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Update to the Salinas Valley Integrated Hydrologic and Operational Models

Prepared for:

Salinas Valley Basin
Groundwater Sustainability Agency

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Prepared for:

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Prepared by:

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ACRONYMS & ABBREVIATIONS

AEM .... Airborne Electromagnetic Survey
AET .... Actual Evapotranspiration
AF .... acre-feet
AF/yr .... acre-feet per year
ASGSA .... Arroyo Seco GSA
ASR .... aquifer storage and recovery
cfs .... cubic feet per second
CSIP .... Castroville Seawater Improvement Project
DEM .... Digital Elevation Model
DIW .... Deep Injection Wells
DWR .... California Department of Water Resources
EKI .... EKI Environment & Water
ET .... evapotranspiration
FMP .... Farm Process
GEMS .... Groundwater Extraction Management System
GHB .... General Head Boundaries
GPD .... gallons per day
GSA .... Groundwater Sustainability Agency
GSP .... Groundwater Sustainability Plan
HCM .... hydrogeologic conceptual models
HFB .... horizontal flow barriers
HGU .... hydrogeologic unit
HOB .... Hydraulic-Head Observation Package
ITRC .... Irrigation Training & Research Center
M&A .... Montgomery & Associates
M&I .... Municipal and Industrial
MAE .... Mean Absolute Error
MCWD .... Marina Coast Water District
MCWRA .... Monterey County Water Resources Agency
MFR .... Mountain Front Recharge
MNW2 .... Multi-Node Well 2 Package
MODFLOW .... Modular Groundwater Flow Model
PAL .... primary aquifer layer
PCE .... tetrachloroethylene
PEST .... Parameter Estimation
PET .... potential evapotranspiration
RMS .... Representative Monitoring Sites
RMSE .... Root Mean Squared Error

RMSE	Root Mean Squared Error
SFR	Stream Flow Routing package
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SSWM	Seaside Watermaster
SVBGSA	Salinas Valley Basin Groundwater Sustainability Agency
SVIHM	Salinas Valley Integrated Hydrologic Model
SVOM	Salinas Valley Operations Model
SWIM	Seawater Intrusion Model
SWRCB	State Water Resources Control Board
TCE	trichloroethylene
USGS	U.S. Geological Survey
WBS	Water Balance Subregion
WY	Water Year

1 INTRODUCTION

On behalf of the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA), Montgomery & Associates (M&A) updated the Salinas Valley Integrated Hydrologic Model (SVIHM) to reflect the most current understanding of the groundwater basin. These updates enhance the model's utility for SVBGSA's Sustainable Groundwater Management Act (SGMA) compliance and long-term groundwater sustainability efforts. M&A worked closely with EKI Environment & Water (EKI), who provides groundwater modeling support for Marina Coast Water District (MCWD).

The U.S. Geological Survey (USGS) developed the SVIHM and publicly released it in April 2025. The SVIHM simulates historical conditions and serves as the foundation for its predictive version, the Salinas Valley Operational Model (SVOM), which is used for future projections. While the SVIHM and SVOM are the best available tools for groundwater management in the Salinas Valley, their development began prior to the development of Groundwater Sustainability Plans (GSPs) and for objectives that were not entirely aligned with SGMA compliance needs. Since GSP development, SVBGSA and partner agencies have collected additional data to enhance understanding of the groundwater basin and its conditions. In response to seawater intrusion present in the coastal aquifers, M&A developed the Salinas Valley Seawater Intrusion Model (SWIM) on behalf of SVBGSA. The SVIHM and SWIM were updated concurrently, using the same aquifer framework and similar model parameters.

This marks the first update to the models since their public release by the USGS. Several aspects of the SVIHM were updated to better align with the current hydrogeologic conceptual model and improve accuracy of model results. These enhancements include:

- Incorporation of new data unavailable during the original USGS model development
- Structural updates to the model grid, layering, and zonation
- Improved representation of surface water features to simulate groundwater-surface water interactions
- Refined input parameters, including municipal and agricultural pumping
- Updated boundary conditions at the model domain margins

These updates were completed by M&A in coordination with SVBGSA, MCWD, Monterey County Water Resources Agency (MCWRA), Seaside Watermaster (SSWM), and Arroyo Seco GSA (ASGSA). This report summarizes changes made to the SVIHM. Updates to the SWIM and SVOM will be documented separately. For detailed descriptions of the original conceptual model and numerical model setup, refer to the pre-print USGS model summary report by Henson *et al.*

(2025); these details are not repeated here. The location of the model grid and maximum active extent are shown on Figure 1.

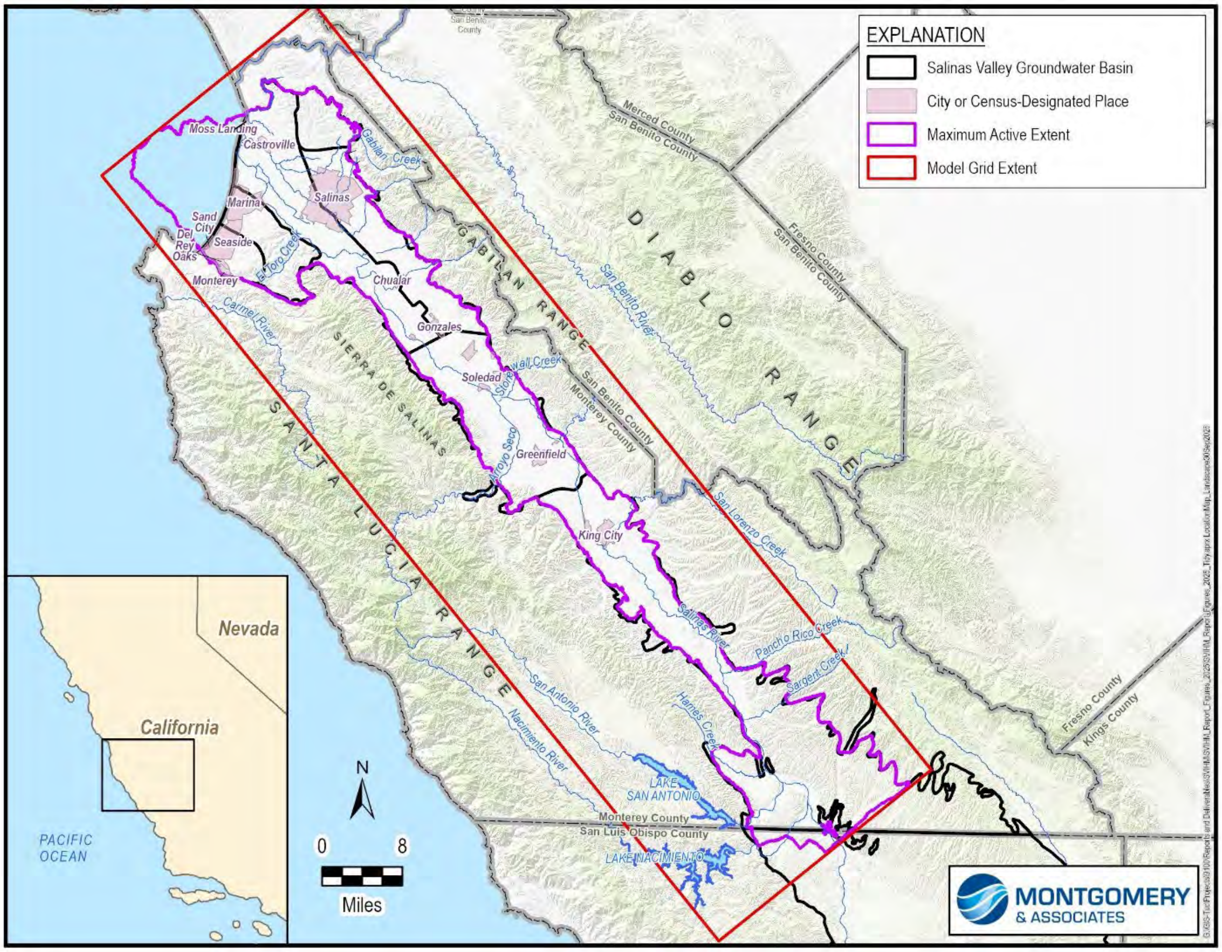

Figure 1. Location of the Updated SVIHM

2 MODEL BACKGROUND

In 2016, the County of Monterey and MCWRA contracted the USGS California Water Science Center to develop the suite of geologic and hydrogeologic models referred to as the Salinas Valley Hydrologic Models, 2 of which are the SVIHM and SVOM. The primary purpose of model development was to inform the County's 5-year (2014 – 2018) hydrologic study of the water supply and groundwater quality in the MCWRA's Zone 2C as part of a settlement agreement (Monterey County, 2010).

During GSP development, SVBGSA determined the SVIHM and SVOM were the best tools available for developing GSP water budgets and initial simulations of projects and management actions. Prior to the public release, the USGS provided provisional versions to MCWRA and SVBGSA under a cooperating partner agency agreement for GSP development and implementation, among other purposes. After GSP development, the USGS updated the models based on new information and a review process with collaborative agencies. In April 2025, the USGS released the models to the public. These versions of the models were improved over the provisional versions; however, based on model review, M&A recommended that certain model components be updated to improve these tools for managing groundwater resources in the Salinas Valley.

The SVIHM and SVOM are integrated hydrologic flow models developed using the modeling software MODFLOW-OWHM (Hanson *et al.*, 2014; Boyce *et al.*, 2020; Boyce, 2023), a robust platform designed for simulating conjunctive use of surface water and groundwater in complex agricultural basins. The SVIHM and SVOM were developed based on multiple components from the Salinas Valley Hydrologic Models, including:

- Salinas Valley Geologic Model – this model provides the hydrogeologic framework and model layering based on the understanding of the extents, depths, and properties of the aquifers and aquitards at the time of model development. Updates to the geologic model are described in this report.
- Salinas Valley Watershed Model – this model uses precipitation and temperature to simulate surface water inflows to the groundwater basin. It has a larger geographic area than the groundwater flow models based on watersheds that provide inflow into the Monterey County reservoirs and tributaries to the Salinas River. The watershed model is unchanged from the USGS release.
- Groundwater Flow Models – SVIHM and SVOM are designed to use data for land and water use, climate, and reservoir releases to simulate landscape water demands, diversions, and reclaimed wastewater use. The models use the MODFLOW Farm Process

(FMP) to dynamically simulate conjunctive use of groundwater and surface water to meet agricultural (or landscape) water demands.

The Salinas Valley Groundwater Basin is an alluvial basin underlying the elongated, intermountain valley of the Salinas River, which flows from the southeast to the northwest into Monterey Bay. The Salinas River watershed includes the Sierra de Salinas and Santa Lucia Range to the west and the Gabilan and Diablo Ranges to the east (Figure 1).

3 MODEL UPDATES

The USGS released the public version of the SVIHM in April 2025. Description of the framework, model code, and other details can be found in the USGS SVIHM and SVOM model summary report (Henson *et al.*, 2025). This section focuses on updates to the model conducted by M&A and modifications to the Monterey Subbasin area by EKI on behalf of MCWD. Primary structural updates include modifications to the model grid, model layering and active extent, surface water network elevations, and farm process. Boundary conditions modified include general head boundaries (GHB), pumping inputs, and horizontal flow barriers (HFB).

3.1 Spatial Discretization and Model Grid

Model review identified that the original USGS grid used to develop the model inputs is not rectangular and is slightly skewed, while the actual grid the model uses is rectangular. This leads to mismatches between the locations of model input and output data. The non-orthogonal grid results in an inconsistency between the spatial locations of the model outputs and the associated input source data. Figure 2 compares the extent of model inputs based on a shapefile provided by the USGS as shown by the red outline, with the locations of model outputs based on the grid dimensions as shown by the green rectangle. The spatial offset is several thousand feet in the northern end of the model and smaller at the southern end of the model domain.

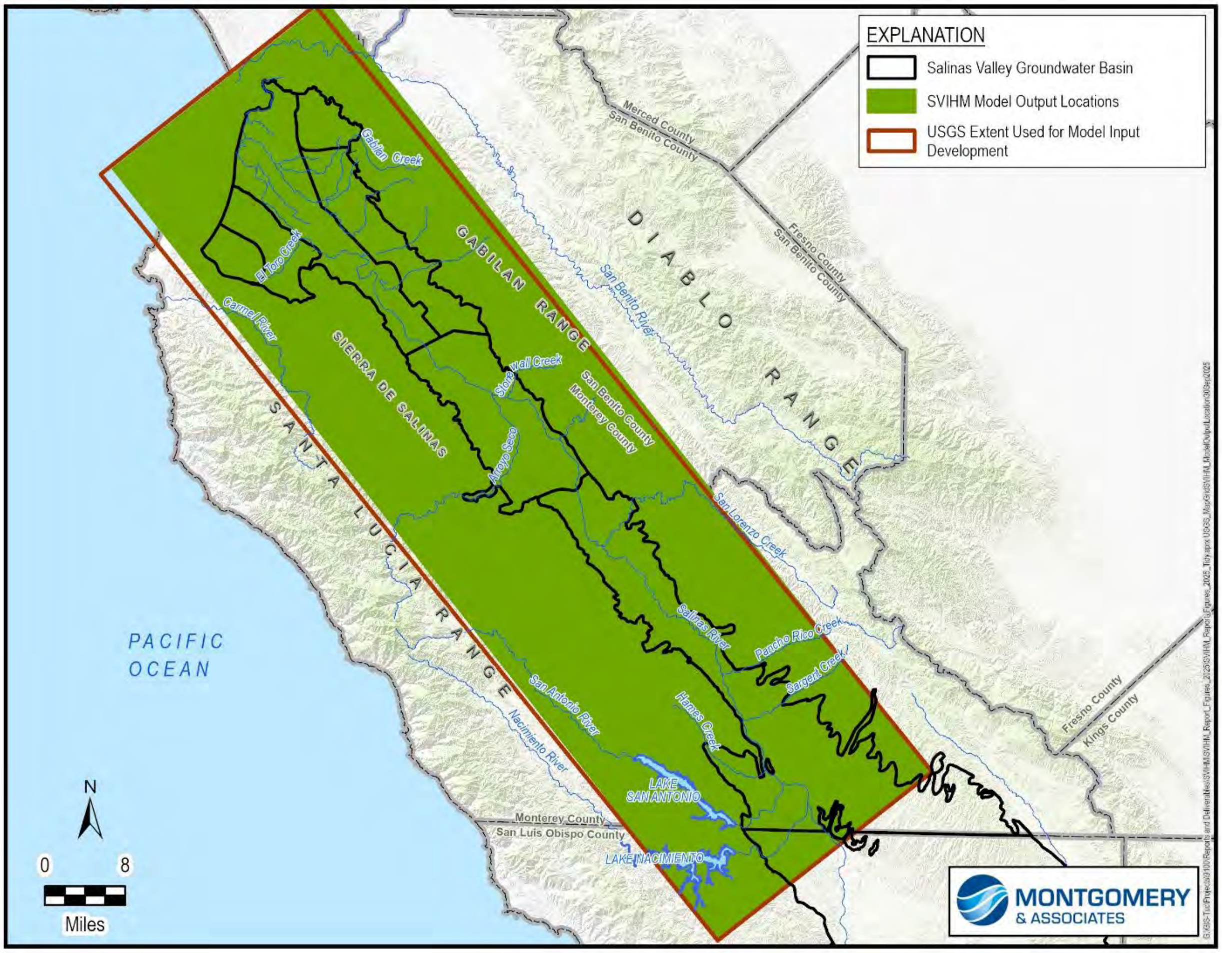

Figure 2. SVIHM Model Grid Extent Showing Offset from Spatial Extent of Source Data

To correct this issue, a new rectangular model grid was developed that matches the existing USGS model grid as closely as possible. The same row and columns indices match along the center of the model but are offset by up to 1 model cell (approximately 530 feet) along the margins of the model. Figure 3 shows the updated rectangular grid used for this model update.

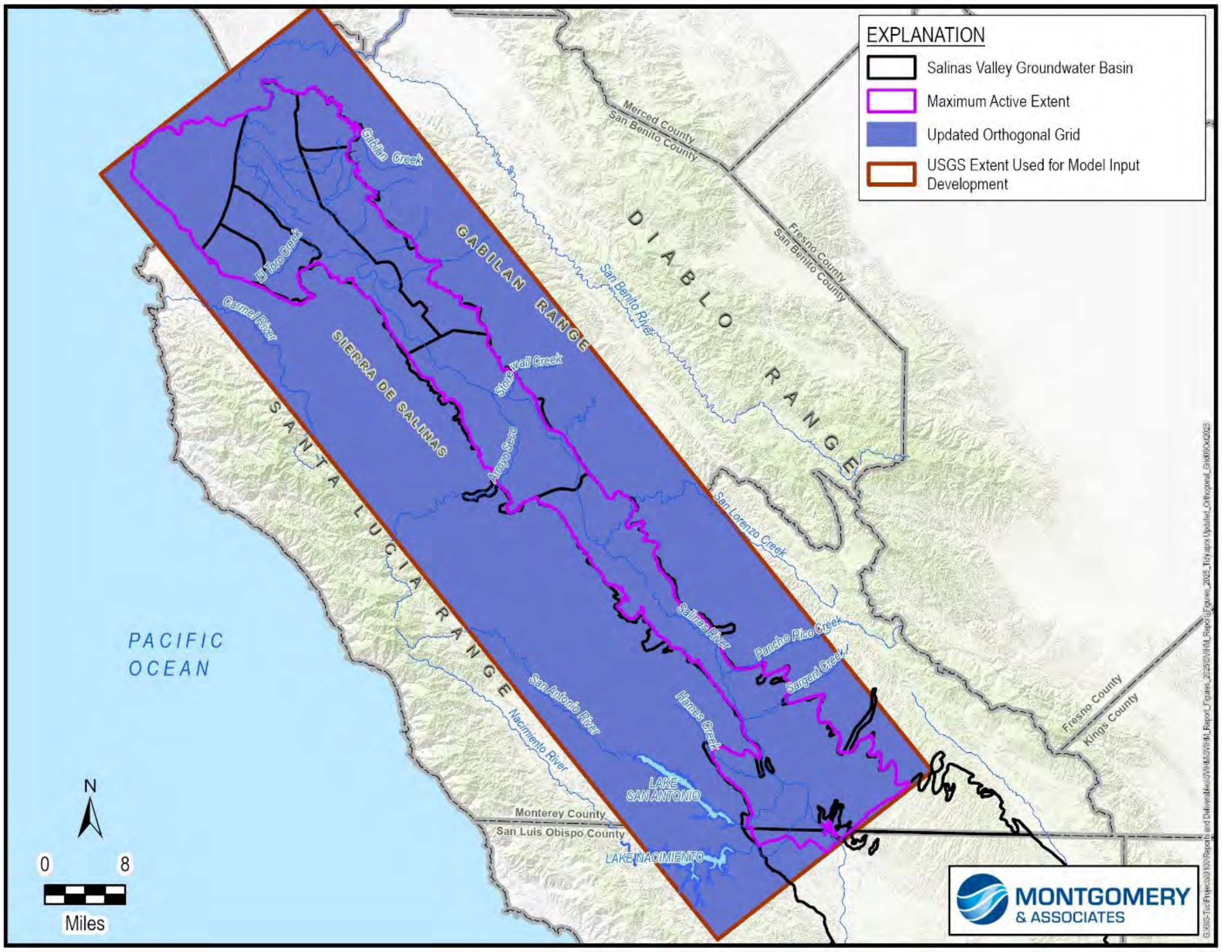

Figure 3. Updated SVIHM Model Grid Extent Showing Corrected Offset from Spatial Extent of Source Data

Table 1 lists the specifications for the updated model grid.

Table 1. Updated Model Grid Specifications

X – origin (feet)	Y – origin (feet)	Azimuth (degrees)	X- spacing (feet)	Y-spacing
5,994,226.007	1,753,483.786	38.86889024	530.3030294	527.8728599

Note: Coordinates are provided in NAD83 California State Plane 0404

3.2 Geologic Framework and Model Layering

The USGS characterizes the Salinas Valley hydrostratigraphy using 9 model layers. From shallowest (layer 1) to deepest (layer 9), the model layers represent Shallow Sediments, Salinas Valley Aquitard or Equivalent, 180-Foot Aquifer or Equivalent, 180/400-Foot Aquitard or Equivalent, 400-Foot Aquifer or Equivalent, Deep Aquitard or Equivalent, Deep Aquifers (Paso Robles Formation) or Equivalent, Deep Aquifers (Purisima or Santa Margarita Formation) or Equivalent, and Bedrock (Monterey Formation or granite).

Recently collected data provide a refined and more accurate interpretation of the geology underpinning the model layering. The SVIHM was developed based on known hydrogeology at the time of model development. Since the initial development of the model layering, a substantial amount of geologic and geophysical information for the Salinas Valley has been compiled.

Table 2 shows the model layers and their respective generalized hydrogeologic unit (HGU) or aquifer, and provides a comparison of the model layering between the original USGS version of the model and the current updated version.

Table 2. Model Layer Generalized Hydrogeologic Units

Updated Model Layering	USGS Model Layering	Generalized Hydrogeologic Unit
1	1	Shallow Sediments
2	2	Salinas Valley Aquitard or Equivalent
3	3	180-Foot Aquifer or Equivalent
4		
5		
6	4	180/400 Foot Aquitard or Equivalent
7	5	400-Foot Aquifer or Equivalent
8	6	Deep Aquitard or Equivalent
9	7	Deep Aquifers (Paso Robles Formation) or Equivalent
10	8	Deep Aquifers (Purisima/Santa Margarita Formation) or Equivalent
11	9	Bedrock (Monterey Formation)

M&A developed a refined geologic model, using Leapfrog Geo software, with model layers based on new information and/or new interpretations, aided by airborne-electromagnetic (AEM) surveys completed by DWR (2020, 2022), and as part of the Salinas Valley Deep Aquifers Study (M&A, 2024). This geologic model was used to update the hydrogeologic conceptual models (HCMs) for the Salinas Valley subbasins in support of GSP Periodic Evaluations. The AEM data allowed for refinement of the depth and extent of clay layers and the contacts with bedrock in the form of either crystalline rocks or the Monterey Formation located within the Salinas Valley. The AEM data were coupled with geologic borehole data to better delineate aquifers and the aquitards that separate them. Important changes to the model layering include:

- Splitting the 180-Foot Aquifer layer into 3 layers to incorporate the presence of an intermediate aquitard in the Monterey Subbasin, which resulted in additional model layers (from a 9-layer model to an 11-layer model [Table 2])
- Shallowing the bedrock contacts along the basin margins, including the Eastside Subbasin bedrock depth near the Gabilan Range, the Langley Subbasin bedrock depth near the Gabilan Range, the Monterey Bay geologic formations and bathymetry, and through the uplifted areas of the Corral de Tierra region of the Monterey and Seaside Subbasins
- Delineating the extent and thickness of the 400/Deep Aquitard through the Salinas Valley Basin as defined in the recently published Deep Aquifers Study (M&A, 2024)
- Refining the extents, thicknesses, and potential gaps in the shallower aquitards and clay intervals in the basin
- Converting model cells representing the Monterey Formation to no-flow cells except in the Monterey and Seaside subbasins (In the Monterey and Seaside areas, the Monterey Formation is deformed and fractured and well records indicate water production from this unit. In the rest of the basin, the limited water is produced, and a minimal number of wells are screened into this formation)

Hydrogeologic cross sections representing the updated aquifer layering along selected transects are shown on Figure 4 through Figure 7. These figures illustrate the complexity of the layering of aquifers and aquitards comprising the Salinas Valley aquifer system. Hydrogeologic units are generally delineated as single layers in the SVIHM; however, some thicker units are split into multiple model layers where variations in vertical gradients are expected within the unit or where one unit is not consistent with adjacent units. For example, the alluvial fans in the Eastside are split into model layers representing the equivalent aquifer units to the 180/400 subbasin. While the model layering is continuous to conform to the SVIHM grid requirements, alluvial fan sediments deposited along the margins of the Gabilan Range in the Eastside Subbasin are distinct hydrogeologic units from other aquifers in the middle of the valley. The updated SVIHM distinguishes between the distinct aquifer units in the same model layer using parameter zones which generally coincide with the extent of the HGUs, as described in the next section.

Further details regarding hydrogeologic conceptual models (HCM) updates for the Salinas Valley subbasins are provided in appendices of the 2024 Annual Reports submitted to DWR. As part of these layering updates, pumping wells, and groundwater elevation target locations were reviewed and reassigned to aquifer layers based on their reported or estimated screened intervals and the new layer elevations, as described later in this report.

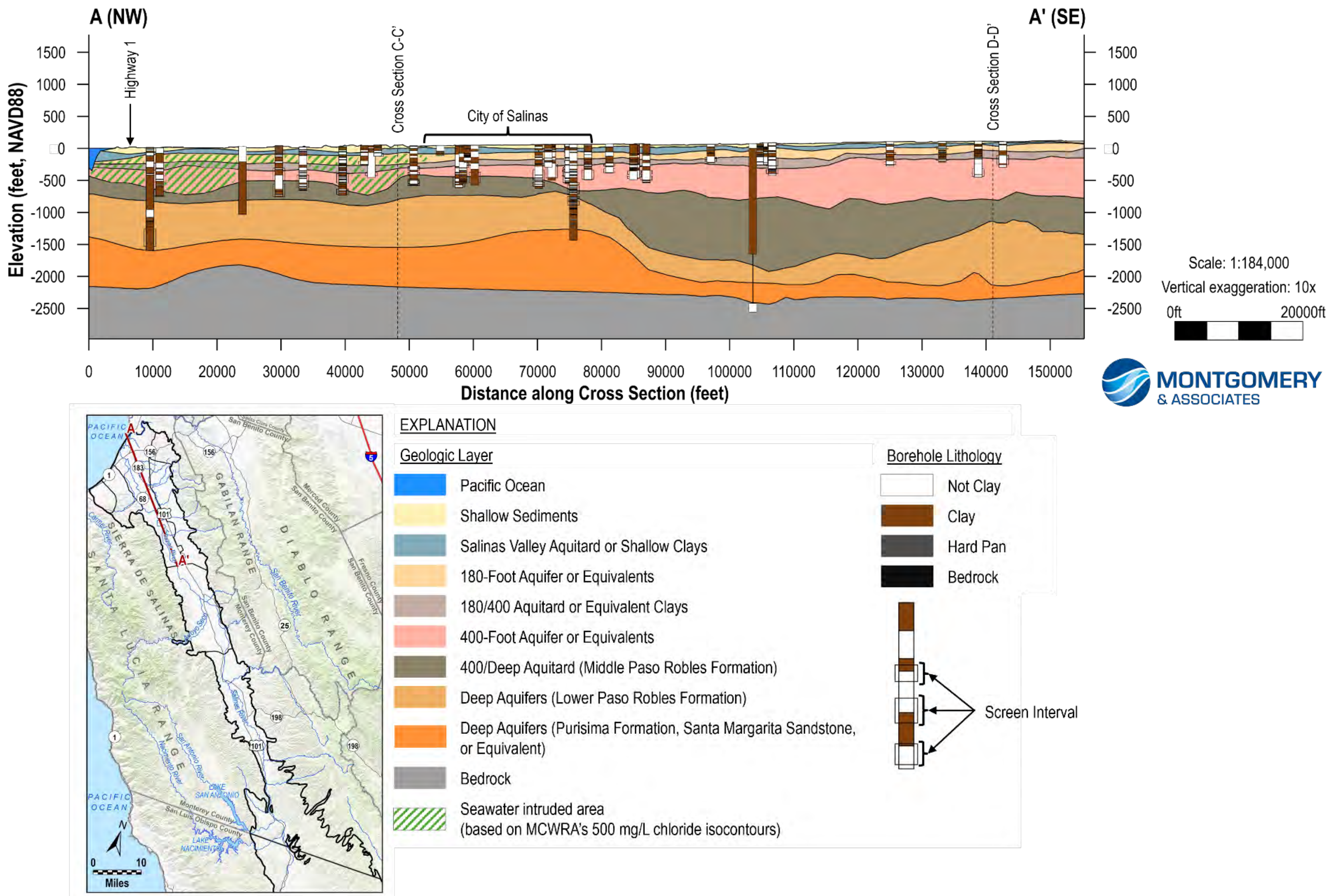

Figure 4. Geologic Cross Section from Updated Hydrogeologic Model: A-A' Valley-wide Longitudinal

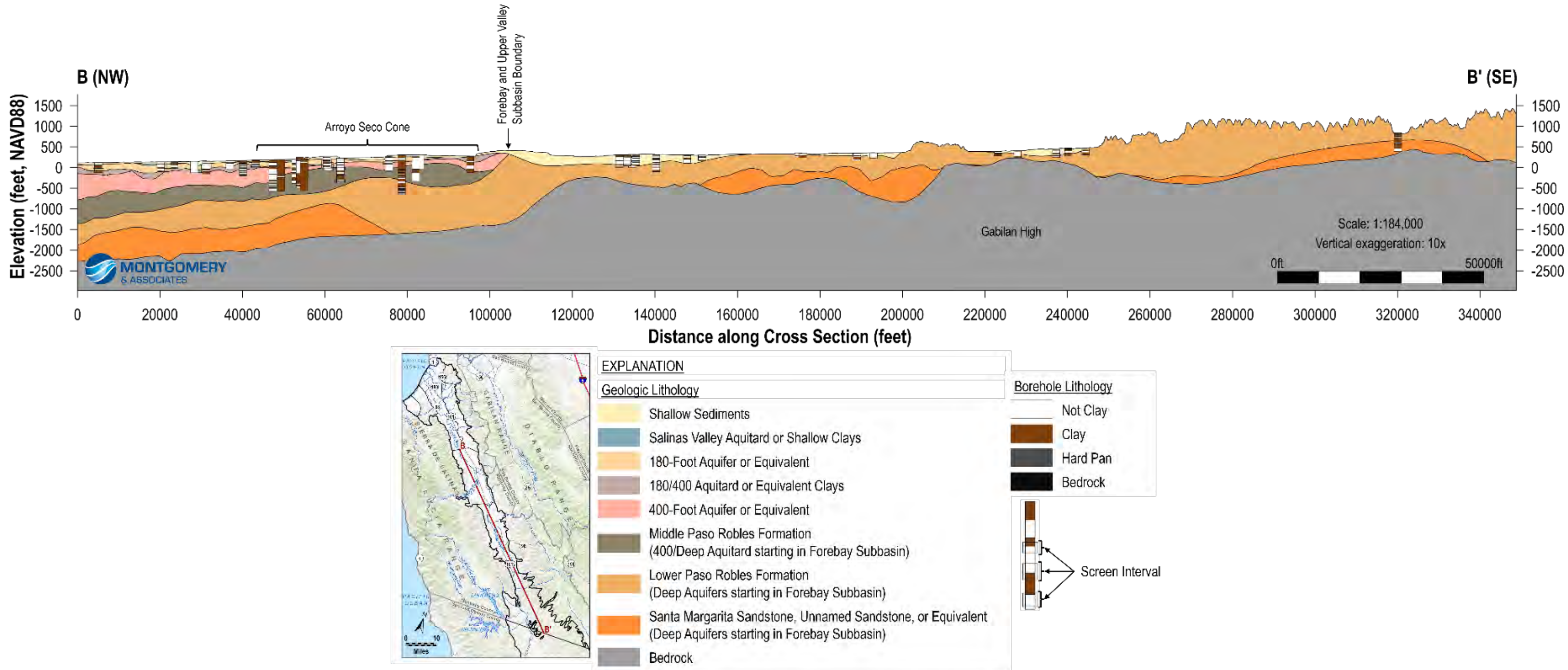

Figure 5. Geologic Cross Section from Updated Hydrogeologic Model: B-B' Valley-wide Longitudinal

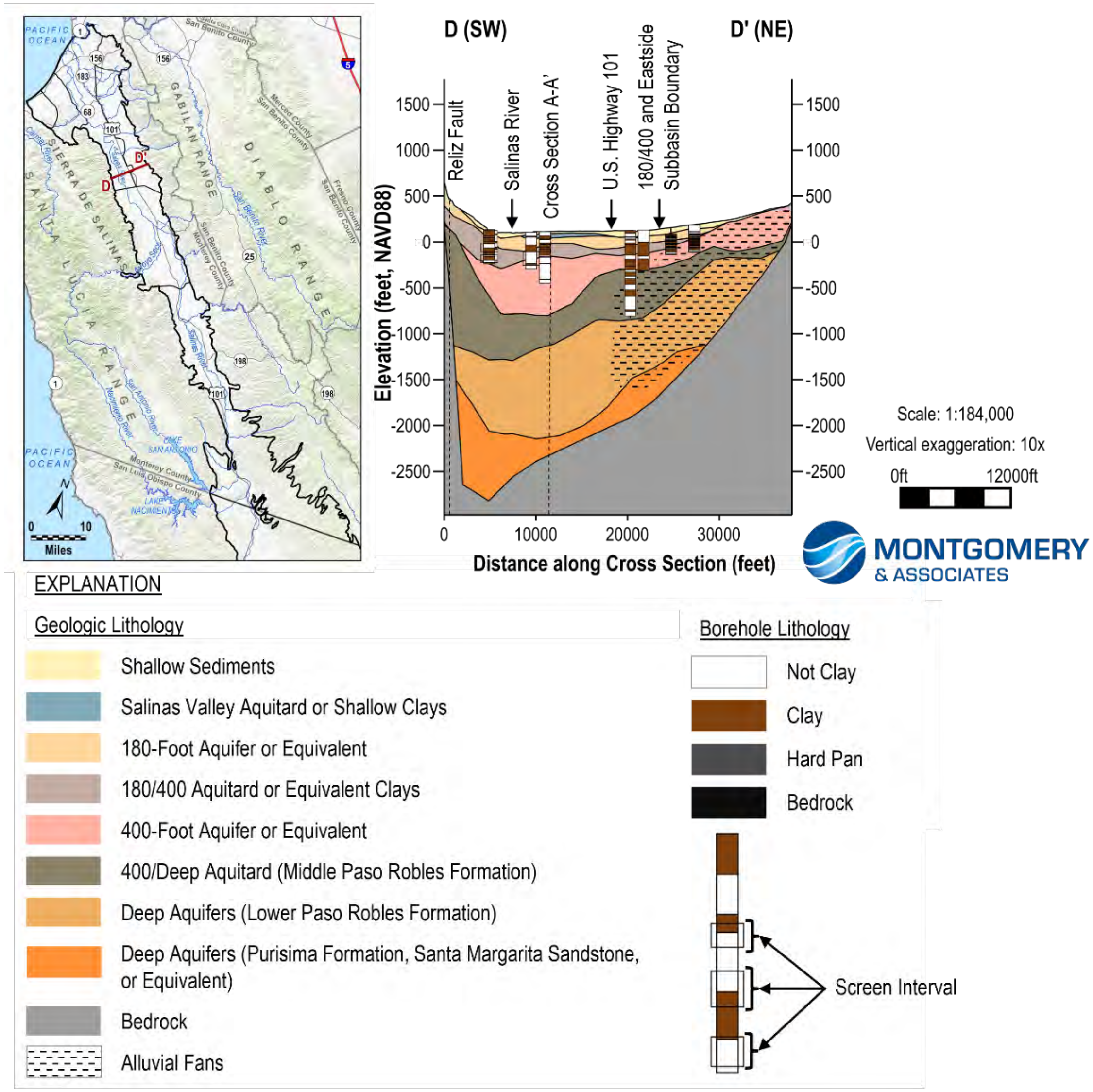

Figure 6. Geologic Cross Section from Updated Hydrogeologic Model: D-D' Valley-wide Traverse

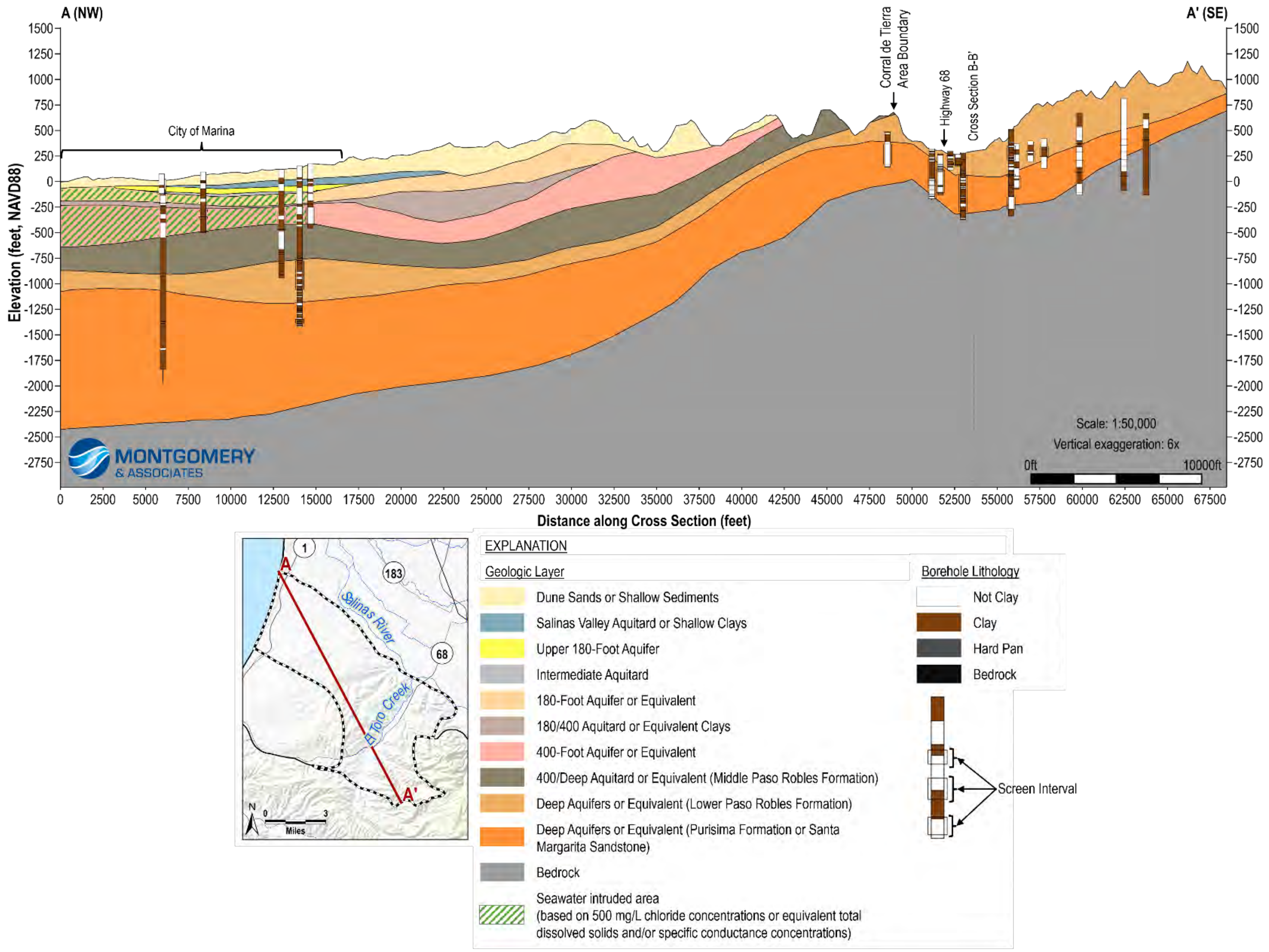

Figure 7. Geologic Cross Section from Updated Hydrogeologic Conceptual Model: A-A' Monterey Subbasin

3.3 Model Zonation of Hydrogeologic Units

Updates to the HCM were applied to the simulated HGUs. The HGUs are represented in the SVIHM through simulated hydraulic parameter zones, which generally coincide with the extent of the HGUs. Model zonation was initially developed based off the geologic framework and further subdivided to yield greater variability in hydraulic parameters. Figure 8 through Figure 18 show the simulated HGUs by model layer. The distribution of aquifer hydraulic properties is assigned to the model grid using a zonal and pilot-point based approach. Hydraulic conductivity is assigned to grid cells by interpolation between pilot points within an HGU. This approach allows for varying degrees of refinement and variability based on the amount of observed data used for calibration. A summary of the HGUs and their hydraulic properties is available in Table 3.

Within the Salinas Valley, aquitards and aquifers have varying extents and are not present in all areas, as shown on Figure 4 through Figure 7. Areas where an HGU is not present in the basin is referred to as a “pinch out.” The SVIHM uses the modeling code MODFLOW-OWHM, which is based off MODFLOW 2005. MODFLOW-OWHM is not able to simulate hydraulic connections through inactive model cells or layers; therefore, a model cell must have active cells above and below it for vertical groundwater flow to be possible. To allow vertical connectivity, model cells with pinched out HGUs were assigned a nominal thickness of 0.1 foot and given the hydraulic properties of the next active HGU below that layer. This approach is similar to the original SVIHM. These pass-through cells are shown on report figures as cells with nominal thicknesses throughout this model report. Thickness is displayed by layer in Appendix A.

