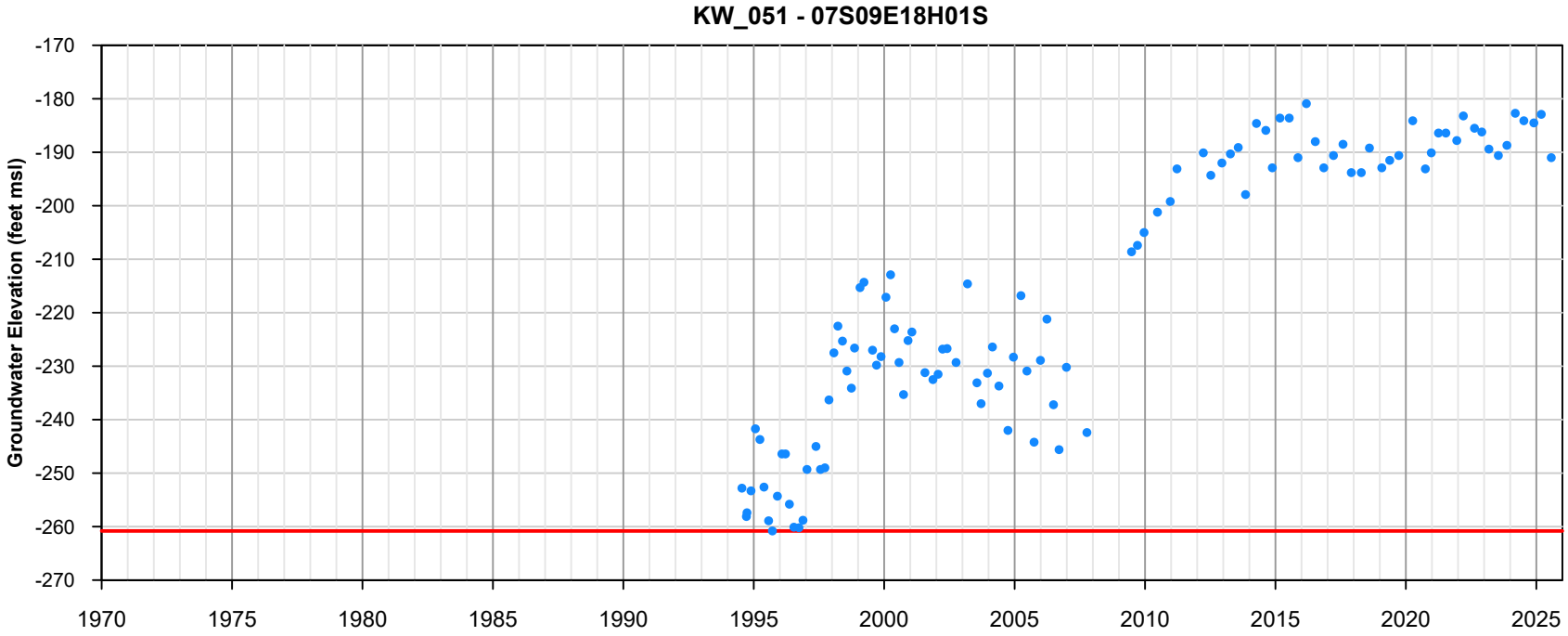
TODD GROUNDWATER

Appendix A-51
Groundwater Elevation Hydrograph
KW_050 - 07S09E16M03S

Well Information

Site Code:	335623N1160801W001
Local Well Name:	KW_051
State Well Name:	07S09E18H001S
Montoring Network Type:	SGMA Representative
Station ID:	56769
Latitude:	33.5623
Longitude:	-116.08
Well Depth (feet bgs):	999
Top Perforation (feet bgs):	420
Bottom Perforation (feet bgs):	520
Ground Surface Elevation:	-195.6
Reference Point Elevation:	-195.6
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

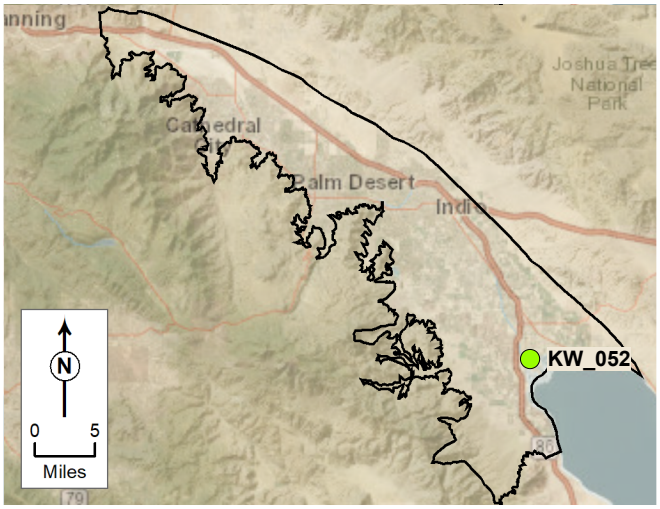
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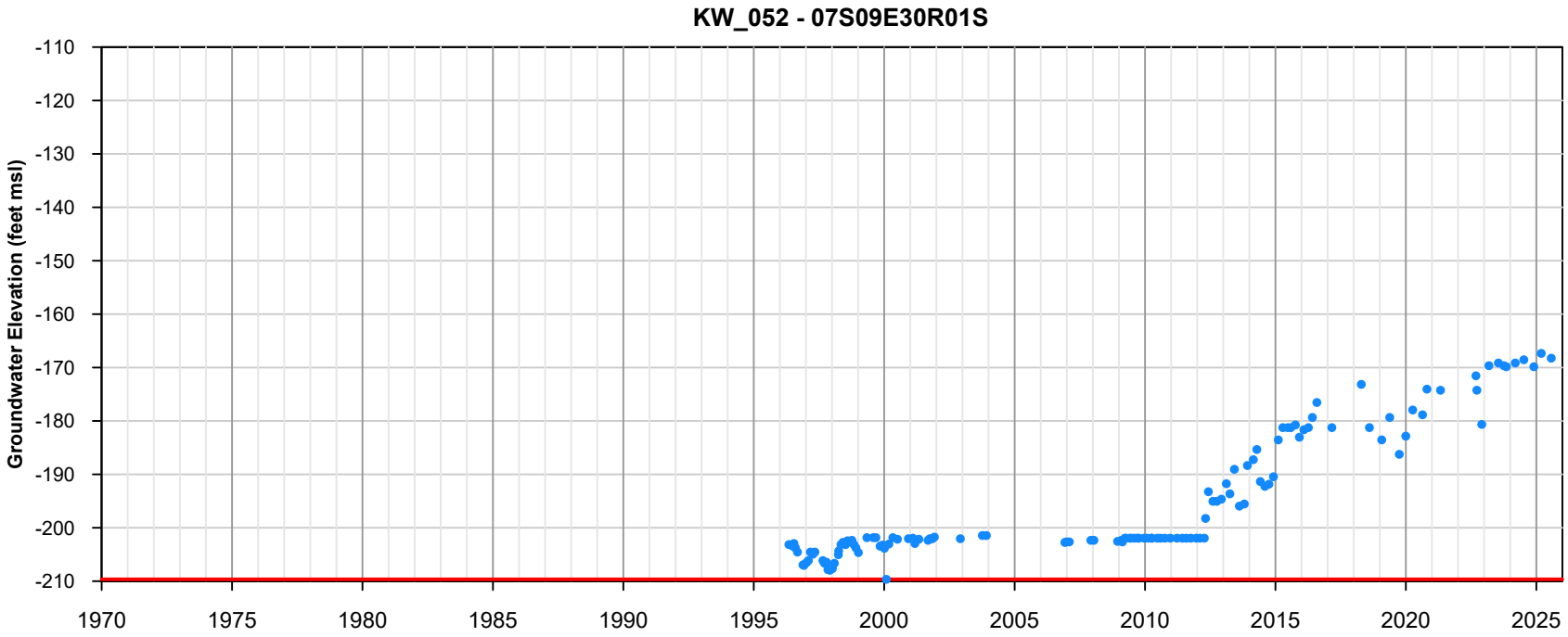
TODD GROUNDWATER

Appendix A-52
Groundwater Elevation Hydrograph
KW_051 - 07S09E18H01S

Well Information

Site Code:	335263N1160806W001
Local Well Name:	KW_052
State Well Name:	07S09E30R001S
Montoring Network Type:	SGMA Representative
Station ID:	56770
Latitude:	33.5264
Longitude:	-116.081
Well Depth (feet bgs):	1475
Top Perforation (feet bgs):	1430
Bottom Perforation (feet bgs):	1470
Ground Surface Elevation:	-202
Reference Point Elevation:	-202
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

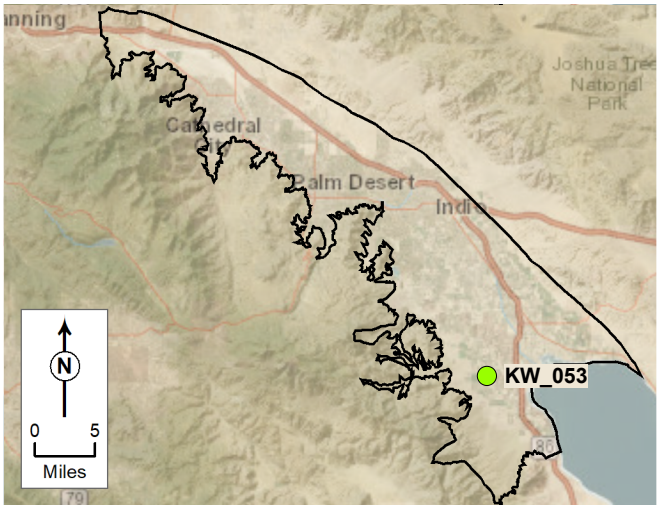
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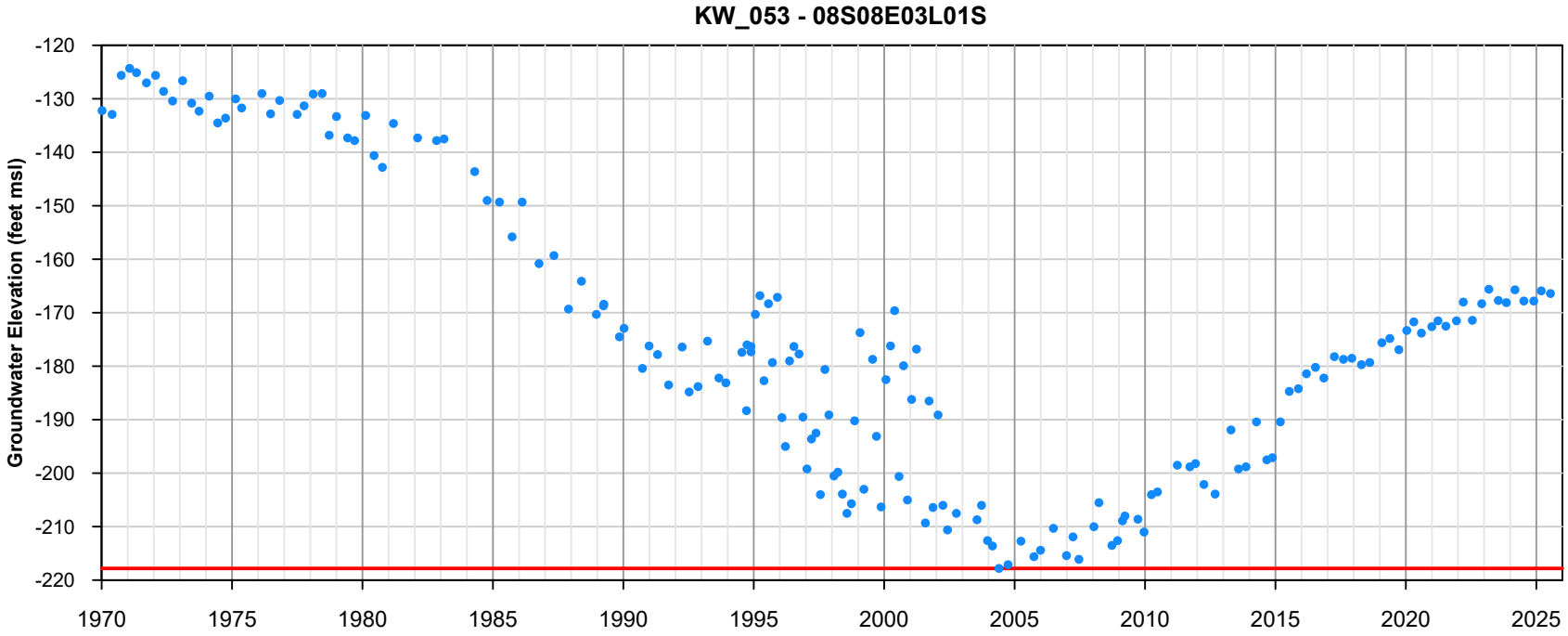
TODD GROUNDWATER

Appendix A-53
Groundwater Elevation Hydrograph
KW_052 - 07S09E30R01S

Well Information

Site Code:	335060N1161430W001
Local Well Name:	KW_053
State Well Name:	08S08E03L001S
Montoring Network Type:	SGMA Representative
Station ID:	56771
Latitude:	33.506
Longitude:	-116.143
Well Depth (feet bgs):	618
Top Perforation (feet bgs):	402
Bottom Perforation (feet bgs):	618
Ground Surface Elevation:	-56.2
Reference Point Elevation:	-56.2
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

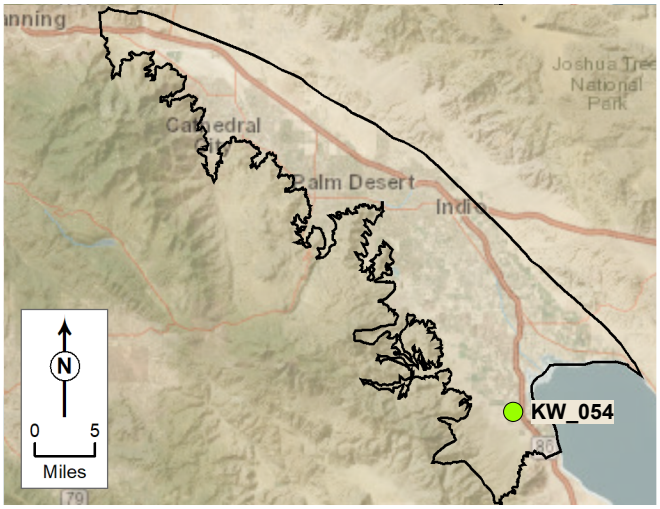
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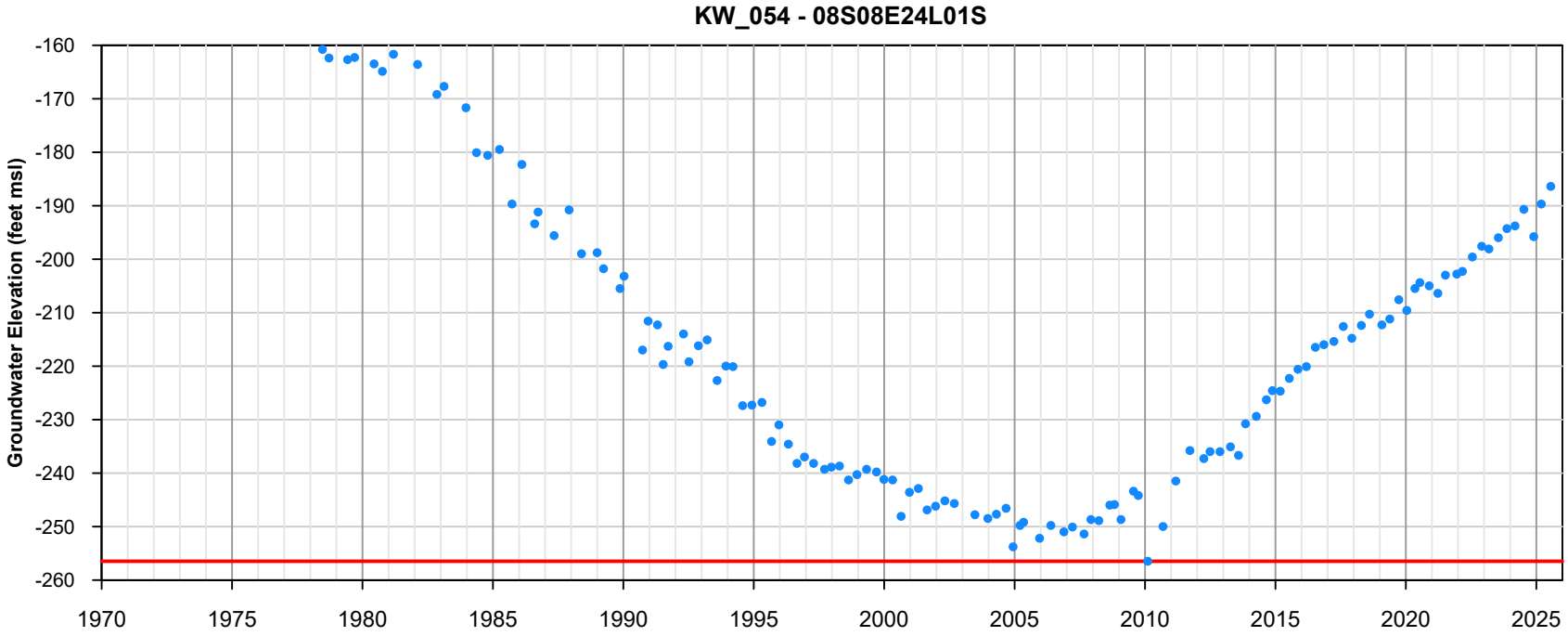
TODD GROUNDWATER

Appendix A-54
Groundwater Elevation Hydrograph
KW_053 - 08S08E03L01S

Well Information

Site Code:	334625N1161051W001
Local Well Name:	KW_054
State Well Name:	08S08E24L001S
Montoring Network Type:	SGMA Representative
Station ID:	56772
Latitude:	33.4625
Longitude:	-116.105
Well Depth (feet bgs):	550
Top Perforation (feet bgs):	100
Bottom Perforation (feet bgs):	550
Ground Surface Elevation:	-107.5
Reference Point Elevation:	-106.2
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

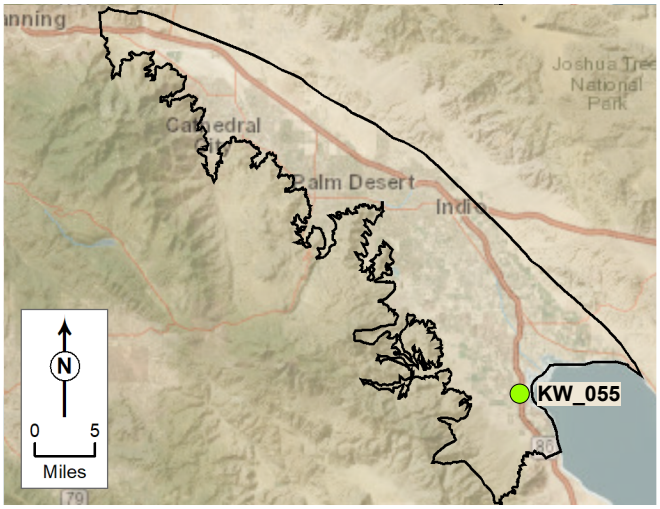
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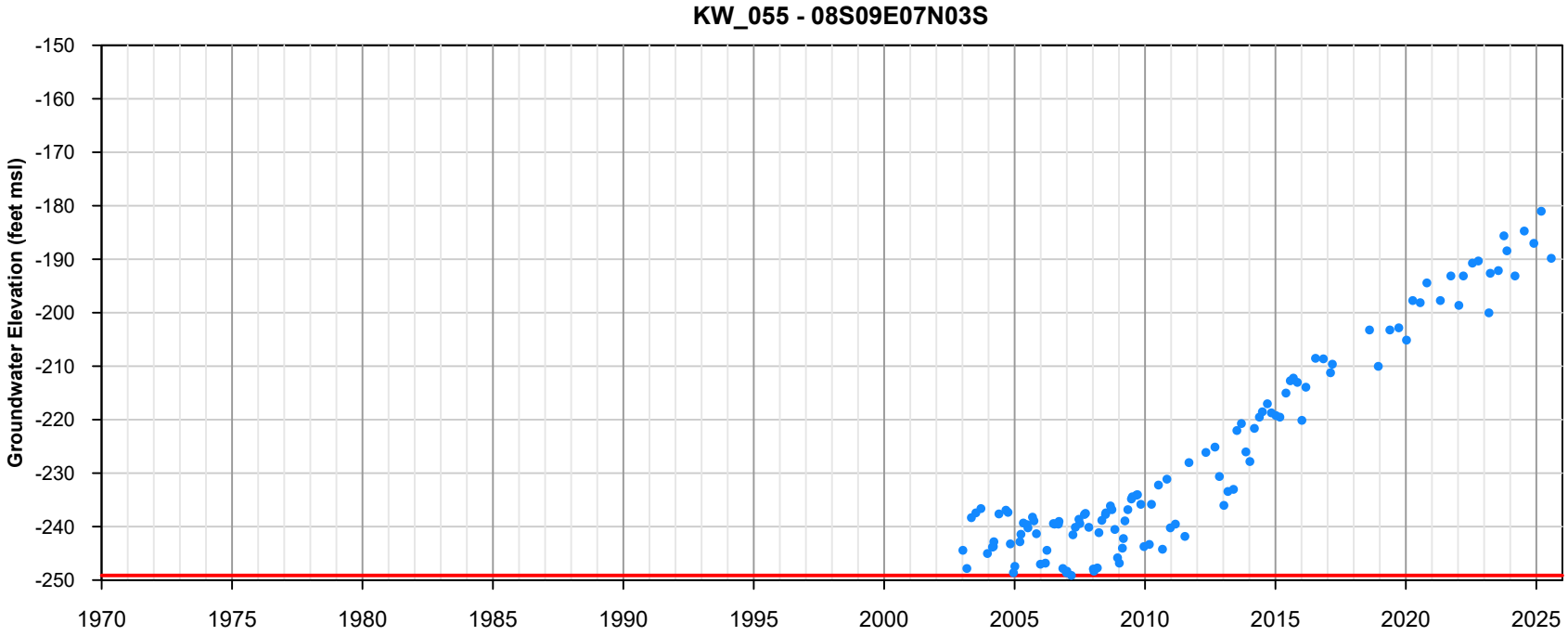
TODD GROUNDWATER

Appendix A-55
Groundwater Elevation Hydrograph
KW_054 - 08S08E24L01S

Well Information

Site Code:	334844N1160957W001
Local Well Name:	KW_055
State Well Name:	08S09E07N003S
Montoring Network Type:	SGMA Representative
Station ID:	56773
Latitude:	33.4845
Longitude:	-116.096
Well Depth (feet bgs):	1380
Top Perforation (feet bgs):	1315
Bottom Perforation (feet bgs):	1375
Ground Surface Elevation:	-206.4
Reference Point Elevation:	-206.4
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

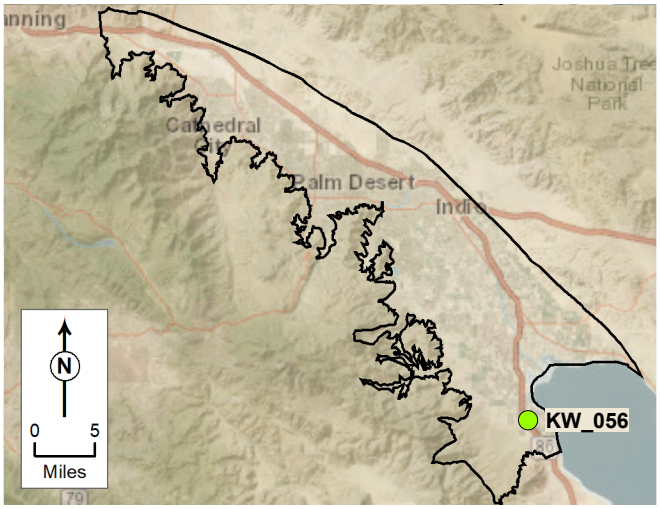
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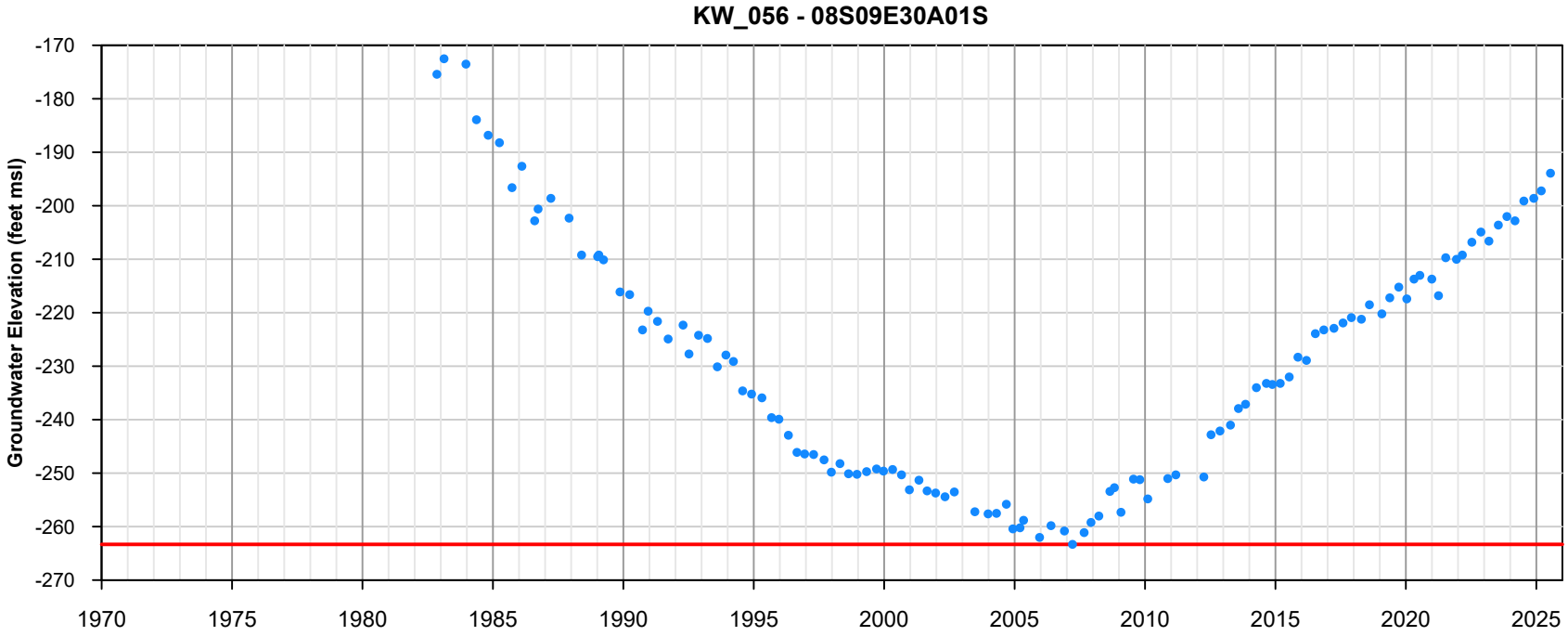
TODD GROUNDWATER

Appendix A-56
Groundwater Elevation Hydrograph
KW_055 - 08S09E07N03S

Well Information

Site Code:	334523N1160836W001
Local Well Name:	KW_056
State Well Name:	08S09E30A001S
Montoring Network Type:	SGMA Representative
Station ID:	56774
Latitude:	33.4524
Longitude:	-116.084
Well Depth (feet bgs):	595
Top Perforation (feet bgs):	315
Bottom Perforation (feet bgs):	595
Ground Surface Elevation:	-149.1
Reference Point Elevation:	-147.9
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

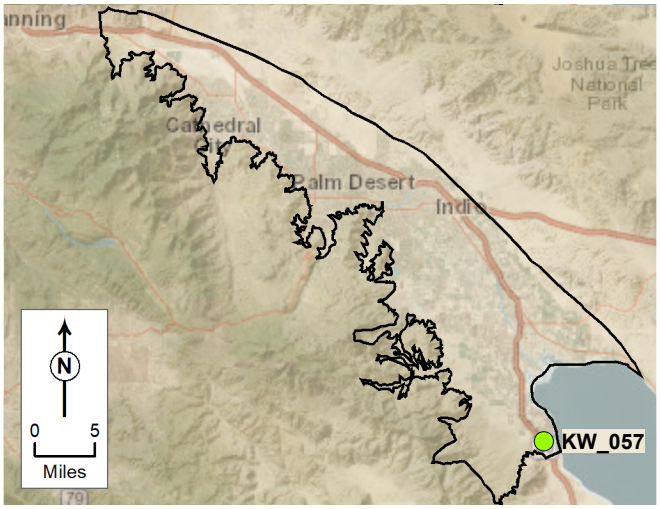
January 2026

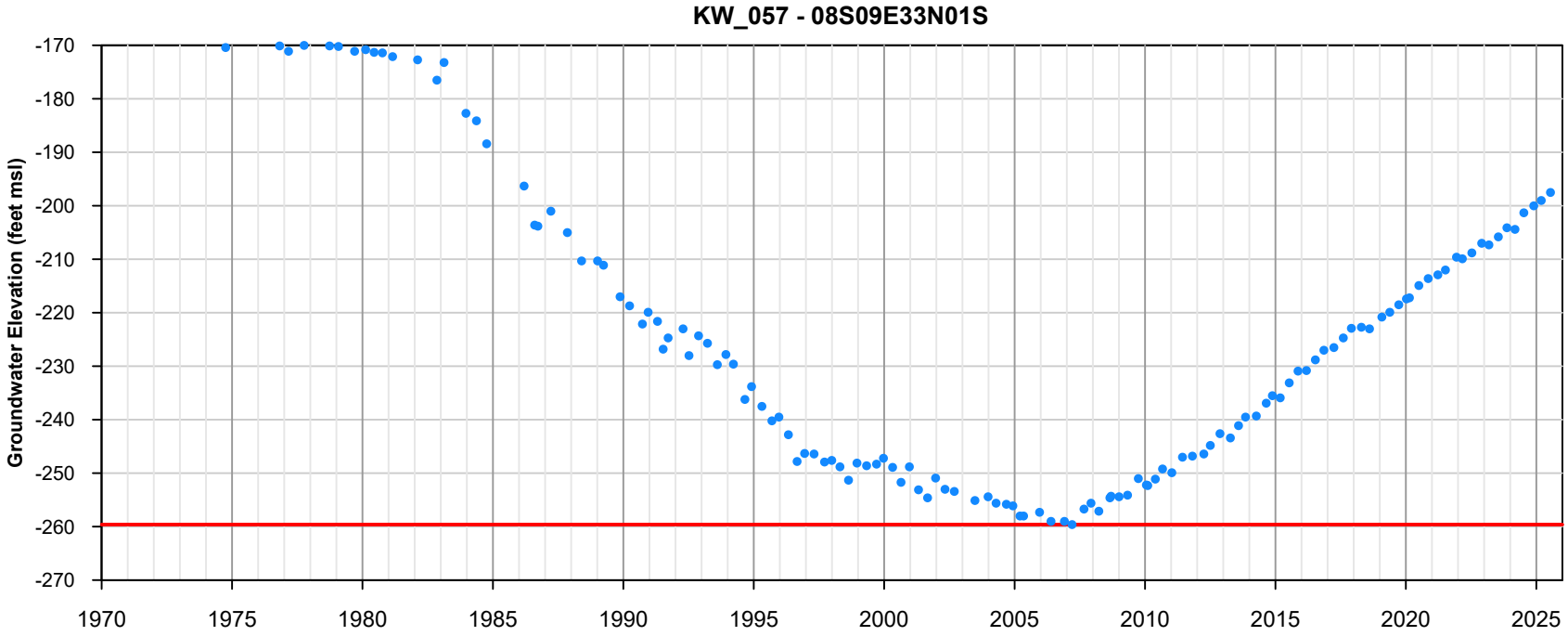
TODD GROUNDWATER

Appendix A-57
Groundwater Elevation Hydrograph
KW_056 - 08S09E30A01S

Well Information

Site Code:	334268N1160610W001
Local Well Name:	KW_057
State Well Name:	08S09E33N001S
Montoring Network Type:	SGMA Representative
Station ID:	56775
Latitude:	33.4269
Longitude:	-116.061
Well Depth (feet bgs):	356
Top Perforation (feet bgs):	100
Bottom Perforation (feet bgs):	356
Ground Surface Elevation:	-130.3
Reference Point Elevation:	-129.5
Sustainability Indicators:	Groundwater Levels





Groundwater Elevation (feet msl)

Minimum Threshold (feet msl)

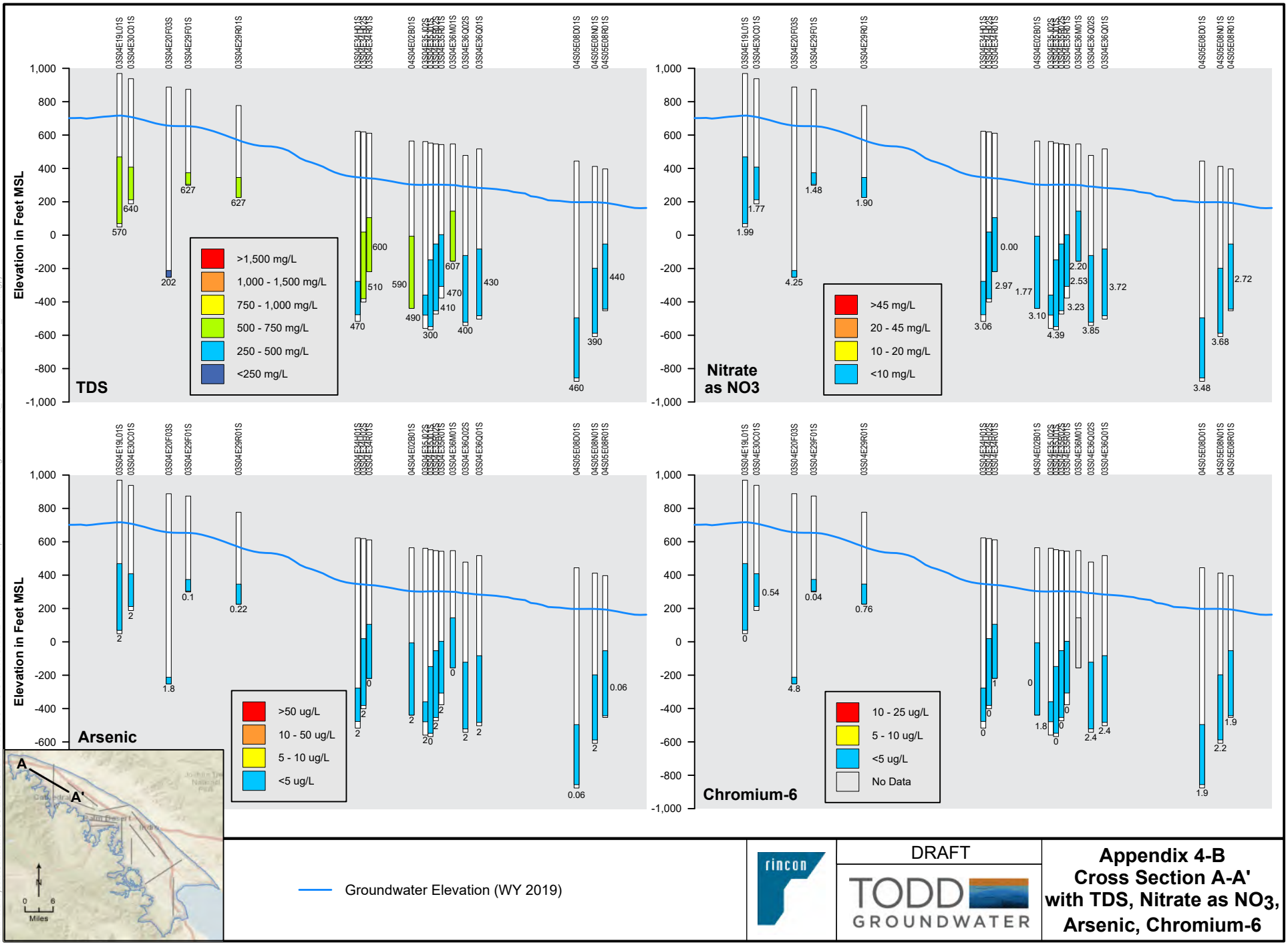
January 2026

TODD GROUNDWATER

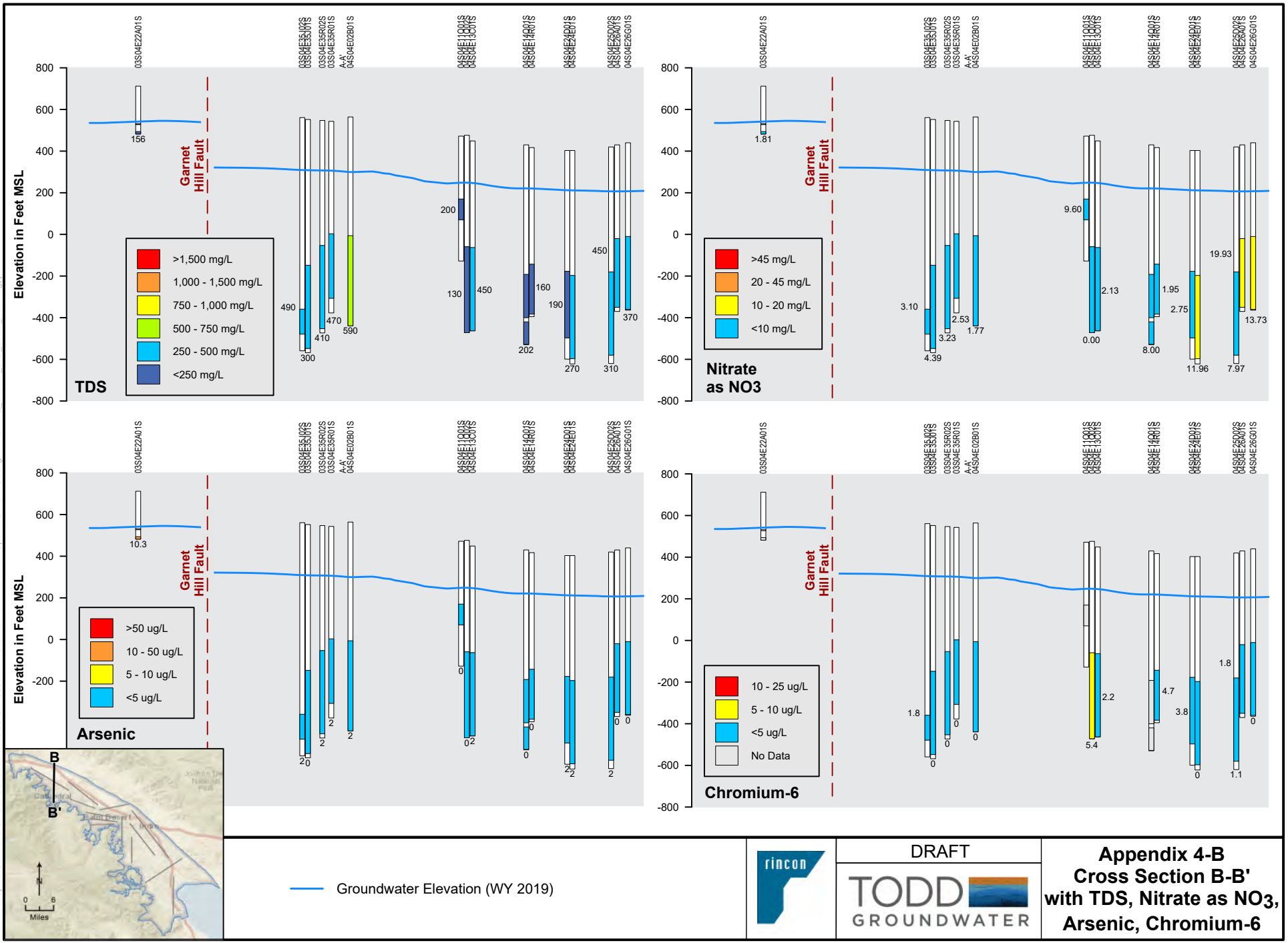
Appendix A-58
Groundwater Elevation Hydrograph
KW_057 - 08S09E33N01S

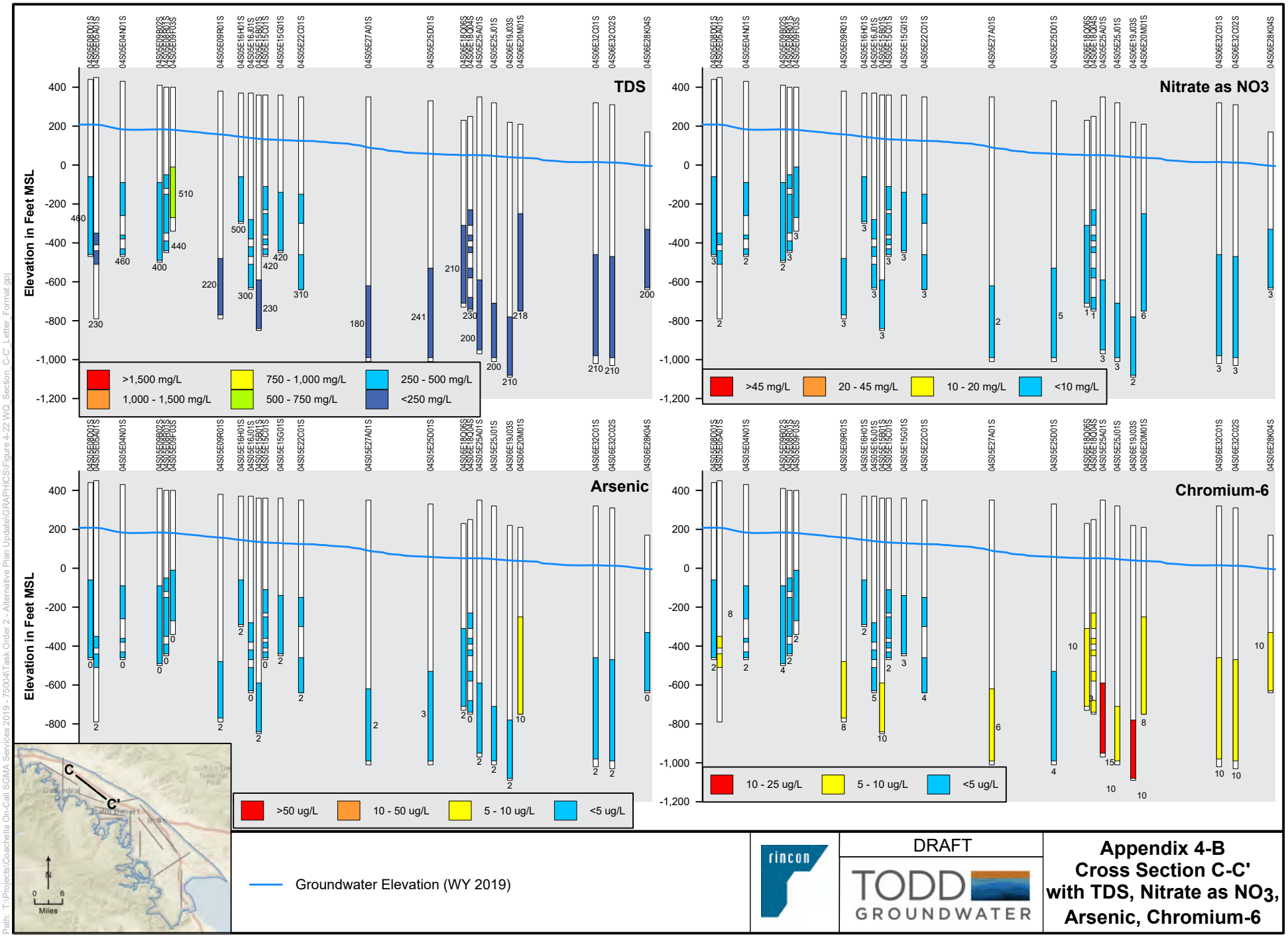
Appendix 4-B

2022 Water Quality Cross Sections (1990-2019)



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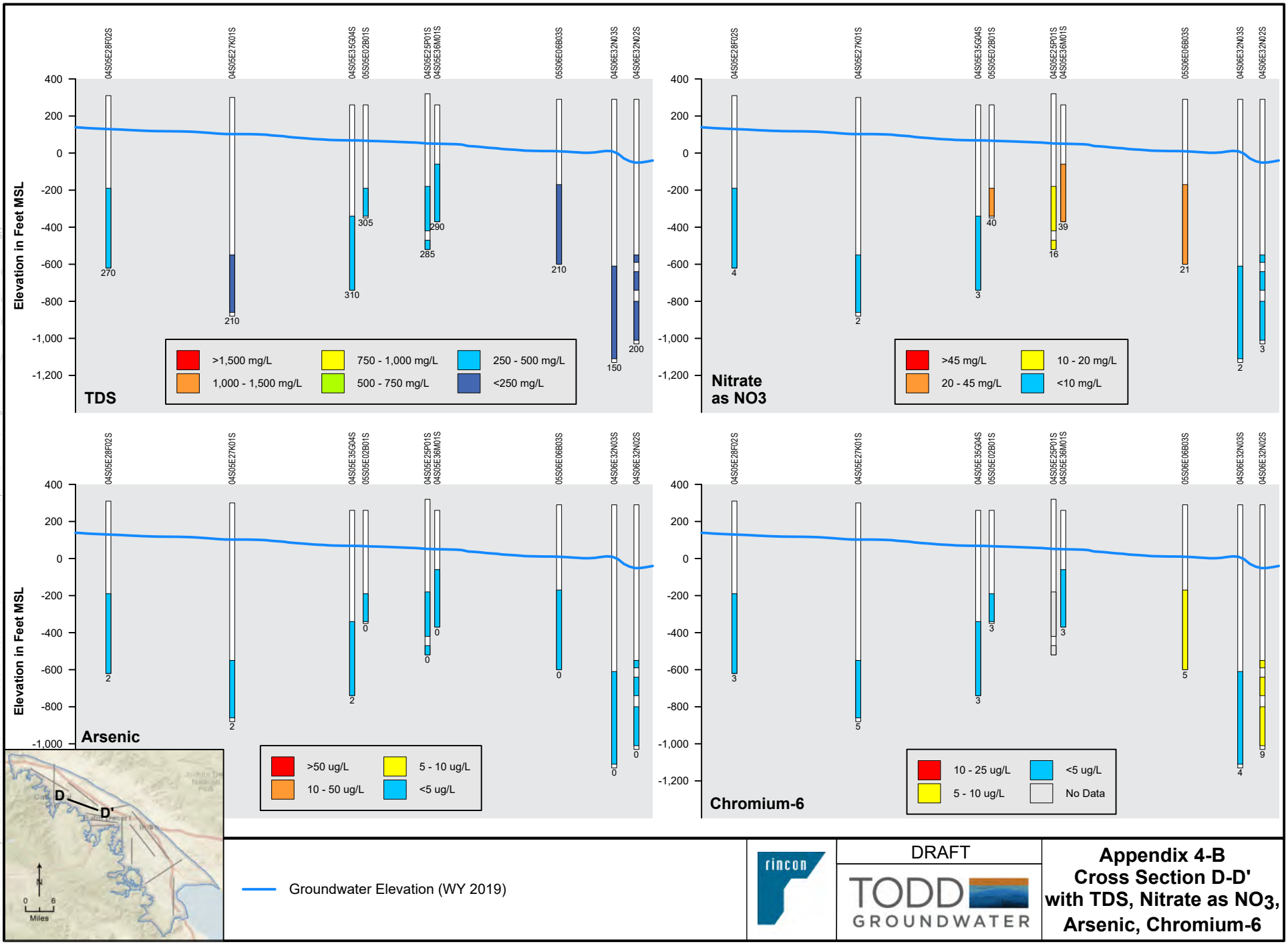

Elevation in Feet MSL
800
600
400
200
0
-200
-400
-600
-800
Garnet Hill Fault
TDS
>1,500 mg/L
1,000 - 1,500 mg/L
750 - 1,000 mg/L
500 - 750 mg/L
250 - 500 mg/L
<250 mg/L
156
490
300
410
470
590
200
130
450
160
202
190
270
450
310
370
Nitrate as NO3
>45 mg/L
20 - 45 mg/L
10 - 20 mg/L
<10 mg/L
1.81
3.10
4.39
3.23
2.53
1.77
9.60
0.00
2.13
1.95
8.00
2.75
11.96
19.93
7.97
13.73
Arsenic
>50 ug/L
10 - 50 ug/L
5 - 10 ug/L
<5 ug/L
10.3
2
0
Chromium-6
10 - 25 ug/L
5 - 10 ug/L
<5 ug/L
No Data
1.8
5.4
2.2
4.7
3.8
1.1
B
B'
N
0
6
Miles
Groundwater Elevation (WY 2019)
rincon
DRAFT
TODD GROUNDWATER
Appendix 4-B
Cross Section B-B'
with TDS, Nitrate as NO3,
Arsenic, Chromium-6
Path: T:\Projects\Coachella On-Call SGMA Services 2019 - 75004\Task Order 2 - Alternative Plan Update\GRAPHICS\Figure 4-21 WQ_Section_B-B'_Letter_Format.gpj



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Appendix 4-B
Cross Section C-C' with TDS, Nitrate as NO_3, Arsenic, Chromium-6

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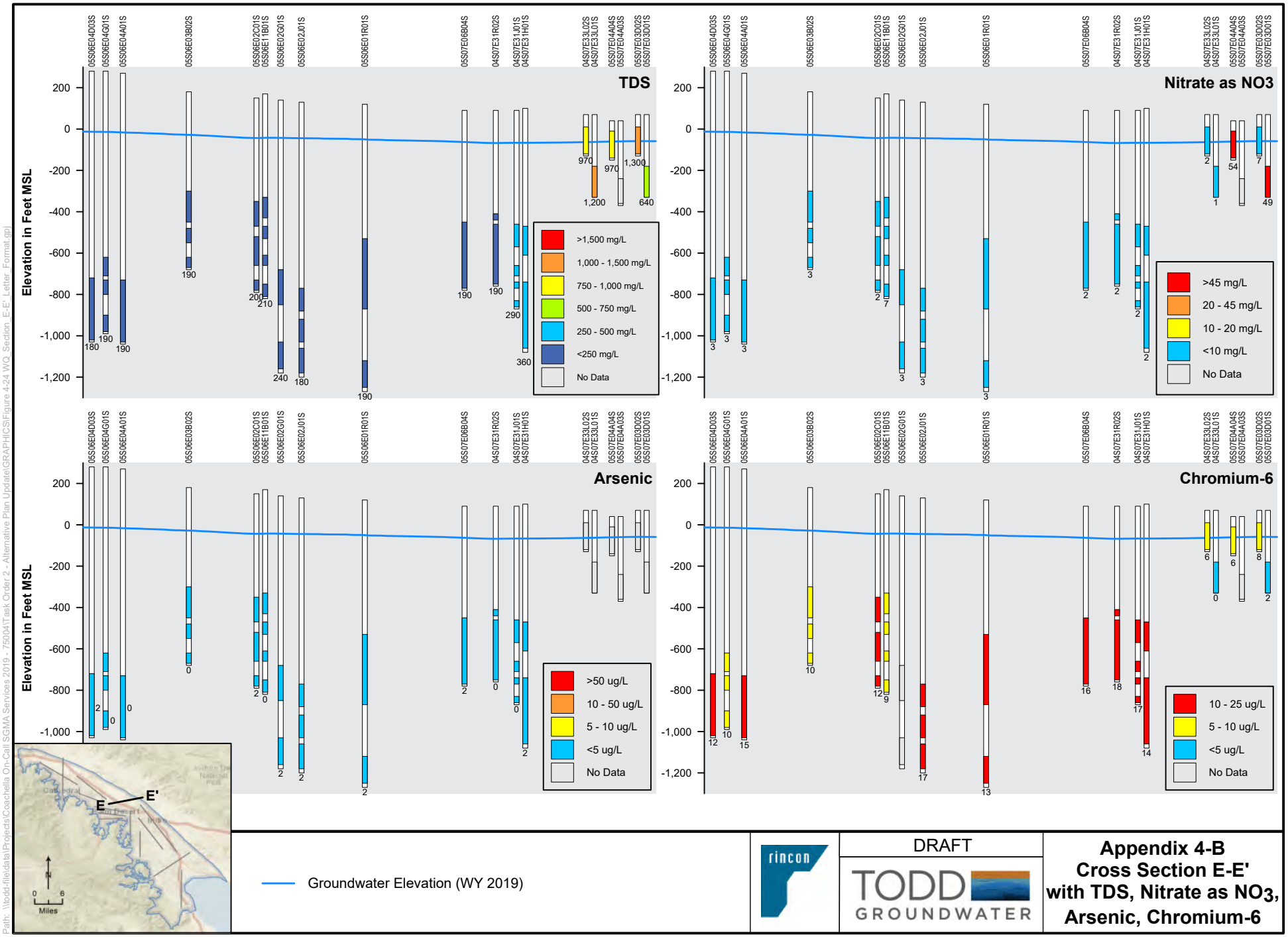