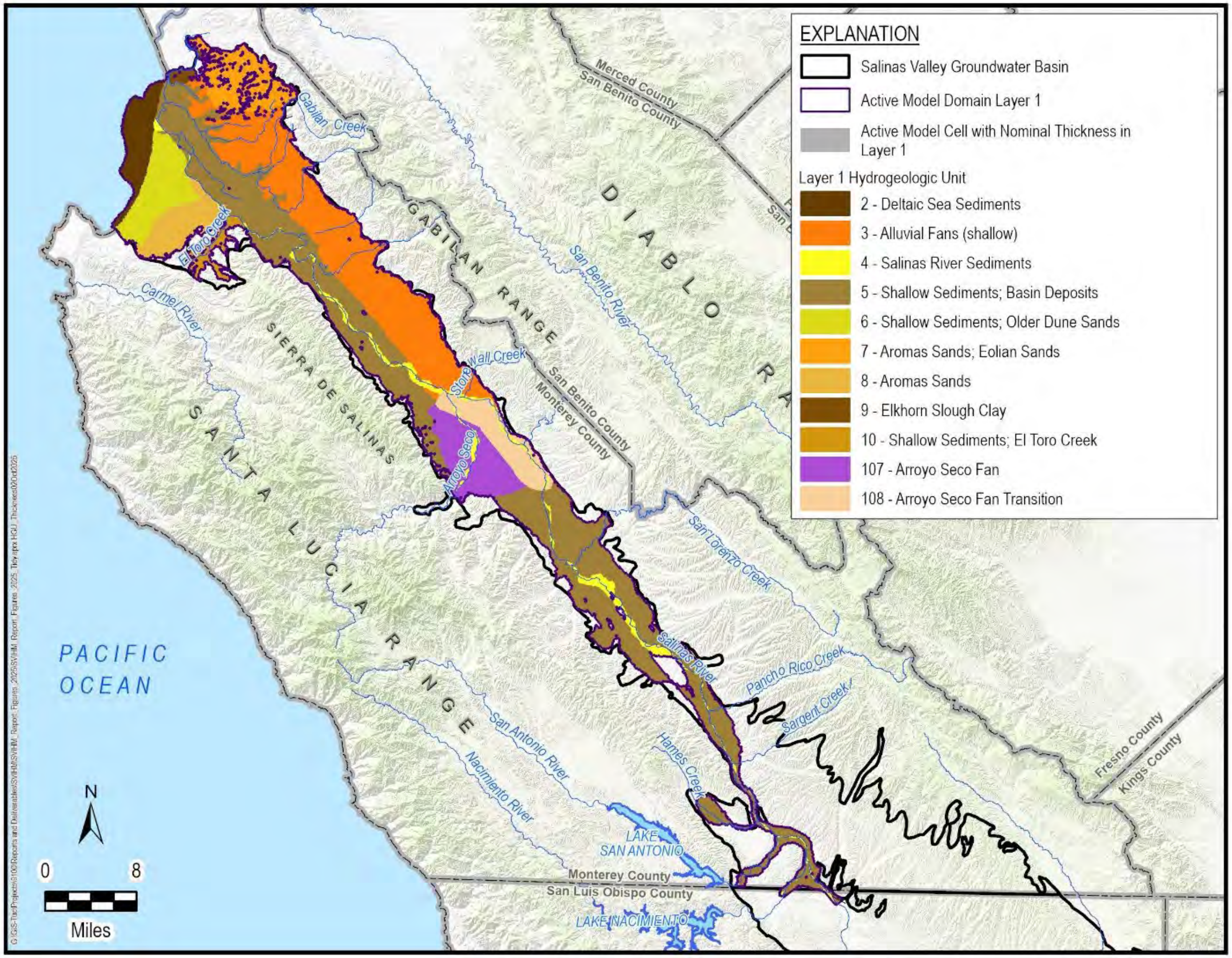

Figure 8. Simulated Hydrogeologic Units in Layer 1

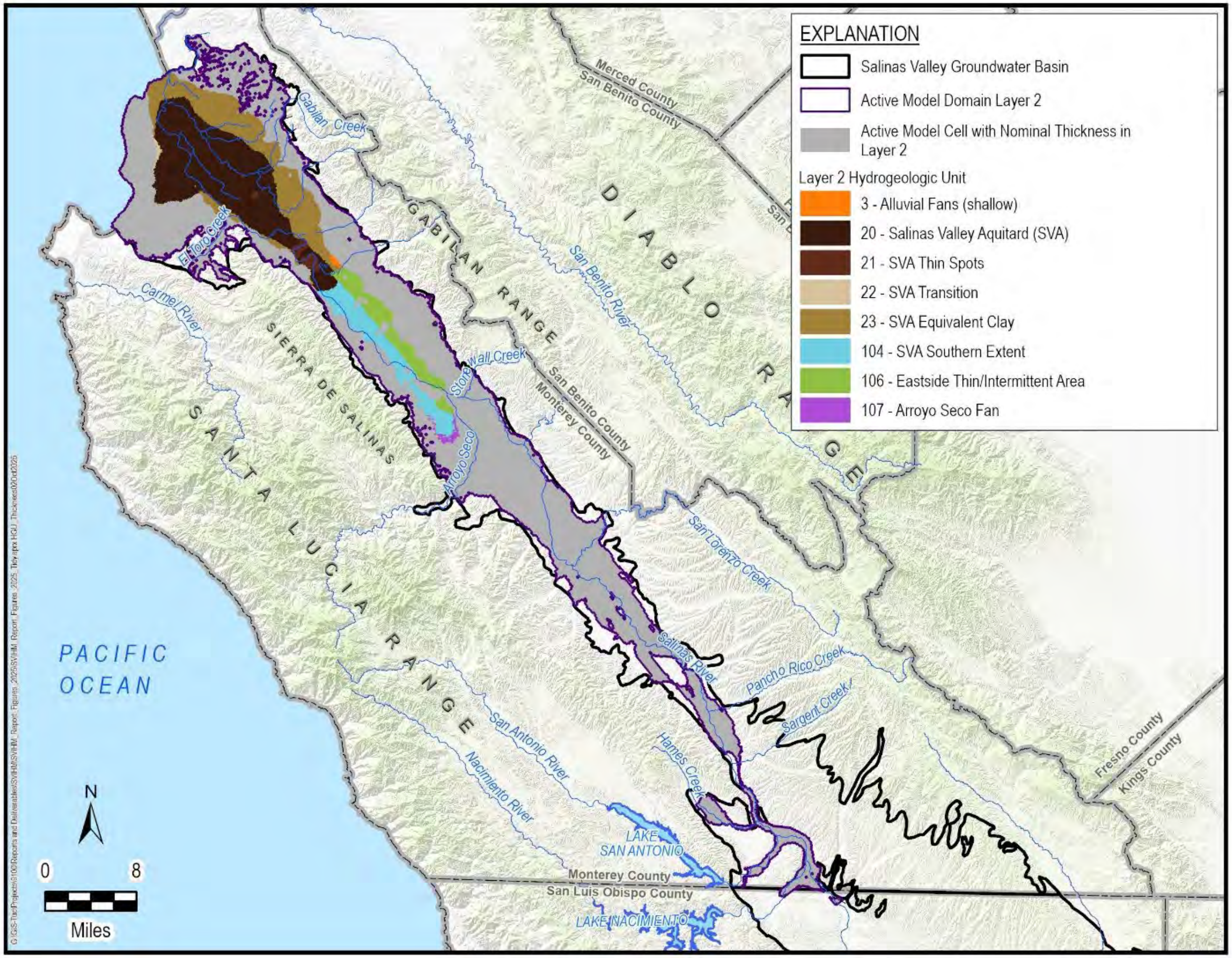

Figure 9. Simulated Hydrogeologic Units in Layer 2

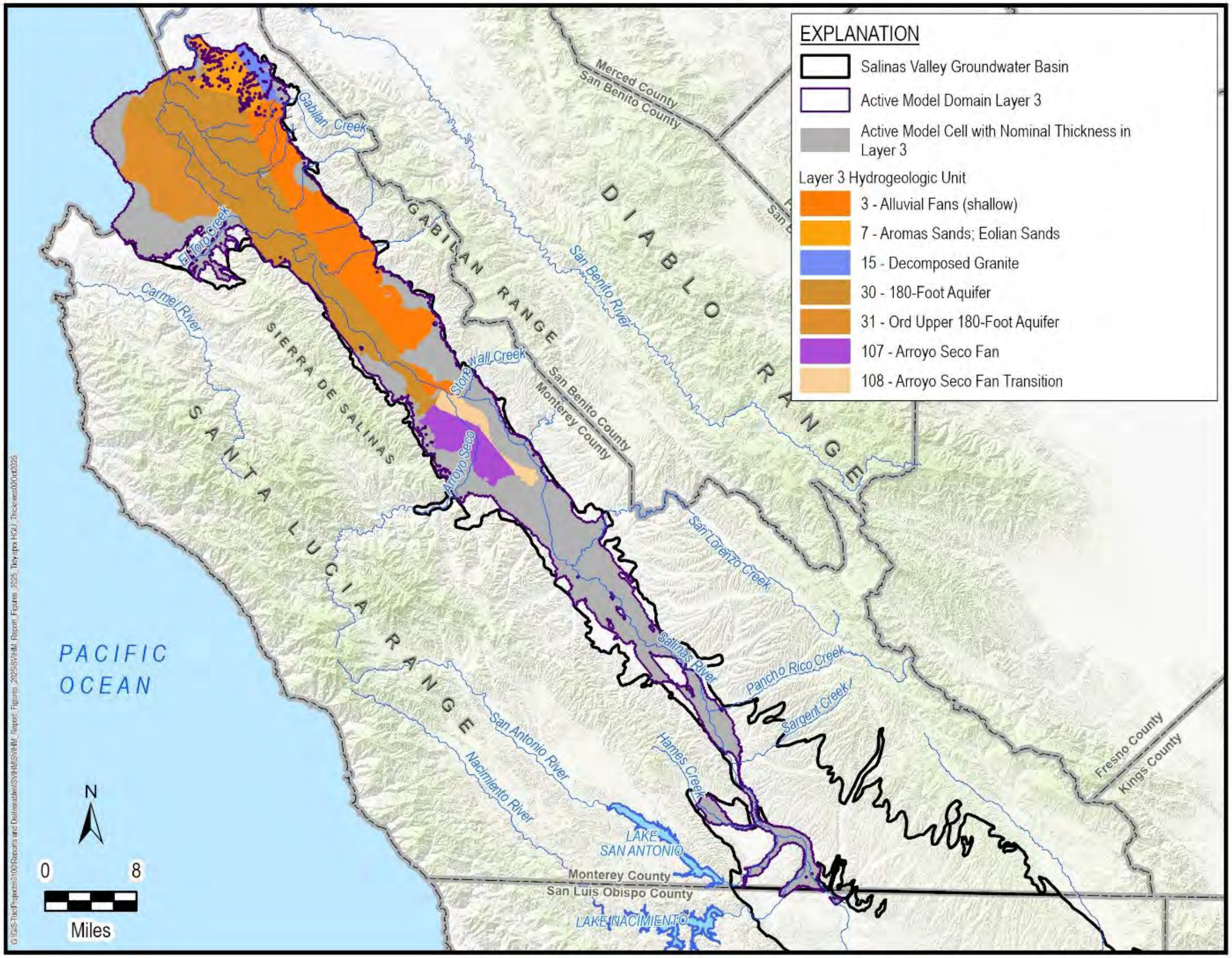

Figure 10. Simulated Hydrogeologic Units in Layer 3

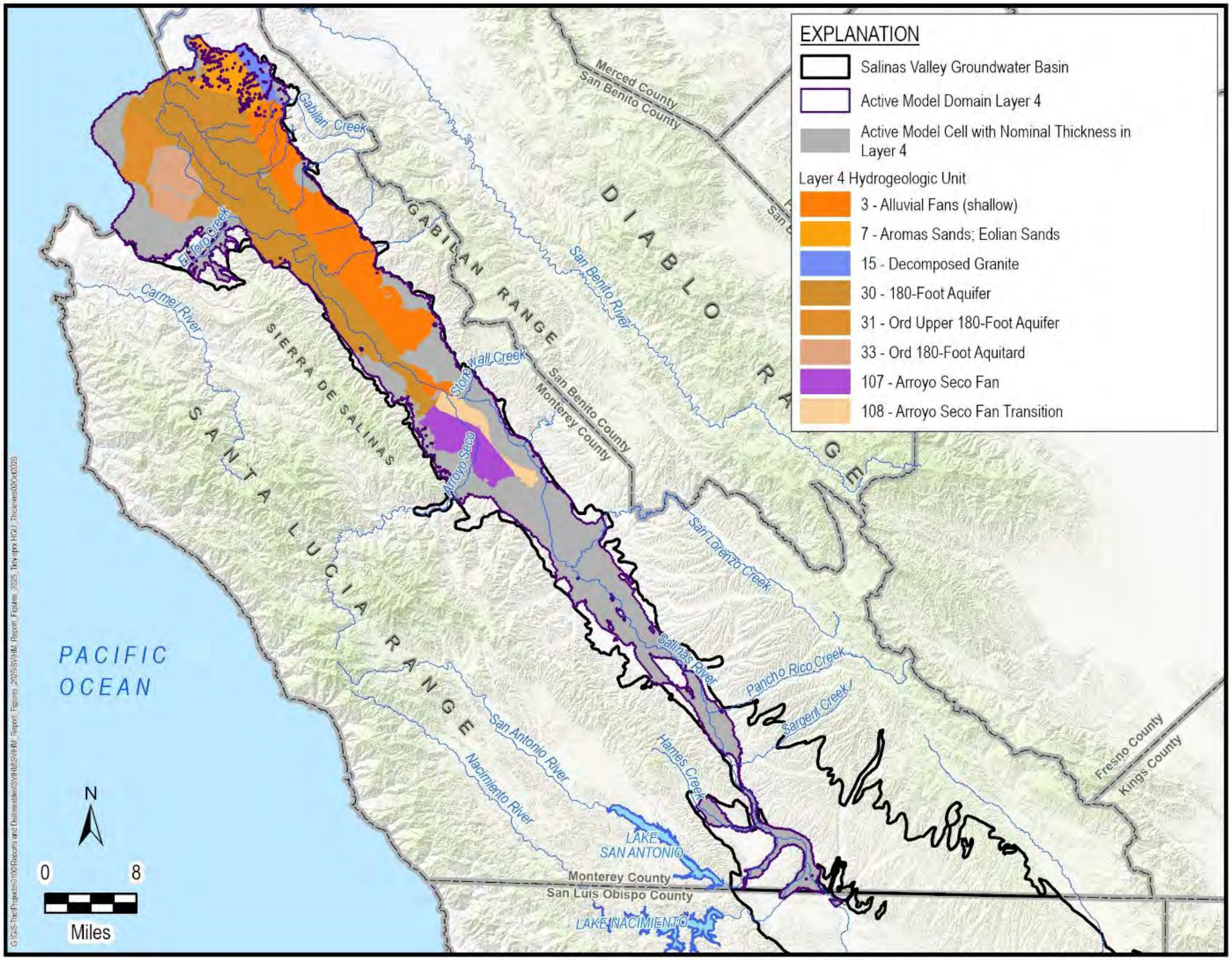

Figure 11. Simulated Hydrogeologic Units in Layer 4

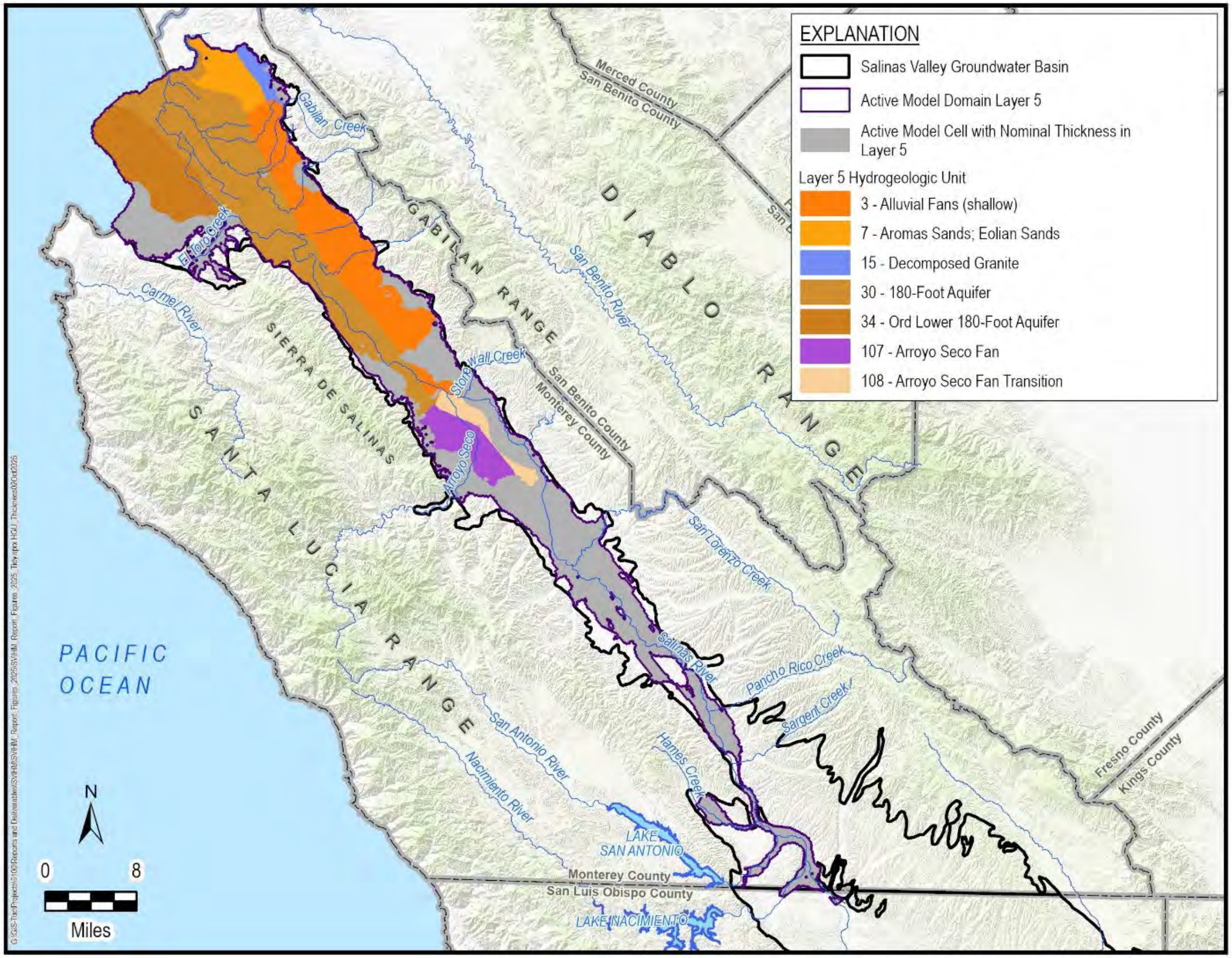

Figure 12. Simulated Hydrogeologic Units in Layer 5

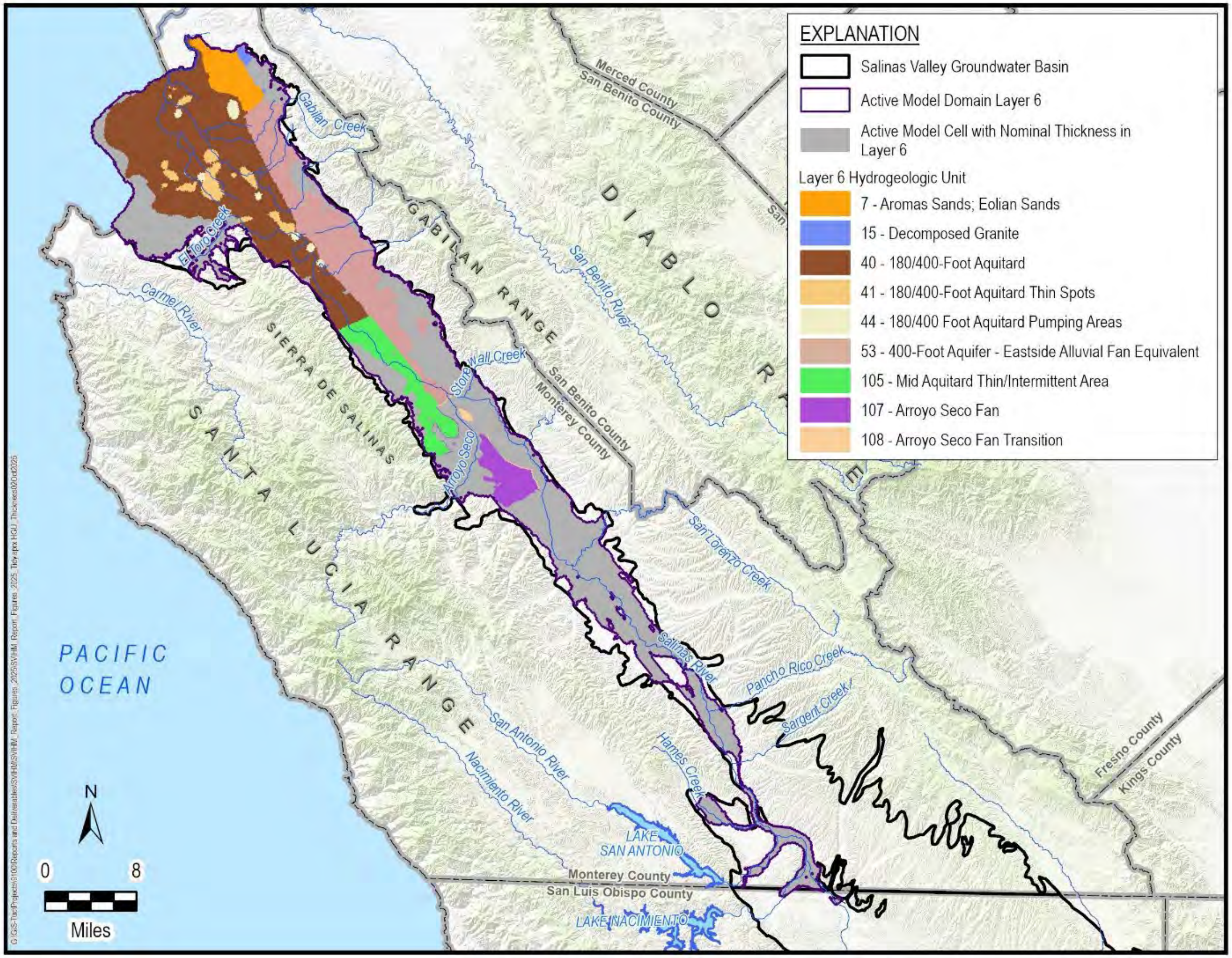

Figure 13. Simulated Hydrogeologic Units in Layer 6

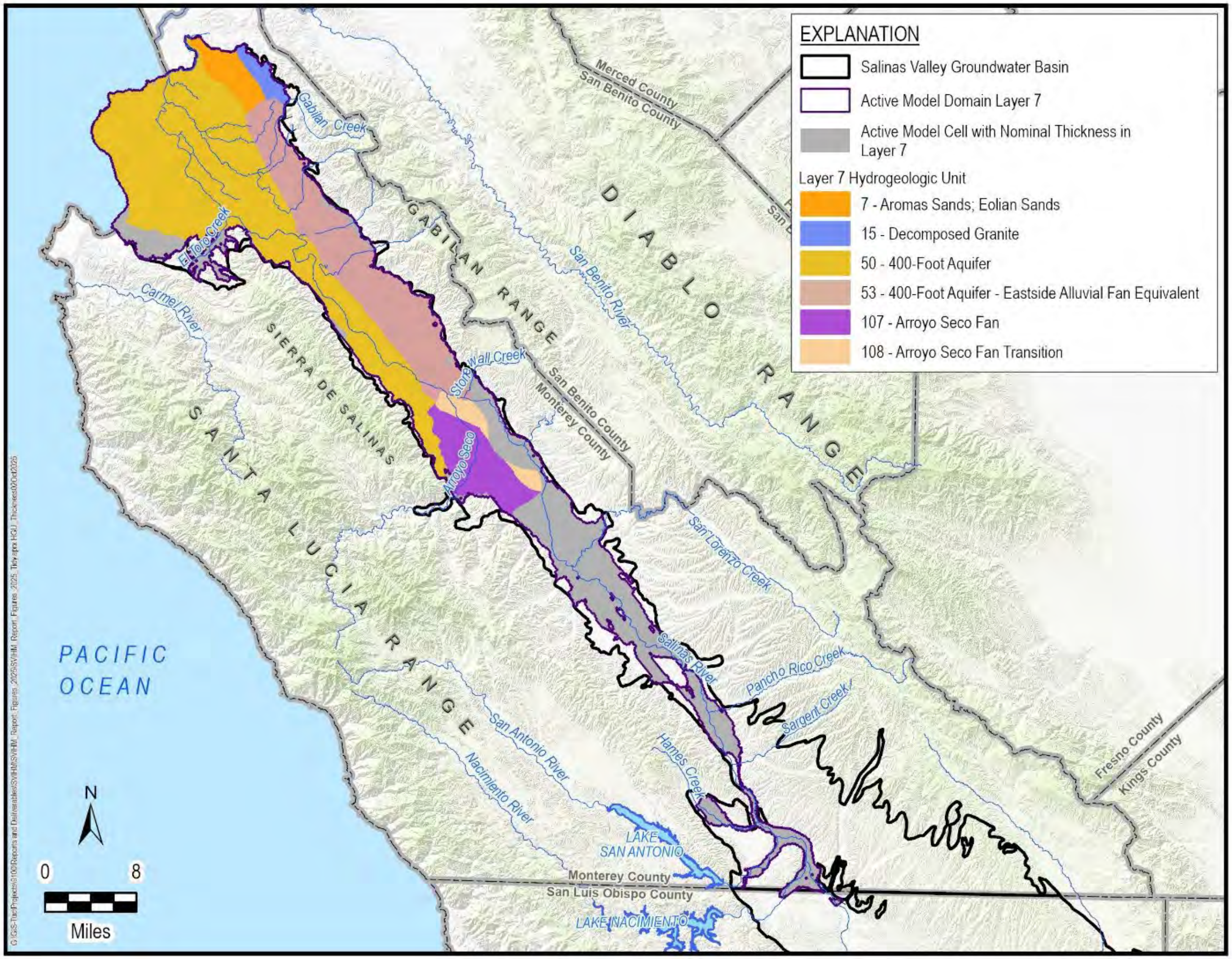

Figure 14. Simulated Hydrogeologic Units in Layer 7

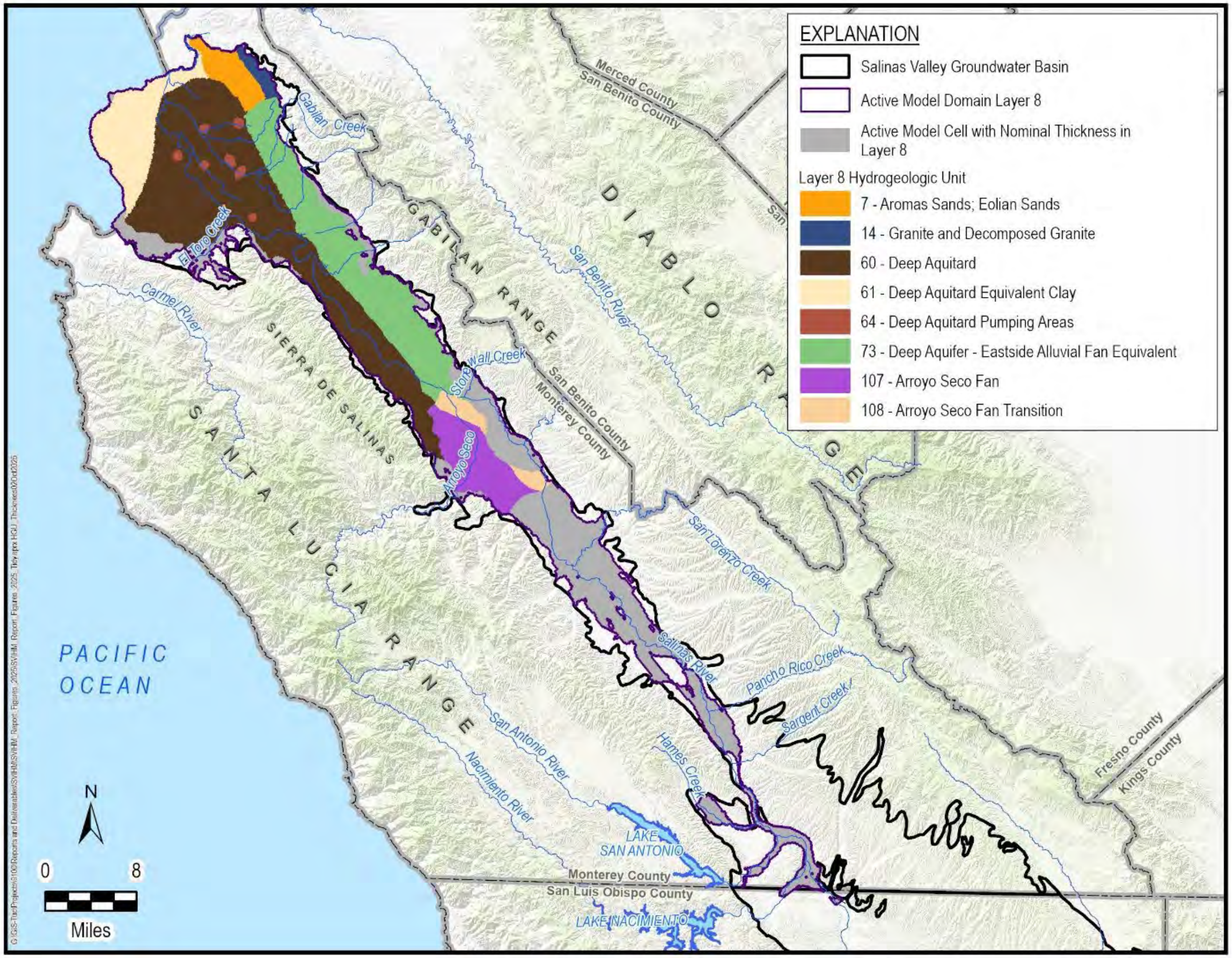

Figure 15. Simulated Hydrogeologic Units in Layer 8

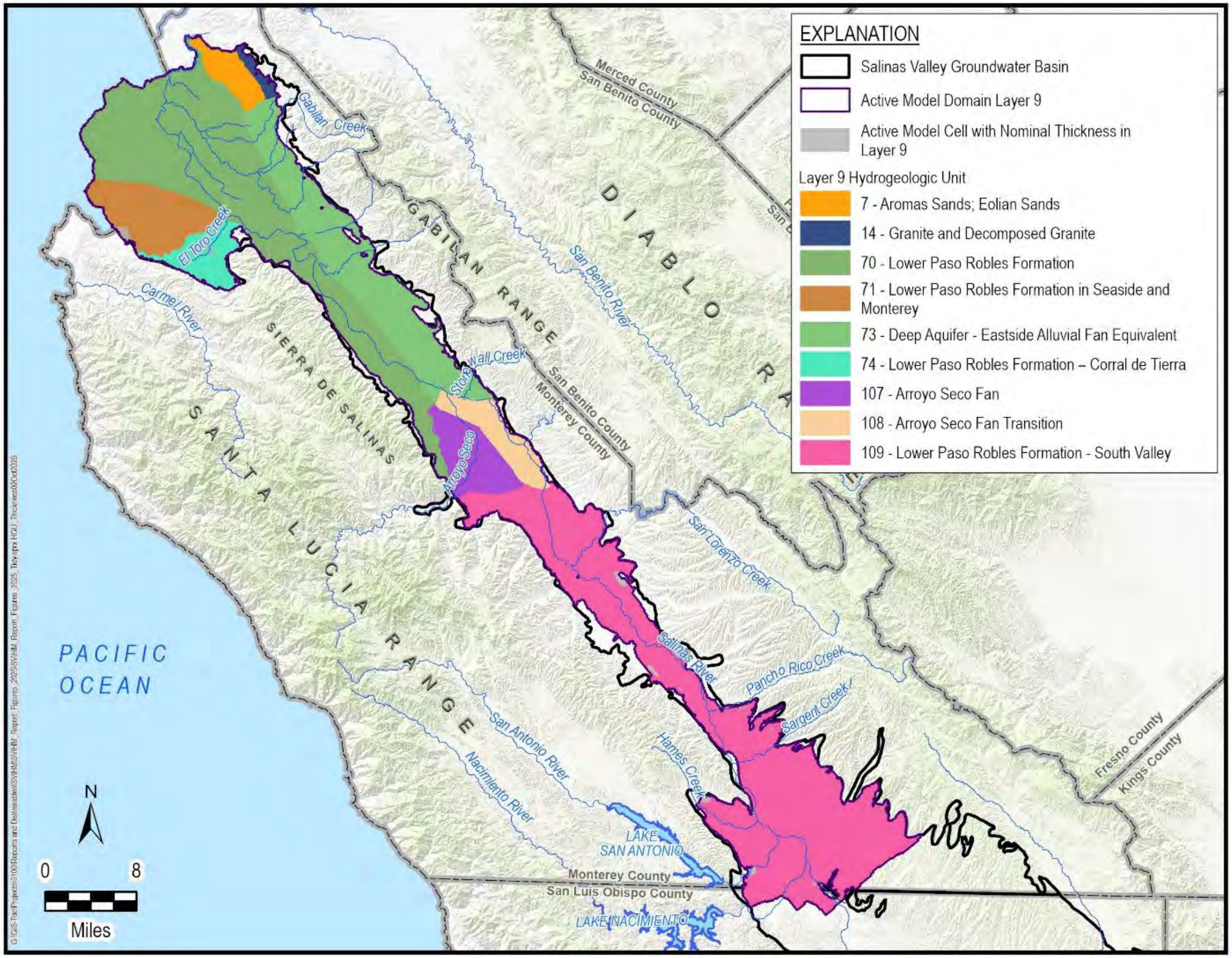

Figure 16. Simulated Hydrogeologic Units in Layer 9

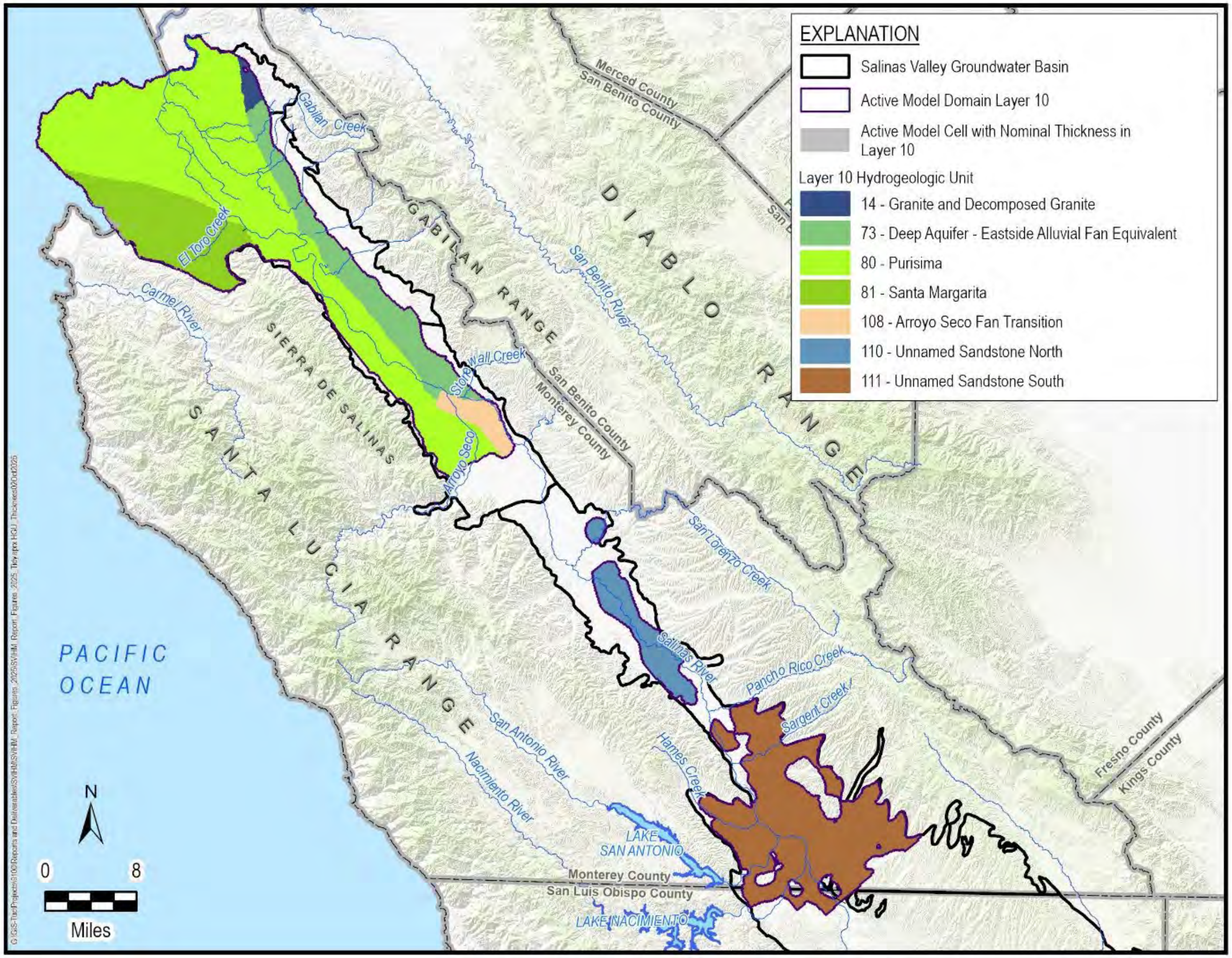

Figure 17. Simulated Hydrogeologic Units in Layer 10

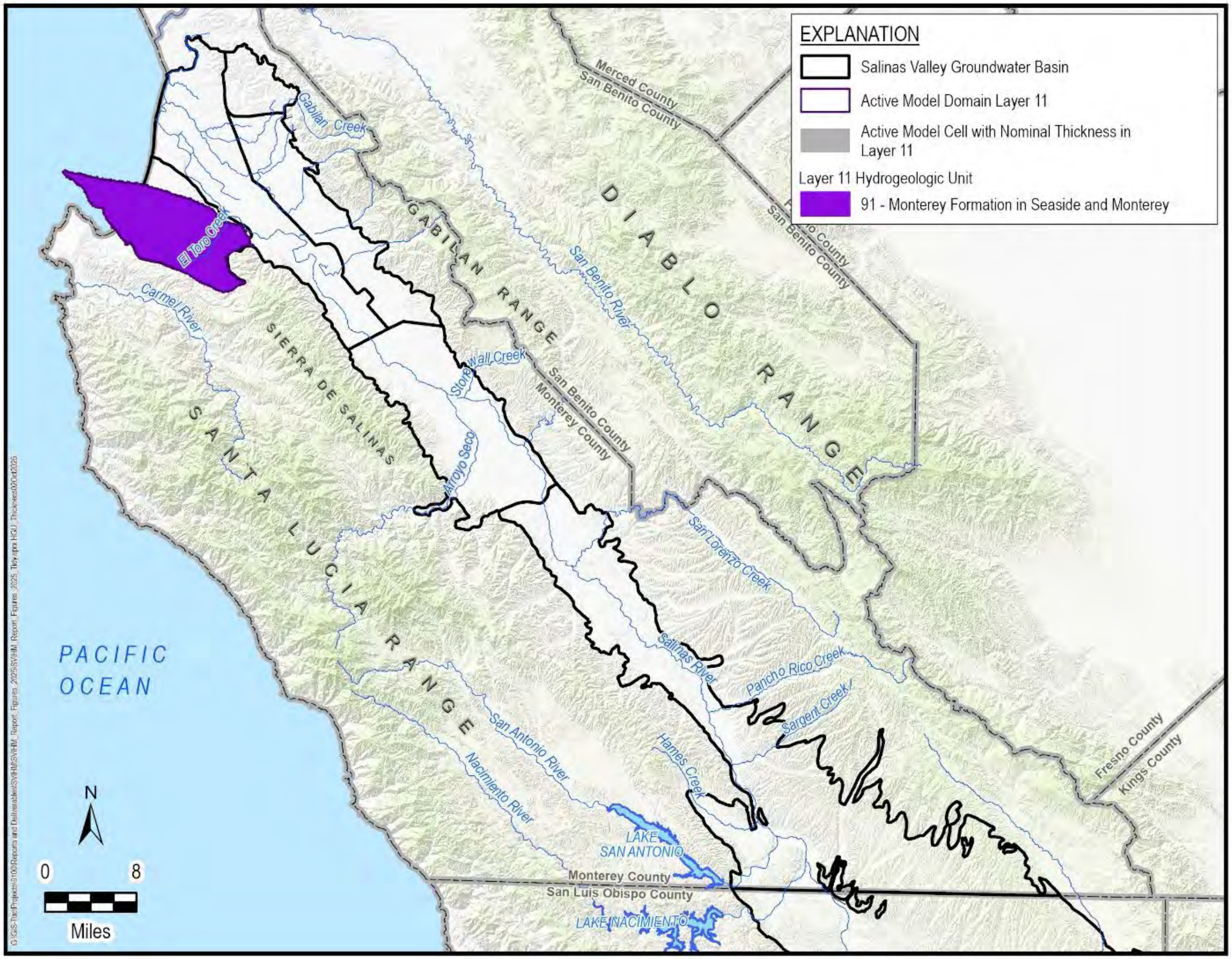

Figure 18. Simulated Hydrogeologic Units in Layer 11

3.4 Wells and Non-Agricultural Groundwater Pumping

M&A improved the SVIHM by updating well information to reflect the best available data and refining domestic pumping rates. For the purposes of this report, non-agricultural pumping in the model is called domestic pumping. Domestic pumping includes municipal (public drinking water systems), rural domestic, and industrial pumping. Injection and extraction through aquifer storage and recovery (ASR) is also included under domestic pumping.

3.4.1 Wells

In recent years, MCWRA has worked to match well permits with their records to identify locations, refine construction information, and verify well statuses for wells within the Salinas Valley. While the effort is still underway, M&A worked closely with MCWRA to incorporate the most current data for the wells that report to the Groundwater Extraction Management System (GEMS) included in this model update. Furthermore, M&A collaborated with EKI and the SSWM to validate well layering information and historical urban pumping rates in the Monterey and Seaside subbasins. Rural domestic pumping wells were added to the Langley Subbasin and Corral de Tierra management area, since rural domestic pumping constitutes a significant portion of the total pumping in those areas. Although other rural domestic pumping exists in the basin, it is considered insignificant compared to agricultural and municipal pumping in those areas. Until 1986, remediation pumping occurred in Fort Ord; these wells and pumping were also added to the model. Figure 19 shows the locations of simulated pumping wells by well type.

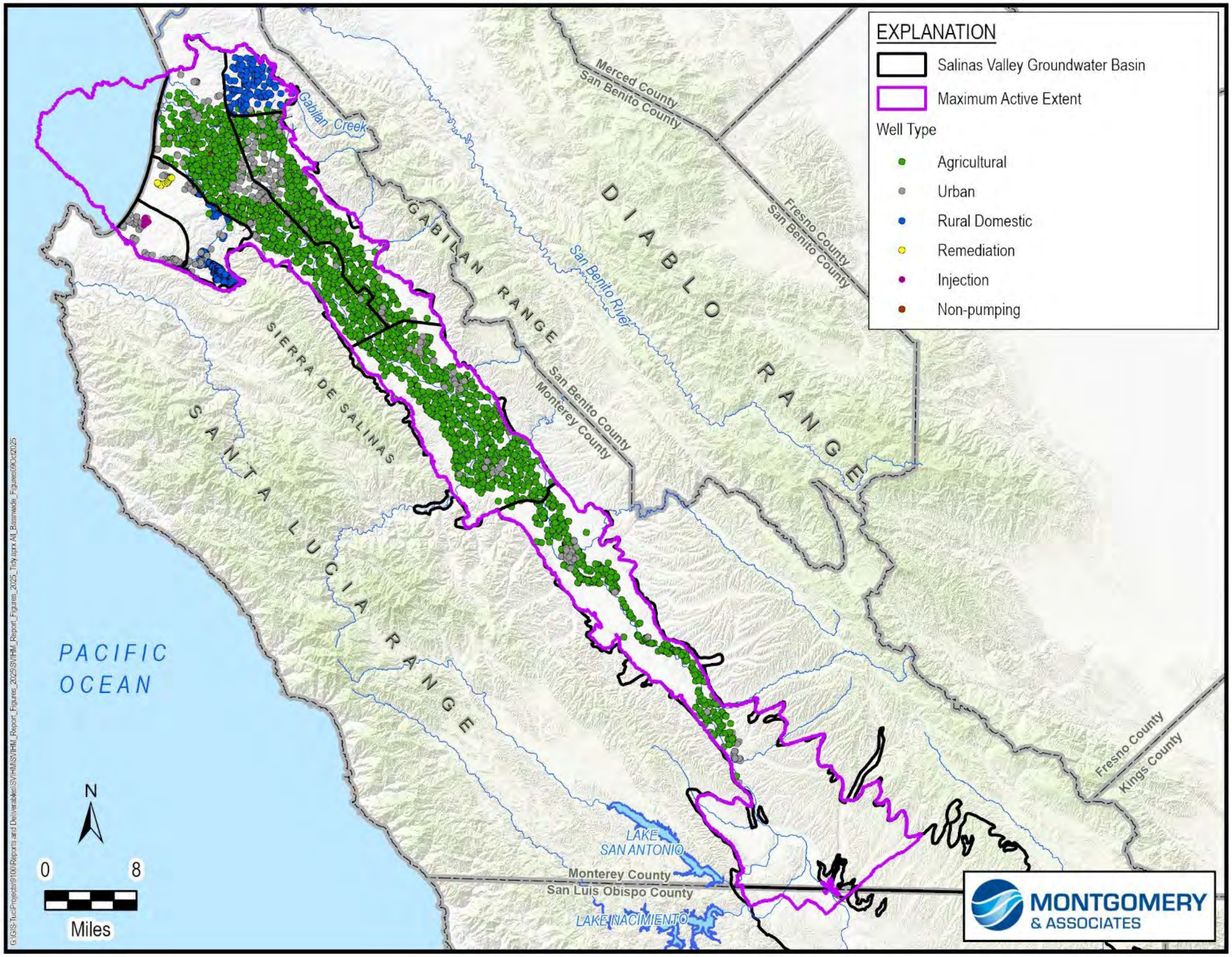

Figure 19. Location of Pumping Wells in Model

The SVIHM uses the Multi-Node Well (MNW2) package to simulate well pumping. In the MNW2, the aquifer(s) from which a well pumps are based on specified screen elevations. Well screen intervals were specified based on the following information, in order of priority:

1. Well screen intervals
2. Well depths
3. Aquifer designations by MCWRA, USGS, and others
4. Nearby wells

The updated well screen intervals result in a significant reduction of pumping in the surficial sediments compared to the USGS version. Additionally, the updated vertical distribution of pumping is more aligned with conceptual estimates of where pumping occurs in the basin.

3.4.2 Domestic Pumping

In addition to updating well locations and specifications in the model, municipal pumping rates were updated to match GEMS monthly reported rates, and areas where GEMS lacks coverage were supplemented with other data sources. Rural domestic pumping was accounted for in the Langley Subbasin and Corral de Tierra management area. Pumping and injection that has occurred in the Seaside Subbasin were updated to align with the Seaside Model.

The GEMS urban category includes municipal and industrial pumpers within the Valley. Municipal pumping rates for MCWD, including wells located within the Marina City boundary and the former Fort Ord, were provided by EKI. Figure 20 shows annual urban pumping at GEMS wells specified in the updated model.

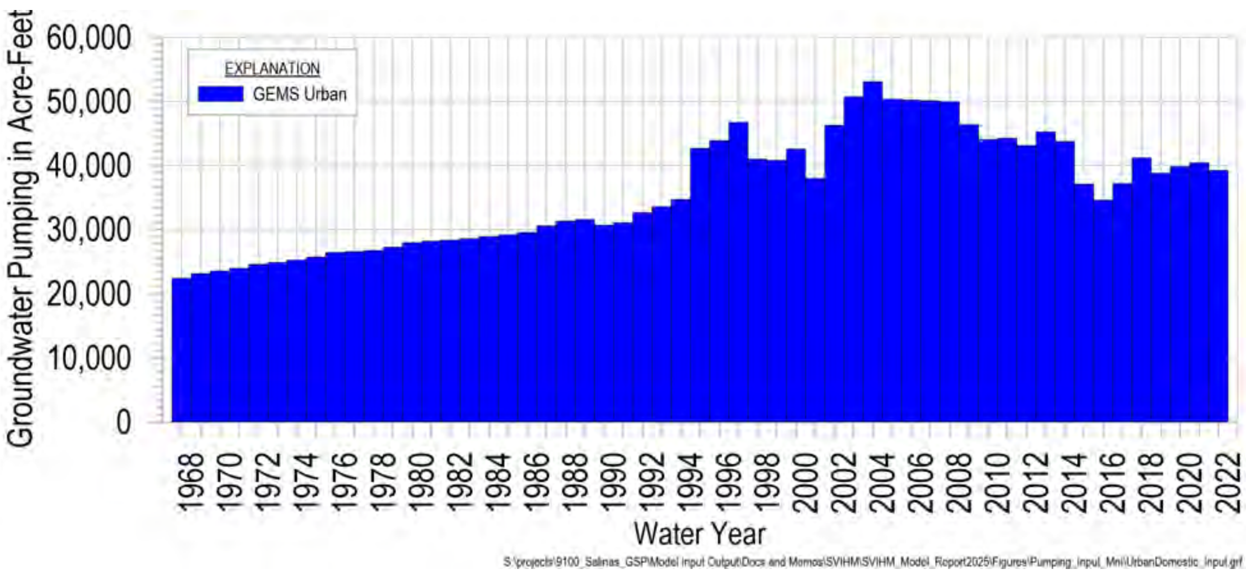

Figure 20. Urban Pumping Input in Model for GEMS Wells

Pumping estimates from GEMS became available in 1995. As a result, the focus period for the model update and calibration are from 1995 on, when simulated groundwater pumping can be constrained by measured data. The period prior to 1995 is considered to be a spin-up period for model stability and for providing information on how the model responds to different observed climate stresses. For this model update, it is more important to have a more representative distribution of pumping immediately preceding 1995 than at the start of the simulation. To prevent a sharp shift in the vertical and spatial distribution of pumping by switching from estimated pumping to GEMS reported data, the 1995 distribution of pumping was projected back to the start of the model in water year 1968. The overall total of urban pumping between water year 1968 and 1994 matches the original SVIHM, but the spatial and vertical distribution matches the measured distribution in 1995. This method results in a reasonable estimate in the years before 1995 but may be less representative of the actual pumping distribution at the beginning of the model since some wells without available well construction information are pumping in the model that may not have existed. For 1995 and after, urban pumping rates were updated with monthly GEMS data.

Pumping for MCWD wells prior to 1995 was provided by EKI. Three of the MCWD wells had annual pumping records from 1988 to 1992. The records were used to estimate pumping for these 3 wells back to water year 1968. The pumping from these 3 wells was subtracted from the total MCWD annual pumping that was scaled backward using total pumping estimates for 1960, 1970, and 1980. This pumping was distributed among the remaining MCWD wells based on the distribution of pumping after 1995. The annual data was then parsed out by month based on the typical monthly distribution of total annual groundwater use.

Because the GEMS reporting area does not extend across the whole Corral de Tierra Area, the GEMS data was supplemented with municipal pumping data reported to the State Water Resources Control Board (SWRCB). The SWRCB began to require public water systems to report monthly pumping in 2013. Pumping for the public water systems in the Corral de Tierra Area that do not report to GEMS were estimated using the SWRCB data and distributed equally among the wells used to serve the water systems. These wells are included in the GEMS urban category to keep all the municipal pumping together for the Corral de Tierra under the same category.

Figure 21 shows other prescribed pumping and injection in the updated model at wells that do not report to GEMS. Positive values indicate net extraction, and negative values indicate net injection.

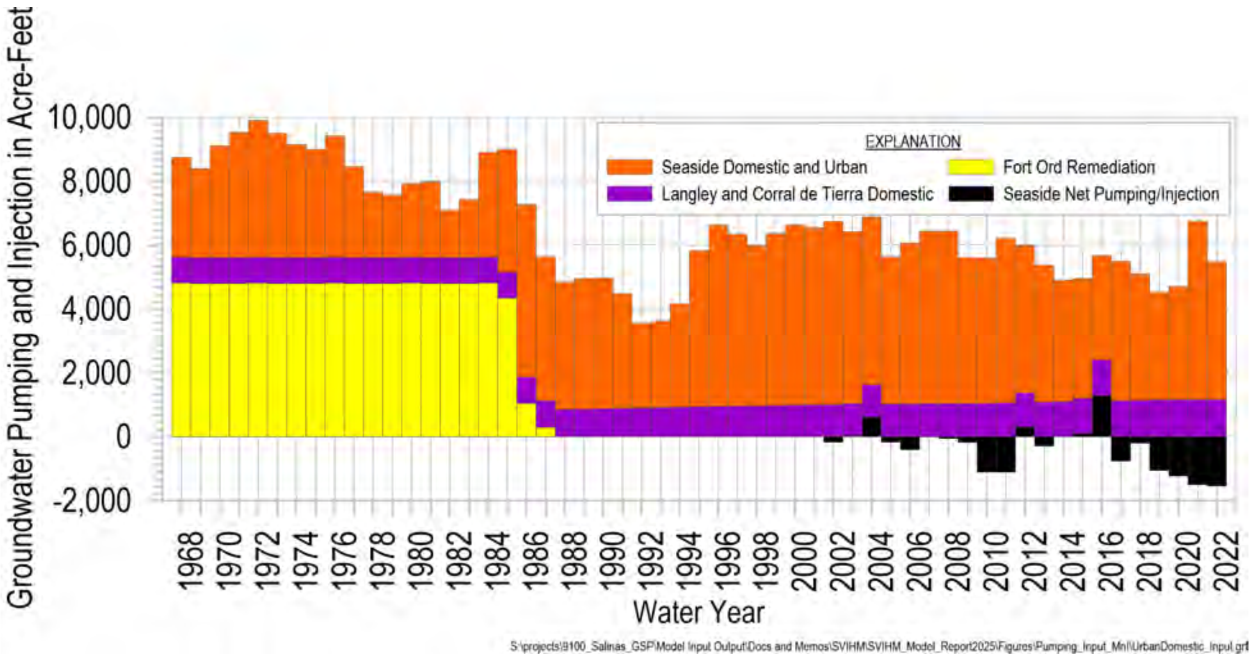

Figure 21. Other Municipal, Rural, Domestic, and Injection Pumping Input in Model

Simulated urban pumping rates were compiled as follows:

Seaside Municipal and Rural Domestic: Rates were provided by the SSWM. Pumping data for the Seaside wells is available starting in 1987. Pumping for these wells was scaled backward using total reported pumping estimates for the Seaside Subbasin from 1967 to 1995 based on CH2M (2004) and Muir (1982) and in collaboration with the SSWM.

Seaside Net Pumping/Injection: Injection at 4 Deep Injection Wells (DIW) and net extraction/injection at 4 ASR wells provided by SSWM.

Fort Ord Remediation: No tabulated reported pumping data were available for Fort Ord wells. Pumping rates at these wells were estimated from well pumping hydrographs for 1975 through 1983. For 1984 through 1986, no hydrographs were available for this period. Monthly pumping was estimated from a combination of the prior year's data, descriptions of when wells were active, and distribution by proportional well yields and monthly demand factors. While it is likely that pumping continued after 1986, pumping estimates could not be constrained and subsequently were not included in the model (Joe Oliver, personal communication 2022). It is possible that this remediation pumping is double counted due to uncertainties in the Army's Fort Ord water demands and how pumping was distributed. Future model calibration efforts might benefit from a better understanding of Fort Ord's pumping distribution prior to 1986.

Langley Rural Domestic: In the Langley Subbasin, rural domestic pumping is estimated to be 842 AF/yr (M&A, 2025). Historical annual pumping was estimated by scaling this pumping estimate by population data from the Prunedale, California, census. Monthly pumping rates at rural domestic wells were assumed to be constant for each month of the year. Constant monthly pumping rates were applied at rural domestic wells whose locations were identified via DWR's well completion database.

Corral de Tierra Rural Domestic: In the Corral de Tierra area, rural domestic pumping is estimated to be 133 AF/yr. This estimate was calculated based on locations and estimates of the number of domestic connections by the Wallace Group (2021). These connections were multiplied by 0.35 AF/yr per connection (M&A 2025) to yield an estimate of rural domestic pumping in this area. The rural domestic pumping includes an additional 192 AF/yr to account for golf course irrigation.

3.5 Farm Process Updates

The SVIHM was developed using MODFLOW OWHM2 and the FMP, which uses a demand-driven, supply-constrained logic to track crop irrigation demands and calculate irrigation pumping. Precipitation, evapotranspiration (ET), and land use data are applied to each cell in the model and grouped into water balance subregions (WBS), also sometimes referred to as "farms" (described below). For each timestep in the model FMP aggregates supply and demand for each WBS. Any leftover demand for a WBS that is not satisfied by precipitation and groundwater root uptake gets supplied by, in order:

1. Recycled water deliveries (Castroville Seawater Improvement Project (CSIP) area only)
2. Surface water diversions (CSIP and Clark Colony)

3. Groundwater pumping, demand of which is distributed amongst wells associated with that WBS based on a prescribed pumping capacity

Unlike a typical groundwater model, the SVIHM estimates irrigation pumping for each irrigation well rather than using a specified rate. While irrigation pumping is metered in the Salinas Valley, FMP allows for a flexible estimate of pumping, as well as recharge, that can vary with changes in climate, land use, and other crop and soil data. This section includes the updates M&A made to the FMP, a detailed description of which is provided in Henson *et al.* (2025).

The update focused on calibrating simulated FMP crop consumptive use to available estimates of actual ET in the Salinas Valley, as well as matching simulated and observed pumping for irrigation. In addition, this update simplified time-varying monthly scaling factures in FMP . While useful in calibration of historical models, time-specific monthly scaling factors limit the potential predictive utility of the model since the stress factors are linked to a specific set of land use, climate data, crop, and irrigation parameters. Time-specific monthly scaling factors on consumptive use were removed. Time-varying irrigation efficiencies were defined to gradually improve over the course of the model and not vary on a monthly basis in attempt to prevent any crop parameters from being dependent on climate inputs.

A study by researchers from the Irrigation Training & Research Center (ITRC) at California Polytechnic State University, San Luis Obispo (CalPoly) used the ITRC-METRIC method to prepare estimates of crop ET in the Forebay and Upper Valley for 2017 through 2021. Results of the study were provided to M&A (personal communication, Daniel Howes, June 18, 2024). Estimates of crop consumptive use (or ET) are also available via the OpenET database (Melton *et al.*, 2022), which provides consumptive use estimates based on multiple energy-balance methods that integrate remotely sensed data with land-station measurements of actual ET for the entire Salinas Basin). Comparison of the results of the IRTC study and OpenET data with the reference ET in the original SVIHM provides evidence that the input SVIHM reference ET arrays are in units of inches per month rather than millimeters per day. Subsequently, the unit conversion in the SVIHM has been updated to reflect units of inches per month.

3.5.1 Water Balance Subregions

The FMP allocates water supplies, simulates or approximates landscape processes, and computes mass balances for subregions of the model domain; these subregions, or "farms," are defined as the WBSs (USGS, 2024). Discretization of the landscape water budget allows for detailed tracking and management of water resources at a more localized scale. Figure 22 shows the updated WBSs in the model. M&A updated the WBSs to the new active extent of the model by extending any existing WBS to the updated model margin. To facilitate analysis at the subbasin scale in the future, the Salinas River WBS was split by subbasin.

To facilitate varying landscape water budgets within portions of the Monterey Subbasin, WBS in this area were further divided into separate WBSs for Corral de Tierra (WBS 7), Armstrong Ranch agricultural area within the extent of the dune sands (WBS 37), Marina Coast Water District (MCWD) service area within the Marina urban footprint (WBS 38), and open or naturally vegetated areas of the Dune Sands (WBS 39). This split allowed the SVIHM to be adjusted to match with conceptual estimates of recharge. Similarly, the Seaside Subbasin was split into urban (WBS 40), Dune Sands (WBS 41), and naturally vegetated areas (WBS 30). However, no changes were made to the properties within the Seaside Subbasin. The delineation was incorporated to allow modifications in a later version of the SVIHM based on feedback from and collaboration with MCWD (Appendix B) and SSWM.

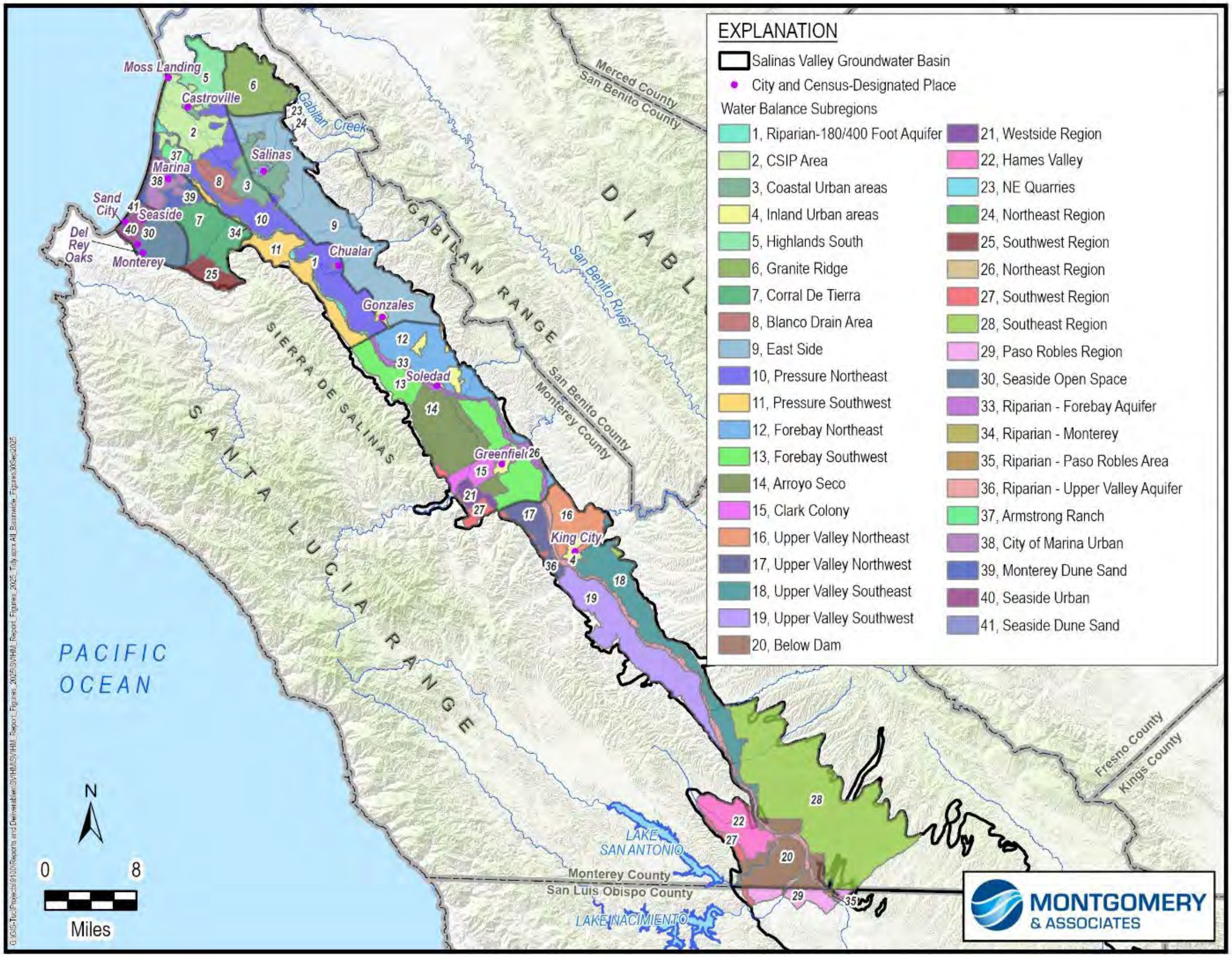

Figure 22. Water Balance Subregions in Updated SVIHM

3.5.2 Effective Precipitation and Recharge/Runoff Parameters

As part of the effort to align recharge estimates of the SVIHM with other models in the region, the precipitation availability coefficient was updated within the Dune Sands area of the Monterey subbasin (WBS 37, 38, and 39). This coefficient is a model parameter in FMP that can be used to limit the amount of precipitation that is available to meet landscape water demands (i.e., effective precipitation). The coefficient value represents the proportion of precipitation applied available for consumptive use. The rest of the precipitation is assumed to become runoff to streams. Runoff events in the Dune Sands are extremely rare due to its high infiltration capacity as documented in previous reports prepared by MCWD and the City of Marina (City of Marina, 2013a, MCWD, 2022). The monthly precipitation availability coefficients were increased to 85% from the original SVIHM value of 60% in WBS 37, 38, and 39 for October through April. This reduces the proportion of runoff from precipitation and allows for more recharge in these highly permeable sediments.

Excess precipitation is defined in MODFLOW-OWHM as the difference between effective precipitation and the crop ET. FMP splits excess precipitation into deep percolation (recharge) and surface water runoff based on relative proportions represented by the FIESWP parameter (fraction of inefficient losses from irrigation to surface water). This parameter was set to 100% recharge and 0% runoff for land use types within the Dune Sands to increase the proportion of recharge in the Dune Sands.

3.5.3 Agricultural Irrigation Demand

The SVIHM calculates crop consumptive use based on spatially distributed estimates of potential ET. In the SVIHM, potential ET is calculated as the reference ET multiplied by the crop coefficient parameter which is specified per land use type defined in the model. SVIHM simulated actual evapotranspiration (AET) is the portion of the potential ET met through natural sources (precipitation and groundwater root uptake) and irrigation. The SVIHM calculates irrigation pumping based on the demand after other sources of water are exhausted (see above) and the specified irrigation efficiency. OpenET and the ITRC study provide estimates of crop consumptive use, or AET, as mentioned in the previous section. Simulated cropping parameters were adjusted during model calibration to align with these data sources. Due to complex cropping patterns and irrigation operations, literature values of crop coefficients did not provide a reasonable match between measured and simulated agricultural pumping in the SVIHM.

Additional demand was applied on a per farm basis to better simulate winter agricultural pumping. The added demand option in FMP increases pumping in the WBS by the amount specified in addition to the irrigation pumping calculated by the model to satisfy crop irrigation demand. Reported irrigation pumping in the GEMS database tends to exceed the magnitude of winter irrigation pumping that would be expected solely to satisfy winter consumptive use, regardless of whether winter consumptive use is estimated using the ITRC or OpenET datasets. This suggests that some portion of winter irrigation pumping is due to other crop-related irrigation needs such as frost mitigation, pre-wetting of soils, and salt leaching.

Well types were reassigned to match well types specified in GEMS and were assigned to water balance subregions based on spatial location.

The capabilities of FMP are not intended to simulate observed irrigation pumping on a well-by-well basis within a WBS; therefore, the SVIHM is not designed to match GEMS irrigation pumping well by well, but rather by WBS and the subbasin as a whole. The simulated pumping capacities of wells were revised to match the maximum monthly pumping rates from the GEMS database, rather than based on well construction details. Details on the pumping calibration and calibration of AET are described in section 4.2.1.

3.5.3.1 Land Use

The SVIHM was developed with multiple land uses per cell, which vary by year and by season. Details on the land use are described in Henson *et al.* (2025). Several modifications were made to the land use input files. The modifications included changes to the urban, beach, and upland land use types. As an example, Figure 23 shows the land use types that were modified from the original SVIHM for January through June 2000.

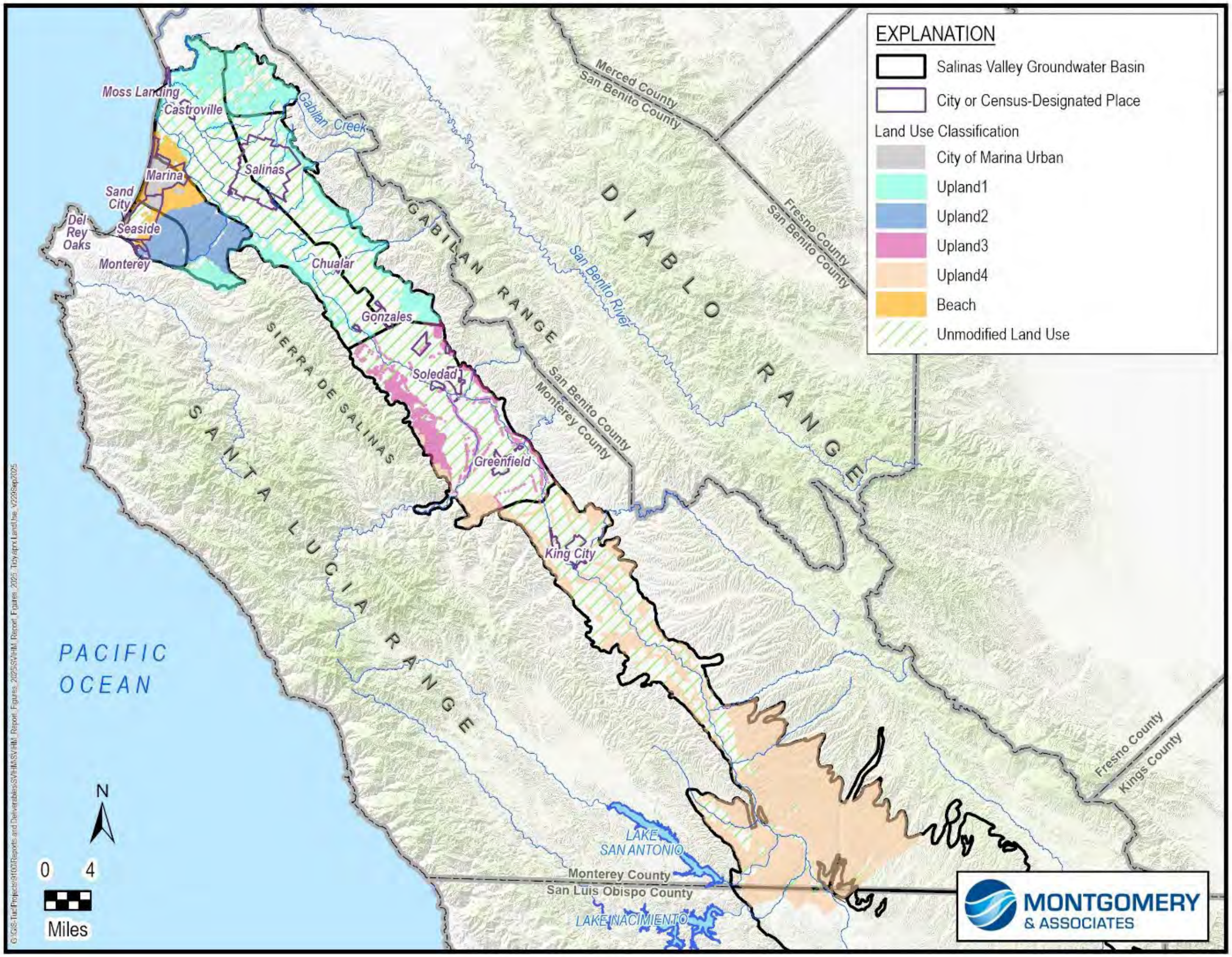

Figure 23. Example of Modified Land Uses

In the Monterey subbasin, the extent of the "beach" land use type was modified to reflect the extent of the mapped Dune Sands. An additional land use type was added reflecting urban areas overlying the Dune Sands in the Monterey Subbasin. While urban land use is largely impermeable, the City of Marina uses infrastructure for stormwater capture and re-infiltration into highly permeable soil. Another modification was the splitting up and extension of the upland land use type. The upland land use was split by region into 4 types to allow more flexibility for adjusting precipitation recharge/runoff parameters. For areas of the model where the groundwater domain was expanded on the valley margins, the upland land uses were extended out to the full active extent. While most of this land categorized as upland is native grasslands and vegetation, a minor amount of irrigated areas occurs in this area. This was a simplifying assumption that could be revised in future updates. These updates were made through collaboration with MCWD.

3.5.3.2 Climate Data

While the grid location was modified spatially, the climate datasets were not modified to reflect the new cell locations. As described in Section 3.1, precipitation and potential evapotranspiration (PET) arrays are offset by up to 1 cell width on the basin margins and less than 1 cell width in the center of the model. Since FMP aggregates climate inputs on a WBS scale, the offset has limited impact on how FMP calculates demand and pumping. For portions of the groundwater model active domain that extended beyond the original SVIHM extent, the precipitation and PET arrays were extrapolated from the former boundary at constant values.

3.5.3.3 Groundwater Supply

Pumping from irrigation wells within the Subbasin is calculated in FMP based on remaining crop irrigation demand after effective precipitation, groundwater root uptake, and surface water sources available have been consumed (in that order). The crop irrigation demand is the remaining crop demand accounting for the specified irrigation efficiency. Irrigation pumping is simulated using "Farm Supply Wells." M&A added wells from GEMS that are categorized as agricultural supply wells, which were assigned to supply the irrigation demands of their respective water balance subregions based on spatial location. FMP distributes the total demand of a WBS on a well-by-well basis based on a well's specified maximum capacity. Details on how this parameter was modified during model calibration are described in Section 4.2.1.

3.5.4 Irrigation Efficiency

Irrigation efficiency refers to the proportion of irrigation water applied to crops which is consumptively used. It is a measure of how much of the water delivered to a field contributes to crop water needs. FMP partitions applied irrigation water into consumptive use of irrigation water and irrigation return flow, proportional to an assigned irrigation efficiency (also referred to as On-Farm Efficiency). A higher irrigation efficiency indicates the crop uses a greater percentage of the water applied and has lower return flow; and a lower irrigation efficiency indicates the crop uses a smaller percentage of the water applied and has higher return flow. In the SVIHM, irrigation efficiencies are specified by irrigation methods (sprinkler1, sprinkler2, drip1 or drip2). One of these irrigation methods is specified for each land use type. Irrigation efficiency was modified during calibration process on a WBS basis. Details on adjustments to the irrigation efficiencies made during model calibration are described as part of the pumping calibration in Section 4.2.1.

3.6 Streamflow Routing

The SVIHM uses the Streamflow Routing (SFR) package to simulate streams in the basin. M&A mapped the same streams used for the original SVIHM to the updated model grid. Figure 24 shows the location of the surface water network on the updated grid.

Segment numbers and connections were unchanged from the USGS version of the model, however the number of reaches per segment were modified to capture the updated cell geometry.

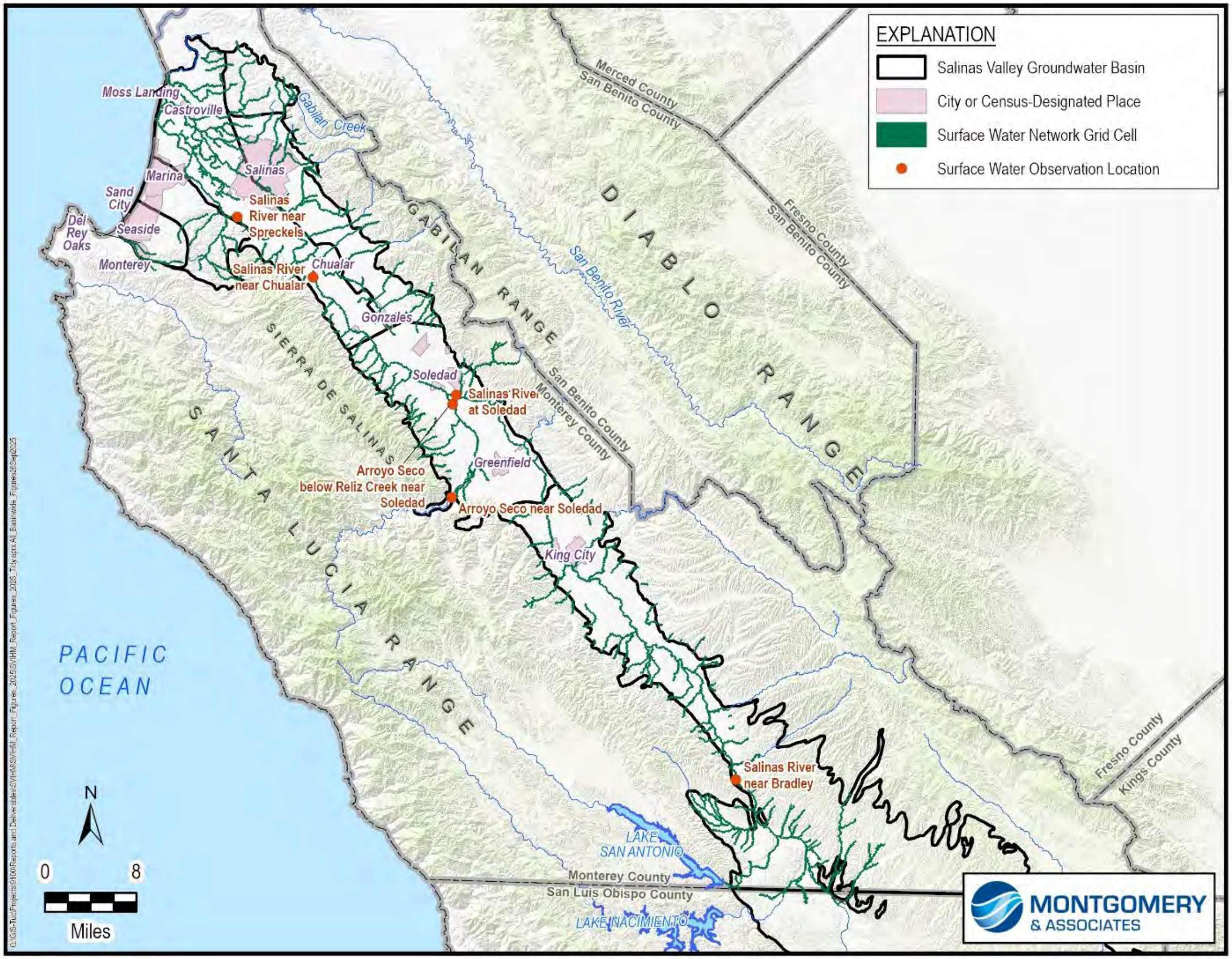

Figure 24. Surface Water Network and Observation Locations

3.6.1 Stream Configuration and Geometry

Streams in the lower Salinas Valley are divided into the same 524 segments as the original model but now comprise 8,793 reaches in 8,221 model grid cells.

Stream elevations were assigned using a 1-meter Digital Elevation Model (DEM) that extends across the entire model area. Stream elevations were adjusted to ensure all segments flow downhill, and that the stream channel is below the land surface elevation except for a small number of reaches in the vicinity of Espinosa Lake. This is consistent with the DEM data showing elevations below sea level and is necessary to ensure that streams flow in the correct direction towards the ocean. This update ensures vertical consistency between the simulated land surface and simulated stream channels and provides a more realistic estimate of groundwater-surface water interaction along the river than the original SVIHM.

The Salinas River is the primary surface water body in the model area. The calculation method for stream depth and width for the Salinas River was modified so that all segments are calculated using specified rating curves. Rating curves for the entire Salinas River were calculated for each segment by interpolating the rating curves at each of the 4 USGS streamflow gages along the Salinas River. Using rating curves for the entire river ensures adjacent stream segments have similar stream stages.

In the original SVIHM, the width of all segments is specified as 1 foot width, except for segments that are specified as rating curves. This narrow width resulted in excessive depths in 30 tributaries. These streams were modified with widths estimated from aerial imagery.

3.6.2 Hydraulic Properties

The flow rate within the stream segments is calculated by the SFR package using the Manning's equation and assumes a steady uniform flow. Interaction between the stream and the aquifer is modeled using a conductance term, which varies spatially. Streambed hydraulic conductivity on a segment-by-segment basis was adjusted as part of calibration process. Details on the stream calibration are described in Section 4.1.2.

3.6.3 Salinas Valley Watershed Model (SVWM) Inputs

Water enters the surface water network on the upstream end of most of the tributaries in the model. Only 3 inflows were modified from the original SVIHM. The Arroyo Seco has a USGS stream gauge near the modeled inflow. Inflows at this location were replaced with average monthly observed values rather than estimates from the SVWM. The other inflows that were modified were the inflows from the Nacimiento and San Antonio Reservoirs. These flows were adjusted to match better with measured releases from the reservoirs.

3.7 Drain Return Flows

The original SVIHM assigned drain cells to the topmost active cell across the entire model. This was used to route groundwater that was simulated above land surface to surface water channels. As a result of the calibration process, as well as reassigning stream elevations to be below land surface, the updated model no longer has significant areas of groundwater elevations above land surface near riparian areas. All drain cells were removed from the model.

3.8 General Head Boundaries

The updated model uses a similar conceptualization of how groundwater enters the model as the original SVIHM. Groundwater flows into or out of the model at the southern boundary from the Paso Robles Subbasin (Inland), from the Pajaro Valley Subbasin (Land Coastal) and through the seafloor (Ocean) using general head boundaries (GHBs). Figure 29 shows the GHB extent by layer for the Ocean and Land Coastal GHB cells; inland GHB cells at the Paso Robles county line are not shown.

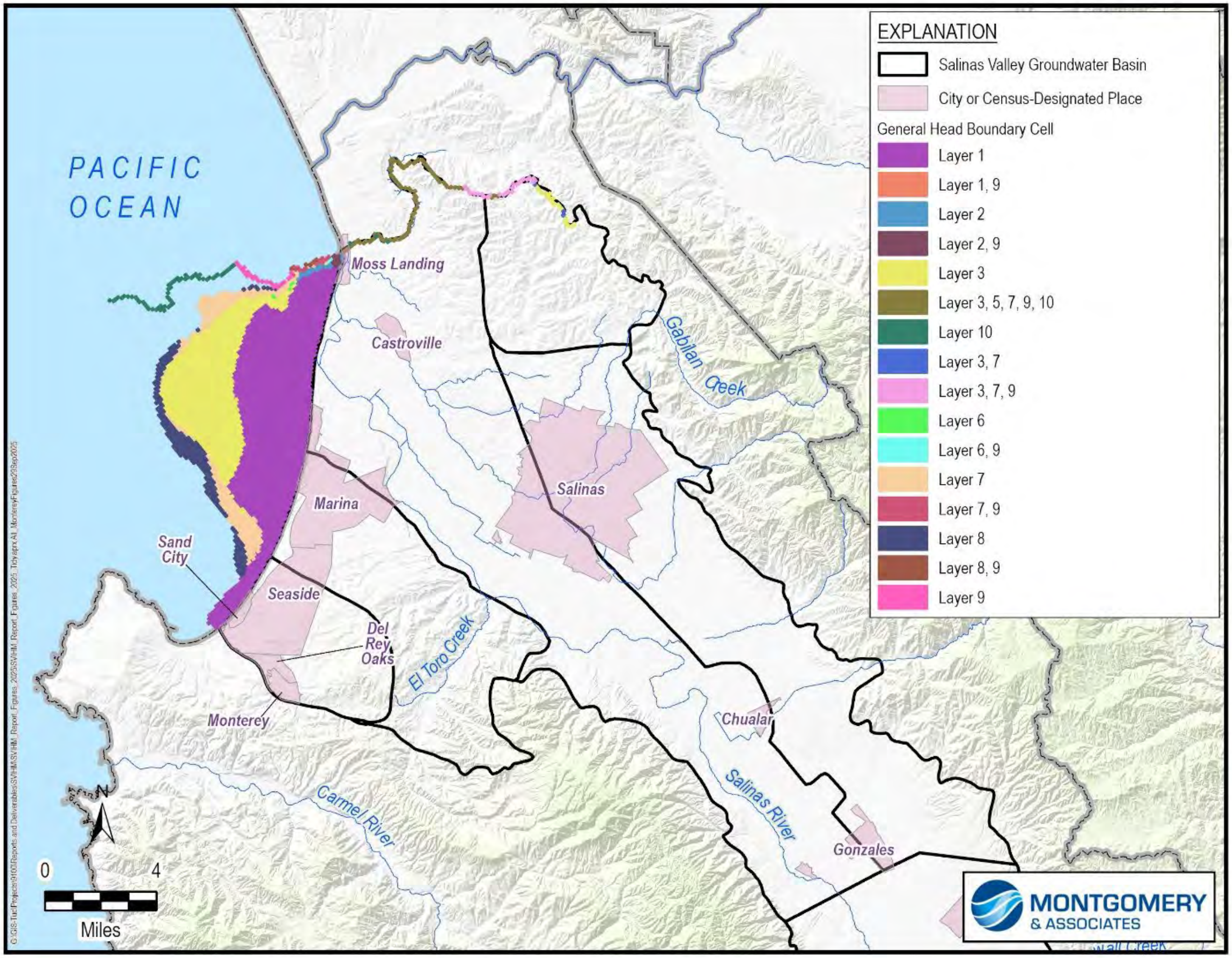

Figure 25. General Head Boundaries in Coastal Portion of Model

In the updated model, GHBs in the ocean are assigned to the topmost active layer in the thinner, shallow layers 1-8. In layers 9 and 10, which are significantly thicker offshore (greater than 1,000 feet thick in layer 10), GHB cells are only assigned to the seafloor along the edge of Monterey Canyon. The GHB is generally placed in cells where the thinnest dimension of the cell (whether that is the lateral width or vertical thickness) is perpendicular to the seafloor contact with the ocean. For the GHB cells sharing a boundary with Pajaro Valley, cells were moved slightly to reflect changes in the groundwater model active extent. Land coastal GHB cell conductance and head values were left unchanged.

For the inland GHB at the Paso Robles-Monterey county line, cells were modified to reflect changes to the active extent of the model. Head values were modified to reflect groundwater elevations at nearby wells outside the basin in the Paso Robles subbasin. Figure 26 shows the GHB heads assigned by aquifer. The alluvium head is applied to layer 1 and the Paso Robles Formation is applied to layers 9 and 10; layers 2 through 8 have nominal thicknesses at this boundary.

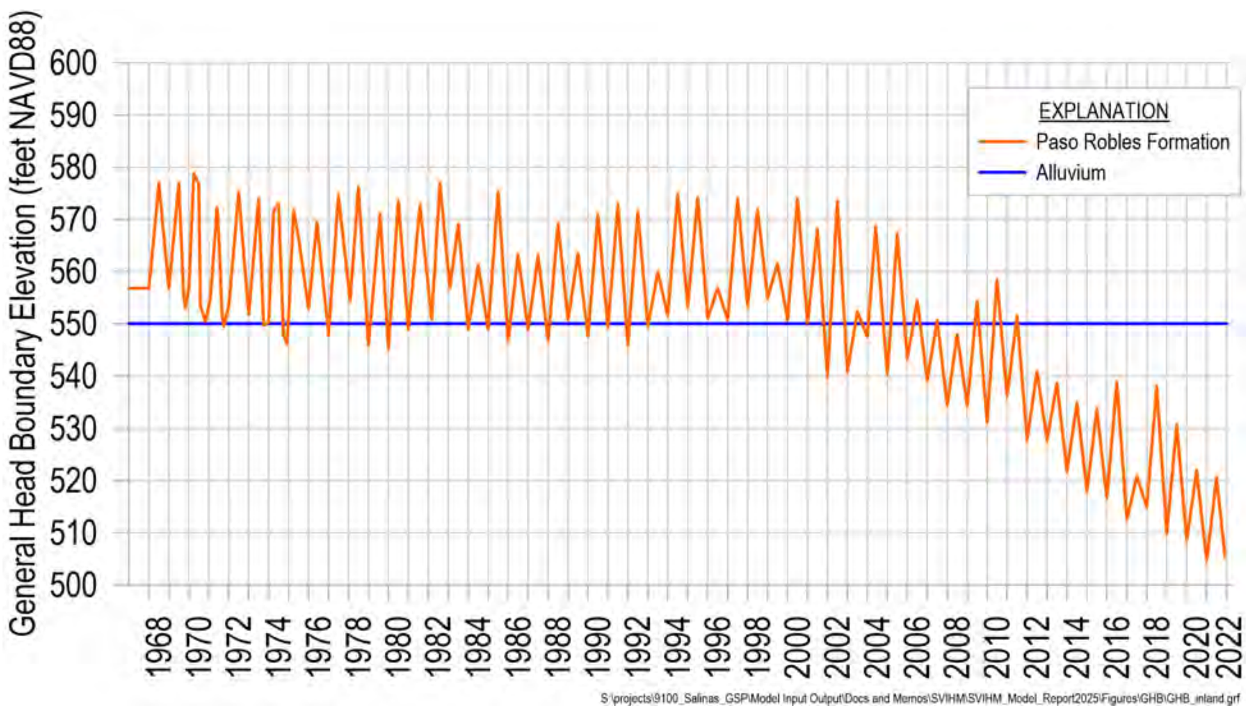

Figure 26. Inland GHB Groundwater Elevations by Unit

4 MODEL CALIBRATION

Calibration is the process of adjusting model parameters to ensure that a simulated model accurately represents real-world conditions. Details on the original SVIHM calibration are provided in Henson *et al.* (2025). After modifying the boundary conditions and model grid, as described in the previous chapter, the SVIHM was re-calibrated using the following steps:

1. Manually adjust crop coefficients to match simulated crop consumptive use to estimates of actual evapotranspiration from OpenET.
2. Manually modify irrigation efficiencies and added demand to match irrigation pumping on a monthly water balance subregion and subbasin basis to GEMS data.
3. Manually adjust pumping capacities at individual wells to improve pumping calibration on a well-by-well basis to GEMS data.
4. Using a combination of manual adjustments and automated parameter estimation (PEST) with PEST_HP, developed by Watermark Numerical Computing, FMP recharge parameters, ocean GHB conductivities, hydraulic properties, and stream conductivities were iteratively modified to minimize the discrepancy between measured and observed groundwater levels and surface water flows.

4.1 Calibration Datasets and Methods

Calibration data were compiled from a variety of published sources as well as through collaboration with other agencies including MCWD, SSWM, and MCWRA. MCWD collaborated and helped with calibration in the Monterey subbasin.

4.1.1 Farm Process

The goal of recalibrating the farm process was to improve the match between simulated pumping and reported monthly pumping from GEMS. The first step in this process was assessing whether the consumptive use estimates from the original SVIHM were in line with observed estimates of consumptive use. Details on this comparison can be found in the technical memorandum provided to SVBGSA (M&A, 2025). The memorandum concluded that consumptive use estimates from the ITRC study (ITRC, 2024) and Open ET (Volk *et al.*, 2024) are more representative than those in the original SVHIM. In FMP, crop coefficients—often referred to as K_c—are multiplied by spatial reference ET to calculate potential ET. FMP attempts to meet the potential ET with available natural and irrigation water sources (see sections above). The amount of potential ET satisfied with available water is the simulated consumptive use, or actual ET. Crop coefficients were manually updated to make simulated final consumptive use estimates consistent with OpenET estimates.

Once consumptive use was consistent with reported values, crop irrigation efficiencies were manually adjusted to match monthly totals of irrigation pumping from GEMS on a WBS basis. Measured irrigation data is available from 1995 to 2022. During this period, M&A observed that all winter crop demand in the original SVIHM was satisfied by effective precipitation and that the model was not simulating winter irrigation pumping, despite simulated consumptive use aligning with OpenET estimates. Reported GEMS data indicate significant pumping in winter. An additional water demand representing winter pumping was added for some WBS in the model to improve winter calibration to GEMS data.

Precipitation loss percentages for the 4 upland land use types were modified as part of the automated calibration process. This parameter defines what proportion of precipitation that is not consumed by the crop becomes surface runoff or deep percolation. This parameter was used to adjust the amount of recharge during the calibration process. Precipitation availability was modified to increase recharge in the Dune Sands near Monterey as described in section 3.5.4

The Farm Process aggregates demands over a WBS and distributes this pumping on wells assigned to that farm based on a specified pumping capacity. This parameter was adjusted to improve the match between simulated and reported pumping at individual wells throughout the calibration process.

4.1.2 Surface Water Calibration

Measured monthly surface water data is available at 6 USGS streamflow gages within the model area as shown on Figure 24. As mentioned above, measured flows at the Arroyo Seco near Soledad gage were used as an inflow to the model. Stream and aquifer conductivities were adjusted to improve the match at observed gauges using PEST. Lower stream flows in the summer months were given a larger statistical weight so that smaller errors in low flows resulted in a larger impact on the calibration. In addition to comparing timeseries data at gaged locations, stream flows were also calibrated to river series measurements prepared by MCWRA in July 2018, August 2019, and July 2021. These river series surveys included 10 measurements along the Salinas River and provide a more refined estimate of seepage losses between measurement locations. River series data were used to calculate estimates of seepage. Estimated losses are total losses and include riparian evapotranspiration whereas simulated losses are only the exchange of surface water and groundwater.

4.1.3 Groundwater Level Calibration

Groundwater level elevations used for calibration are compiled from data provided to M&A from MCWD, MCWRA, and the Seaside Water Master. These data are compiled and stored in a database.

The Hydraulic-Head Observation Package (HOB) file is used for integrating observed hydraulic heads (groundwater levels) into the model for comparison with simulated hydraulic heads. Screen elevations were compiled for each well and mapped onto the model layering.

For automated calibration, a statistical weighting system was applied to observation wells where increased weights are used for wells that are identified as representative monitoring sites (RMS) and to measurements after 1995, when reported pumping is available to validate FMP estimated pumping. The weighting scheme is applied to focus model calibration to more recent periods where the groundwater conditions in the basin are better understood and at locations that will be used for SGMA-related monitoring.

The location of HOB wells used for calibration are shown on Figure 27. The HOB locations are displayed by aggregate groups. These groups are combinations of wells that are associated with HGUs that have generally similar properties and locations.

Initial heads were adjusted to reduce more error in early time. However, the focus of the calibration is from 1995 on, and the initial heads have limited impact on this later time.

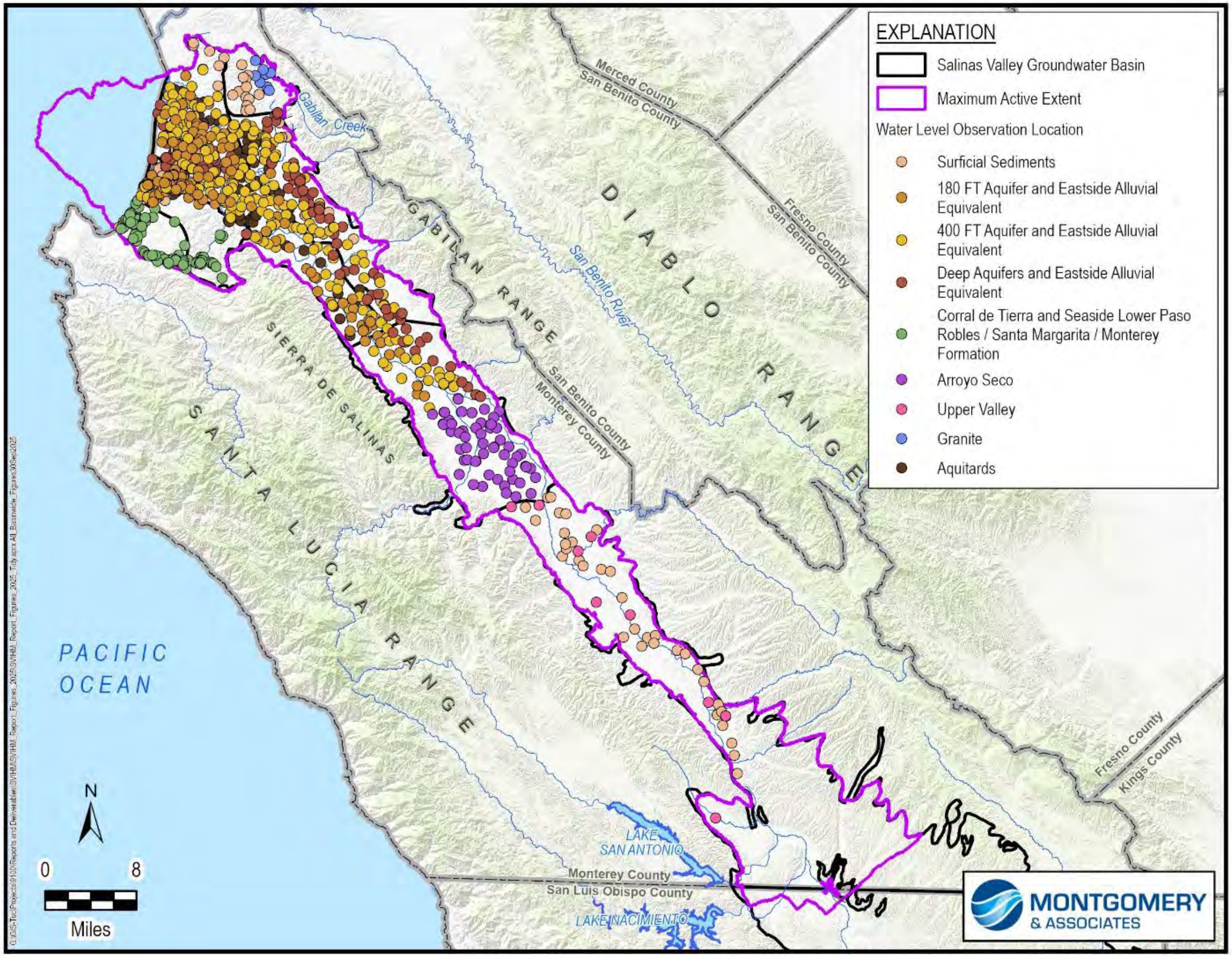

Figure 27. Groundwater Elevation Observation Locations by Group

4.2 CALIBRATION RESULTS

This section provides a summary of the results of the Farm Process, groundwater elevation, and surface water flow calibration process. Groundwater elevation calibration in this section includes a summary of the estimated aquifer hydraulic parameters, groundwater level calibration statistics, simulated versus observed groundwater level contours and hydrographs, and spatial distribution of groundwater level residuals. To assess the quality of the surface water calibration, this section includes a summary of simulated versus observed surface water flow at gage stations along the Salinas River and the Arroyo Seco, simulated river series along the Salinas River, and simulated versus estimated streamflow seepage along the Salinas River. Overall, the updated SVIHM is better calibrated than the original version.

4.2.1 Farm Process

The Farm Process was calibrated first by adjusting crop coefficients to match simulated consumptive use with estimates of actual evapotranspiration from OpenET (Volk *et al.*, 2024). Figure 28 shows a comparison between simulated actual evapotranspiration from the updated SVIHM and OpenET estimates of crop consumptive use for 2003 through 2022.

In general, simulated consumptive use is similar to OpenET estimates on a large scale for North Valley, which includes irrigated WBS north of Forebay and for Forebay. Consumptive use is generally underpredicted in Upper Valley. This match could be improved in future calibration efforts. This discrepancy has limited effect on simulated irrigation pumping since irrigation efficiencies are adjusted to modify the pumping calibration after this step. This initial step was performed to get consumptive use roughly consistent with measured data. Appendix C lists monthly crop coefficients for each of the 60 land use types in the model. While literature values of crop coefficients were reviewed, in this case, simulated crop coefficients should be thought of more as scaling factors or calibration parameters used to calibrate the model to estimates of consumptive use. The calibrated parameters attempt to account for other inaccuracies in the model that are not well constrained with observed data such as the extent of groundwater root uptake, farm-scale runoff, and other landscape processes that the SVIHM does not simulate.

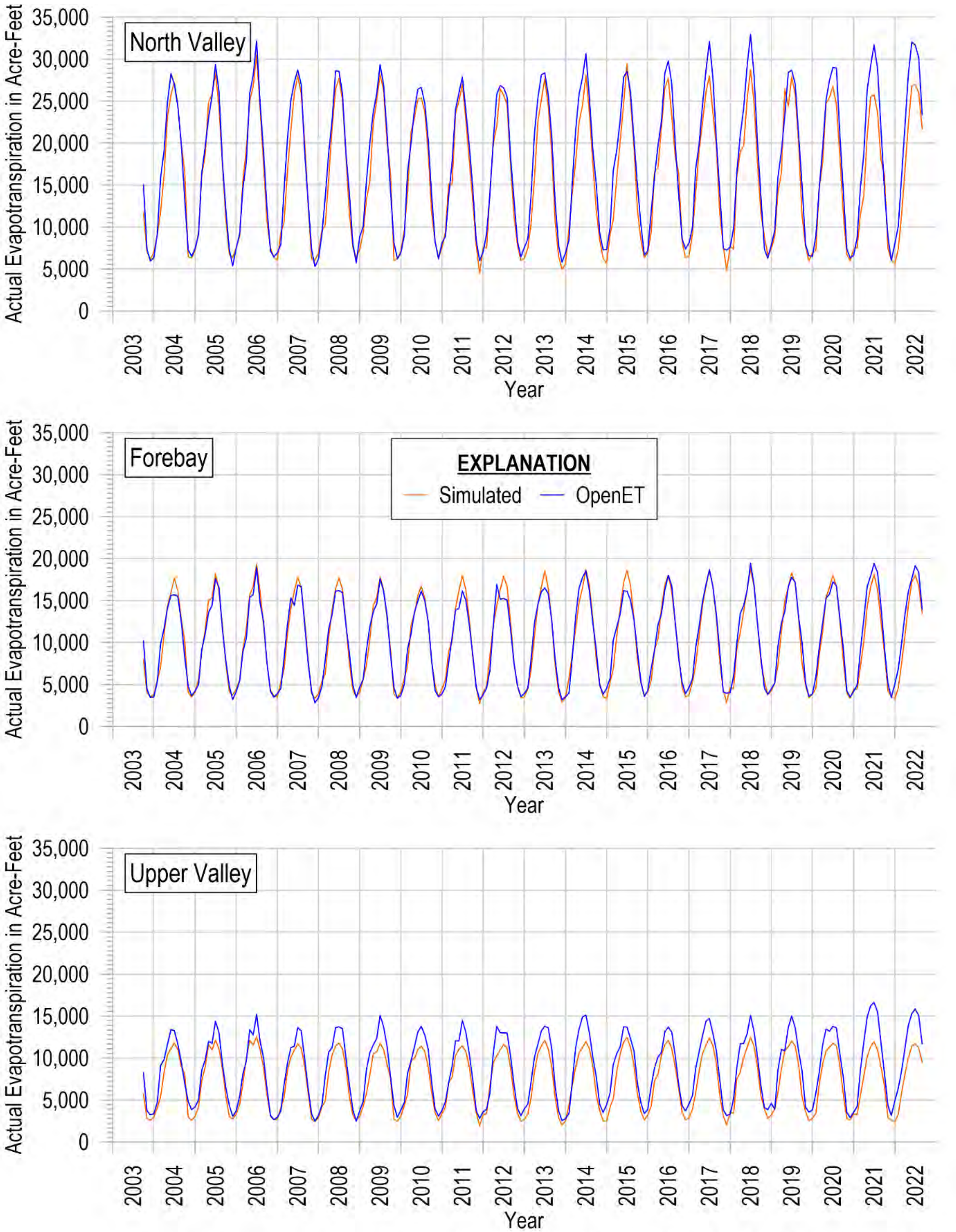

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Figure 28.Comparison Between Observed and Simulated Actual Evapotranspiration

Once the match between estimated and simulated consumptive use was improved, irrigation efficiencies were then adjusted to calibrate simulated irrigation pumping. This approach was applied so that a discrepancy in consumptive use does not impact the final simulated pumping. For example, the updated model generally underpredicts consumptive use in the Upper Valley. As a result, irrigation efficiencies are lower in the Upper Valley than they would be otherwise to compensate for this discrepancy. The resulting values for simulated crop coefficients and irrigation efficiencies are not directly comparable to actual observed values. FMP is a simplification of a natural system and is not able to capture all the complexities and variations in irrigation practices that farmers may use. As such, crop coefficients and irrigation efficiencies should be thought of as calibration parameters used to convert estimates of reference evapotranspiration into pumping. Appendix D contains tables of irrigation efficiency by irrigation type. Figure 29 through Figure 34 show the monthly pumping calibration on a WBS basis. Some WBSs are not included in the figures because irrigation pumping is not simulated in these areas. All graphs are shown with the same axes so that the quality of the calibration, and the overall magnitude of pumping in each WBS could be compared. Locations of WBSs are shown on Figure 22.