DRAFT

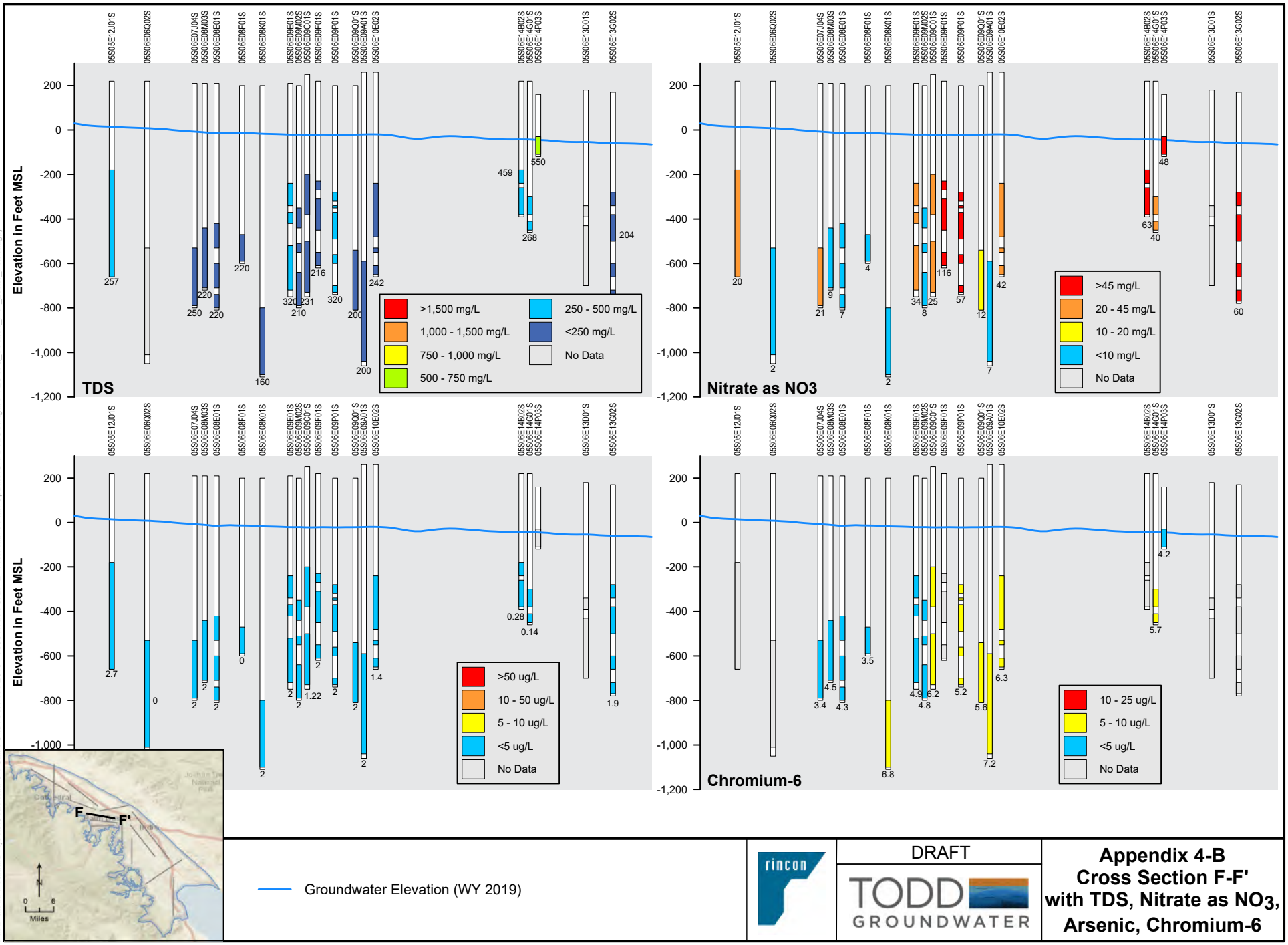
TODD GROUNDWATER

Appendix 4-B
Cross Section D-D' with TDS, Nitrate as NO_3, Arsenic, Chromium-6

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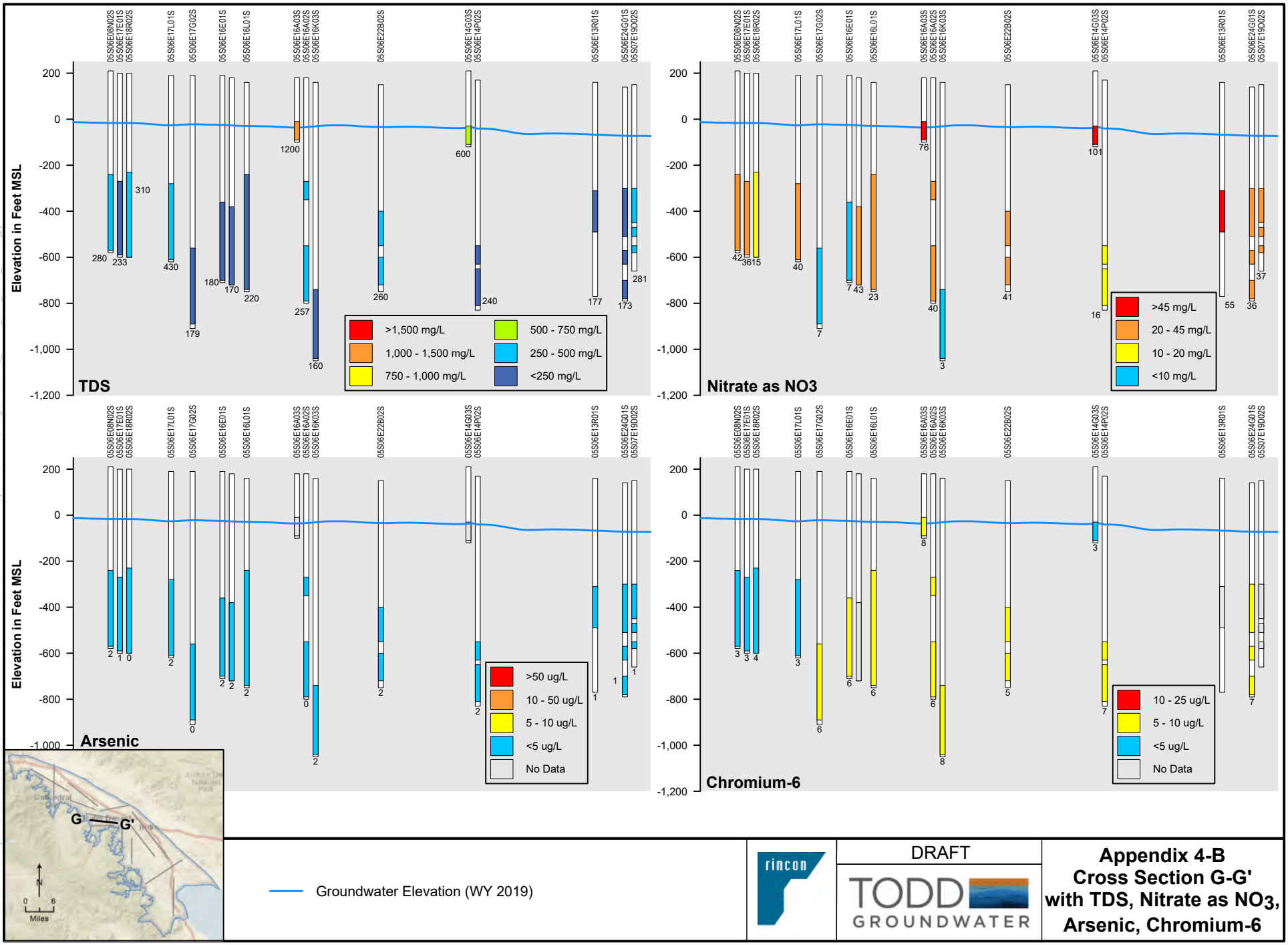
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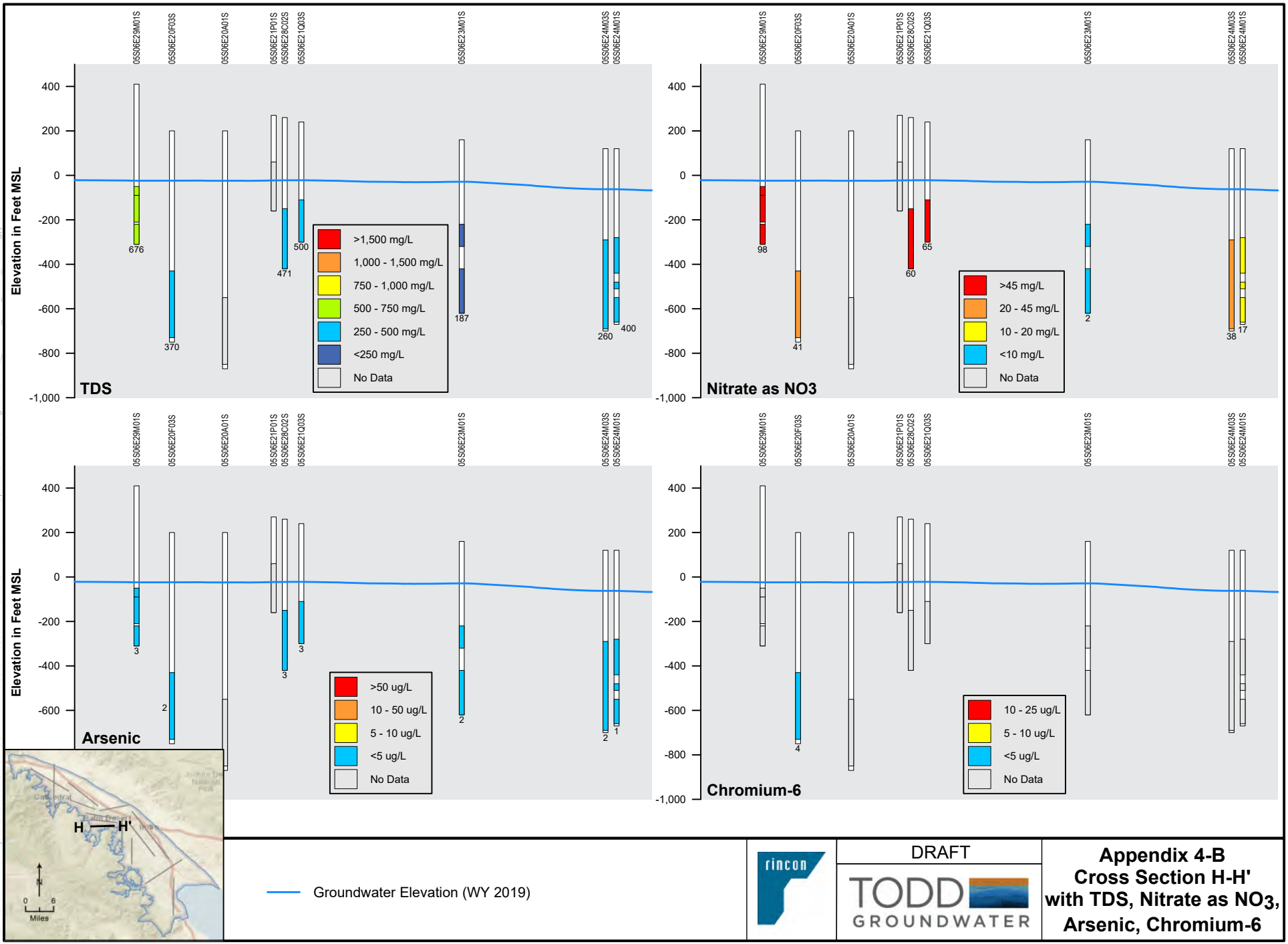
DRAFT

Appendix 4-B
Cross Section F-F' with TDS, Nitrate as NO_3, Arsenic, Chromium-6

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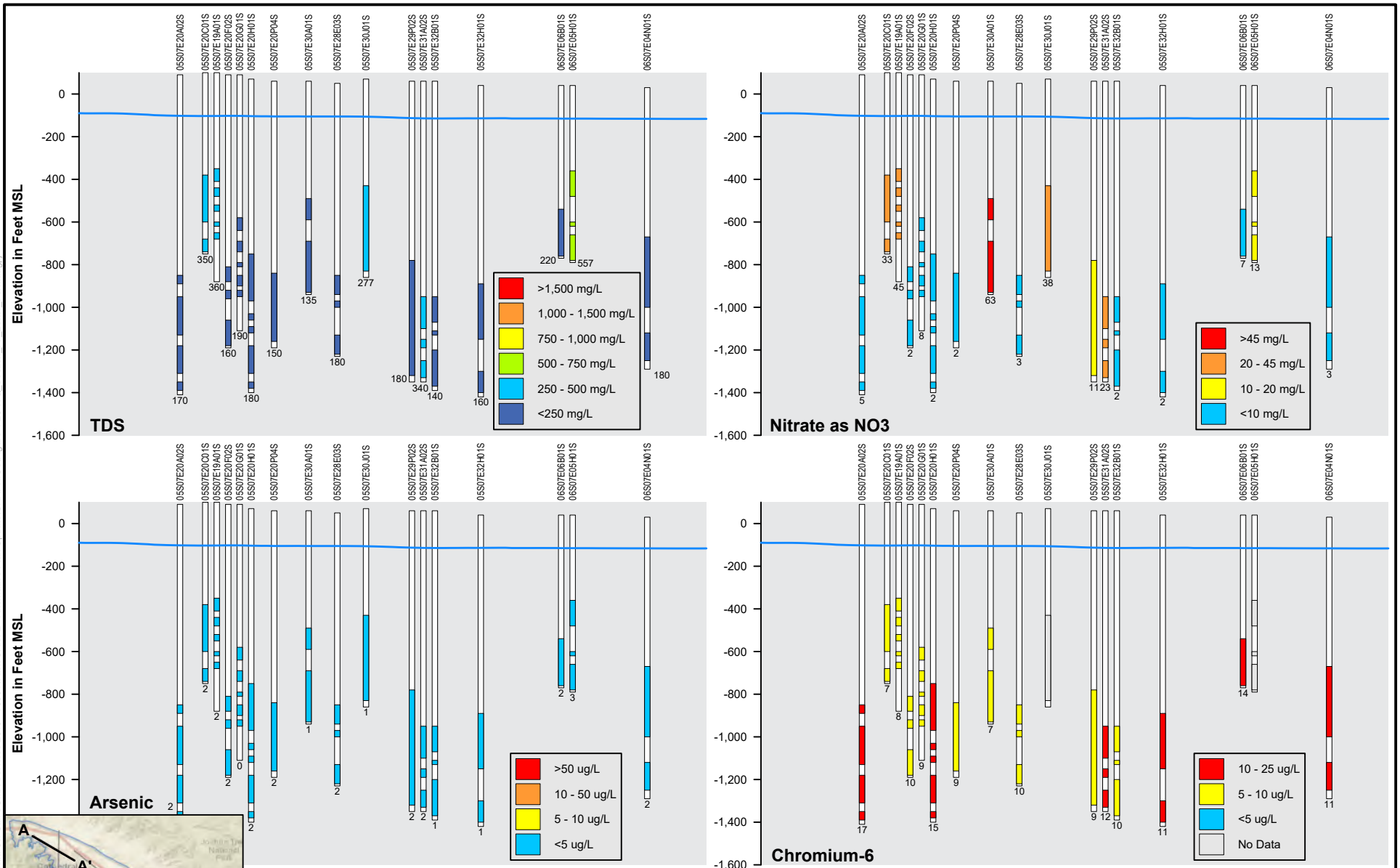


Groundwater Elevation (WY 2019)

DRAFT

Appendix 4-B
Cross Section H-H' with TDS, Nitrate as NO_3, Arsenic, Chromium-6

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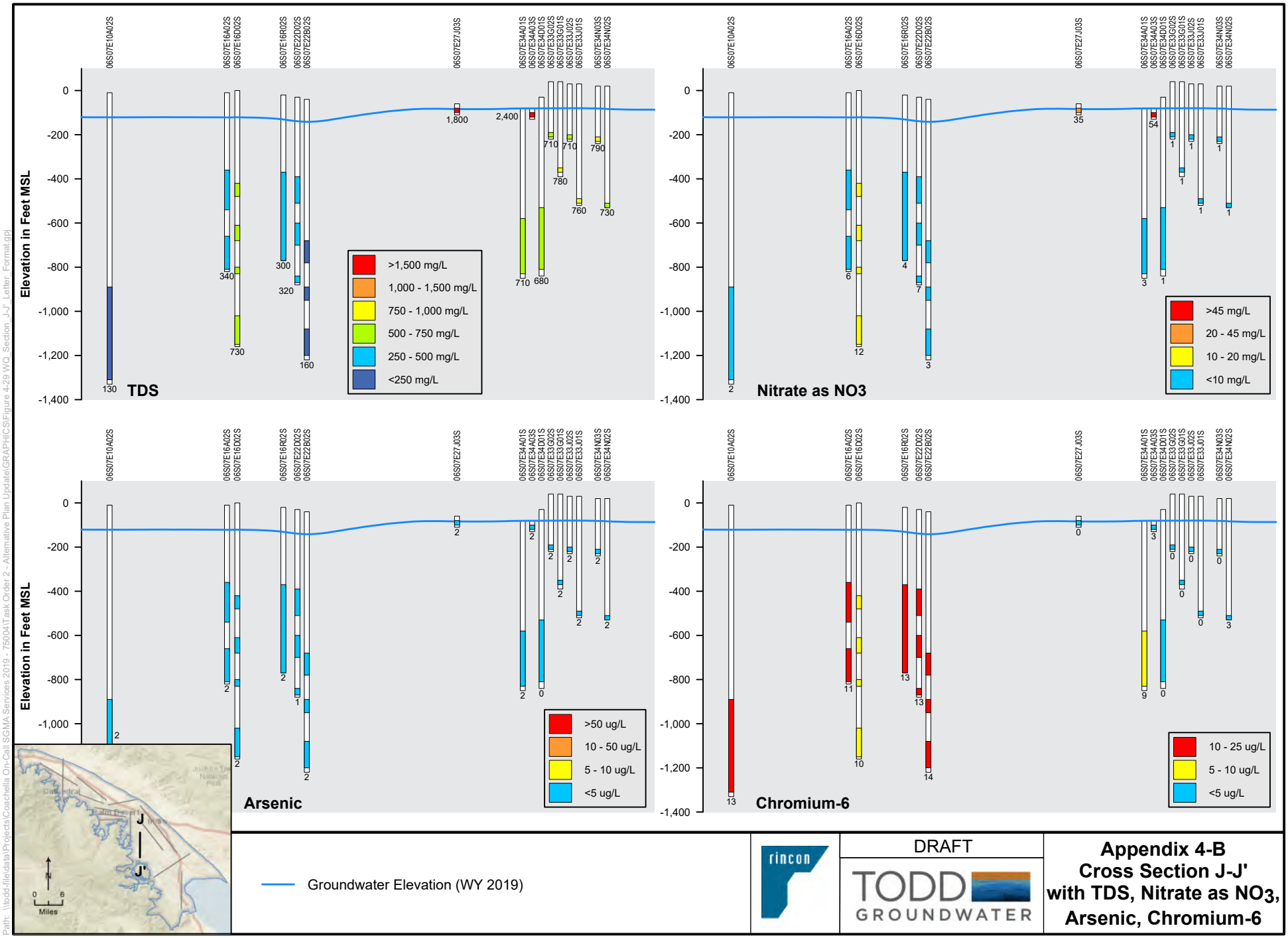
Groundwater Elevation (WY 2019)

DRAFT

TODD GROUNDWATER

Appendix 4-B
Cross Section I-I'
with TDS, Nitrate as NO_3, Arsenic, Chromium-6

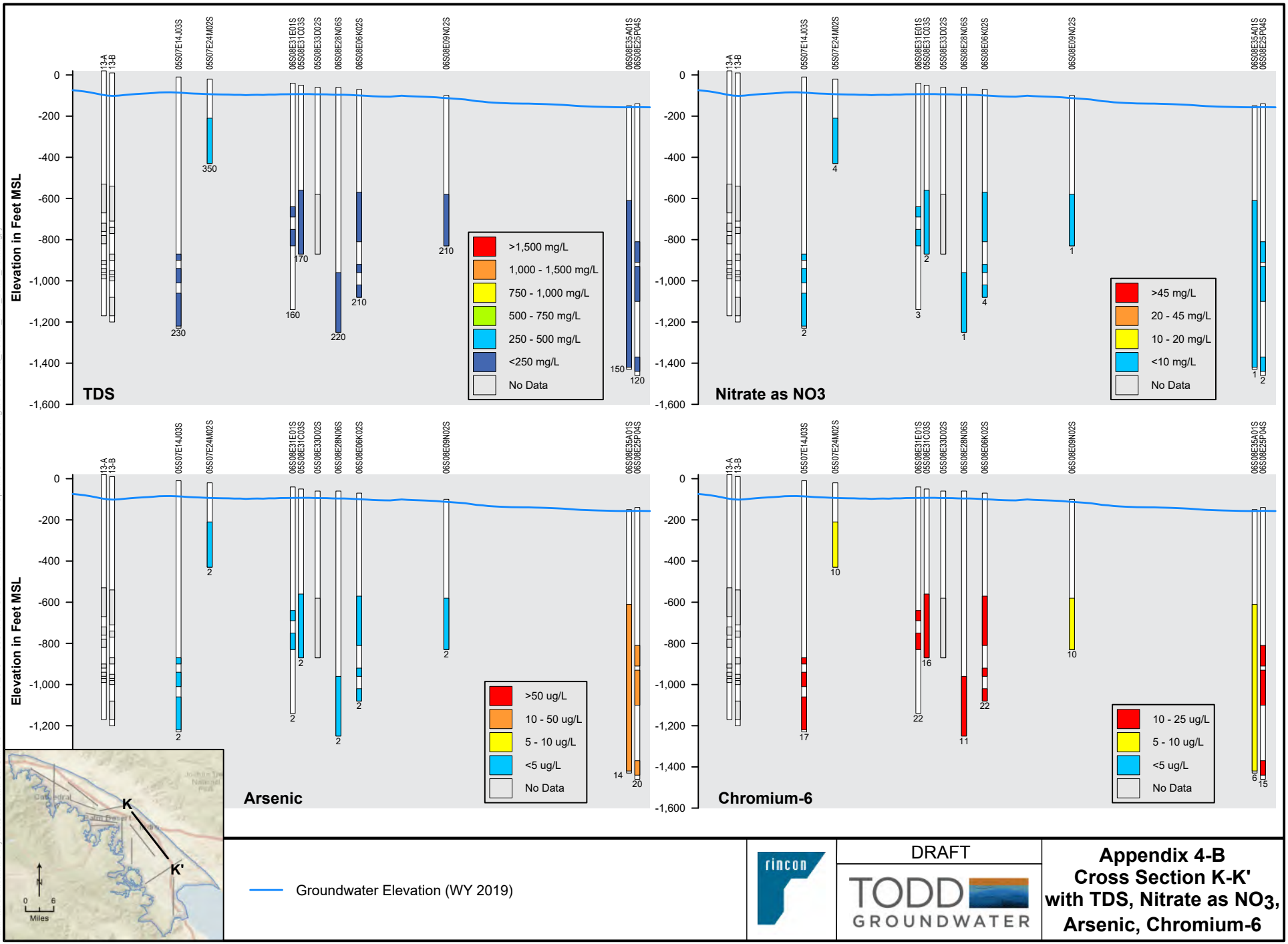
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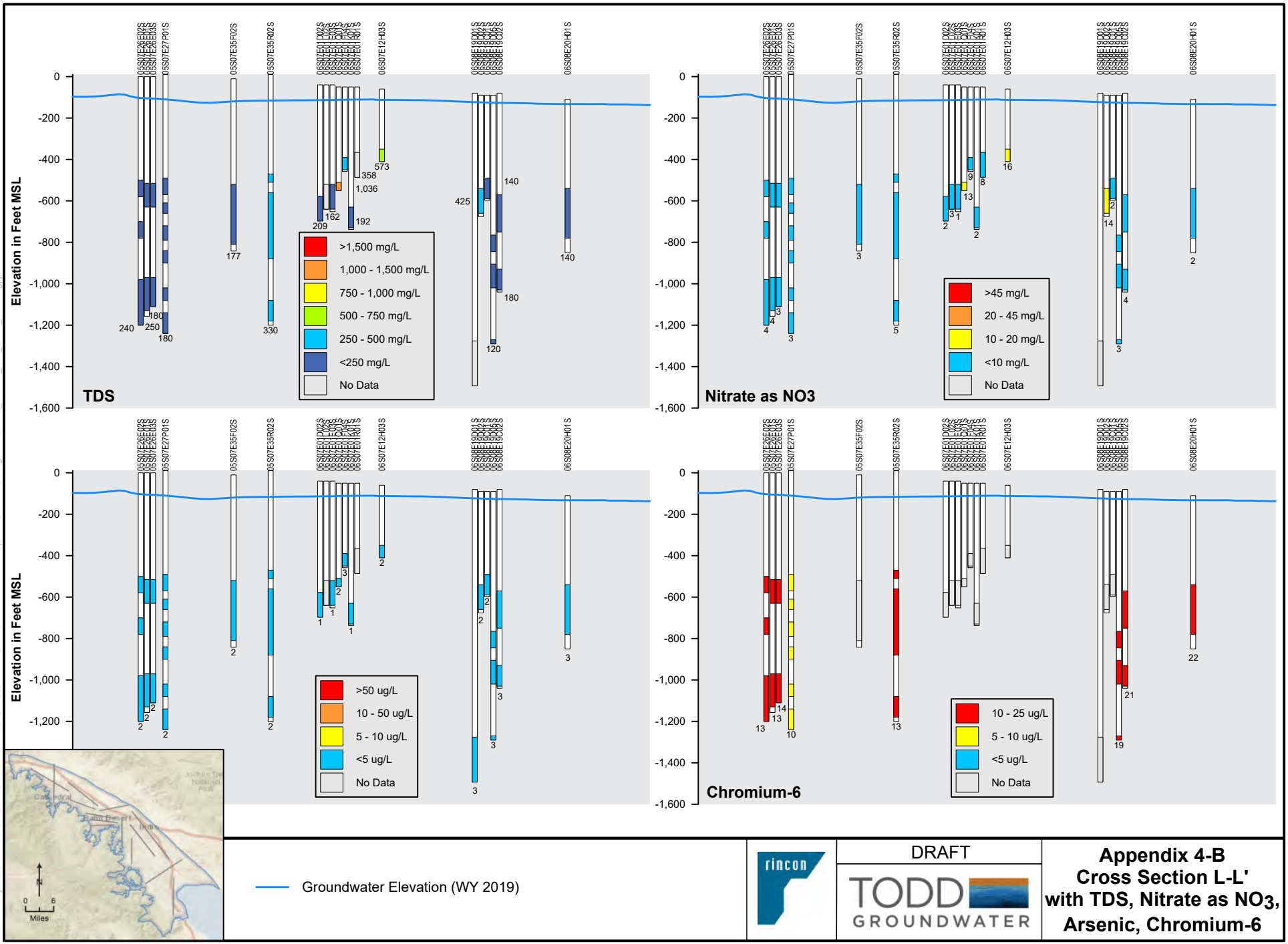
DRAFT

Appendix 4-B
Cross Section J-J' with TDS, Nitrate as NO_3, Arsenic, Chromium-6

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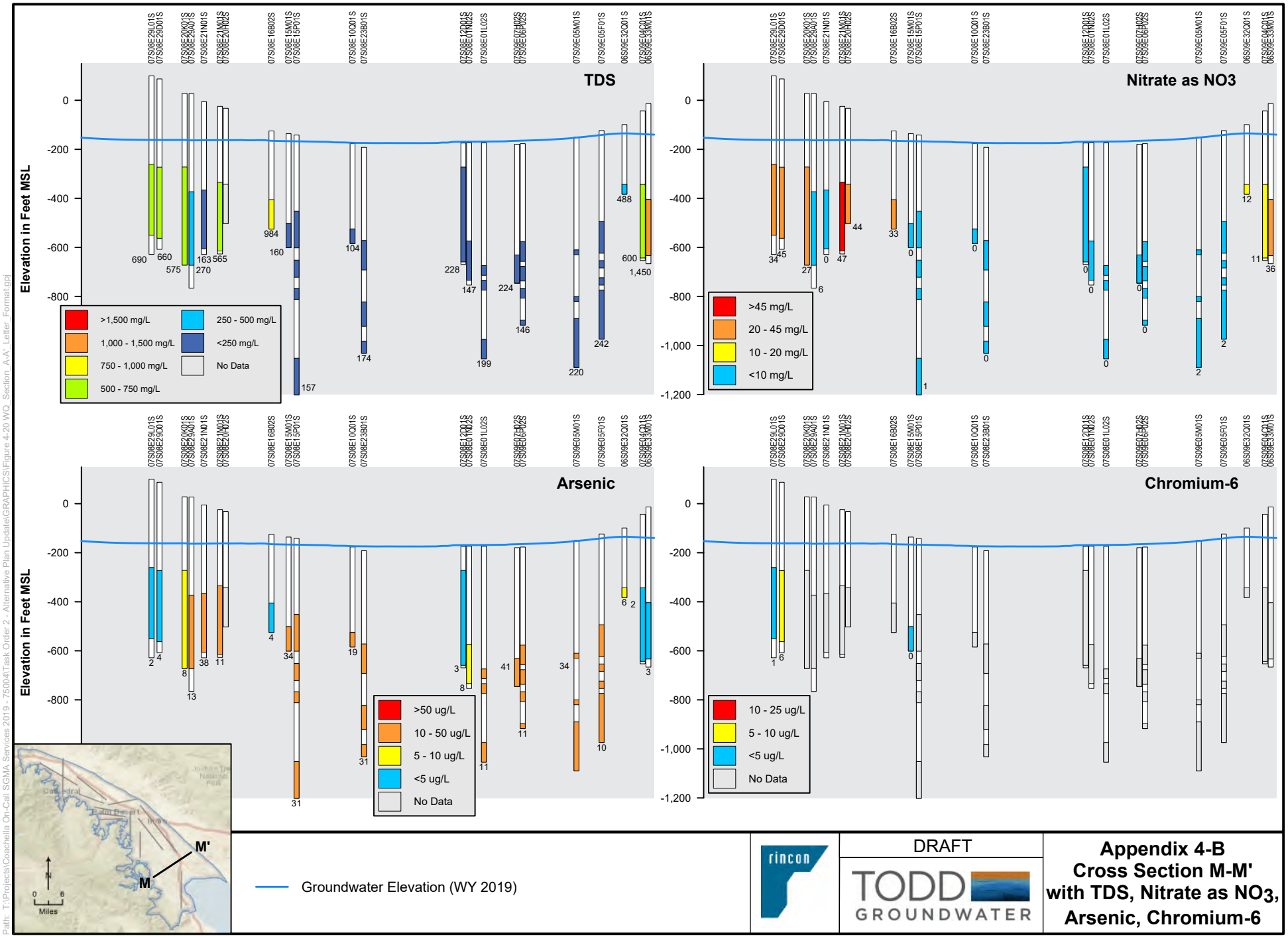
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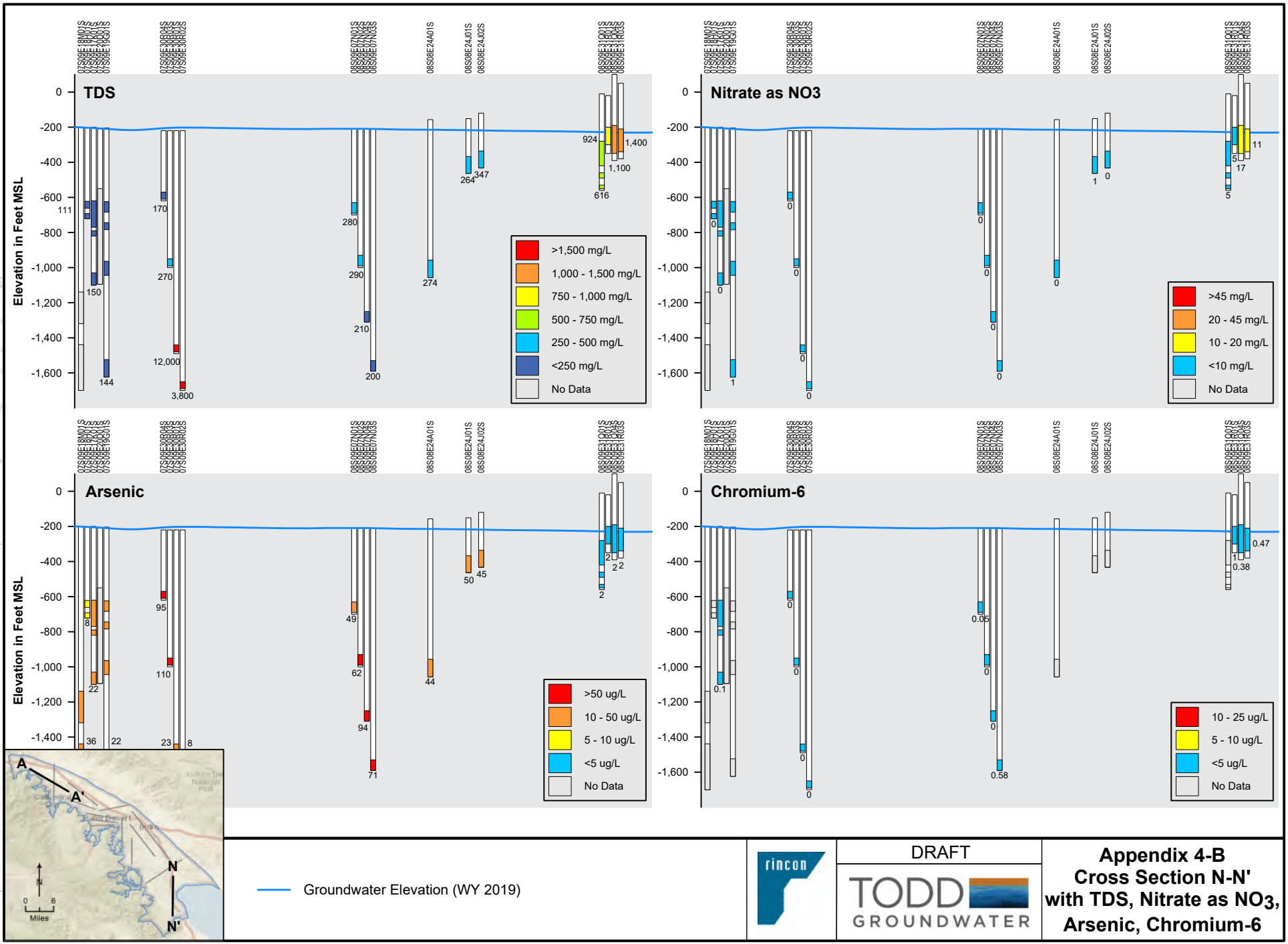


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Appendix 4-B
Cross Section L-L' with TDS, Nitrate as NO_3, Arsenic, Chromium-6

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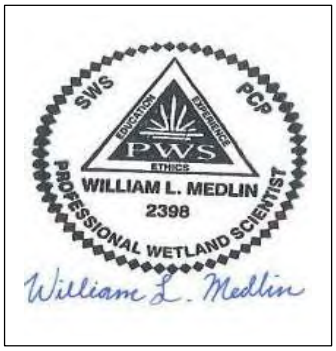

TDS
Nitrate as NO3
Arsenic
Chromium-6
Elevation in Feet MSL
0
-200
-400
-600
-800
-1,000
-1,200
>1,500 mg/L
1,000 - 1,500 mg/L
750 - 1,000 mg/L
500 - 750 mg/L
250 - 500 mg/L
<250 mg/L
No Data
>45 mg/L
20 - 45 mg/L
10 - 20 mg/L
<10 mg/L
>50 ug/L
10 - 50 ug/L
5 - 10 ug/L
<5 ug/L
No Data
10 - 25 ug/L
5 - 10 ug/L
<5 ug/L
No Data
M
M'
N
0
6
Miles
Groundwater Elevation (WY 2019)
rincon
DRAFT
TODD GROUNDWATER
Appendix 4-B
Cross Section M-M'
with TDS, Nitrate as NO3,
Arsenic, Chromium-6
Path: T:\Projects\Coachella On-Call SGMA Services 2019 - 75004\Task Order 2 - Alternative Plan Update\GRAPHICS\Figure 4-20 WQ_Section_A-A' Letter_Format.gpj


TDS
Nitrate as NO3
Arsenic
Chromium-6
Elevation in Feet MSL
>1,500 mg/L
1,000 - 1,500 mg/L
750 - 1,000 mg/L
500 - 750 mg/L
250 - 500 mg/L
<250 mg/L
No Data
>45 mg/L
20 - 45 mg/L
10 - 20 mg/L
<10 mg/L
No Data
>50 ug/L
10 - 50 ug/L
5 - 10 ug/L
<5 ug/L
No Data
10 - 25 ug/L
5 - 10 ug/L
<5 ug/L
No Data
A
A'
N
N'
0
6
Miles
Groundwater Elevation (WY 2019)
rincon
DRAFT
TODD GROUNDWATER
Appendix 4-B
Cross Section N-N'
with TDS, Nitrate as NO3,
Arsenic, Chromium-6
Path: T:\Projects\Coachella On-Call SGMA Services 2019 - 7500\4Task Order 2 - Alternative Plan Update\GRAPHICS\Figure 4-20 WQ_Section_A-A' Letter_Format.gpj

Appendix 4-C

Indio Subbasin Groundwater Dependent Ecosystems Study

TECHNICAL MEMORANDUM



TO: Coachella Valley Water District

CC: Iris Priestaf, Todd Groundwater

PREPARED BY: William L. Medlin, PWS, ENV SP

REVIEWED BY: Rosalyn Prickett, AICP

DATE: November 2021

RE: Indio Subbasin Groundwater Dependent Ecosystems Study

Identification of Groundwater Dependent Ecosystems (GDEs) are a required component of groundwater management planning under the Sustainable Groundwater Management Act (SGMA). SGMA defines GDEs as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (23 CCR § 351(m)). This Technical Memorandum (memo) specifically focuses on potential GDEs identified within the Indio Subbasin of the Coachella Valley Groundwater Basin (project area).

1. INDIO GROUNDWATER BASIN ECOLOGICAL SETTING

An ecoregion is an area with generally similar ecosystems with similar quantity, quality, and type of environmental resources. Ecoregions are an important geospatial mapping system that are used by many local, state, and federal regulatory agencies and non-governmental organizations as a frame of reference for assessment and management of ecosystems across the United States (US). In the context of GDEs, it is important to consider the ecoregion where the GDEs are being assessed because biotic and abiotic processes may vary widely between localities.

The Indio Subbasin is located in southern California and sits between the San Jacinto Mountains to the west and the Little San Bernardino Mountains to the east. The project area encompasses multiple cities and unincorporated communities within Riverside County, California. A very small section in the southwestern extent of the Subbasin extends into San Diego County and Imperial County. The Subbasin sits entirely within the Sonoran Basin and Range (85) Level III ecoregion (USGS, EPA 2016). The Sonoran Basin and Range ecoregion consists of low mountains with large swaths of federal government-owned property and is generally hotter than the Mojave. Vegetation is typically adapted to prolonged drought and hot weather, along with accompanying extreme soil moisture and temperature regimes. Predominant natural vegetative communities are desert scrub including multiple species of cacti and creosotebush (*Larrea tridentata*) and microphyll woodlands that generally occupy desert washes or bajadas that carry occasional stormwater flow.

The project area covers four different Level IV ecoregions. Figure 1 (Attachment A) illustrates the general location of the Indio Subbasin in the context of the Ecoregions of California. The extreme southwestern extents of the Indio Subbasin occupy the Western Sonoran Mountain Woodland and Shrubland (81b) ecoregion. This montane transition area occurs at the western edge of the Sonoran Desert and is generally above 3,000 feet in elevation. The landscape typically consists of desert chapparal mixed with pinyon pine (*Pinus monophylla*) and California juniper (*Juniperus californica*) along with a few canyon live oak (*Quercus chrysolepis*) among the scattered granitic boulders. Native fan palm oases are found in some of the steeper canyons. Rocky mountainous slopes, cliffs, canyons, dry washes, and alluvial fans in this region provide habitat for the protected Peninsular bighorn sheep (*Ovis canadensis nelsoni*).

The western edges and tips of the basin extend into the Western Sonoran Mountains (81a) ecoregion. This area is characterized by erosional highlands of exposed bedrock dissected by dry washes that are subject to flash flooding. Rainfall is infrequent in this ecoregion. Vegetative communities in this rocky terrain are typically creosotebush scrub

with ocotillo (*Fouquieria splendens*) and cacti scattered throughout. Spring annual forbs are also abundant in this region.

The northern half of the basin consists of the Upper Coachella Valley and Hills (81e) ecoregion. This area is made up of alluvial and sand deposits surrounded by mountains to the east, west, and north. To the south, the valley slopes towards the Salton Sea and land use transitions to a vast agricultural landscape. However, the Mecca Hills and Indio Hills provide some rolling topography, and the Indio Hills have canyons where some native fan palm oases still persist. Soils are typically hot and very dry. Certain sandy areas may provide suitable habitat for the protected Coachella Valley fringe-toed lizard (*Uma inornata*) as well as other rare or unusual species. Habitat fragmentation and loss by urban and suburban land development presents constant pressure on these protected species.

The southern half of the basin consists of the Imperial/Lower Coachella Valleys (81f) ecoregion. This area is largely comprised of the former Lake Cahuilla lakebed within the greater Salton Sink geologic formation. The region is mostly below sea level and contains significant areas of historically deposited silts and other river sediments that have made the area rich in agricultural productivity. Planted and fallow fields dominate the landscape and there is a complex system of irrigation for crop production. The Salton Sea sits at the low point of the Salton Trough and serves as the terminal drainage point for the Whitewater River/Coachella Valley Stormwater Channel (CVSC), New River, and Alamo River along with numerous other small tributaries, agricultural drains, and dry washes. The Salton Sea is an important ecological "stopover" habitat for a multitude of migratory birds and waterfowl that travel the Pacific Flyway; however, there are some persistent water quality problems that pose a threat to species such as eutrophication, contamination, and ever-increasing salinity.

According to United States Geological Survey (USGS) 7.5-minute topography, the approximate elevation of the western extent of the Indio Subbasin within the Santa Rosa Mountains is 3,000 above mean sea level and the approximate elevation of the southern extent of the basin along the shoreline of the Salton Sea is -230 feet below mean sea level. The principal surface drainage features within the Indio Subbasin are mainly comprised of larger, named urban stormwater channels, canals, creeks, agricultural drains, and dry washes that drain to the Whitewater River Stormwater Channel (which becomes the Coachella Valley Stormwater Channel in the lower portion of the valley). Most of these major drainages generally flow east and south through the project area eventually emptying into the Salton Sea. It should also be noted that, according to the USGS topography mapping, there are many mapped springs in various locations throughout the basin. Refer to Figure 2 (Attachment A) for USGS 7.5-minute topography in the vicinity of the Indio groundwater basin.

2. THREATENED AND ENDANGERED SPECIES IN THE INDIO BASIN

As part of the GDEs assessment, Woodard & Curran conducted a preliminary review of special-status species within the Indio Subbasin. This study focuses on state and federal listed species designated as "threatened" and/or "endangered" by the California Department of Fish and Wildlife (CDFW) or the US Fish and Wildlife Service (USFWS). Other listed or otherwise unlisted special status species were excluded from our evaluation. The purpose of this exercise was to support the determination of ecological value for potential GDEs within the Subbasin.

Much of the Indio Subbasin is covered by the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP). The plan was approved in September 2008 and most recently amended in August 2016. The CVMSHCP is administered by the Coachella Valley Conservation Commission (CVCC) and is designed to conserve regional sensitive ecological habitat and protected plant and animal species by coordinating project impacts and compensatory mitigation through the issuance of "take" permits for special-status species. The CVMSHCP plan area encompasses approximately 1.2 million acres within Riverside County, California. The small portions of the Indio Subbasin located within San Diego and Imperial Counties are not covered by the CVMSHCP. Refer to Figure 3 (Attachment A) for protected areas covering the Coachella Valley and the Indio Subbasin.

Woodard & Curran conducted a literature review of the California Natural Diversity Database (CNDDB; CDFW 2020) for the Indio Subbasin. Additionally, Woodard & Curran reviewed the USFWS Critical Habitat Mapper and the Information, Planning and Consultation (IPaC) database for the area covering the Indio Subbasin. Refer to Figure 4 (Attachment A) for federal and state listed threatened and endangered species occurring within the Indio Subbasin according to CNDDB.

As part of the GDEs field assessment, thirteen (13) representative locations were surveyed in the field by a Woodard & Curran senior biologist to document the vegetative community and general habitat conditions from January 11 – 14, 2021. The field survey locations were selected during the preliminary desktop assessment of GDEs for the project area. Plant and wildlife species observed were documented during the field visit(s), and representative photographs were taken. Protocol-level or presence-absence surveys were not conducted as part of this scope of work. Refer to Figure 4 for a map of state and federal protected species potentially occurring within the Indio Subbasin. Table 1 below describes state and federal listed threatened and endangered species within the Indio Subbasin and whether they were observed during the field assessment.

Table 1. State and Federal Threatened and Endangered Species in Indio Subbasin.

Scientific Name Common Name	**Status**	**Habitat**	**Potential to Occur Within the Project Area**	**Reliance on Groundwater**	**Individual(s) Observed**
Fauna					
Ovis canadensis nelsoni Peninsular bighorn sheep	**USFWS:** E **CDFW:** T **CVMSHCP coverage:** yes	Open rocky slopes, cliffs, canyons, dry washes, and alluvial fans.	**Presumed extant** based on CNDDB (2020) data. Suitable habitat exists within the project area. USFWS-designated critical habitat in project area.	**Indirect.** Species relies on GDE vegetation and surface water that may be supported by groundwater.	No
Charadrius nivosus nivosus Western snowy plover	**USFWS:** T **CDFW:** none **CVMSHCP coverage:** no	Coastal beaches sand spits, and salt pans; freshwater and brackish wetlands.	**Presumed extant** based on USFWS IPaC (2021). Potential habitat may exist within the project area.	**Indirect.** Species may nest in or near wetlands supported by groundwater.	No
Empidonax traillii extimus southwestern willow flycatcher	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** yes	Riparian and wetland thickets.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Indirect.** Species relies on GDE riparian vegetation.	No
Polioptila californica californica coastal California gnatcatcher	**USFWS:** T **CDFW:** none **CVMSHCP coverage:** no	Coastal sage scrub; dry slopes, washes, mesas.	**Presumed extant** based on CNDDB (2020) data. However, habitat does not appear to exist within the project area.	No	No
Rallus obsoletus yumanensis Yuma Ridgway's rail	**USFWS:** E **CDFW:** T **CVMSHCP coverage:** yes	Freshwater and alkali marshes with shallow open water areas.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Direct.** Species relies on shallow wetlands that may be supported by groundwater.	No
Vireo bellii pusillus least Bell's vireo	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** yes	Willow-cottonwood forest, streamside thickets, and scrub oak.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Indirect.** Species relies on GDE vegetation in riparian areas for breeding.	No
Gopherus agassizii desert tortoise	**USFWS:** T **CDFW:** T **CVMSHCP coverage:** yes	Sandy flats, dry washes, and canyons with enough soil for burrowing.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Indirect.** Species may rely on GDE vegetation.	No

Scientific Name Common Name	Status	Habitat	Potential to Occur Within the Project Area	Reliance on Groundwater	Individual(s) Observed
Uma inornata Coachella Valley fringe-toed lizard	**USFWS:** T **CDFW:** E **CVMSHCP coverage:** yes	Sparsely vegetated areas and dry washes with fine, wind-blown sand.	**Presumed extant** based on CNDDB (2020) data. Suitable habitat exists within the project area. USFWS-designated critical habitat in project area.	**Indirect.** Species may rely on GDE vegetation such as mesquite.	No
Charina umbratica southern rubber boa	**USFWS:** none **CDFW:** T **CVMSHCP coverage:** no	Damp woodlands, grassy meadows, and sandy areas along streams.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Indirect.** Species relies on GDE vegetation in woodlands and moist sandy areas near springs and streams.	No
Anaxyrus californicus arroyo toad	**USFWS:** E **CDFW:** none **CVMSHCP coverage:** yes	Washes, streams, arroyos, and adjacent riparian uplands; shallow gravelly pools.	**Presumed absent** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Direct and indirect.** Species relies on groundwater for breeding and on GDE vegetation for foraging.	No
Batrachoseps aridus desert slender salamander	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** no	Small permanent desert springs and creeks with riparian vegetation.	**Presumed absent** based on CNDDB (2020) data. Potential habitat may exist within the project area.	N/A*	No
Rana muscosa southern mountain yellow-legged frog	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** no	Sunny streambanks, pools, and lake borders; rocky streams fed by snow melt.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Direct.** Species relies on surface water features that may be supported by groundwater.	No
Rana draytonii California red-legged frog	**USFWS:** T **CDFW:** none **CVMSHCP coverage:** no	Ponds, wetlands, and seeps and adjacent grassy uplands.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Direct.** Species relies on surface water features that may be supported by groundwater.	No
Cyprinodon macularius desert pupfish	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** yes	Freshwater springs, oases, and saline/brackish pools; also found in agricultural drains.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	**Direct.** Species relies on springs and other surface water features that may be supported by groundwater.	No
Xyrauchen texanus razorback sucker	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** no	Runs and pools of freshwater rivers; warm, shallow backwaters.	**Presumed extant** based on CNDDB (2020) data. However, habitat does not appear to exist within the project area. Additionally, the literature suggests that no naturally propagating populations are left in California.	**Direct.** Species relies on rivers and other surface water features that may be supported by groundwater.	No

Scientific Name Common Name	Status	Habitat	Potential to Occur Within the Project Area	Reliance on Groundwater	Individual(s) Observed
Dinacoma caseyi Casey's June beetle	**USFWS:** E **CDFW:** none **CVMSHCP coverage:** no	Found in the desert in coarse gravelly sands.	**Presumed extant** based on CNDDB (2020) data. Suitable habitat may exist within the project area. USFWS-designated critical habitat in project area.	N/A*	No
Euphydryas editha quino quino checkerspot	**USFWS:** E **CDFW:** none **CVMSHCP coverage:** no	Chaparral; coastal sage scrub with *Plantago* spp.	**Presumed absent** based on CNDDB (2020) data. Habitat does not appear to exist within the project area.	N/A*	No
Flora					
Astragalus lentiginosus var. coachellae Coachella Valley milk-vetch	**USFWS:** E **CDFW:** none **CVMSHCP coverage:** yes	Sandy washes and windblown dunes; creosotebush scrub.	**Presumed extant** based on CNDDB (2020) data. Suitable habitat may exist within the project area. USFWS-designated critical habitat in project area.	N/A*	No
Astragalus tricarinatus triple-ribbed milk-vetch	**USFWS:** E **CDFW:** none **CVMSHCP coverage:** yes	Sandy, gravelly soils in dry washes; gravelly soils and granite at the base of slopes.	**Presumed extant** based on CNDDB (2020) data. Suitable habitat may exist within the project area.	N/A*	No
Dodecahema leptoceras slender-horned spineflower	**USFWS:** E **CDFW:** E **CVMSHCP coverage:** no	Old sandy benches or floodplain terraces with alluvial fan scrub just below 2200 feet.	**Presumed extant** based on CNDDB (2020) data. Potential habitat may exist within the project area.	N/A*	No

E – Endangered
T – Threatened
N/A* - Reliance on groundwater unknown or otherwise not fully understood based on species omission from the *Critical Species LookBook* (2019).
Source: California Natural Diversity Database (CDFW 2020); USFWS Critical Habitat Mapper (2021); IPaC Trust Resources List (USFWS 2021).

3. GROUNDWATER DEPENDENT ECOSYSTEM ASSESSMENT

To support identification and protection of GDEs under SGMA, The Nature Conservancy (TNC) developed a 2018 report entitled *Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans.* The GDEs Guidance suggests three criteria for assessment of the presence of GDEs: 1) Is the GDE underlain by a shallow unconfined or perched aquifer? 2) Is the depth to groundwater under the GDEs less than 30 feet? 3) Is the GDE located in an area known to discharge groundwater (e.g., springs/seeps)? These questions were considered during this assessment.

Preliminary Desktop Assessment

Using Geographic Information Systems (GIS), Woodard & Curran completed a preliminary desktop analysis of the California *Natural Communities Commonly Associated with Groundwater* (NCCAG) database for the project area. The NCCAG database represents a compilation of 48 publicly available state and federal environmental datasets that map wetlands, springs, seeps, and vegetation in California. The datasets were reviewed by a working group made up of multiple agencies and stakeholders including the California Department of Water Resources (DWR), CDFW, and TNC. The current NCCAG database includes a set of GIS data for vegetative communities and a separate data set for wetlands which together are considered to be GDE indicators.

Additional relevant environmental and hydrogeological GIS data sets were also reviewed as part of the desktop GDE assessment. Data resources included, but were not limited to, the following:

- Aerial photography, including USDA-NRCS National Agricultural Imagery Program (NAIP) data and Microsoft Bing aerial imagery
- United States Geological Services (USGS) 7.5-minute topography
- USGS Geological Survey Hydrologic Atlas: National Hydrography Dataset (NHD) and USGS Hydrologic Unit Code (HUC) 8-digit maps
- USDA-NRCS Soil Surveys
- United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) data
- USFWS Critical Habitat mapper
- National Oceanic and Atmospheric Administration (NOAA) Essential Fish Habitat (EFH) mapper
- NRCS land use/land cover and conservation plan data
- California DWR list of impaired (303d/305b) waters (latest approved)
- United States National Vegetation Classification (USNVC) data
- USFWS Information for Planning and Consultation (IPaC) online data
- California Department of Fish and Wildlife (CDFW) Biogeographic Information and Observation System (BIOS)
- CDFW California Natural Diversity Database (CNDDB)
- LIDAR (as available for the project counties)

A Subbasin map was created using these publicly available statewide and regional data layers to understand the extent of the NCCAG dataset within the project area. Refer to Figure 5 (Attachment A) for a map of GDE indicators within the project area. Once the basin map of GDE indicators was developed, Woodard & Curran then reviewed the project area and attempted to identify NCCAG polygons that appeared to be "probable GDEs" based on the following observations:

- Presence of a USGS-mapped stream, spring, seep, or other waterbody
- Presence of USFWS National Wetlands Inventory (NWI) mapped wetlands
- Inundation visible on aerial imagery
- Saturation visible on aerial imagery
- Dense riparian and/or wetland vegetation visible on aerial imagery
- CNDDB and/or CNPS vegetative community data indicating a concentration of deep-rooted woody phreatophytes
- California Protected Areas and/or Areas of Conservation Emphasis

If an NCCAG polygon, or a portion thereof, included one or multiple of the above characteristics, then it was marked as a "Probable GDE" for further evaluation and field validation. NCCAG polygons that did not exhibit the above characteristics (or similar) were tentatively considered "Probable Non-GDEs" for purposes of the desktop study and would be subject to further review as part of the field study. Areas that appeared to consist primarily of wetland

vegetation at drainages along the exposed seabed of the Salton Sea where the water level has receded from historic levels were classified as "Playa Wetland Communities" and were not included as GDEs at this point.

As part of our preliminary desktop GDE assessment, Woodard & Curran selected 15 separate locations for a GDE field assessment. These locations were selected from various representative NCCAG polygons across the project area based on apparent habitat type and accessibility for field survey. Refer to Figure 6 (Attachment A) for GDE field assessment locations.

GDE Field Assessment

Woodard & Curran completed a GDE field assessment study at representative locations throughout the Indio Subbasin. Fifteen representative locations were originally selected based on geographic position within the project area, vegetative community/habitat type, land use, topography, and other environmental factors determined via remote sensing. Prior to field work, Woodard & Curran coordinated with the Indio Subbasin GSAs and other agencies, tribes, and landowners to review the selected GDE field assessment sites and property owner information, as well as confirm physical access to the sites. Survey permissions were obtained from the appropriate property owners for 13 field assessment sites prior to mobilization for the field effort.

The field study was conducted January 11 – 14, 2021. Woodard & Curran Senior Biologist Will Medlin and CVWD environmental staff (Mr. Luis Sanchez and Mr. Sergio Martinez) worked together to complete the field study. Sites one (1) through eight (8), ten (10) through twelve (12), and fourteen (14) and fifteen (15) were assessed in the field. Sites nine (9) and thirteen (13) were not accessible at the time of field deployment and have therefore been eliminated from this assessment and report.

Field observations were made at NCCAG-mapped seeps, springs, wetlands, and other riparian habitats to document plant communities, aquatic or semi-aquatic wildlife, indicators of surface and subsurface hydrology, soil-based evidence of a high-water table, and other relevant ecological and hydrological data. Soils were sampled to an approximate depth of between 12 – 20 inches (depending on restrictive layer) to determine moisture content and texture. The soil profile was assessed and classified based on color using a Munsell soil color chart. Photographs were taken in the four cardinal directions (north, east, south, west) at each GDE field assessment site to document the general habitat conditions. Field notes and additional photographs were taken of plant species, wildlife, and other relevant ecological data to support the GDE assessment at each site. Global Positioning System (GPS) points were also collected using a sub-meter Trimble Geo 7x GPS unit at each GDE field assessment site.

Upon completion of the GDE field assessment, Woodard & Curran refined the preliminary desktop GDE assessment data and revised the mapping for Probable GDEs and Probable Non-GDEs based on field observations and further research.

4. RESULTS

Using a combination of GIS desktop study and field assessments, Woodard & Curran attempted to assess 882 NCCAG-mapped polygons (136 NCCAG wetland and 746 NCCAG vegetation) within the project area. During the desktop assessment, 1,045 individual locations were visually reviewed and a determination of potential GDE status was made for a point on the landscape within the NCCAG polygon(s). Out of 1,045 assessment locations, 50 points (5%) were determined to be Probable GDEs. 932 points (89%) were determined to be Probable non-GDEs. 63 points (6%) were determined to be Playa Wetland Communities. Refer to Figure 7 (Attachment A) for the Preliminary GDE Assessment map.

Probable GDEs consisted of areas with apparent dense riparian and wetland vegetative communities along mapped drainage systems with potential for deep-rooted phreatophytes and/or visible, natural surface water flow. These

Probable GDE clusters comprise hot or cold springs, seeps, and stream channels that convey snowmelt from the surrounding San Jacinto mountain front. The USGS has studied the Agua Caliente Spring, located in downtown Palm Springs, and determined that faulting of the basement rock provides a pathway for deep thermal water to rise from an underlying geothermal reservoir (USGS 2011). The USGS study assessed multiple thermal and non-thermal springs in Palm and Chino Canyons, determining that the hot springs are sourced from deep thermal water and not the regional aquifer. Typically, probable GDEs might be identified where monitoring well data for the regional aquifer indicated the depth to groundwater at 30 feet or less relative to the ground surface. The 30-foot threshold is based on scientific literature that indicates that groundwater levels extracted to greater than 30 feet below ground surface (bgs) may result in adverse impacts to ecosystem structure and function (Eamus et al., 2015). It should be noted that the areas within the Indio Subbasin where Probable GDEs were identified for this study do not have existing groundwater data that was available for review. Probable GDEs identified herein along the mountain-front may be associated with surface runoff, snowmelt, or springs and seeps from up-gradient sources.

Probable Non-GDEs consisted of areas that appeared incorrectly mapped based on current land development and land-use or that otherwise appeared to be dry upland areas, cultivated and/or flooded agricultural land, obvious human-made ponds, lakes, and other features, channelized drains, and where there were no other indicators of groundwater presence near the surface. It should be noted that dry washes, arroyos, bajadas, and other ephemeral conveyances where water only flows in response to heavy precipitation events were not classified as GDEs for purposes of this study.

Playa Wetland Community included areas of wetland habitat along the Salton Sea exposed seabed (playa) generally downstream of stream, agricultural drain, or stormwater channel outlets. The receding of the Salton Sea, due to reduced inflows, is exposing thousands of acres of playa each year. A 2020 Audubon report on Salton Sea wetlands explains that the irrigation ditches and other drainages “that used to drain directly into the Sea now spread out and slowly flow and pool on the exposed playa where new vegetation and wetlands now form” (Audubon California 2020). Irrigation drainage to the Salton Sea was determined to be the major driver of these pockets of vegetation along the northern seashore. The irrigation drains are fed by collected groundwater from agricultural return flows; as they discharge to the playa, they can potentially create wetland habitats. The CVMSHCP identifies some of these playa wetlands as part of the CVSC/Delta Conservation Area, which includes the CVSC, agricultural drains emptying into the Salton Sea which may contain desert pupfish habitat, and areas along the seashore that contain sensitive natural communities (CVAG 2007). The CVMSHCP acknowledges that this habitat is sustained largely by agricultural runoff and outflow in the CVSC, but that maintenance of the drains and the flood control channel periodically modifies the habitat. .

For the field study, 13 representative locations were assessed for GDE indicators, functions, and values. Of the 13 sites reviewed in the field, one appeared to be a Probable GDE, nine appeared to be Probable Non-GDEs, and three appeared to be Playa Wetland Communities. The four GDE and Playa Wetland Community sites had deep-rooted woody riparian or wetland species growing there. Further, two sites (4 and 15) had either standing or flowing water observed at the surface. Table 2 below describes each of the field assessment sites in more detail.

Table 2. Woodard & Curran GDE Field Assessment Sites in the Indio Subbasin.

GDE Field Assessment Site[1]	Latitude / Longitude	NCCAG-Mapped Polygon?	NCCAG Vegetation / Wetland Type*	Dominant Plant Species Observed	Field Assessment Notes
1	33.422221 N, 116.095600 W	Yes	**Vegetation** – Parkinsonia florida – Olneya tesota	*Parkinsonia florida, Larrea tridentata, Encelia farinosa, Lotus rigidus, Ferocactus acanthodes, Ericameria linearifolia, Cylindropuntia ramosissima*	Site is a dry creek/wash or bajada. Appears to only receive flow in response to major rainfall events. Soils are fine to coarse sands and gravel overlying bedrock and boulders. Some surface soil cracking observed in lower pools indicating temporary water presence. **This location does not appear to be a GDE.**
2	33.492767 N 116.199718 W	Yes	**Vegetation** – Alkaline Mixed Scrub	*Acacia greggii, Larrea tridentata, Parkinsonia florida, Bromus tectorum*	Site is a dry wash bajada habitat with no evidence of recent flooding or high groundwater. Cobble-gravel and boulders are strewn throughout the valley. Soils are dry coarse sands and fine gravel over bedrock. Some birds and lizards observed at the data point location. **This location does not appear to be a GDE.**
3	33.502204 N 116.080565 W	Yes	**Wetland** – Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded, Hyperhaline	*Allenrolfea occidentalis*	Site is an alkaline salt flat; soils have redoximorphic features and deep surface cracking indicating periodic saturation or inundation. Multiple songbirds were observed/heard at this site. **This location appears to be a Playa Wetland Community.**
4	33.524165 N 116.042841 W	Yes	**Wetland** - Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded, Hyperhaline	*Bolboschoenus robustus, Typha domingensis, Phragmites australis, Rumex crispus, Tamarisk ramosissima, Pluchea odorata, Polypogon monspeliensis*	Site is located near an agricultural drain that flows to the Salton Sea and consists of a dense emergent marsh wetland with standing water; soils are saturated and low-chroma with some organic content. Multiple songbirds, raptors, and wading birds observed at this location. Tadpoles observed in pools. **This location appears to be a Playa Wetland Community.**
5	33.511431 N 115.922835 W	Yes	**Wetland** – Palustrine, Emergent, Persistent, Semi-permanently Flooded	*Tamarisk ramosissima, Allenrolfea occidentalis, Pluchea sericea, Prosopis glandulosa*	Site is located near the Salton Sea alongside a dense, low vegetated swale; the area appears to have burned in the recent past. No visible surface water; however, soils do have some redoximorphic concentrations indicating some periodic saturation or inundation. **This location appears to be a Playa Wetland Community.**
6	33.571216 N 116.096213 W	Yes	**Vegetation** - Alkali Desert Scrub	*Atriplex lentiformis*	Site is located just west of large agricultural drain and consists of alkaline salt scrub. Soils were dry and high chroma with no redoximorphic features. **This location does not appear to be a GDE.**
7	33.580616 N 116.007632 W	Yes	**Wetland** – Palustrine, Emergent, Persistent, Seasonally Flooded	*Tamarisk ramosissima*	Site is within a basin created by the sloping land and the levee embankment for the Coachella Canal. The area likely receives and temporarily holds surface runoff. Soils are high chroma and very friable. Multiple songbirds heard/observed. **This location does not appear to be a GDE.**
8	33.655652 N 116.125904 W	Yes	**Vegetation** – Alkali Desert Scrub	N/A	Site is an active agricultural field with planted row crops. Site has active irrigation system and soils are wet due to watering. **This location does not appear to be a GDE.**

GDE Field Assessment Site[1]	Latitude / Longitude	NCCAG-Mapped Polygon?	NCCAG Vegetation / Wetland Type*	Dominant Plant Species Observed	Field Assessment Notes
10	33.714428 N 116.262822 W	Yes	**Wetland** – Riverine, Unknown Perennial, Unconsolidated Bottom, Semi-permanently Flooded	*Xanthium strumarium, Atriplex canescens, Distichlis spicata, Tamarisk ramosissima, Ricinus communis*	Site is an alkaline salt scrub community located within the Coachella Valley Stormwater Channel. Soils are high chroma fine sands that are a little moist below six inches. **This location does not appear to be a GDE.**
11	33.591113 N 116.190892 W	Yes	**Vegetation** – Alkali Desert Scrub	N/A	Site is an active agricultural field with planted row crops. Site has active irrigation system and soils are wet due to watering. **This location does not appear to be a GDE.**
12	33.731912 N 116.430599 W	Yes	**Vegetation** – Desert Willow	*Acacia greggii, Larrea tridentata, Ericameria linearifolia, Dalea spinosa, Bromus tectorum*	Site is a creosote bush scrub habitat located in a valley above a small dam. No evidence of recent water flow or prolonged inundation. Soils are very dry, friable sands. **This location does not appear to be a GDE.**
14	33.853607 N 116.506499 W	Yes	**Wetland** – Riverine, Unknown Perennial, Unconsolidated Bottom, Semi-permanently Flooded	*Larrea tridentata, Atriplex canescens, Encelia farinosa, Artemisia* sp.,	Site is a dry riverbed wash within the floodplain of the upper Whitewater River. Some soil surface cracking observed, however no indicators of groundwater near surface. Soils are loose, dry sand. **This location does not appear to be a GDE.**
15	33.843826 N 116.604978 W	Yes	**Vegetation** – Riparian Mixed Hardwood; **Wetland** – Palustrine, Scrub-Shrub, Seasonally Flooded	*Platanus racemosa, Salix exigua, Salix laevigata, Typha domingensis, Schoenoplectus americanus, Erythranthe cardinalis*	Site is located in a palustrine scrub-shrub and forested freshwater wetland seepage. Groundwater was visibly seeping at this data point. Soils were saturated to the surface and had some organic content. Multiple songbirds heard/observed. **This location appears to be a GDE.**
1 Note that GDE Field Assessment Sites #9 and 13 were not granted access by property-owners and are therefore not included in this table.					

5. CONCLUSIONS

Based on our preliminary assessment, few true GDEs appear to be present within the Indio Subbasin. Groundwater monitoring well data and groundwater contours shows depth to water at greater than 50 feet bgs for much of the northern and western portions of the Subbasin. However, the southeastern portion of the Subbasin between Thermal and the Salton Sea appears to indicate depth to water of less than 30 feet bgs in a shallow semi-perched aquifer zone. These shallow groundwater levels in the southeastern Indio Subbasin may be affected by local groundwater replenishment facilities or through surface infiltration via agricultural irrigation or subsurface collection via agricultural tile drains.

Although the project area is heavily urbanized in the west and impacted by significant agricultural operations to the east, the major surface water drainageways still appear to have some pockets of riparian and wetland vegetative communities growing along them. The streams, hot and cold springs, palm oases, stormwater channels, canals, agricultural drains, and their associated riparian vegetative communities provide valuable ecological habitat for many animal species to shelter, feed, and breed. They also provide wildlife corridors for movement and migration through the urban and suburban and agricultural landscapes.

The *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin* acknowledges that "there is no direct interconnection between surface water and groundwater" in the western Subbasin (Stantec 2016). This finding is generally supported by the desktop and field assessments completed for this study, with the exception of several obvious mountain-front springs that support palm oases and wetland habitats. The few **Probable GDEs** present within the project area are located in the northwestern extents of the Indio Subbasin within canyons along streams that convey mountain-front runoff. It is undetermined whether these Probable GDEs depend on the regional groundwater table. These GDEs may rely on surface runoff, snowmelt, and springs and seeps from up-gradient sources to influence soil moisture requirements for vegetative communities. However, the three probable GDE clusters identified in this assessment are not likely directly affected by management of the primary aquifer in the Indio Subbasin. The connection between these potential GDEs and the regional groundwater basin should be further investigated.

In the eastern Subbasin, this study identifies **Playa Wetland Communities** along the Salton Sea, but acknowledges that these habitats are likely dependent on collection and discharge of agricultural drain water. The collection of agricultural return flows into a surface water conveyance system results in the concentrated discharge of groundwater onto the Salton Sea playa, which spreads out and creates wetland habitats. It is important to note that DWR staff do not consider the subsurface tile drain system and the conveyance of agricultural runoff in the eastern Coachella Valley as a surface water system (DWR 2019). These wetland communities may not exist if it were not for the human-made tile drain system, coupled with the recession of the Salton Sea which creates large, exposed playa areas. There is a clear dynamic between the agricultural drains and the Playa Wetland Communities. Based on the 2020 Audubon study the drivers for wetlands creation are the surface drainage coupled with the recession of Salton Sea. The aerial extent of the playa wetlands appears to have grown over the last decade while drain flows were declining. The interconnection between these factors is uncertain and dependent on other state and federal entities' management of the Salton Sea and its surface elevation. The aerial extent of Playa Wetland Communities may continue to change over time regardless of Indio Subbasin management activities. Further study of these habitats may be conducted to better assess their dependance on drain flows and/or underlying perched groundwater. Changes in the footprint of the Playa Wetland Communities should be explored through additional study and field validation, including monitoring of drain and surface water discharges and groundwater levels in the shallow perched aquifer. Additionally, collaboration with Salton Sea Authority and other entities focused on Salton Sea wetlands protection is warranted.

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ATTACHMENT A: FIGURES

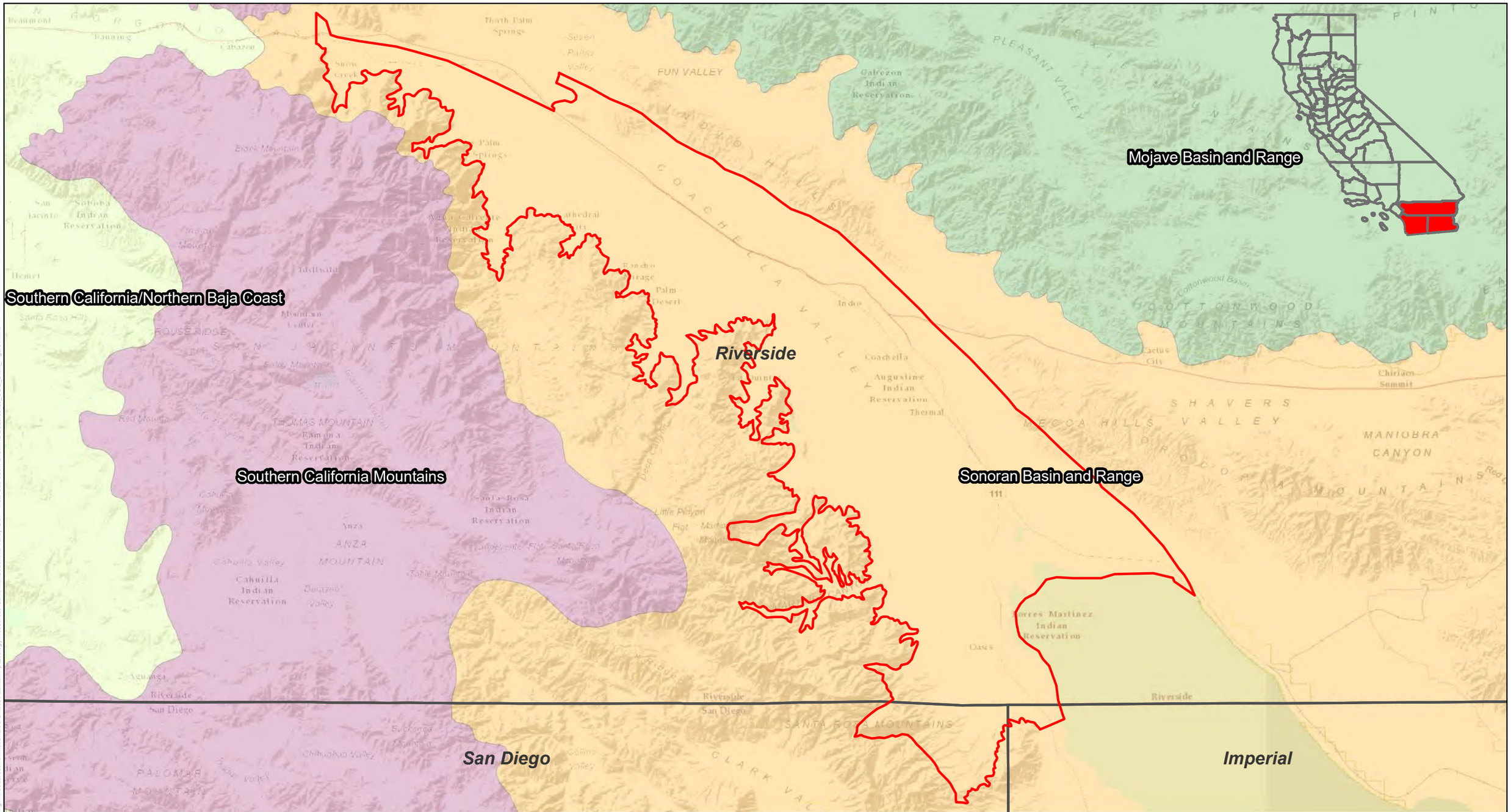


Figure 1
Project Location and Ecoregions

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

EPA Level III Ecoregion

- Mojave Basin and Range
- Sonoran Basin and Range
- Southern California Mountains
- Southern California/Northern Baja Coast

- Indio Groundwater Basin
- California Counties

1 inch = 5 miles

0 2.5 5 10 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: May 2020

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources: ESRI World Terrain Basemap; USEPA Level III Ecorgegions**

Figure Exported: 5/20/2020 By: kmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\Coachella Valley GSP - Indio Sub-basin\GIS\MXD\2020.05.20_GDE_Draft_Figure1.mxd

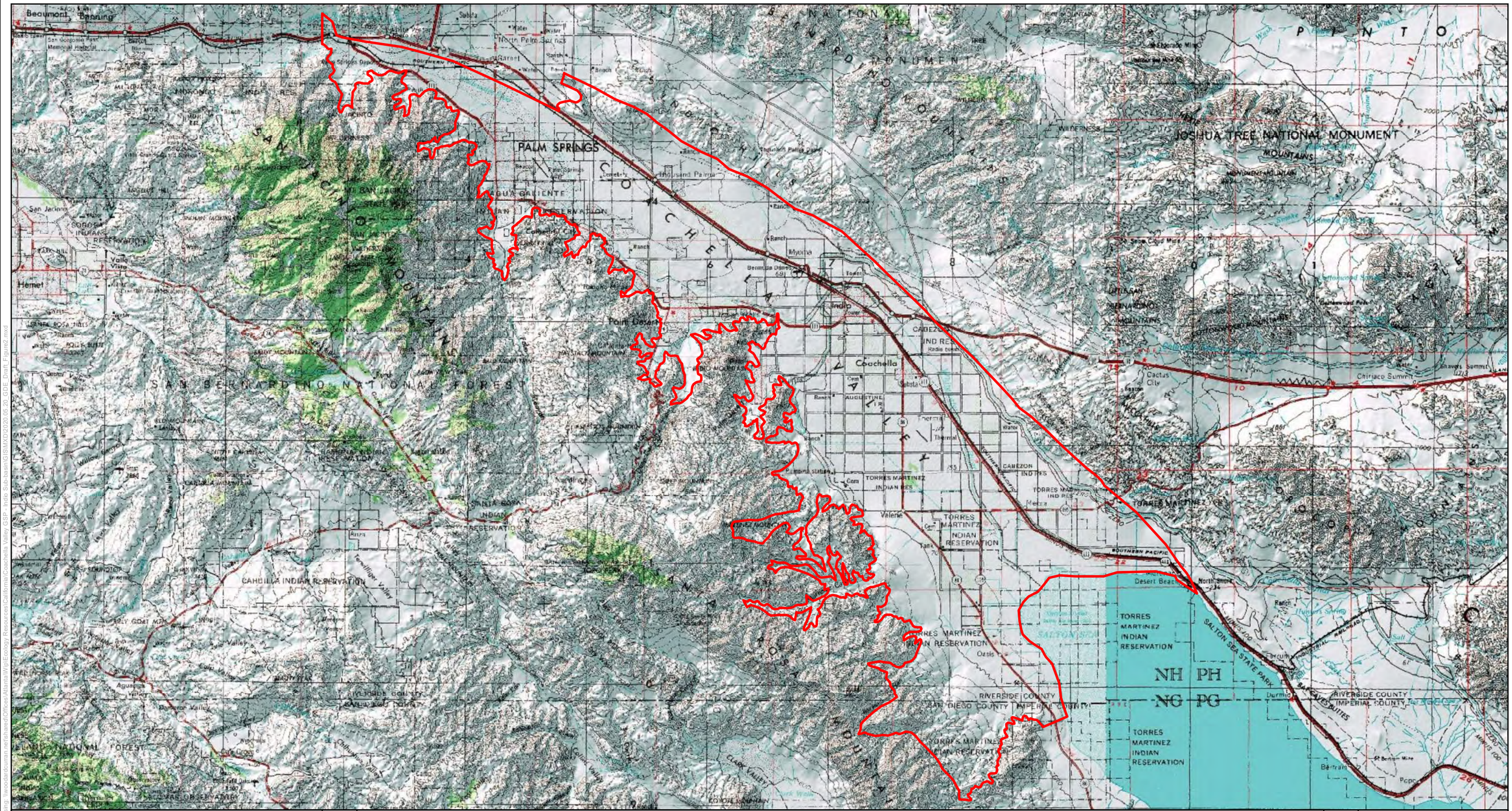


Figure 2
USGS Topography

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

Indio Groundwater Basin

1 inch = 5 miles

0 2.5 5 10 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: May 2020

Figure Exported: 5/20/2020 By: wmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\Coachella Valley GSP- Indio Sub-basin\GIS

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Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:ESRI USGS 7.5 Minute Topography**

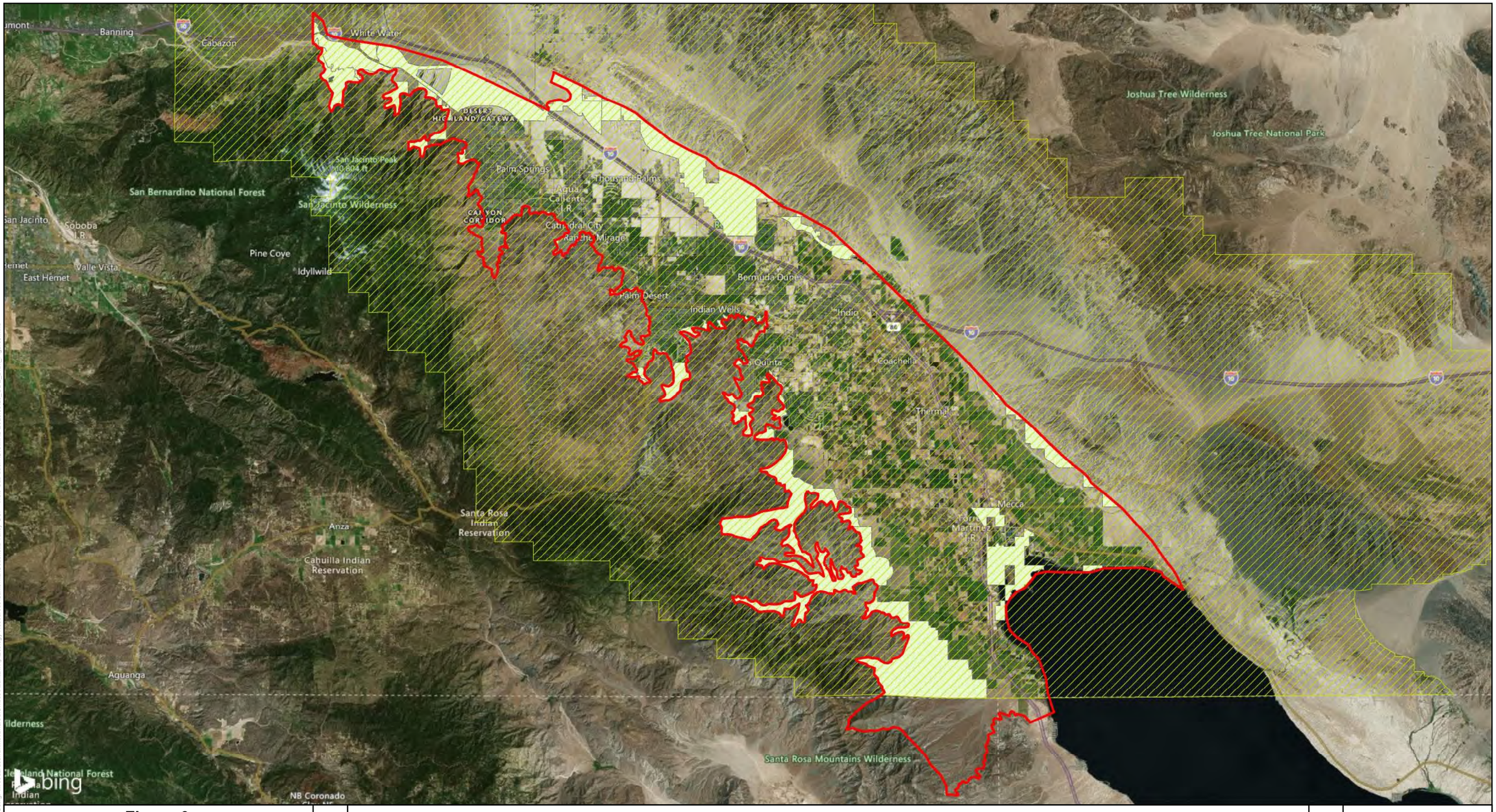


Figure 3
Coachella Valley Protected Areas

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Groundwater Basin
- Coachella Valley Multiple Species Habitat Conservation Plan Boundary
- CVMSHCP Conservation Area Boundaries in Indio Basin

1 inch = 5 miles

0 2.5 5 10 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: May 2020

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:ESRI USGS 7.5 Minute Topography**

Figure Exported: 5/20/2020 By: kmedin Using: \\woodardcurran.net\shared\Offices\Atlanta\Projects\California\Coachella Valley GSP - Indio Sub-basin\GIS\MXD\2020.05.20_GDE_Draft_Figure3.mxd

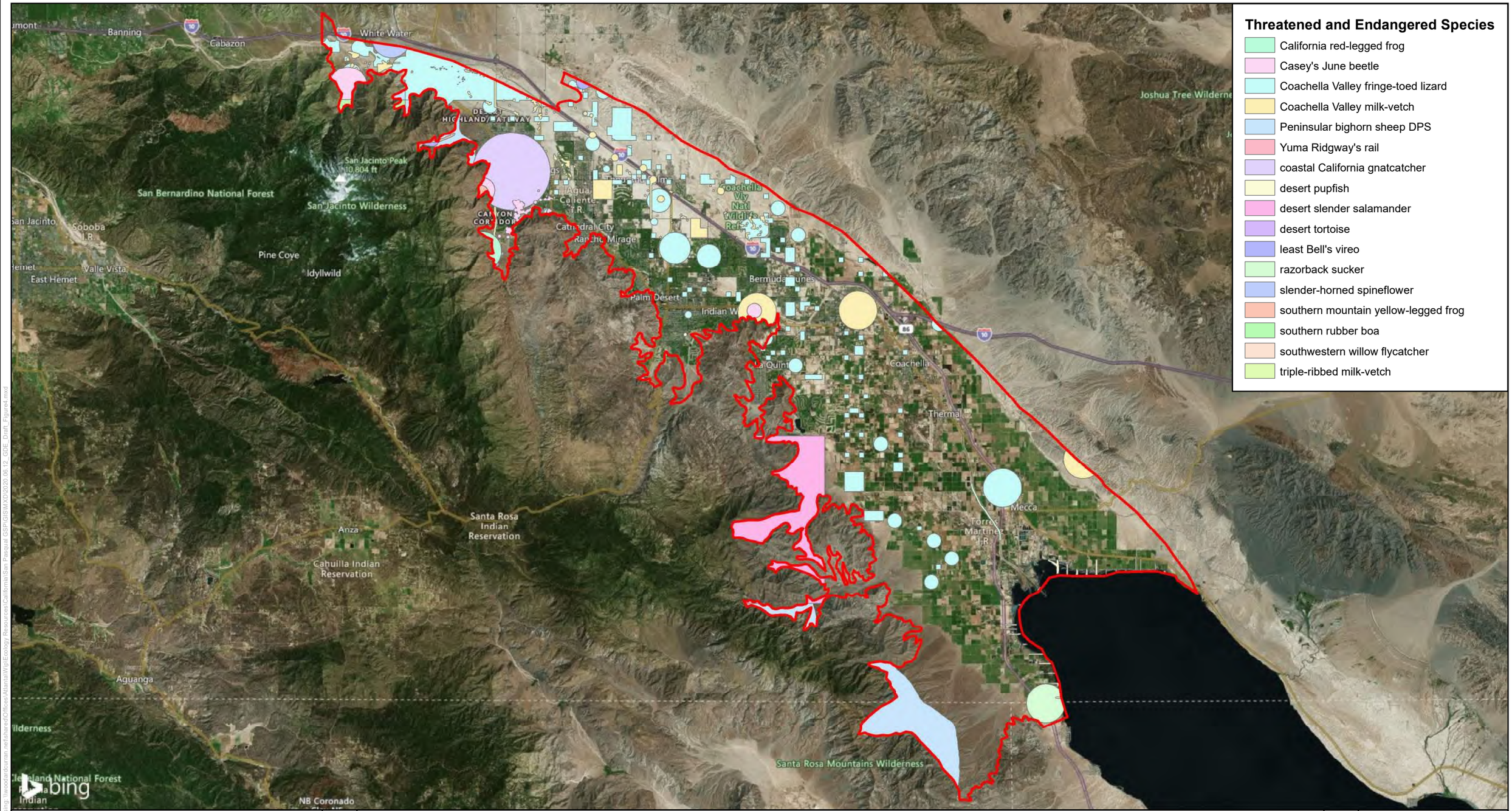


Figure 4
Threatened and Endangered Species

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

Indio Groundwater Basin

1 inch = 5 miles

0 2.5 5 10 Miles

N

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Project #: 0011492.02
Map Created: June 2020

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Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:BING Aerial Imagery; California Natural Diversity Database 2020.**

Figure Exported: 6/12/2020 By: wmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\San Pasqual GSP\GIS\MXD\2020.06.12_GDE_Draft_Figure4.mxd

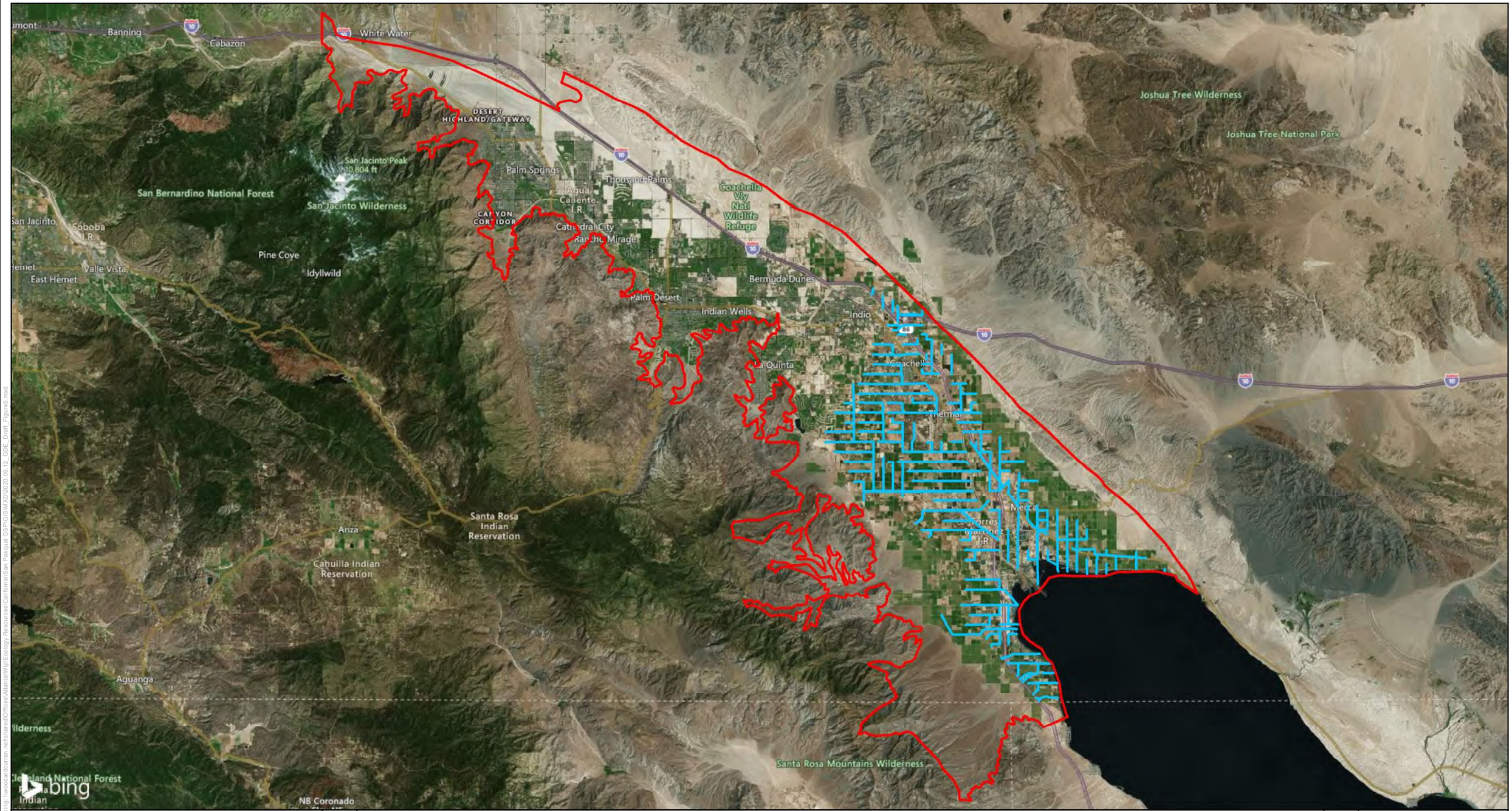


Figure 5
Agricultural Drains

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Groundwater Basin
- Agricultural Drains

1 inch = 5 miles

0 2.5 5 10 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2020

Figure Exported: 6/12/2020 By: vmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\San Pasqual GSP\GIS\MXD\2020.06.12_GDE_Draft_Figure5.mxd

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Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:BING Aerial Imagery; California Natural Diversity Database 2020.**

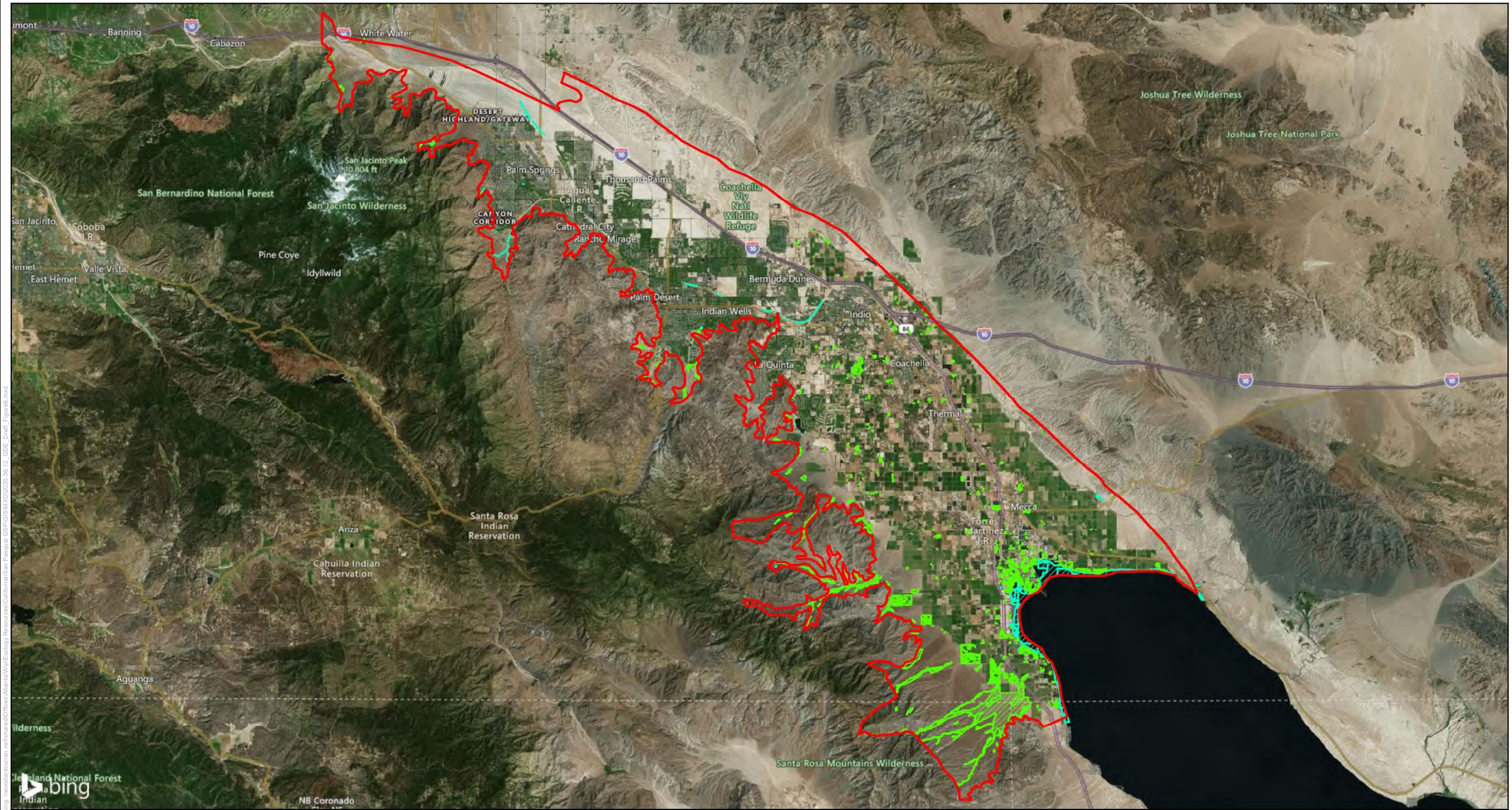


Figure 6
GDE Indicators

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Groundwater Basin
- NCCAG (Vegetation)
- NCCAG (Wetlands)

1 inch = 5 miles

0 2.5 5 10 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2020

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Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:Microsoft BING Aerial Imagery; CA DWR Natural Communities Commonly Associated with Groundwater.**

Figure Exported: 6/12/2020 By: wmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\San Pasqual GSP\GIS\MXD\2020 06 12_GDE_Draft_Figure6.mxd

Figure 7
Preliminary GDE Assessment

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Subbasin Boundaries
- NCCAG (Vegetation)
- NCCAG (Wetlands)
- Probable GDE
- Probable Non-GDE
- Playa Wetland Community

1 inch = 5 miles

0 2.5 5 10 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2021

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:Microsoft BING Aerial Imagery; CA DWR Natural Communities Commonly Associated with Groundwater.**

Figure Exported: 6/10/2021 By: wmedin Using: \\woodardcurran.net\shared\Offices\Atlanta\Projects\Ecology Resources\California\Coachella Valley GSP - Indio Sub-basin\GIS\Sub-basin\GIS\MXD\2021-06-10_GDE_Draft_Figure7.mxd

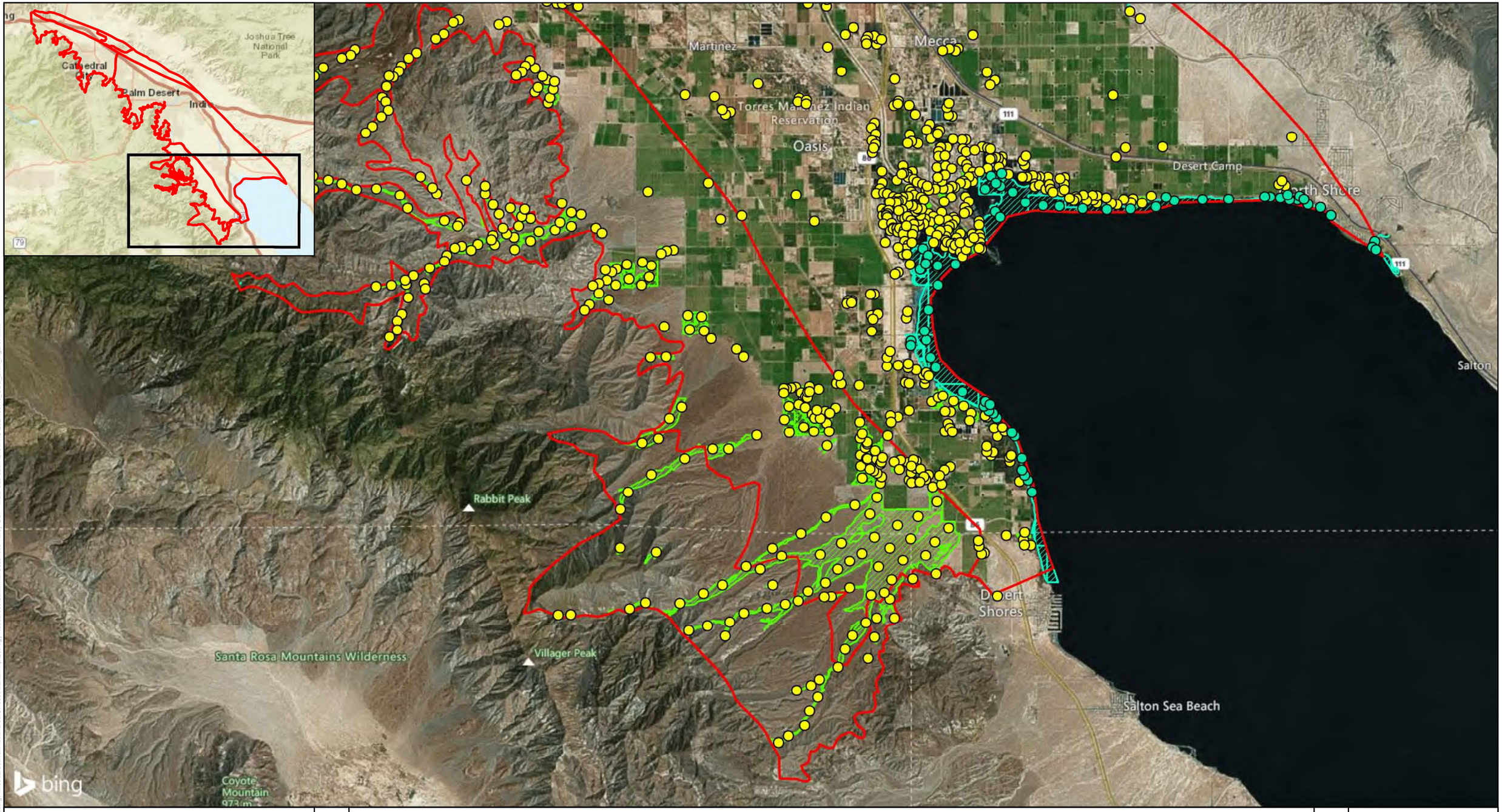


Figure 7a
Preliminary GDE Assessment

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Subbasin Boundaries
- NCCAG (Vegetation)
- NCCAG (Wetlands)
- Probable GDE
- Probable Non-GDE
- Playa Wetland Community

1 inch = 2 miles

0 1 2 4 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2021

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:Microsoft BING Aerial Imagery; CA DWR Natural Communities Commonly Associated with Groundwater.**

Figure Exported: 6/10/2021 By: wmedin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\Coachella Valley GSP - Indio Sub-basin\GIS\MXD\2021-06-10_GDE_Draft_Figure7.mxd

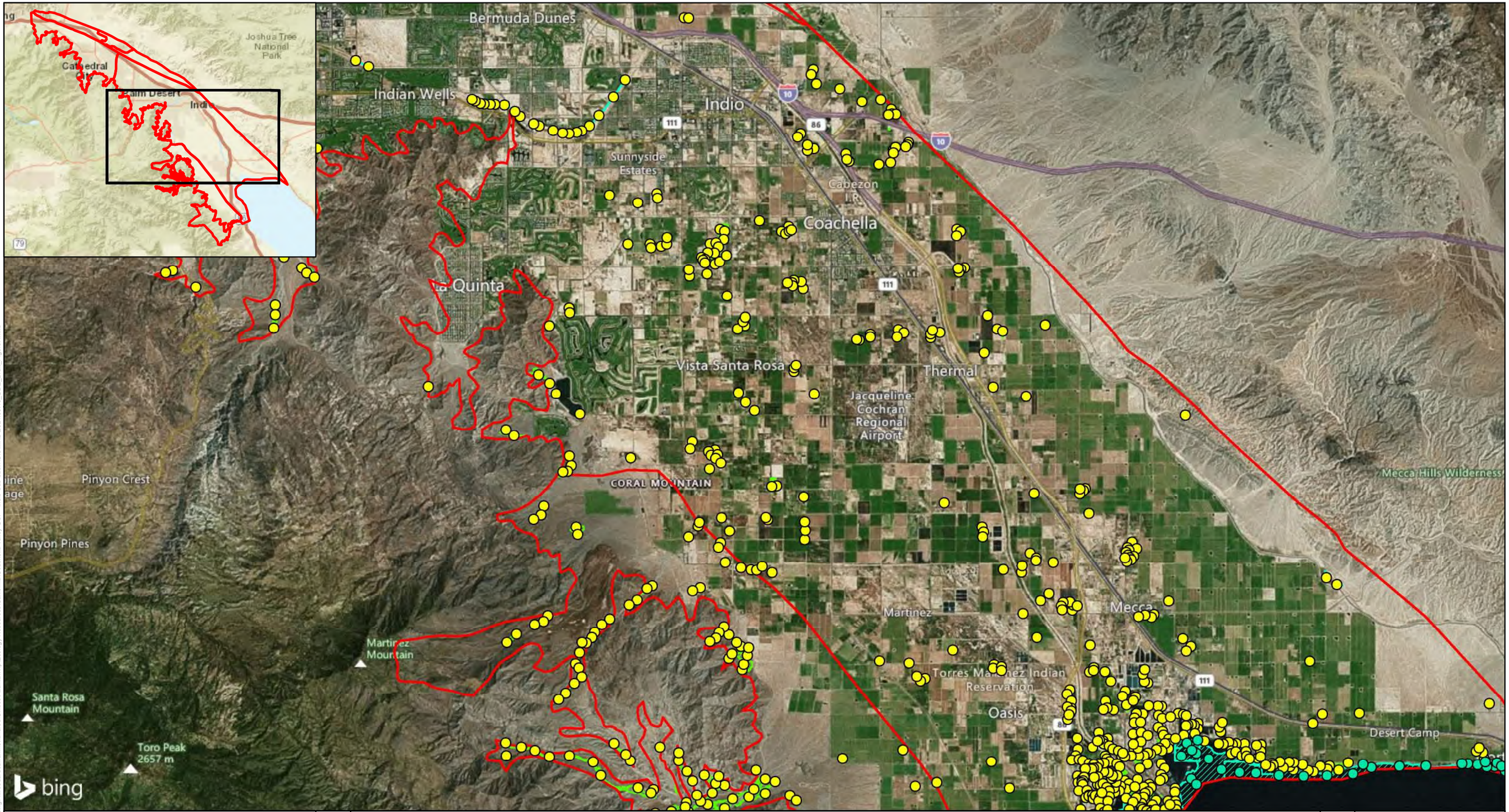


Figure 7b
Preliminary GDE Assessment

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Subbasin Boundaries
- NCCAG (Vegetation)
- NCCAG (Wetlands)
- Probable GDE
- Probable Non-GDE
- Playa Wetland Community

1 inch = 2 miles

0 1 2 4 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2021

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:Microsoft BING Aerial Imagery; CA DWR Natural Communities Commonly Associated with Groundwater.**

Figure Exported: 6/10/2021 By: wmedin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wip\Ecology Resources\California\Coachella Valley GSP - Indio Sub-basin\GIS\MXD\2021-06-10_GDE_Draft_Figure7.mxd

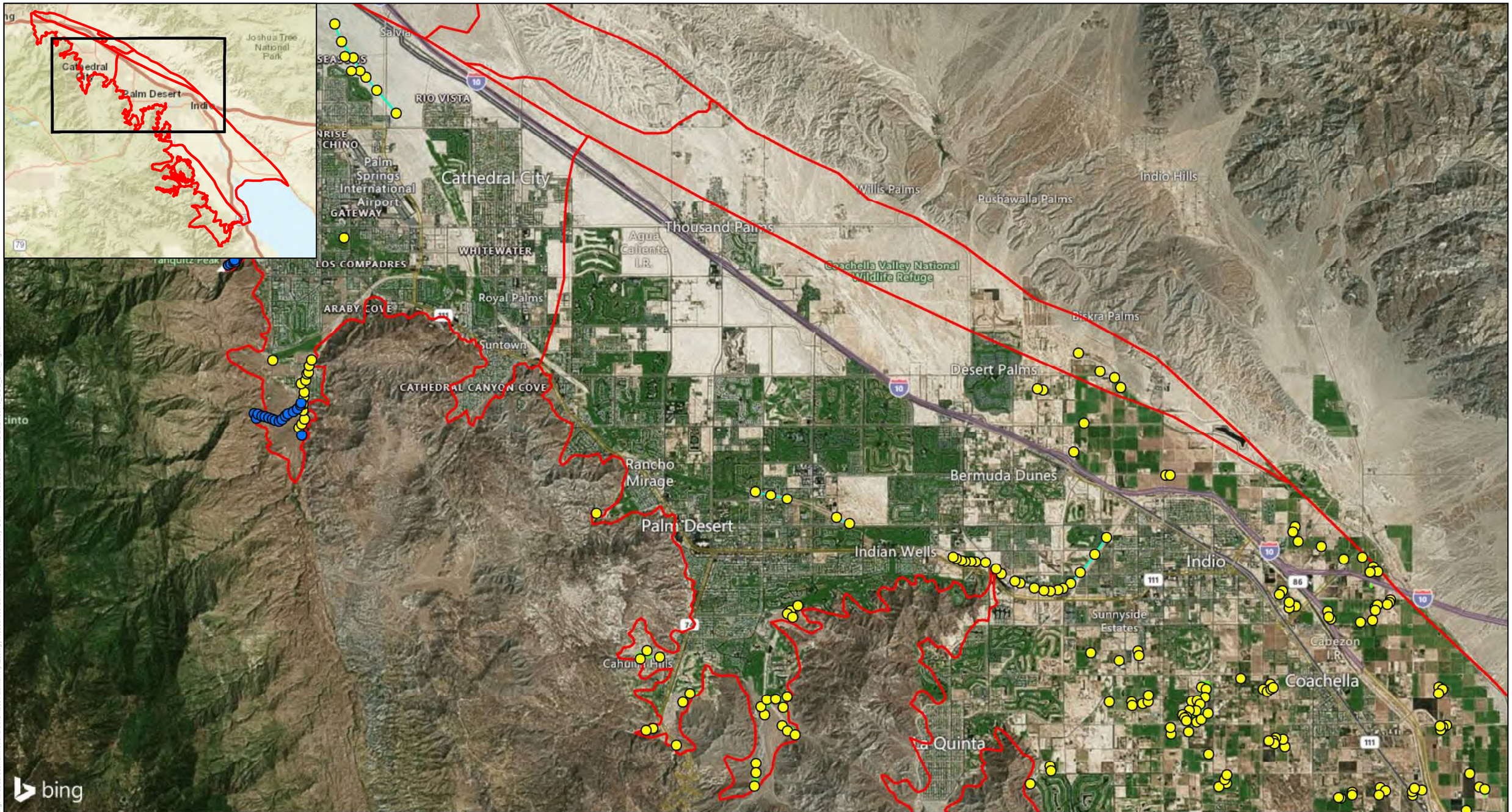


Figure 7c
Preliminary GDE Assessment

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Subbasin Boundaries
- NCCAG (Vegetation)
- NCCAG (Wetlands)
- Probable GDE
- Probable Non-GDE
- Playa Wetland Community

1 inch = 2 miles

0 1 2 4 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2021

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:Microsoft BING Aerial Imagery; CA DWR Natural Communities Commonly Associated with Groundwater.**

Figure Exported: 6/10/2021 By: wmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wp\Ecology Resources\California\Coachella Valley GSP - Indio Sub-basin\GIS\MXD\2021-06-10_GDE_Draft_Figure7.mxd

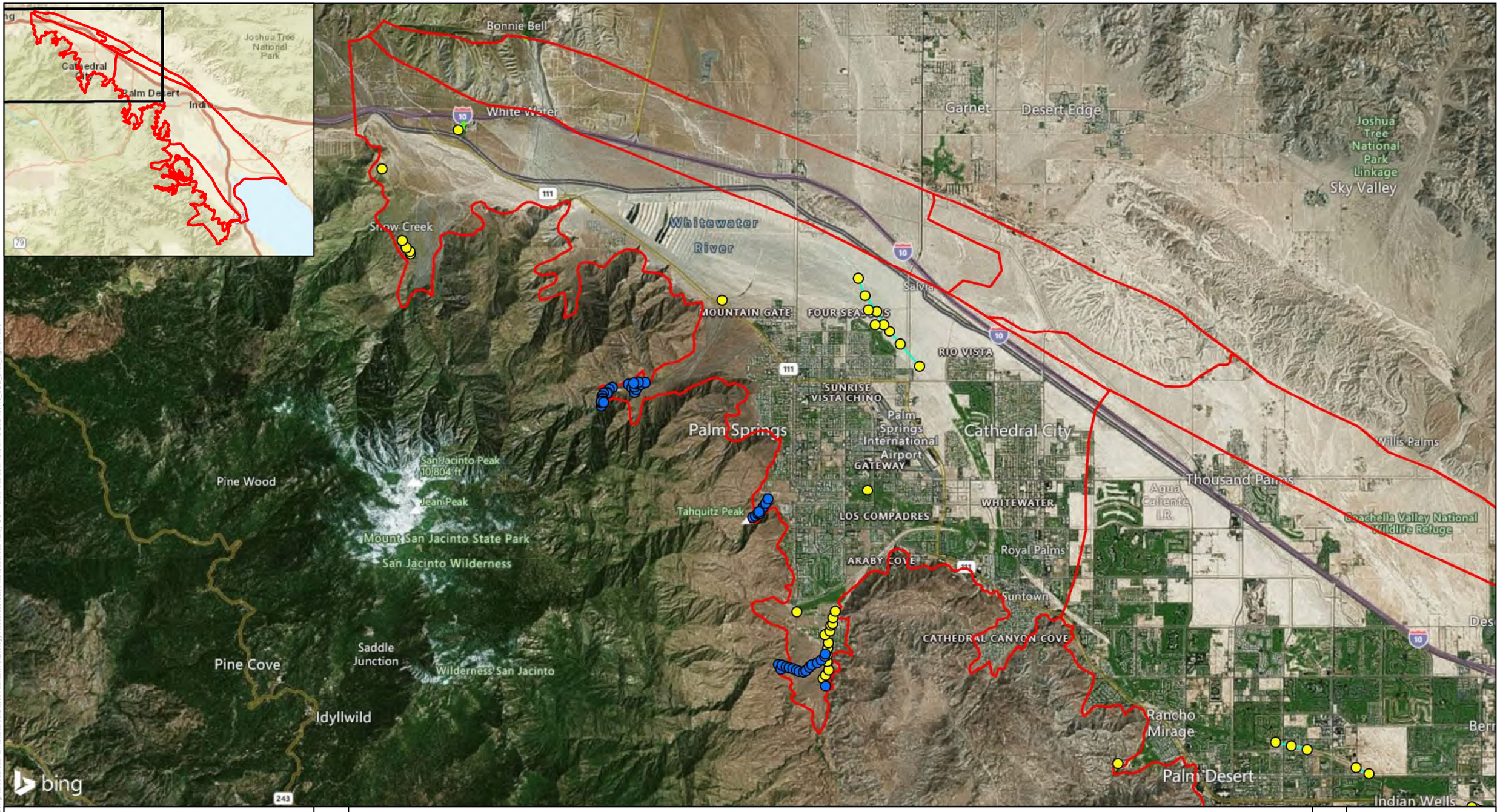


Figure 7d
Preliminary GDE Assessment

Indio Groundwater Basin
Coachella Valley Water District

Imperial, Riverside, and San Diego Counties, CA

Legend

- Indio Subbasin Boundaries
- NCCAG (Vegetation)
- NCCAG (Wetlands)
- Probable GDE
- Probable Non-GDE
- Playa Wetland Community

1 inch = 2 miles

0 1 2 4 Miles

N

WOODARD &CURRAN

Project #: 0011492.02
Map Created: June 2021

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:Microsoft BING Aerial Imagery; CA DWR Natural Communities Commonly Associated with Groundwater.**

Figure Exported: 6/10/2021 By: wmedlin Using: \\woodardcurran.net\shared\Offices\Atlanta\Wp\Ecology Resources\California\Coachella Valley GSP - Indio Sub-basin\GIS\MXD\2021-06-10_GDE_Draft_Figure7.mxd

ATTACHMENT B: PHOTOGRAPHIC LOG OF GDE FIELD ASSESSMENT SITES



Photo Number: 1 | **View Direction:** West | **Date:** January 11, 2021
Description: Representative photograph taken of confirmed probable groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 15.



Photo Number: 2 | **View Direction:** Northwest | **Date:** January 11, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 14.



Photo Number: 3 | **View Direction:** North | **Date:** January 11, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 12.



Photo Number: 4 | **View Direction:** Southwest | **Date:** January 12, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken GDE field assessment site 10.



Photo Number: 5 | **View Direction:** North | **Date:** January 12, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken GDE field assessment site 11.



Photo Number: 6 | **View Direction:** Southwest | **Date:** January 12, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 2.



Photo Number: 7 | **View Direction:** North | **Date:** January 12, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 6.



Photo Number: 8 | **View Direction:** West | **Date:** January 12, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 8.



Photo Number: 9 | **View Direction:** South | **Date:** January 13, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 1.



Photo Number: 10 | **View Direction:** South | **Date:** January 13, 2021
Description: Representative photograph taken of playa wetland community. Photo taken at GDE field assessment site 5.



Photo Number: 11 | **View Direction:** East | **Date:** January 13, 2021
Description: Representative photograph taken of potential incorrectly mapped groundwater dependent ecosystem (NCCAG 2020). Photo taken at GDE field assessment site 7.



Photo Number: 12 | **View Direction:** West | **Date:** January 14, 2021
Description: Representative photograph taken of playa wetland community. Photo taken at GDE field assessment site 4.