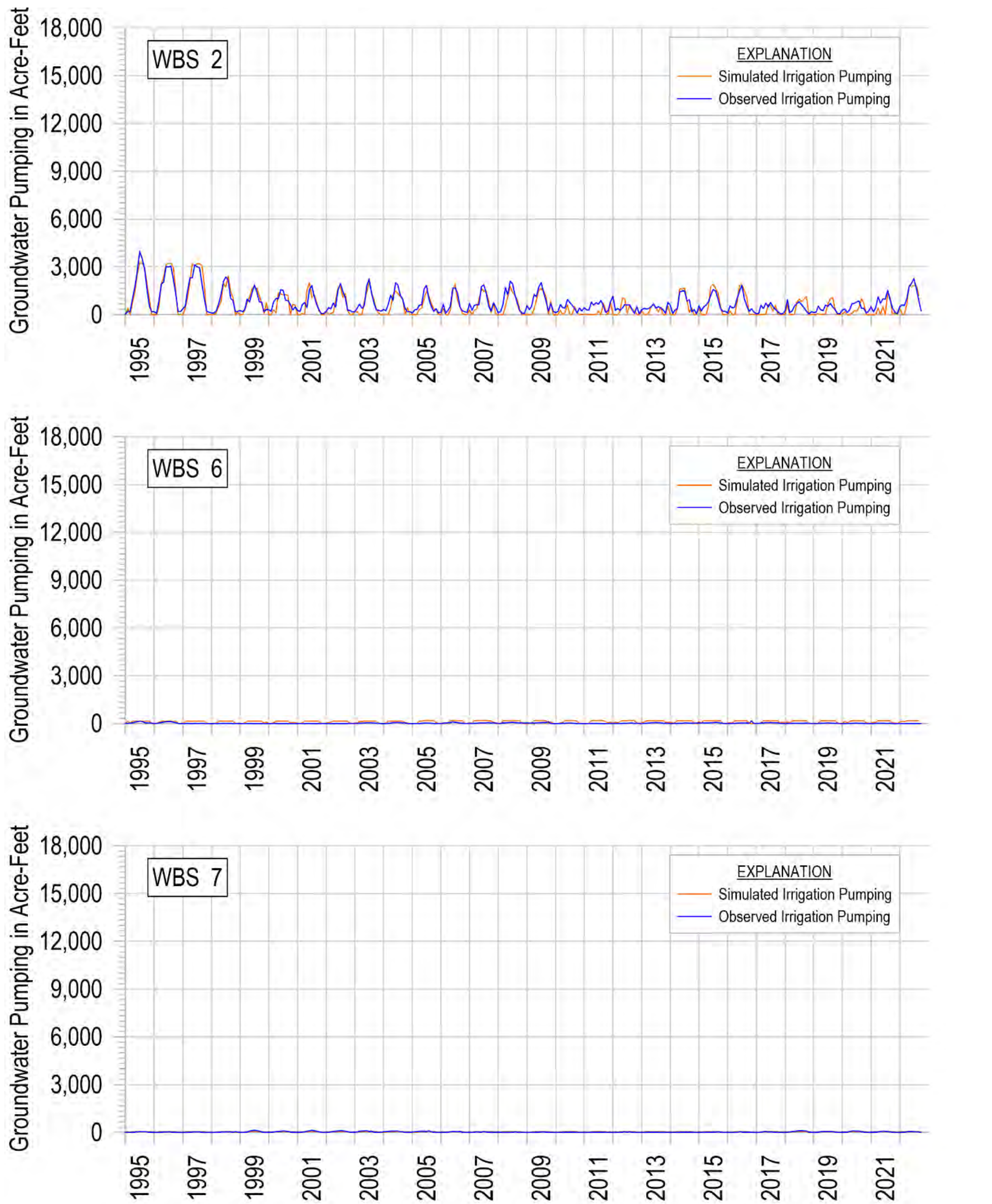

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Figure 29. Observed Versus Simulated Irrigation Pumping for Water Balance Subregions 2, 6, and 7

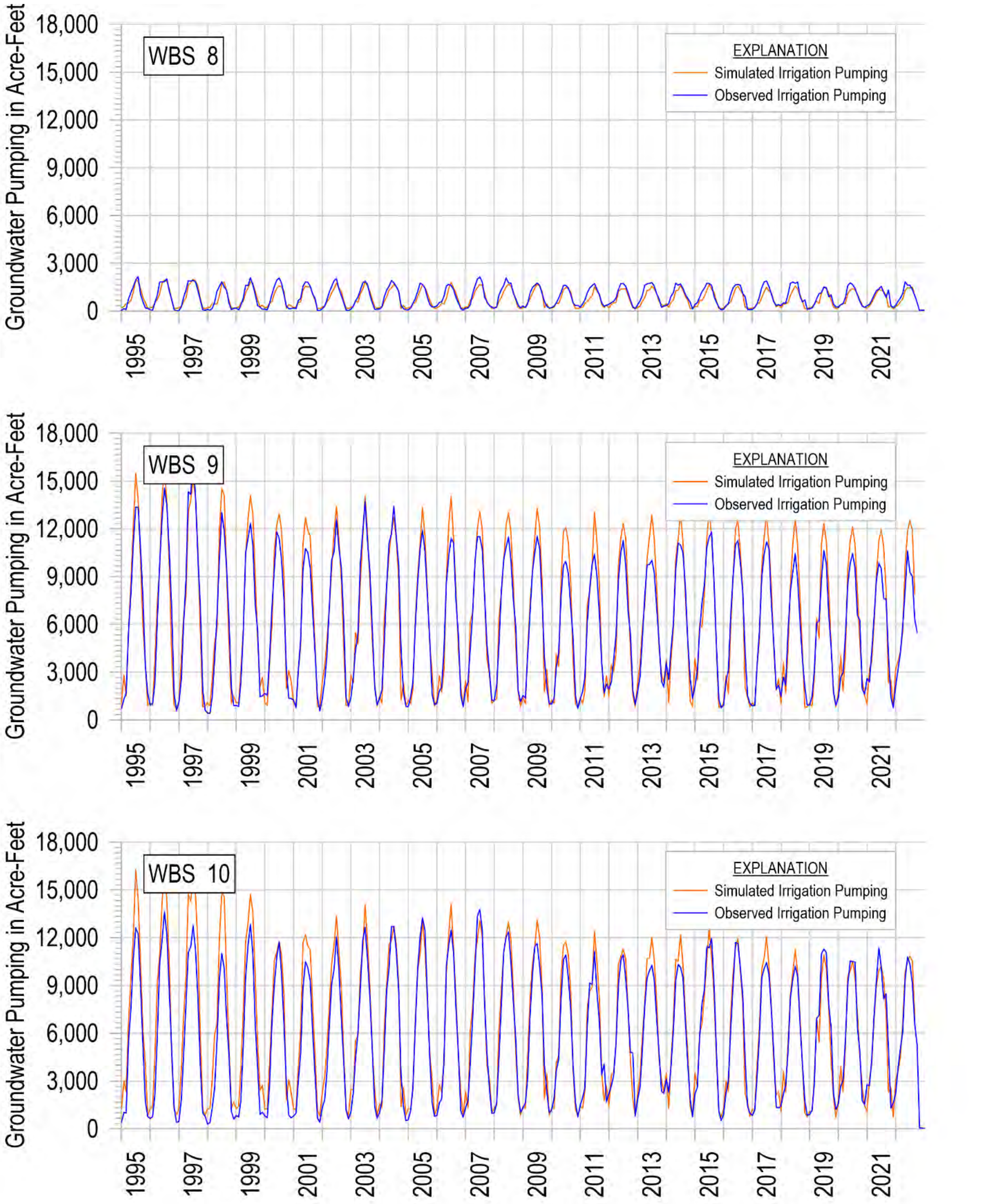

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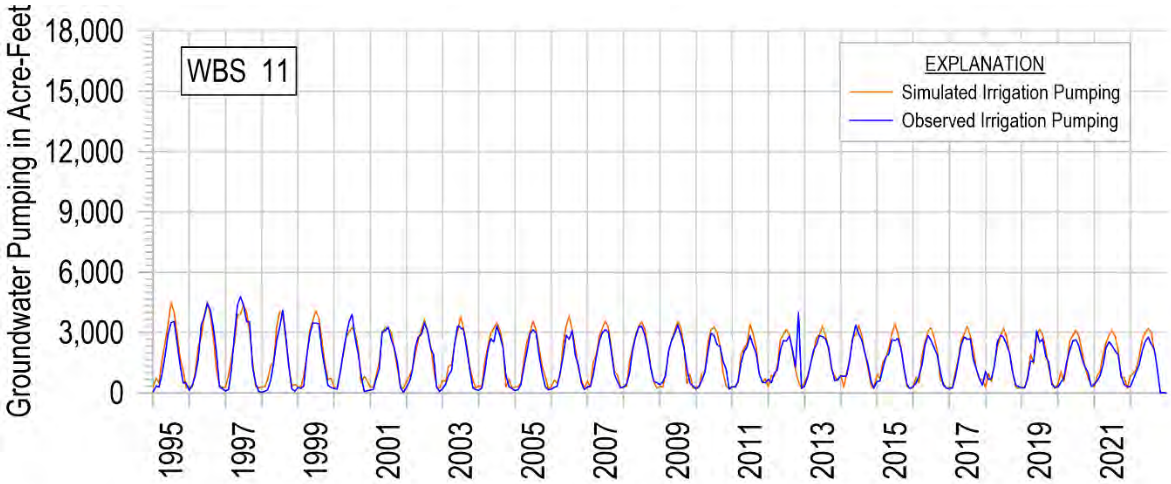
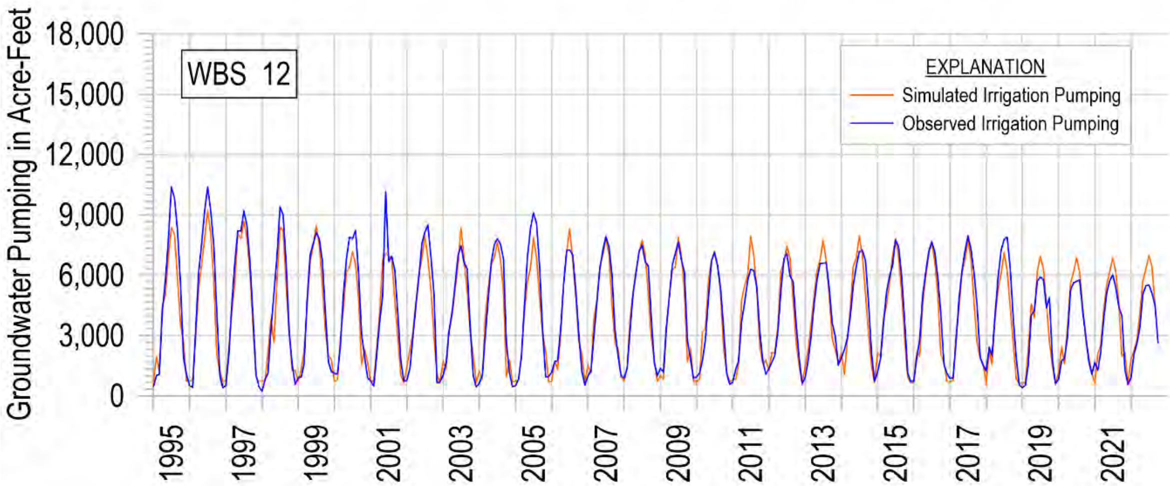
Figure 30. Observed Versus Simulated Irrigation Pumping for Water Balance Subregions 8, 9, and 10





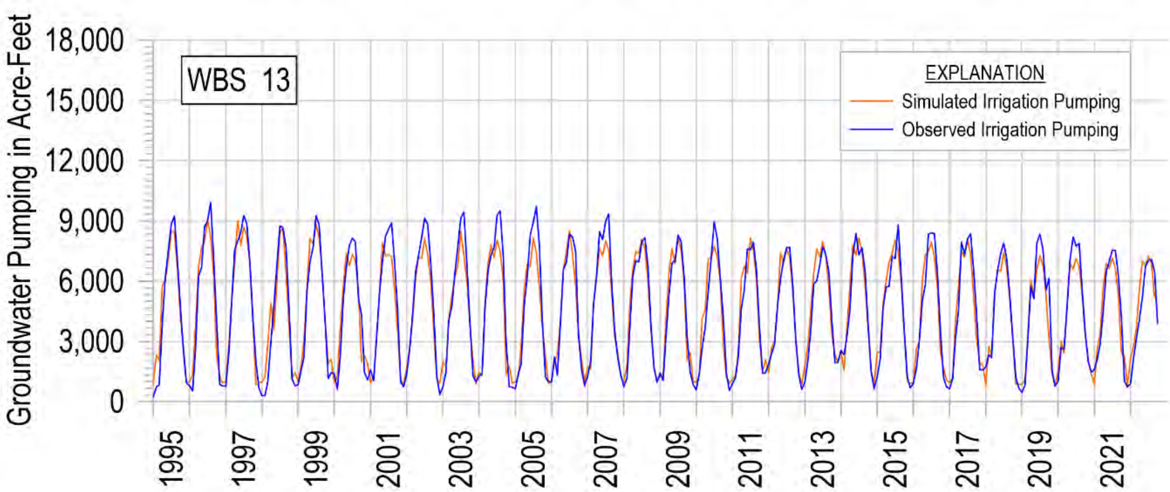


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Figure 31. Observed Versus Simulated Irrigation Pumping for Water Balance Subregions 11, 12, and 13

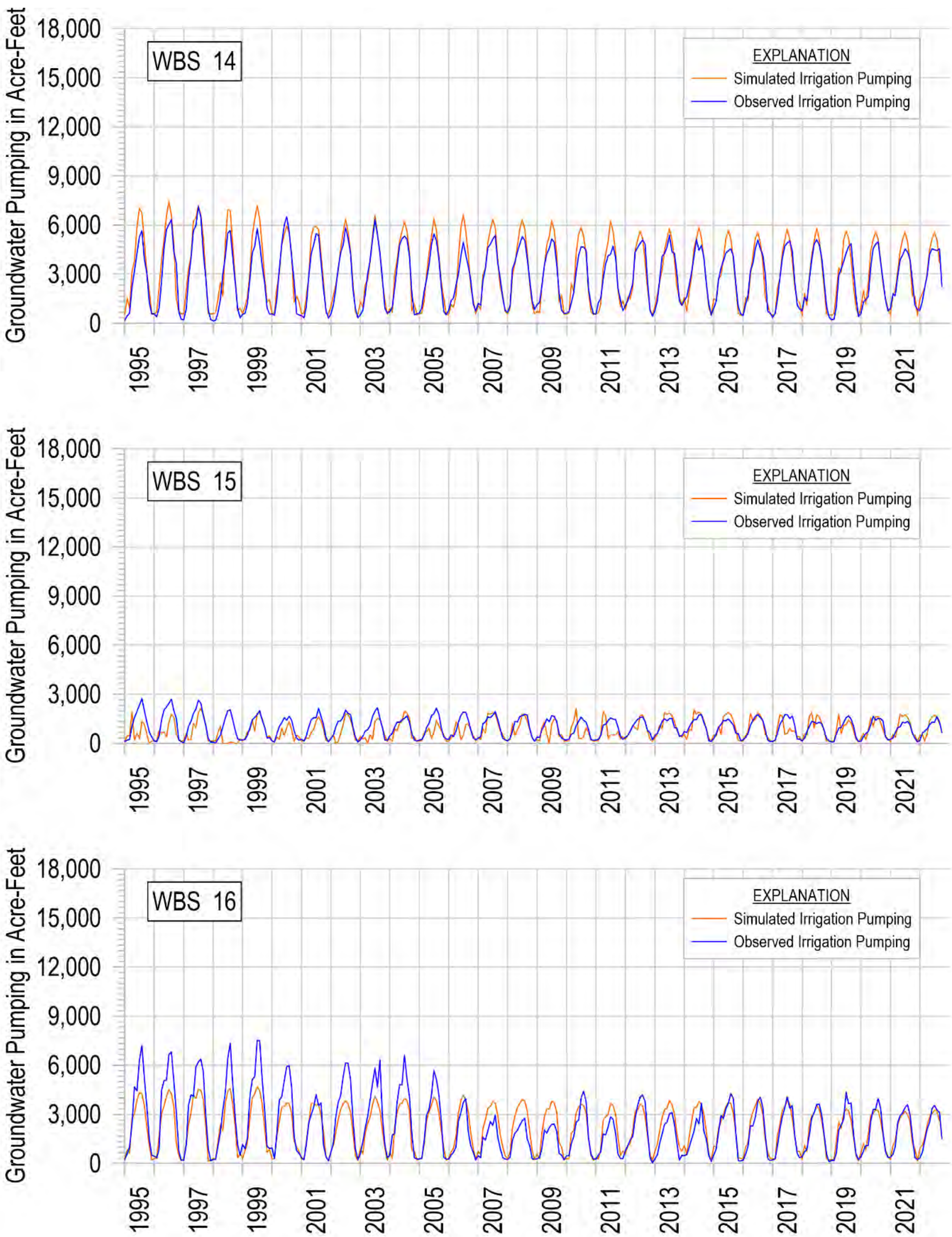

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Figure 32. Observed Versus Simulated Irrigation Pumping for Water Balance Subregions 14,15, and 16

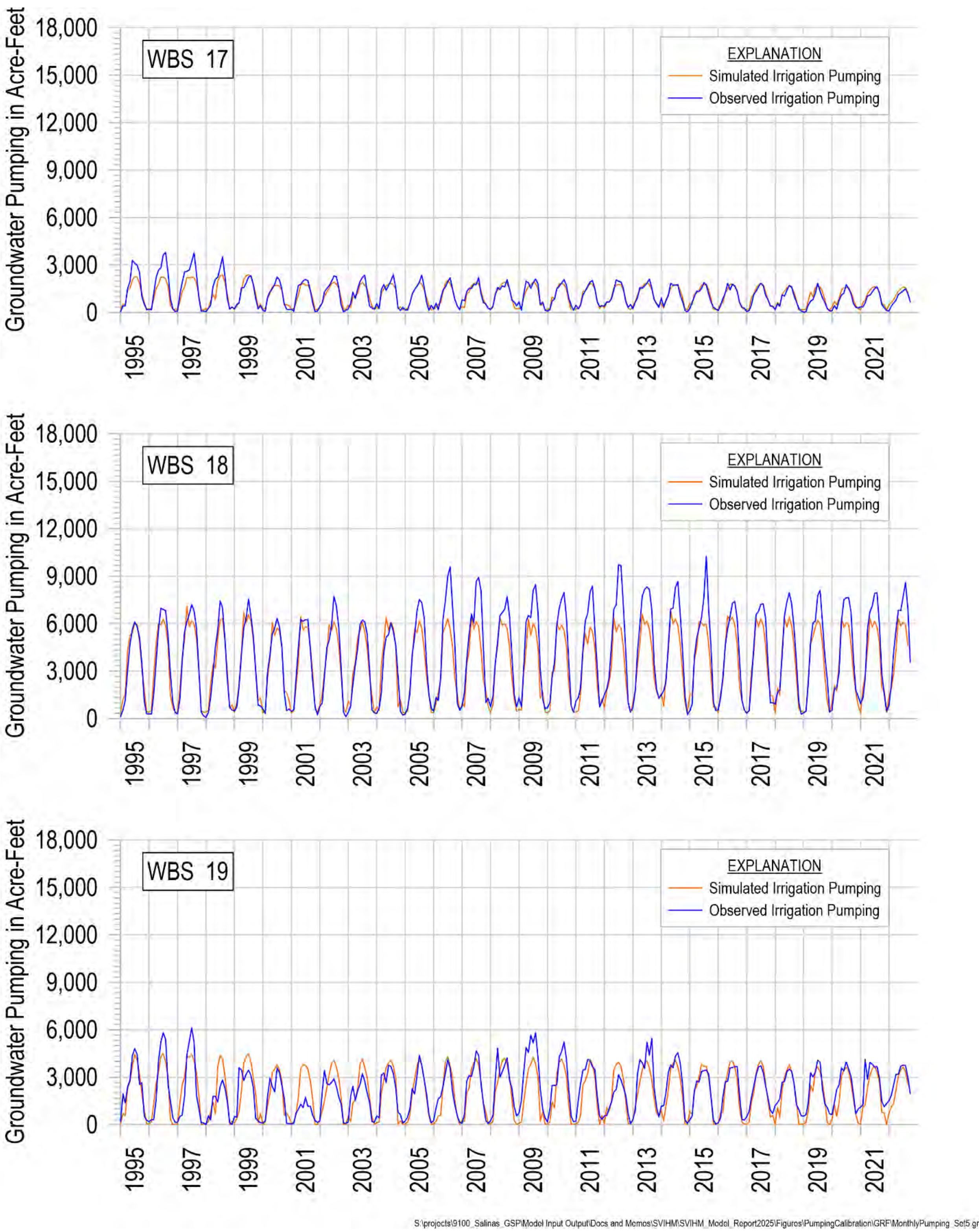

Figure 33. Observed Versus Simulated Irrigation Pumping for Water Balance Subregions 17, 18, and 19

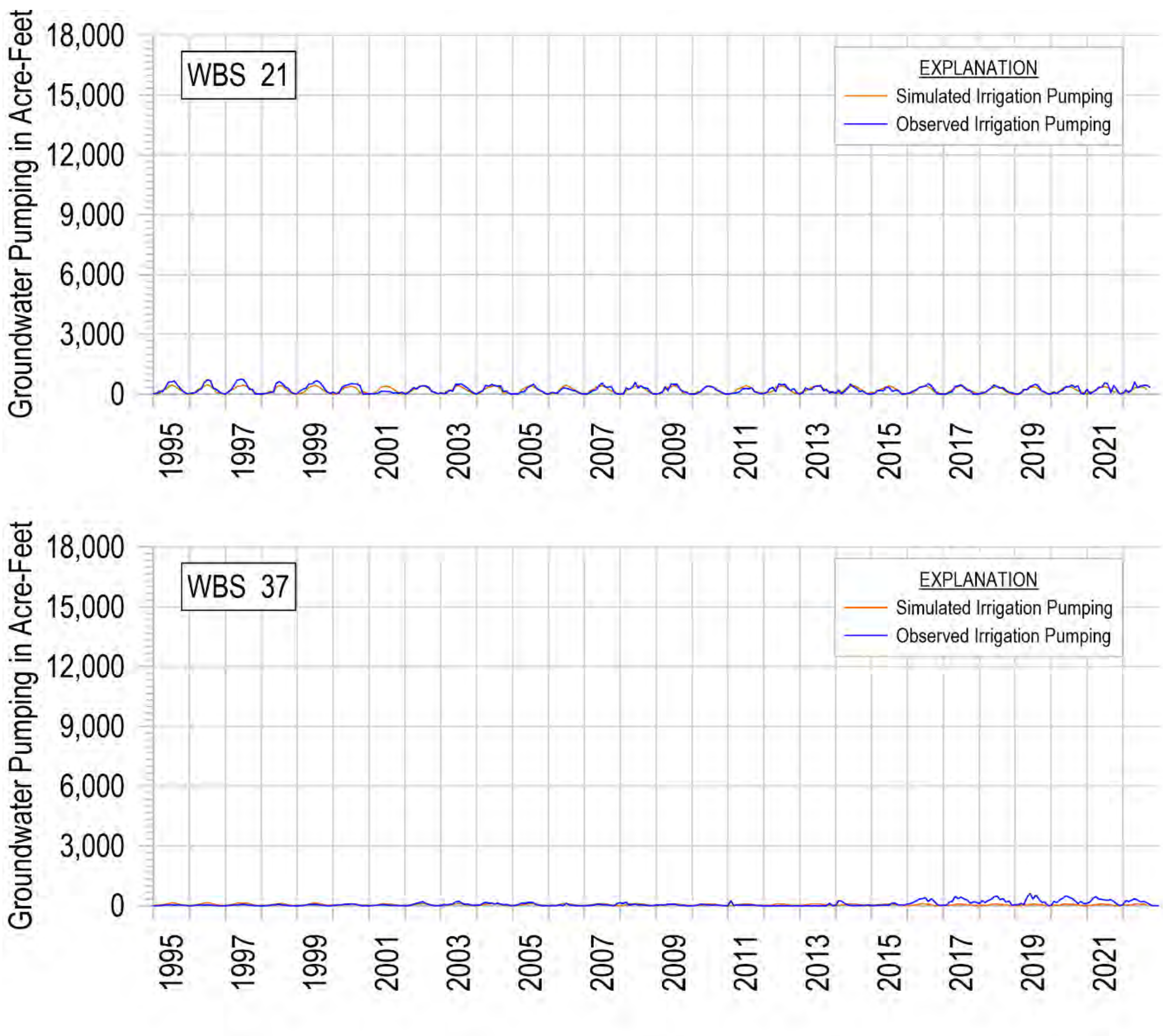

Figure 34. Observed Versus Simulated Irrigation Pumping for Water Balance Subregions 21 and 37

4.2.2 Eastside Stream Recharge

Observed hydrographs in Eastside suggested a stronger response to wet winters than initially simulated by the SVIHM. To allow more stream recharge during these periods, the stream width in the tributaries located in the Eastside was increased to 200 feet in the winters of 1982-1983, 1994-1995, 1996-1997, 1997-1998, and 2016-2017. The widths were adjusted during the years specified to represent overbank flooding. This increased the simulated magnitude of groundwater level response in wet months without increasing the recharge during drier periods where groundwater levels did not rise as much.

4.2.3 Estimated Hydraulic Properties

PEST calibrated aquifer parameters are shown on Figure 35 through Figure 69. Figure 35 shows a box and whisker plot of calibrated horizontal hydraulic conductivity by simulated HGU. Measured estimates of hydraulic conductivity for the zones are displayed where available. This data is also summarized in Table 3. In general, the calibrated hydraulic parameters (median value shown as red points on Figure 35) are consistent with observed measurements. Observed data was compiled from a variety of sources for developing the Seawater Intrusion Model and for subsequent investigations. Only tests deemed to be “high” quality are shown in the plot; these tests are generally longer-term, constant-rate pumping tests.

Figure 36 through Figure 46 show simulated horizontal hydraulic conductivity by layer.

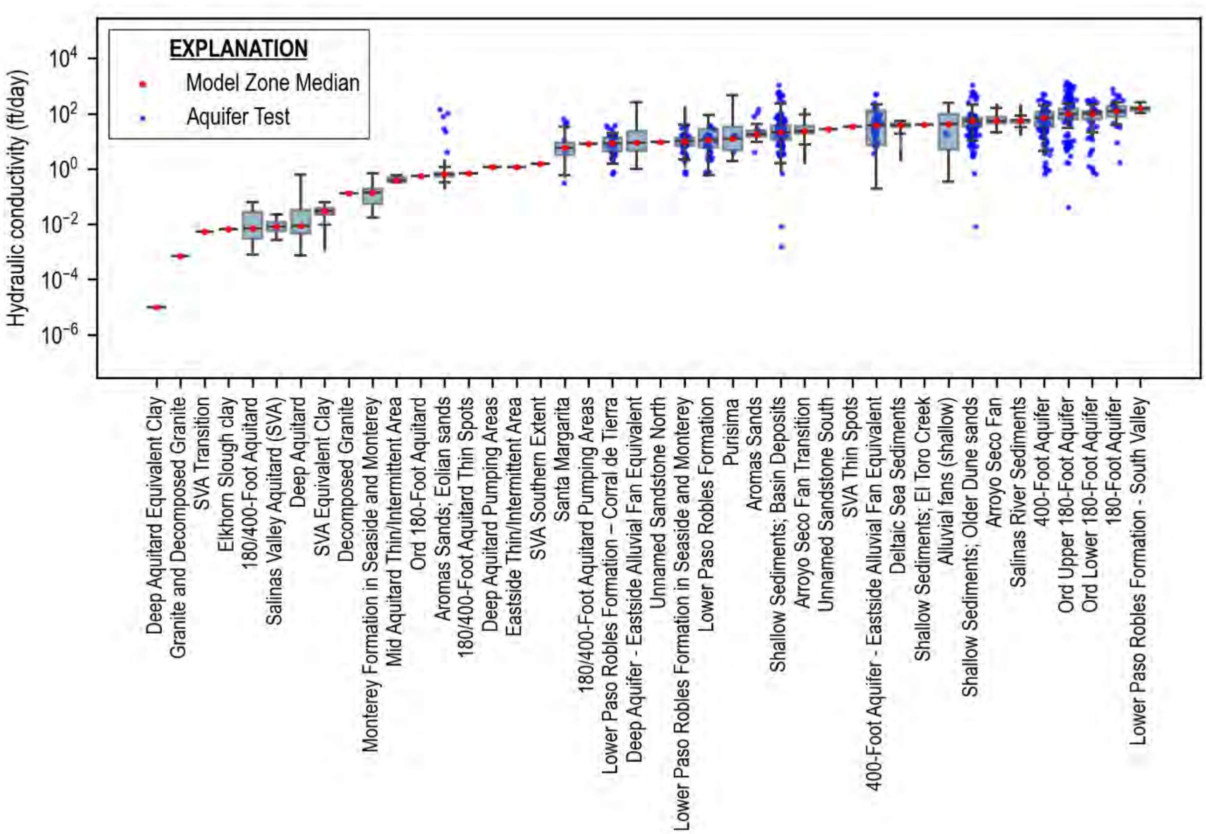

Figure 35. Box and Whisker Plot of Horizontal Hydraulic Conductivity by Model Zone

Table 3. Summary of Simulated and Measured Hydraulic Properties by HGU

HGU Zone No.	HGU Description	Simulated Horizontal Hydraulic Conductivity (ft/day)			Simulated Vertical Hydraulic Conductivity (ft/day)			Measured Horizontal Hydraulic Conductivity (ft/day)			Simulated Specific Storage (1/ft)
		Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean	Zone Value
2	Deltaic Sea Sediments	2.08	55	31	16	48	32	-	-	-	2.36E-02
3	Alluvial fans (shallow)	0.35	241	21	0.06	20	1.75	-	-	-	2.63E-05
4	Salinas River Sediments	17	198	53	1.63	10	3.8	-	-	-	1.00E-03
5	Shallow Sediments; Basin Deposits	0.84	225	20	0.02	19	0.69	1.55E-03	612	23	1.27E-03
6	Shallow Sediments; Older Dune sands	10	211	52	0.37	8.39	3.09	-	-	-	5.00E-04
7	Aromas Sands; Eolian sands	0.2	1.98	0.63	7.86E-03	0.06	0.02	-	-	-	3.12E-04
8	Aromas Sands	9.21	42	18	3.15	15	8.8	3.9	29	14	1.94E-04
9	Elkhorn Slough clay	6.46E-03	6.46E-03	6.46E-03	1.62E-04	1.62E-04	1.62E-04	-	-	-	2.94E-05
10	Shallow Sediments; El Toro Creek	40	40	40	7.06	7.06	7.06	-	-	-	1.37E-04
14	Granite and Decomposed Granite	7.03E-04	7.03E-04	7.03E-04	9.21E-05	9.21E-05	9.21E-05	-	-	-	9.28E-05
15	Decomposed Granite	0.13	0.13	0.13	0.03	0.03	0.03	-	-	-	1.31E-03
20	Salinas Valley Aquitard (SVA)	2.62E-03	0.02	8.06E-03	8.46E-05	0.02	7.87E-04	-	-	-	5.85E-05
21	SVA Thin Spots	34	34	34	2.74	2.74	2.74	-	-	-	2.00E-06
22	SVA Transition	5.42E-03	5.42E-03	5.42E-03	2.23E-04	2.23E-04	2.23E-04	-	-	-	3.41E-05
23	SVA Equivalent Clay	1.16E-03	0.06	0.02	3.83E-05	0.02	3.25E-03	-	-	-	3.24E-05
30	180-Foot Aquifer	39	260	119	0.75	25	7.23	8.94	785	84	2.95E-05
31	Ord Upper 180-Foot Aquifer	30	229	93	0.01	5.4	0.41	0.04	1,396	85	9.30E-06
33	Ord 180-Foot Aquitard	0.56	0.56	0.56	5.00E-03	5.00E-03	5.00E-03	-	-	-	7.57E-06

HGU Zone No.	HGU Description	Simulated Horizontal Hydraulic Conductivity (ft/day)			Simulated Vertical Hydraulic Conductivity (ft/day)			Measured Horizontal Hydraulic Conductivity (ft/day)			Simulated Specific Storage (1/ft)
		Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean	Zone Value
34	Ord Lower 180-Foot Aquifer	15	218	84	0.48	3.9	1.51	3.2	332	45	6.65E-05
40	180/400-Foot Aquitard	7.78E-04	0.06	7.72E-03	1.67E-05	9.87E-03	1.62E-04	-	-	-	1.21E-05
41	180/400-Foot Aquitard Thin Spots	0.69	0.69	0.69	8.37E-04	3.83E-03	1.37E-03	-	-	-	1.04E-05
44	180/400-Foot Aquitard Pumping Areas	7.85	7.85	7.85	7.83E-03	7.83E-03	7.83E-03	-	-	-	3.61E-05
50	400-Foot Aquifer	3.5	199	56	0.01	8.39	0.89	-	-	-	7.68E-06
53	400-Foot Aquifer - Eastside Alluvial Fan Equivalent	0.19	213	24	2.31E-03	6.66	0.39	-	-	-	4.38E-06
60	Deep Aquitard	7.41E-04	0.64	0.01	9.38E-06	0.63	8.40E-03	-	-	-	5.36E-05
61	Deep Aquitard Equivalent Clay	1.00E-05	1.00E-05	1.00E-05	1.00E-05	1.00E-05	1.00E-05	-	-	-	8.58E-06
64	Deep Aquitard Pumping Areas	1.14	1.14	1.14	0.14	0.14	0.14	-	-	-	5.35E-04
70	Lower Paso Robles Formation	0.57	89	12	0.06	24	0.95	2.	25	7.75	8.20E-07
71	Lower Paso Robles Formation in Seaside and Monterey	1.09	183	11	0.09	7.59	0.55	-	-	-	1.46E-03
73	Deep Aquifer - Eastside Alluvial Fan Equivalent	0.99	260	9.9	0.01	11	0.74	-	-	-	3.27E-06
74	Lower Paso Robles Formation - Corral de Tierra	1.54	20	7.46	0.09	0.96	0.18	-	-	-	3.37E-03
80	Purisima	1.87	460	13	0.03	87	1.25	17	17	17	7.39E-07
81	Santa Margarita	0.48	34	5.17	0.05	5.36	0.72	0.3	63	13	4.04E-05

HGU Zone No.	HGU Description	Simulated Horizontal Hydraulic Conductivity (ft/day)			Simulated Vertical Hydraulic Conductivity (ft/day)			Measured Horizontal Hydraulic Conductivity (ft/day)			Simulated Specific Storage (1/ft)
		Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean	Zone Value
91	Monterey Formation in Seaside and Monterey	0.02	0.68	0.11	2.97E-03	2.97E-03	2.97E-03	-	-	-	9.13E-05
104	SVA Southern Extent	1.48	1.48	1.48	1.48	1.48	1.48	-	-	-	6.40E-06
105	Mid Aquitard Thin/Intermittent Area	0.32	0.59	0.41	3.39E-03	0.27	0.04	-	-	-	7.57E-06
106	Eastside Thin/Intermittent Area	1.16	1.16	1.16	0.58	0.58	0.58	-	-	-	1.21E-05
107	Arroyo Seco Fan	21	201	56	0.25	2.76	0.73	-	-	-	5.32E-05
108	Arroyo Seco Fan Transition	1.66	144	23	0.02	14	0.3	-	-	-	2.97E-05
109	Lower Paso Robles Formation - South Valley	100	259	152	1.15	14	3.84	-	-	-	7.41E-05
110	Unnamed Sandstone North	9.26	9.26	9.26	3.76	3.76	3.76	-	-	-	1.32E-05
111	Unnamed Sandstone South	27	27	27	14	14	14	-	-	-	4.81E-06