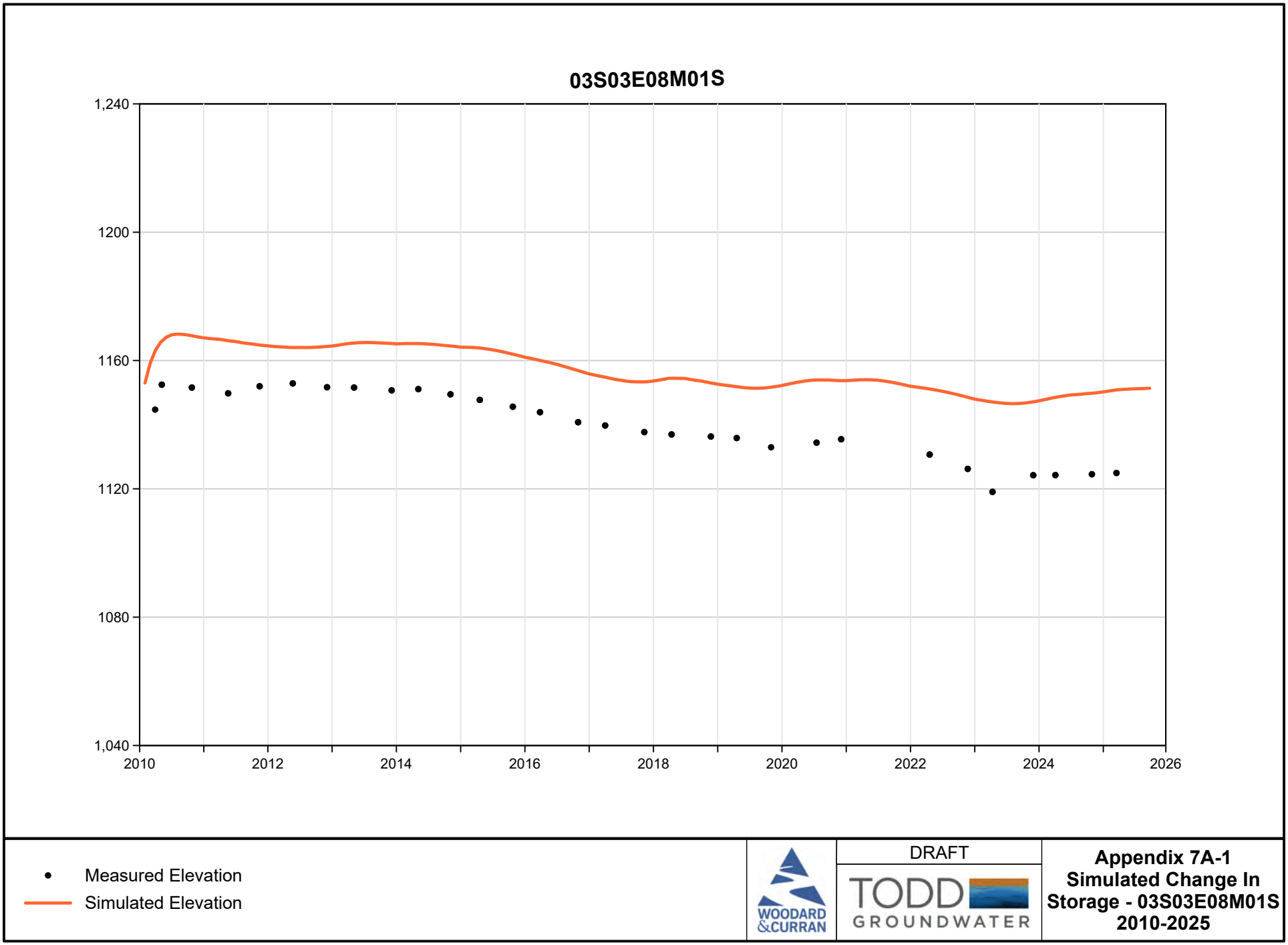


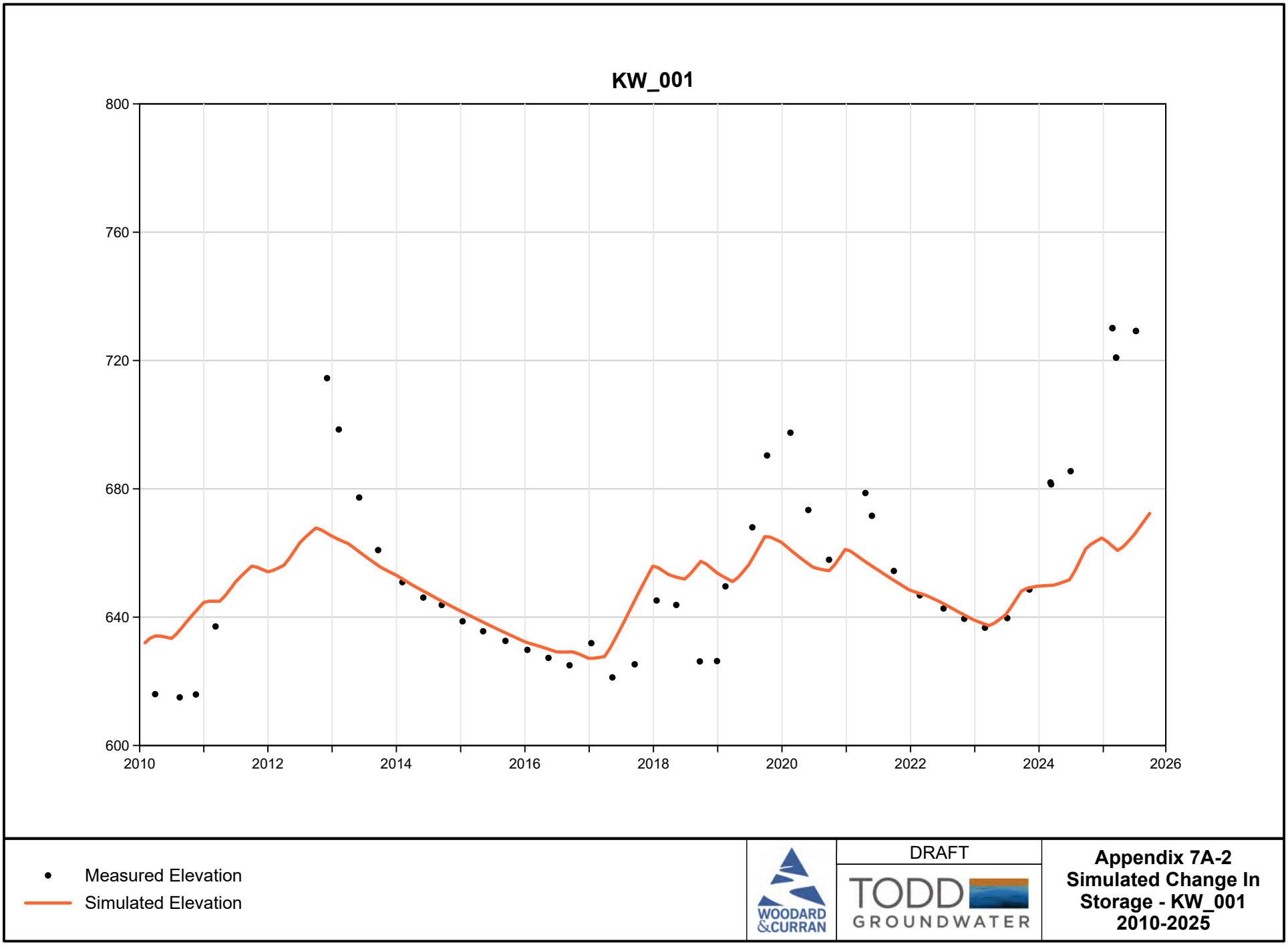
Photo Number: 13 | **View Direction:** East | **Date:** January 14, 2021

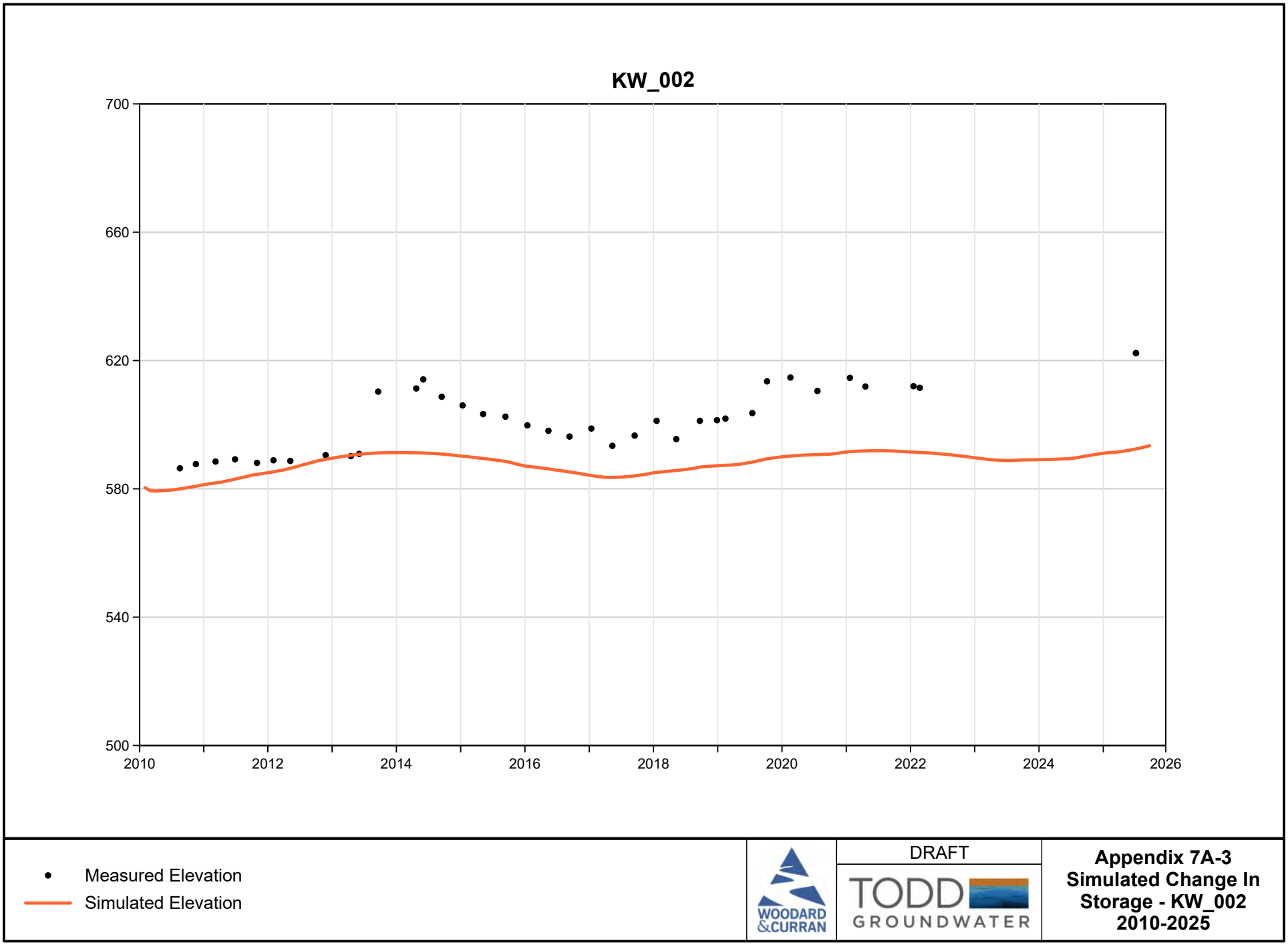
Description: Representative photograph taken of playa wetland community. Photo taken at GDE field assessment site 3.

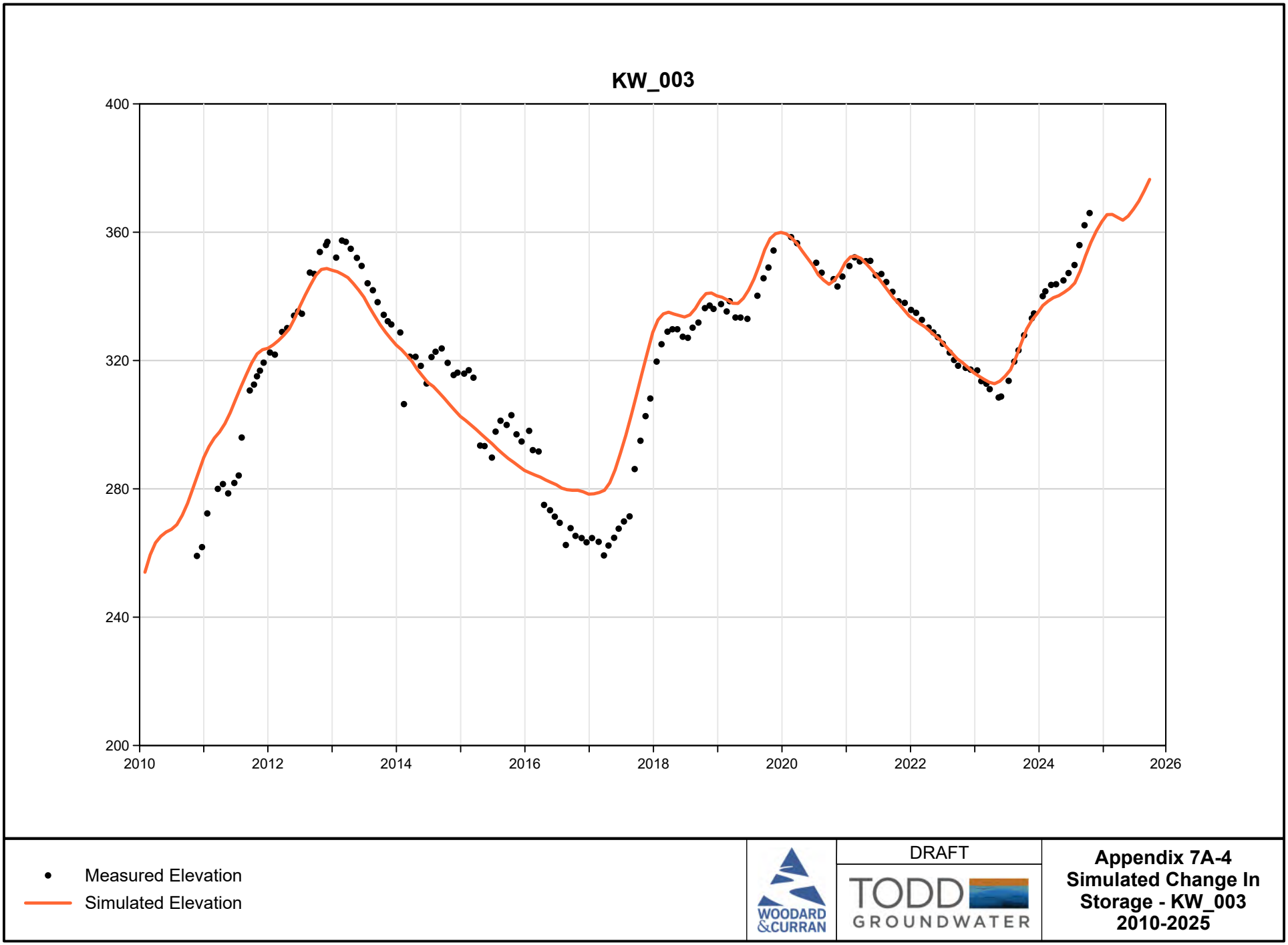
Appendix 7-A

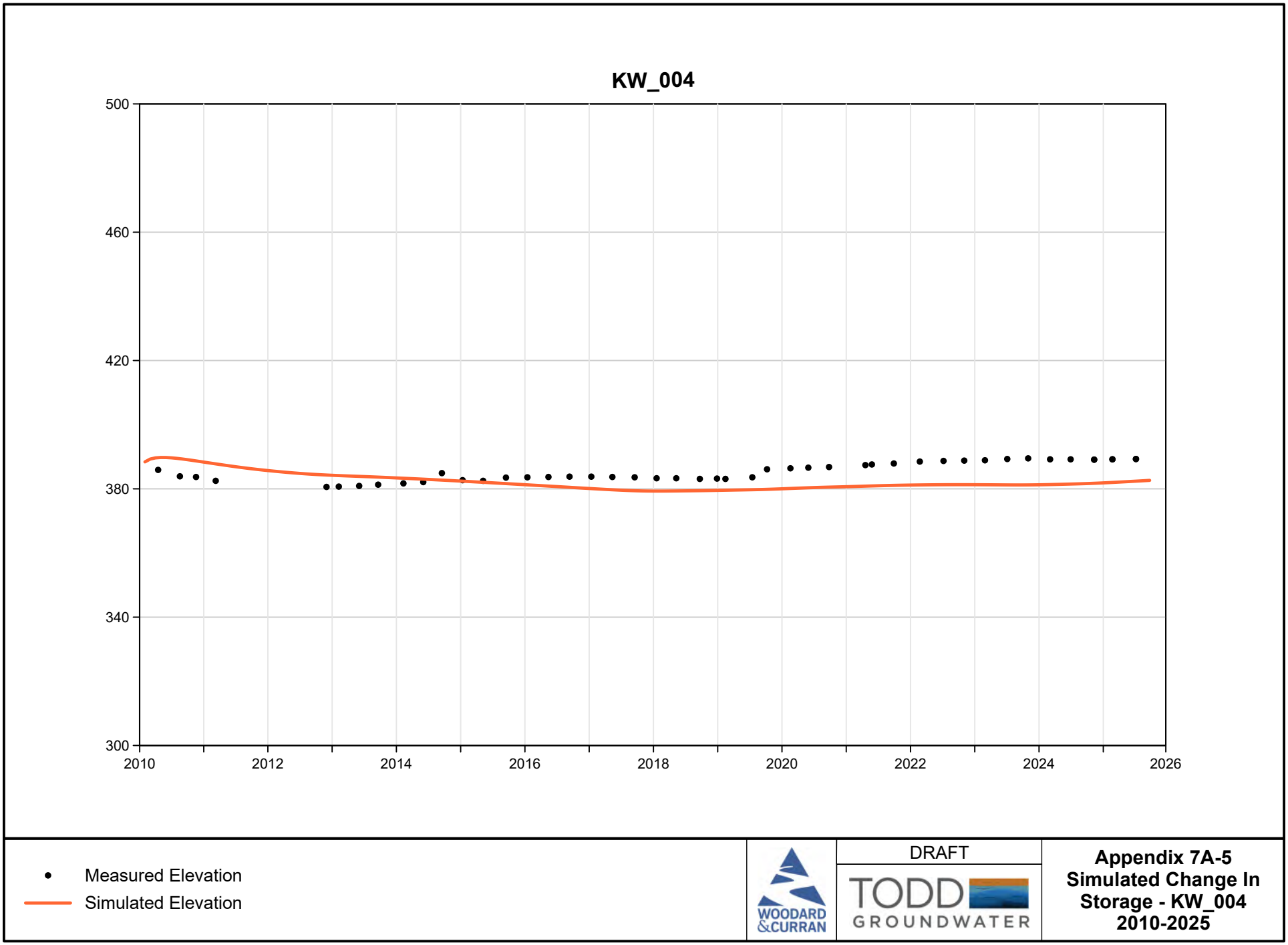
2010-2025 Observed vs. Simulated Groundwater Elevation Hydrographs

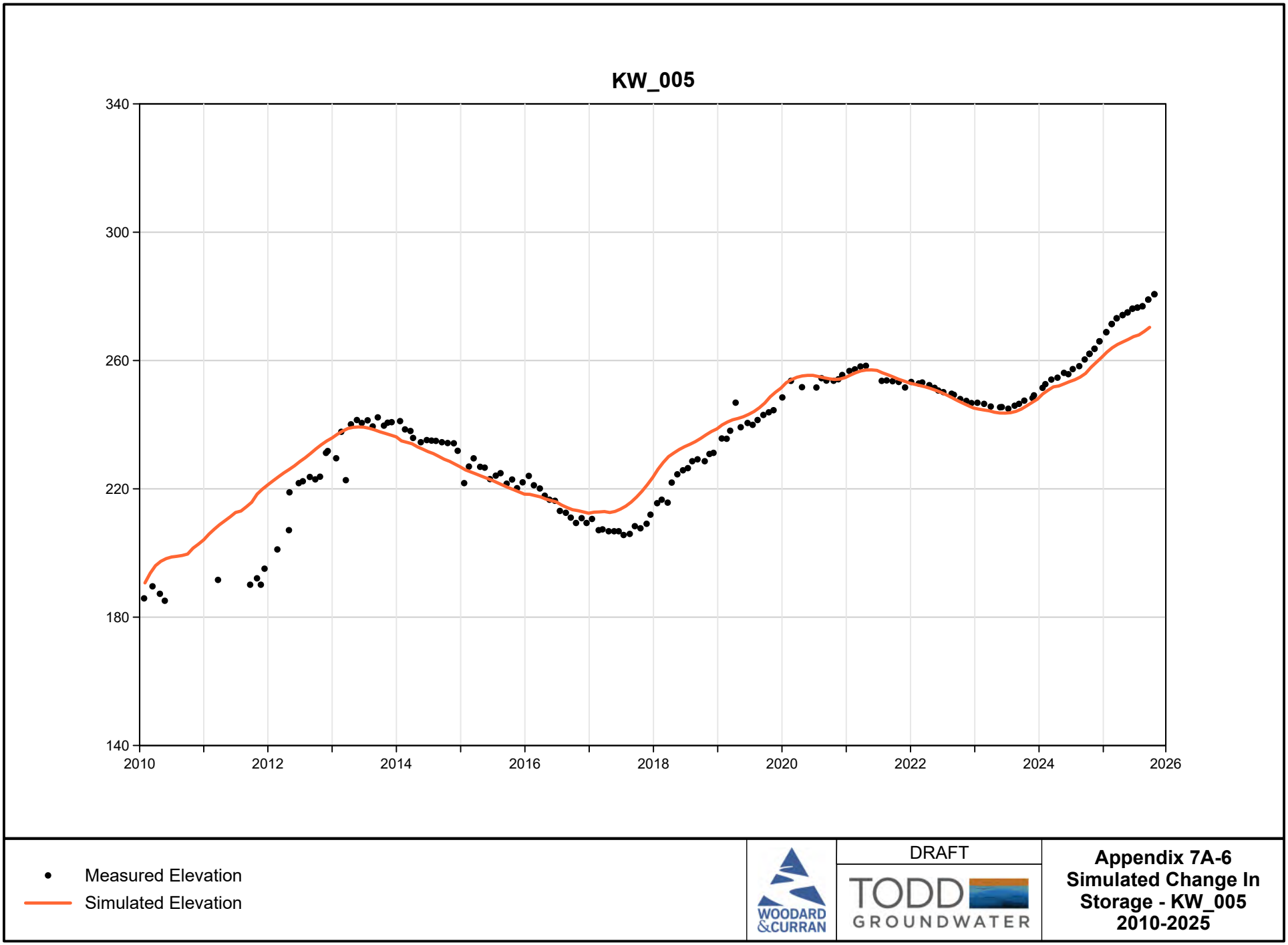

03S03E08M01S
1,240
1200
1160
1120
1080
1,040
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-1
Simulated Change In Storage - 03S03E08M01S
2010-2025

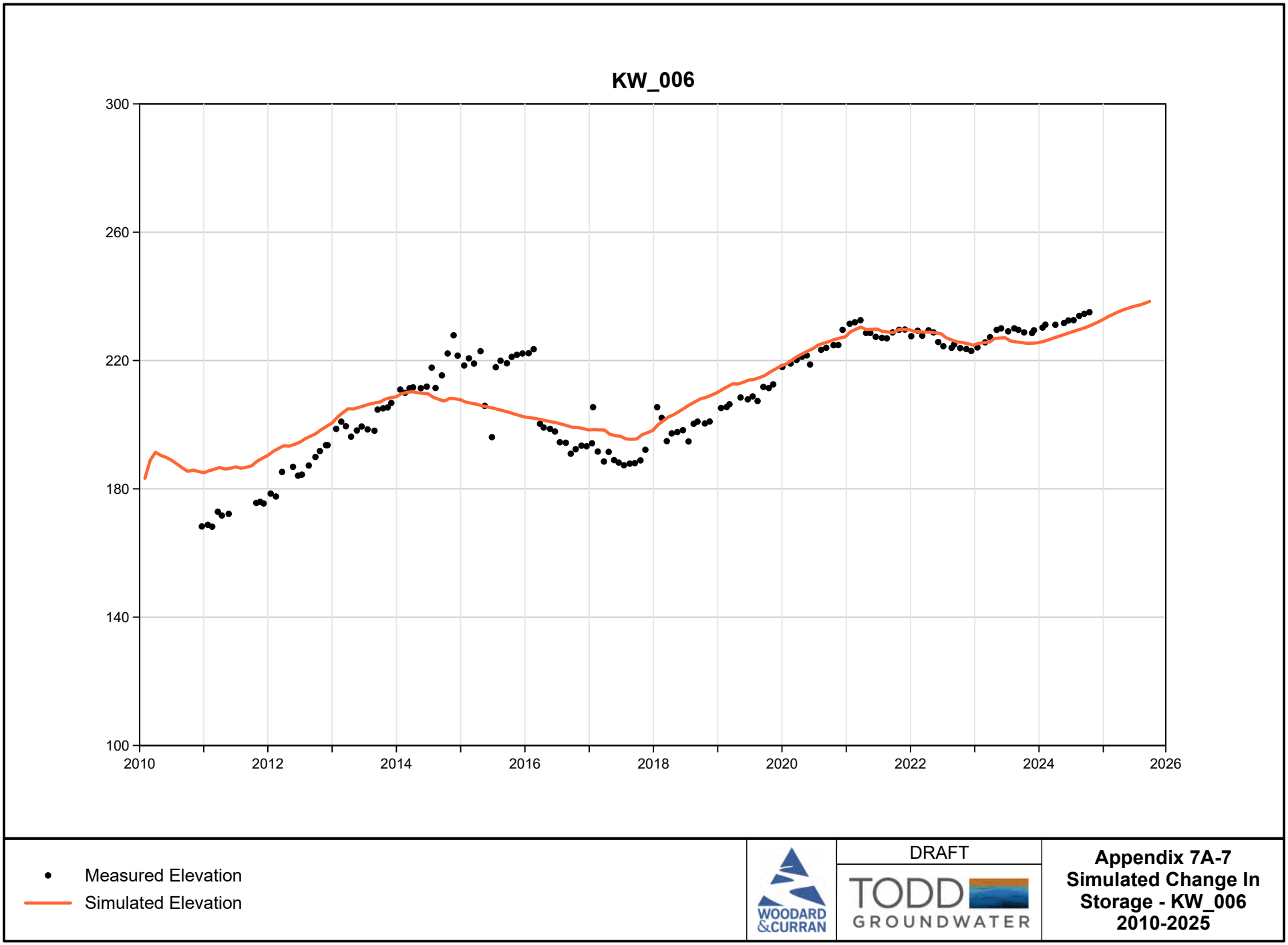

KW_001
800
760
720
680
640
600
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-2
Simulated Change In Storage - KW_001
2010-2025

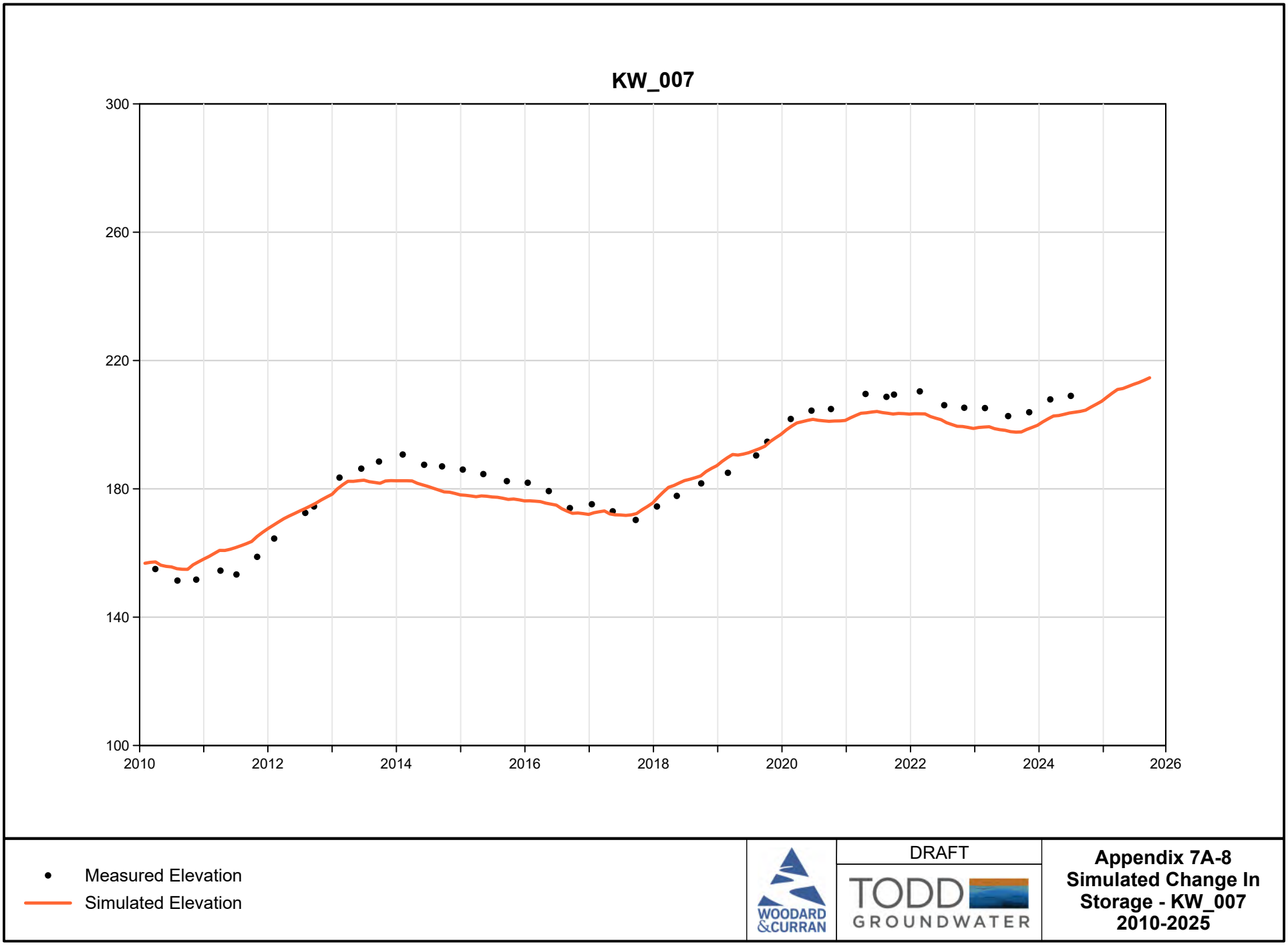

KW_002
700
660
620
580
540
500
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
DRAFT
WOODARD &CURRAN
TODD GROUNDWATER
Appendix 7A-3
Simulated Change In Storage - KW_002
2010-2025

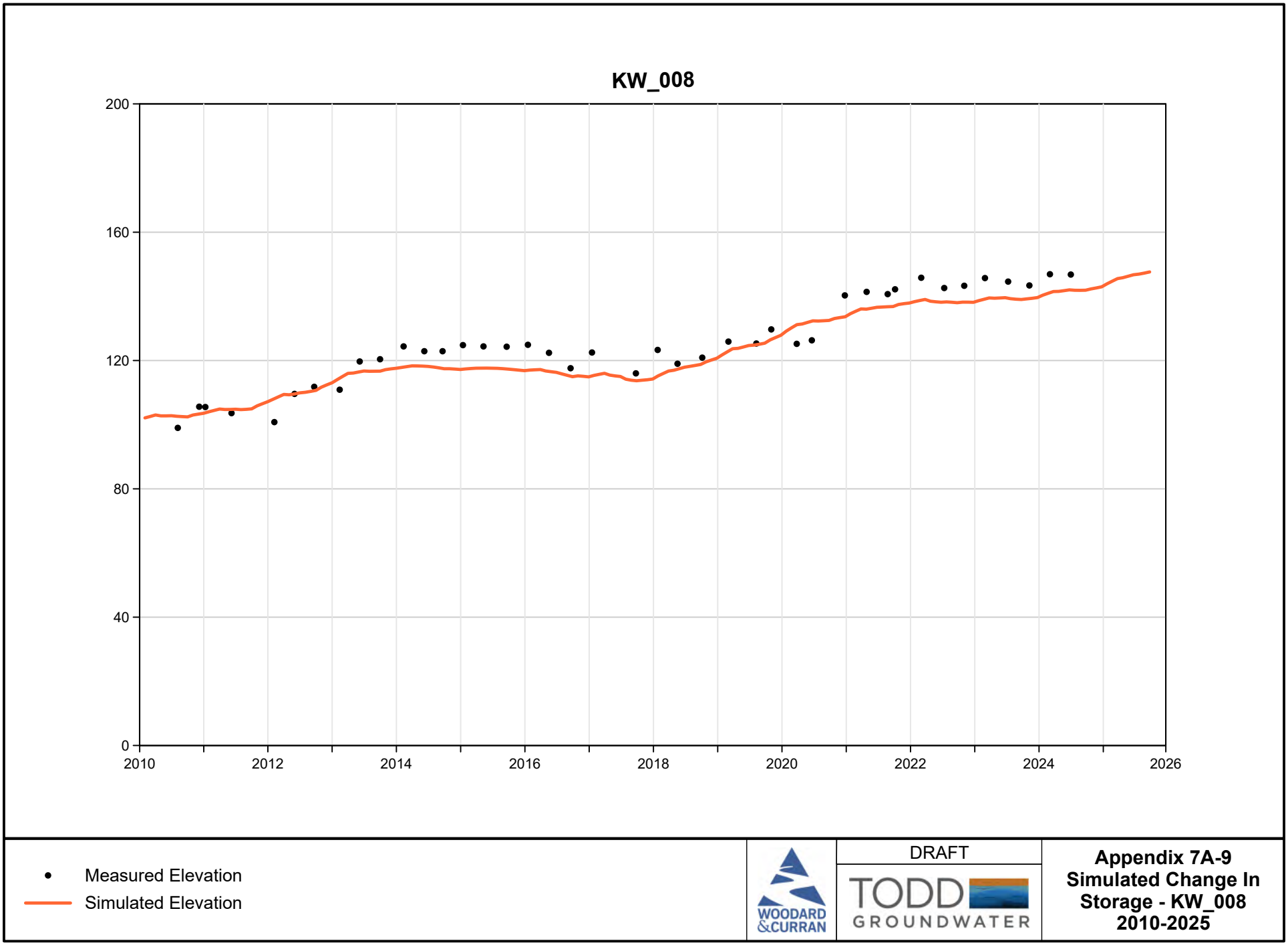

KW_003
400
360
320
280
240
200
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-4
Simulated Change In Storage - KW_003
2010-2025

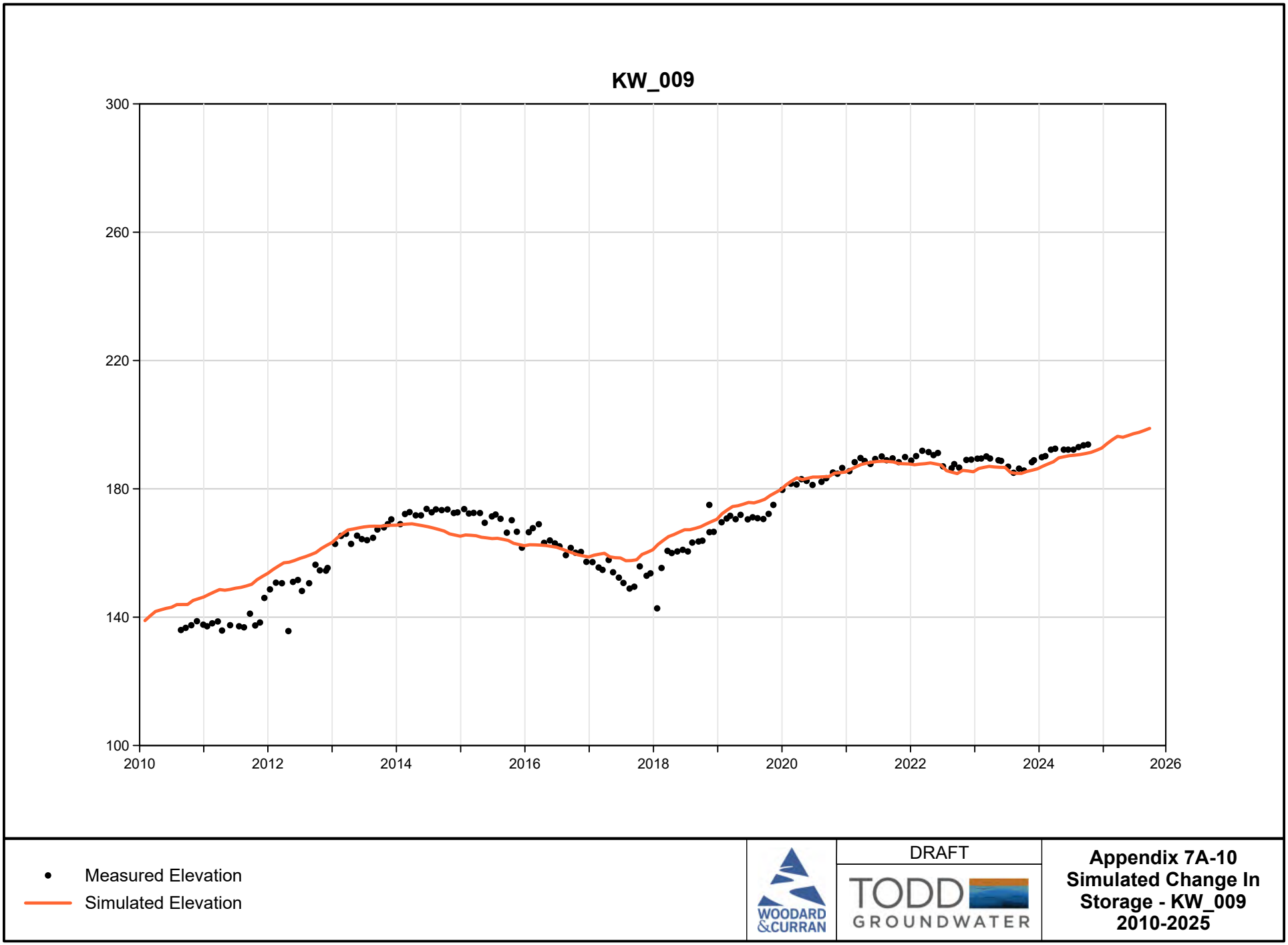

KW_004
500
460
420
380
340
300
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-5
Simulated Change In Storage - KW_004
2010-2025

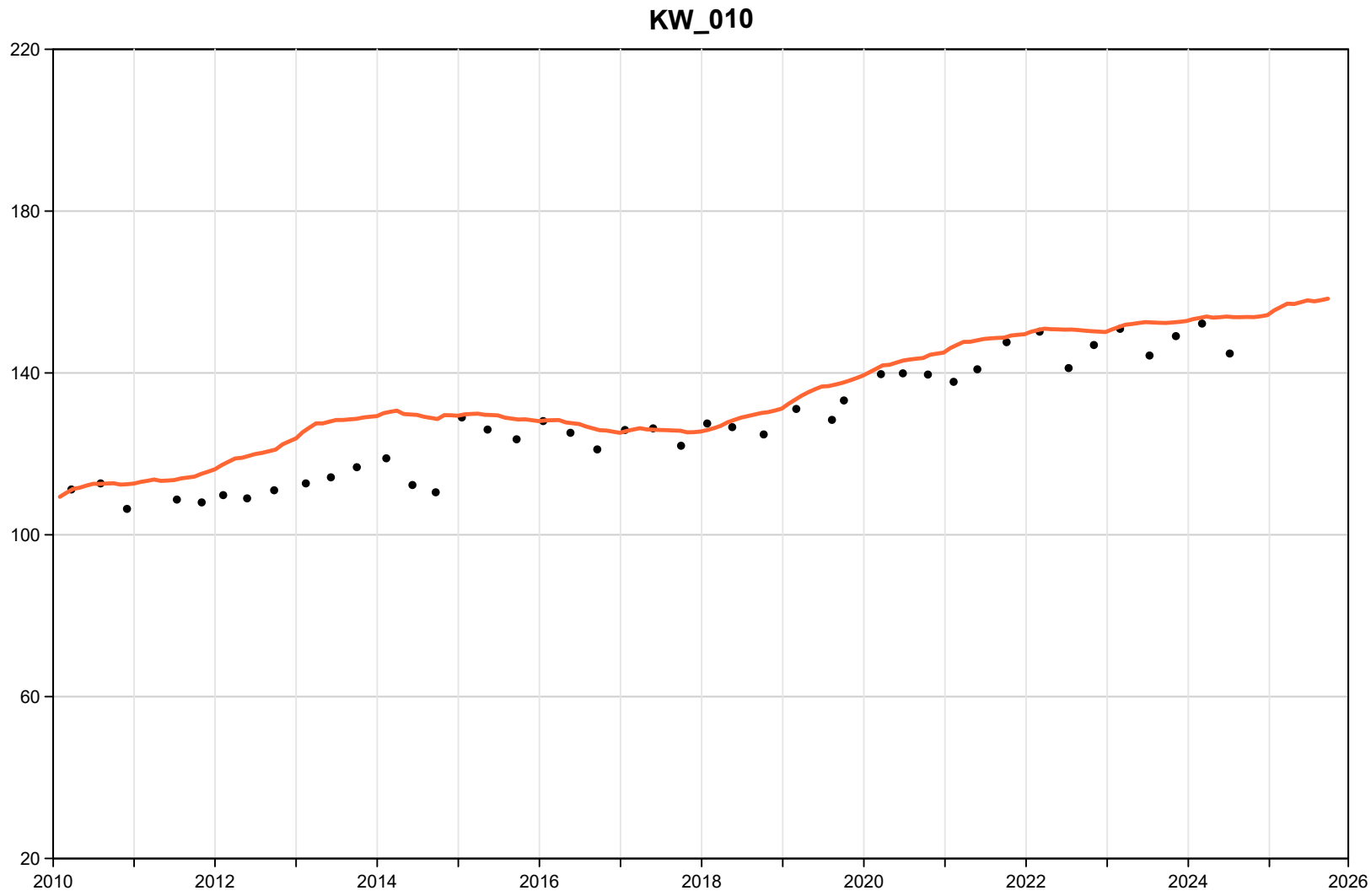

KW_005
340
300
260
220
180
140
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-6
Simulated Change In Storage - KW_005
2010-2025


KW_006
300
260
220
180
140
100
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-7
Simulated Change In Storage - KW_006
2010-2025


KW_007
300
260
220
180
140
100
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-8
Simulated Change In Storage - KW_007
2010-2025


KW_008
200
160
120
80
40
0
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-9
Simulated Change In Storage - KW_008
2010-2025


KW_009
300
260
220
180
140
100
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-10
Simulated Change In Storage - KW_009
2010-2025



• Measured Elevation

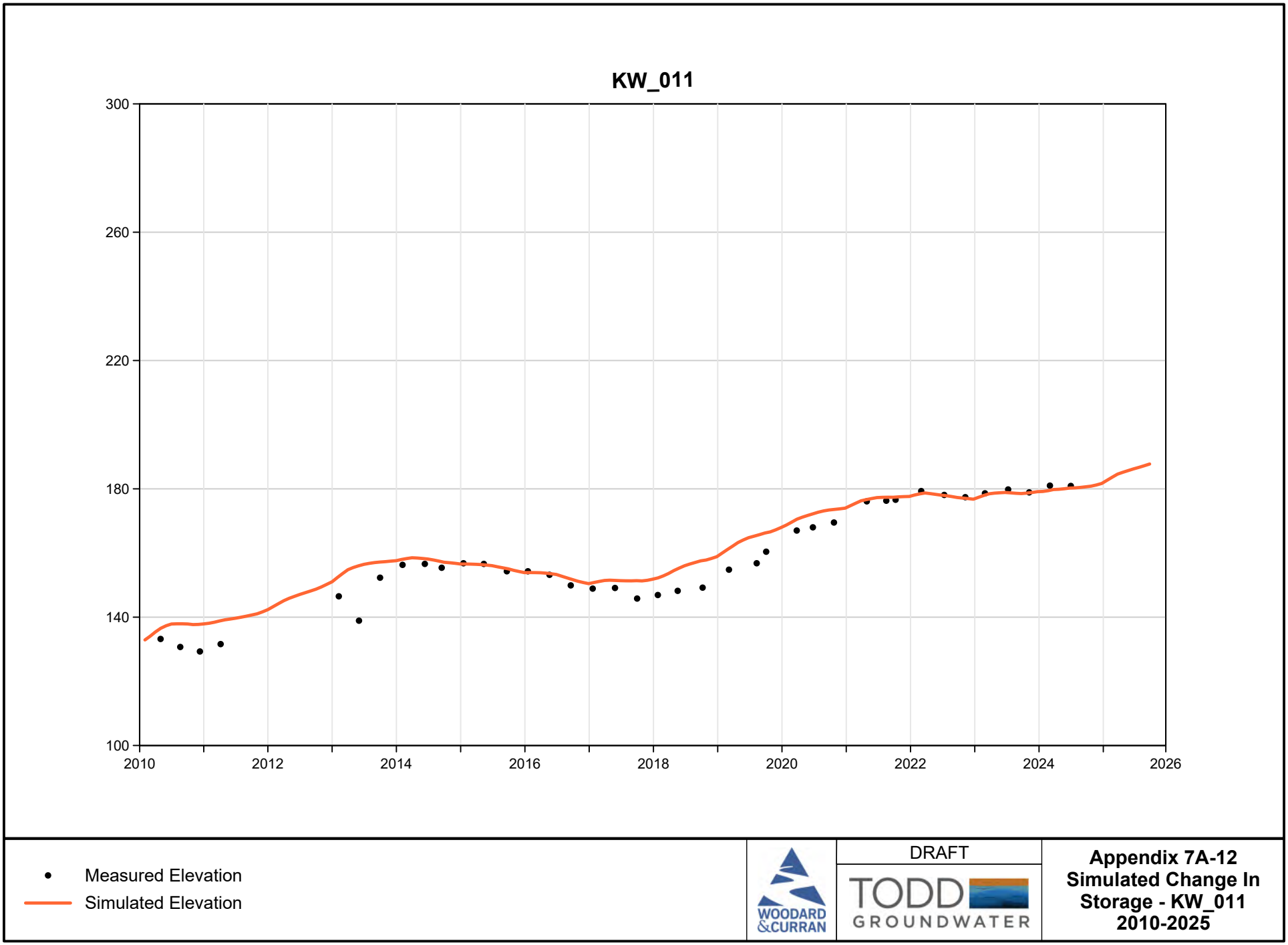
Simulated Elevation

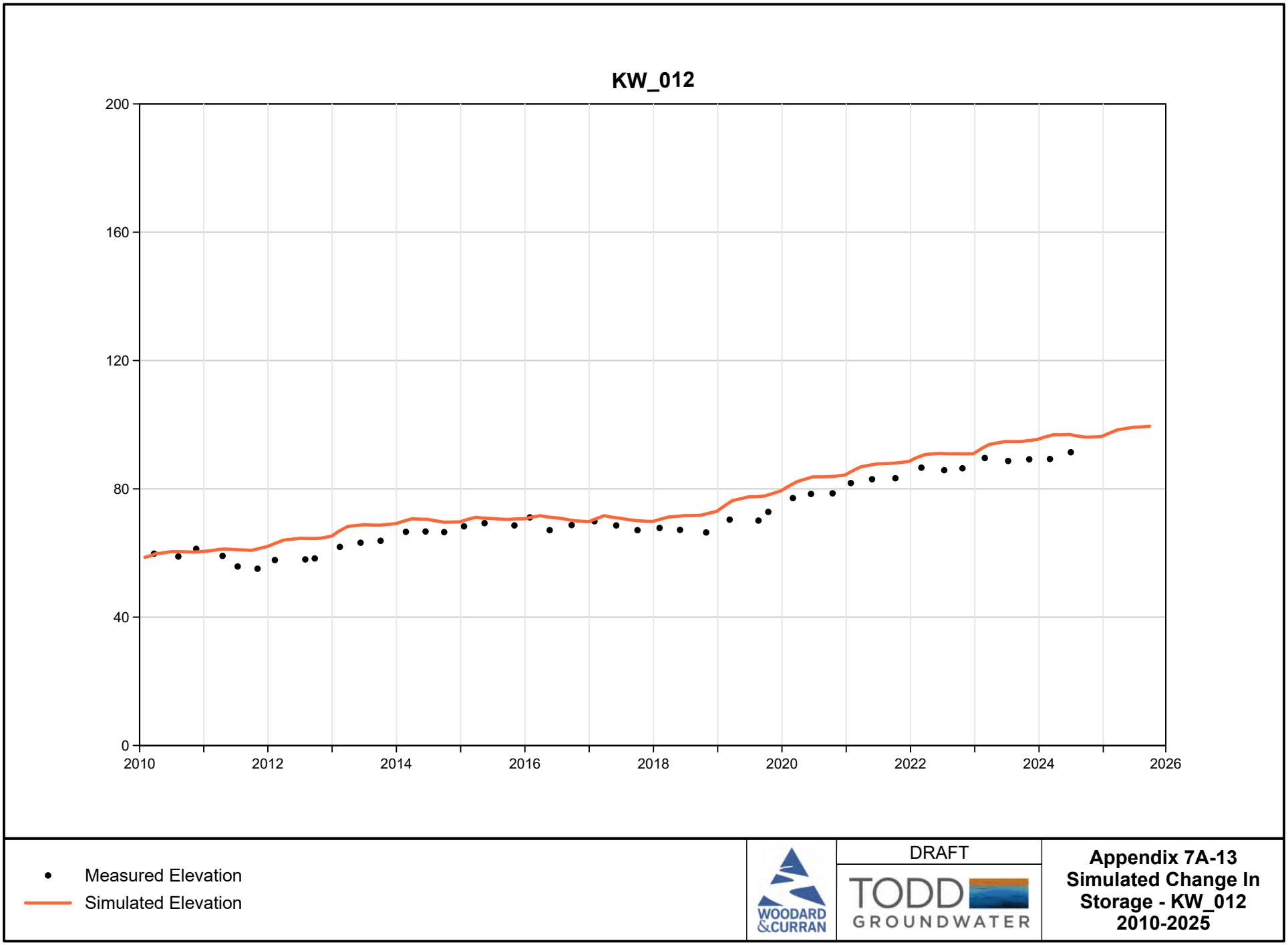
WOODARD &CURRAN

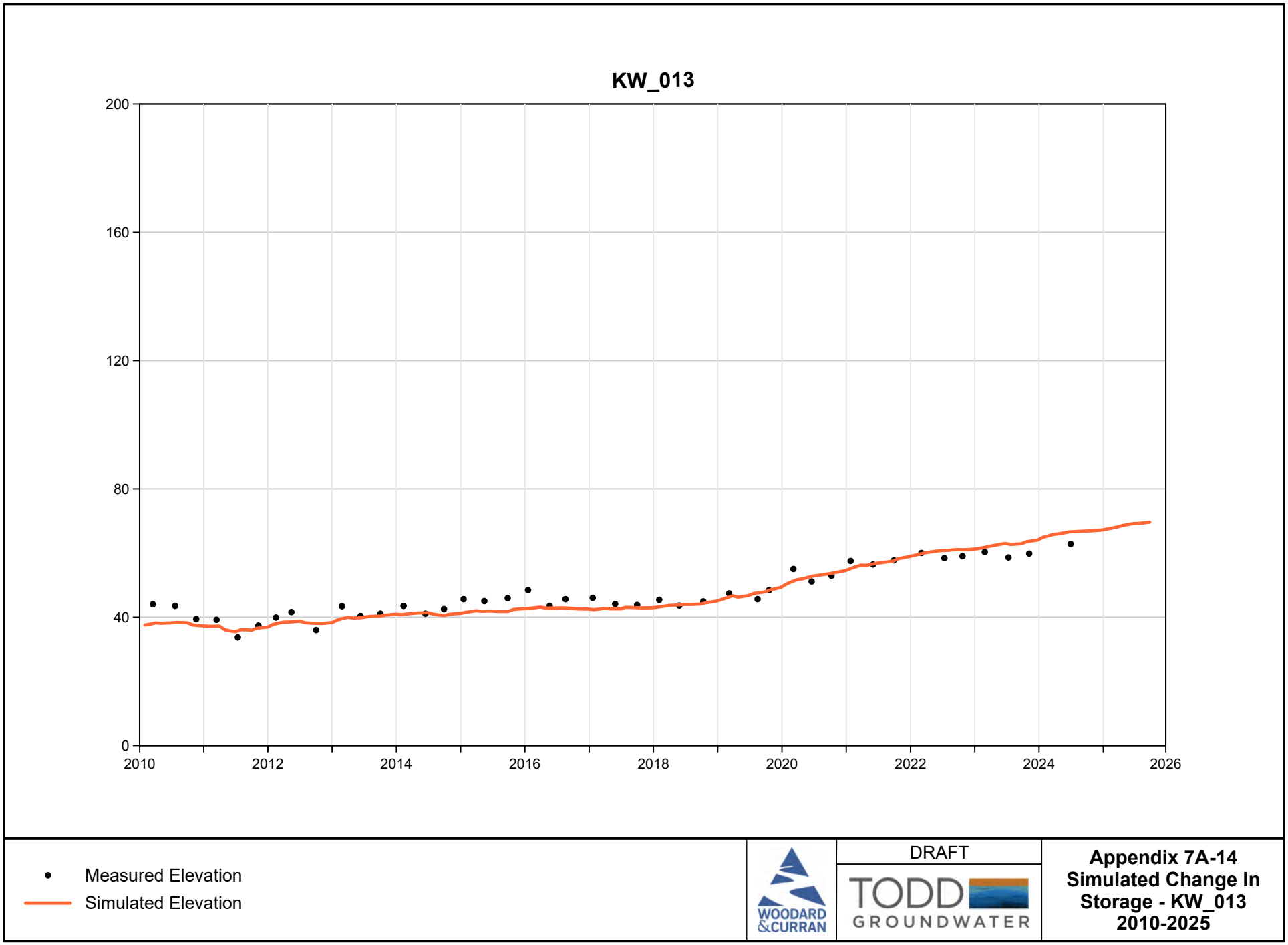
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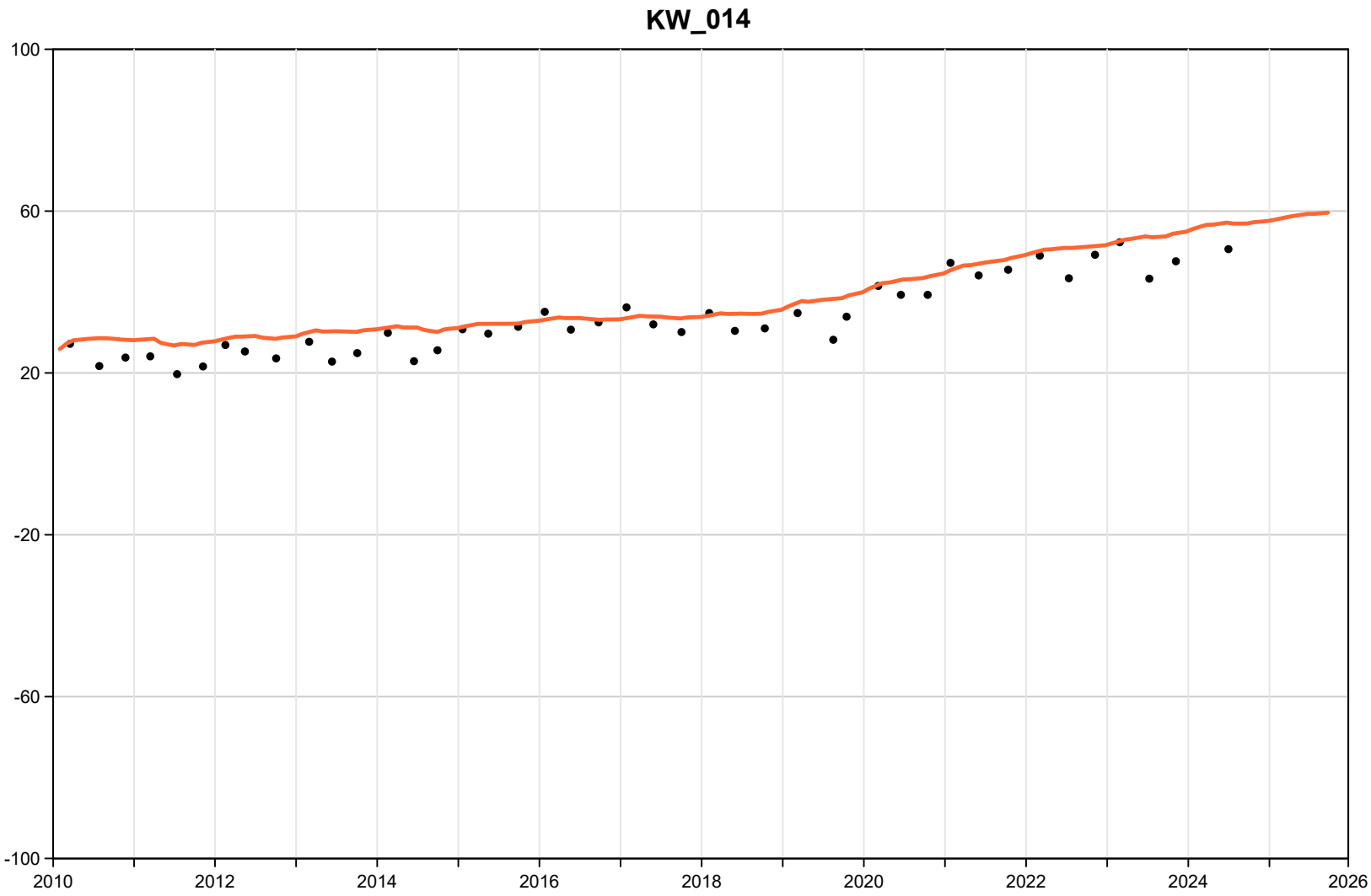
TODD GROUNDWATER

Appendix 7A-11
Simulated Change In Storage - KW_010
2010-2025


KW_011
300
260
220
180
140
100
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-12
Simulated Change In Storage - KW_011
2010-2025


KW_012
200
160
120
80
40
0
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-13
Simulated Change In Storage - KW_012
2010-2025


KW_013
200
160
120
80
40
0
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-14
Simulated Change In Storage - KW_013
2010-2025



• Measured Elevation

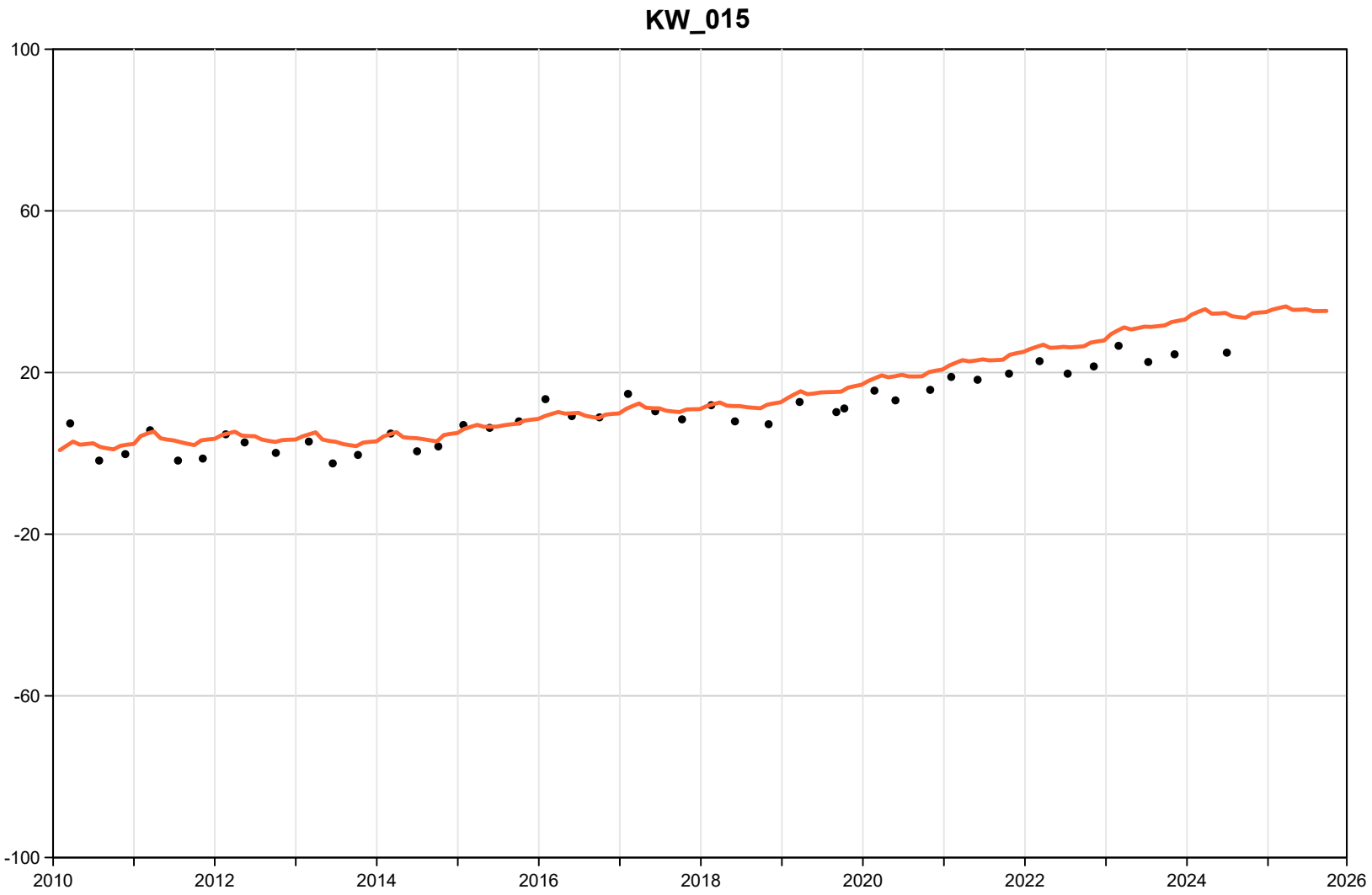
Simulated Elevation

WOODARD &CURRAN

DRAFT

TODD GROUNDWATER

Appendix 7A-15
Simulated Change In Storage - KW_014
2010-2025



Measured Elevation

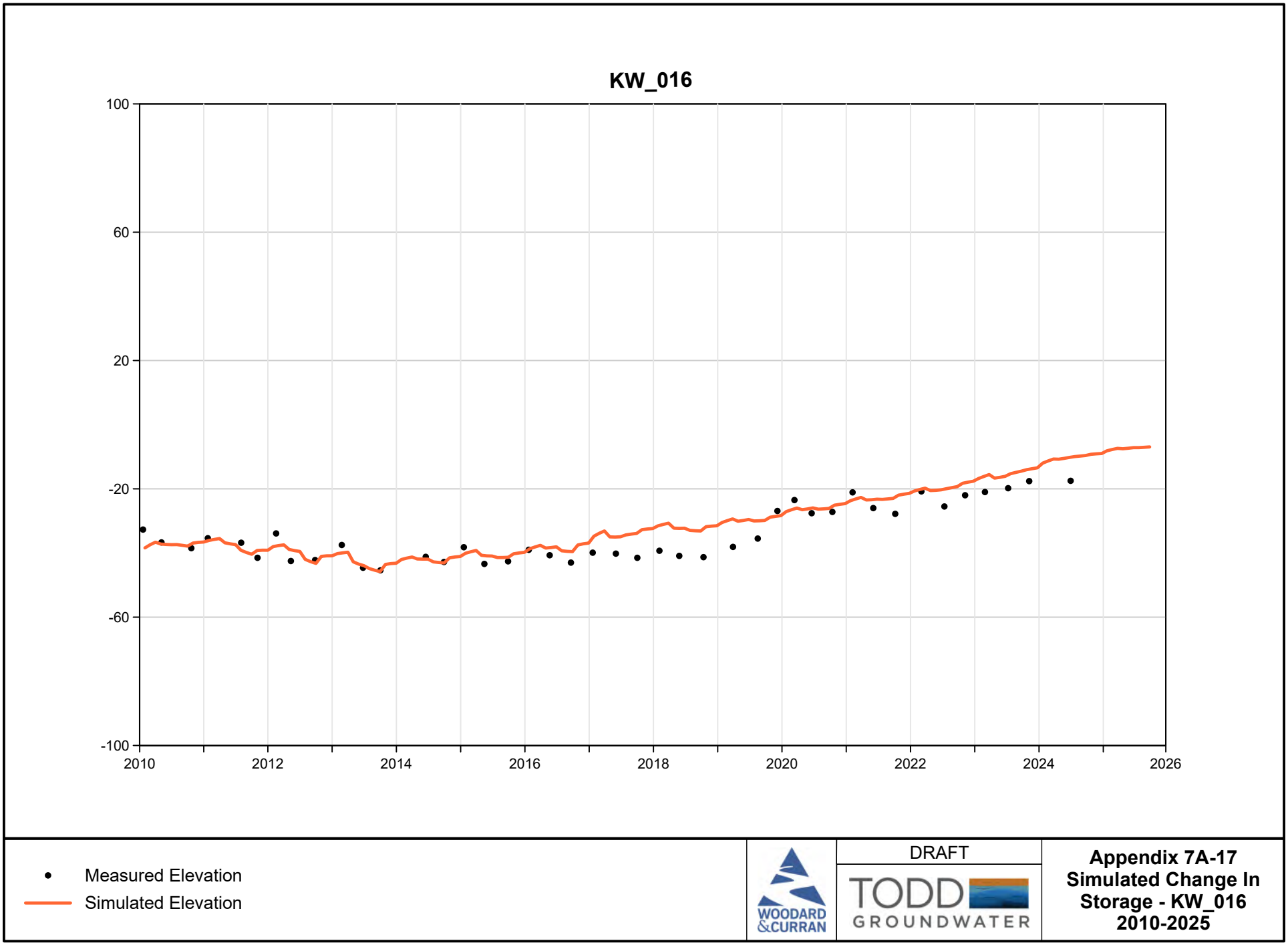
Simulated Elevation

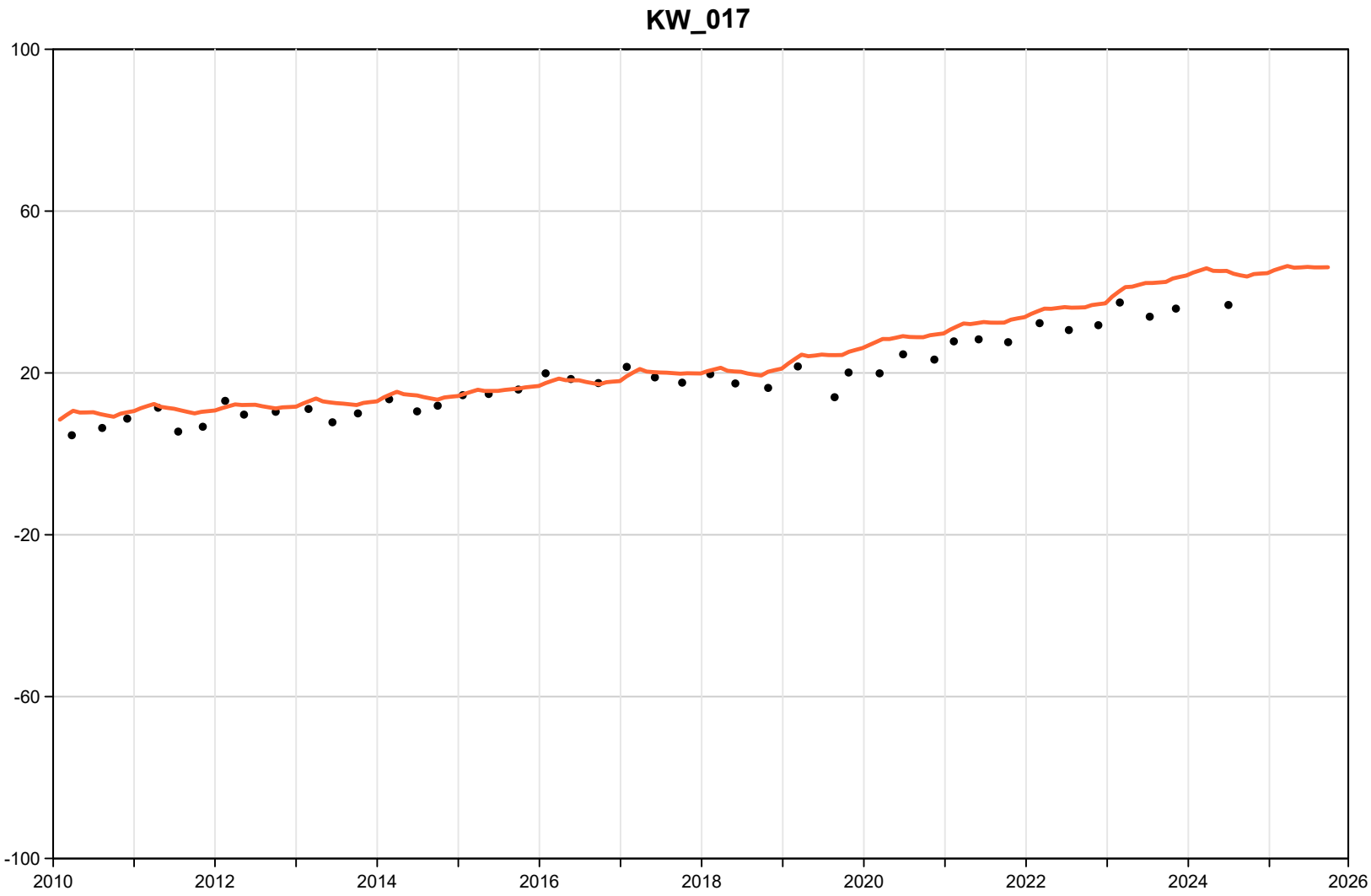
WOODARD &CURRAN

DRAFT

TODD GROUNDWATER

Appendix 7A-16
Simulated Change In Storage - KW_015
2010-2025


KW_016
100
60
20
-20
-60
-100
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-17
Simulated Change In Storage - KW_016
2010-2025



• Measured Elevation

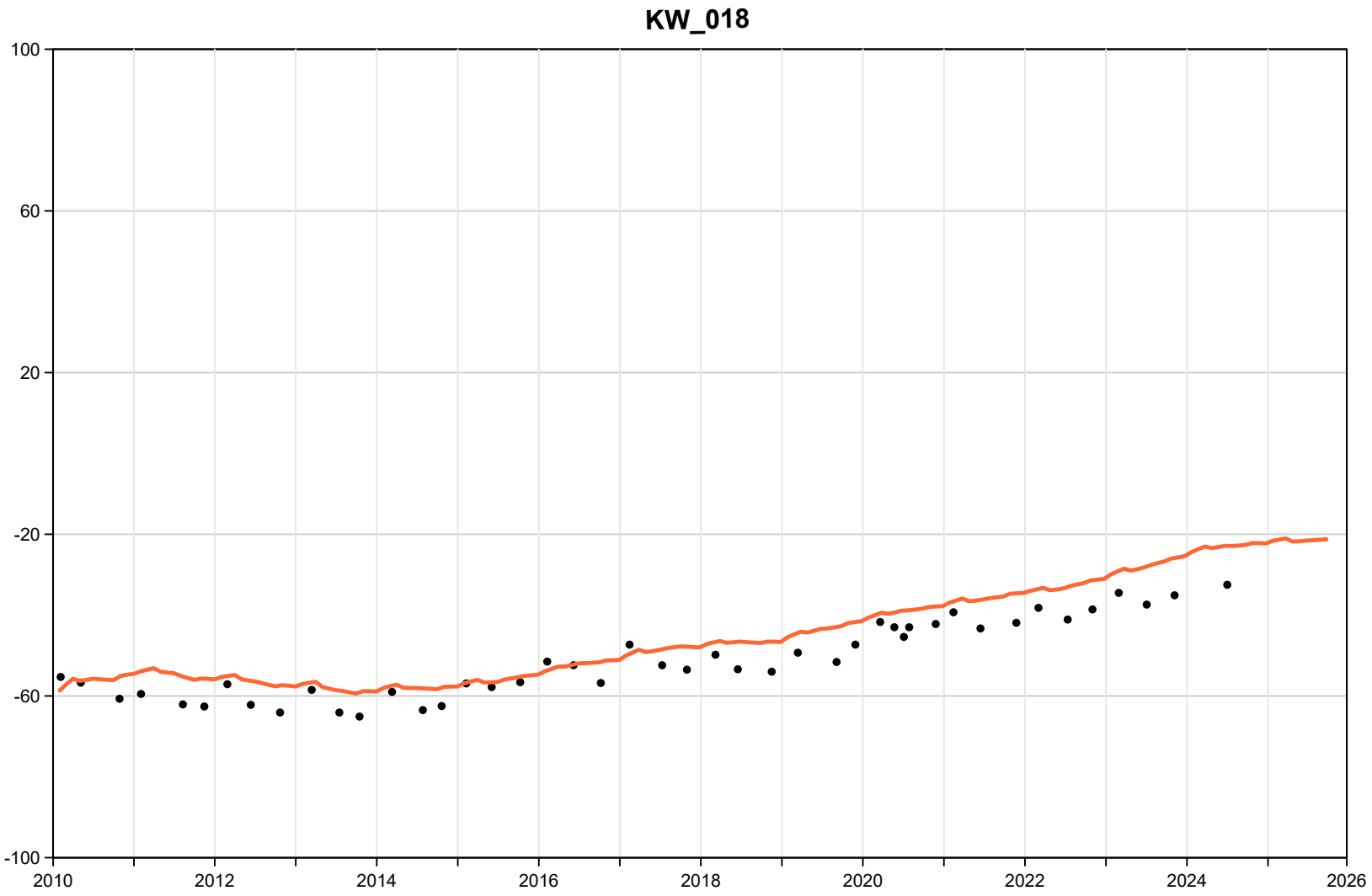
Simulated Elevation

WOODARD &CURRAN

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TODD GROUNDWATER

Appendix 7A-18
Simulated Change In Storage - KW_017
2010-2025



• Measured Elevation

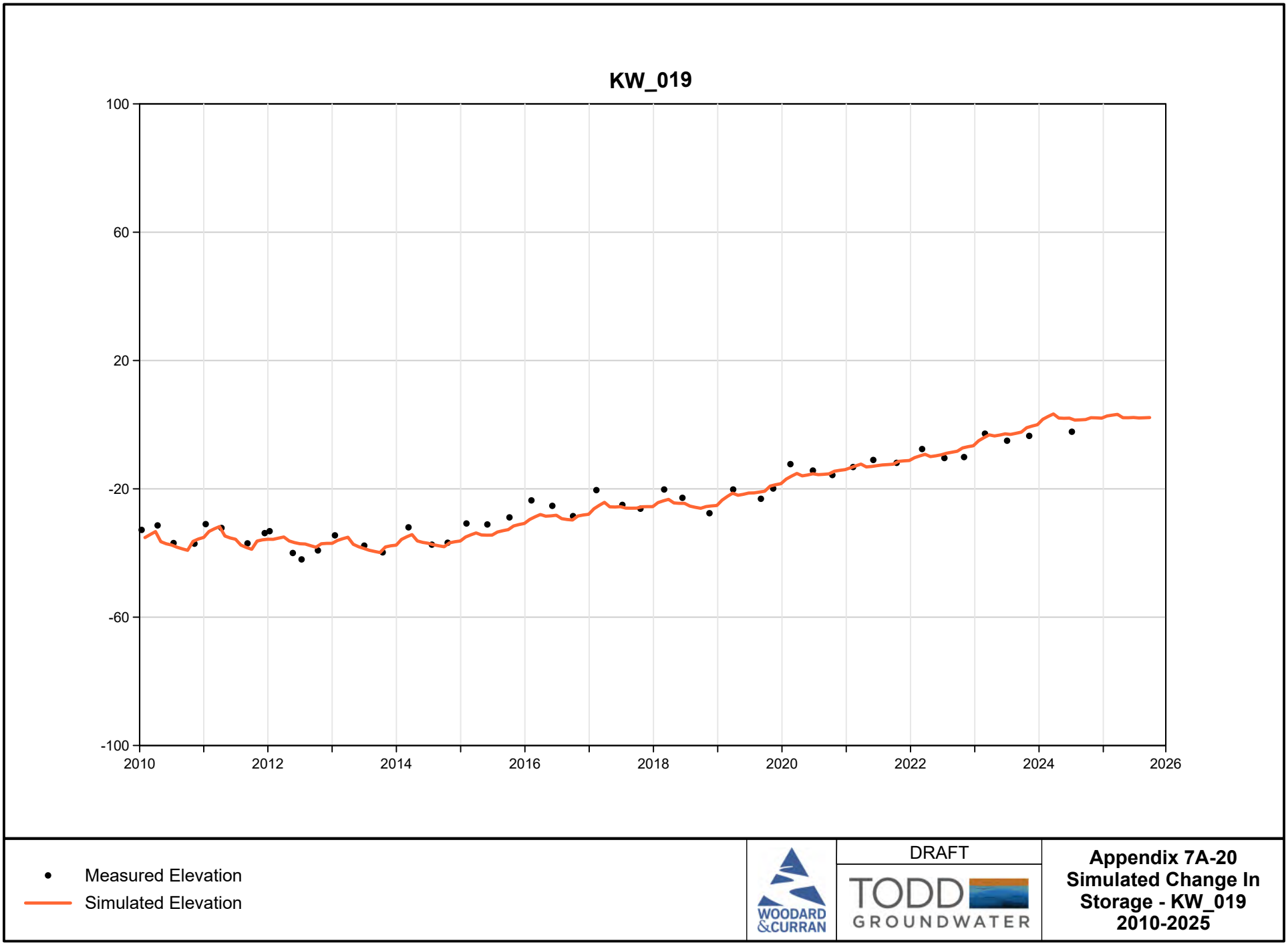
Simulated Elevation

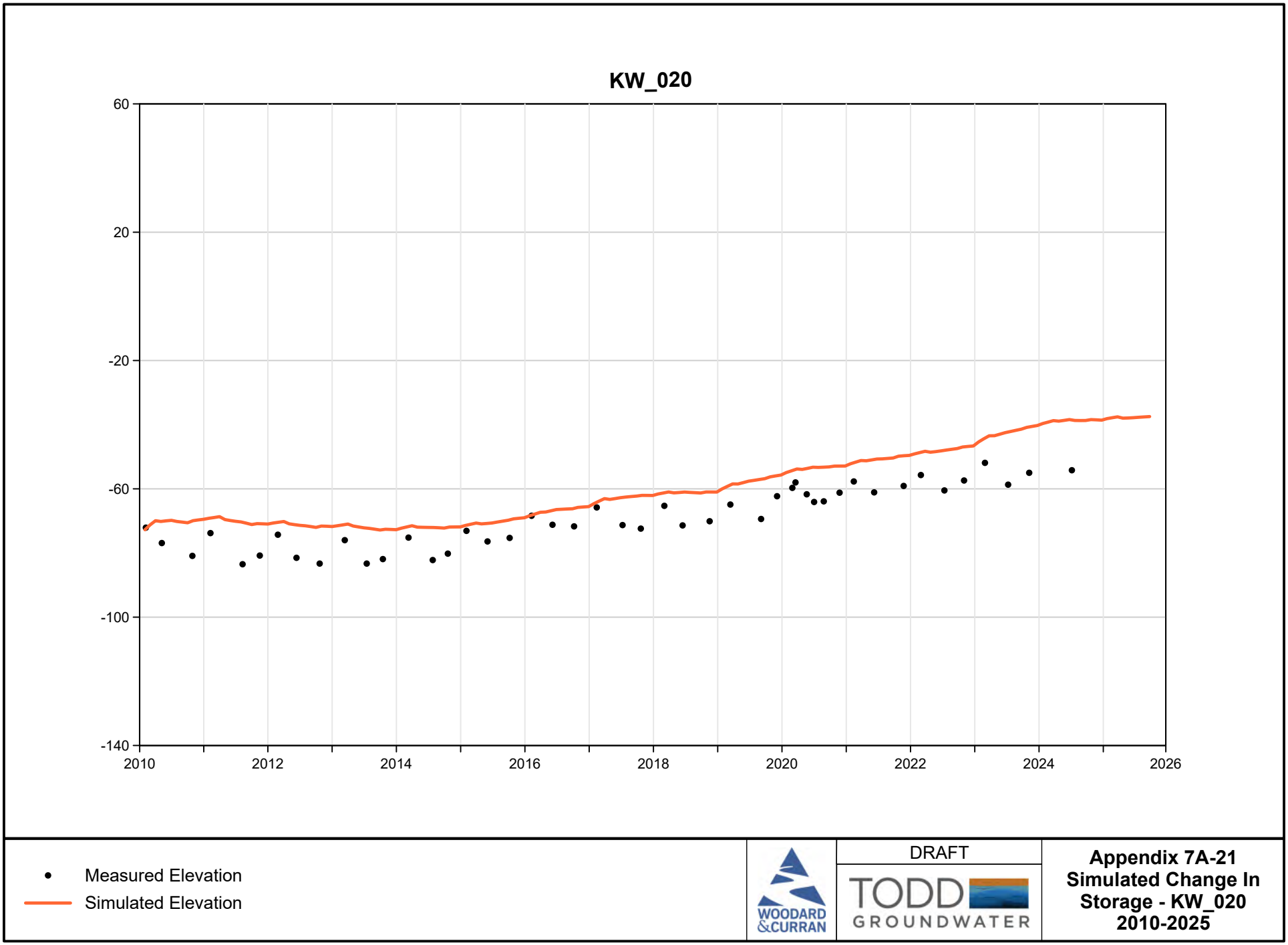
WOODARD &CURRAN

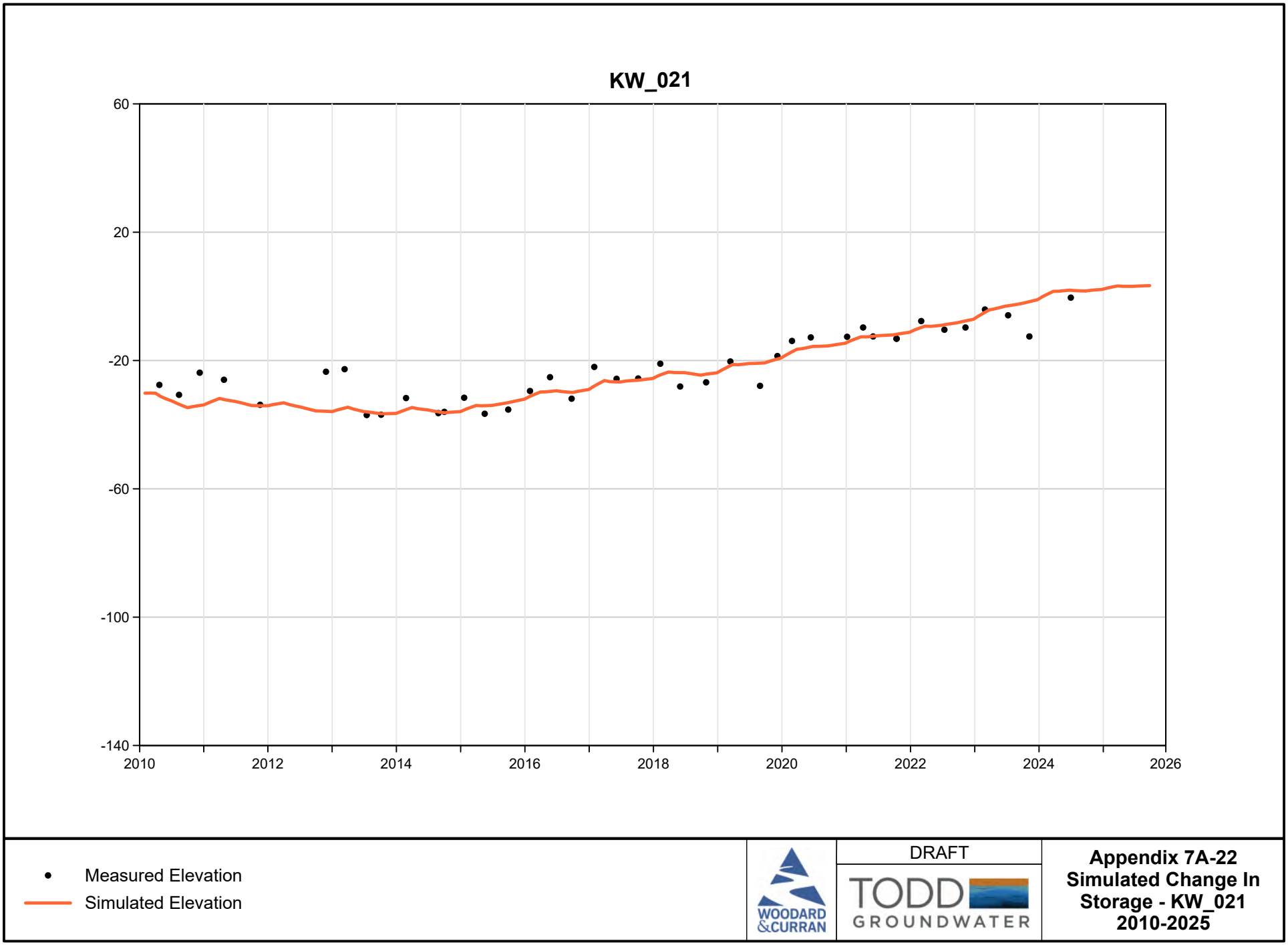
DRAFT

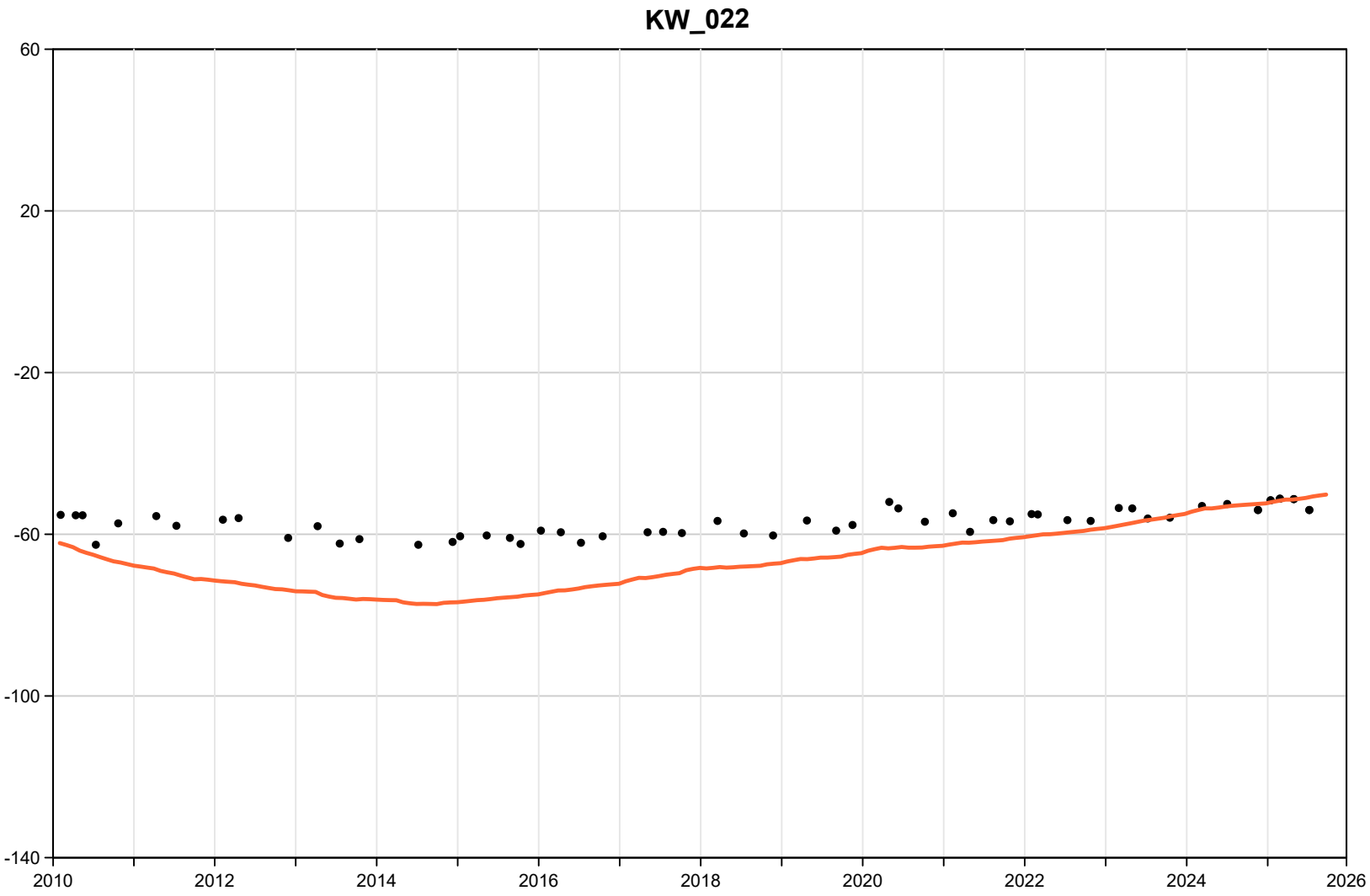
TODD GROUNDWATER

Appendix 7A-19
Simulated Change In Storage - KW_018
2010-2025


KW_019
100
60
20
-20
-60
-100
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
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TODD GROUNDWATER
Appendix 7A-20
Simulated Change In Storage - KW_019
2010-2025


KW_020
60
20
-20
-60
-100
-140
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
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TODD GROUNDWATER
Appendix 7A-21
Simulated Change In Storage - KW_020
2010-2025


KW_021
60
20
-20
-60
-100
-140
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
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TODD GROUNDWATER
Appendix 7A-22
Simulated Change In Storage - KW_021
2010-2025

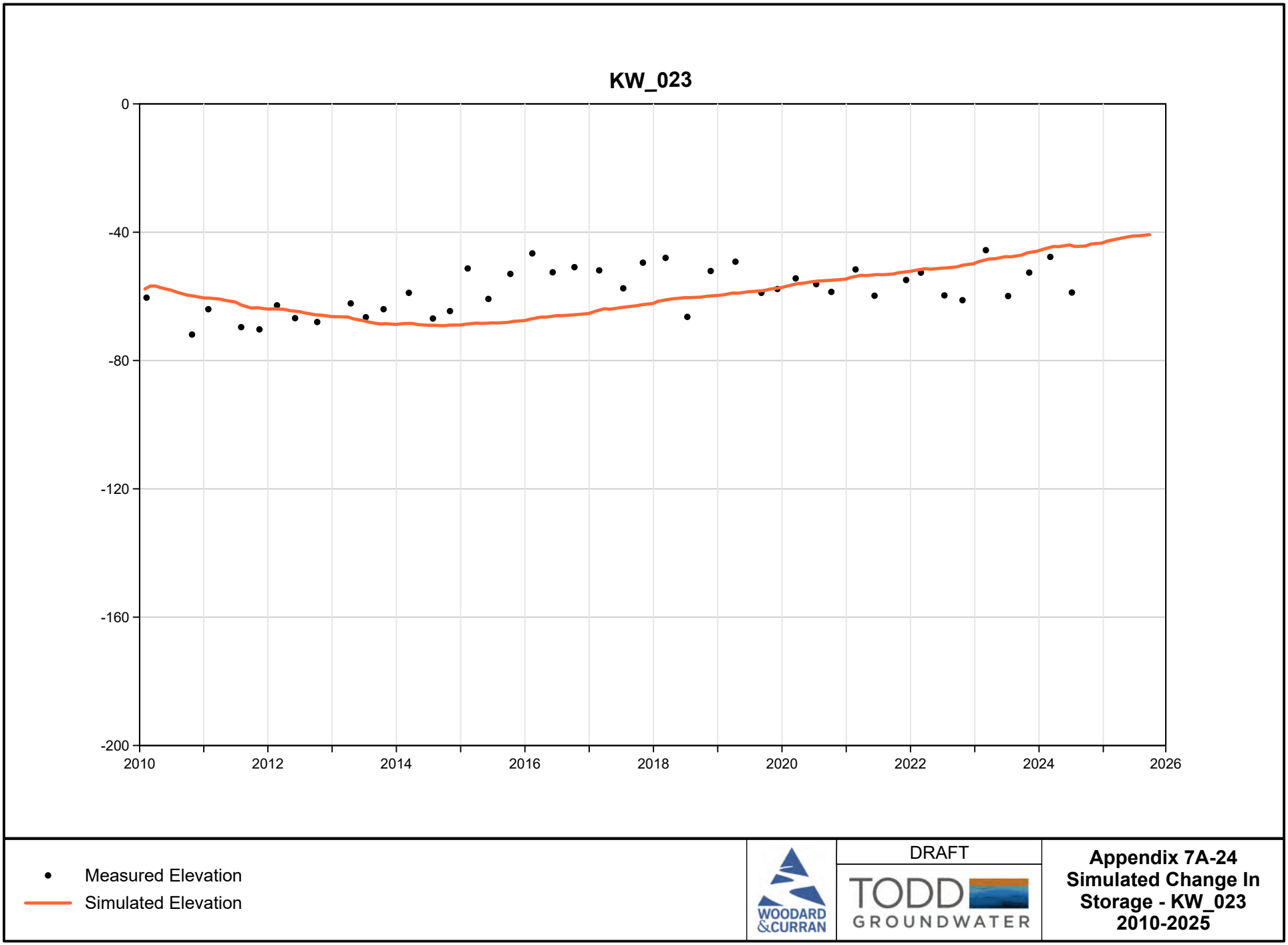


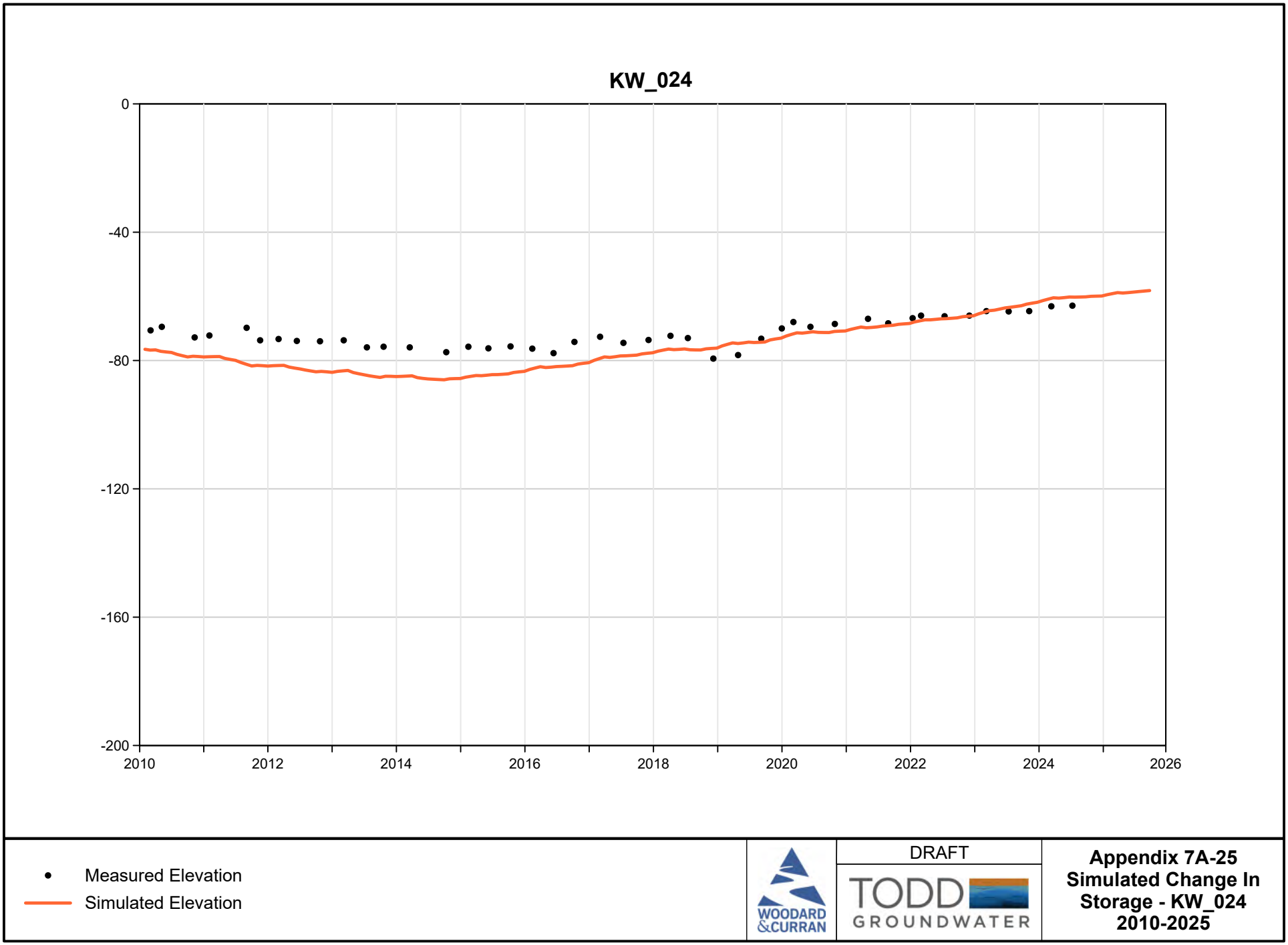
Measured Elevation

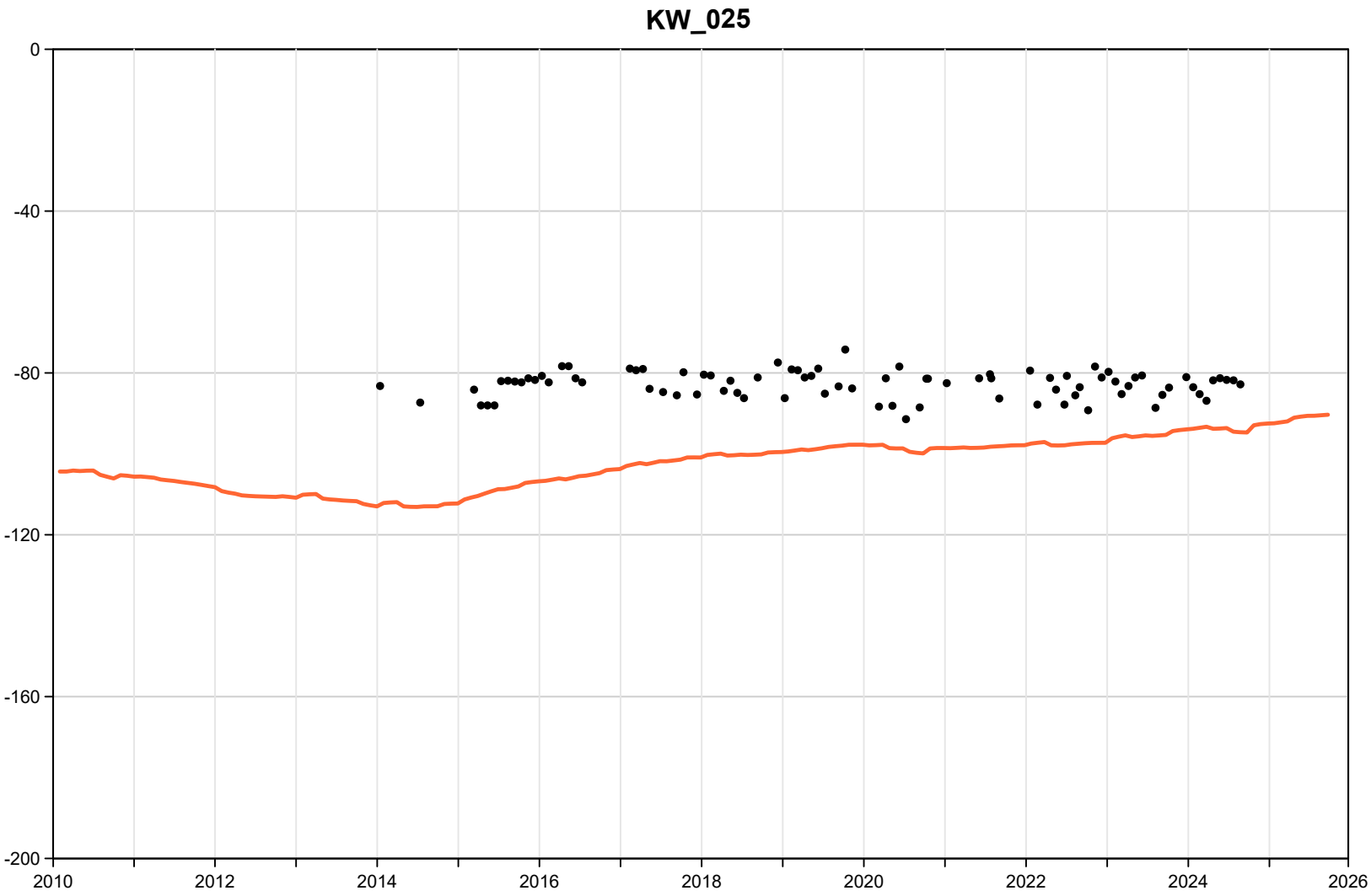
Simulated Elevation

DRAFT

Appendix 7A-23
Simulated Change In Storage - KW_022
2010-2025


KW_023
0
-40
-80
-120
-160
-200
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
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TODD GROUNDWATER
Appendix 7A-24
Simulated Change In Storage - KW_023
2010-2025


KW_024
0
-40
-80
-120
-160
-200
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
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TODD GROUNDWATER
Appendix 7A-25
Simulated Change In Storage - KW_024
2010-2025



• Measured Elevation

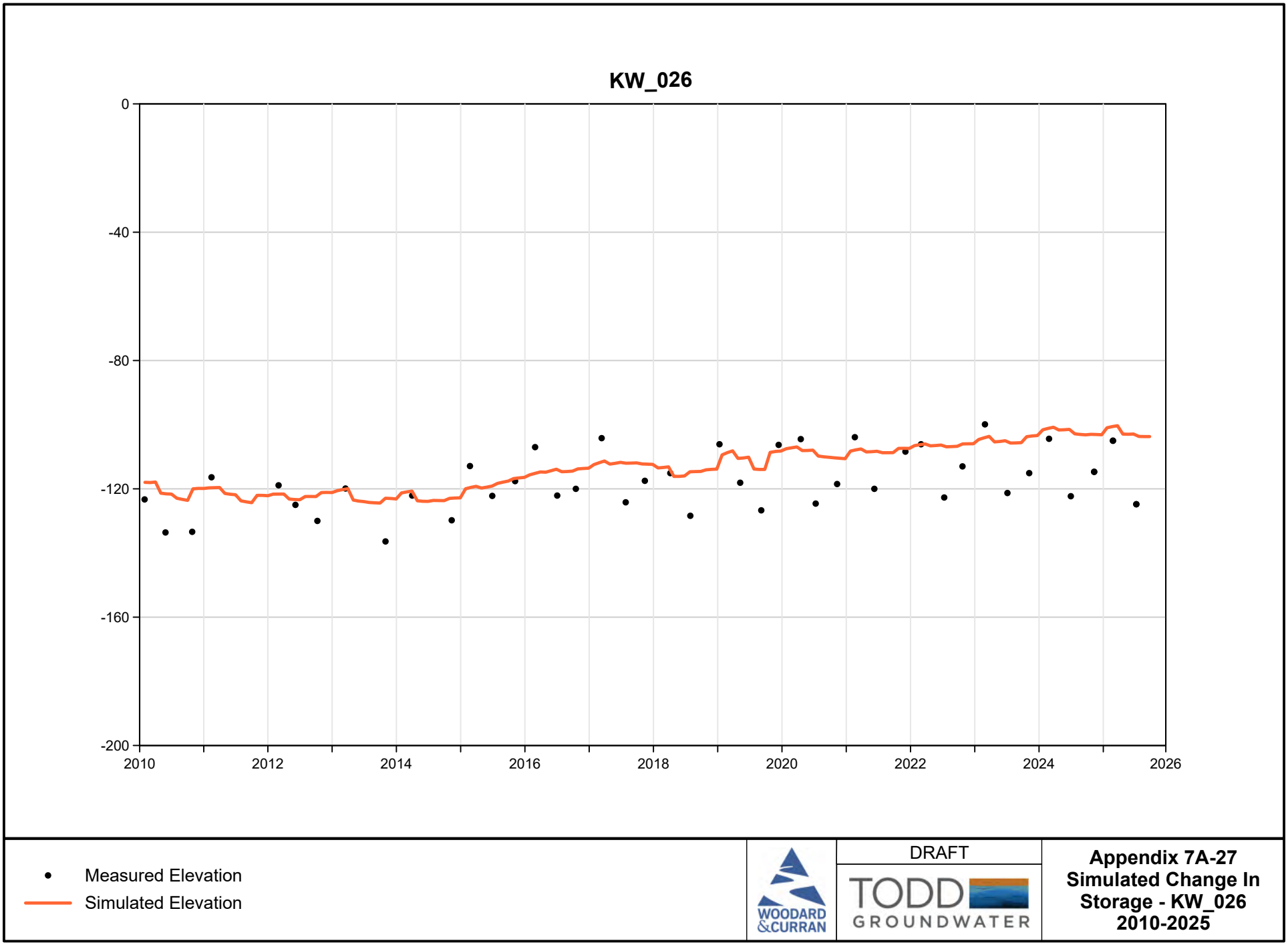
Simulated Elevation

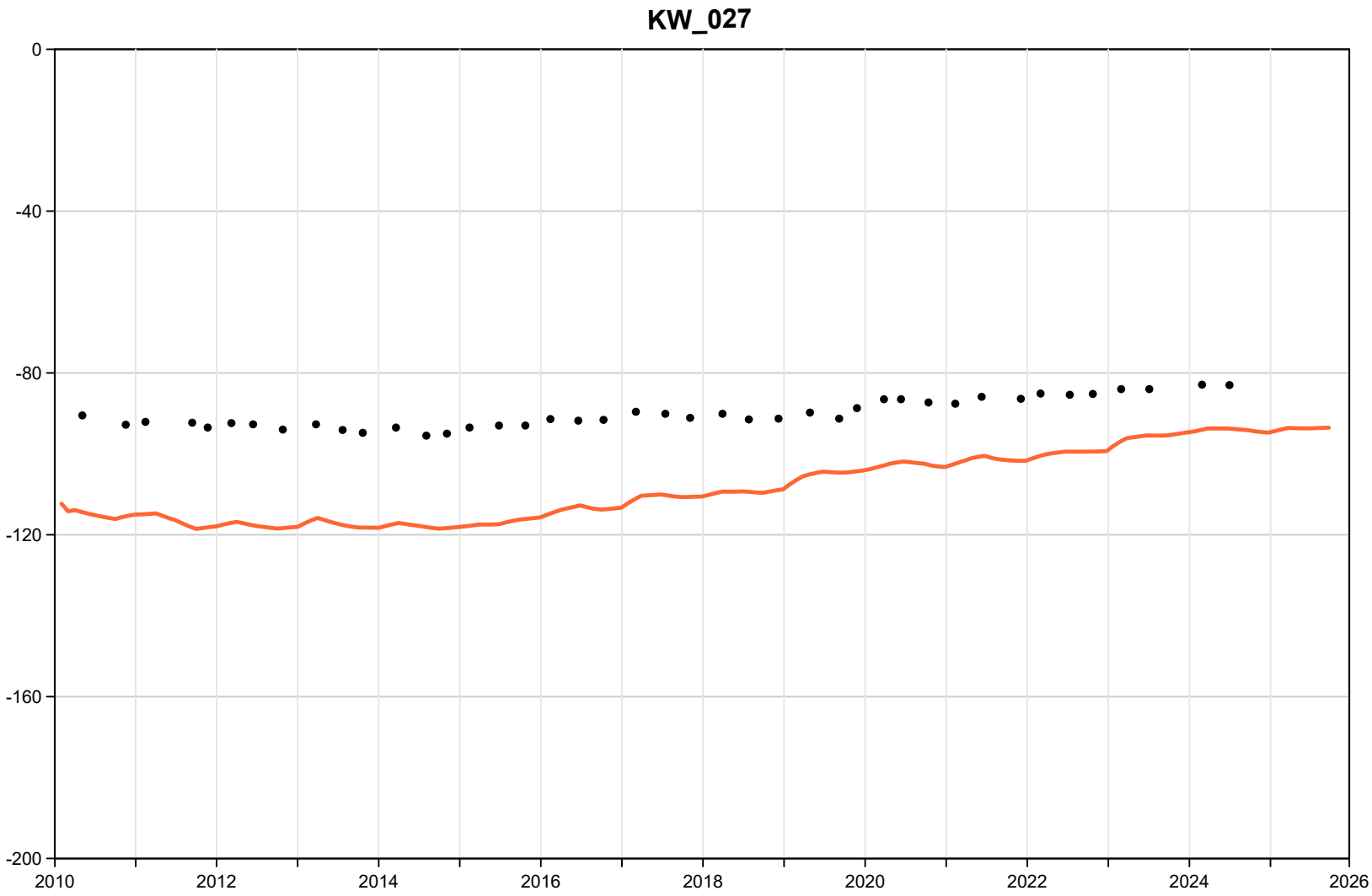
WOODARD &CURRAN

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TODD GROUNDWATER

Appendix 7A-26
Simulated Change In Storage - KW_025
2010-2025


KW_026
0
-40
-80
-120
-160
-200
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
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TODD GROUNDWATER
Appendix 7A-27
Simulated Change In Storage - KW_026
2010-2025



• Measured Elevation

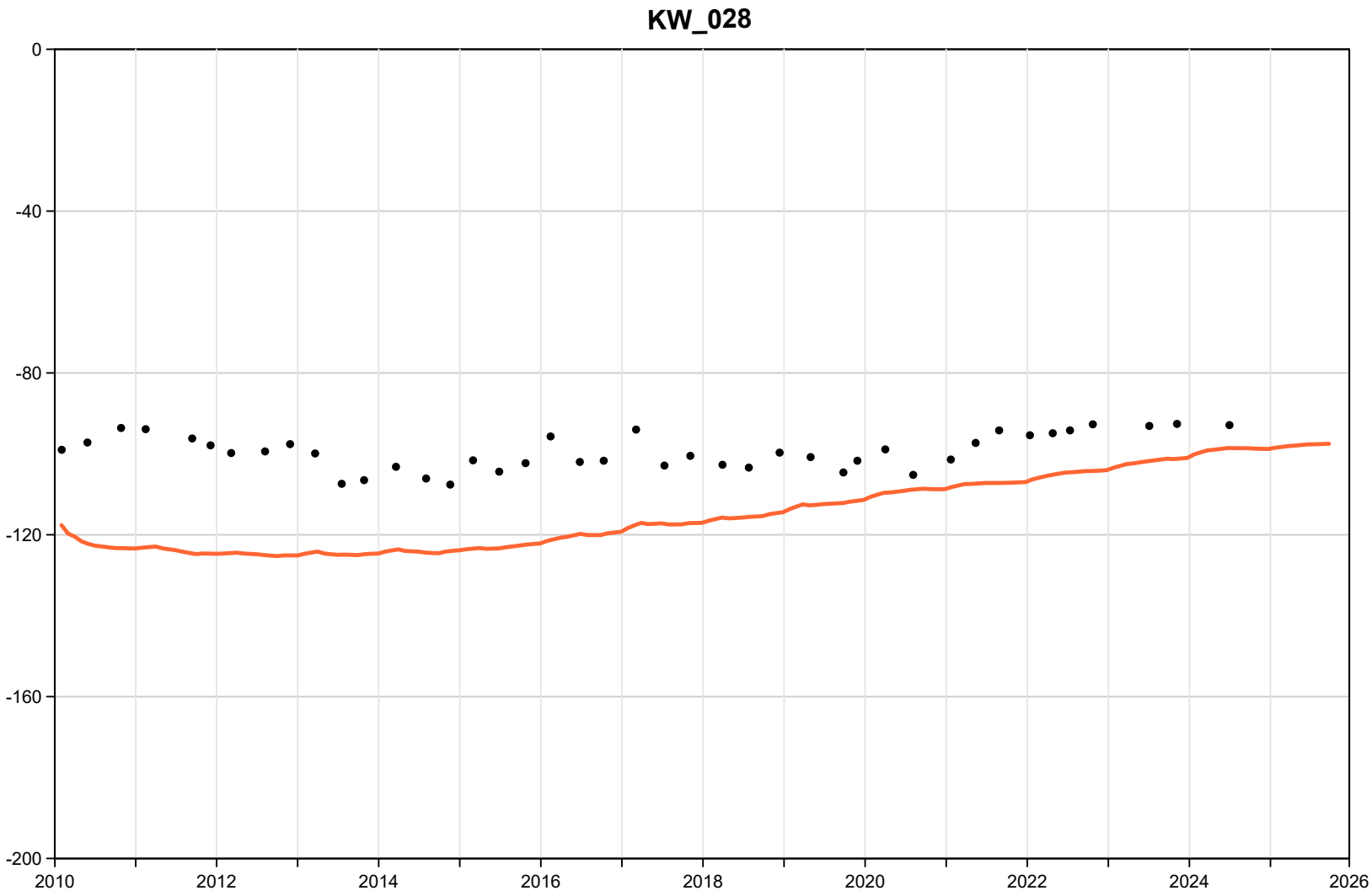
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-28
Simulated Change In Storage - KW_027
2010-2025