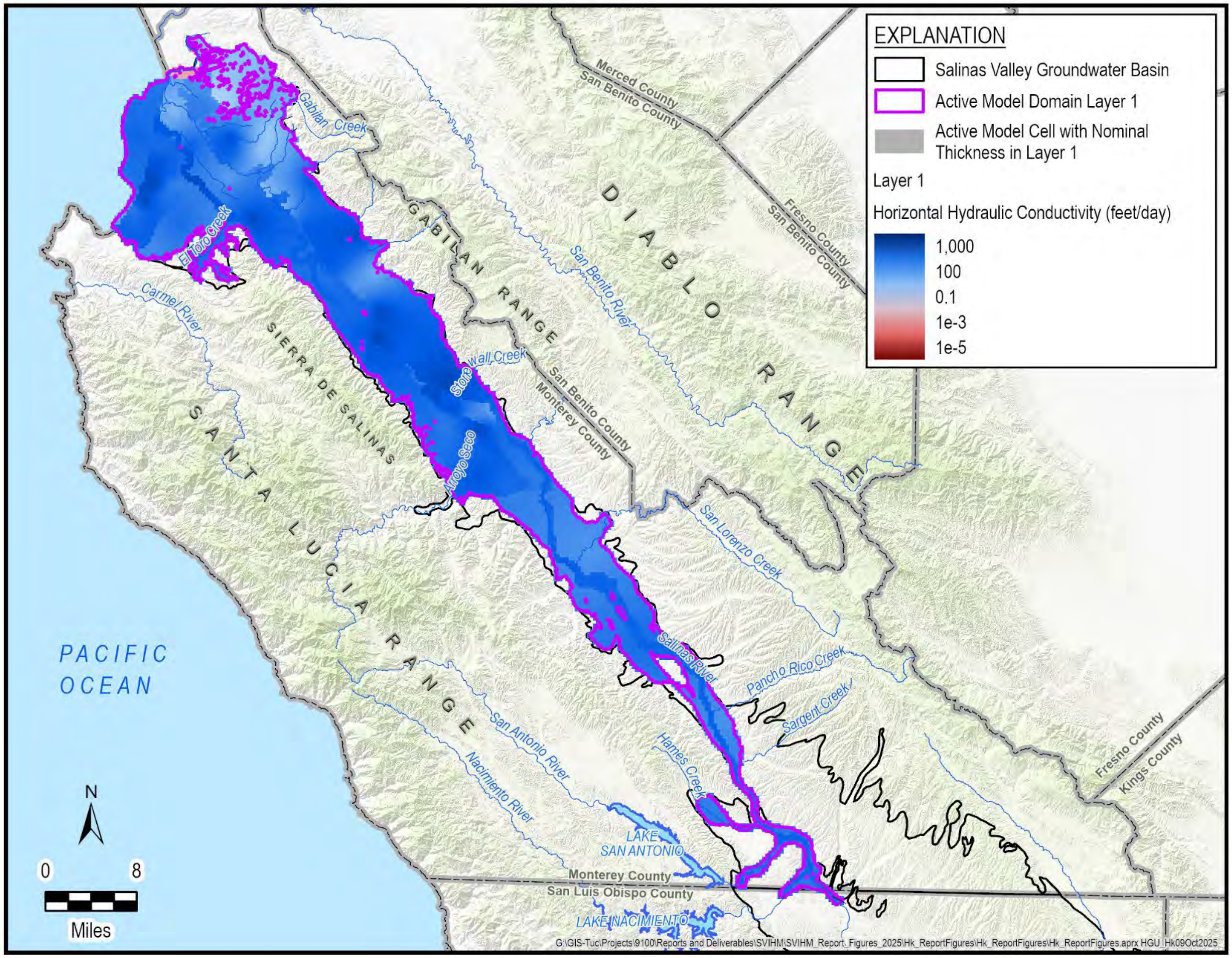

Figure 36. Simulated Horizontal Hydraulic Conductivity for Layer 1

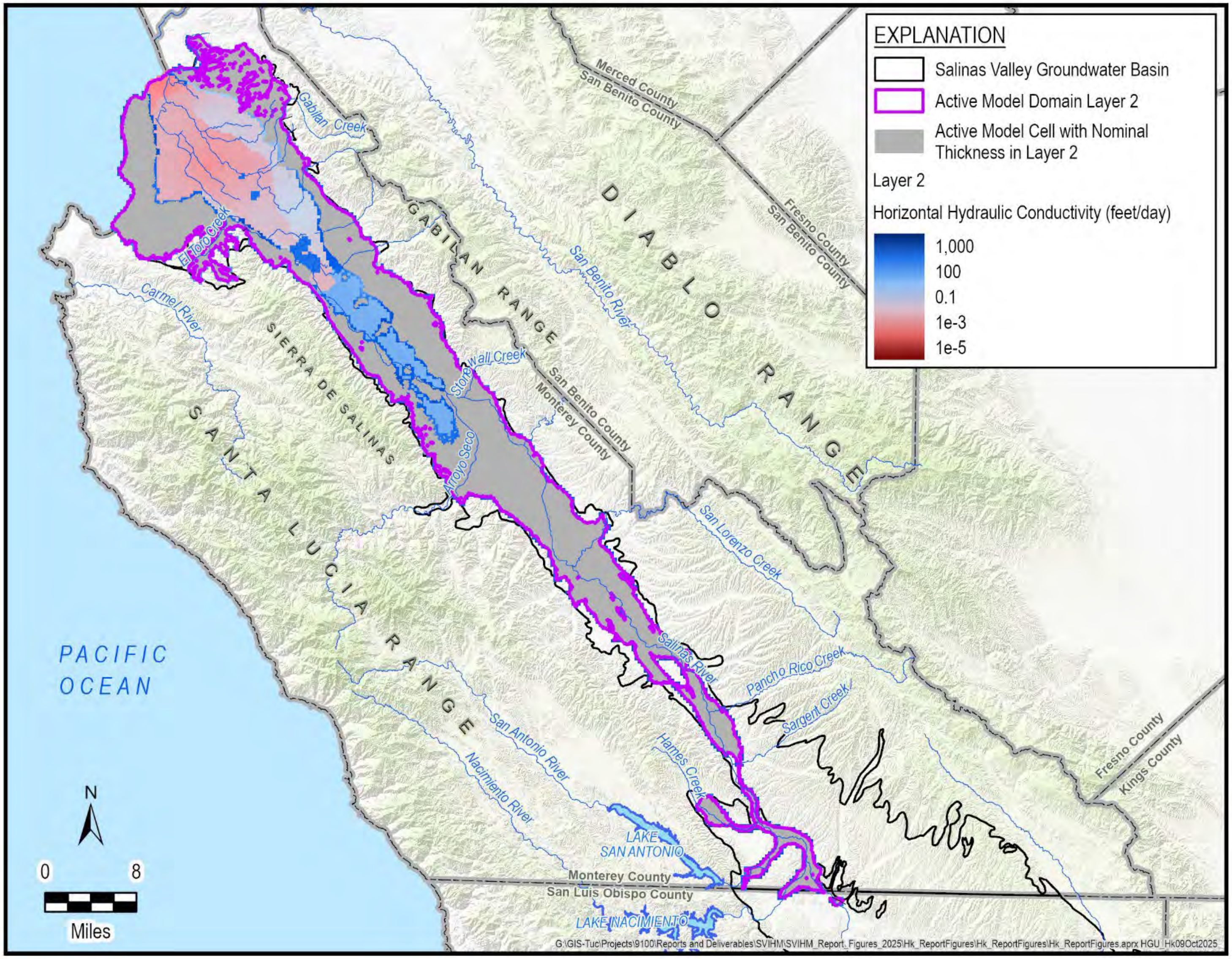

Figure 37. Simulated Horizontal Hydraulic Conductivity for Layer 2

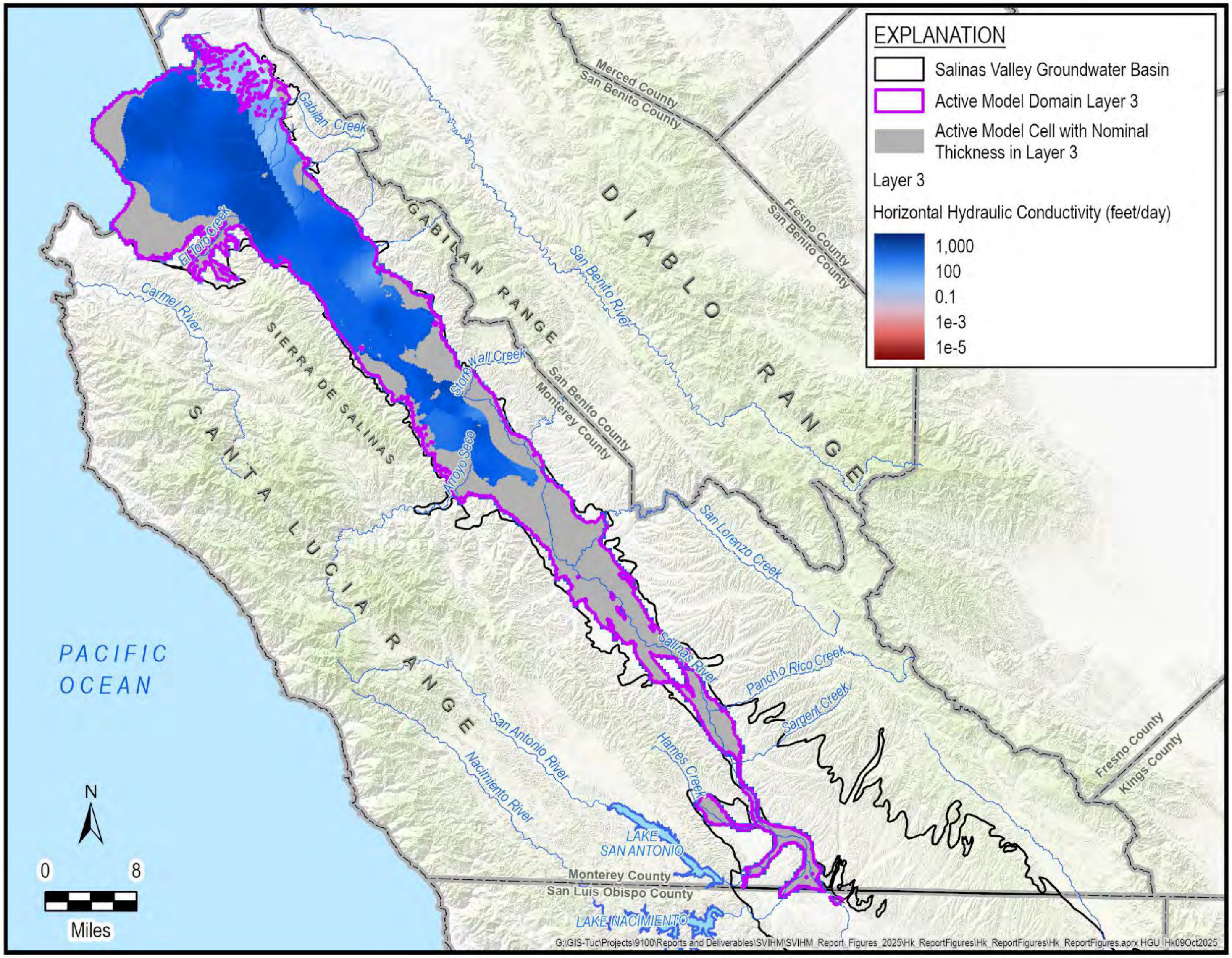

Figure 38. Simulated Horizontal Hydraulic Conductivity for Layer 3

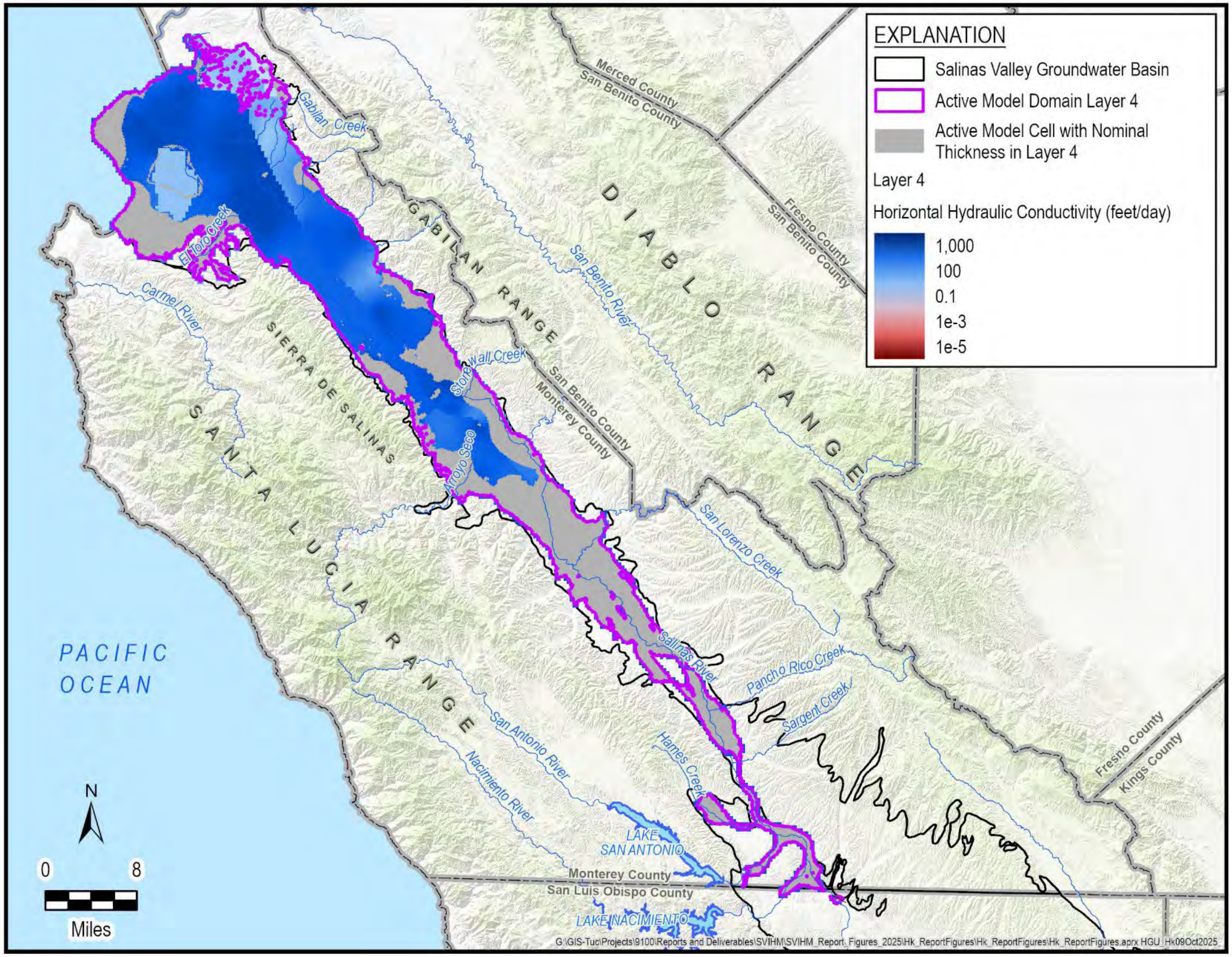

Figure 39. Simulated Horizontal Hydraulic Conductivity for Layer 4

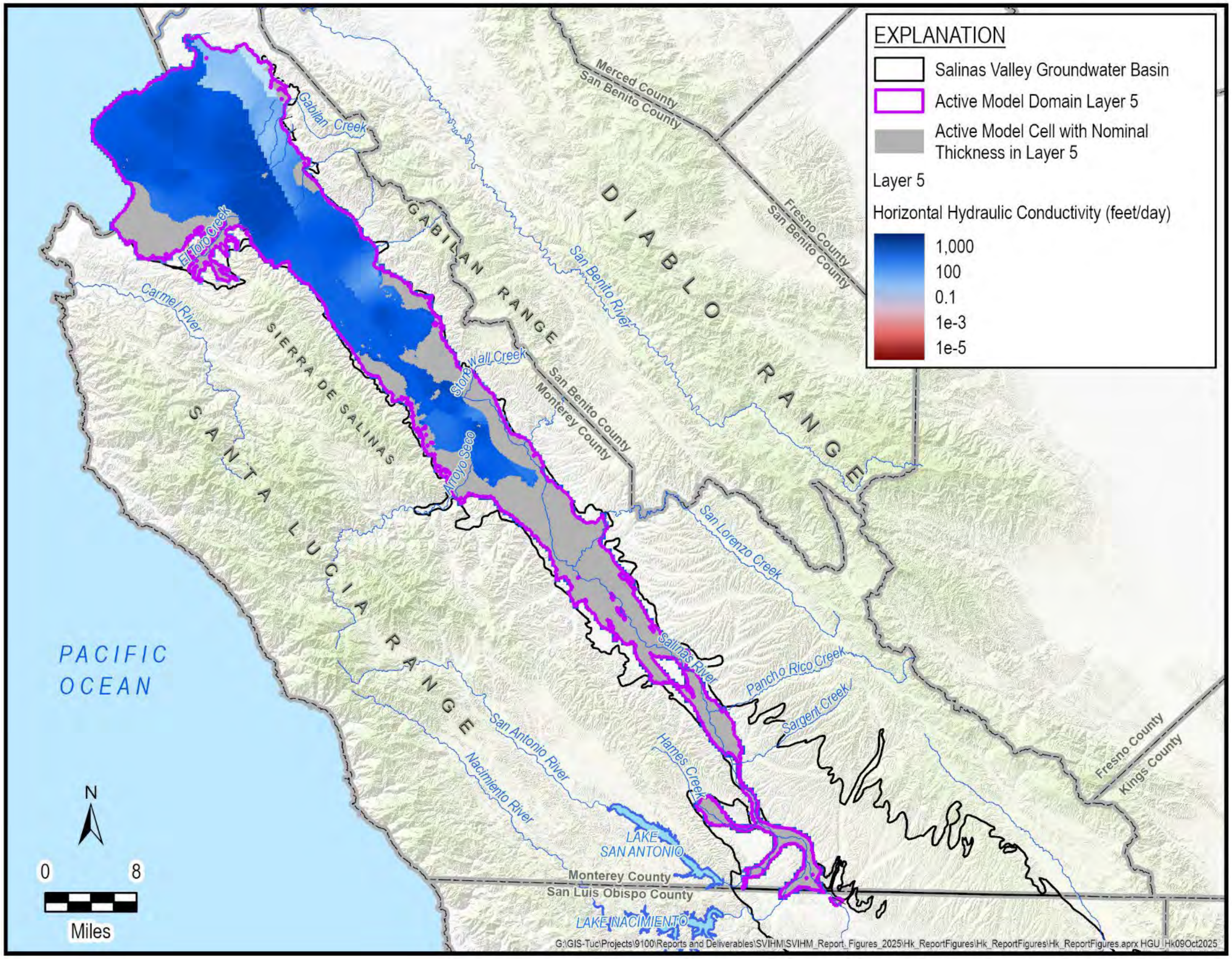

Figure 40. Simulated Horizontal Hydraulic Conductivity for Layer 5

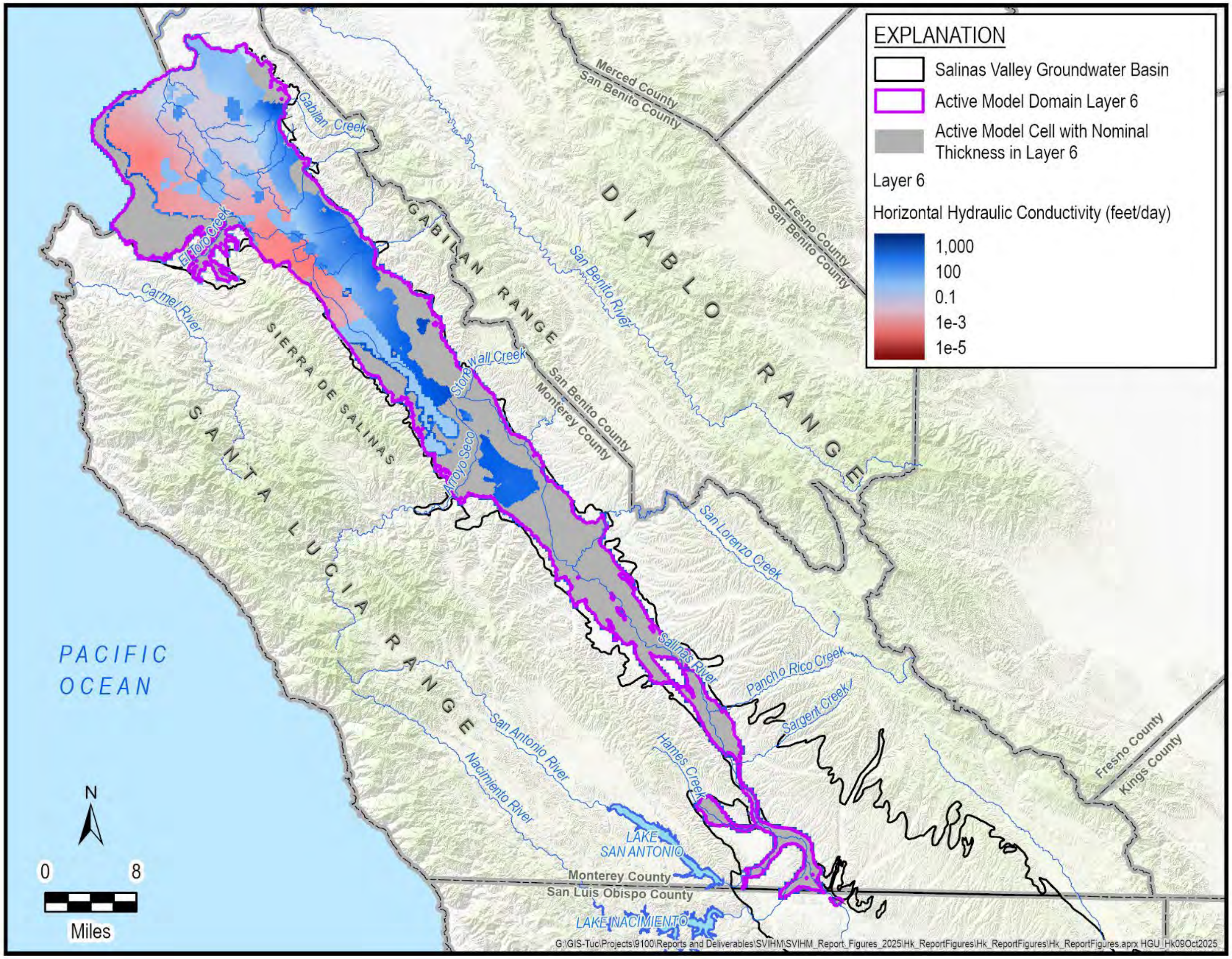

Figure 41. Simulated Horizontal Hydraulic Conductivity for Layer 6

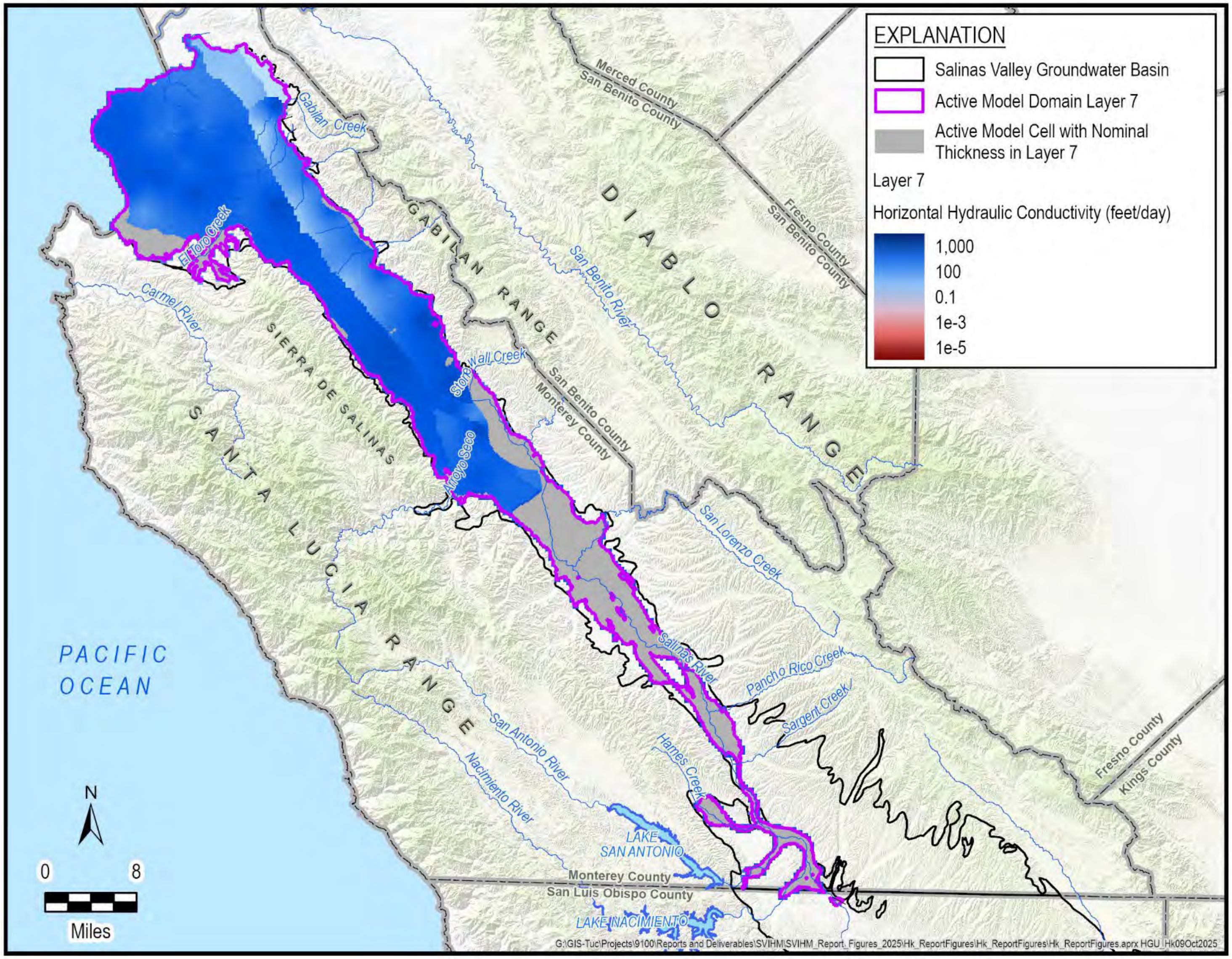

Figure 42. Simulated Horizontal Hydraulic Conductivity for Layer 7

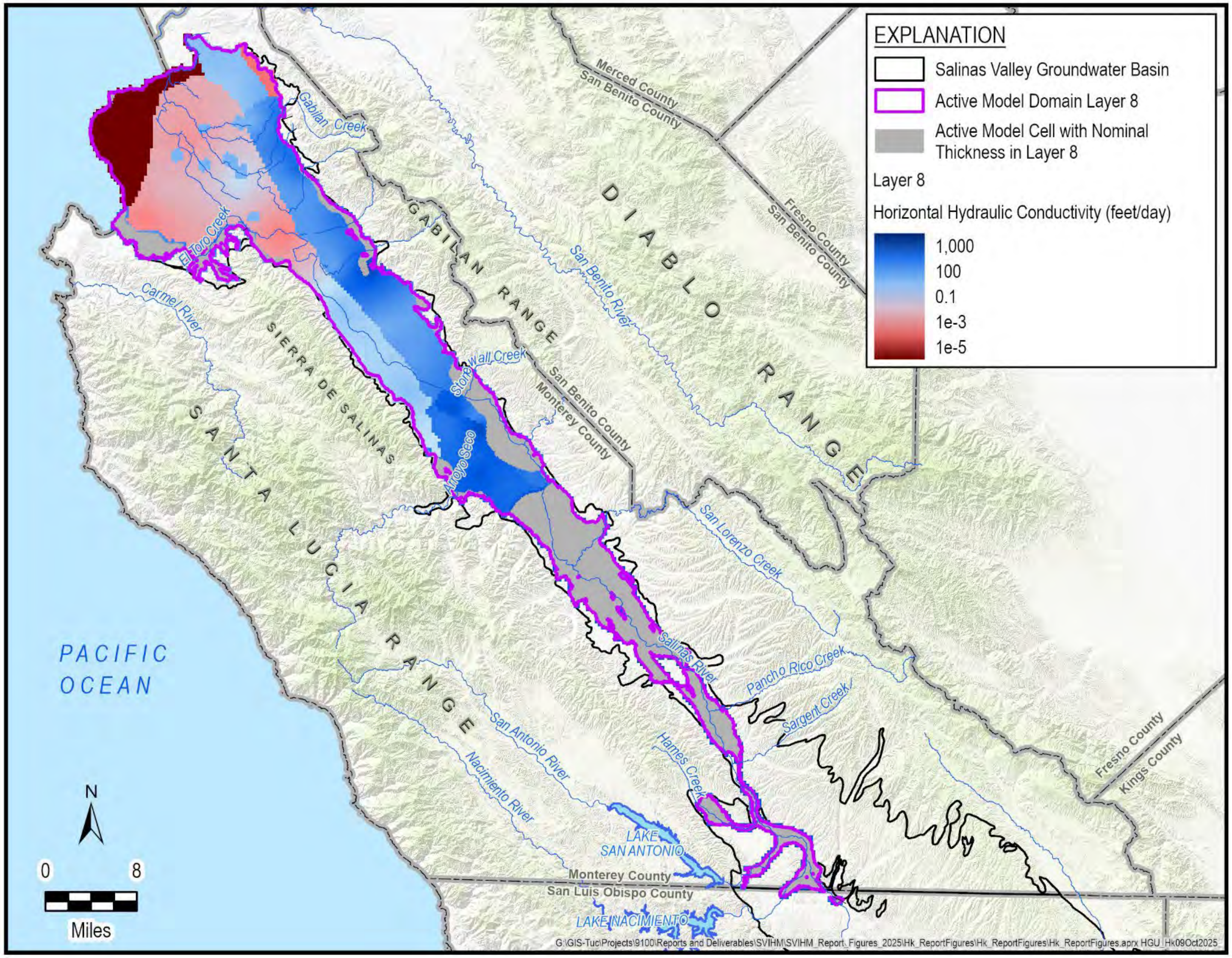

Figure 43. Simulated Horizontal Hydraulic Conductivity for Layer 8

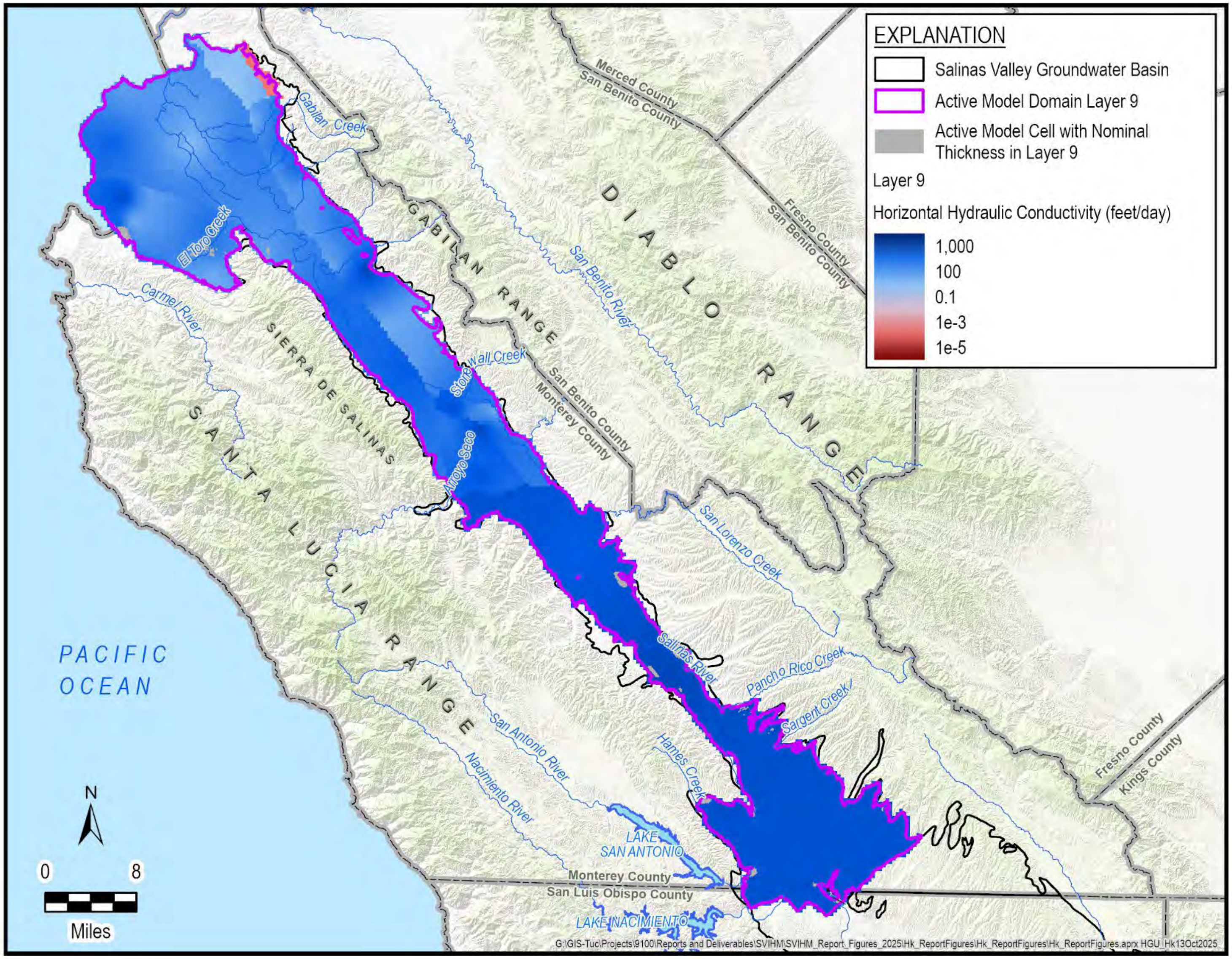

Figure 44. Simulated Horizontal Hydraulic Conductivity for Layer 9

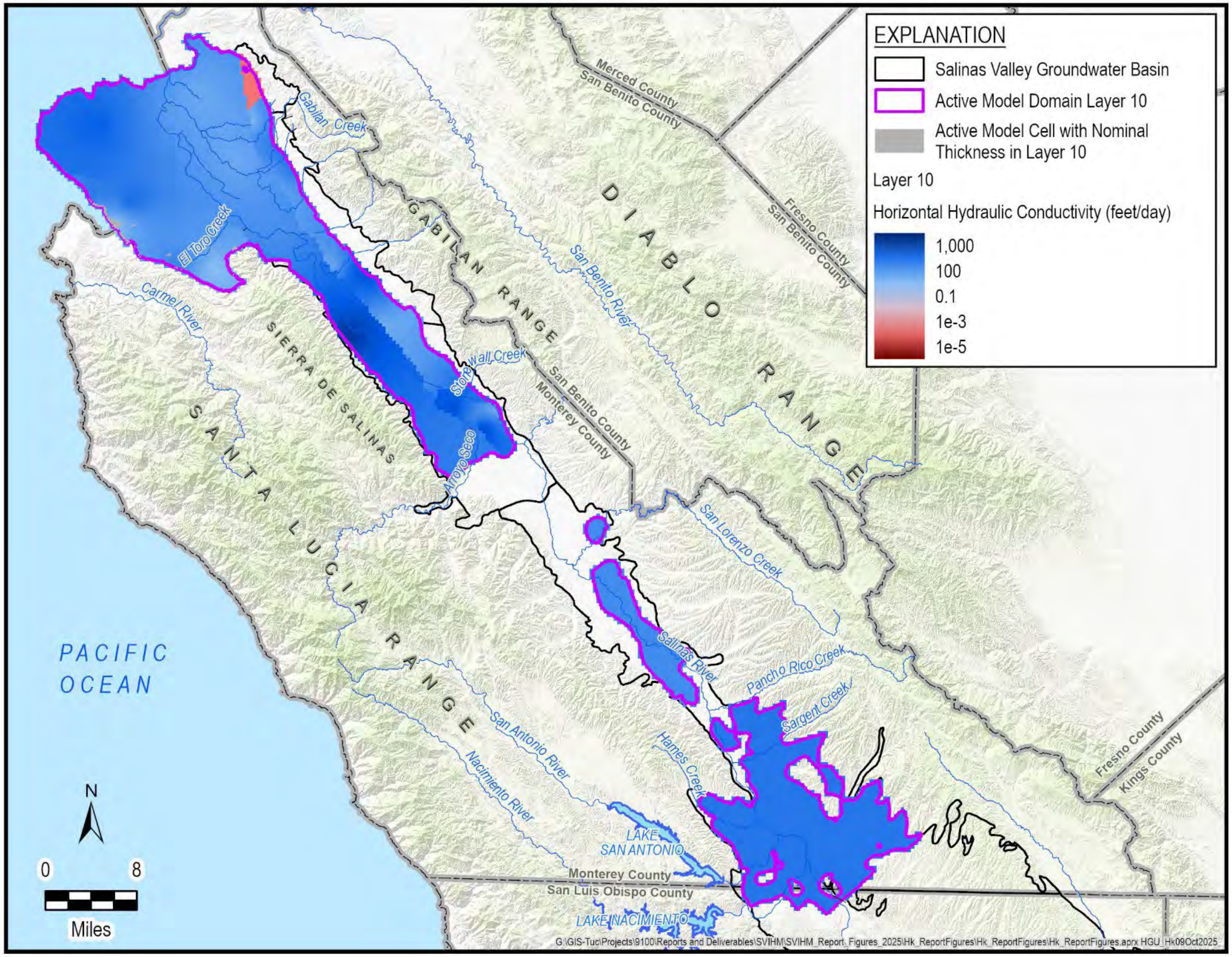

Figure 45. Simulated Horizontal Hydraulic Conductivity for Layer 10

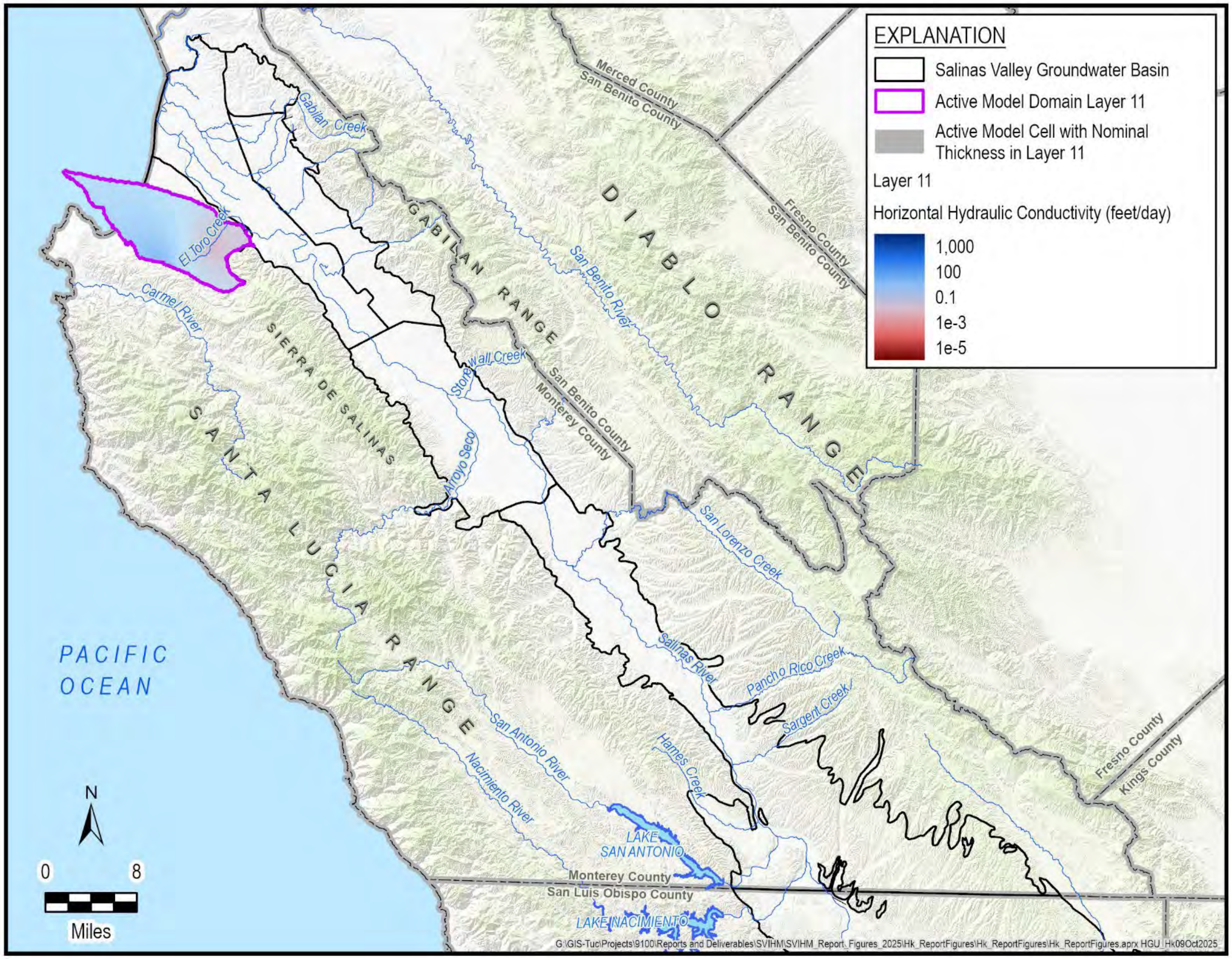

Figure 46. Simulated Horizontal Hydraulic Conductivity for Layer 11

Figure 47 shows a box and whisker plot of the ranges of calibrated vertical hydraulic conductivity by simulated HGU. Available observed data for vertical hydraulic conductivity were mostly from slug tests and were characterized as low or medium quality. Low to medium quality test data are not shown on the figure.