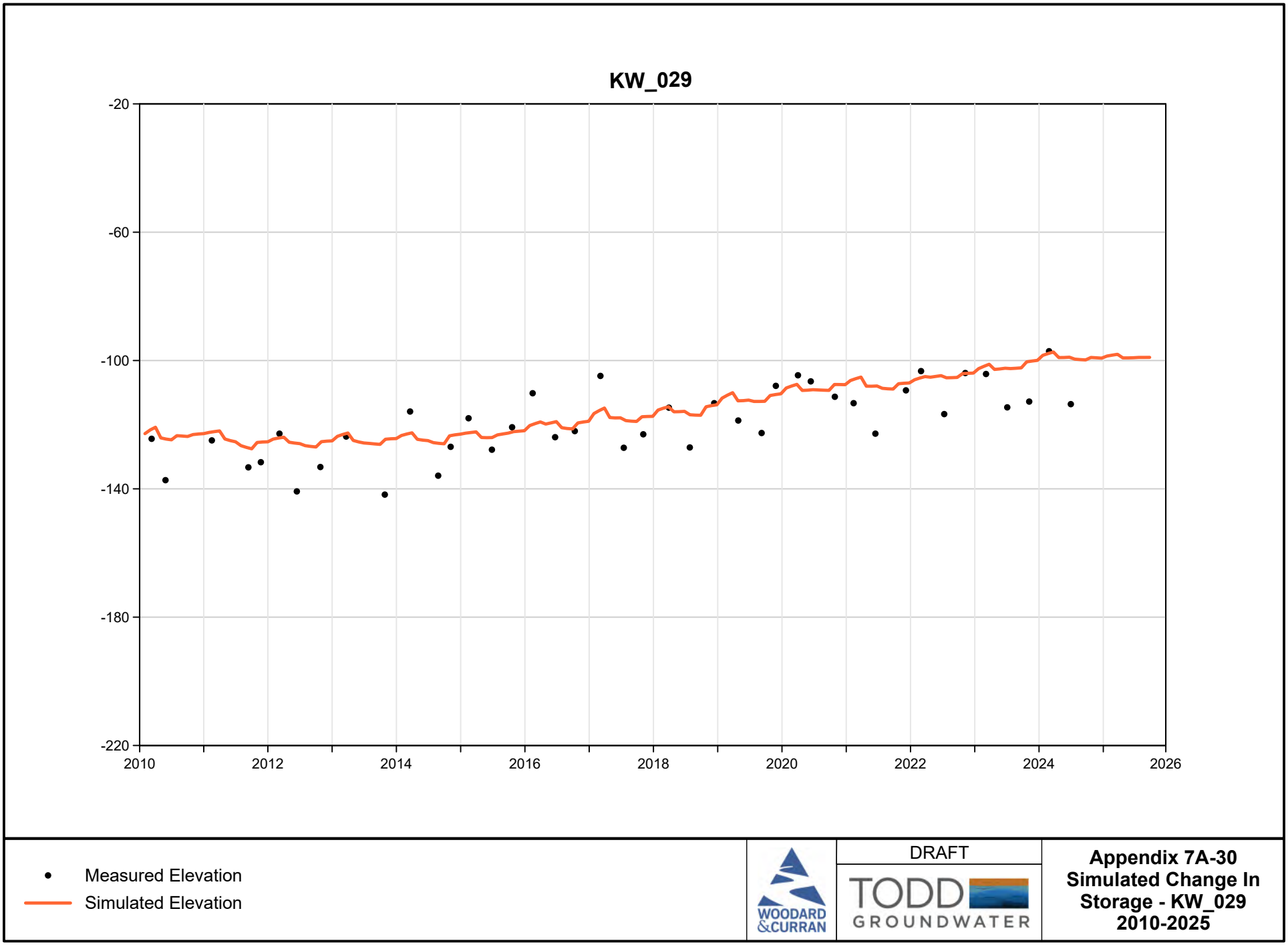


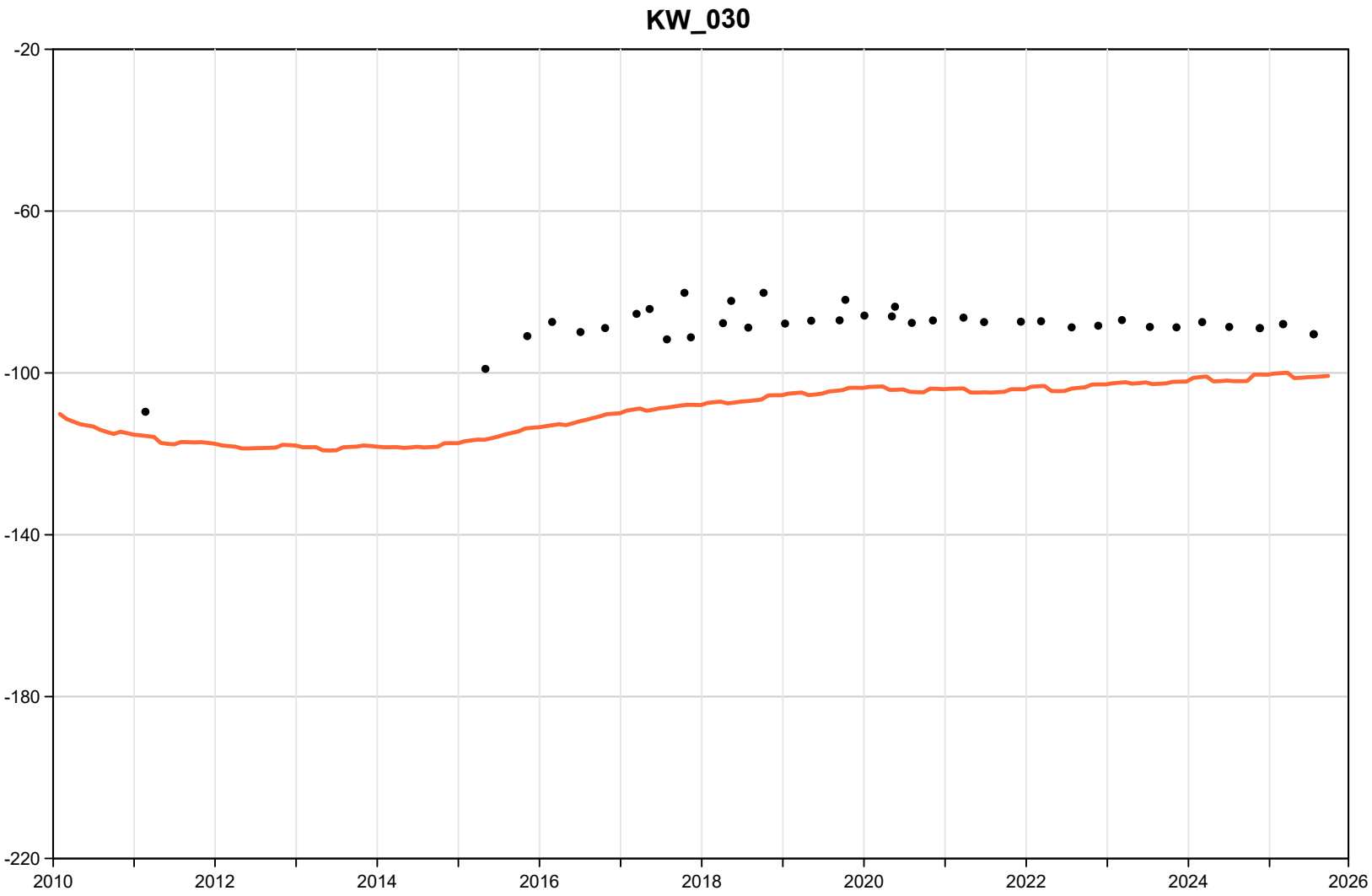
• Measured Elevation

Simulated Elevation

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Appendix 7A-29
Simulated Change In Storage - KW_028
2010-2025


KW_029
-20
-60
-100
-140
-180
-220
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
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TODD GROUNDWATER
Appendix 7A-30
Simulated Change In Storage - KW_029
2010-2025



• Measured Elevation

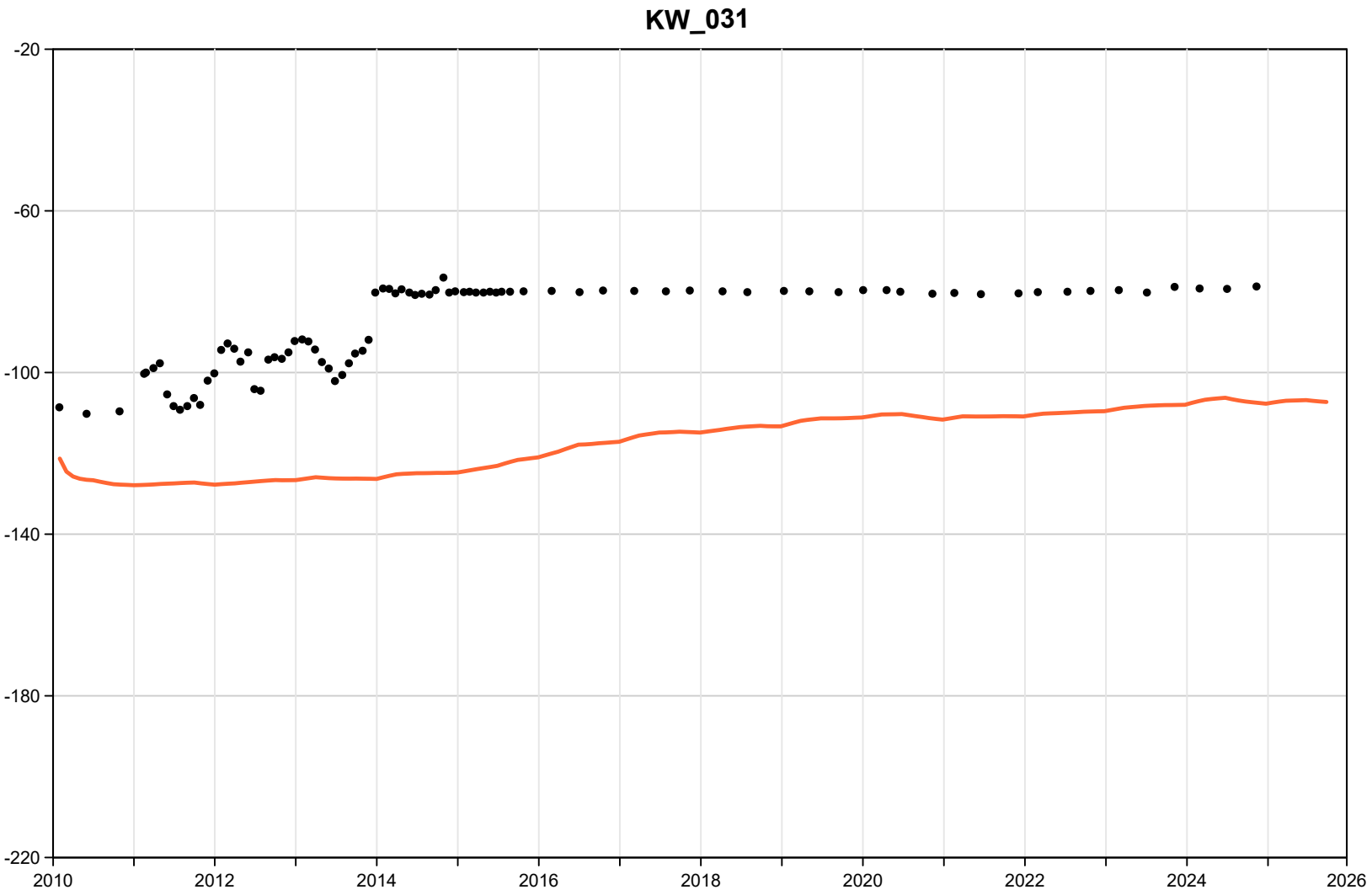
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-31
Simulated Change In Storage - KW_030
2010-2025

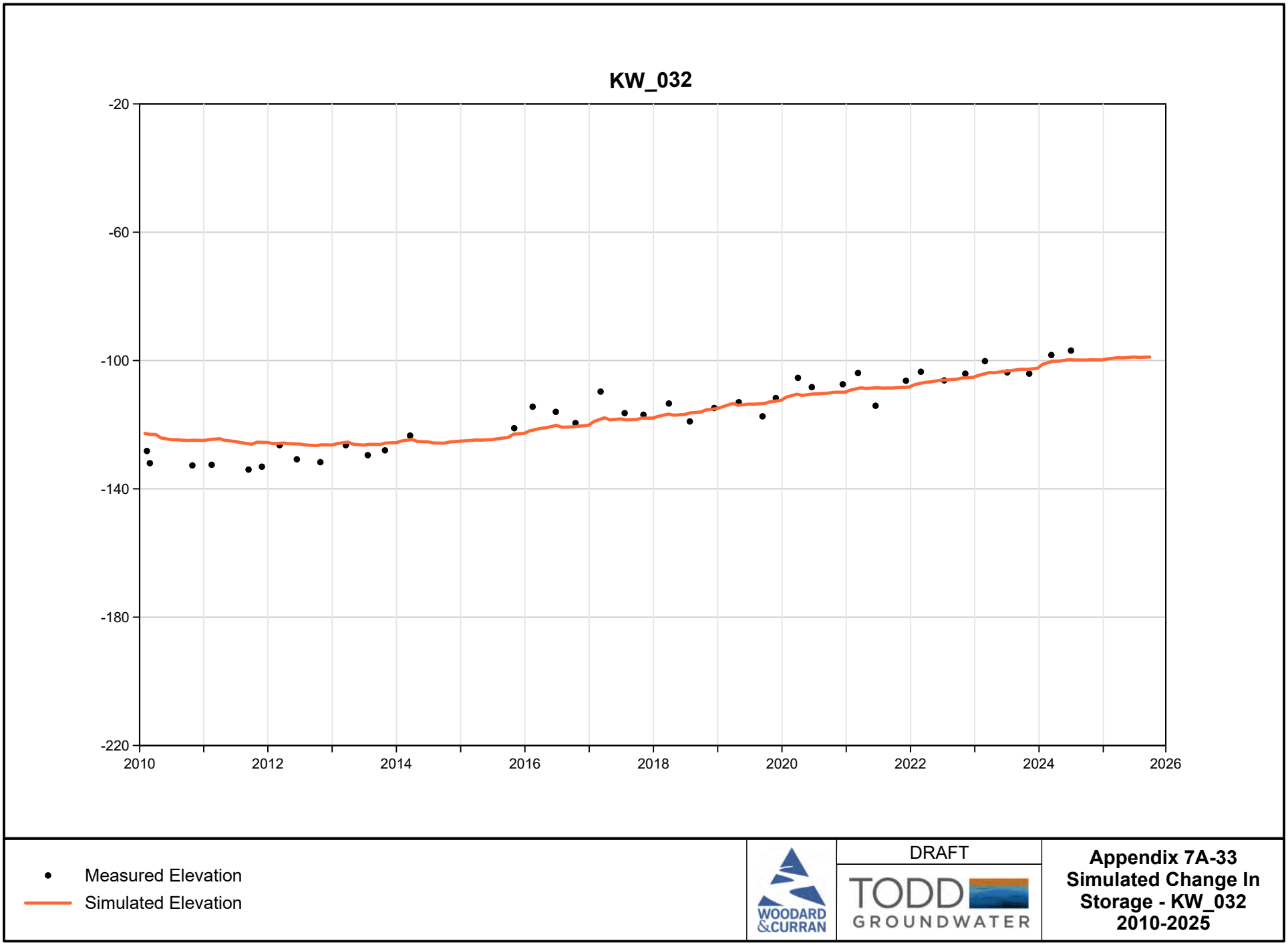


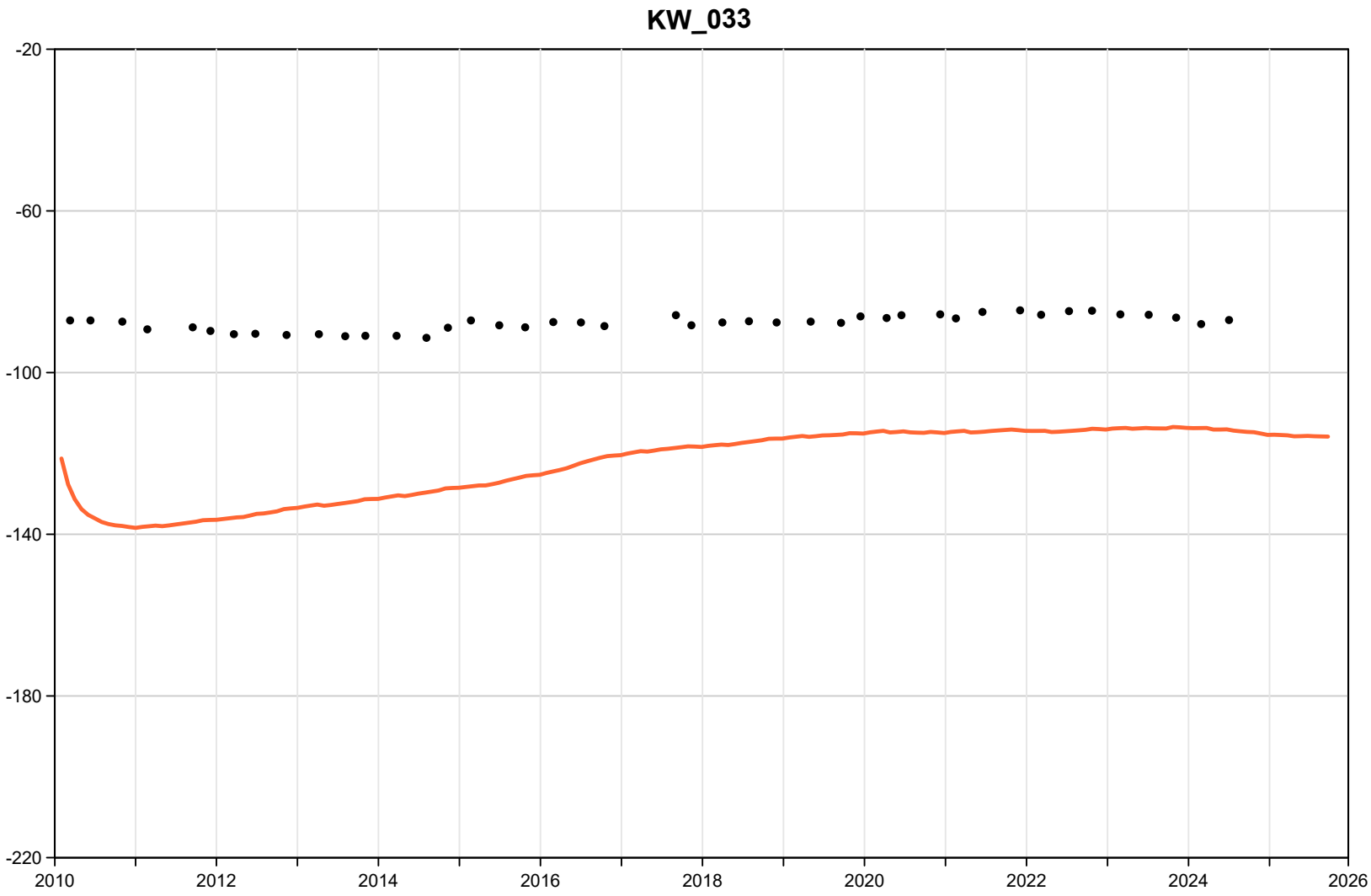
Measured Elevation

Simulated Elevation

DRAFT

Appendix 7A-32
Simulated Change In Storage - KW_031
2010-2025


KW_032
-20
-60
-100
-140
-180
-220
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
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TODD GROUNDWATER
Appendix 7A-33
Simulated Change In Storage - KW_032
2010-2025

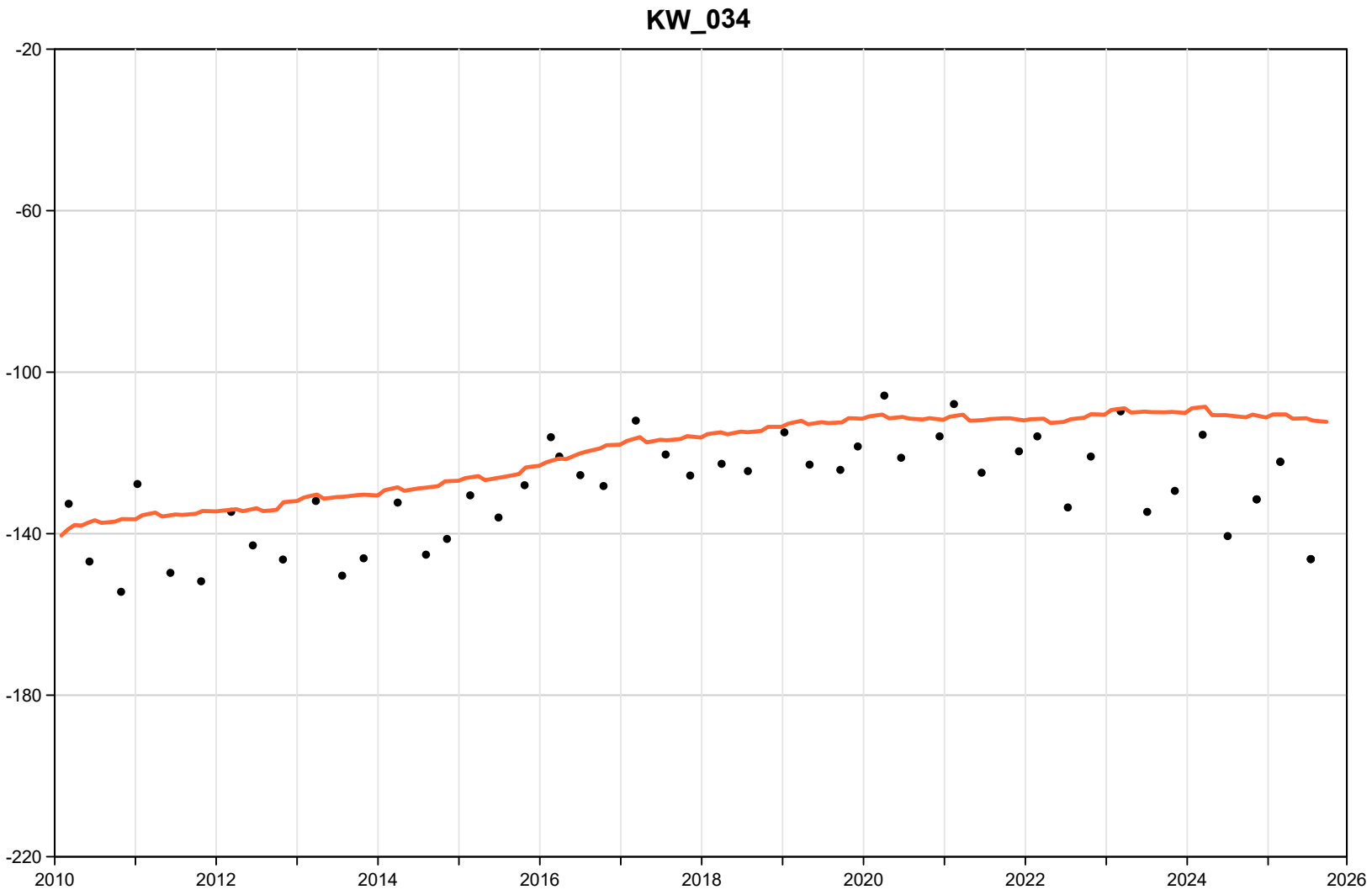


• Measured Elevation

Simulated Elevation

DRAFT

Appendix 7A-34
Simulated Change In Storage - KW_033
2010-2025



• Measured Elevation

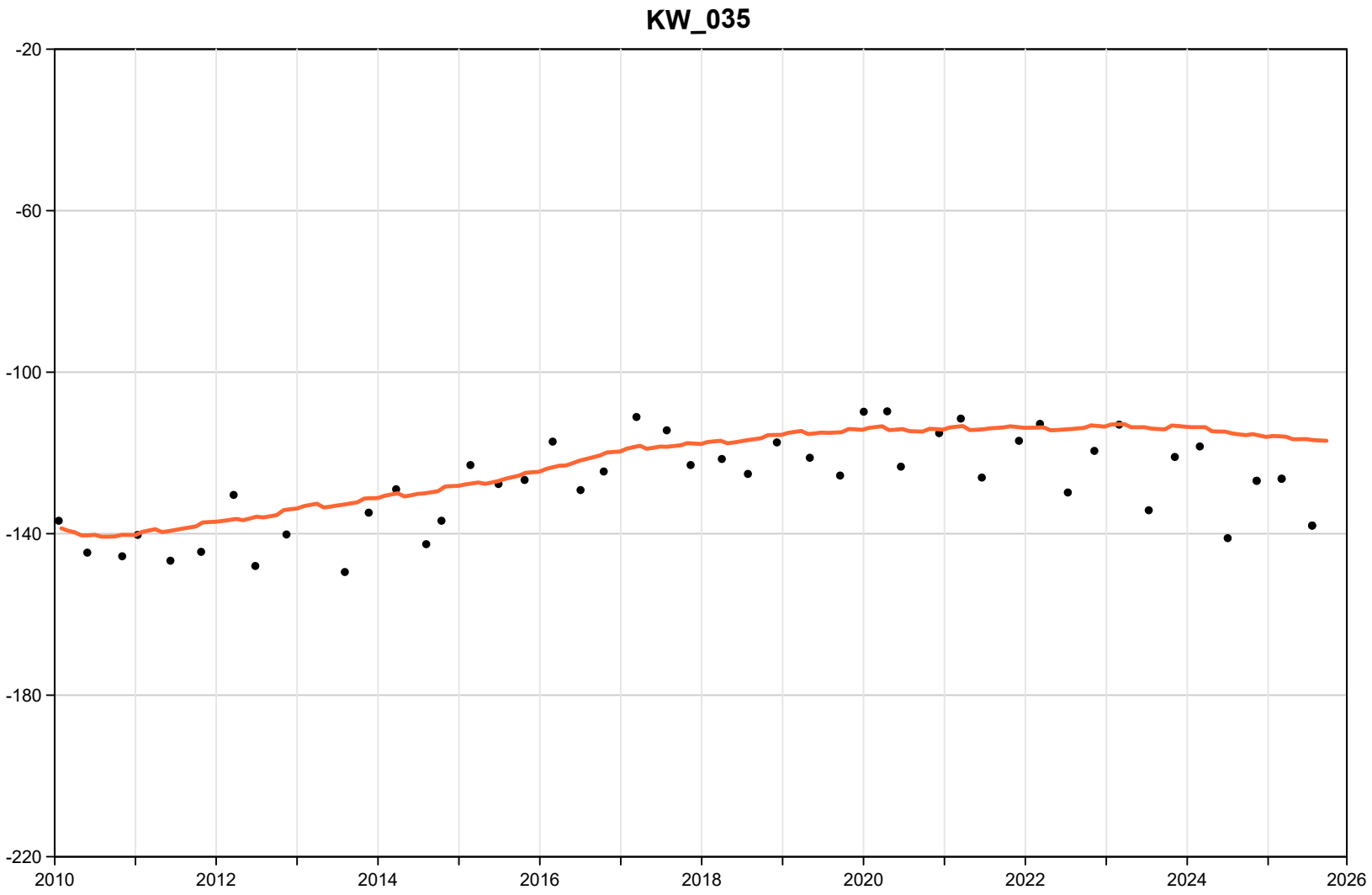
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-35
Simulated Change In Storage - KW_034
2010-2025



• Measured Elevation

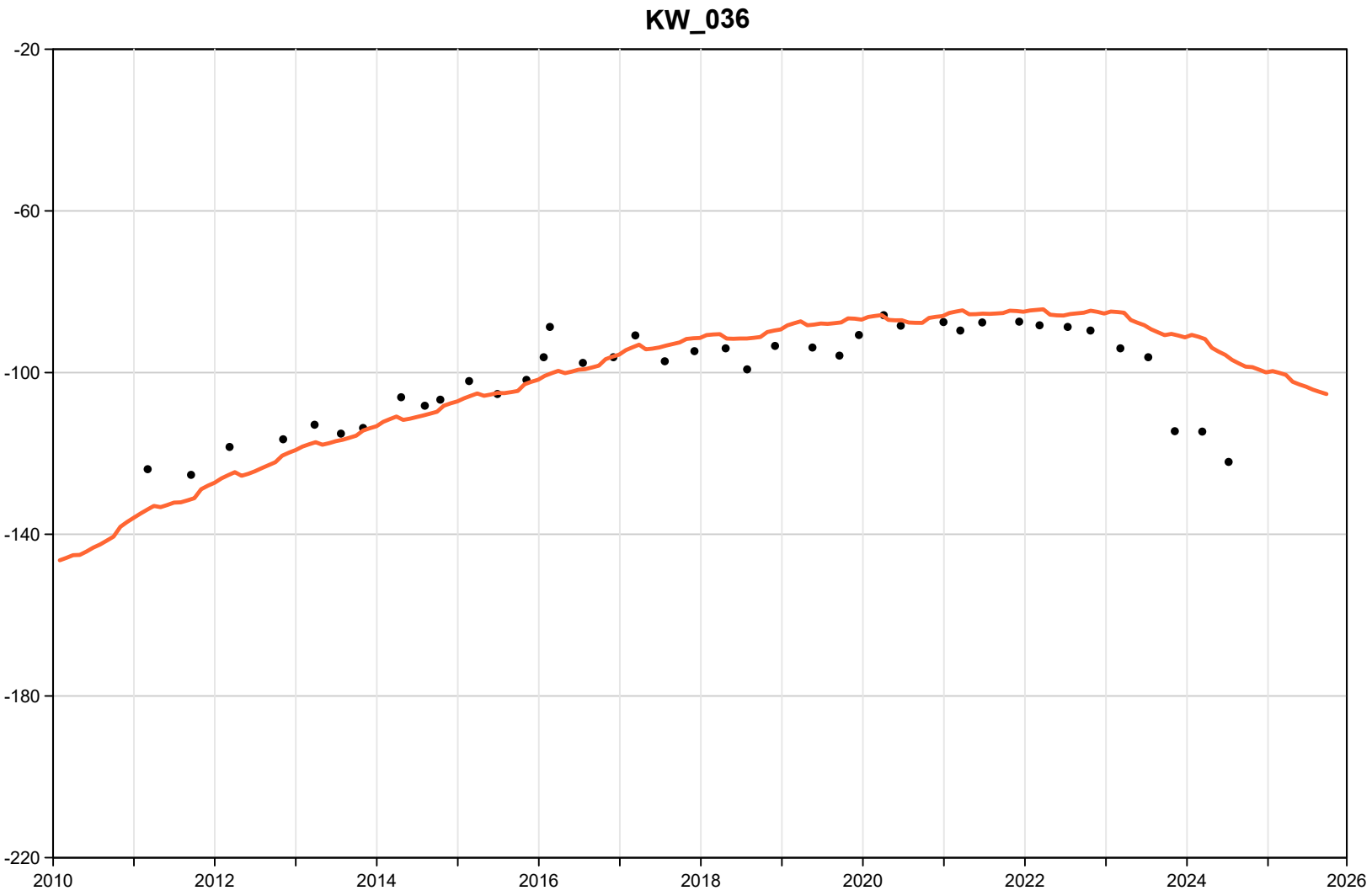
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-36
Simulated Change In Storage - KW_035
2010-2025



• Measured Elevation

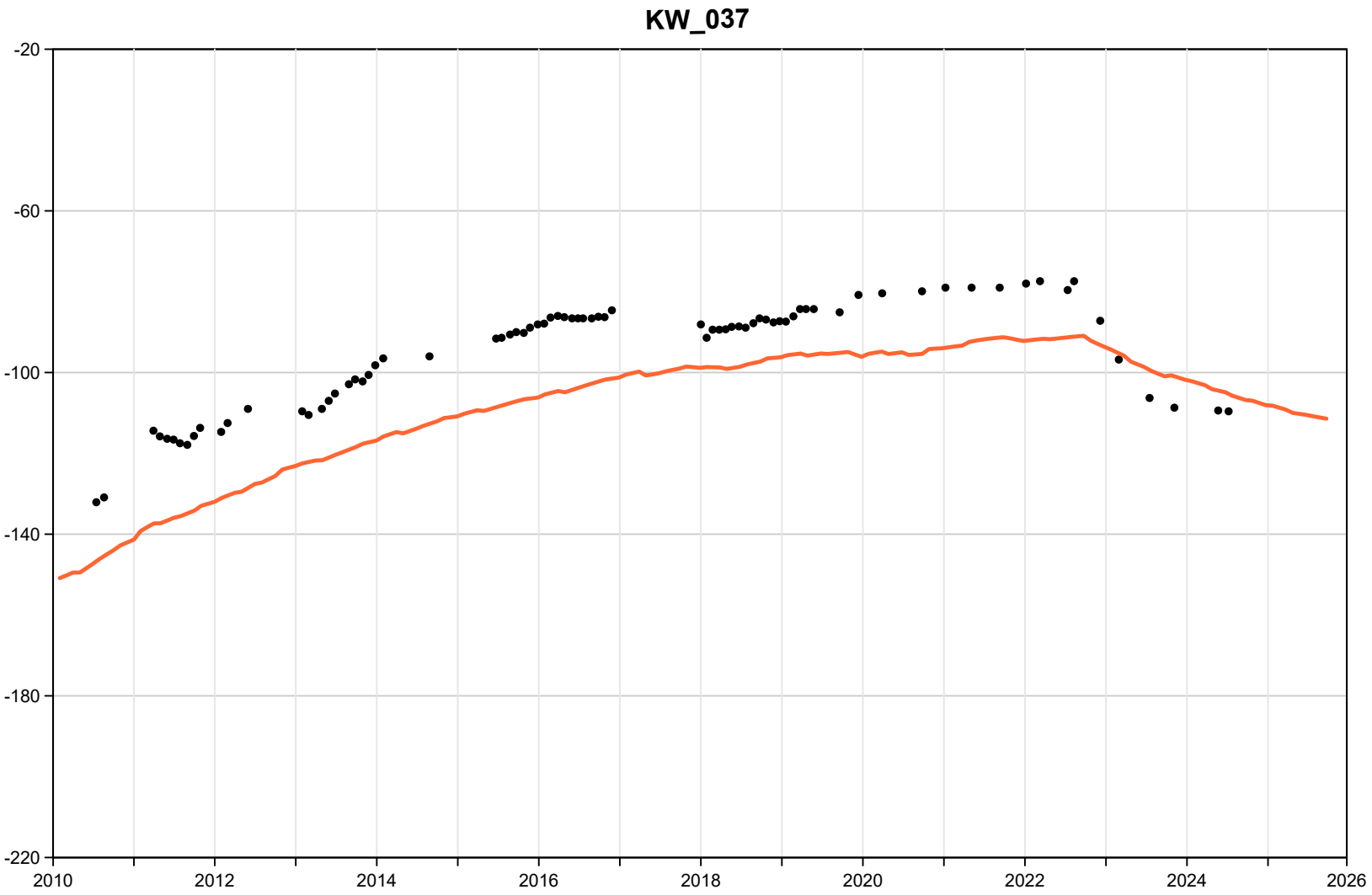
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-37
Simulated Change In Storage - KW_036
2010-2025



• Measured Elevation

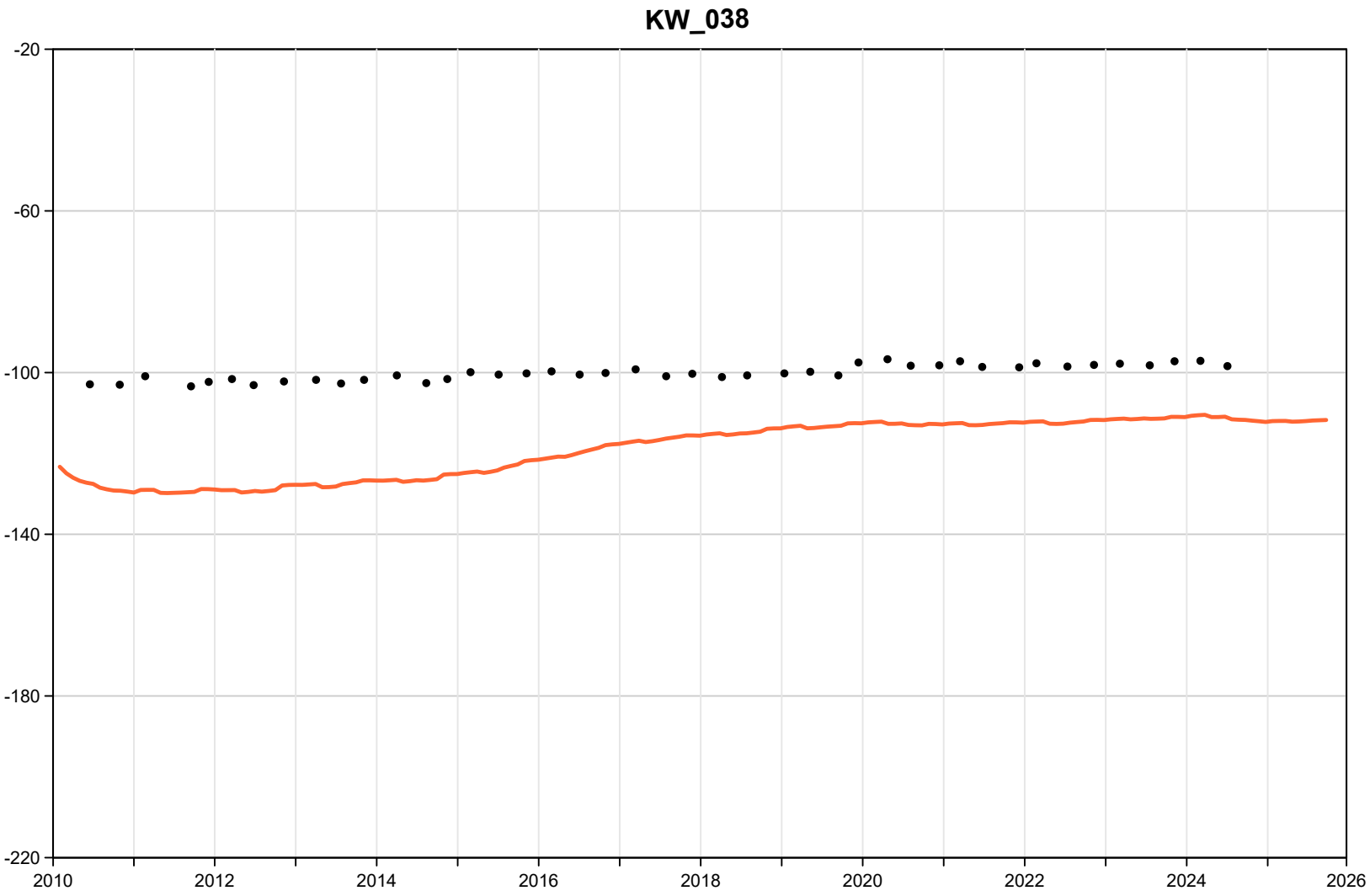
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-38
Simulated Change In Storage - KW_037
2010-2025



• Measured Elevation

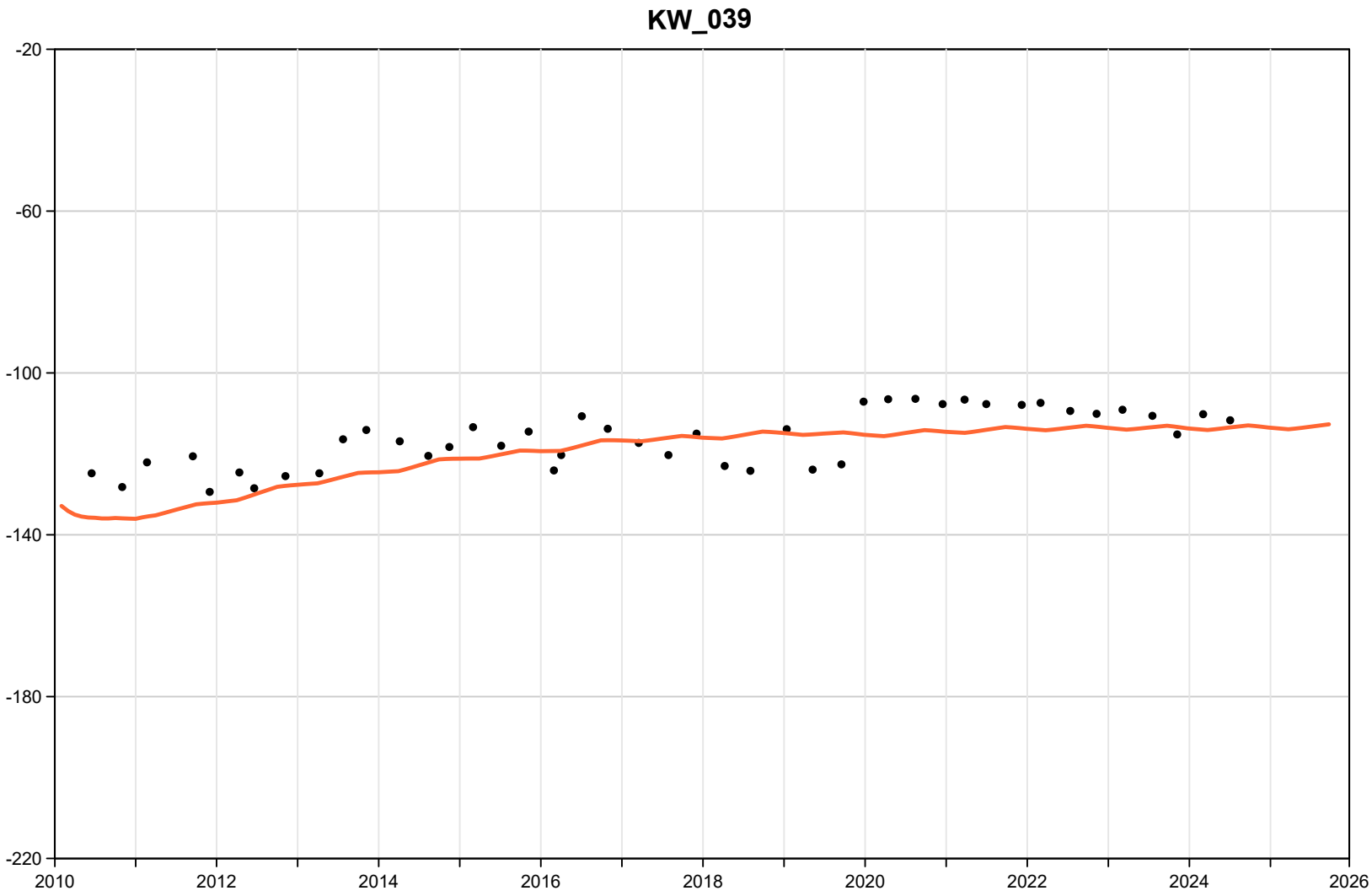
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-39
Simulated Change In Storage - KW_038
2010-2025



• Measured Elevation

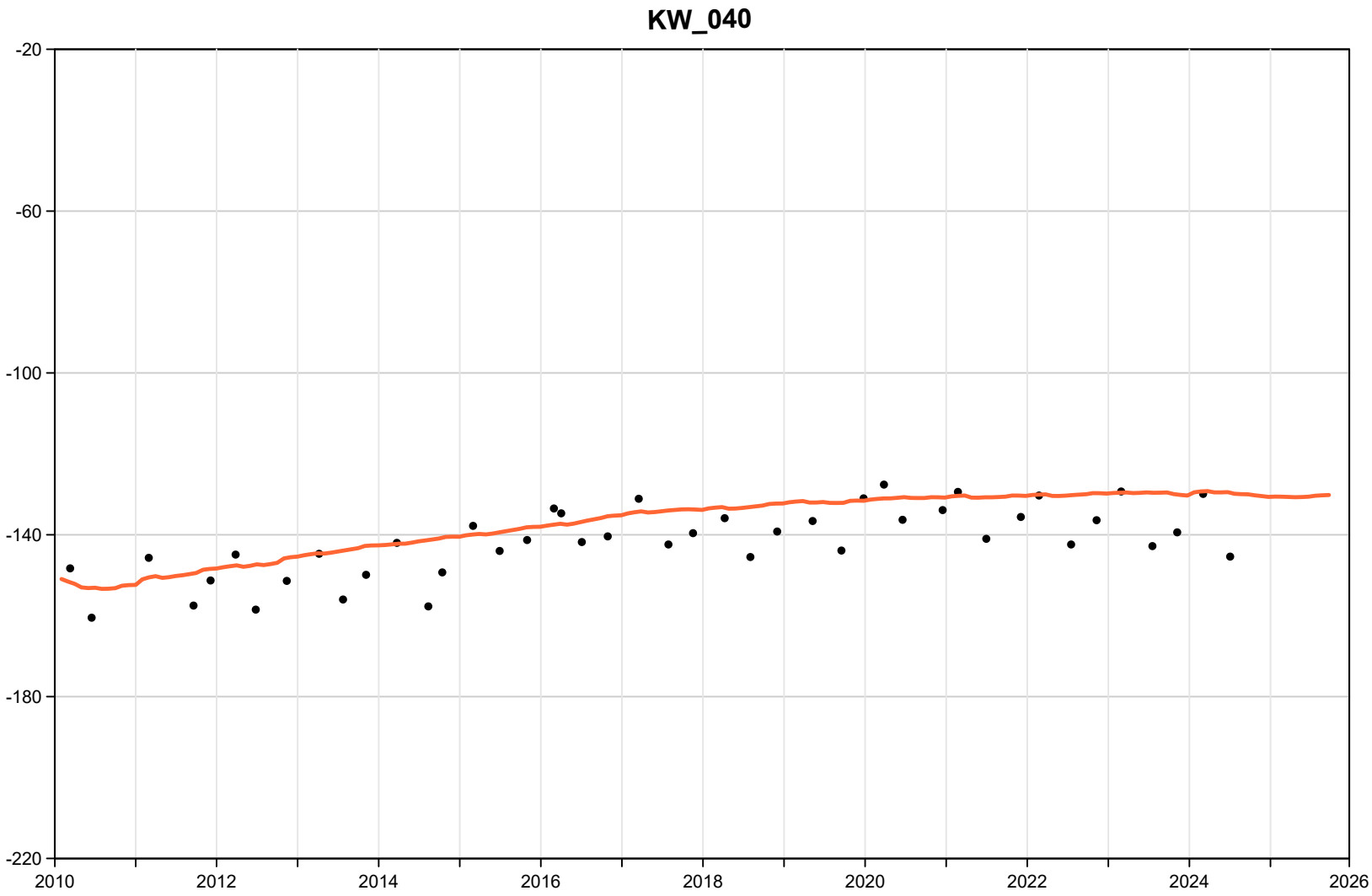
Simulated Elevation

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Appendix 7A-40
Simulated Change In Storage - KW_039
2010-2025



• Measured Elevation

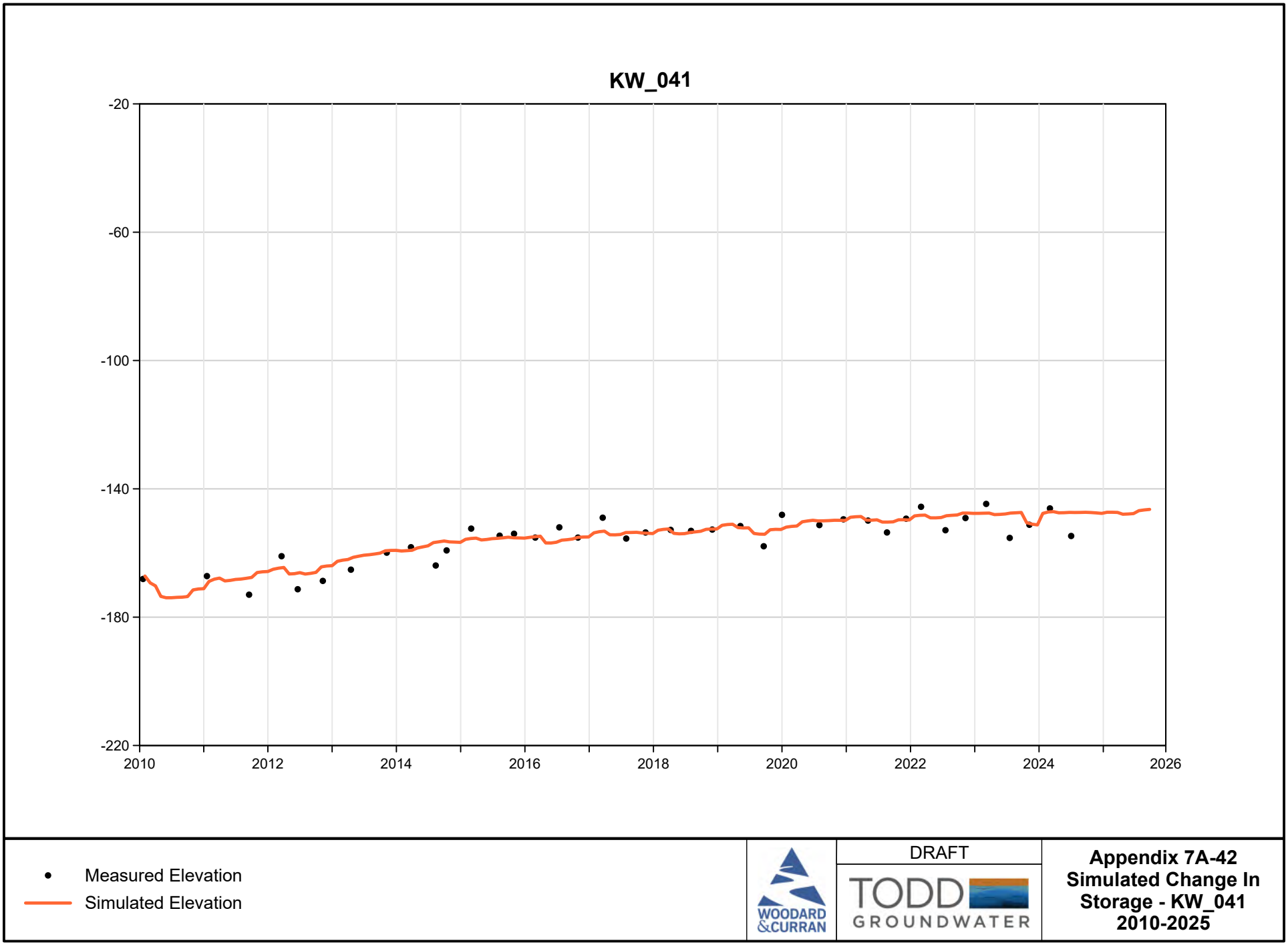
Simulated Elevation

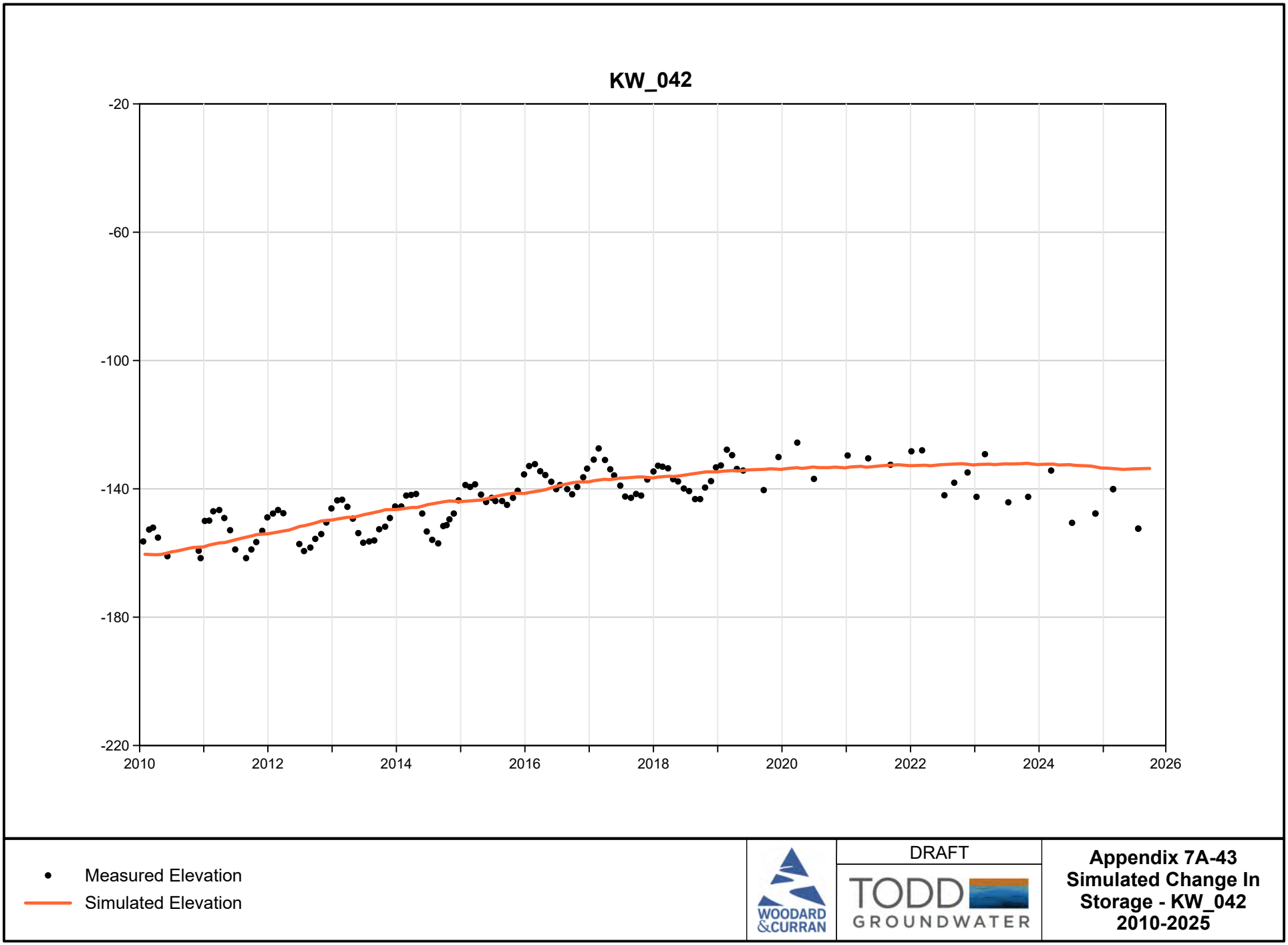
WOODARD &CURRAN

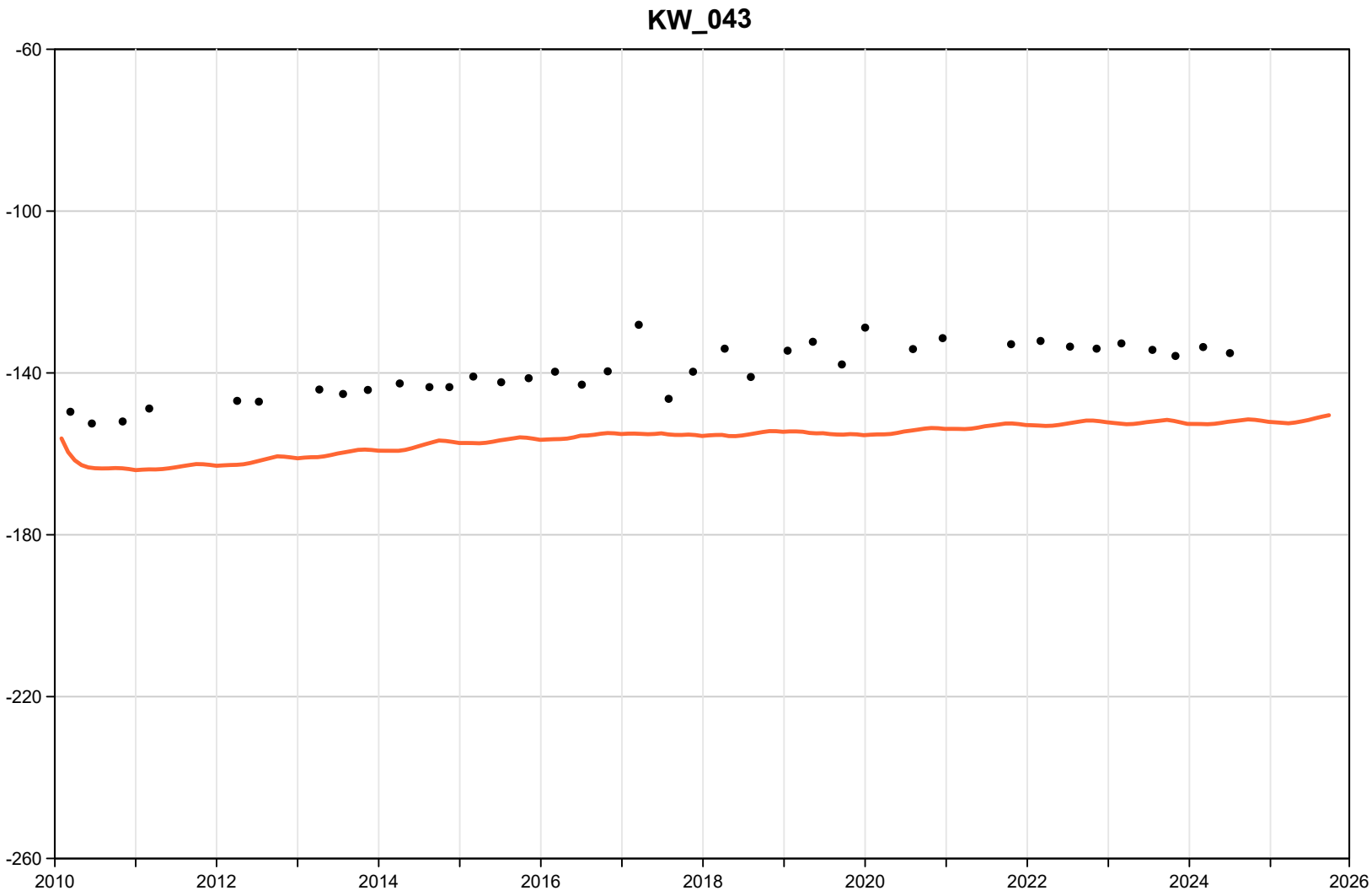
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TODD GROUNDWATER

Appendix 7A-41
Simulated Change In Storage - KW_040
2010-2025


KW_041
-20
-60
-100
-140
-180
-220
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
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TODD GROUNDWATER
Appendix 7A-42
Simulated Change In Storage - KW_041
2010-2025


KW_042
-20
-60
-100
-140
-180
-220
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
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TODD GROUNDWATER
Appendix 7A-43
Simulated Change In Storage - KW_042
2010-2025