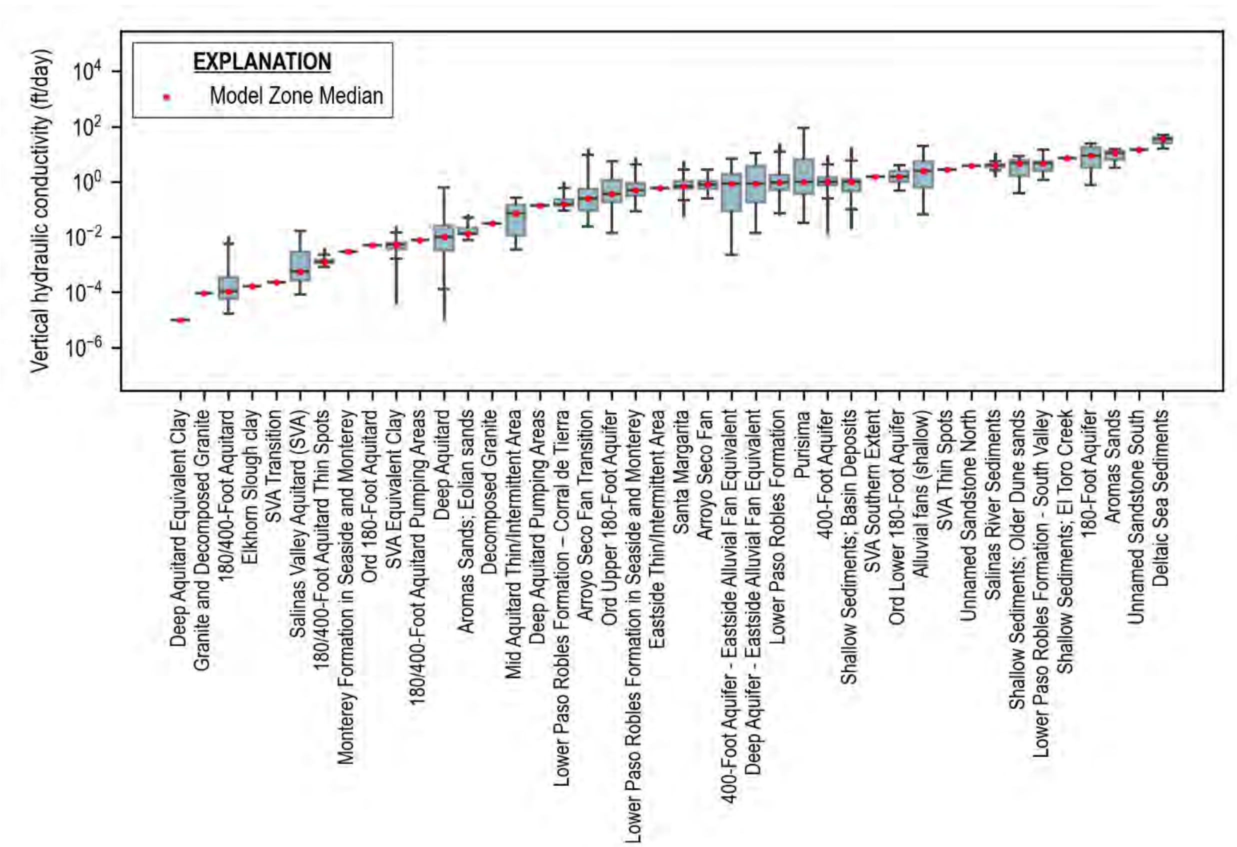

Figure 47. Box and Whisker Plot of Vertical Hydraulic Conductivity by Model Zone

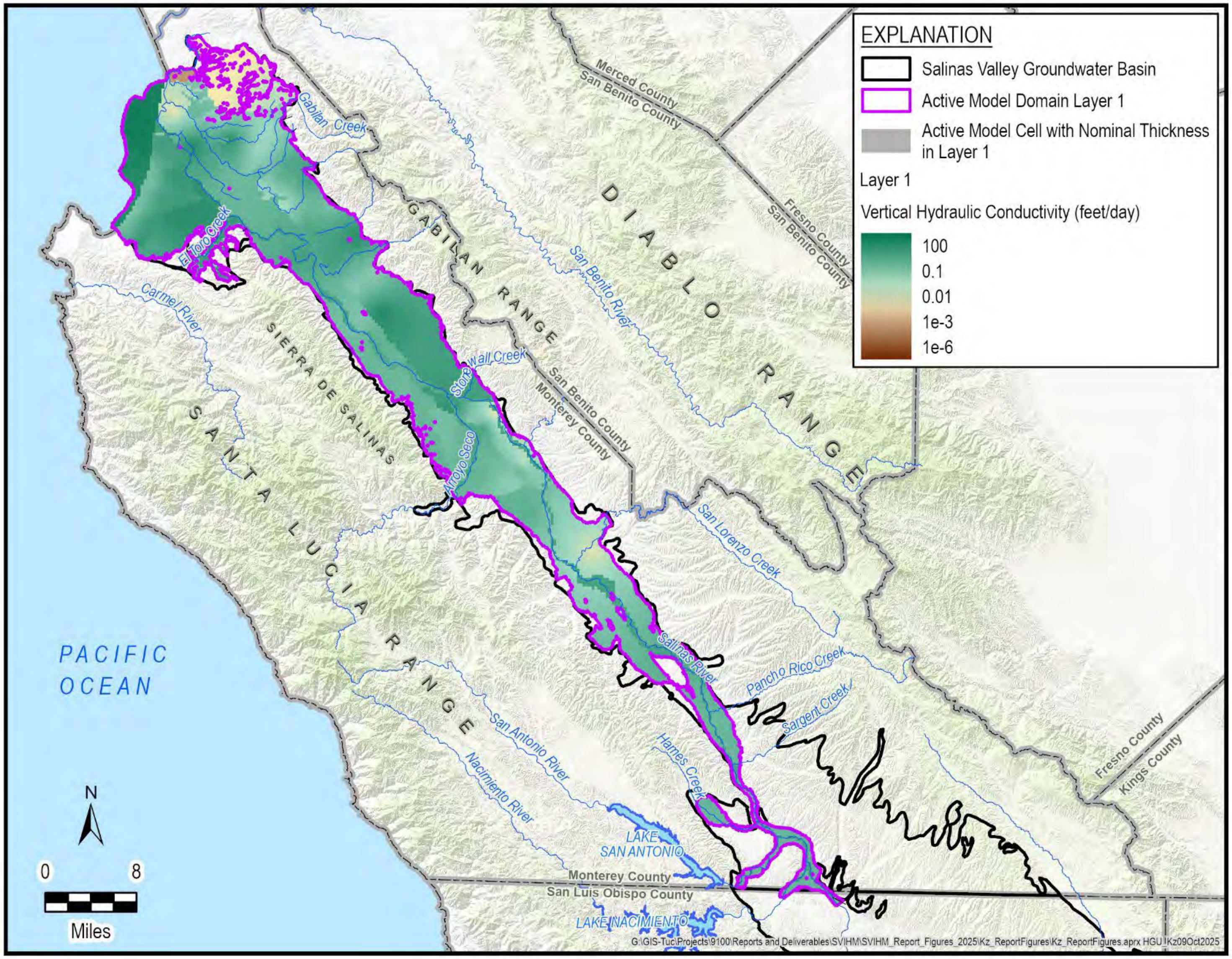

Figure 48. Simulated Vertical Hydraulic Conductivity in Layer 1

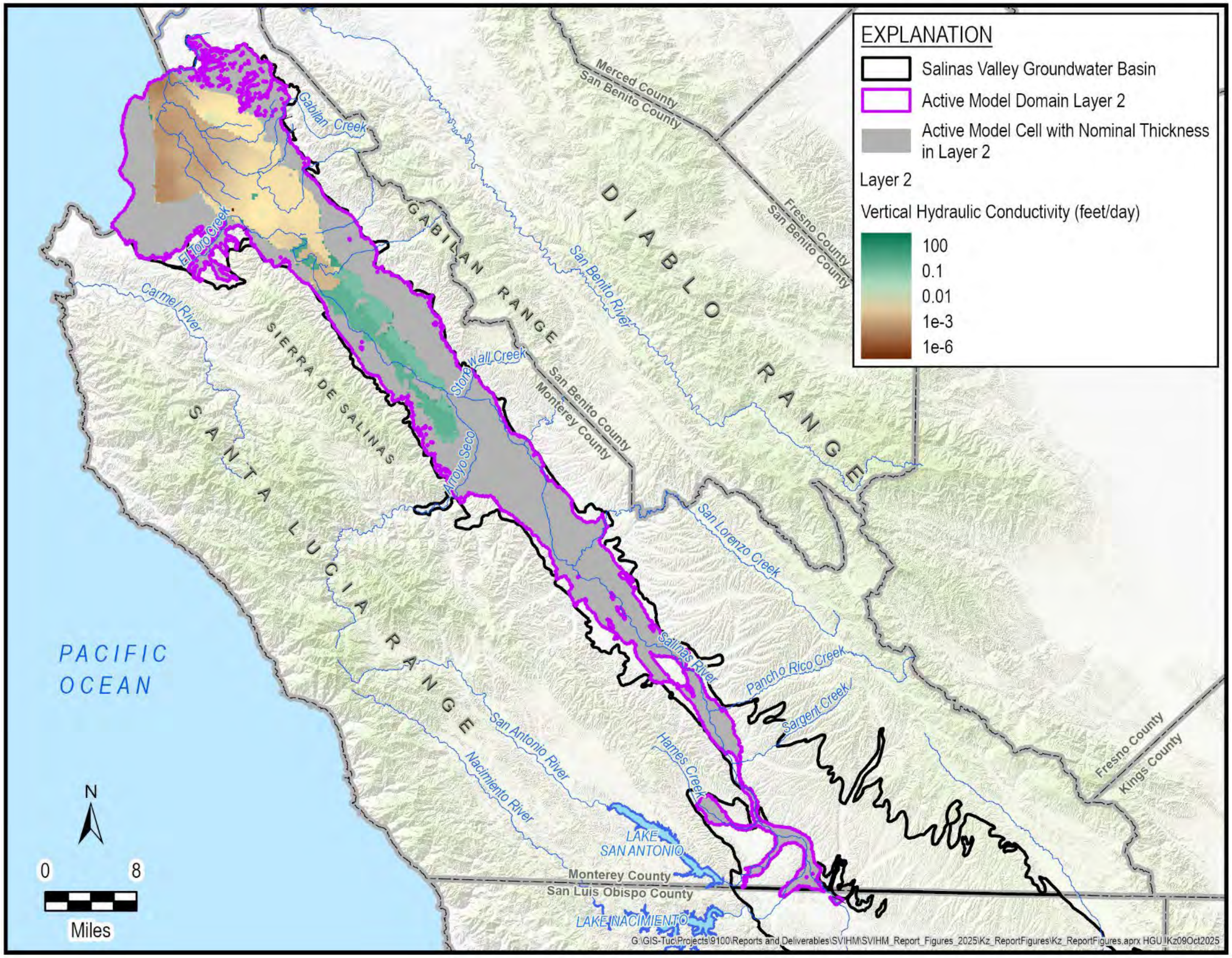

Figure 49. Simulated Vertical Hydraulic Conductivity in Layer 2

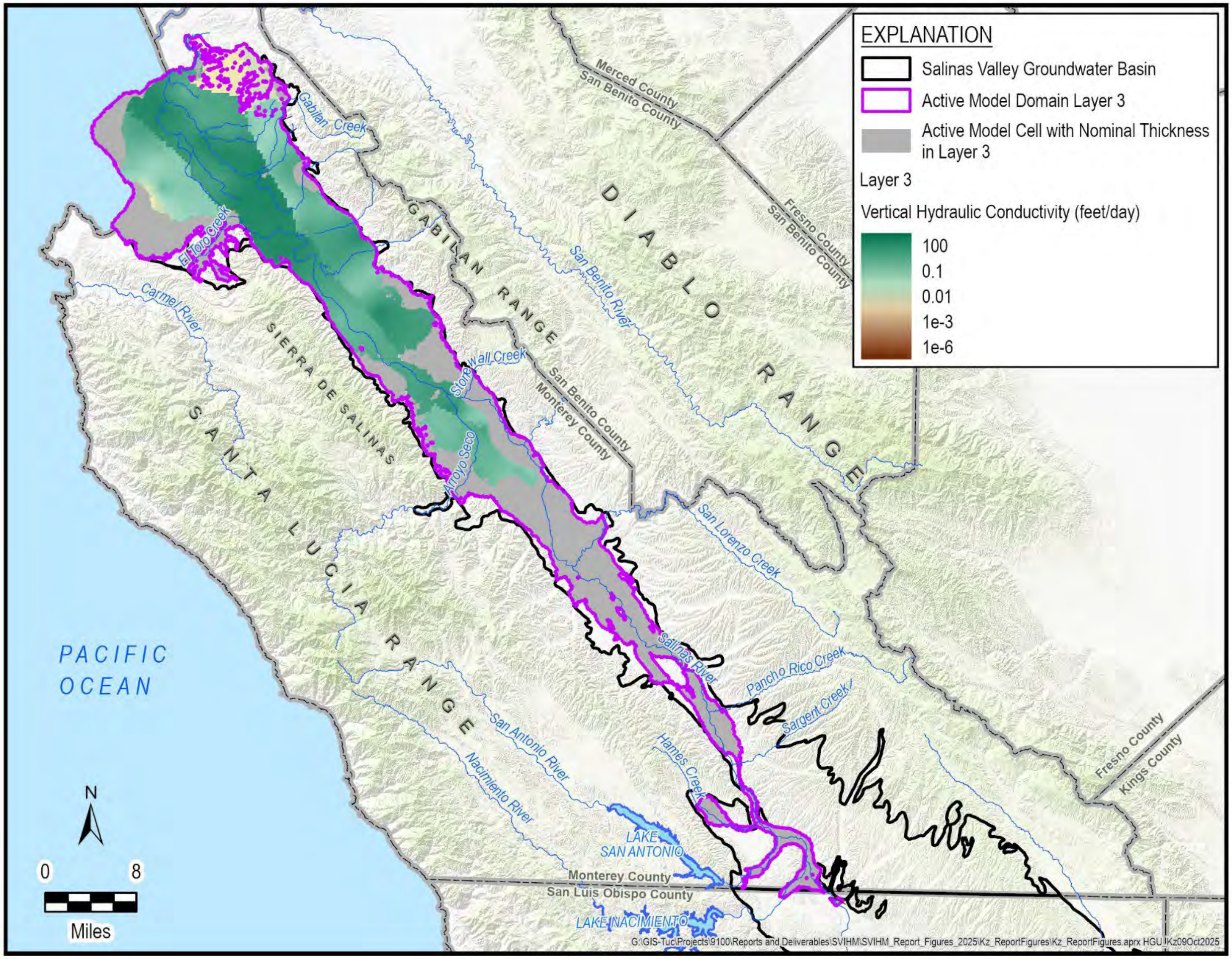

Figure 50. Simulated Vertical Hydraulic Conductivity in Layer 3

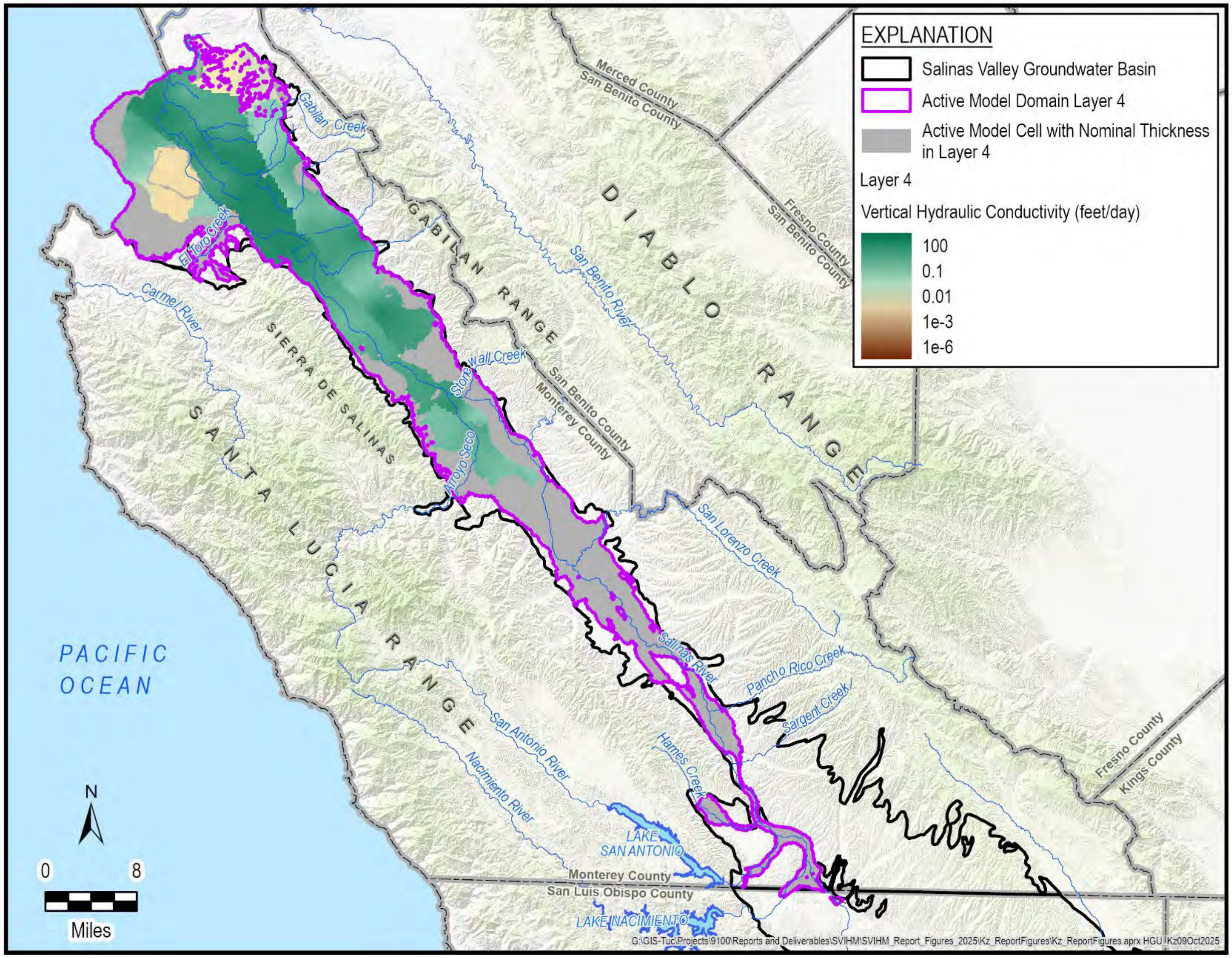

Figure 51. Simulated Vertical Hydraulic Conductivity in Layer 4

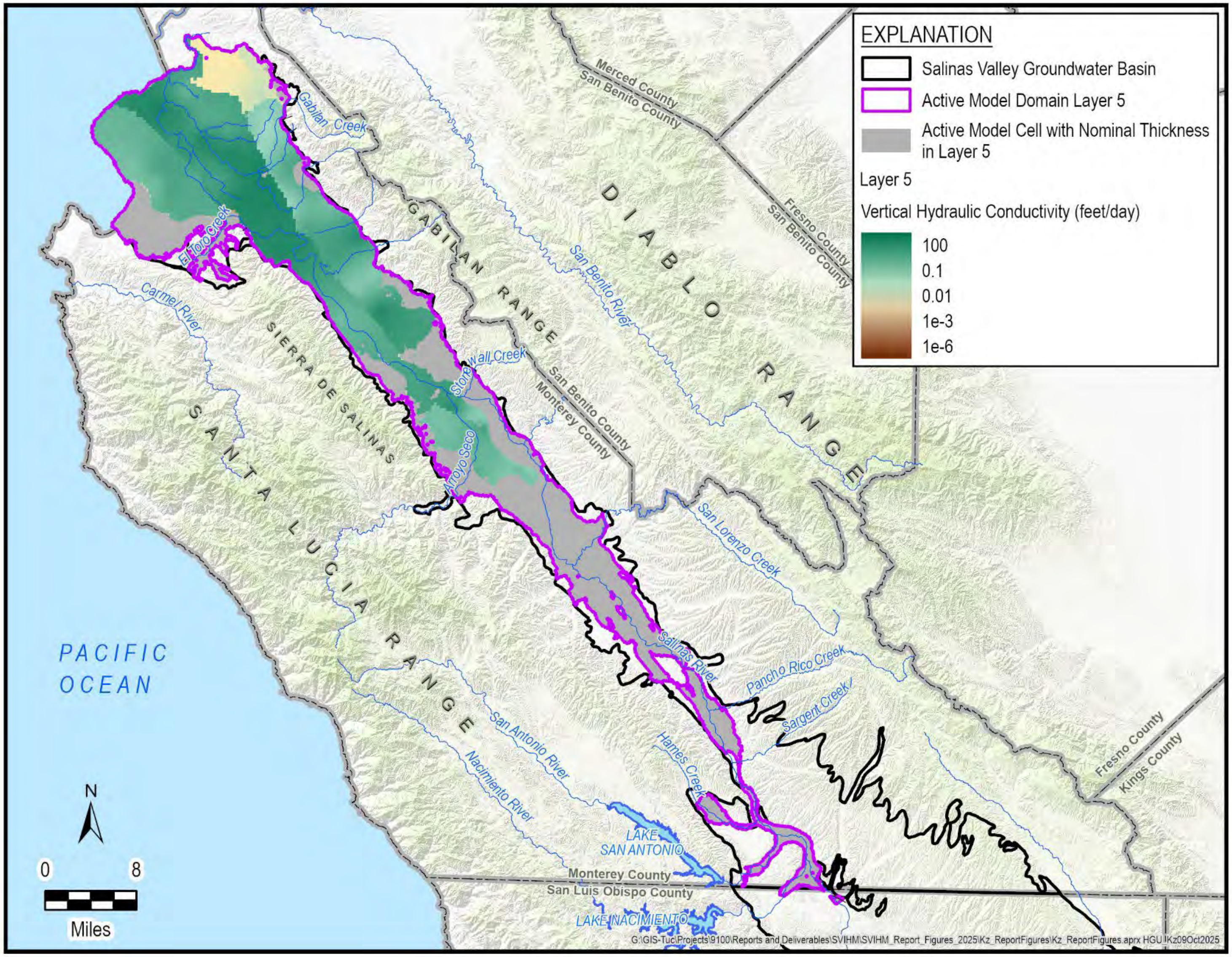

Figure 52. Simulated Vertical Hydraulic Conductivity in Layer 5

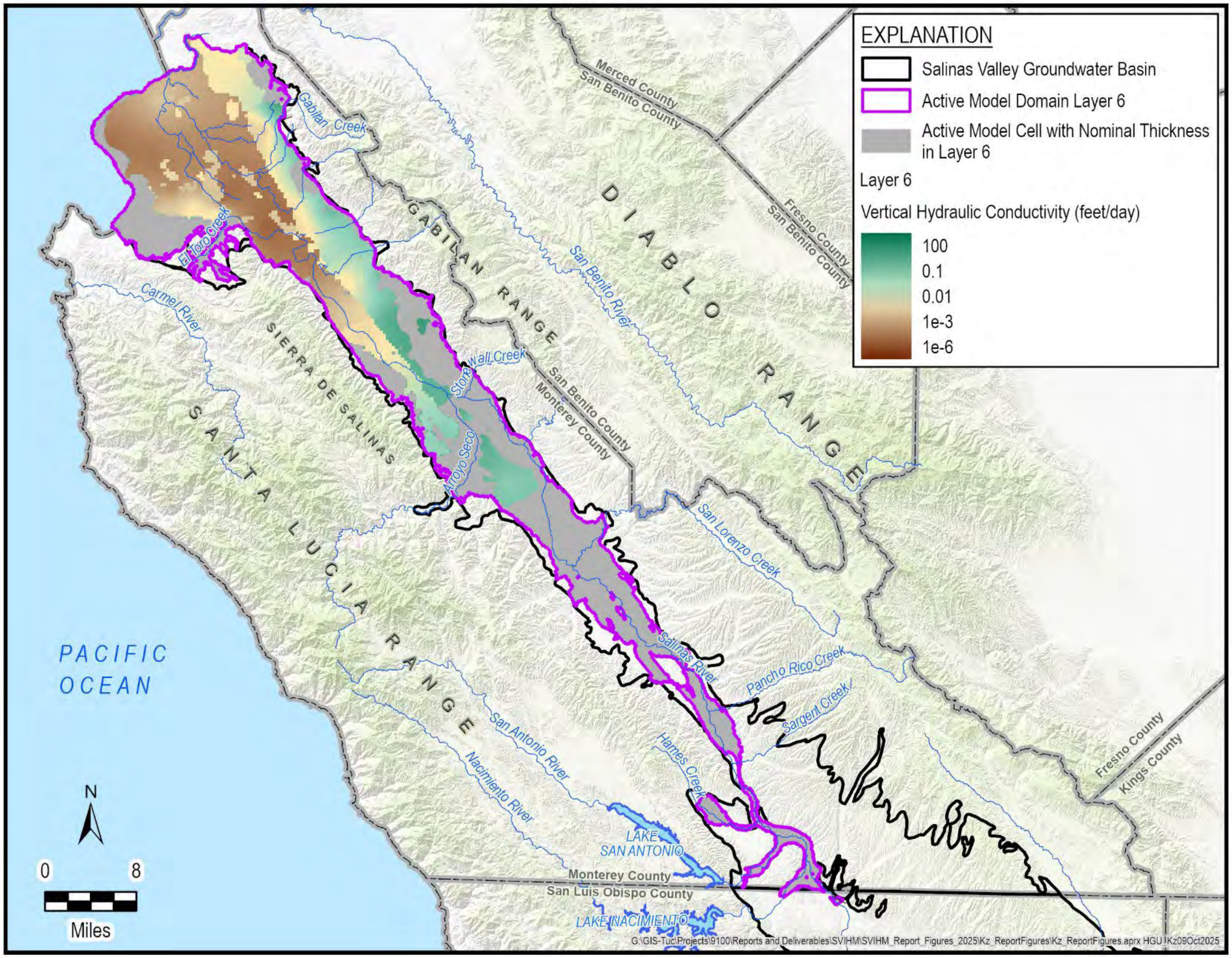

Figure 53. Simulated Vertical Hydraulic Conductivity in Layer 6

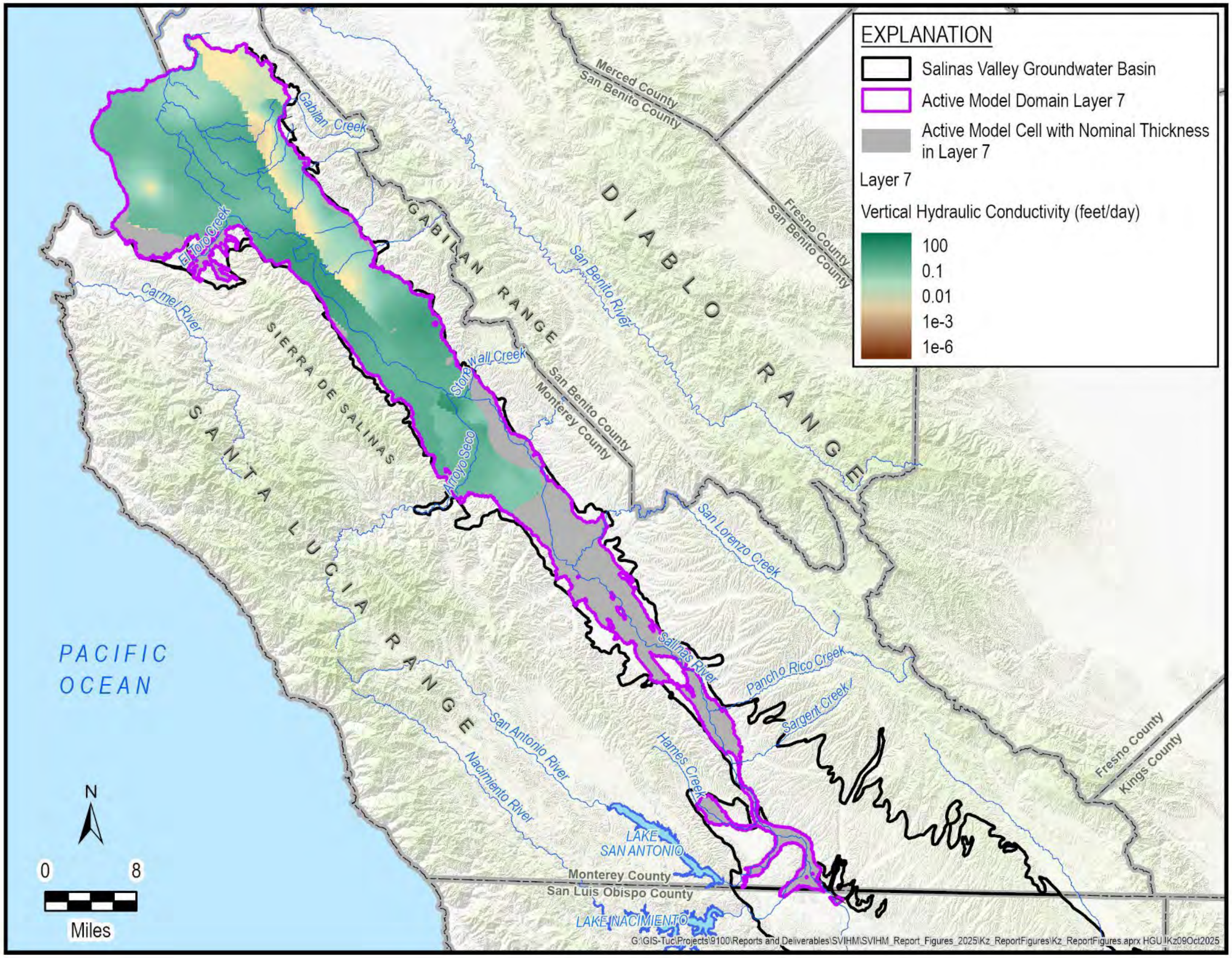

Figure 54. Simulated Vertical Hydraulic Conductivity in Layer 7

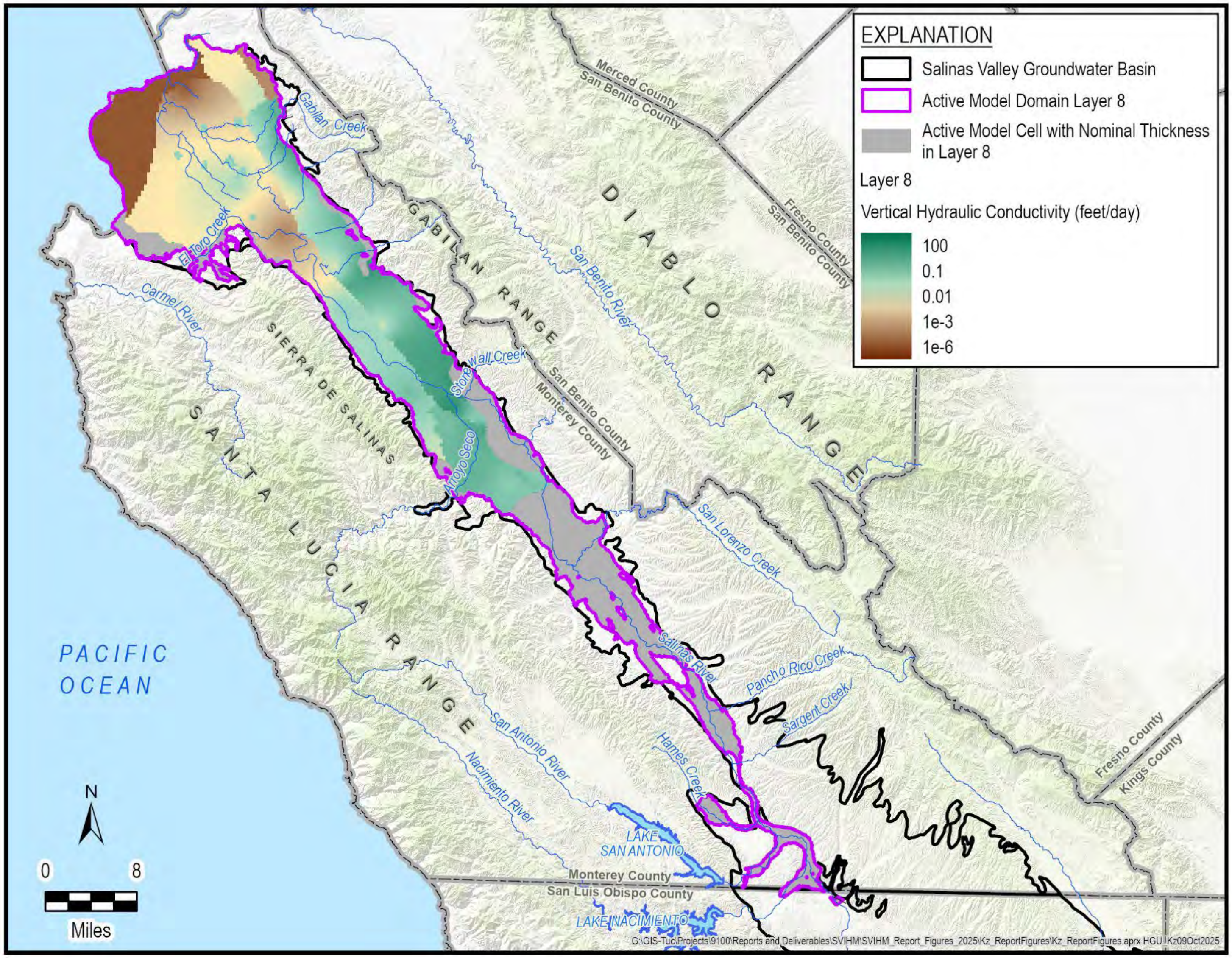

Figure 55. Simulated Vertical Hydraulic Conductivity in Layer 8

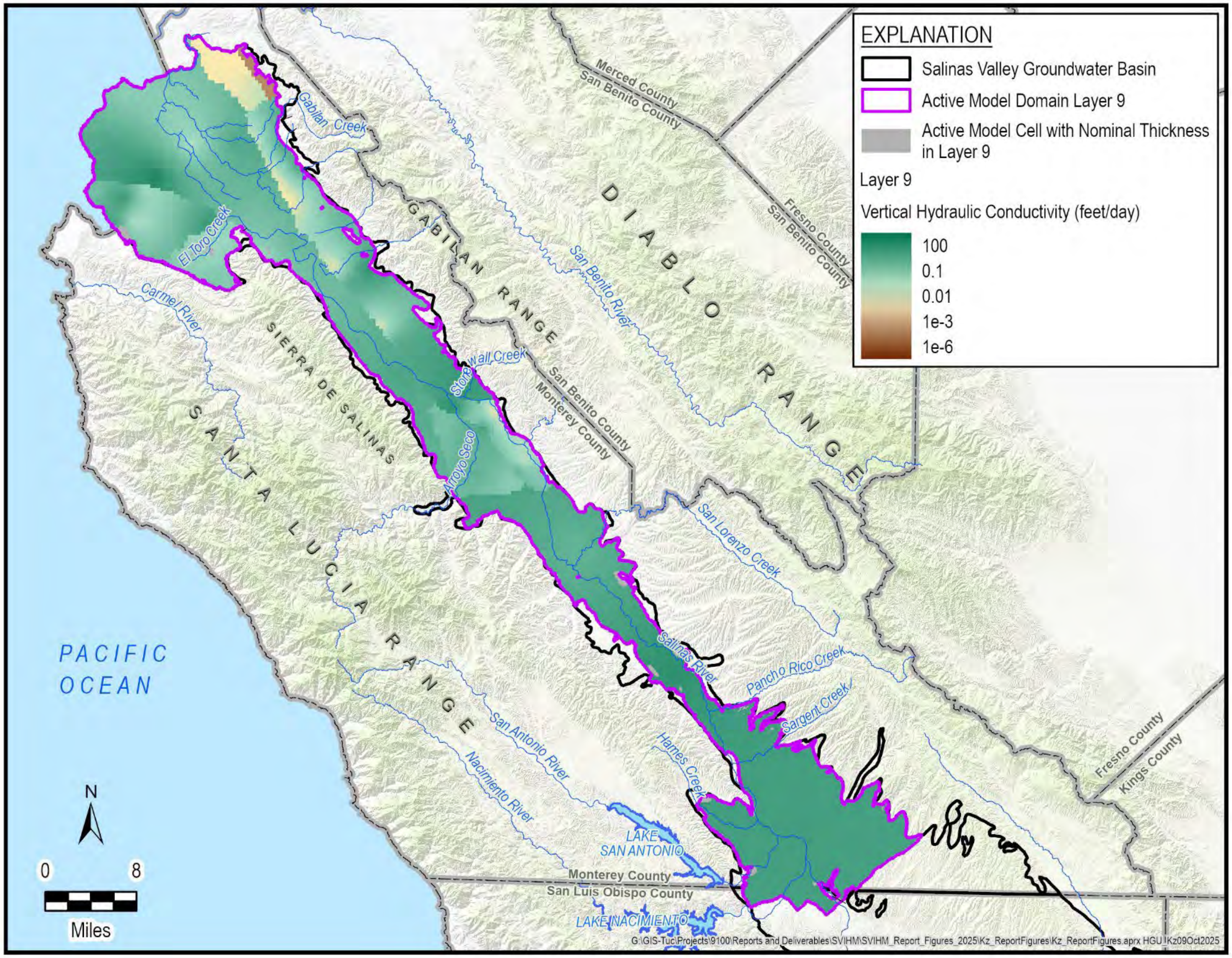

Figure 56. Simulated Vertical Hydraulic Conductivity in Layer 9

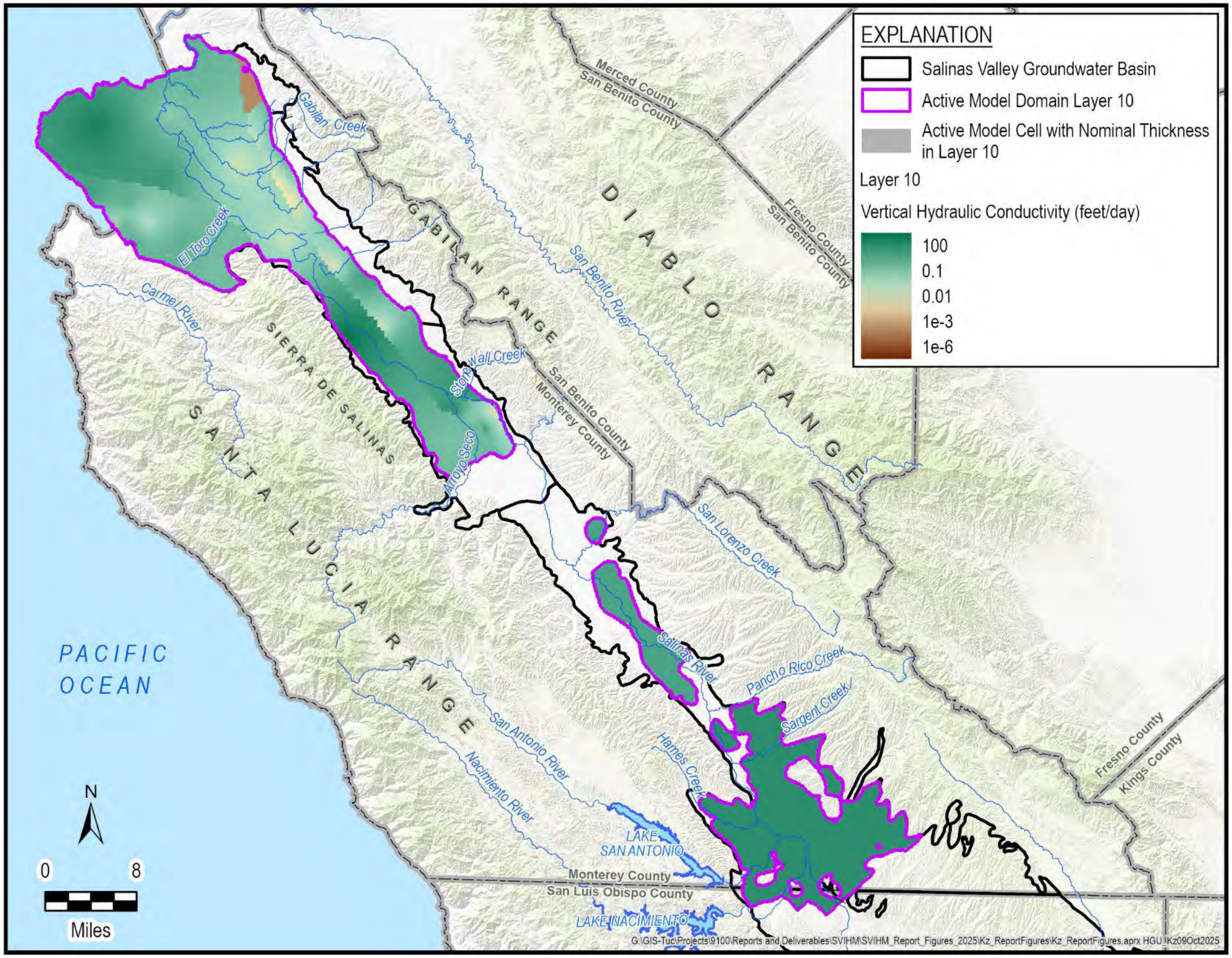

Figure 57. Simulated Vertical Hydraulic Conductivity in Layer 10

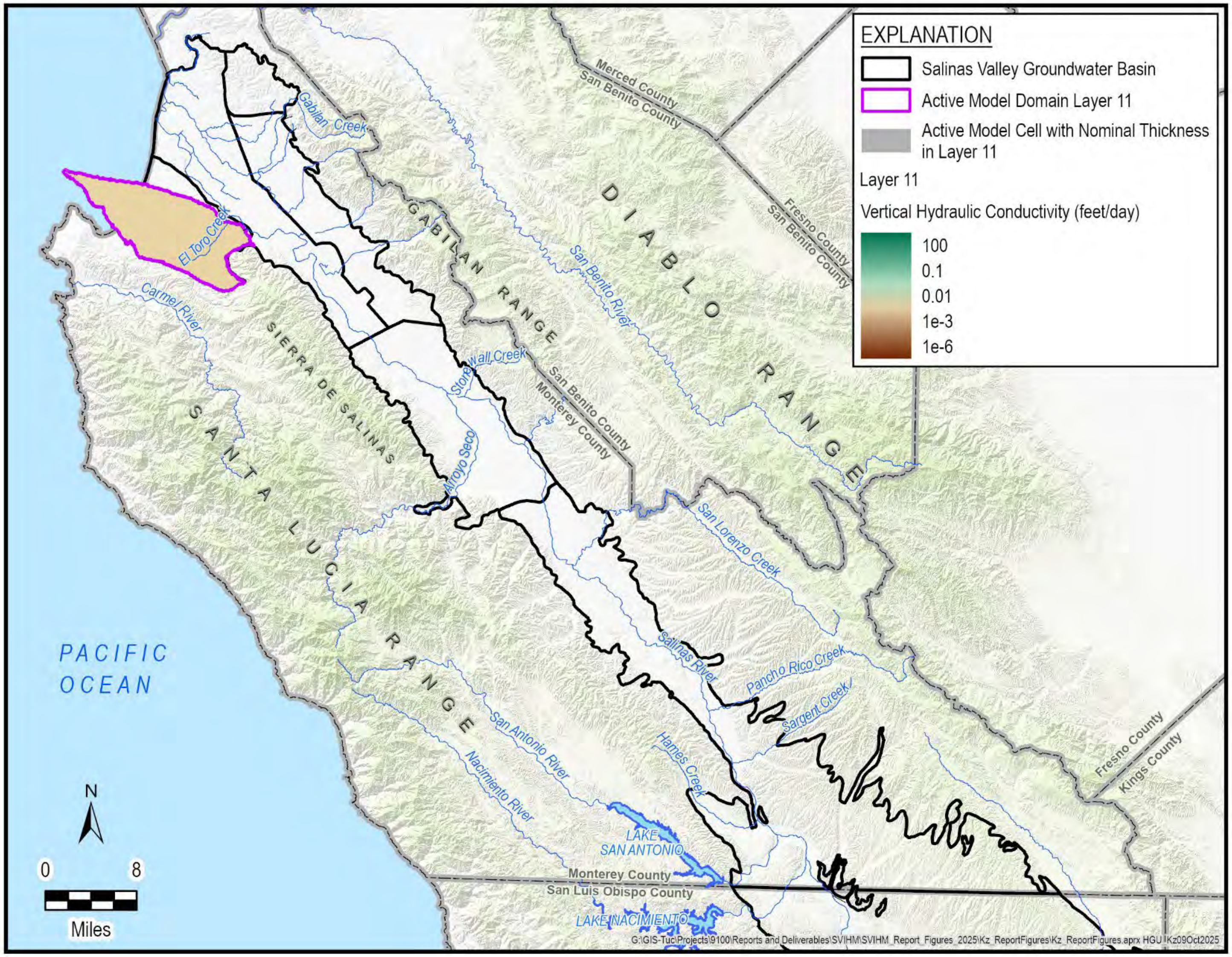

Figure 58. Simulated Vertical Hydraulic Conductivity in Layer 11

Figure 59 through Figure 69 show calibrated specific storage in the model by layer. Specific storage was applied by zone within the model. The zones used for specific storage mostly match the HGUs and the zones used for hydraulic conductivities. The one exception is the specific storage zones in the shallow portion of the Eastside Subbasin. A zone based on the conceptual understanding of the water table was added in Layers 1 through 7. This zone becomes progressively narrower with depth and can be seen on Figure 59 through Figure 65. In this area, the water table cuts across these model layers. This zone was added such that the specific storage multiplied by an average layer thickness yields a quasi-specific yield value, generally between 0.05 and 0.12. This approach was applied to account for unconfined conditions in the upper layers of the model; however, changing these layers to "convertible" to allow the model to solve for unconfined conditions resulted in prohibitively long run times and mass balance errors. This zone allows for simulation of water table conditions and estimates of change in storage more consistent with observed water level declines in the region.

Surficial specific storage zones were also applied to the Aromas Sands and the Arroyo Seco Fan and Arroyo Seco Transition zones. Table 4 lists the surficial specific storage zones and the simulated specific storage value.

Table 4. Surficial Specific Storage Zones

HGU Zone No.	HGU Description	Simulated Specific Storage 1/feet
103	Eastside Shallow Specific Storage	7.00E-04
117	Arroyo Seco Fan Shallow Specific Storage	1.20E-03
118	Arroyo Seco Fan Transition Shallow Specific Storage	1.91E-03
119	Aromas Sands Shallow Specific Storage	1.71E-03

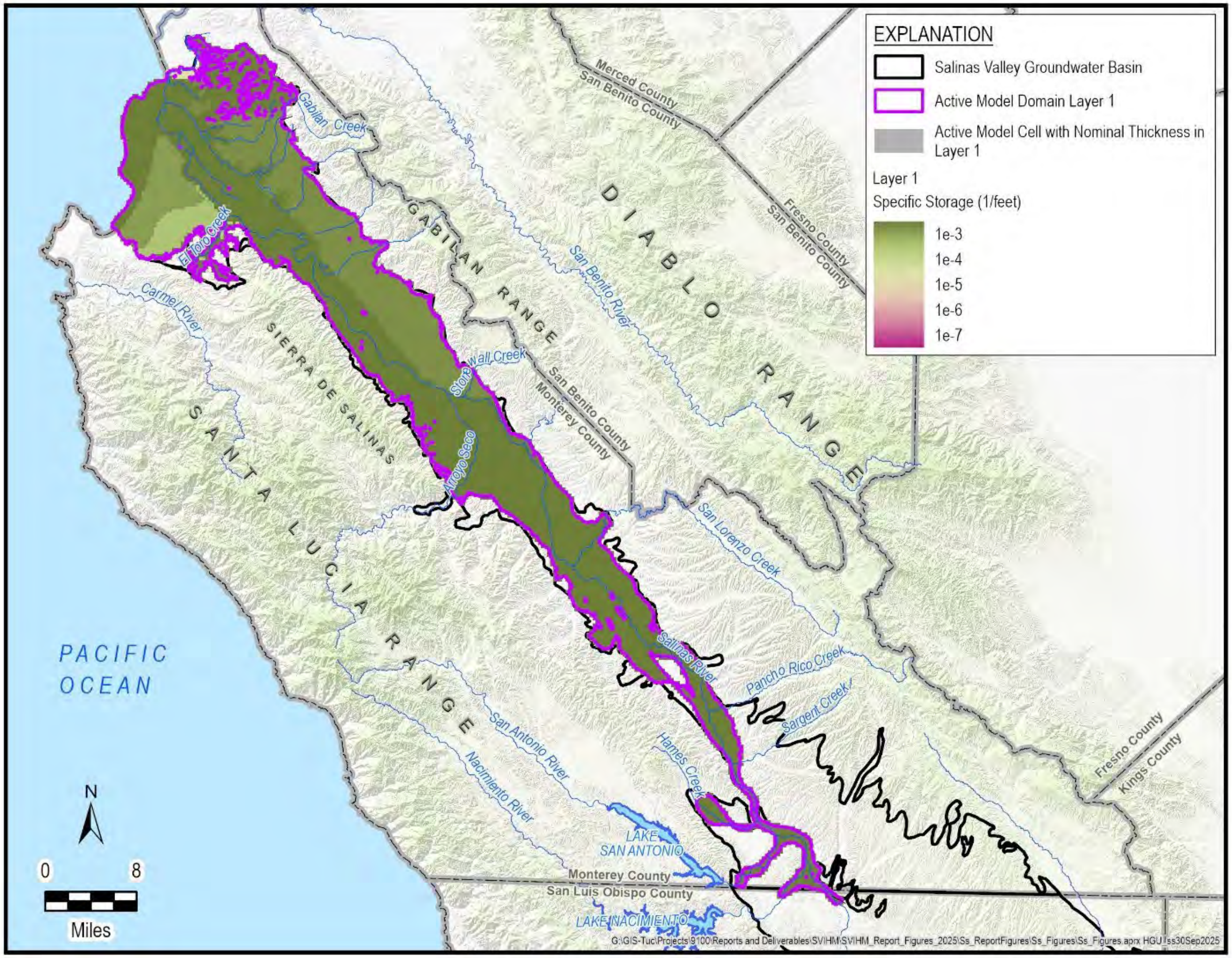

Figure 59. Specific Storage in Layer 1

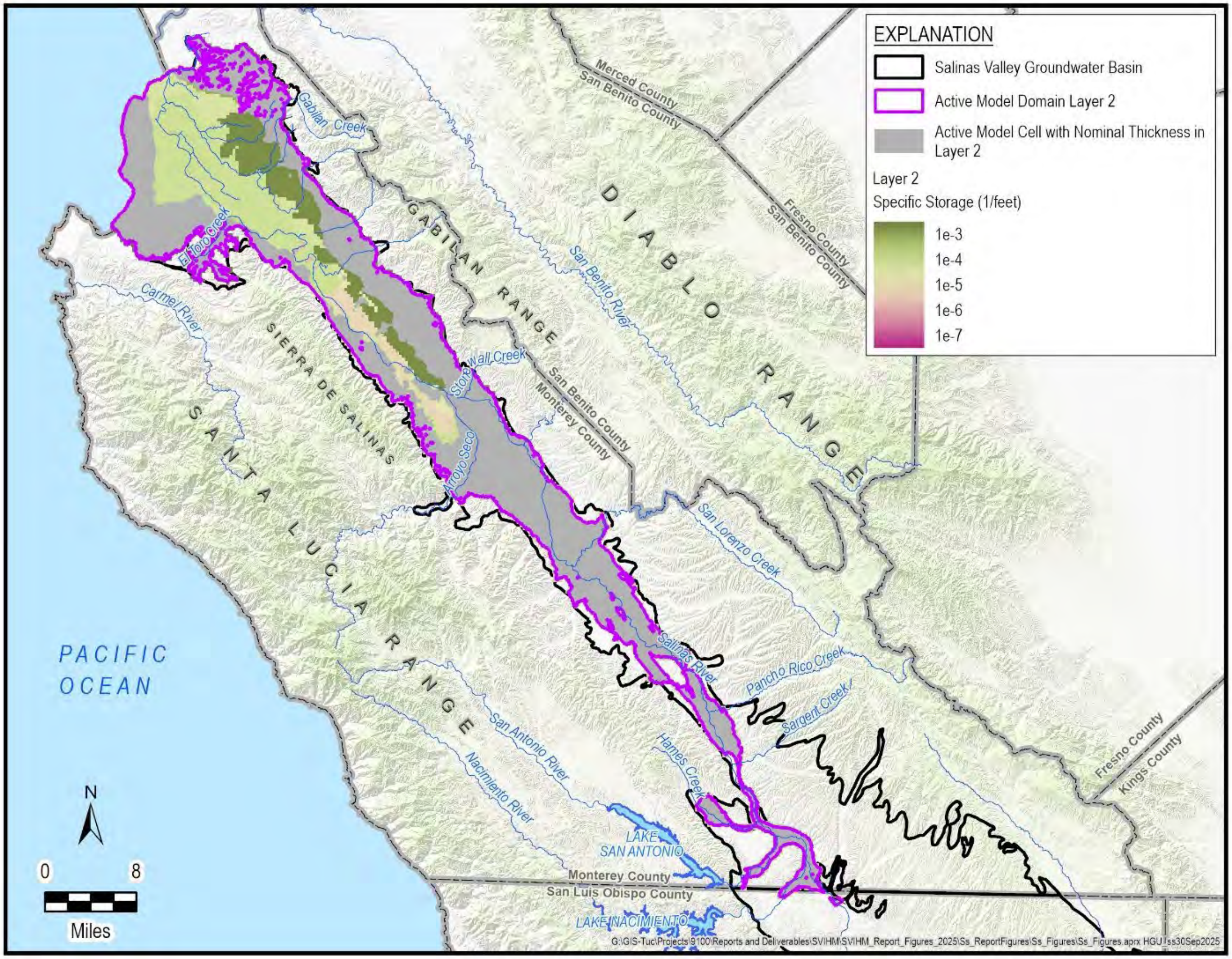

Figure 60. Specific Storage in Layer 2

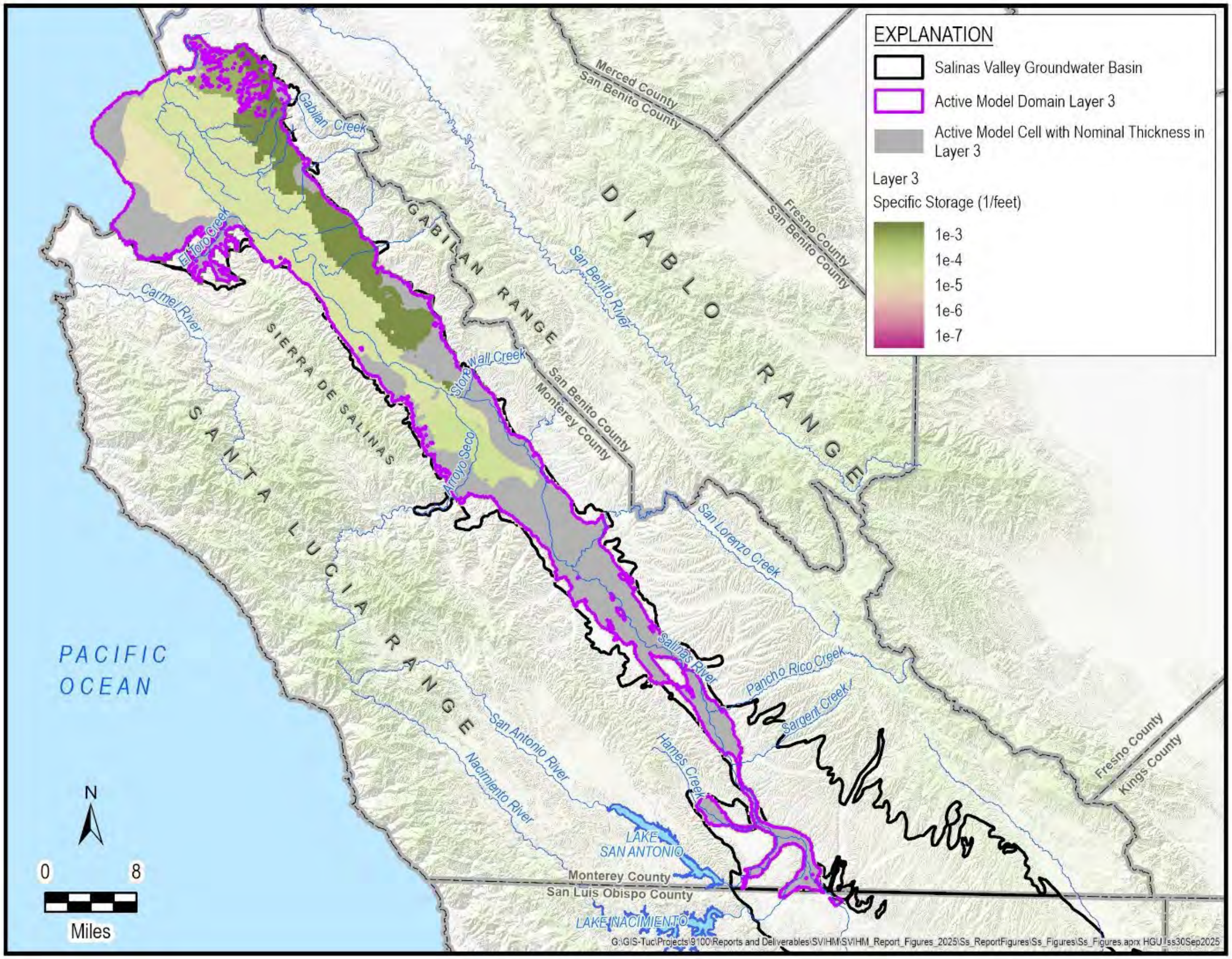

Figure 61. Specific Storage in Layer 3

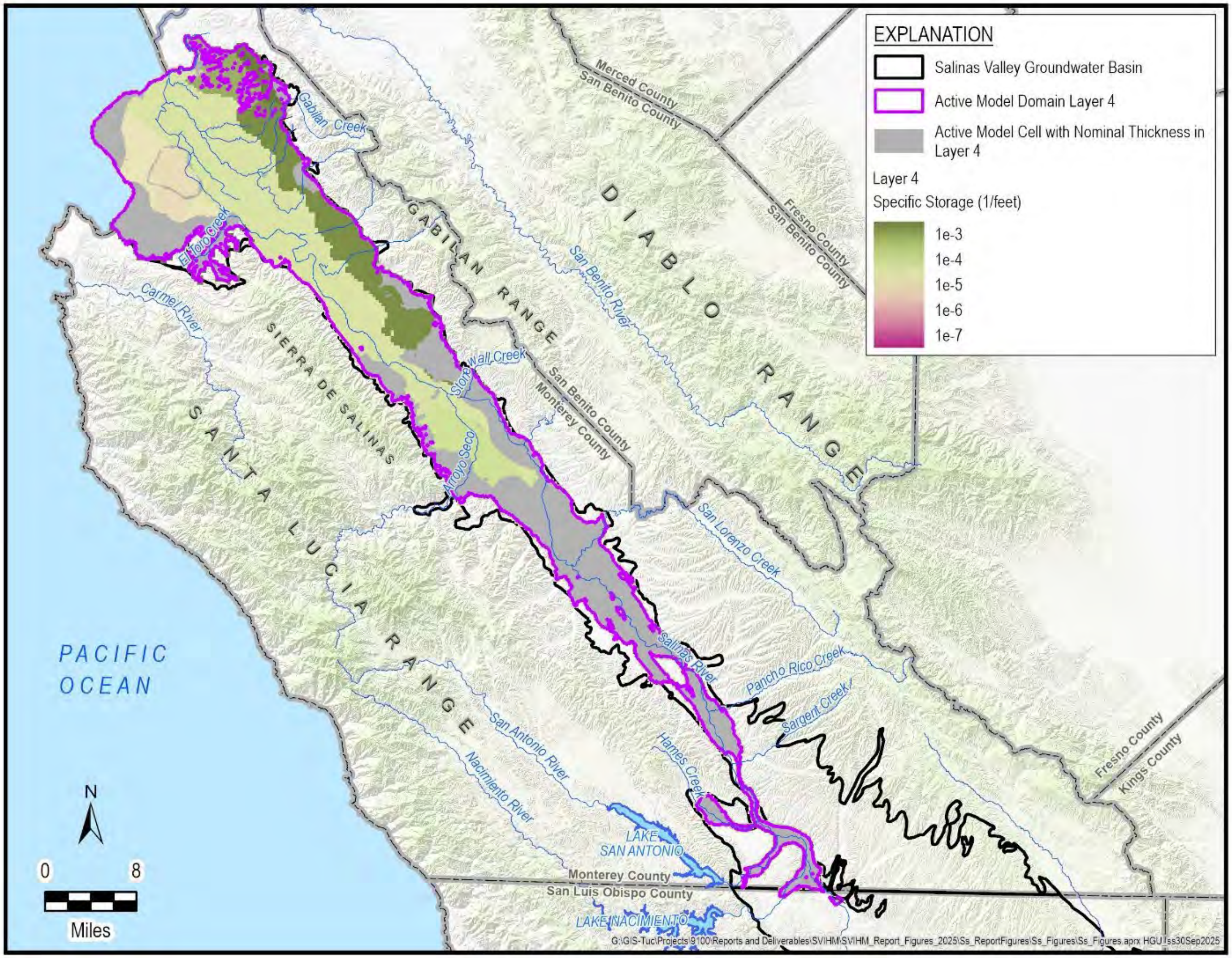

Figure 62. Specific Storage in Layer 4

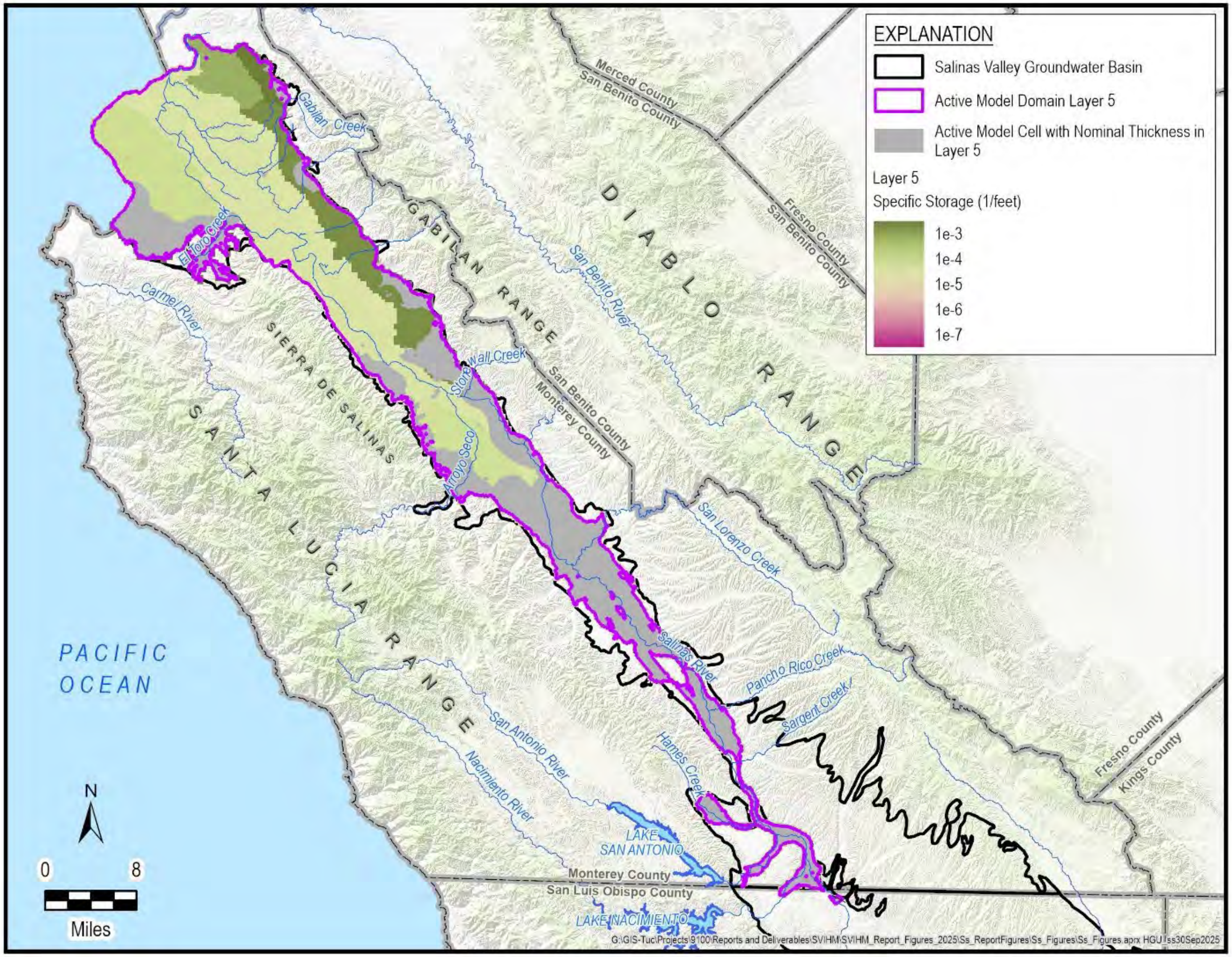

Figure 63. Specific Storage in Layer 5

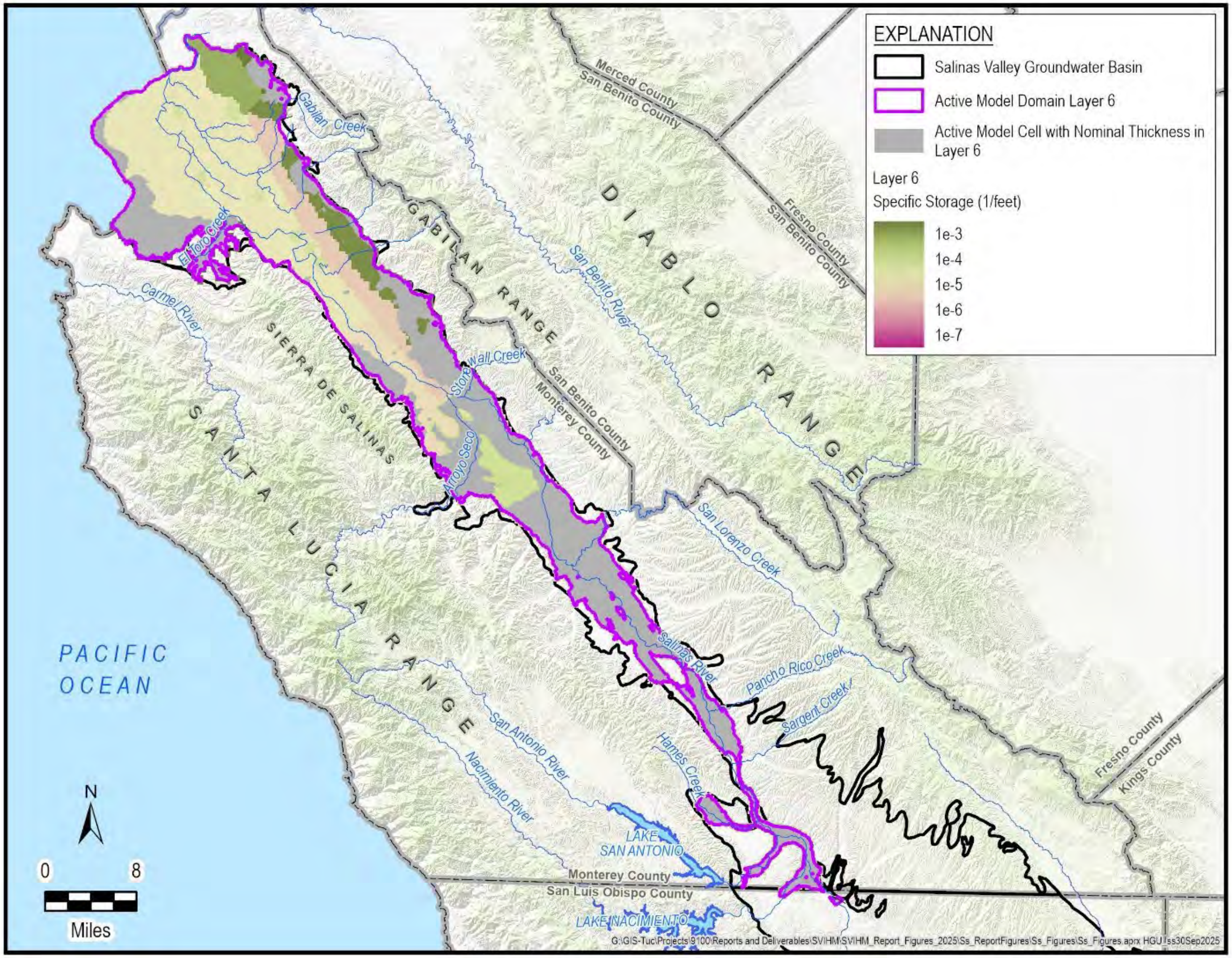

Figure 64. Specific Storage in Layer 6

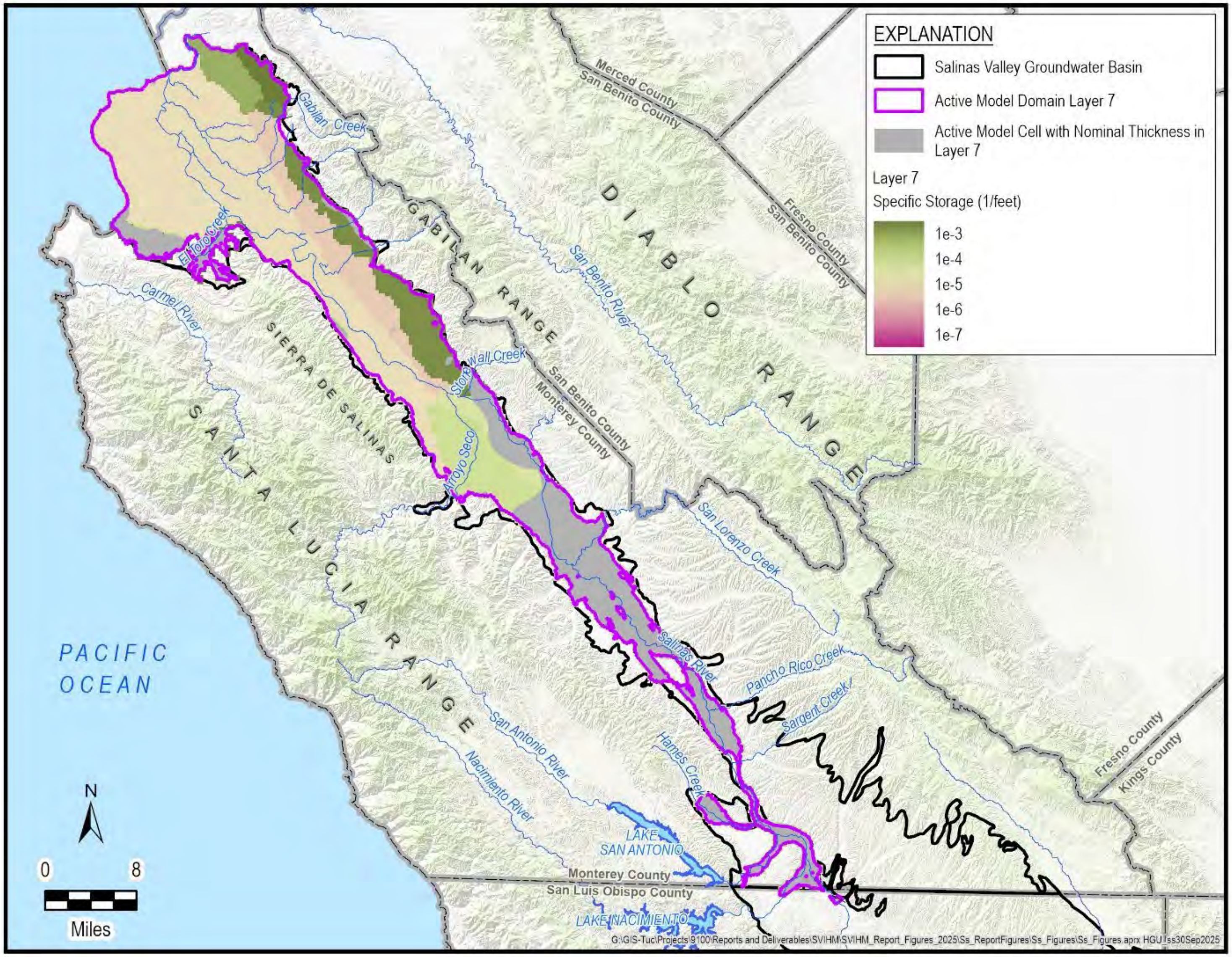

Figure 65. Specific Storage in Layer 7

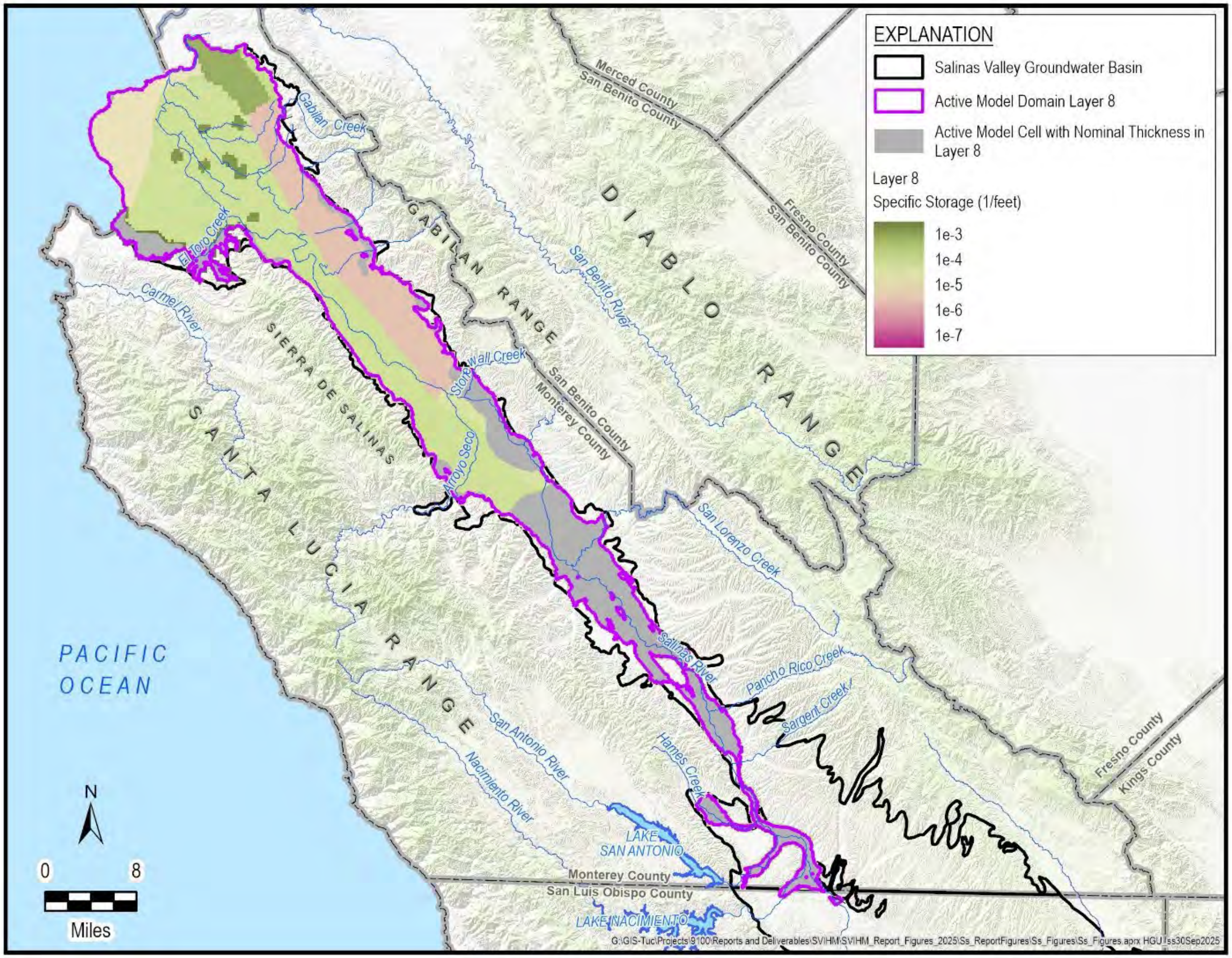

Figure 66. Specific Storage in Layer 8

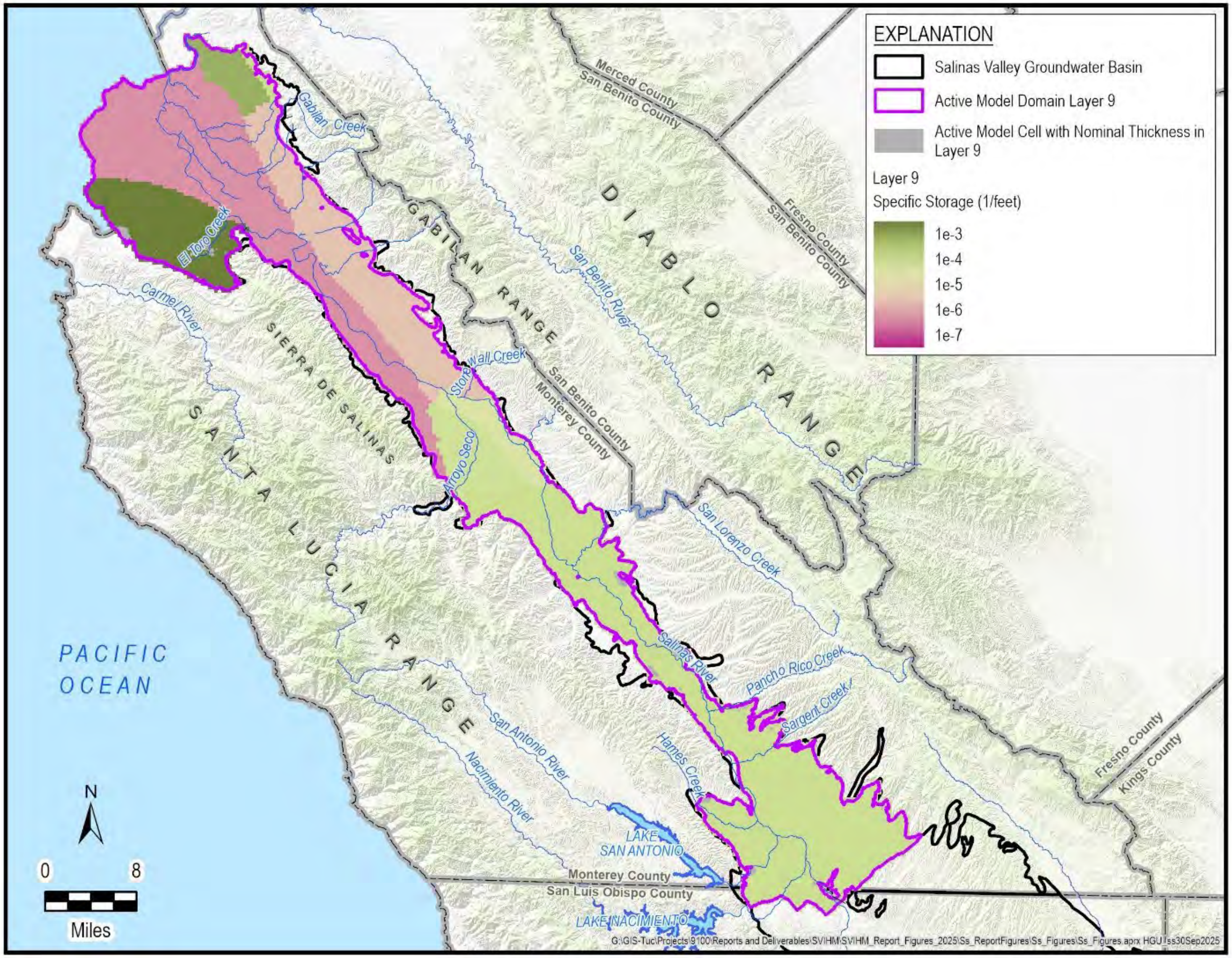

Figure 67. Specific Storage in Layer 9

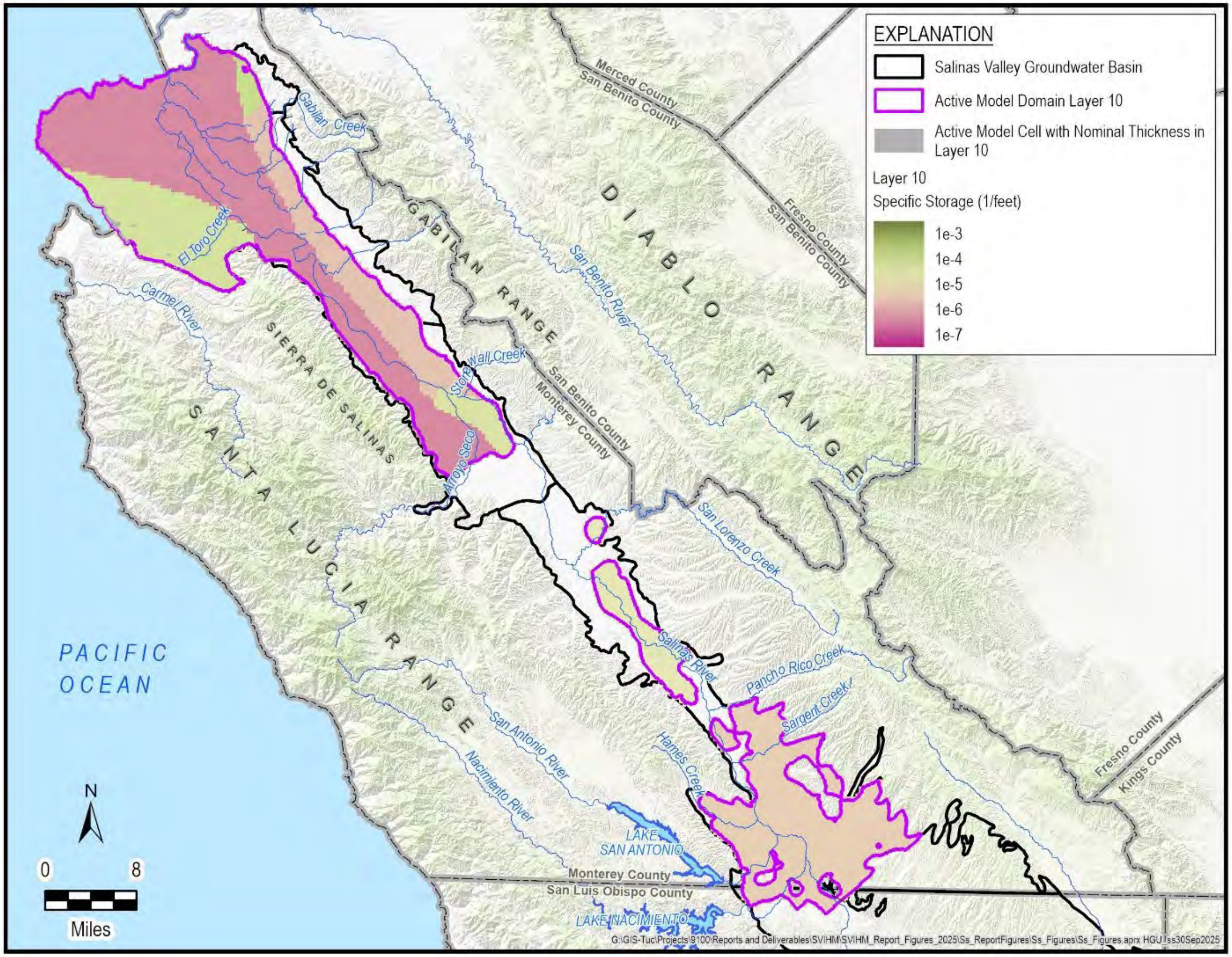

Figure 68. Specific Storage in Layer 10

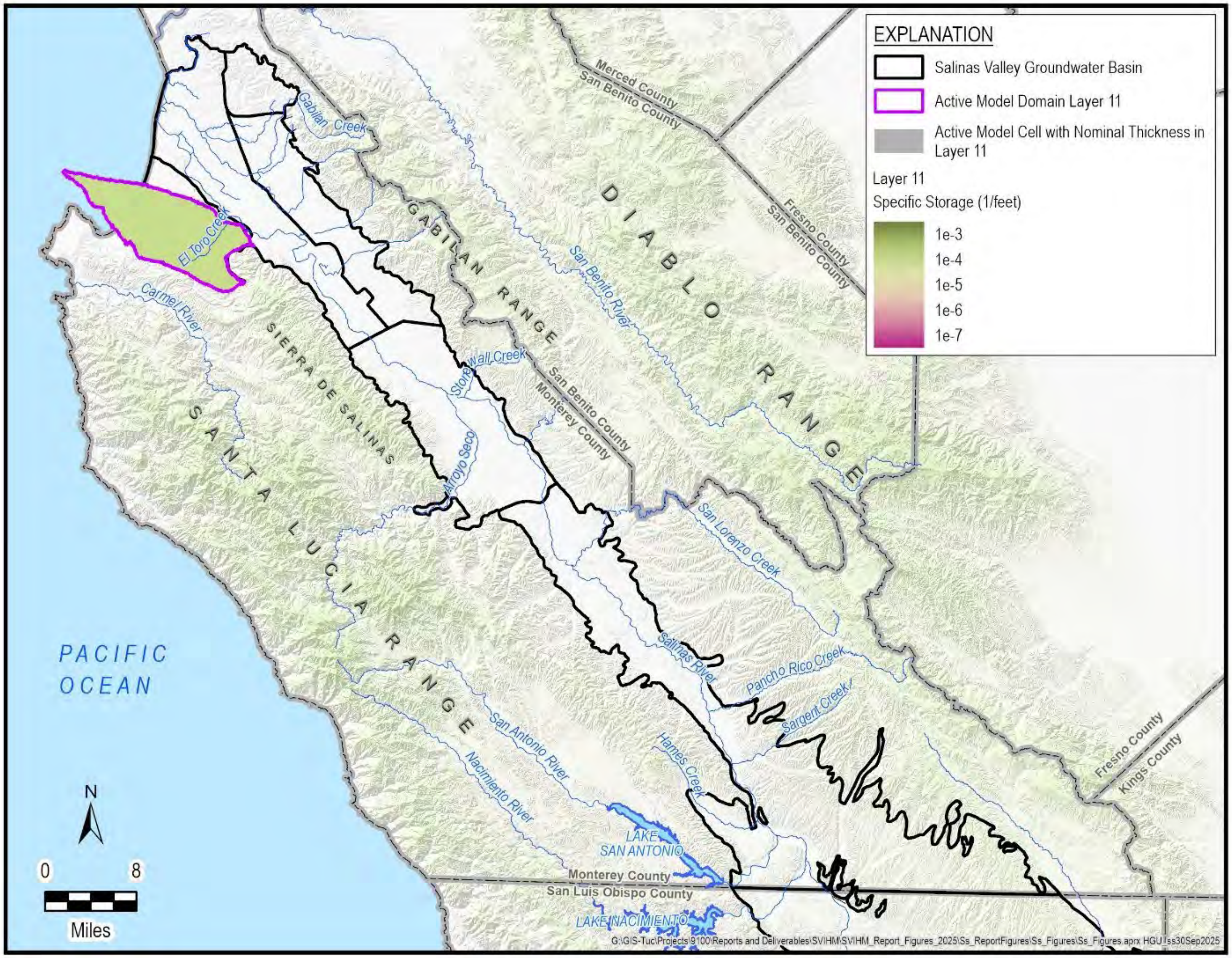

Figure 69. Specific Storage in Layer 11

4.2.4 Groundwater Level Calibration Statistics / Plots

Calibration statistics were calculated to illustrate the match between simulated and measured hydraulic heads (groundwater level elevations) for the historical model period. Head residuals are calculated as simulated minus measured heads at a given well. Positive residual values indicate the model is overestimating heads, whereas negative residual values indicate that the model is underestimating heads. Calibration statistics and associated results are shown in Table 5. Observations are grouped to show differences in the quality of the calibration throughout the model area and provide some vertical discretization for the model calibration.

The key calibration statistics include the following:

- Number of Observations – The number of head measurements in the calibration dataset, including all measurement locations and times.
- Mean Residual – the mean, or average, value of the head residuals. This indicates whether the model tends to overestimate or underestimate heads.
- Absolute Mean Residual – the mean, or average value of the absolute value of the head residuals. This provides a measure of the magnitude of the differences between the simulated and measured heads.
- Range in Observations – The difference between the minimum and maximum measured head, over all measurement locations within the grouped observations.
- Root Mean Squared Error (RMSE) – Square root of the mean squared error, which is computed as the average value of the squared head residuals. RMSE is more influenced by large residuals than absolute mean residual, and so differences between the 2 statistics reflect the influence of relatively large residuals.
- Scaled RMSE (SRMSE) – The RMSE divided by the range in measured heads and expressed as a percentage.

Table 5. Groundwater Level Calibration Statistics

Group	Number of Observations	Mean Residual	Absolute Mean Residual	Range in Observations	RMSE	SRMSE
Full Model	113,342	0.3	15.9	851.6	24.6	3%
Surficial Sediments	24,398	14.2	23.5	544.7	32.4	6%
180 FT Aquifer and Eastside Alluvial Equivalent	18,798	-0.2	8.2	230.3	10.6	5%
400 FT Aquifer and Eastside Alluvial Equivalent	22,694	-2.7	9.1	352.0	13.6	4%
Deep Aquifers and Eastside Alluvial Equivalent	12,191	-12.8	17.3	373.9	25.7	7%
Corral de Tierra and Seaside Lower Paso Robles / Santa Margarita / Monterey Formation	12,126	-10.4	27.4	851.6	36.7	4%
Arroyo Seco	9,395	-1.4	6.4	110.8	8.6	8%
Upper Valley	772	-0.03	12.9	347.2	24.0	7%

The updated model is generally better calibrated to groundwater levels than the original USGS version. The SRMSE value for groundwater levels for the full model is 3% for the updated model and 6% for the original version. The calibration statistics are not consistently reported for subregions or aquifers, so a direct comparison between the models is not possible from reported values. However, the SRMSE values from the updated model are consistently smaller than the values reported by Henson *et al.* (2025) for the original model.

A plot of simulated versus observed groundwater levels along a 1:1 slope line is shown on Figure 70. Observations above the 1:1 line are overpredicted by the model and observations below the line are underpredicted by the model. In general, most observations plot along the 1:1 line indicating that the model does a reasonable job of representing observed water levels. Appendix E shows the 1:1 plots by subbasin. These plots are displayed by “primary aquifer layer” (PAL). Many observation locations are screened through multiple layers. PAL is calculated as the aquifer layer with the longest screen interval. If a well has its longest screen interval in an aquitard layer, then the PAL was changed to be the nearest aquifer layer. The model uses the HOB package, which integrates water level data from multiple layers based on hydraulic conductivity so PAL is a rough approximation of the depth that the observation represents.

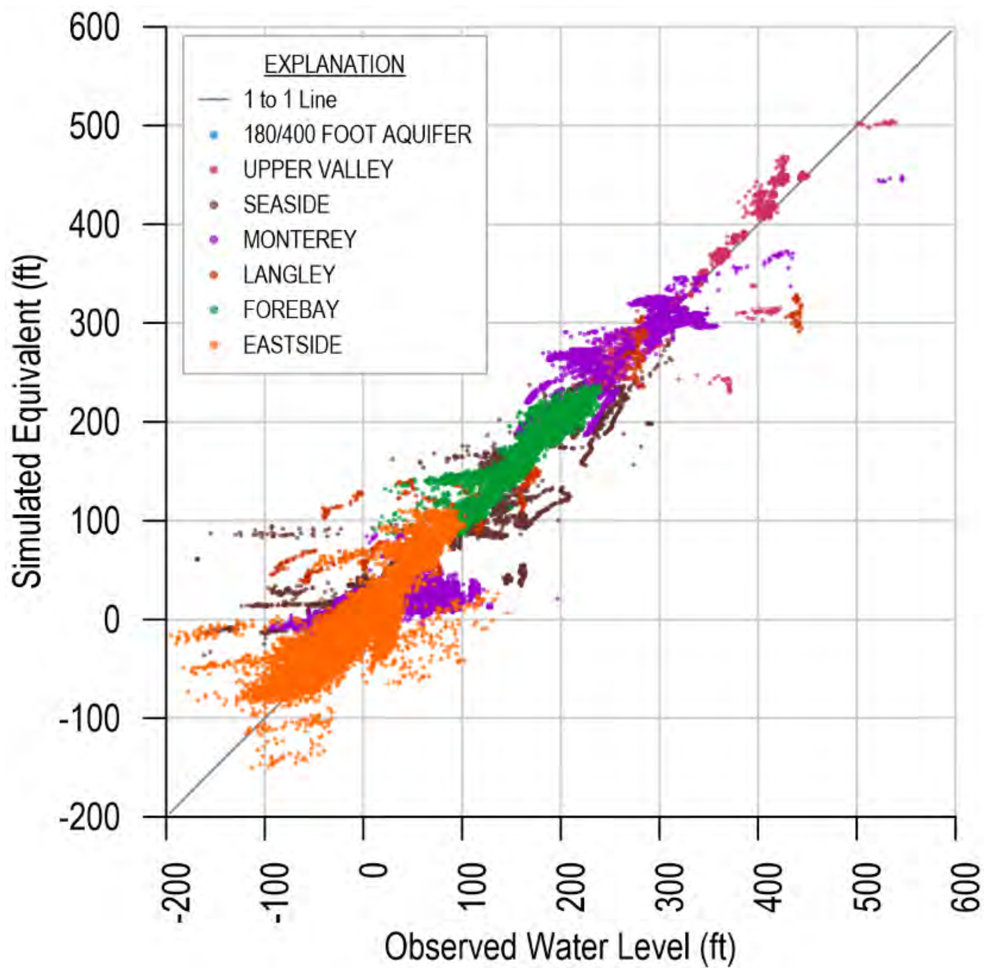

Figure 70. Simulated vs Observed Groundwater Levels by Subbasin

4.2.5 Simulated and Observed Groundwater Level Contours

Observed and simulated water level contours from fall 1995 and fall 2020 for the 180-Foot, 400-Foot and Deep Aquifers and their equivalent adjacent HGUs are shown on Figure 71 through Figure 76. Observed water level contours in different portions of the basin are compiled from multiple different sources and may have different contour intervals. In general, simulated contours in the 3 aquifers generally align with the direction of groundwater movement shown in the observed contours. Groundwater generally moves to the north-northwest from the Monterey-Paso Robles County line toward the coast along the axis of the basin. Groundwater contours also indicate that groundwater flows from the Monterey Subbasin into the 180/400 Subbasin and from the 180/400 Subbasin to the Eastside Subbasin, which occurs as a result of groundwater pumping. Observed groundwater level contours are not available for the Monterey Subbasin for fall 1995 and for the Seaside Subbasins for fall 1995 and 2020.

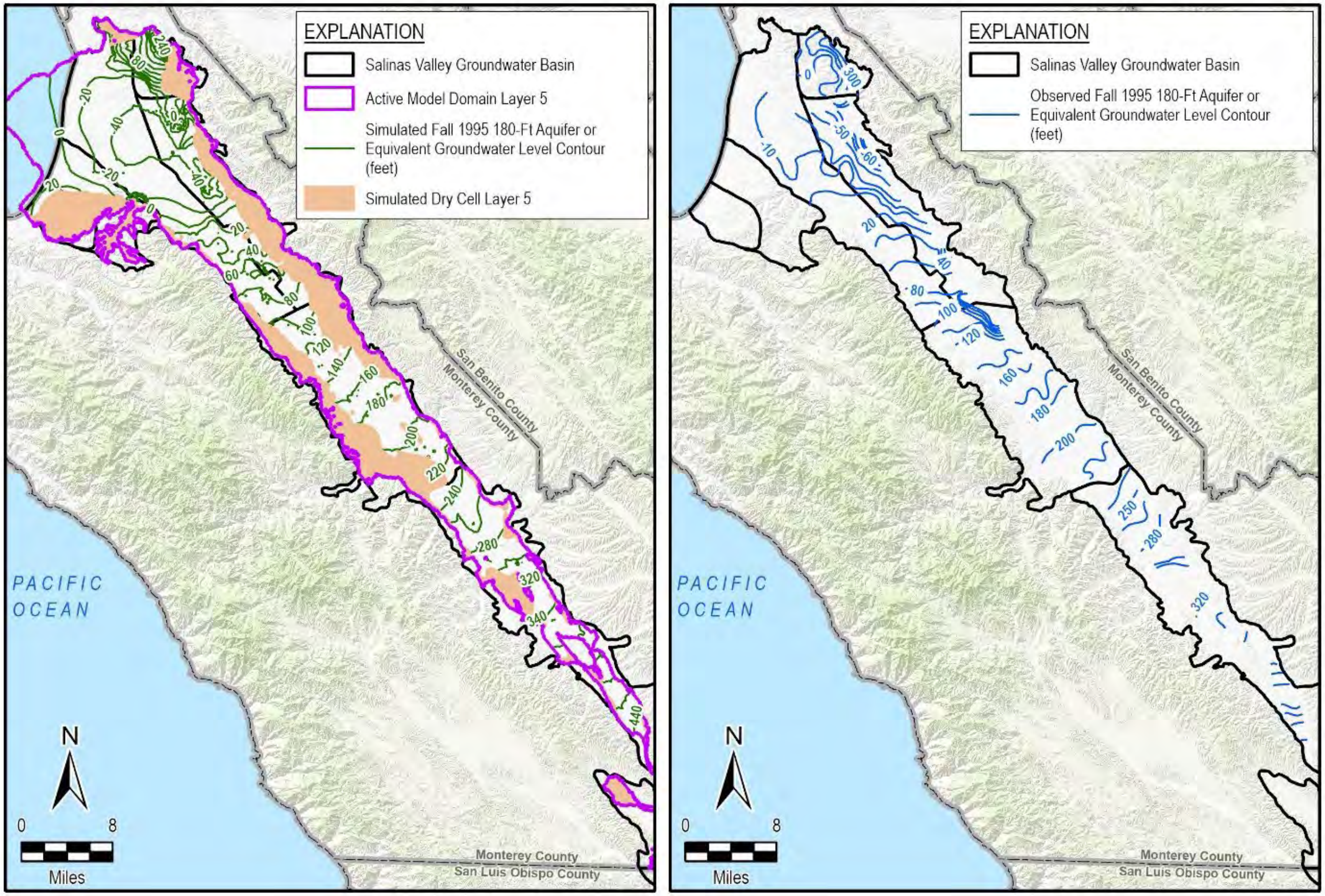

Figure 71. Fall 1995 Simulated and Observed Groundwater Elevation Contours for the 180-Foot Aquifer and Equivalent HGUs

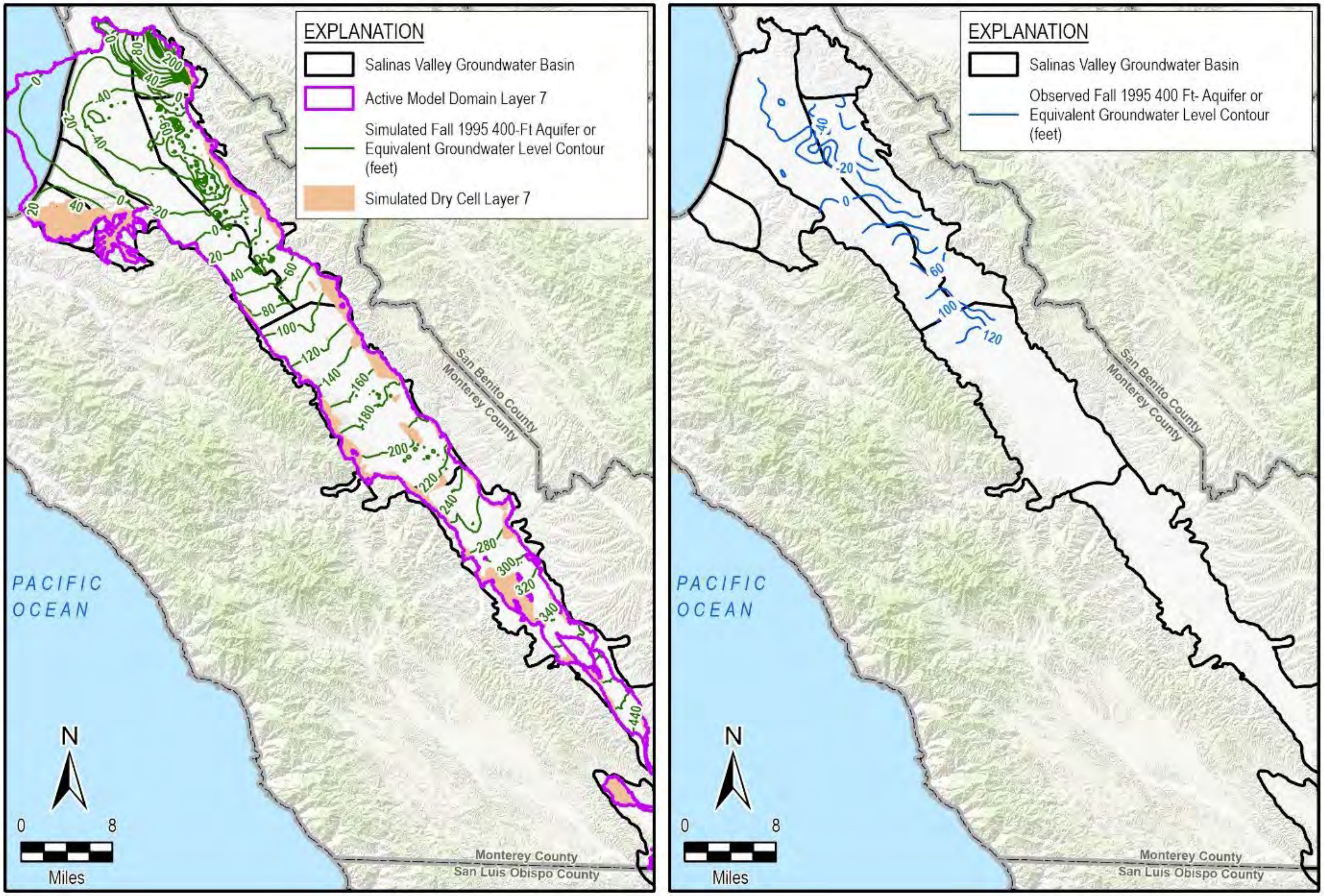

Figure 72. Fall 1995 Simulated and Observed Groundwater Elevation Contours for the 400-Foot Aquifer and Equivalent HGUs

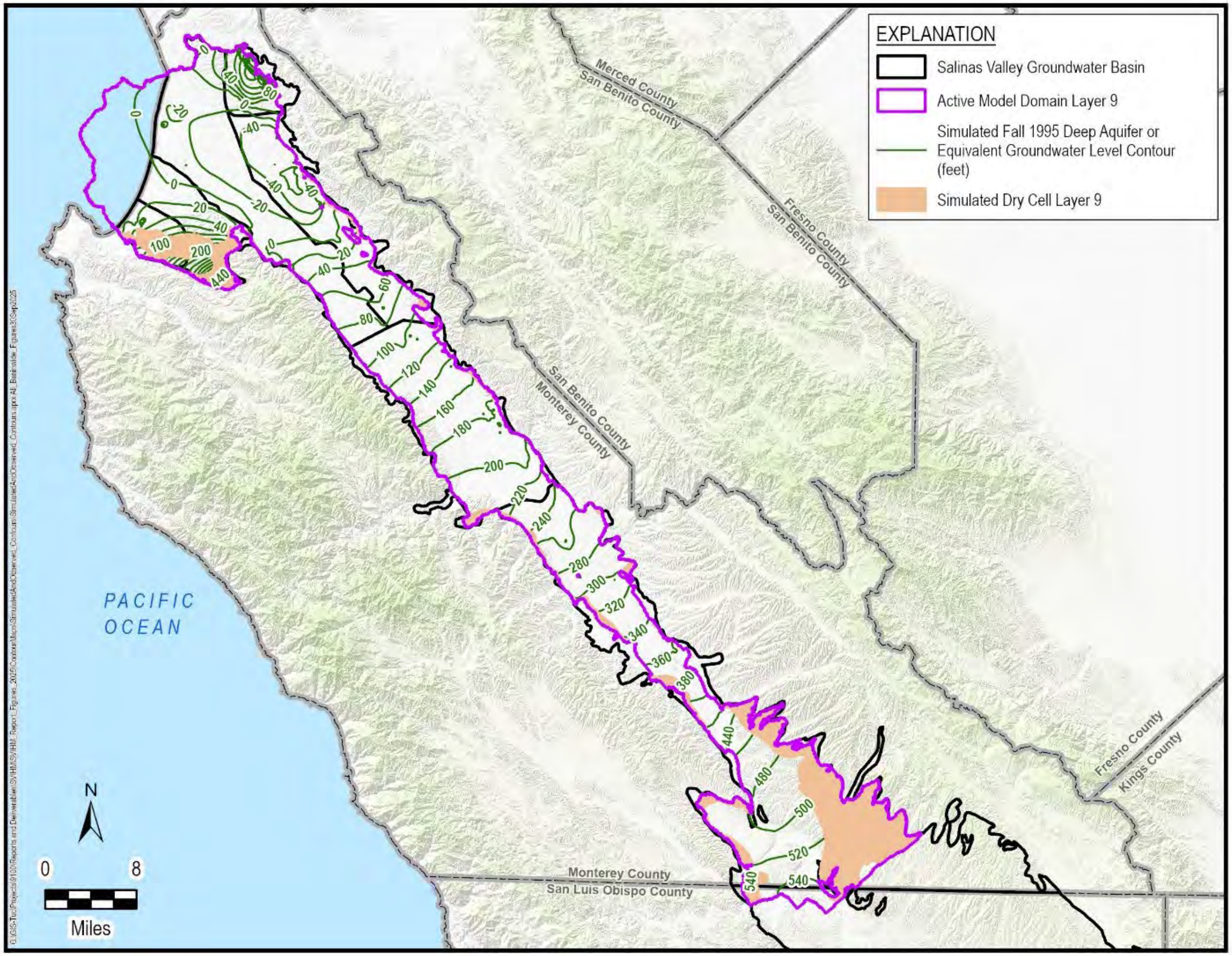

Figure 73. Fall 1995 Simulated Groundwater Elevation Contours for the Deep Aquifer and Equivalent HGUs

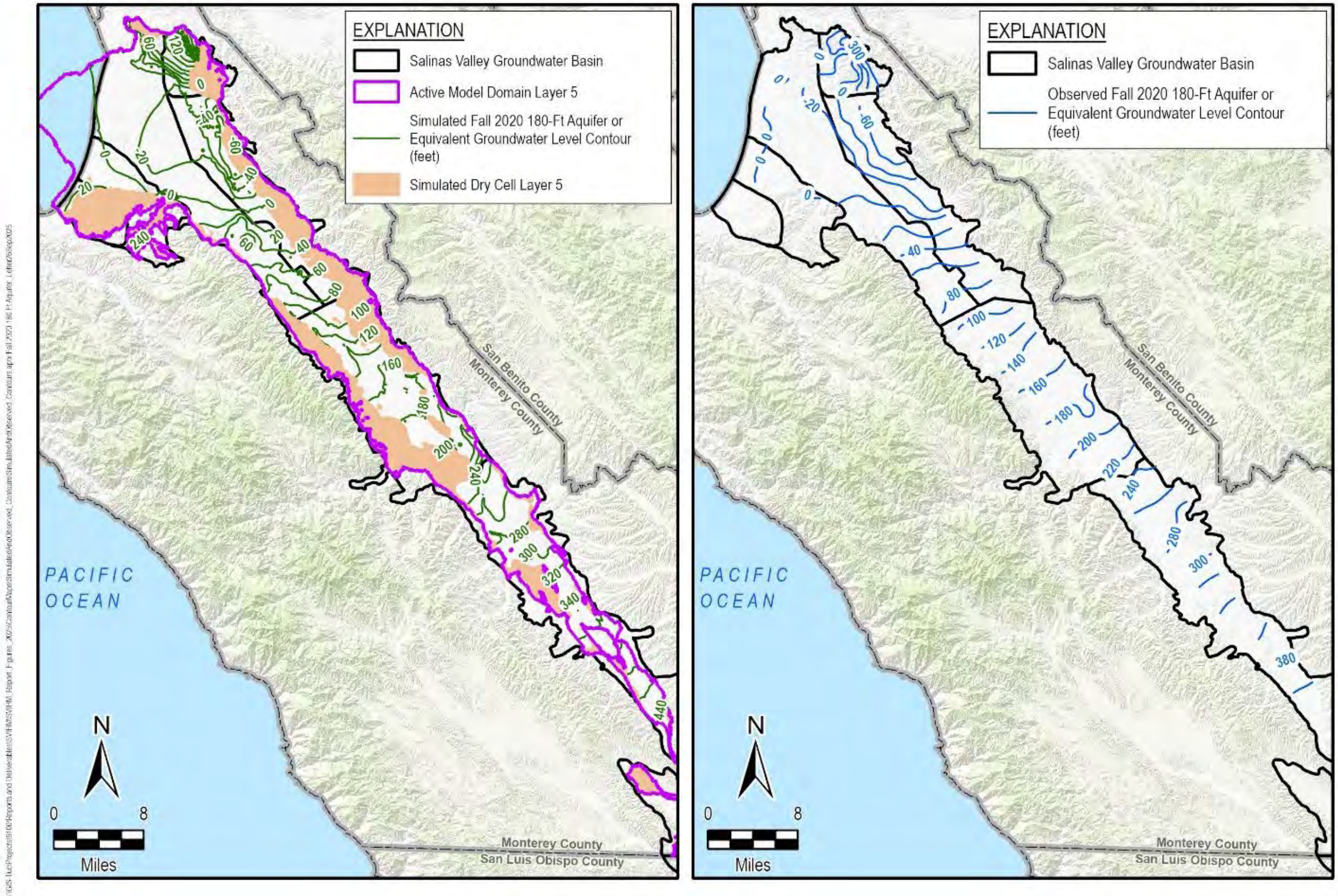

Figure 74. Fall 2020 Simulated and Observed Groundwater Elevation Contours for the 180-Foot Aquifer and Equivalent HGUs

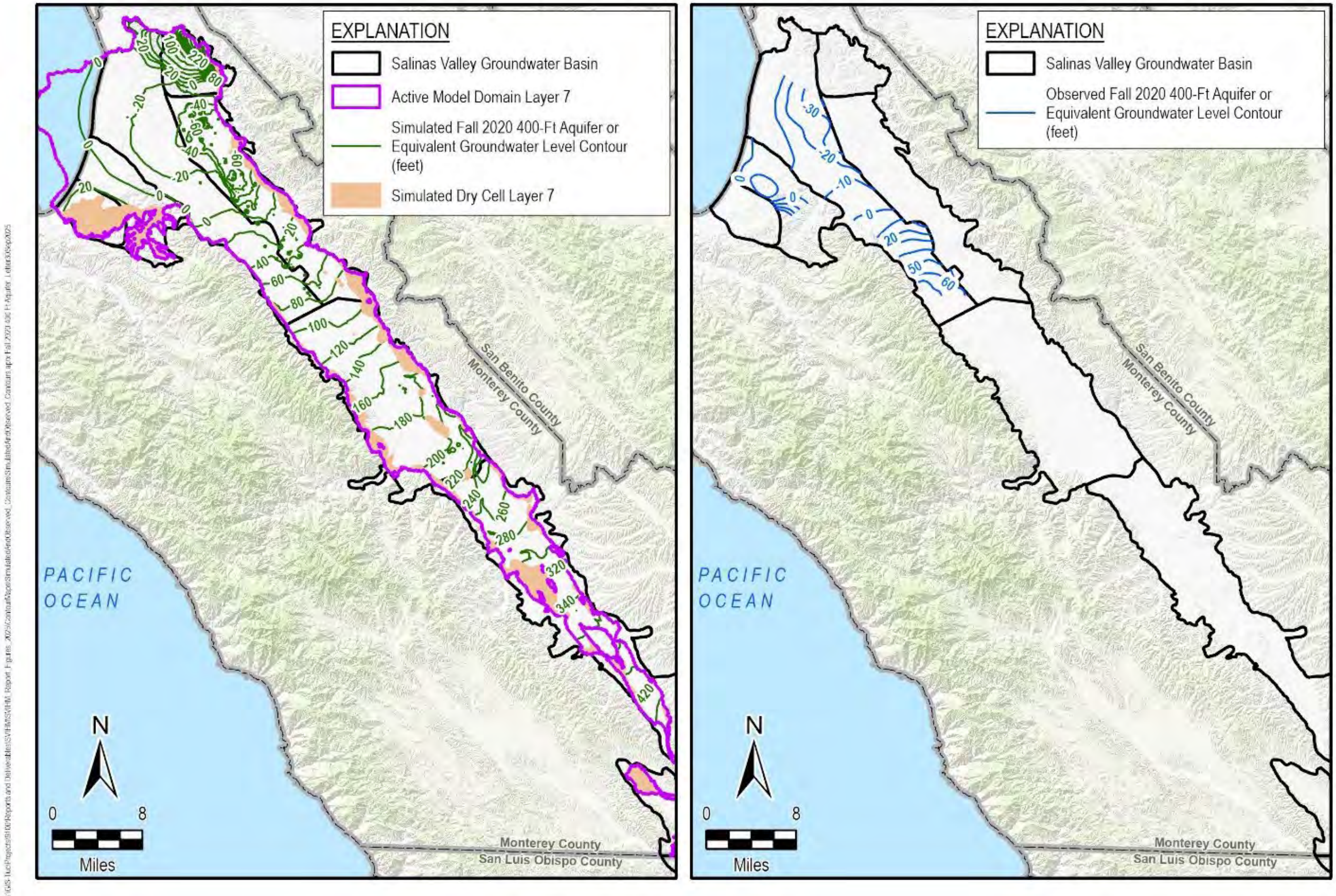

Figure 75. Fall 2020 Simulated and Observed Groundwater Elevation Contours for the 400-Foot Aquifer and Equivalent HGUs

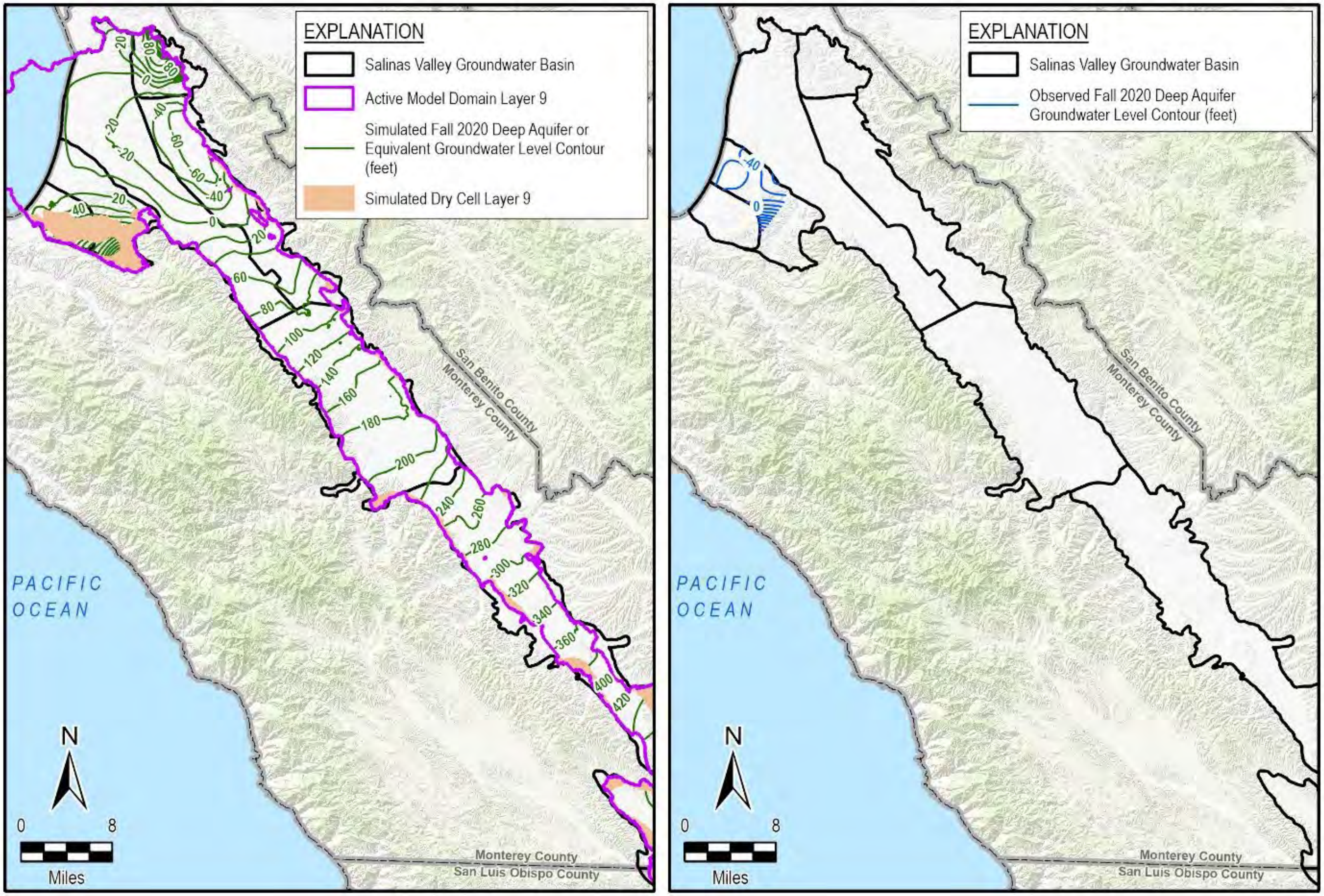

Figure 76. Fall 2020 Simulated and Observed Groundwater Elevation Contours for the Deep Aquifer and Equivalent HGUs

4.2.6 Groundwater Level Mean Residuals

Unweighted, mean residuals by aquifer group are shown on Figure 77 through Figure 80. Residuals are calculated as simulated minus observed for each month where an observed value exists for that well. These residuals are then averaged to provide the magnitude of error and to identify if a well is being generally underpredicted or over predicted by the model. Positive values, shown in orange, indicate that the model is overpredicting groundwater level elevations (too high) at that location, and negative values, shown in green, indicate the model is underpredicting groundwater level elevations (too low). Figure 77 shows mean residuals for the 180-Foot Aquifer and equivalent units in the Eastside. The model is generally underpredicting water levels in the coastal portion of the 180/400 Subbasin and generally overpredicting water levels in the Monterey Subbasin and inland portions of the 180/400 Subbasin.