• Measured Elevation

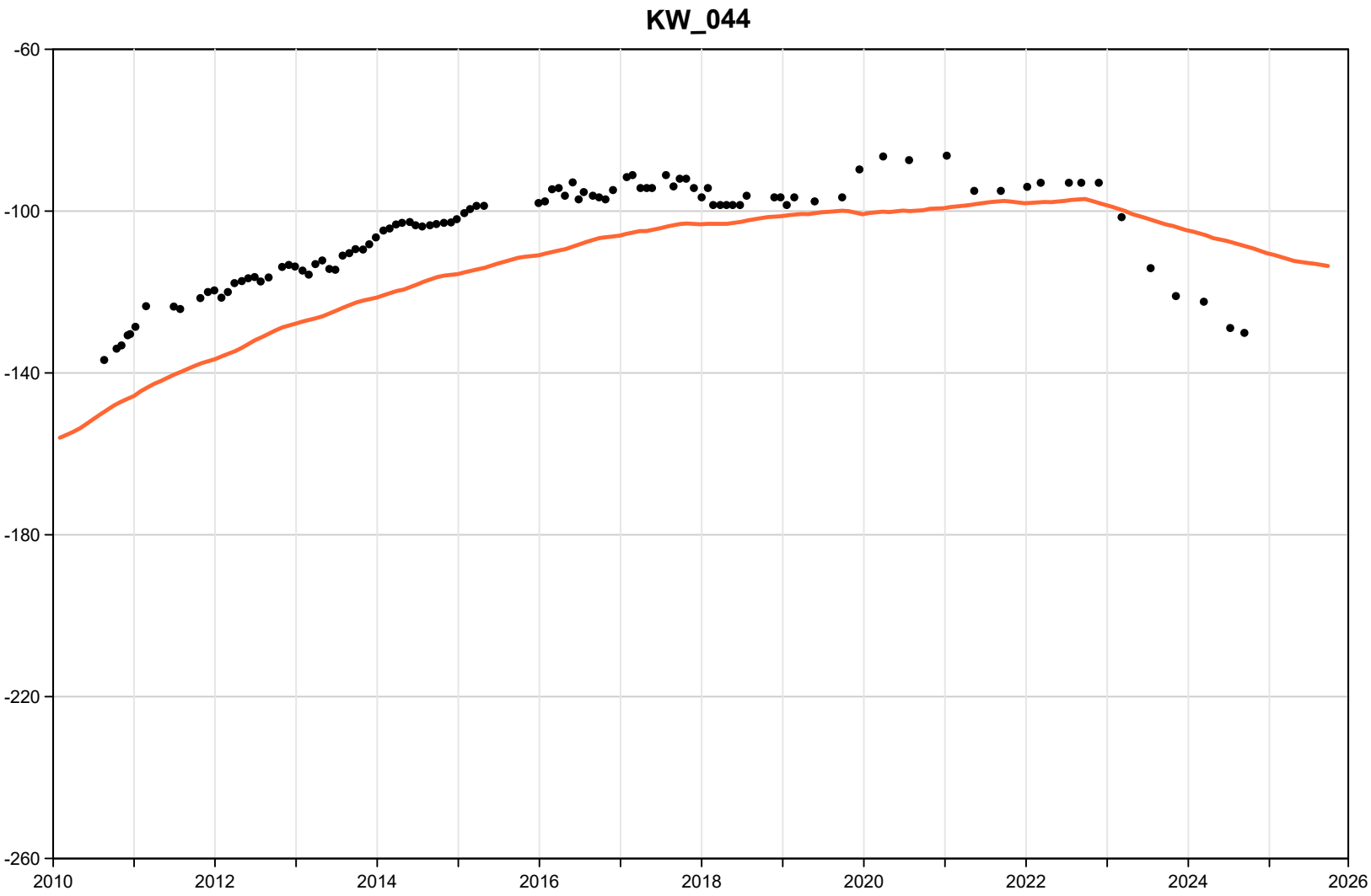
Simulated Elevation

WOODARD &CURRAN

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TODD GROUNDWATER

Appendix 7A-44
Simulated Change In Storage - KW_043
2010-2025



• Measured Elevation

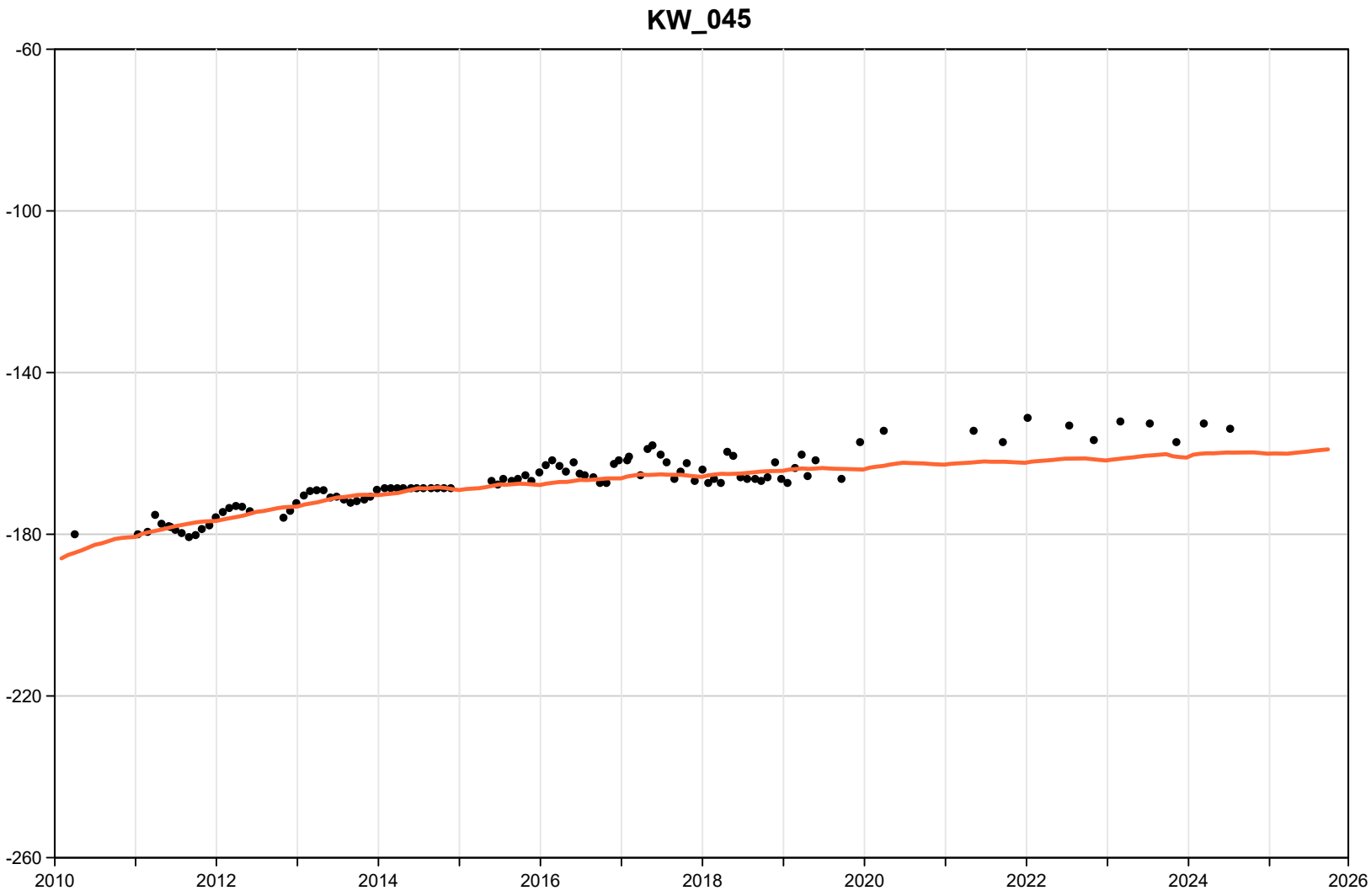
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-45
Simulated Change In Storage - KW_044
2010-2025

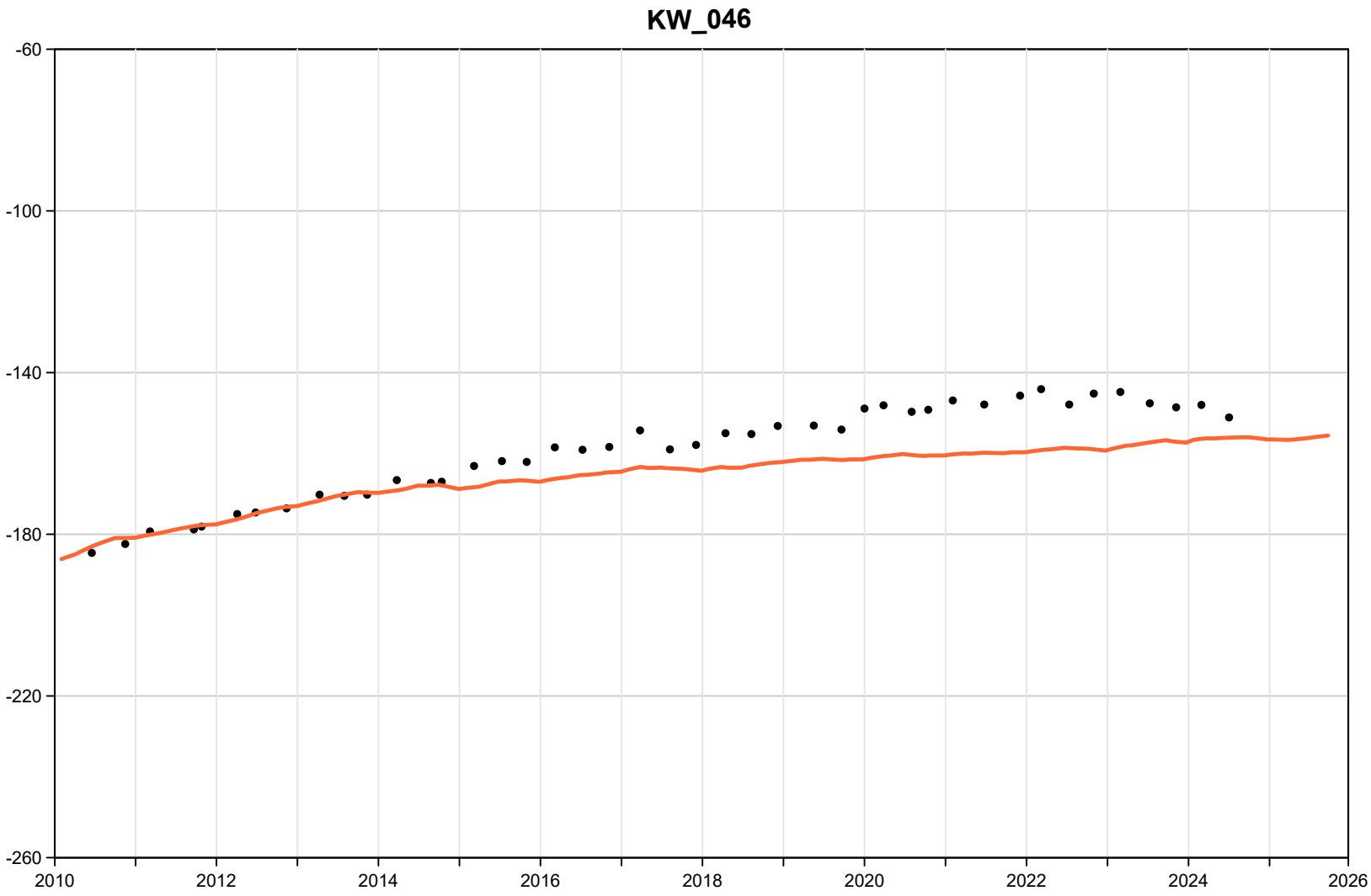


Measured Elevation

Simulated Elevation

DRAFT

Appendix 7A-46
Simulated Change In Storage - KW_045
2010-2025



• Measured Elevation

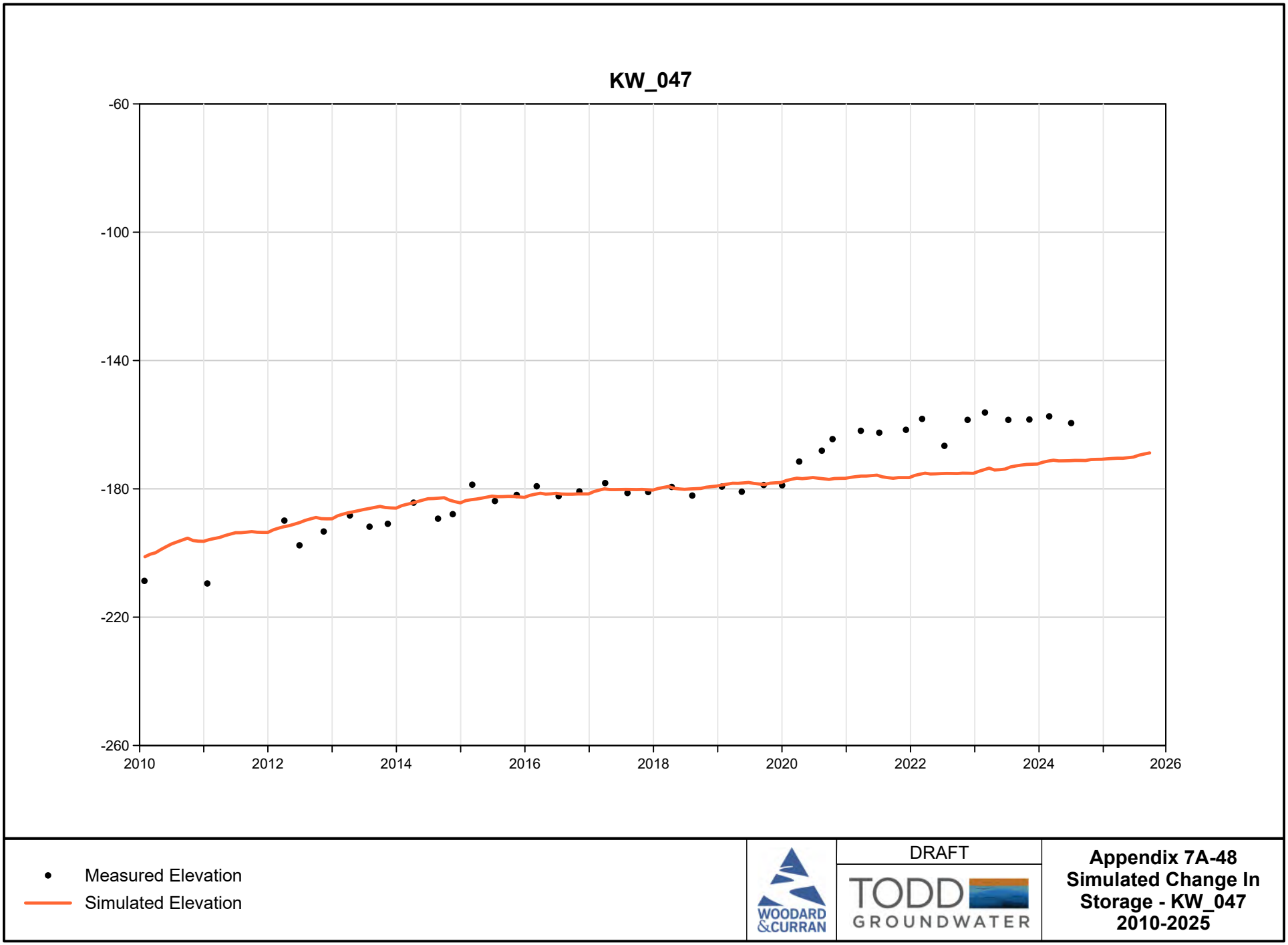
Simulated Elevation

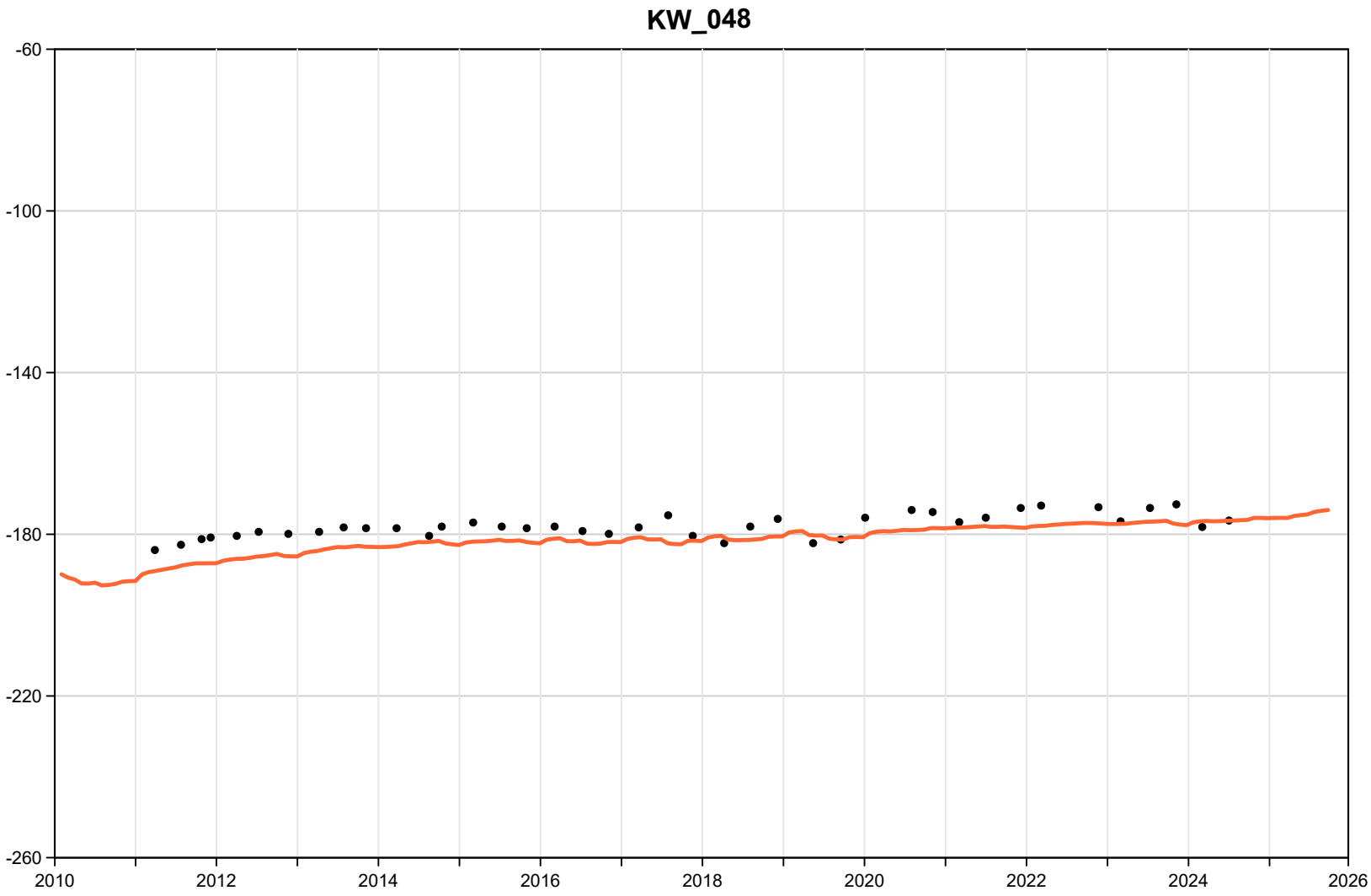
WOODARD &CURRAN

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TODD GROUNDWATER

Appendix 7A-47
Simulated Change In Storage - KW_046
2010-2025


KW_047
-60
-100
-140
-180
-220
-260
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
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Appendix 7A-48
Simulated Change In Storage - KW_047
2010-2025



• Measured Elevation

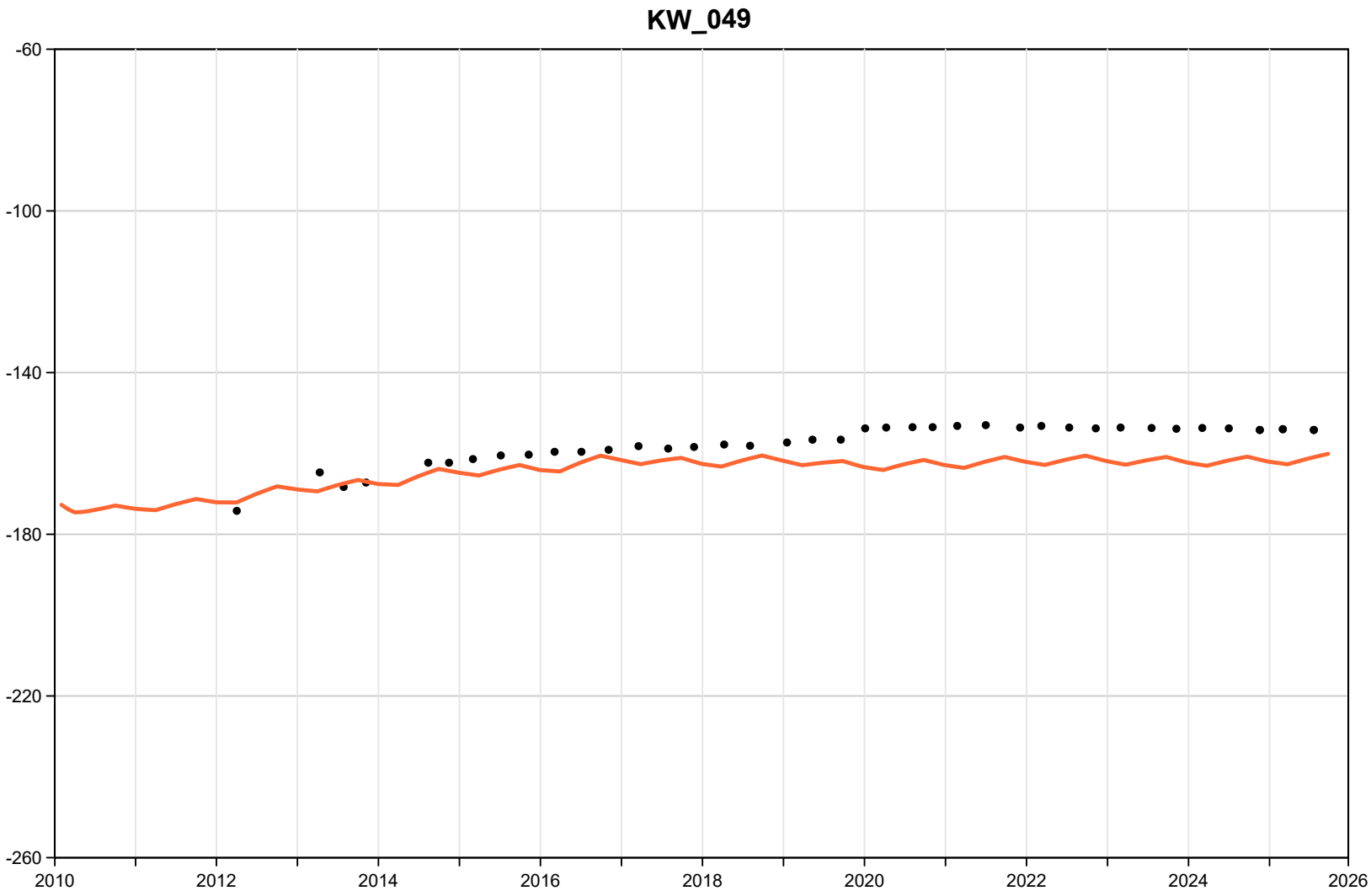
Simulated Elevation

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TODD GROUNDWATER

Appendix 7A-49
Simulated Change In Storage - KW_048
2010-2025

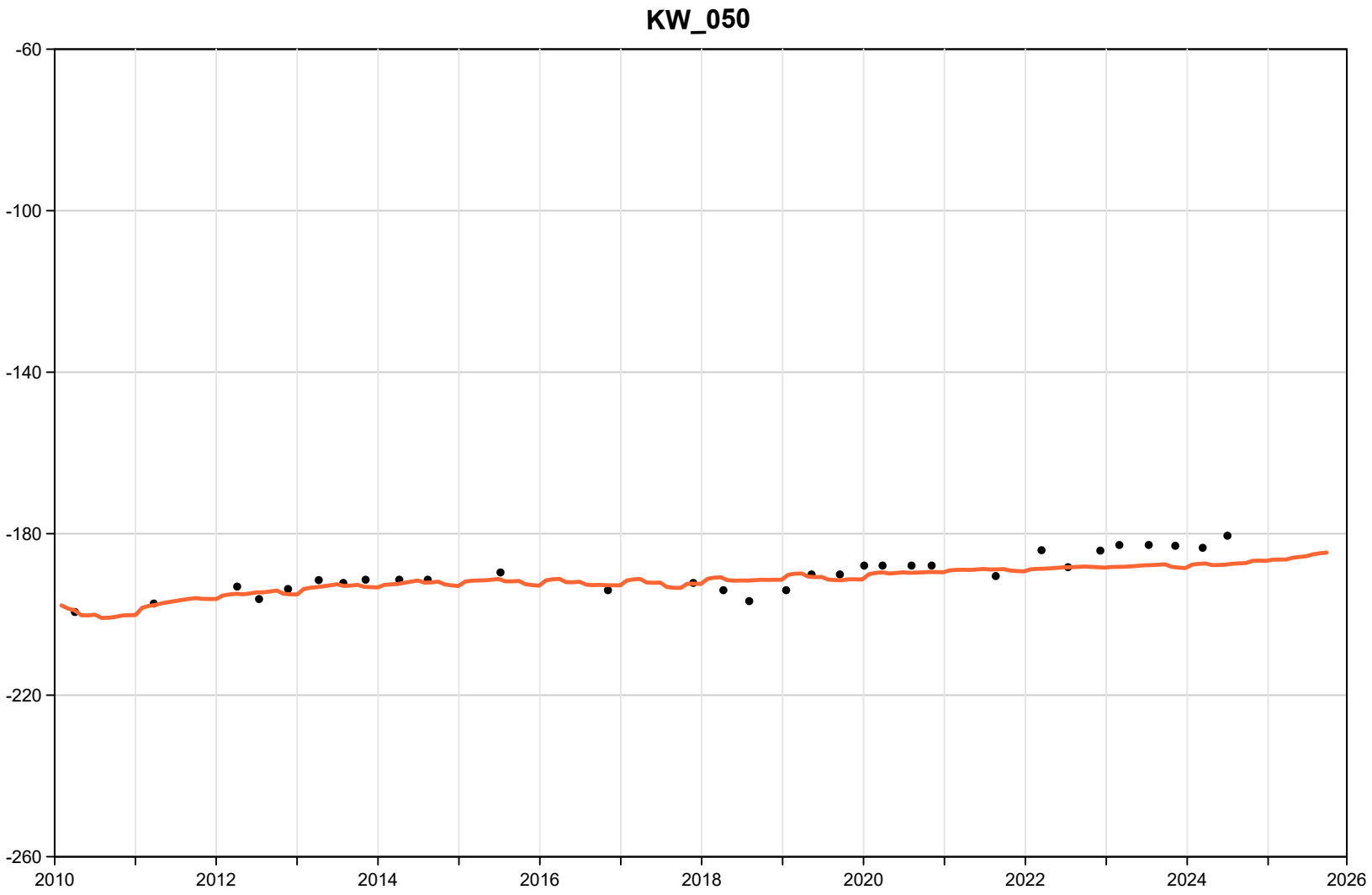


• Measured Elevation

Simulated Elevation

DRAFT

Appendix 7A-50
Simulated Change In Storage - KW_049
2010-2025



• Measured Elevation

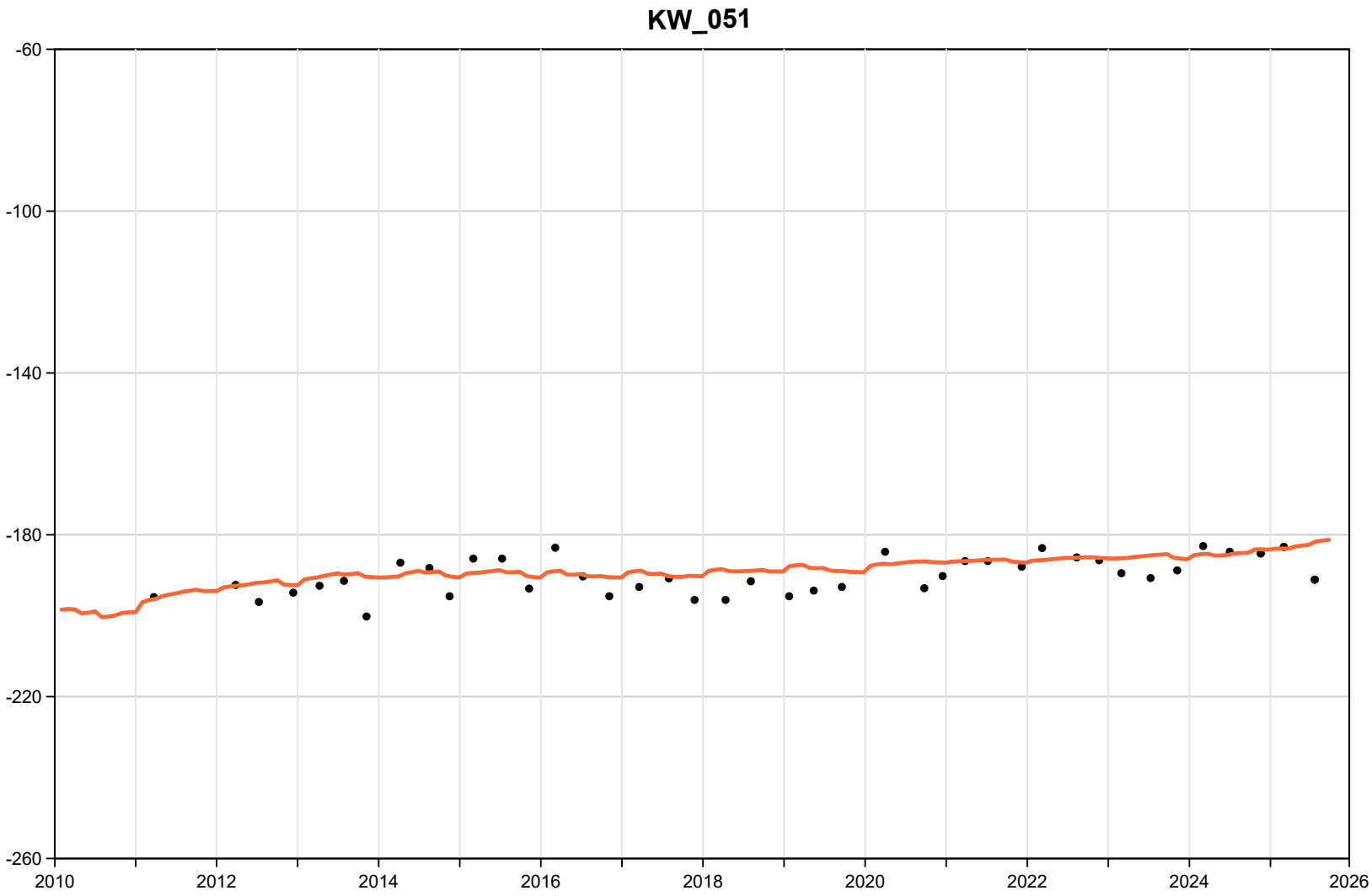
Simulated Elevation

WOODARD &CURRAN

DRAFT

TODD GROUNDWATER

Appendix 7A-51
Simulated Change In Storage - KW_050
2010-2025



• Measured Elevation

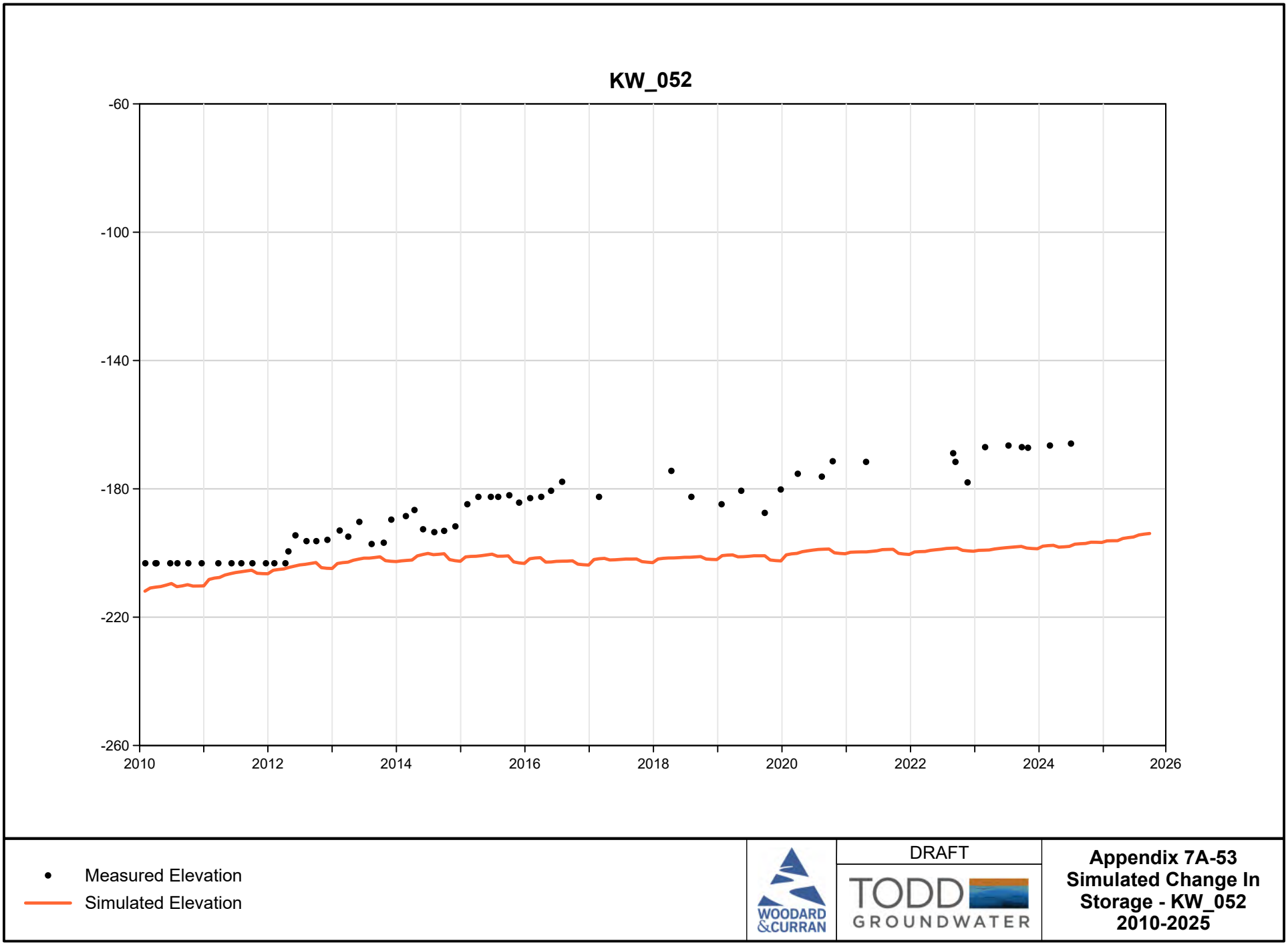
Simulated Elevation

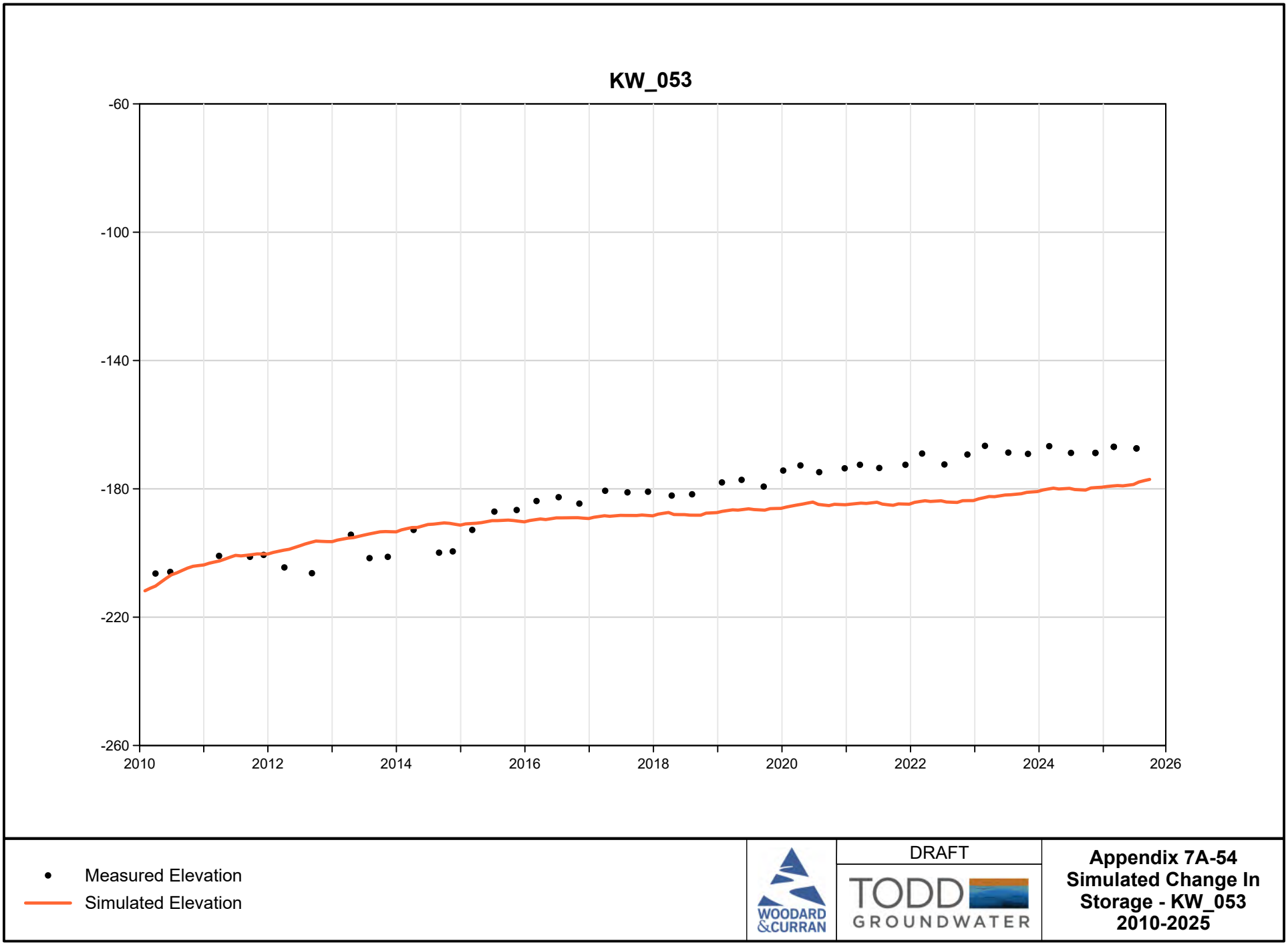
WOODARD &CURRAN

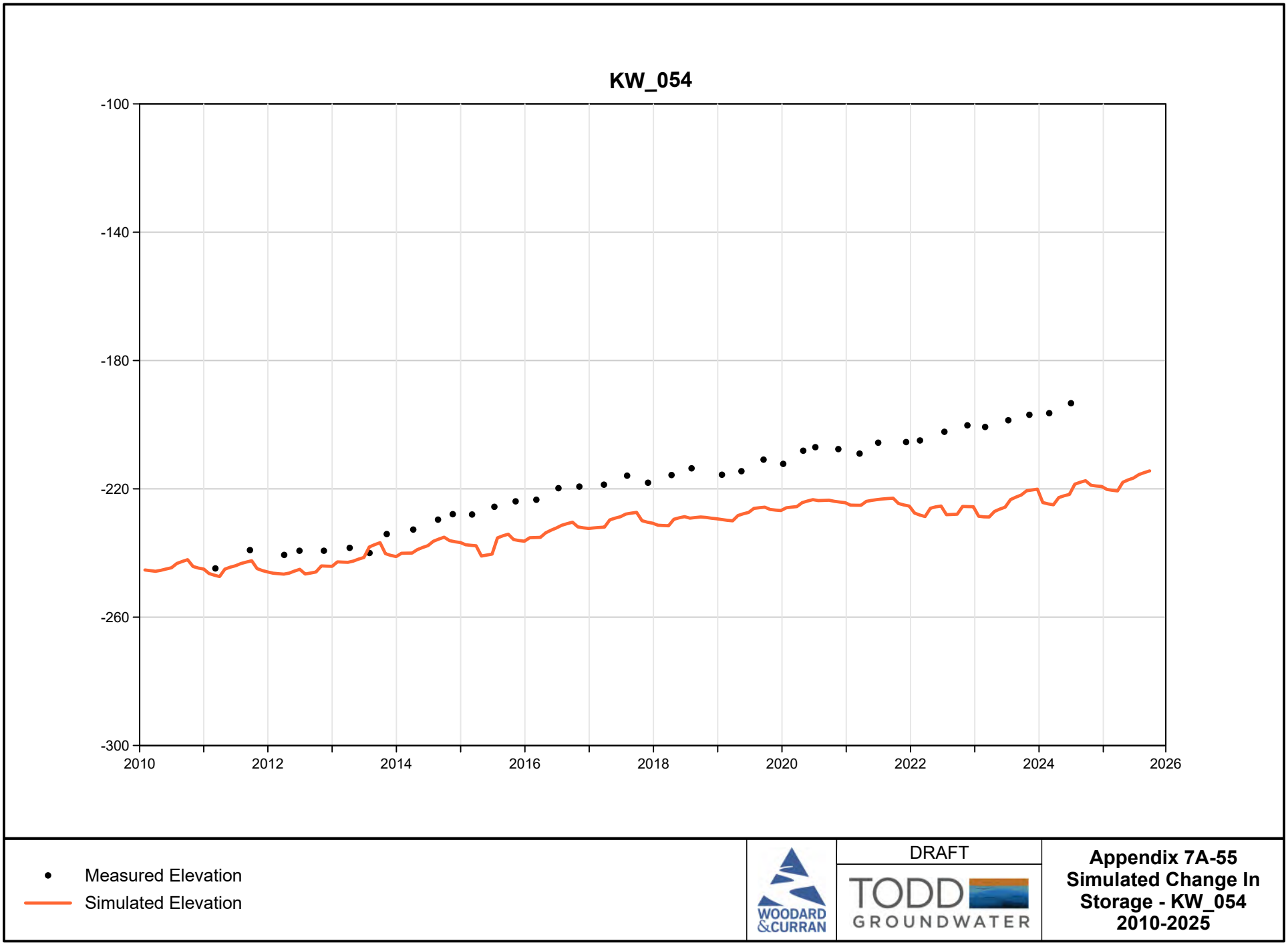
DRAFT

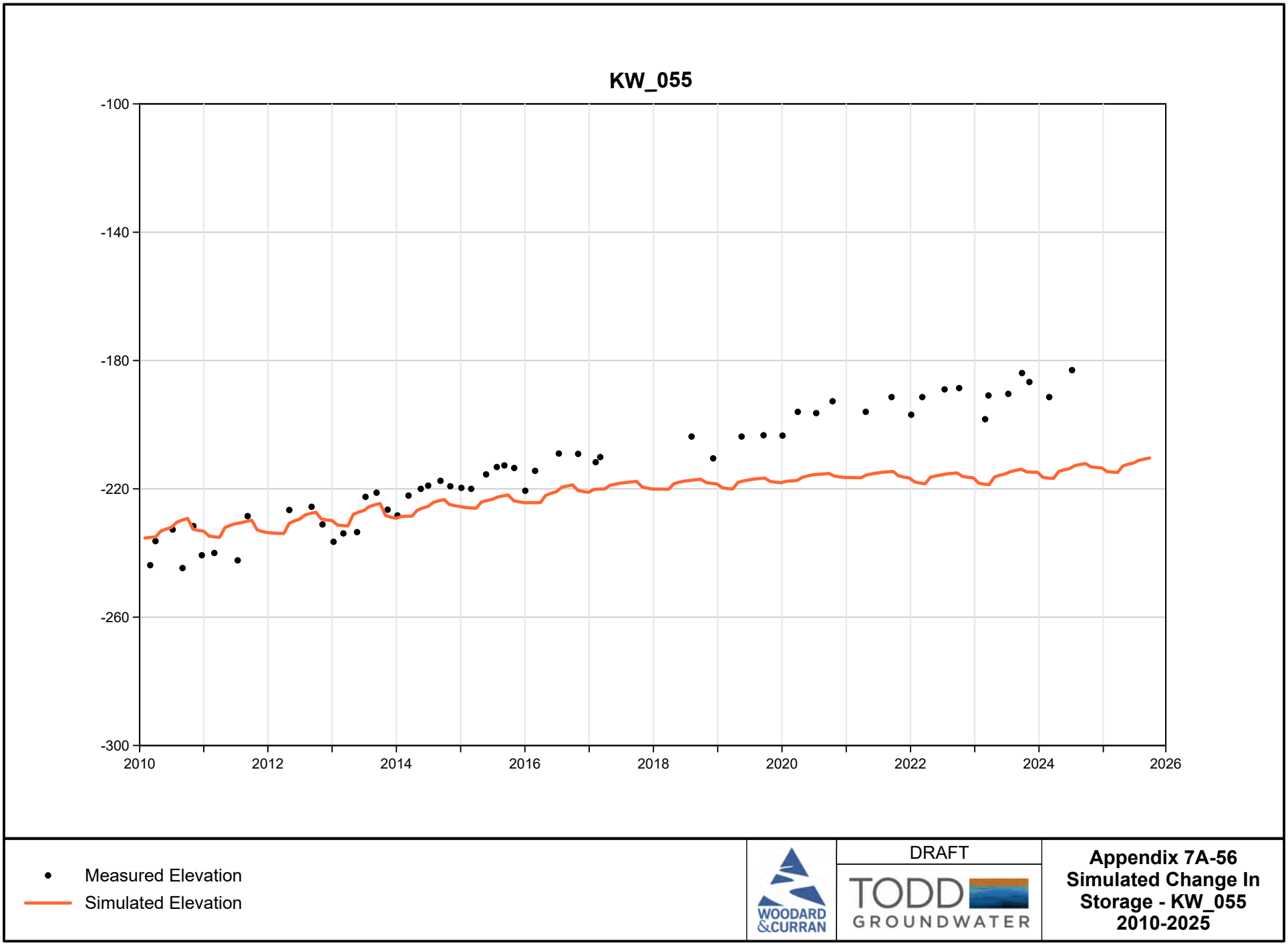
TODD GROUNDWATER

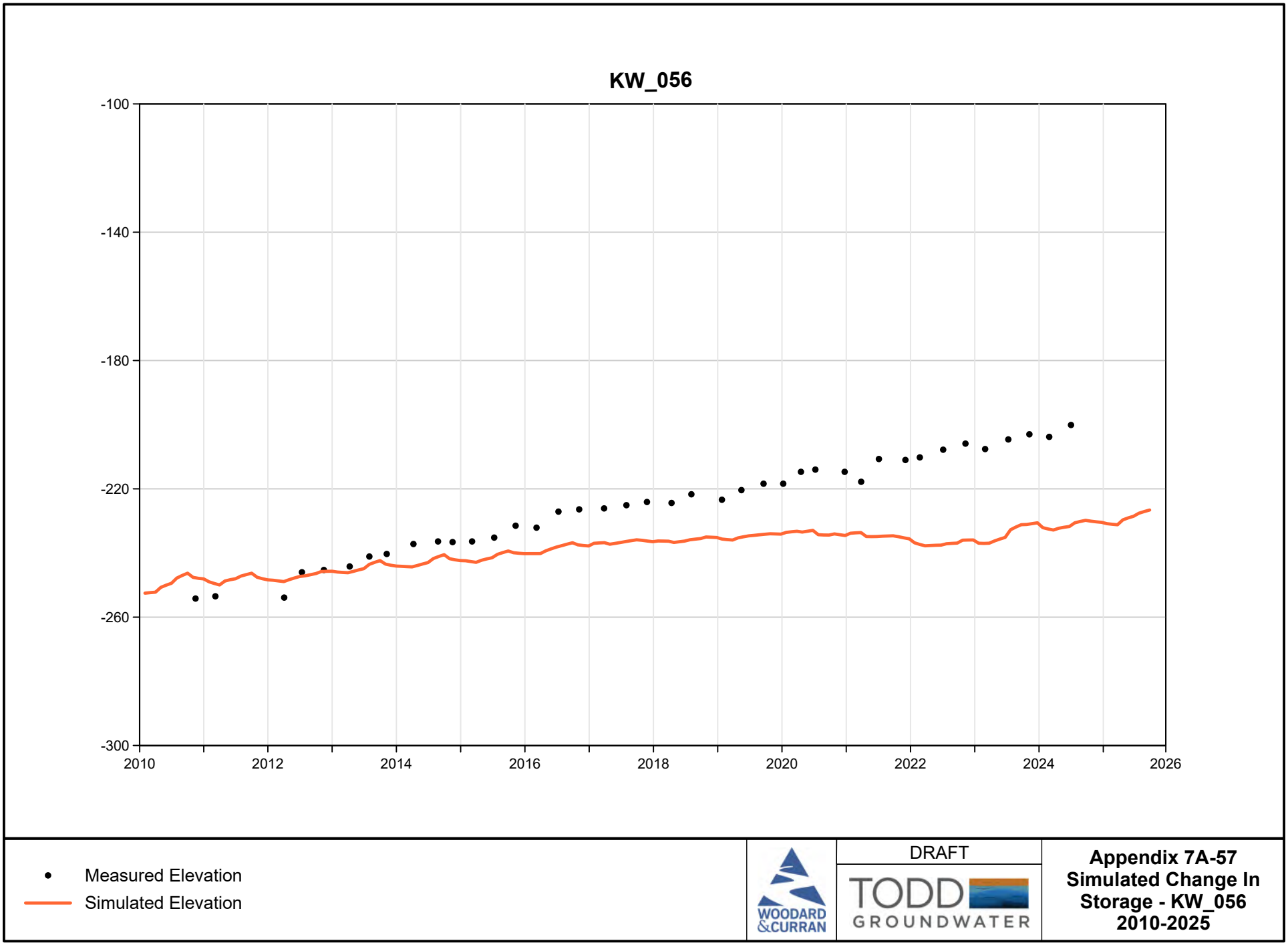
Appendix 7A-52
Simulated Change In Storage - KW_051
2010-2025

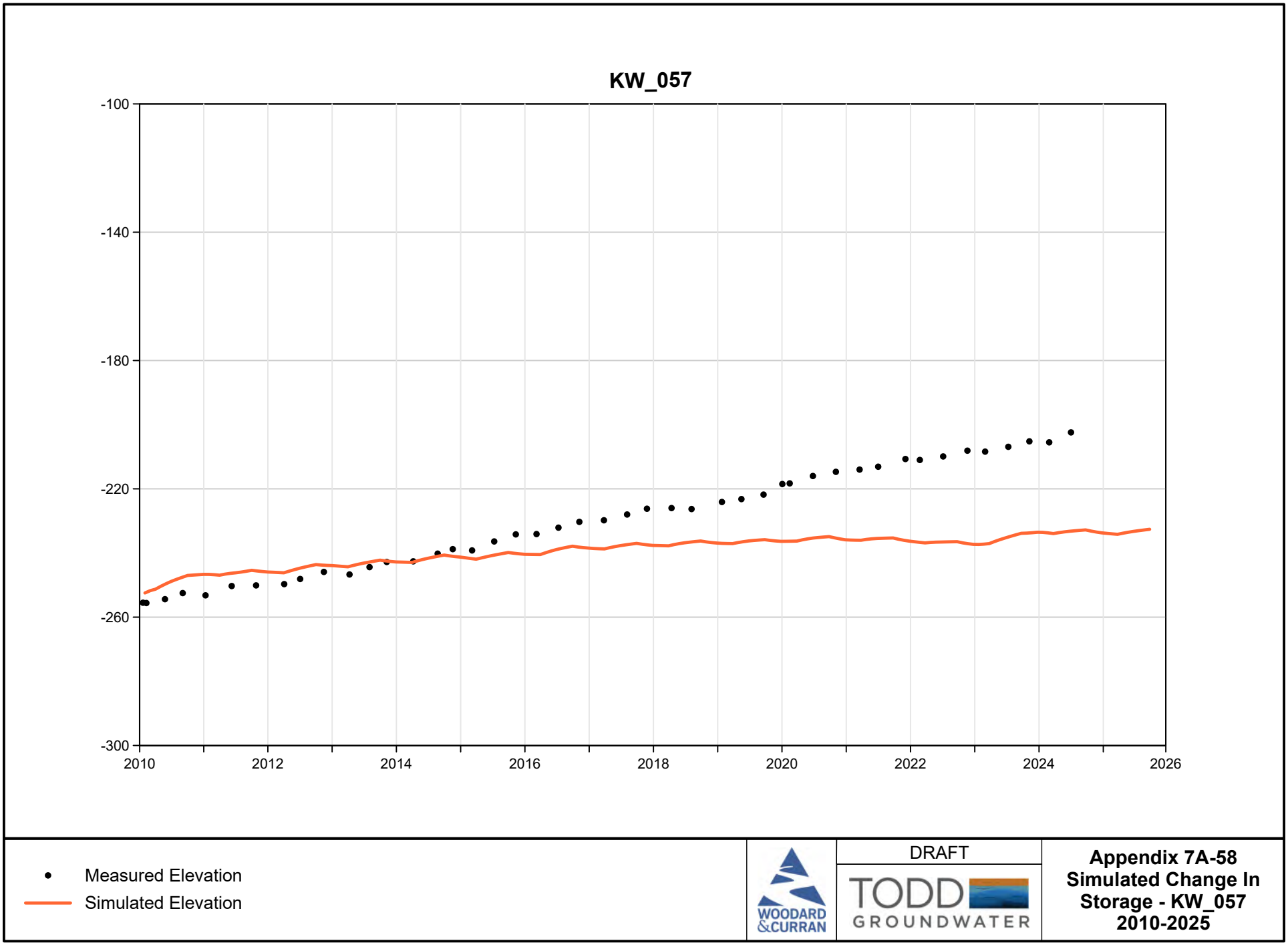

KW_052
-60
-100
-140
-180
-220
-260
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-53
Simulated Change In Storage - KW_052
2010-2025


KW_053
-60
-100
-140
-180
-220
-260
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-54
Simulated Change In Storage - KW_053
2010-2025


KW_054
-100
-140
-180
-220
-260
-300
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-55
Simulated Change In Storage - KW_054
2010-2025


KW_055
-100
-140
-180
-220
-260
-300
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-56
Simulated Change In Storage - KW_055
2010-2025


KW_056
-100
-140
-180
-220
-260
-300
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-57
Simulated Change In Storage - KW_056
2010-2025


KW_057
-100
-140
-180
-220
-260
-300
2010
2012
2014
2016
2018
2020
2022
2024
2026
Measured Elevation
Simulated Elevation
WOODARD &CURRAN
DRAFT
TODD GROUNDWATER
Appendix 7A-58
Simulated Change In Storage - KW_057
2010-2025

Appendix 8-A

Quality Control Plan for Colorado River Basin Triennial Review 2023; CVSC and Salton Sea project

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

2023 TRIENNIAL REVIEW OF WATER QUALITY CONTROL PLAN FOR THE COLORADO RIVER BASIN

FINAL STAFF REPORT

December 2023

California Regional Water Quality Control Board
Colorado River Basin Region
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1 INTRODUCTION

This Staff Report is written in support of the Colorado River Basin Regional Water Quality Control Board's (Colorado River Basin Water Board) triennial review of its water quality standards (Triennial Review), which are contained in the Water Quality Control Plan for the Colorado River Basin Region (Basin Plan). The purpose of this Staff Report is to detail the Triennial Review process and to develop a three-year workplan for water quality standards projects.

The Triennial Review is a process conducted to meet the requirements of the Clean Water Act section 303(c)(1), which requires the Colorado River Basin Water Board to hold public hearings for the purpose of reviewing applicable water quality standards at least once each three-year period. Likewise, the Water Code section 13240 requires the periodic review and revision of regional water quality control plans. Water quality standards consist of beneficial uses for surface water and groundwater bodies and water quality objectives established to protect those uses. In addition to water quality standards, the Basin Plan also describes the water bodies and surrounding environments, actions and policies implementing the water quality standards, monitoring plans to ensure that water quality standards are being met, and other pertinent information. During the Triennial Review, possible additions and revisions to the Basin Plan are identified and prioritized at a public hearing. These prioritized additions and revisions are then developed and implemented through changes to the Basin Plan, as necessary, based upon available resources.

2 TRIENNIAL REVIEW PROCESS

In January 2023, staff began the Triennial Review for the period of January 2024 through December 2026 (2023 Triennial Review Period). On April 26, 2023, staff sent out a Public Notice to solicit potential Triennial Review projects from the general public and local Native American Tribes. The Public Notice announced a comment period to provide project proposals, ending on June 9, 2023. During the comment period, staff also solicited projects internally from other Colorado River Basin Water Board programs. In total, one comment letter was received. Staff prepared a Response to Scoping Comments, provided in **Appendix A**.

After reviewing the comment letter submitted by the public, staff developed a preliminary list of Triennial Review proposed projects and systematically ranked them in order to develop a prioritized list (see section 4 below) of proposed Basin Planning projects to pursue during the 2023 Triennial Review Period (Triennial Review List). Many of the proposed projects are carried over from the previous Triennial Review List completed in December 2020.

This Staff Report was released for public review, along with the Triennial Review List, for a 30-day comment period that began on September 25, 2023, and ended on October 24, 2023. During the comment period, staff also held a public workshop on October 10, 2023 to provide more information about the Triennial Review process and additional comments. After the comment period ended, staff prepared another Response to Comments on the Draft Staff Report, provided in **Appendix D**. Staff also prepared a Tentative Resolution adopting this Final Staff Report.

The approved Triennial Review List and associated administrative record will be transmitted to the State Water Resources Control Board (State Water Board) and the United States Environmental Protection Agency (USEPA).

Upon approval of this Final Staff Report by the Colorado River Basin Water Board (via the Tentative Resolution) and transmittal to USEPA, staff will work on developing the identified projects as appropriate throughout the 2023 Triennial Review Period of January 2024 to December 2026. Importantly, because resources are not available to complete all projects, as detailed in section 5 of this Staff Report, placement of a project on the Triennial Review List does not guarantee that the project will be completed, or that it will be completed as described. Additional public participation opportunities will be presented during the development of each project.

Triennial Review projects are implemented through Basin Plan Amendments, Total Maximum Daily Load (TMDL) Plans, and through policies. Basin Plan Amendments are changes to the Basin Plan. A Basin Plan Amendment project is complete when the amendment goes into effect, which happens when the project has been reviewed and approved by all appropriate agencies, which includes the Colorado River Basin Water Board, followed by the State Water Board, after which the process will vary depending on the project. TMDLs are water pollution control plans that must be developed to

address water quality impairments, which are identified on the 303(d) list of impaired waters. TMDLs are also typically implemented through Basin Plan Amendments, but can be achieved through other regulatory means and for the purposes of this Staff Report they are considered separately. A TMDL project is considered complete after it goes into effect, which occurs after the TMDL has been approved by the USEPA. Policies are typically adopted by Resolution and may also be incorporated into the Basin Plan through a Basin Plan Amendment.

3 STATUS OF 2020 TRIENNIAL REVIEW

The previous review of the Basin Plan took place during the 2020 Triennial Review. The 2020 Triennial Review List was reviewed by the public and adopted by the Regional Water Board on December 10, 2020. The 2020 Triennial Review List consisted of 29 projects, as summarized in **Table 1**. Typically, Triennial Review Lists only contain water quality standards-related projects that may result in Basin Plan Amendments, including TMDLs. Of the 29 projects in the 2020 Triennial Review, fourteen projects were potential Basin Plan Amendments, of which four were assigned to staff. Two of the Basin Plan Amendment projects that were assigned to staff have been completed. Two of the TMDL projects that were assigned to staff have also been completed. Pending projects include projects that were categorized as new during the 2020 Triennial Review, but have since not been started or assigned to staff.

Table 1: 2020 Triennial Review Projects

No.	Rank	Item	Type of Project	Status	Expected Completion by Dec. 2026
1	1	Salton Sea Watershed, Imperial Valley Organochlorine Compounds and Organophosphate Pesticides TMDLs	TMDL	Complete	Yes
2	1	Salton Sea Watershed, Coachella Valley Stormwater Channel Organochlorine Compounds TMDLs Alternatives	TMDL	Complete	Yes
3	1	Salton Sea Watershed, Alamo River Chloride, Indicator Bacteria, and Toxicity TMDLs	TMDL	Ongoing	Yes
4	1	Salton Sea Watershed, New River Ammonia and Toxicity TMDLs	TMDL	Ongoing	Yes
5	1	Salton Sea Dissolved Oxygen and Nutrients TMDLs	TMDL	Ongoing	Yes
6	2	Yucca Valley Septic System Prohibition Revision	Basin Plan Amendment	Complete	Yes

No.	Rank	Item	Type of Project	Status	Expected Completion by Dec. 2026
7	2	Salton Sea Watershed, Coachella Valley Stormwater Channel Ammonia, Dissolved Oxygen and Toxicity TMDLs	TMDL	Ongoing	Yes
8	2	Imperial Valley Pyrethroid Pesticides TMDLs	TMDL	Ongoing	Yes
9	3	Salton Sea Beneficial Use Review	Basin Plan Amendment	Ongoing	Yes
10	3	Regionwide Indicator Bacteria Basin Plan Amendment	Basin Plan Amendment	Complete	Yes
11	6	Beneficial Use Designation for Salton Sea Constructed Aquatic Habitats	Basin Plan Amendment	Ongoing	Yes
12	6	Salton Sea Watershed Bacteria TMDL	TMDL	Pending	No
13	6	Adopt Secondary MCLs as Ground- and Surface Water Quality Objectives	Basin Plan Amendment	Pending	No
14	6	Adopt Region-Wide Water Quality Objectives Based on USEPA 304(a) Criteria	Basin Plan Amendment	Pending	No
15	6	Salton Sea Arsenic TMDL	TMDL	Pending	No
16	6	Salton Sea Toxicity TMDL	TMDL	Pending	No
17	6	Salton Sea DDT and DDE TMDLs	TMDL	Pending	No
18	6	Delineate Groundwater Beneficial Uses by Groundwater Subbasin and/or Aquifer	Basin Plan Amendment	Pending	No

No.	Rank	Item	Type of Project	Status	Expected Completion by Dec. 2026
19	7	Designate Tribal Beneficial Uses for Specific Water Bodies	Basin Plan Amendment	Pending	No
20	7	Administrative Update to the Basin Plan	Basin Plan Amendment	Pending	No
21	8	Imperial Valley Drains Toxicity TMDL	TMDL	Pending	No
22	8	OWTS Prohibitions in Areas Where OWTS Pose a Threat to Water Quality	Basin Plan Amendment	Pending	No
23	8	List Certain Unlisted Waterbodies and Applicable Beneficial Uses, And Designate Miscellaneous Beneficial Uses to Listed Waterbodies	Basin Plan Amendment	Pending	No
24	9	General Prohibition of Unpermitted Waste Discharges that Pose a Threat to Water Quality	Basin Plan Amendment	Pending	No
25	9	Palo Verde Outfall Drain and Lagoon Chloride and Indicator Bacteria TMDLs	TMDL	Pending	No
26	9	Groundwater Numeric Water Quality Objectives in Indio Subbasin	Basin Plan Amendment	Pending	No
27	10	Colorado River Toxicity TMDL	TMDL	Pending	No
28	11	Salton Sea Watershed Site-Specific Objectives	Basin Plan Amendment	Pending	No
29	11	Salton Sea Watershed Ammonia TMDL	TMDL	Pending	No

4 PROPOSED PROJECTS

The proposed 2023 Triennial Review projects were compiled and ranked to develop the Triennial Review List, consisting of ongoing, pending, and new projects summarized in **Table 2**, **Table 3**, and **Table 4**.

The 2023 Triennial Review List also contains seven ongoing projects, listed in **Table 2**. Ongoing projects include 2020 Triennial Review projects that have not been completed and other water quality standards projects that were started since the 2020 Triennial Review list was approved, and TMDL projects which have been included since 2020.

There are 18 pending projects for the 2023 Triennial Review List. Ten of these pending projects are Basin Plan Amendments and eight are TMDL projects. Pending projects include projects from the 2020 Triennial Review that have not been started.

Two new projects have been included in the 2023 Triennial Review List. New projects usually include staff-proposed projects, projects proposed by other programs and/or projects proposed in response to public comments. In this case, the Tribal Beneficial Uses Amendment is a part of the proposed Administrative Update to the Basin Plan amendment that was included in the 2020 Triennial Review (#26). It was developed into its own project and started due to the prioritization of Tribal and Environmental Justice issues statewide. Although it is a new project on the 2023 Triennial Review list, some of the contents were included in the administrative amendment project which states that it may be done as multiple projects. We have also added a new project in response to public comment. This project will include designating the COMM (Commercial and Sport Fishing) Beneficial Use in applicable regional waters. The complete Triennial Review List is provided with project descriptions and other details in **Appendix B**.

Table 2: 2023 Triennial Review Ongoing Projects

No.	Project Title
1	Salton Sea Watershed, Alamo River Chloride, Indicator Bacteria, and Toxicity TMDLs
2	Salton Sea Watershed, New River Ammonia and Toxicity TMDLs
3	Salton Sea Dissolved Oxygen and Nutrients TMDLs
4	Salton Sea Watershed, Coachella Valley Stormwater Channel Ammonia, Dissolved Oxygen and Toxicity TMDLs
5	Imperial Valley Pyrethroid Pesticides TMDLs
6	Salton Sea Beneficial Use Review

No.	Project Title
7	Beneficial Use Designation for Salton Sea Constructed Aquatic Habitats

Table 3: 2023 Triennial Review Pending Projects

No.	Project Title
1	Palo Verde Outfall Drain and Lagoon Chloride and Indicator Bacteria TMDLs
2	OWTS Prohibitions in Areas Where OWTS Pose a Threat to Water Quality
3	Groundwater Numeric Water Quality Objectives in Indio Subbasin
4	Colorado River Toxicity TMDL
5	Salton Sea Watershed Site-Specific Objectives
6	Salton Sea Watershed Ammonia TMDL
7	Salton Sea Watershed Bacteria TMDL
8	Adopt Secondary MCLs as Groundwater and Surface Water Quality Objectives for the Municipal and Domestic Supply Beneficial Use
9	Adopt Region-Wide Water Quality Objectives Based on USEPA 304(a) Criteria
10	Salton Sea Arsenic TMDL
11	Salton Sea Toxicity TMDL
12	Salton Sea DDT and DDE TMDLs
13	Delineate Groundwater Beneficial Uses by Groundwater Subbasin and/or Aquifer
14	Designate Tribal Beneficial Uses for Specific Water Bodies
15	Administrative Update to the Basin Plan
16	Imperial Valley Drains Toxicity TMDL
17	List Certain Unlisted Waterbodies and Applicable Beneficial Uses, And Designate Miscellaneous Beneficial Uses to Listed

No.	Project Title
18	General Prohibition of Unpermitted Waste Discharges that Pose a Threat to Water Quality

Table 4: 2023 Triennial Review New Projects

No.	Project Title
1	Tribal Beneficial Uses Definitions and Administrative Updates to the Basin Plan
2	Designating COMM (Commercial and Sport Fishing) Beneficial Use in Applicable Regional Waters

5 BASIN PLANNING RESOURCES

The Colorado River Basin Water Board is allocated limited staff resources to administer Water Quality Standards programs, which include implementation of Triennial Review projects. Staff resources are calculated in Personnel Years (PY), where one PY equates to the resources needed to fund one Colorado River Basin Water Board staff person for one year.

Currently, 4.95 PYs are assigned to Basin Planning and TMDL Projects for this fiscal year on an annual basis, which adds up to a total of 14.85 PY's over the course of the 2023 Triennial Review period. Currently, 9.9 PYs are assigned to ongoing Triennial Review projects listed in **Table 2**. This leaves just 4.95 PYs available for new projects and pending projects listed in **Table 3** and **Table 4**.

The ability to apply these resources to these projects is further limited by when the ongoing projects will be completed, which is subject to change. Based on projected resource availability, it is expected that no more than three to five pending or new projects may be started during the 2023 Triennial Review period. To begin working on all new and pending projects an estimated 21.3 PY's are required. This means, that to begin working on all pending and new projects during the 2023 Triennial Review, an additional 16.35 PYs would be needed over the course of the Triennial Review period, which would require five to six new staff positions to be funded, filled and fully available for water quality standards projects.

6 PRIORITIZATION

In order to prioritize the use of limited staff resources, the Triennial Review List has been ranked using scoring criteria, which were developed based on public input and program priorities. The scoring criteria are described in **Table 5**. The scoring criteria were revised following the October 10 workshop to include Board Member comments. The Groundwater criterion scores were increased by 5 points at the request of a Board Member who was concerned that groundwater needed to be weighted more due to the overwhelming surface water nature of the other criteria. Rankings were not changed with the increase in available score because only 4 projects qualify for the Groundwater criterion and none of them are likely to be started during this Triennial Review period due to higher priority projects in progress. During the 2026 Triennial Review, this will be revisited and ranked accordingly.

Table 5: Prioritization Scoring Criteria

Criterion	Question	Min Score	Middle Score	Max Score
Ongoing project	Is this an ongoing project that is already assigned to staff?	0 (no)	N/A	30 (yes)
Groundwater	Does the project address groundwater impairments?	0 (no)	10 (possibly or indirectly)	15 (yes, directly)
Salton Sea	Does the project protect water quality at the Salton Sea?	0 (no)	5 (possibly or indirectly)	10 (yes, directly)
EJ or Tribal	Does the project address Environmental Justice or Tribal issues?	0 (no)	5 (possibly or indirectly)	10 (yes, directly)
Completion (ongoing)	For ongoing projects, how likely is the project to be completed before December 2026?	0 (not likely)	5 (somewhat likely)	10 (very likely)
Completion (new)	For new projects, how long will the project take once started?	0 (≤ 6 months)	5 (18 months)	10 (≥ 48 months)

Criterion	Question	Min Score	Middle Score	Max Score
Public interest	Does the project address concerns expressed by the public?	0=not at all	5 (somewhat or some)	10 (yes, many)
Time sensitivity	When does the project need to be completed to meet commitments?	0 (≥ 2031)	5 (by 2028)	10 (≤ 2026)
Impairments	Does the project address 303(d) listed impairments?	0 (no)	3 (yes, indirectly)	5 (yes, directly)
Beneficial Uses	Does the project protect or designate beneficial uses?	0 (no)	3 (yes, indirectly)	5 (yes, directly)

The scores and rankings are represented by project in **Appendix C**. The prioritization ranking is meant to serve as a guide to assigning resources. When resources become available, a higher-ranking new project may be considered before lower ranking projects. Likewise, when staff resources must be re-assigned, a lower ranking ongoing project would be more likely to be delayed than a higher-ranking ongoing project. Exceptions may be made to account for staff expertise, amount of staff time available, new projects not identified in the Triennial Review, and other emerging priorities.

7 SECTION 304(A) CRITERIA

Title 40, section 131.20 of the Code of Federal Regulations (CFR) requires that Colorado River Basin Water Board provide an explanation when it does not adopt new or revised criteria for parameters for which USEPA has published new or updated Clean Water Act section 304(a) criteria recommendations, adopted since May 30, 2000.

Due to the limited resources available and higher priorities present, staff does not recommend updating the Basin Plan to reflect updated section 304(a) criteria at this time. Revising such criteria involves considerable effort most efficiently done by the State Water Board's Division of Water Quality, since a change to the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Statewide Basin Plan or ISWEBE) would supersede all regional Basin Plans.

The Colorado River Basin Water Board staff will continue to engage in discussions and assessments with the State Water Board regarding recommended water quality objectives.

APPENDIX A: RESPONSE TO SCOPING COMMENTS

Colorado Basin Water Board staff solicited input from interested persons during a 30-day public comment period that ended on June 9, 2023. On June 9, 2023, Aydee Palomino, Environmental Justice Project Manager, submitted a comment letter on behalf of Alianza. No other comments were submitted as part of the scoping process.

Alianza-1

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: It is important that public health and the environment be considered as compelling reasons for urgent implementation of a TMDL.

Response: The comment addresses the Salton Sea Dissolved Oxygen and Nutrients TMDL. The project is one of the 27 projects included in this Triennial Review. This project includes evaluating the concentrations of dissolved oxygen and nutrients in the Salton Sea, determining the sources contributing to the concentrations of nutrients and dissolved oxygen detected, Staff will subsequently, look at the water quality criteria developed to protect the beneficial uses of the Salton Sea. The water quality criteria will be used to calculate the amount of each listed nutrient that can be discharged and an appropriate level of dissolved oxygen which will enable the Salton Sea to meet the water quality criteria. We are aware that this TMDL project has a high level of public interest due to its relevance to public health and the environment. It has been prioritized in this review period because it is an ongoing project, a Salton Sea project, it is an EJ or tribal concern, and of high public interest.

Alianza-2

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: Request that the state disclose a comprehensive list of the nutrients to be tested in order to determine or forecast environmental hazards such as algal blooms.

Response: This specific project will focus on implementing TMDLs for dissolved oxygen and nutrients within the Salton Sea. This TMDL will include developing numeric targets for total phosphorous, nitrate, chlorophyll a, Secchi disk depth, and dissolved oxygen.

Alianza-3

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: The region 7 water board's sampling should include a site in the main body of the Salton Sea outside of where the Species Conservation Habitat (SCH) project water exchanges and where the New River meets the Sea.

Response: Monitoring locations include the main body of the Salton Sea outside of where the SCH project water exchanges and where the New River meets the Sea (see Figure 1 below).

Alianza-4

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: Please include a mention of potential contaminants introduced from lithium extraction to address the community requests.

Response: This specific TMDL is only to address dissolved oxygen and nutrients (discussed earlier) within the Salton Sea. This TMDL does not involve lithium extraction, or other pollutants listed in the section 303(d) list. Lithium extraction is regulated by other programs within the Regional Board and is beyond the scope of this project. There are currently no known discharges to surface waters associated with lithium extraction. Moreover, it would be difficult to distinguish between naturally occurring pollutants and those traceable to lithium extraction. At this time, the Board has no factual basis to suspect that pollutants from lithium extraction are being discharged into the Salton Sea.

Alianza-5

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: Request that community science participants in initiatives including SSET be included in the scientific review process.

Response: Scientific peer review is conducted through our contractor, UC Berkeley through which we request scientific peer review by subject matter experts. Subject matter experts are chosen and thoroughly review the staff report. It is an external process and is compliant with USEPA requirements for changes to water quality standards. The responses to the peer review will be made available as part of the draft staff report prior to adoption. As with all Board actions, project documents will be open for public comment, in which community science participants are welcome to submit their

comments. The public comment period comes after the conclusion of the peer review. If we receive substantive comments during the public comment period, we may pose those questions to the peer reviewers.

Alianza-6

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: Near-shore areas should be included in the survey of the Salton Sea.

Response: Monitoring locations include near shore locations, where the river outlets empty into the sea as well as deep water monitoring locations (see Figure 1 below).

Alianza-7

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: We recommend that the regional board secure funding for water quality monitoring that will last beyond the three years which is when the next Triennial Review will take place. The Board should seek more Salton Sea water monitoring funding from other state and federal agencies such as the Bureau of Reclamation and the USEPA, which have an increasing interest in the Salton Sea.

Response: The Water Boards are always considering funding for ambient water quality monitoring, especially concerning the Salton Sea. However, funding is often limited and competitive. We will continue to look for sources of funding and agencies to work with to help continue monitoring the Salton Sea beyond the three years for which we currently have funding. We want to note that we are maximizing the funding we currently have as we participate in a joint venture with the Department of Water Resources and California Department of Fish and Wildlife to collect the samples. The totality of our budget is funding lab analyses since we have partnered with agencies that are conducting monitoring of their own.

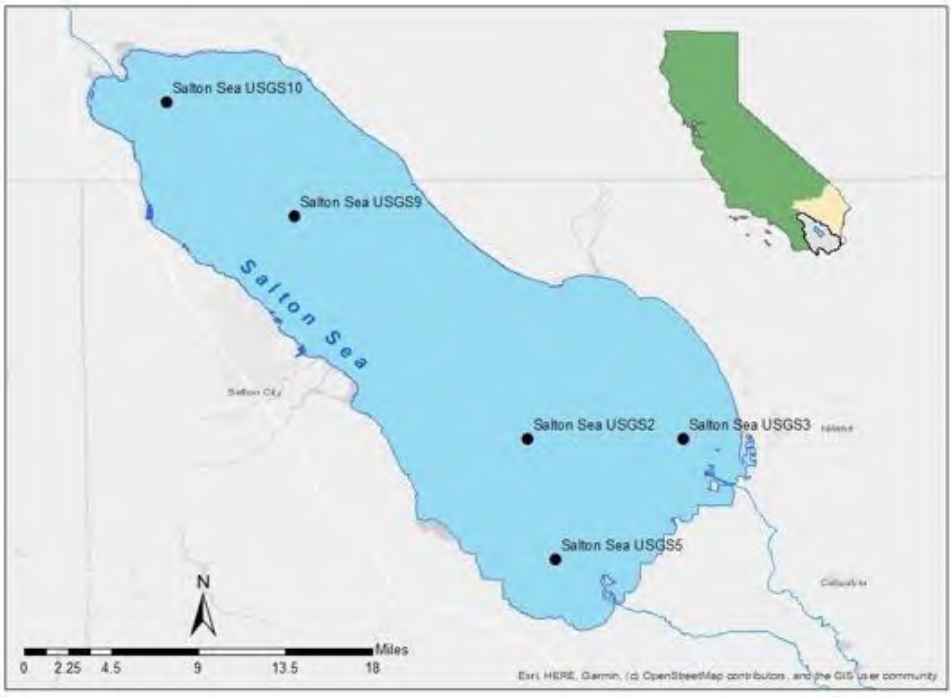
Alianza-8

Subject: Salton Sea Dissolved Oxygen and Nutrients TMDL

Comment: We recommend that the board collaborate with other agencies to compile this information and work towards the dashboard, which can serve as a resource to other agency entities, but primarily the public.

Response: The data and information collected from the Salton Sea monitoring program used for this TMDL will be made publicly available in the CEDEN database. The development and/or implementation of a dashboard is outside of the scope of the Triennial Review.

Figure 1: Proposed Salton Sea Monitoring Locations (Colorado River Basin Water Board, 2023)



Appendix B: 2023 Triennial Review List

The Triennial Review List contains the following information:

Description: Purpose and justification for the project.

Public Comments: List of public comments, listed in Appendix A and Appendix D, interpreted to be in support of the entire project or of specific elements of the project.

Rank: The ranking of the project as defined in Appendix C.

Status: "Ongoing" projects are currently assigned to staff, whereas "New" projects are not currently assigned to staff.

Type: Each project will be one of the following three options:

TMDL Plan – Total Maximum Daily Load (TMDL) implementation plan that will likely be proposed to be adopted as a Basin Plan amendment.

TMDL Plan alternative – a Total Maximum Daily Load (TMDL) implementation plan that will be implemented without a Basin Plan Amendment

Basin Plan Amendment – a change to the Basin Plan; for the purposes of this list, this refers to amendments other than TMDL Plans.

Basin Plan: This section specifies the Basin Plan provisions that may be amended or affected as a result of the project.

Projected Staff Resources: An estimate of staff resources required to complete the project, calculated from beginning to completion for new projects, or from January 2024 to completion for ongoing projects. Projected staff resources are presented in Personnel Years (PY), where one PY equates to the resources needed to fund one staff person for one year. Note that actual required staff resources are likely to vary, especially for new projects where a greater number of unknown factors will determine the actual complexity of the project.

Expected Completion or Expected Duration: For ongoing projects, Expected Completion provides an estimate of when the project is expected to be completed. For new projects, Expected Duration provides an estimate of the duration of the project from start to completion. A project is considered to be "completed" when the amendment or TMDL goes into effect, which occurs after it has been reviewed and approved by all applicable parties. The actual completion date is subject to change due to factors that may increase the complexity of the project or due to a need to divert resources to other projects.

Project 1: Salton Sea Watershed, Alamo River Chloride, Indicator Bacteria, and Toxicity TMDLs

Description	The Alamo River is 303(d) listed for multiple impairments, including chloride, indicator bacteria (Enterococcus and Escherichia coli), and toxicity. Staff is developing TMDLs to address these impairments. The Salton Sea is also impaired for chloride and indicator bacteria and developing these TMDLs at the Alamo River, which discharges to the Salton Sea, will work toward addressing these impairments at the Salton Sea. The Alamo River toxicity TMDL may also contribute to addressing the Salton Sea toxicity impairment if the two impairments are caused by the same pollutants.
Public Comments	None
Status	Ongoing
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	1.0
Expected Completion by December 2026	Yes

Project 2: Salton Sea Watershed, New River Ammonia and Toxicity TMDLs

Description	The New River is 303(d) listed for multiple impairments, including ammonia and toxicity. Staff is developing TMDLs to address these impairments. The Salton Sea is also impaired for ammonia and developing these TMDLs at the New River, which discharges to the Salton Sea, will work toward addressing these impairments at the Salton Sea. The New River toxicity TMDL will also contribute to addressing the Salton Sea toxicity impairment if the two impairments are caused by the same pollutants.
Public Comments	None
Status	Ongoing
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	1.3
Expected Completion by December 2026	Yes

Project 3: Salton Sea Dissolved Oxygen and Nutrients TMDLs

Description	The Salton Sea is 303(d) listed for multiple impairments, including dissolved oxygen and nutrients. Projects are already underway to develop TMDLs for nutrients at the New River and for dissolved oxygen at the CVSC. Under this project, staff is developing TMDLs for nutrients and dissolved oxygen for the entire Salton Sea Watershed. This project will incorporate the New River and Coachella Valley Stormwater Channel (CVSC) proposed TMDLs after they are submitted to the United States Environmental Protection Agency (USEPA).
Public Comments	Alianza-06.09
Status	Ongoing
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	2.1
Expected Completion by December 2026	Yes

Project 4: Salton Sea Watershed, Coachella Valley Stormwater Channel Ammonia, Dissolved Oxygen, and Toxicity TMDLs

Description	The Coachella Valley Stormwater Channel (CVSC) is 303(d) listed for multiple impairments, including ammonia and toxicity, and it is proposed to be listed for dissolved oxygen under the 2018 Integrated Report. Staff is developing TMDLs to address these impairments. The Salton Sea is also impaired for ammonia and dissolved oxygen and developing these TMDLs at the CVSC, which discharges to the Salton Sea, will work toward addressing these impairments at the Salton Sea. The CVSC toxicity TMDLs will also contribute to addressing the Salton Sea toxicity impairment if the two impairments are caused by the same pollutants.
Public Comments	None
Status	Ongoing
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	1.5
Expected Completion by December 2026	Yes

Project 5: Imperial Valley Pyrethroid Pesticides TMDLs

Description	The New River is 303(d) listed for multiple impairments, including pyrethroids bifenthrin, cypermethrin, and lambda cyhalothrin. The Alamo River is also 303(d) listed for cypermethrin and lambda cyhalothrin. Staff is developing TMDLs to address these impairments. Addressing these impairments at the tributaries may contribute to improving water quality at the Salton Sea.
Public Comments	None
Status	Ongoing
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.6
Expected Completion by December 2026	Yes

Project 6: Salton Sea Beneficial Use Review

Description	The Salton Sea is a terminal lake without an outlet, which means that certain pollutants have been concentrating in it since 1905 when it was first formed. Such pollutants include salinity and one of its components, chloride, which are both 303(d) listed impairments that are impairing the Salton Sea's Warm Freshwater Habitat (WARM) beneficial use. The Salton Sea is not a freshwater and because of its terminal nature may never meet the current water quality objectives for these pollutants associated with the WARM beneficial use. Under this amendment, staff will determine whether WARM is attainable for these pollutants and establish whether the Salton Sea should be considered a saltwater body for the purposes of applicable water quality objectives. Other pollutants and/or beneficial uses may be included as data is gathered and analyzed. Based on the results of this analysis, a change the Salton Sea's beneficial uses may be proposed.
Comments	None
Status	Ongoing
Type	Basin Plan Amendment
Projected Staff Resources	1.7
Basin Plan	Chapter 2, Table 2-3
Expected Completion by December 2026	Yes

Project 7: Beneficial Use Designation for Salton Sea Constructed Aquatic Habitats

Description	The California Natural Resources Agency (CNRA), in coordination with other Salton Sea stakeholders, is developing plans for and building a series of constructed aquatic habitats as part of the Salton Sea Management Program. The aquatic habitats will be filled with mixed water from the existing tributaries and the Salton Sea and used to provide wildlife habitat while suppressing dust from the exposed playa, as the Sea recedes. Because the habitats will be using mixed water and will be different from both the Salton Sea and the tributaries, they may have different beneficial uses from those parent water bodies, and possibly from each other. As the CNRA develops plans for these habitats, the Colorado River Basin Water Board should coordinate with CNRA to identify and designate beneficial uses for these aquatic habitats.
Public Comments	None
Status	Ongoing
Type	Plan
Basin Plan	N/A
Projected Staff Resources	1.7
Expected Completion by December 2026	Yes

Project 8: Salton Sea Watershed Bacteria TMDL

Description	The Salton Sea is 303(d) listed for the multiple impairments, including indicator bacteria (enterococcus). The Coachella Valley Stormwater Channel (CVSC) is also impaired for indicator bacteria and currently has an associated TMDL that is being implemented, which may need to be revised to make consistent with the Statewide Bacteria Objectives. A TMDL for Alamo River indicator bacteria is also under development and can be incorporated once it is submitted to USEPA. Staff proposes to develop a new TMDL for indicator bacteria for the Salton Sea Watershed, including and the New River and a revised TMDL for CVSC.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	1.1
Expected Completion by December 2026	No

Project 9: Adopt Secondary MCLs as Ground- and Surface Water Quality Objectives

Description	Numeric water quality objectives for groundwater and surface water with municipal and domestic supply use (MUN) have been developed as Maximum Contaminant Levels (MCLs) contained in Title 22 of California Code of Regulations (CCR), incorporated into the basin plan by reference in Chemical Constituents objective for surface waters (Chapter 3, Section II.N) and Chemical and Physical Quality Objective for ground waters (Chapter 3, Section IV.C.) The MCL values incorporated are those in CCR Title 22 sections 64431, 64444, and 64678. In equivalent objectives, other Regional Water Boards have also incorporated Secondary MCLs (SMCLs) contained in CCR section 64449. SMCLs contain numeric limits for turbidity, color, metals, and other pollutants. Staff proposes to adopt the Secondary MCLs table in CCR Title 22, Section 64449 as water quality objectives to protect the MUN beneficial use in both surface waters and groundwaters.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 3, Section IV.C; Chapter 3, Section II
Projected Staff Resources	1.9
Expected Completion by December 2026	No

Project 10: Adopt Region-Wide Water Quality Objectives Based on USEPA 304(a) Criteria

Description	Staff recommends considering adopting surface water quality objectives (WQOs) based on USEPA 304(a) criteria for pollutants that do not have a CA Toxics rule criterion or an existing Basin Plan WQO. Staff recommends consideration of adoption of aquatic life criteria for ammonia, arsenic, chlorpyrifos, diazinon, iron, and malathion. Adoption of these objectives may help address existing impairments as it would trigger the development of water quality-based effluent limitations for discharges to surface waters. These pollutants are associated with 17 impairments, with 14 of those being located in the Salton Sea Watershed. Among them, ammonia and chlorpyrifos are associated with the greatest number of impairments, with five and four impairments, respectively, all located in the Salton Sea Watershed.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 3, Section 3.C
Projected Staff Resources	1.1
Expected Completion by December 2026	No

Project 11: Salton Sea Arsenic TMDL

Description	The Salton Sea is 303(d) listed for the multiple impairments, including arsenic. None of the tributaries are currently listed as impaired for arsenic. Staff proposes to develop a TMDL to address the arsenic impairment at the Salton Sea.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.8
Expected Completion by December 2026	No

Project 12: Salton Sea Toxicity TMDL

Description	The Salton Sea is 303(d) listed for the multiple impairments, including toxicity. Salton Sea tributaries are also impaired for toxicity, however these impairments may need to be addressed separately if they are caused by different pollutants. Staff proposes to develop a TMDL to address the toxicity impairment at the Salton Sea.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.9
Expected Completion by December 2026	No

Project 13: Salton Sea DDT and DDE TMDLs

Description	The Salton Sea is 303(d) listed for the multiple impairments, including DDT; it is also proposed to be listed for DDE under the 2018 Integrated Report. TMDLs for DDT and DDE are under development for its tributaries and can be incorporated once they are submitted to USEPA. Staff proposes to develop TMDLs for DDT and DDE for the Salton Sea.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.5
Expected Completion by December 2026	No

Project 14: Delineate Groundwater Beneficial Uses by Groundwater Subbasin and/or Aquifer

Description	This project was included in the 2017 Triennial Review under two projects: item 3, "Review of Municipal Beneficial Use Designation in Ground Water With High Salinity," and item 4, "Revise Beneficial Use Designations to Correspond with Individual Ground Water Basins and Aquifers." The groundwater beneficial uses are currently designated based on hydrologic units, or watersheds. Staff proposes to review the appropriate groundwater data and revise groundwater beneficial uses designations so that they will correspond to individual groundwater subbasins within the various hydrologic units, and to aquifers in areas where additional precision is necessary. The proposed changes in designations would also be consistent with the State Water Board's Sources of Drinking Water Policy, Resolution 88-63. These changes would result in an updated version of Table 2-5 (Chapter 2) and a more detailed map of the groundwater aquifers in this Region in Basin Plan Appendix B. This project is consistent with the Basin Plan Chapter 5, Section III.B, where the need for these changes is identified as a key Regional Water Board issue.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 2, Table 2-5
Projected Staff Resources	1.1
Expected Completion by December 2026	No

Project 15: Designate Tribal Beneficial Uses for Specific Water Bodies

Description	Tribal Beneficial Uses are beneficial uses developed by the State Water Board and available for adoption and designation by the Regional Water Boards into their Basin Plans. These uses are Tribal Traditional Culture (CUL) and Tribal Subsistence Fishing (T-SUB). Tribal Beneficial Uses can be designated to waters within a Regional Water Board's jurisdiction. Colorado River Basin Water Board received comment letters from Campo Environmental Protection Agency and from Morongo Band of Mission Indians stating that it would be appropriate to designate Tribal Beneficial Uses for water bodies within the Colorado River Basin regions. However, the commenters did not name specific water bodies that should be designated with which of the two beneficial uses. To designate Tribal Beneficial Uses, designation requests for specific water bodies must be made with supporting data. Morongo Band of Mission Indians also requested to remove Tribal water bodies or segments of water bodies from the Basin Plan beneficial uses tables. Staff proposes to work with the Tribes in the region to identify specific water bodies that should be designated with Tribal Beneficial Uses, and to identify water bodies or segments of water bodies that are on Tribal land that the Tribes would wish to be removed from the Basin Plan beneficial uses tables.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 2, Tables 2-2 through 2-4
Projected Staff Resources	1.2
Expected Completion by December 2026	No

Project 16: Tribal Beneficial Uses Definitions and Administrative Updates to the Basin Plan

Description	This amendment would add Tribal Beneficial Uses to the Basin Plan and make various non-regulatory updates and revisions to the Basin Plan which can be accomplished administratively, without California Environmental Quality Act (CEQA) documentation or peer review. Tribal Beneficial Uses are beneficial uses developed by the State Water Board and available for adoption and designation by the Regional Water Boards into their Basin Plans. These uses are Tribal Traditional Culture (CUL) and Tribal Subsistence Fishing (T-SUB). Tribal Beneficial Uses can be designated to waters within a Regional Water Board's jurisdiction. This amendment would also incorporate statewide mercury objectives, the HRTW Policy into the Policies chapter, revise Salton Sea language to reflect current restoration plans and other pertinent information, and other minor errors.
Public Comments	None
Status	New
Type	Basin Plan Amendment
Basin Plan	Chapters 1-6
Projected Staff Resources	0.9
Expected Completion by December 2026	Yes

Project 17: Administrative Update to the Basin Plan

Description	This amendment would make various non-regulatory updates and revisions to the Basin Plan which can be accomplished administratively, without California Environmental Quality Act (CEQA) documentation or peer review. This amendment would incorporate changes proposed by staff and in public comments. All changes proposed below are tentative and subject to change upon further research. These changes may be adopted under a single amendment, multiple amendments, or some changes may be incorporated into other amendments. The following changes were proposed by staff: Update New River language; in beneficial uses tables, correct water body spelling, any non-region 7 water bodies, and map out the springs consistently with NHD maps; update Appendix A and B maps. The following changes are proposed in response to public comments: incorporate Environmental Justice as a Board priority; incorporate DAC community water and wastewater infrastructure as a Board priority; revise Chapter 5, Section III.A "Septic System Impacts to Ground Water Basins" to identify next steps and provide more detail; revise Chapter 4, Section II.H.1 "Statewide Onsite Wastewater Treatment System Requirements" to specify the responsible parties under OWTS Policy and highlight local agency monitoring and reporting requirements; re-structure and revise Chapter 4 to separate out Surface Water and Groundwater Programs, and describe the Colorado River Basin Water Board's permitting, regulatory and enforcement authority in the introductory paragraphs for each set of programs. Make changes to Chapter 4, Section II.E "Confined Animal Facilities" to make the terminology consistent with NPDES definitions; to distinguish CAFO's from smaller AFO's; and to expand the list of possible types of AFO's; revise Table 2-3 footnotes 17 and 23 to clarify where Whitewater River ends and Coachella Valley Stormwater Channel begins; revise and re-structure Chapter 6 Section II "Regional Water Board Monitoring" to separate out groundwater and surface water monitoring programs, and under groundwater monitoring programs describe GAMA and local cooperative relationships and how that data is used; update monitoring activities; make changes to language in Chapter 3, Section III "Specific Water Quality Objectives" as proposed by Colorado River Board; and incorporate identification of Animal Feeding Operations (AFOs) and other unregulated facilities as a Board priority.
Public Comments	None
Status	Pending

Type	Basin Plan Amendment
Basin Plan	Chapters 2-6
Projected Staff Resources	1.0
Expected Completion by December 2026	No

Project 18: Imperial Valley Drains Toxicity TMDL

Description	Imperial Valley Drains are 303(d) listed for the multiple impairments, including toxicity. Salton Sea and its other tributaries are also impaired for toxicity, however these impairments may need to be addressed separately if they are caused by different pollutants. Staff proposes to develop a TMDL to address the toxicity impairment at the Imperial Valley Drains.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.7
Expected Completion by December 2026	No

Project 19: OWTS Prohibitions in Areas Where OWTS Pose a Threat to Water Quality

Description	This project was included in the 2017 Triennial Review as Item 1, "Evaluate Potential Sources of Nitrates in Prioritized Basins." Staff has been collecting data and information to identify areas where nitrate pollution from Onsite Wastewater Treatment Systems (OWTS), also referred to as septic systems, may be posing a threat to groundwater quality. In areas where the density of existing OWTS may be contributing to nitrate and other pollution, and the OWTS density cannot be mitigated by existing regulations, staff plans to propose a prohibition of discharge from OWTS.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 4, Section II.H.2
Projected Staff Resources	1.4
Expected Completion by December 2026	No

Project 20: List Certain Unlisted Waterbodies and Applicable Beneficial Uses, And Designate Miscellaneous Beneficial Uses to Listed

Description	The Basin Plan lists beneficial use definitions in table 2-1 and designates beneficial uses for water bodies in tables 2-2 through 2-5. These tables do not include all water bodies within the region, and certain existing beneficial uses may not be identified for certain water bodies that are listed. Water bodies and beneficial uses should be added to these tables as information becomes available. Staff proposes to make changes to the beneficial uses tables, including, but not limited to, the following: add Commercial and Sport Fishing (COMM) beneficial use definition to table 2-1 and designated it to all REC II waters; add Freshwater Replenishment (FRSH) beneficial use to Cadiz Hydrologic Unit; list beneficial uses for Gieselmann Lake and Imperial Valley Canals, Coachella Valley Stormwater Channel from Palm Springs to Indio; identify general beneficial uses for unnamed lakes; list beneficial uses for 303(d)-listed water bodies not currently in beneficial use tables; list beneficial uses for water bodies monitored by the Surface Water Ambient Monitoring Program (SWAMP) not currently in beneficial use tables; Old Woman Springs Creek; Long Canyon Channel. Additionally, to protect beneficial uses of any unlisted tributaries to listed water bodies, staff proposes to incorporate a tributary clause, which would specify that beneficial uses of a listed water body apply to any of its tributaries that are not listed in the Basin Plan.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 2, Table 2-3
Projected Staff Resources	0.7
Expected Completion by December 2026	No

Project 21: Designate COMM (Commercial and Sport Fishing) Beneficial Use in Applicable Regional Waters

Description	This project would add the beneficial use for COMM (Commercial and Sport Fishing) to the Basin Plan. The Regional Water Board will review all waterbody designations and add the COMM beneficial use to any freshwaters that should be covered for recreational/sport fishing for consumption.
Public Comments	USEPA-1
Status	New
Type	Basin Plan Amendment
Basin Plan	Chapter 2
Projected Staff Resources	1.5
Expected Completion by December 2026	No

Project 22: General Prohibition of Unpermitted Waste Discharges that Pose a Threat to Water Quality

Description	Currently, the Basin Plan does not include a prohibition against waste discharges and threatened waste discharges to waters of the state. This limits enforcement actions on unpermitted discharges that could have water quality impacts. To address this, staff proposes to adopt a general prohibition of unpermitted waste discharges and threatened waste discharges that pose a threat to water quality.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 4, Section II
Projected Staff Resources	0.7
Expected Completion by December 2026	No

Project 23: Palo Verde Outfall Drain and Lagoon Chloride and Indicator Bacteria TMDLs

Description	The Palo Verde Outfall Drain and Lagoon are 303(d) listed for multiple impairments, including chloride and indicator bacteria. Staff is developing TMDLs to address these impairments. 2018 Integrated Report identifies TMDLs for these pollutants as due to be implemented by 2025 and 2019, respectively.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	1.2
Expected Completion by December 2026	Yes

Project 24: Groundwater Numeric Water Quality Objectives in Indio Subbasin

Description	This project was included in the 2017 Triennial Review as Item 2, "Establish Water Quality Objectives for Ground Water Throughout the Coachella Valley." Staff is developing site-specific numeric water quality objectives for TDS and other constituents in the Indio subbasin. To help establish appropriate water quality objectives, a 3-year contract with USGS to determine existing water quality was completed in 2023. Analysis of findings and determination of next steps has begun.
Public Comments	None
Status	New
Type	Basin Plan Amendment
Basin Plan	Chapter 3, Section IV.A
Projected Staff Resources	0.9
Expected Completion by December 2026	No

Project 25: Colorado River Toxicity TMDL

Description	The Colorado River is 303(d) listed for multiple impairments, including toxicity. Staff is developing a TMDL to address this impairment. 2018 Integrated Report identifies TMDL for this pollutant as due to be implemented by 2025.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.8
Expected Completion by December 2026	No

Project 26: Salton Sea Watershed Site-Specific Objectives

Description	The Basin Plan lists site-specific selenium water quality objectives (WQOs) for the Salton Sea and its tributaries as 0.005 mg/L four-day average and 0.02 mg/L one-hour average, stating that these criteria are based on USEPA's National Ambient Water Quality Criteria, also known as the 304(a) criteria. These objectives may have been based on the 1987 USEPA selenium water column criteria. Since 1987, USEPA selenium criteria have been updated repeatedly, including in 1999 for saltwater and 2016 for freshwater. Because of these updates, the Salton Sea watershed selenium WQOs should also be updated, either by removing the site-specific objectives to ensure that USEPA criteria apply, or by developing new site-specific WQOs. It should also be determined whether freshwater or saltwater WQOs apply. The Basin Plan also lists a site-specific WQO for salinity at 35,000 mg/L, however it is stated in the same paragraph that this objective "may not be realistically achievable." Due to the Salton Sea's terminal nature, its salinity has reached almost

	double that value and will continue to rise. Staff recommends to reevaluate this WQO. Chloride, a component of salinity, also concentrates at the Salton Sea. Because WQO for chloride are not listed in the Basin Plan, 304(a) aquatic life criteria apply, which are 860 mg/L for the acute criterion and 230 mg/L for the chronic criterion, both for freshwater. Chloride criteria for saltwater have not been established. Staff recommends developing site-specific WQOs for the Salton Sea and/or its tributaries for selenium, salinity, chloride, and/or other pollutants as necessary.
Public Comments	None
Status	Pending
Type	Basin Plan Amendment
Basin Plan	Chapter 3, Section 3.C
Projected Staff Resources	2.2
Expected Completion by December 2026	No

Project 27: Salton Sea Watershed Ammonia TMDL

Description	The Salton Sea, Alamo River and Imperial Valley Drains are 303(d) listed for ammonia. Projects are already underway to develop TMDLs for ammonia at Coachella Valley Stormwater Channel (CVSC), and ammonia and nutrients at the New River. Staff proposes to develop a TMDL for ammonia for the entire Salton Sea Watershed. This project will incorporate the CVSC and New River proposed TMDLs after they are submitted to USEPA.
Public Comments	None
Status	Pending
Type	TMDL Plan
Basin Plan	Chapter 4, Section V
Projected Staff Resources	0.7
Expected Completion by December 2026	No

APPENDIX C: 2023 TRIENNIAL REVIEW LIST PRIORITIZATION RANKING

Project Title	Ongoing project (30)	Salton Sea (10)	EJ or Tribal (10)	Completion (10)	Groundwater (15)	Public interest (10)	Time sensitivity (10)	Impairments (5)	Beneficial Uses (5)	Total Score
1. Salton Sea Watershed, Alamo River Chloride, Indicator Bacteria, and Toxicity TMDLs	30	8	8	2	0	9	8	5	3	73
2. Salton Sea Watershed, New River Ammonia, Nutrients, and Toxicity TMDLs	30	8	8	3	0	9	5	5	3	71
3. Salton Sea Dissolved Oxygen and Nutrients TMDLs	30	10	10	0	0	10	2	5	3	70
4. Salton Sea Watershed, Coachella Valley Stormwater Channel Ammonia, Dissolved Oxygen and Toxicity TMDLs	30	8	7	0	0	9	5	5	3	67
5. Imperial Valley Pyrethroid Pesticides TMDLs	30	7	8	3	0	5	5	5	3	66
6. Salton Sea Beneficial Use Review	30	10	6	0	0	6	3	2	5	62
7. Beneficial Use Designation for Salton Sea Constructed Aquatic Habitats	30	8	10	9	0	2	10	3	5	47

Project Title	Ongoing project (30)	Salton Sea (10)	EJ or Tribal (10)	Completion (10)	Groundwater (15)	Public interest (10)	Time sensitivity (10)	Impairments (5)	Beneficial Uses (5)	Total Score
8. Adopt Region-Wide Water Quality Objectives Based on USEPA 304(a) Criteria	0	7	5	8	0	8	10	4	4	46
9. Adopt Secondary MCLs as Ground- and Surface Water Quality Objectives	0	6	7	6	10	5	5	3	4	46
10. Salton Sea Watershed Bacteria TMDL	0	10	10	7	0	10	2	4	3	46
11. Salton Sea Arsenic TMDL	0	10	10	6	0	10	2	4	3	45
12. Salton Sea Toxicity TMDL	0	10	10	6	0	10	2	4	3	45
13. Salton Sea DDT and DDE TMDLs	0	10	10	5	0	10	2	4	3	44
14. Delineate Groundwater Beneficial Uses by Groundwater Subbasin and/or Aquifer	0	2	4	8	10	6	8	0	5	43
15. Designate Tribal Beneficial Uses for Specific Water Bodies	0	4	10	9	1	6	5	2	5	42
16. Tribal Beneficial Uses Definitions and Administrative Updates to the Basin Plan	0	5	10	10	0	6	5	0	5	41

Project Title	Ongoing project (30)	Salton Sea (10)	EJ or Tribal (10)	Completion (10)	Groundwater (15)	Public interest (10)	Time sensitivity (10)	Impairments (5)	Beneficial Uses (5)	Total Score
17. Administrative Update to the Basin Plan	0	5	9	4	3	10	6	0	2	39
18. Imperial Valley Drains Toxicity TMDL	0	6	10	6	0	5	2	4	3	36
19. OWTS Prohibitions in Areas Where OWTS Pose a Threat to Water Quality	0	2	6	0	10	7	6	0	3	34
20. Designate Beneficial Uses for Listed and Unlisted Waterbodies, and Apply Beneficial Uses of Listed Water Bodies to Their Unlisted Tributaries	0	3	4	7	5	2	5	2	5	33
21. Designating COMM (Commercial and Sport Fishing) Beneficial Use in Applicable Regional Waters	0	0	5	7	0	5	5	5	5	32
22. General Prohibition of Unpermitted Waste Discharges that Pose a Threat to Water Quality	0	4	5	5	5	4	6	0	3	32
23. Palo Verde Outfall Drain and Lagoon Chloride and Indicator Bacteria TMDLs	0	0	7	4	0	2	10	5	3	31

Project Title	Ongoing project (30)	Salton Sea (10)	EJ or Tribal (10)	Completion (10)	Groundwater (15)	Public interest (10)	Time sensitivity (10)	Impairments (5)	Beneficial Uses (5)	Total Score
24. Groundwater Numeric Water Quality Objectives in Indio Subbasin	0	3	5	0	10	4	5	0	4	31
25. Colorado River Toxicity TMDL	0	2	7	0	0	2	5	4	3	23
26. Salton Sea Watershed Site-Specific Objectives	0	10	10	9	0	10	6	4	3	22
27. Salton Sea Watershed Ammonia TMDL	0	10	10	9	0	10	2	5	3	19

APPENDIX D: RESPONSE TO COMMENTS ON DRAFT STAFF REPORT

Colorado Basin Water Board staff solicited input from interested persons during a 30-day public comment period that began on September 25, 2023, and ended on October 24, 2023. The written comments on the Draft Staff Report submitted during the comment period are listed in **Table 6** below.

Table 6: Comments Received on Draft Staff Report

Commentor	Submittal Date
Matthew Mitchell, Policy Analyst U.S. Environmental Protection Agency (USEPA), Water Division, Standards and Assessment Section	October 24, 2023
Lilian Garcia, Executive Officer United for Justice Inc. (UFJ)	October 24, 2023

USEPA-1

Subject: N/A

Comment: The Colorado River Basin Water Board should adopt site specific criteria for additional pollutants to address priority water quality goals where the California Toxics Rule criteria or Basin Plan objectives are not consistent with current science.

Response: Site-specific criteria will continue to be incorporated through individual permitting actions that are specific to the waterbodies and impairments. Multiple projects in the 2023 Triennial Review List will require site-specific criteria for implementation.

USEPA-2

Subject: Basin Plan, Chapter 2

Comment: The Colorado River Basin Water Board should review all waterbody designations and add Commercial and Sport Fishing (COMM) as a designated beneficial use to any freshwaters that should be covered for recreational/ sport fishing for consumption.

Response: Staff have added a new project to designate COMM as a beneficial use for surface waters, where such uses are applicable. See project number 21 in Appendix B for more detail.

UFJ-1

Subject: Basin Plan, Ch. 4, § V

Comment: The Colorado River Basin Water Board has not developed enough Total Maximum Daily Loads (TMDLs) to address the increasing number of impairments on the Clean Water Act Section 303(d) List. As the Salton Sea recedes, its residents will be exposed to airborne particles and toxic air contaminants. In 2012, the 303(d) List included 68 listings. In 2018, another 24 listings were added. Unlike other regions, there are several sources of pollution within the Colorado River Basin Region. Therefore, the Colorado River Basin Water Board must prioritize the development of TMDLs, and in particular, TMDLs for the Salton Sea and its tributaries, the Coachella Valley, and the Imperial Valley Drains.

Response: Despite considerable challenges, the Colorado River Basin Water Board has already made significant progress towards addressing many of the impairments identified in the 303(d) List. The 303(d) List currently contains 110 combinations of waterbodies and impairments. Seven of these listings have already been addressed by TMDLs that are currently in place. Another six combinations are being addressed through TMDL alternatives (e.g., Irrigated Lands Regulatory Program). Additionally, the USEPA is currently reviewing adopted TMDLs that address another 30 combinations; USEPA approval is expected by the end of the year. All of these activities are focused exclusively on the Salton Sea watershed (which includes Coachella Valley surface waters and Imperial Valley Drains).

Colorado River Basin Water Board staff are currently developing TMDLs to address an additional 18 pollutant/waterbody combinations. These TMDLs will be presented to the Board for adoption starting in the next calendar year. Further, the top seven Basin Plan Amendment projects in the 2023 Triennial Review Staff Report are all focused on the Salton Sea watershed.

UFJ-2

Subject: Basin Plan, Ch. 6, § II.F, p. 6-8 (TMDLs Compliance Assurance and Enforcement)

Comment: The Water Quality Control Plan for the Colorado River Basin Region (Basin Plan) provides that “[t]he Executive Officer shall use, as the circumstances of the case may warrant, any combination of the following actions to ensure that the water pollution threats identified in TMDLs are

promptly and effectively corrected." None of the previously approved TMDLs have been effective or corrected.

Response: The provision cited by the Commentor lists a series of actions that may be taken by the Executive Officer to ensure that the impairments addressed by TMDLs are corrected. The enumerated actions are listed below:

- Implementation and enforcement of sections 13225, 13267, and 13268 of the Water Code to ensure that all responsible parties submit in a prompt and complete manner, the Water Quality Management Plan defined in Chapter 4, Section V.E.1.i.

- Require submission of reports of waste discharge pursuant to Water Code section 13260.

- Adoption of waste discharge requirements, pursuant to section 13263 of the Water Code, as appropriate (i.e., for any responsible party who fails to implement voluntary or regulatory-encouraged sediment controls).

- Adoption of enforcement orders pursuant to section 13304 of the Water Code against any responsible party who violates Regional Water Board waste discharge requirements and/or fails to implement voluntary or regulatory-encouraged sediment control measures to prevent and mitigate sediment pollution or threatened pollution of surface waters.

- Adoption of enforcement orders pursuant to section 13301 of the Water Code against those who violate Regional Water Board waste discharge requirements and/or prohibitions.

- Issuance of Administrative Civil Liability Complaints, pursuant to sections 13261, 13264, or 13268 of the Water Code, against any responsible party who fails to comply with Regional Water Board orders, prohibitions, and requests.

- Adoption of referrals of recalcitrant violators of Regional Water Board orders and prohibitions to the

District Attorney or Attorney General for criminal prosecution or civil enforcement. [1]

None of these actions involve the adoption or revision of TMDLs. However, the Colorado River Basin Water Board routinely utilizes the referenced Water Code sections when developing Waste Discharge Requirements and Monitoring and Reporting Programs, and when required to enforce those orders.

A TMDL is a basin planning action that establishes load allocations for pollutants that are impairing the beneficial uses of the water body. The TMDL is implemented in permits issued to discharge to those waterbodies. Enforcement associated with the TMDL would occur as a result of violations of the permit.

UFJ-3

Subject: Basin Plan, Ch. 6, § II.F.1.i(d)-(e), p. 6-11

Comment: The Colorado River Basin Water Board's TMDL for Silt and Sedimentation in the Imperial Valley Drains requires Board staff to track the implementation of sediment control activities, and report on such activities to the Board on a yearly or more frequent basis. Staff are further required to prepare an annual "report assessing compliance with the TMDL Goals and Milestones." There are no records of any reports being prepared for any of the Board's nine TMDLs.

Response: Although the Commentor references nine TMDLs, the cited requirements are only applicable to the TMDL for Silt and Sedimentation in Imperial Valley Drains. It does not apply to the other existing TMDLs. In any event, the Colorado River Basin Water Board has produced Water Quality Report Cards for Imperial Valley Drains and presented annual program updates on TMDLs and Basin Planning activities.

[1] It should be noted that the authority to take many of the listed actions, such as the adoption of waste discharge requirements orders and certain enforcement orders, cannot be delegated to the Executive Officer. (Wat. Code, § 13223, subd. (a).)

UFJ-4

Subject: N/A

Comment: The Colorado River Basin Water Board should conduct monitoring in designated areas within the Salton Sea and its tributaries, as well as within the Imperial and Coachella Valley Drains. Monitoring should also be conducted at the drains' point of entry to the Salton Sea. Such monitoring would help determine the source of pollution. This request was made more than 3 years ago and has yet to be fulfilled. The monitoring of harmful algal blooms should also be a priority to take precautions and protect public health, and the ecosystem. Monitoring should be done year-round, and locations of testing should be changed throughout the year to obtain an accurate assessment.

Response: It should be noted at the outset that the requested monitoring activities are not related to the 2023 Triennial Review Staff Report that is currently being considered for adoption. That said, the Colorado River Basin Water Board monitors the New River, the Alamo River, and the Coachella Valley Stormwater Channel twice a year through the Surface Water Ambient Monitoring Program. All waterbodies in the region are sampled for a suite of constituents tied to their impairments. Salton Sea tributaries are monitored from the headwaters to where they discharge to the Sea. Data is available in the California Environmental Data Exchange Network (CEDEN; https://ceden.waterboards.ca.gov) on a rolling basis as data is entered. Harmful algal blooms are monitored in the Salton Sea around holidays when recreation at the sea is most likely. Unfortunately, monitoring is limited by funding availability.

The Colorado River Basin Water Board is currently working with the Department of Water Resources and California Natural Resources Agency to sample the Salton Sea quarterly for three years at various locations within the Sea. The first sampling occurred in November 2023; results are pending.

Monitoring other bodies of water including the Imperial Valley and Coachella Valley Drains is dependent of the availability of funding. However, the Irrigated Lands General Orders require monitoring of the drains and rivers. All other dischargers, such as those permitted under the National Pollutant Discharge Elimination Systems Program, are also required to monitor discharges and receiving waters. Data collected as part of these programs is housed in CEDEN or the California Integrated Water Quality System (CIWQS). The Colorado River Basin Water Board is always looking for funding for ambient water quality monitoring, especially concerning the Salton Sea. However, funding is often limited and competitive. We will continue to look for sources of funding and agencies to work with to help

continue monitoring the Salton Sea, its tributaries and the Coachella Valley and Imperial Valley Drains.

UFJ -5

Subject: N/A

Comment: The New River should be monitored for the larger number of constituents, as was done from 1997 to July 2008. Per the Basin Plan, New River, parameters are being monitored in the New River, but the data available online does not reflect this.

Response: The requested monitoring activities are not related to the 2023 Triennial Review Staff Report that is currently being considered for adoption. The Colorado River Basin Water Board monitors the New River at the International Boundary monthly and has for decades. The monitoring conducted between 1997 and 2008 was bolstered by additional funding that ceased in mid-2008. The Colorado River Basin Water Board had to prioritize constituents to analyze with a smaller budget. The current constituents were chosen and continually monitored since then. If the budget allows or if additional funding is secured, a reevaluation of constituents will be conducted.

UFJ-6

Subject: N/A

Comment: The Colorado River Basin Water Board should investigate for noncompliance those permitted waste discharges in the Colorado River Basin Region that discharge directly/indirectly into the Salton Sea and its tributaries/Imperial/Coachella Drains.

Response: The requested activities are not related to the 2023 Triennial Review Staff Report that is currently being considered for adoption. The Board's permittees are continually monitored for compliance with their Waste Discharge Requirements (WDRs). Permit violations are evaluated and appropriate enforcement actions are implemented.