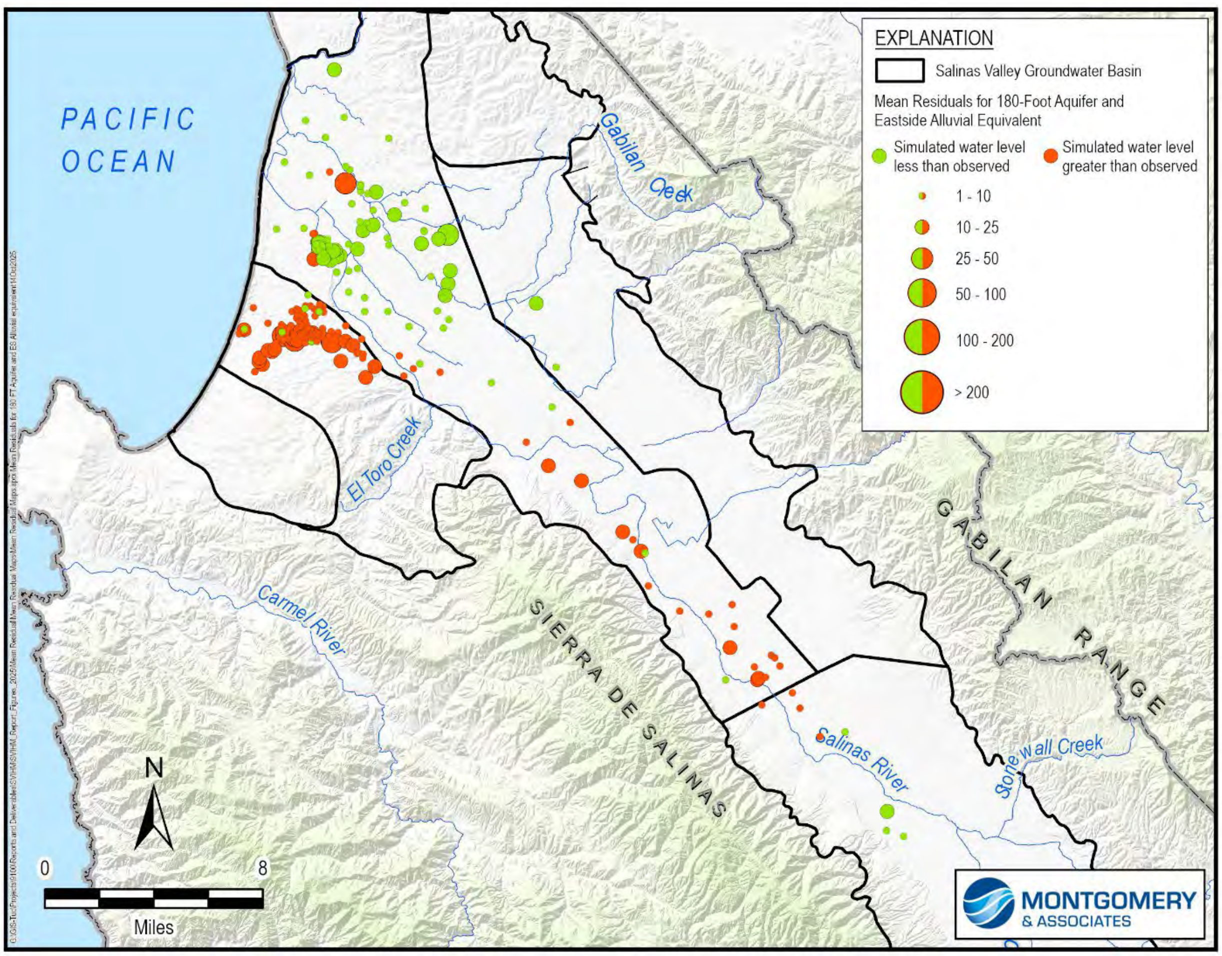

Figure 77. Mean Residual Map for 180-Foot Aquifer and Eastside Alluvial Equivalent

Figure 78 shows average mean residuals for the 400-Foot Aquifer and Eastside Alluvial Equivalent units. The calibration is variable in this observation group and includes a combination of large and small residuals and overpredicts and underpredicts in different portions of the model domain. Relatively large residuals occur in the northern portion of Eastside Subbasin, where measured groundwater levels are substantially different from one well to another.

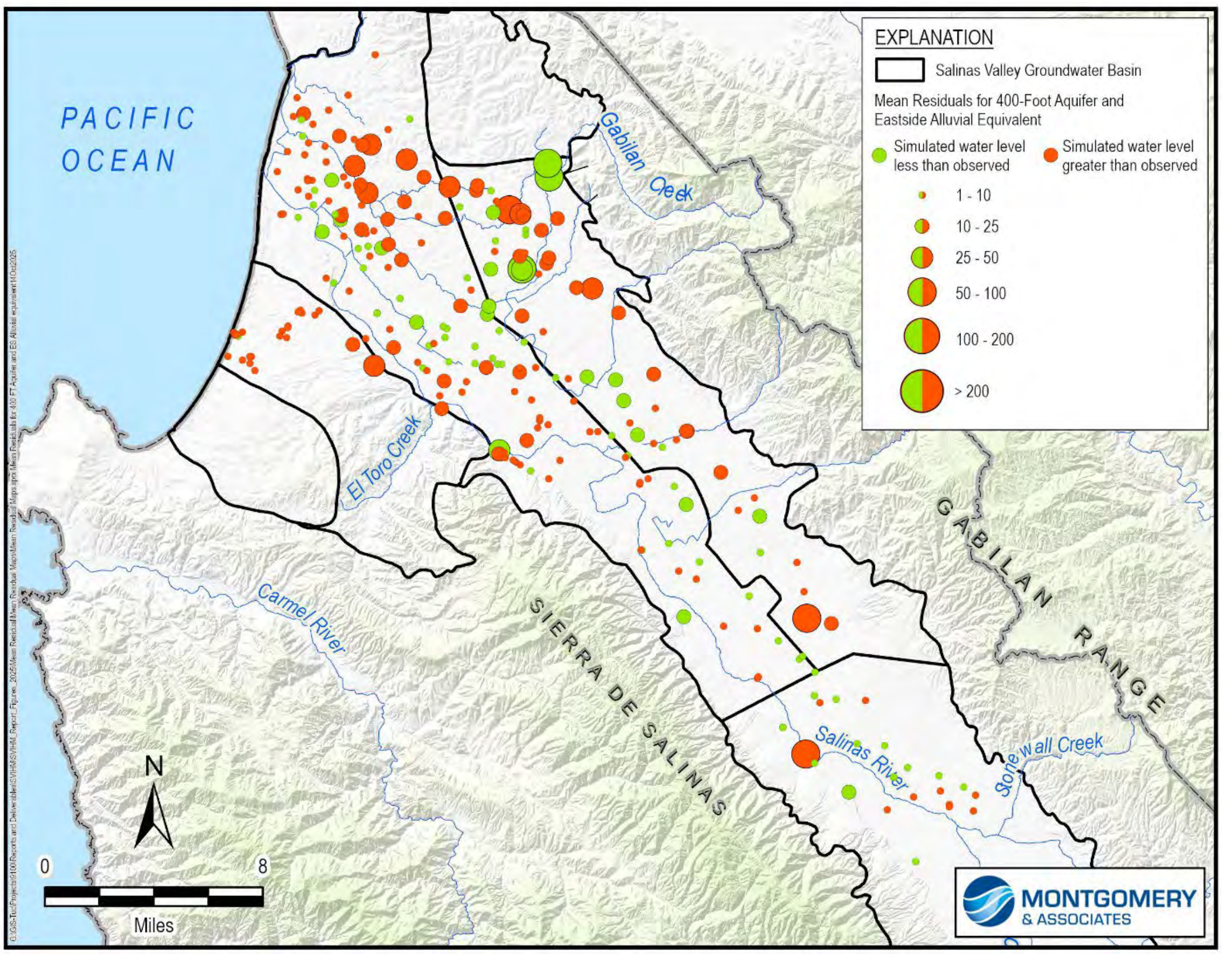

Figure 78. Mean Residual Map for 400-Foot Aquifer and Eastside Alluvial Equivalent

Figure 79 shows mean residuals for the Deep Aquifers and observations located primarily in model layers 9, 10, and 11 in the Monterey and Seaside subbasins. In general, the quality of the calibration in deeper layers of the model is worse than in the upper layers. The model primarily overpredicts groundwater level elevations in the coastal portions of the deeper layers and in the deeper portions of the Eastside alluvial fans, and underpredicts observations along the upland margins of the model in the Seaside Subbasin and Corral de Tierra area. Additional investigation is required to better understand the flows between these areas of the model and the impacts geologic structures, such as faults in the area, may have on the model.

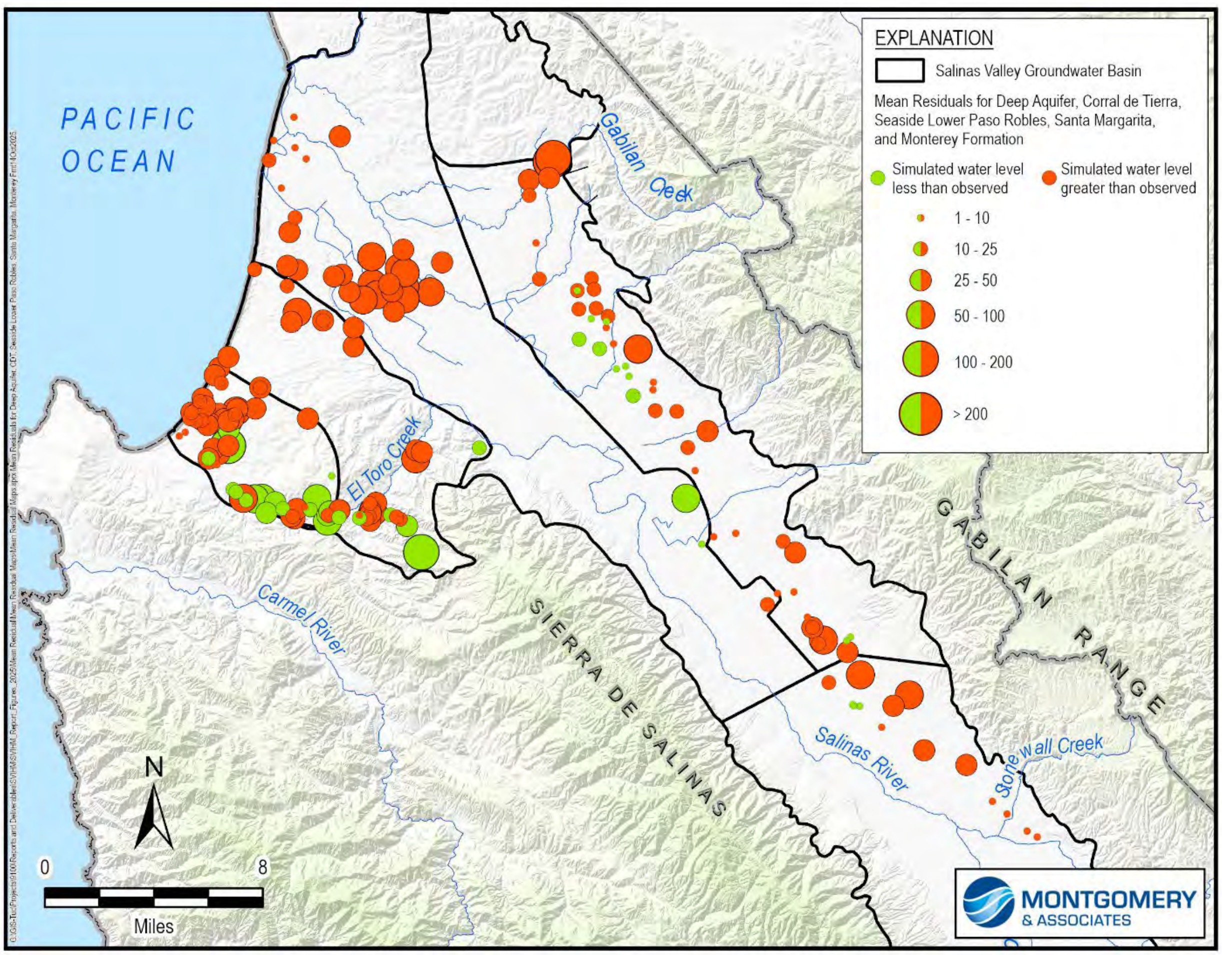

Figure 79. Mean Residuals for the Deep Aquifers, Corral de Tierra, and the Seaside Subbasin Observation Groups

Figure 80 shows mean residuals for the Arroyo Seco and Upper Valley observation groups. The model generally Overpredicts observations of groundwater level elevations along the Arroyo Seco, and overpredicts elevations in the transition area where the Arroyo Seco Fan meets the Eastside alluvial fans. One explanation for overpredicting along the Arroyo Seco is that river leakage may be greater than actual, resulting in elevated groundwater levels. The Upper Valley has the lowest concentration of groundwater elevation data in the model. Additional water level measurements in this area could be used to better understand the movement and occurrence of groundwater in this area.

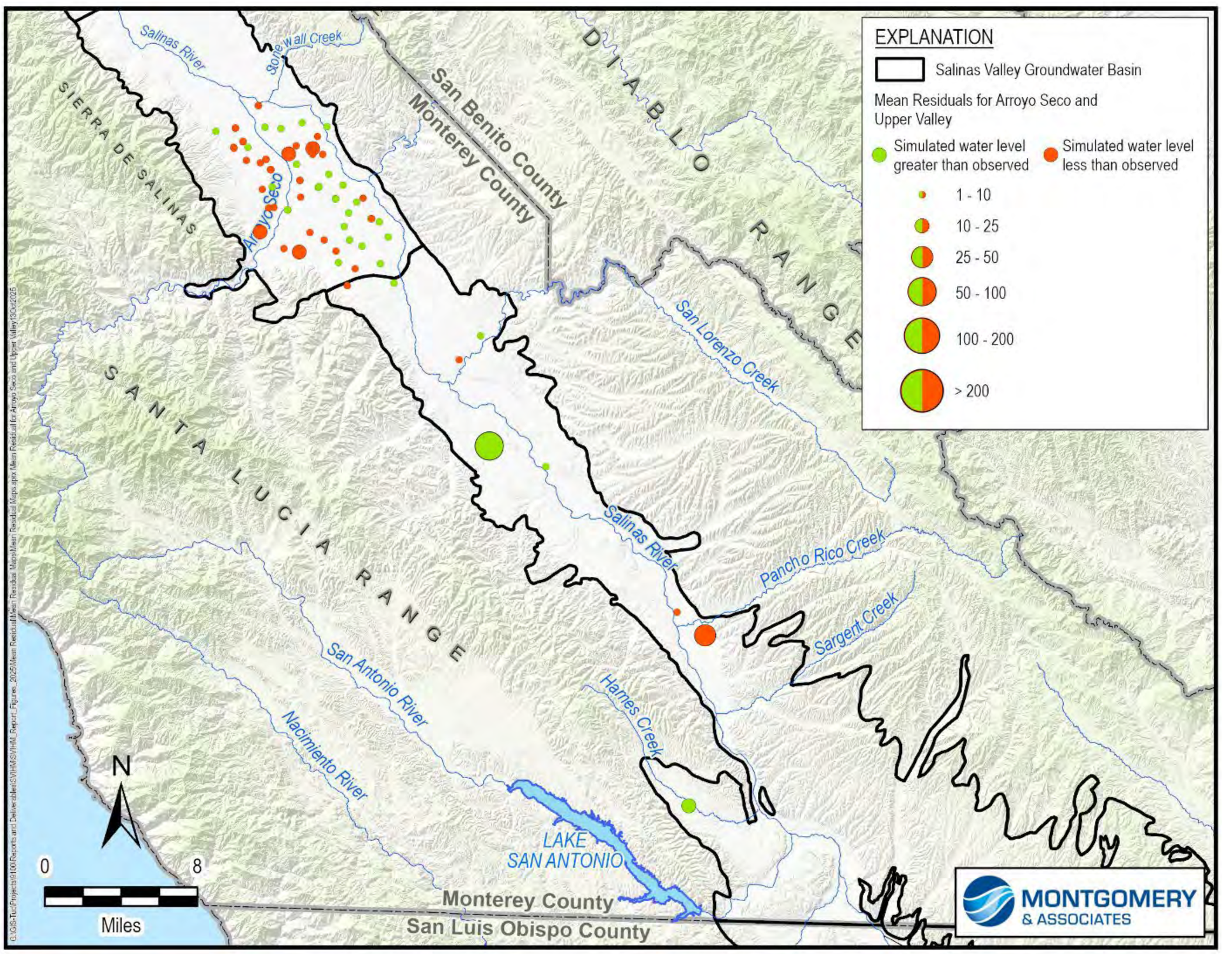

Figure 80. Mean Residual Map for Arroyo Seco and Upper Valley Observation Groups

4.2.7 Groundwater Water Level Hydrographs

Figure 81 through Figure 84 show the locations and hydrographs of selected wells. These wells are a small subset of the calibration dataset but show some of the time varying successes and challenges at individual wells. Model simulated and measured groundwater level hydrographs for all RMS wells are provided in Appendix F. During the historical period, simulated groundwater levels generally align with both short-term and long-term trends for many observation wells, though some wells exhibit a closer match than others. Some observation wells show matching of seasonal or long term trends while exhibiting a high or low bias. Other wells may miss some trends or seasonal fluctuations while having a relatively good match on the average water level. Note that the hydrographs pictured have varying y-axis scales. This provides better refinement for individual wells on the hydrographs but makes the graphs less directly comparable. Simulated groundwater levels are shown as a colored line, while observed groundwater levels are shown as points with corresponding color as the line.

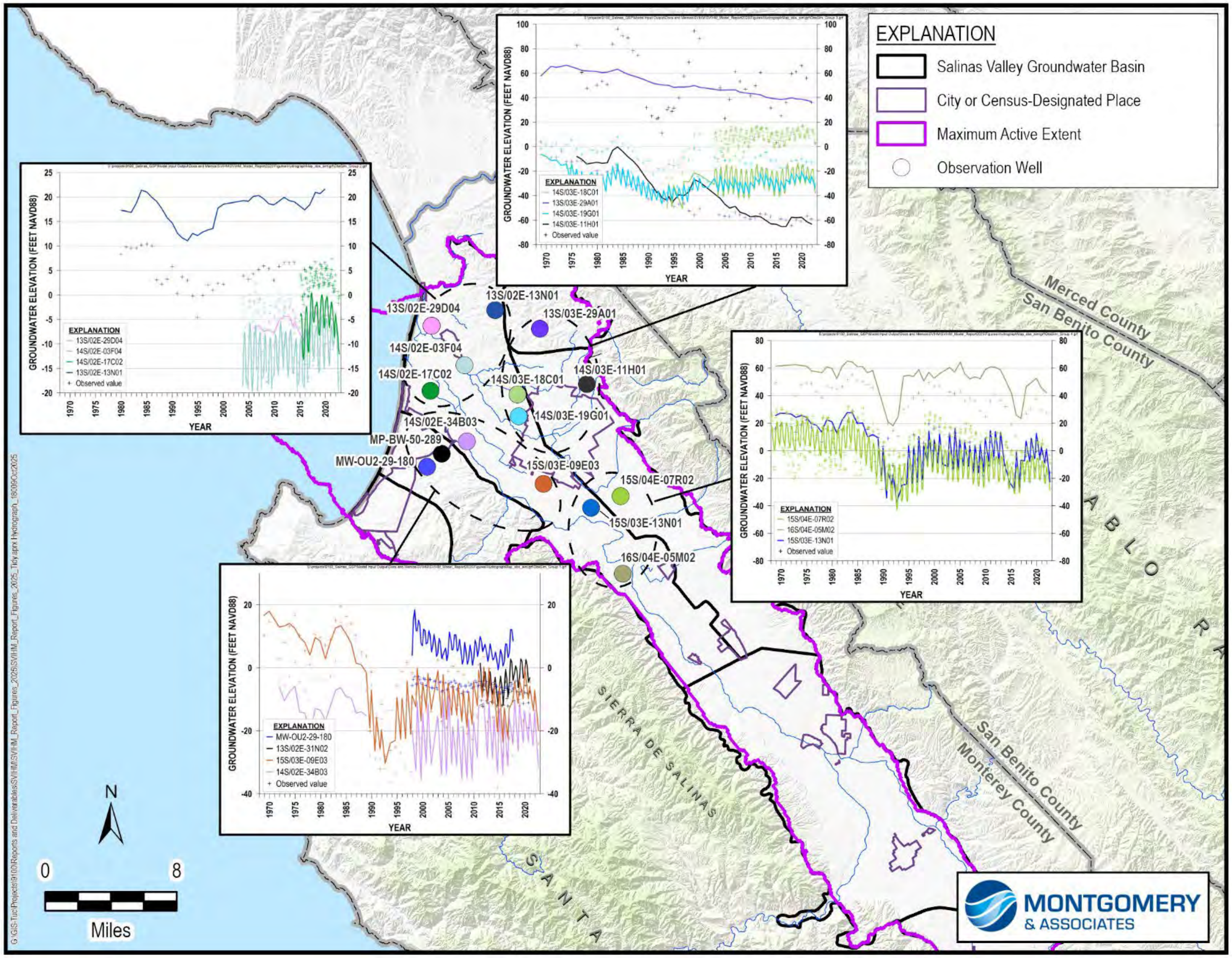

Figure 81. Observed and Simulated Hydrographs at Selected Wells in the 180-Foot Aquifer or Equivalent HGUs

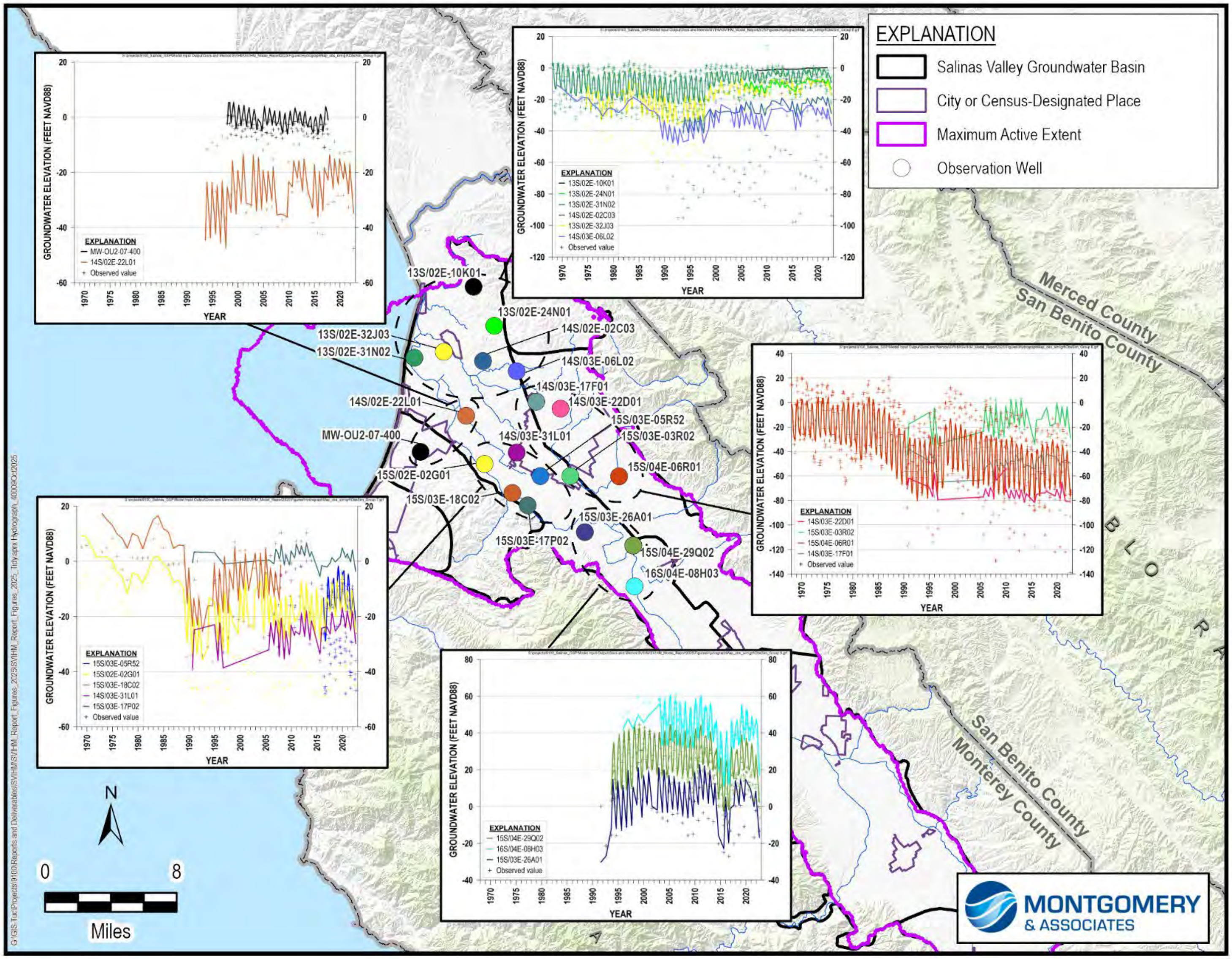

Figure 82. Observed and Simulated Hydrographs at Selected Wells in the 400-Foot Aquifer or Equivalent HGUs

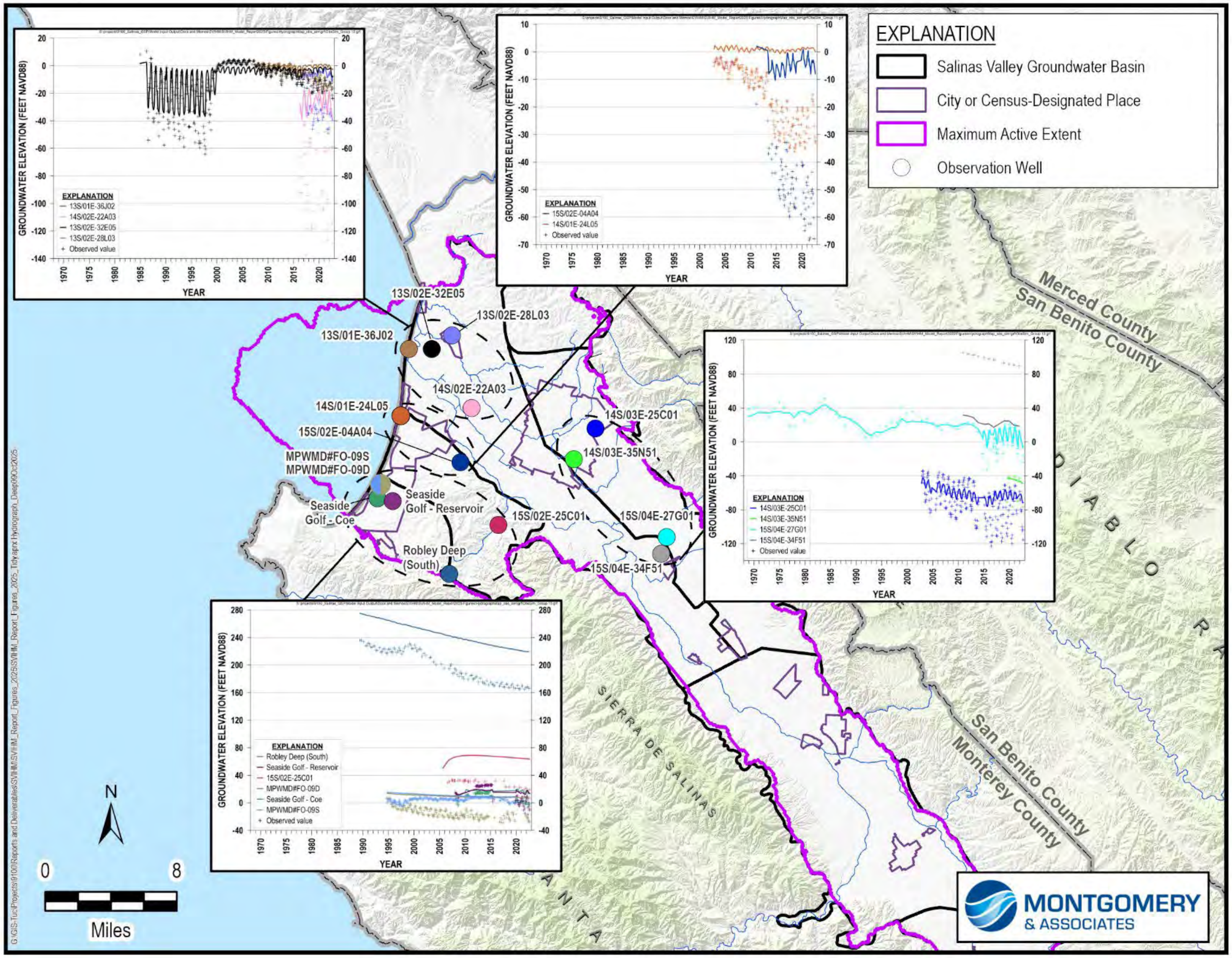

Figure 83. Observed and Simulated Hydrographs at Selected Wells in the Deep Aquifer or Equivalent HGUs

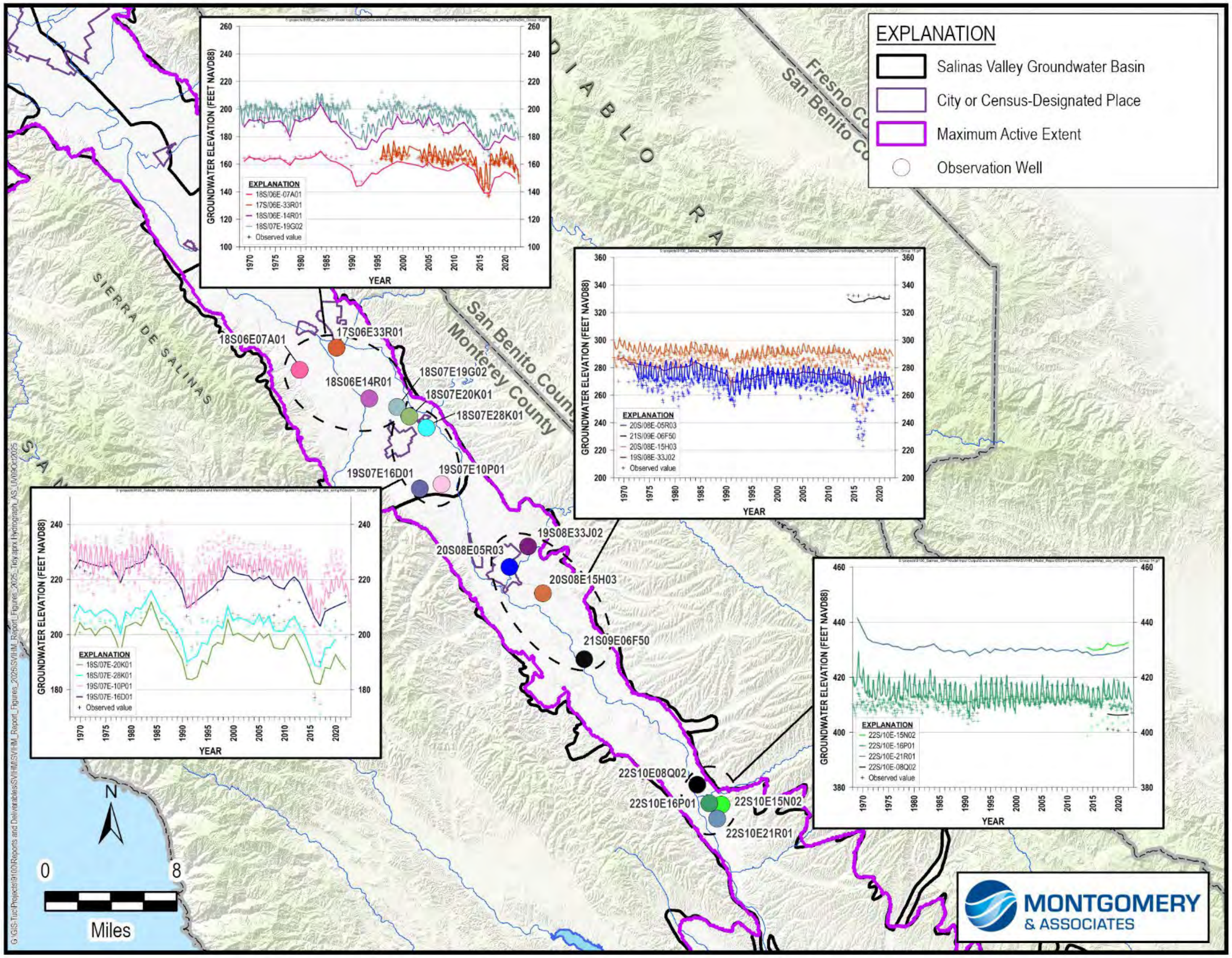

Figure 84. Observed versus Simulated Hygrographs at Representative Wells in Arroyo Seco and Upper Valley

4.2.8 Surface Water Flow Hydrographs

Simulated streamflows are plotted with observed data from gaged locations along the Salinas River. The y-axis is in log-scale for better display of higher flow values; however, this scale does not allow the display of measured zero flow values. Observation locations are shown on Figure 24.

In general, the Salinas River calibration is better at the Bradley and Soledad gages than the other gages and generally captures high (>1,000 cubic feet per second (cfs)), medium (100-1,000 cfs), and low streamflows (<100 cfs). At Chualar, the model generally over predicts high and medium flows while under predicting low flows. At Spreckels, low and medium observed flows are more variable than upstream in the basin. The model reproduces high flows reasonably well at all the gage locations but struggled to match low flows, particularly before 1990. In the updated model, stream elevations are generally below land surface. This creates a direct interface between the surface water and groundwater flow domains and is more representative of real-world conditions. However, this makes calibration more difficult than if the SFR network is located above ground surface, as seepage can be directly controlled by adjusting stream conductivities since the surface water domain is disconnected from the groundwater domain.

Figure 86 shows the stream flow calibration at the Arroyo Seco gage below Reliz Creek, near Soledad. Observed data for the Arroyo Seco frequently indicates zero flow at this location. To show zero flows on a logarithmic scale, zero flow months are replaced with a value of 0.1 for the observed data. The model provides a reasonable match at medium and high flows. The model overestimated the number of months with 0 flows and struggled to reproduce flows in the 1-10 cfs range.

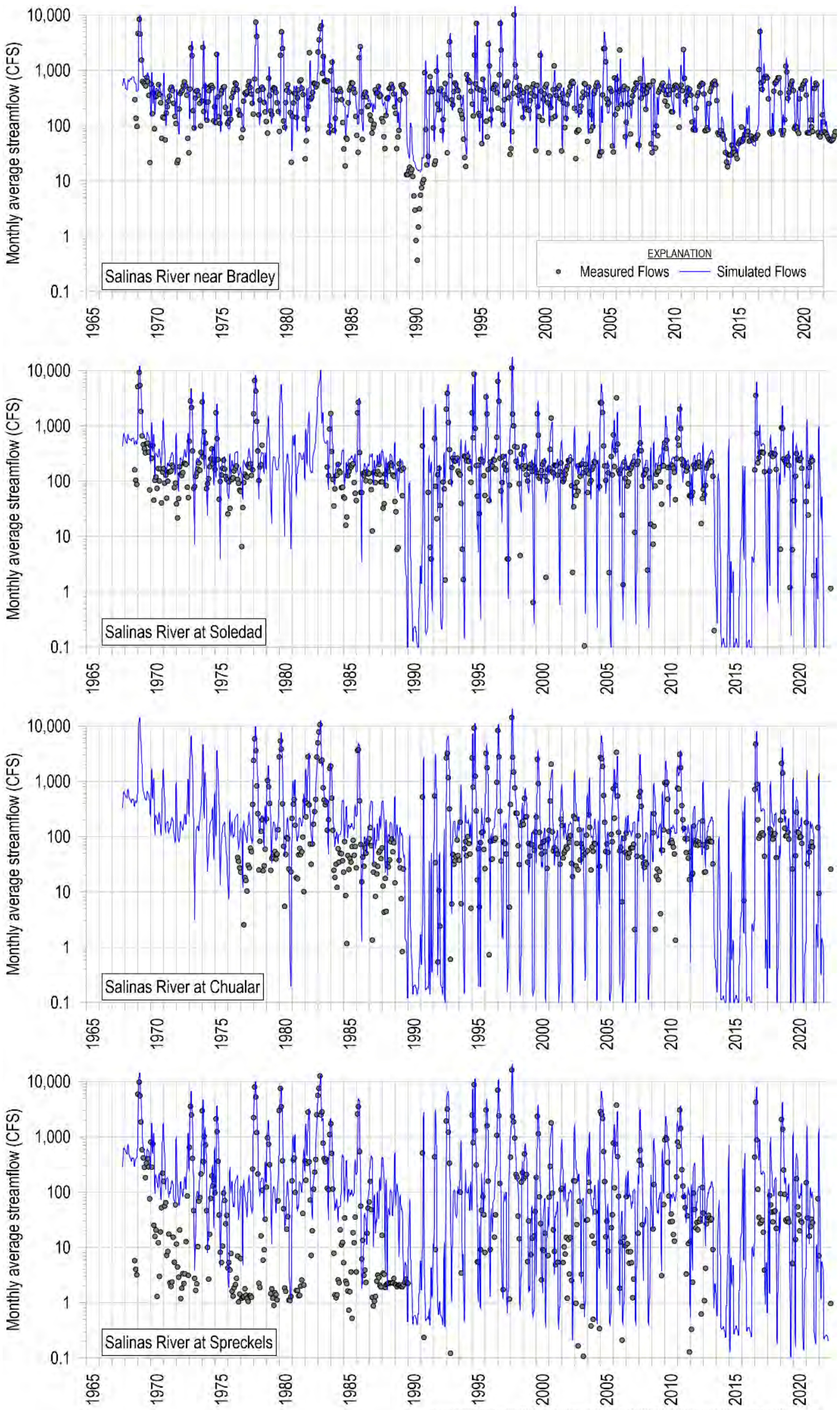

Figure 85. Simulated and Observed Streamflow Hydrographs for Gage Locations along the Salinas River

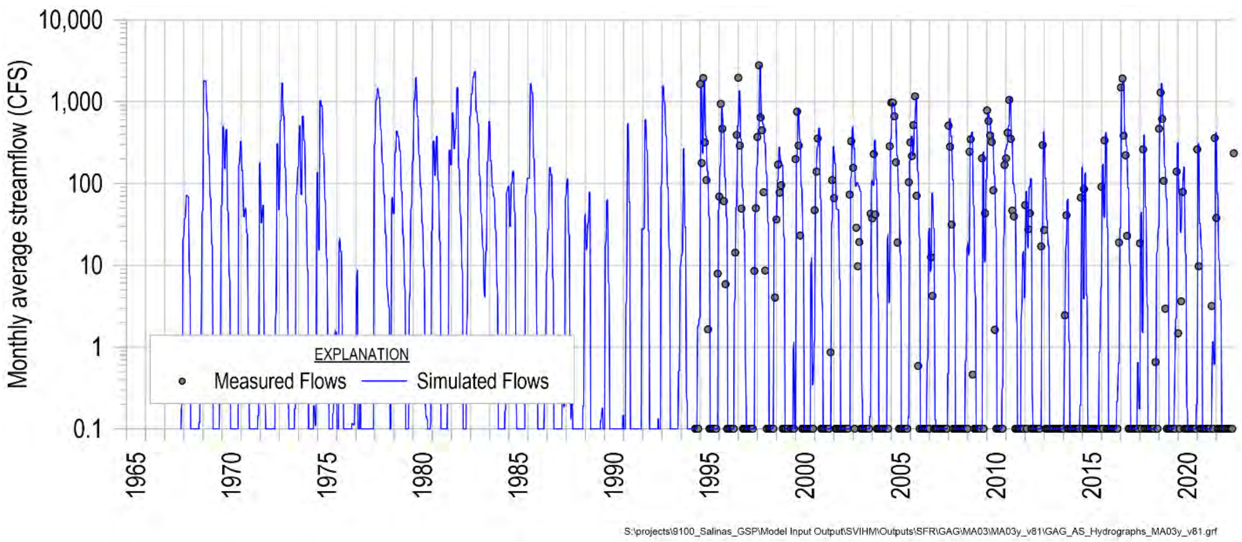

Figure 86. Observed and Simulated Hydrograph for the Arroyo Seco below Reliz Creek near Soledad Gage

4.2.9 River Series and Surface Water Seepage

Figure 87 shows observed and simulated river series snapshots along the Salinas River during reservoir release season. Daily measurements from MCWRA are shown as well as average monthly measurements calculated from USGS gages. The difference in fit for each of the 3 snapshots illustrates the complexity of simulating the natural river system. The model simulates July 2021 most accurately and over predicts or under predicts slightly at each of the various measurement points. In July 2018 and August 2019, the model generally over predicts the river series. Throughout the calibration process the model struggled to match at Chualar due to underestimating the amount of seepage between Gonzales and Chualar. Figure 88 shows a comparison between modeled seepage and estimated seepage calculated from river series measurements. Positive values indicate that the stream is losing surface water to groundwater; negative values indicate the stream is gaining water from groundwater.

Estimated seepage loss along these reaches are compared to simulated seepage over the historical model period on Figure 88. Simulated streambed losses only include streambed seepage and do not include estimates of riparian evapotranspiration losses. Simulated streambed conductance values were manually adjusted to better match estimated losses as part of the model calibration. Overall, simulated seepage losses are generally consistent with estimated seepage losses. The only reach where the model is simulating a different direction than estimated is between the reservoirs and Bradley. This area had no groundwater elevation monitoring locations and was not the focus of this calibration. The reach with the worst match to observed seepage losses within the area of interest was between Gonzales and Chualar. The model consistently underpredicted the amount of seepage in this reach, resulting in an over prediction of surface water flows at this location. Improvements in the stream calibration resulted in a worse fit to groundwater levels near this location. As such, the groundwater elevation calibration was prioritized, resulting in slightly poorer match to surface water conditions.

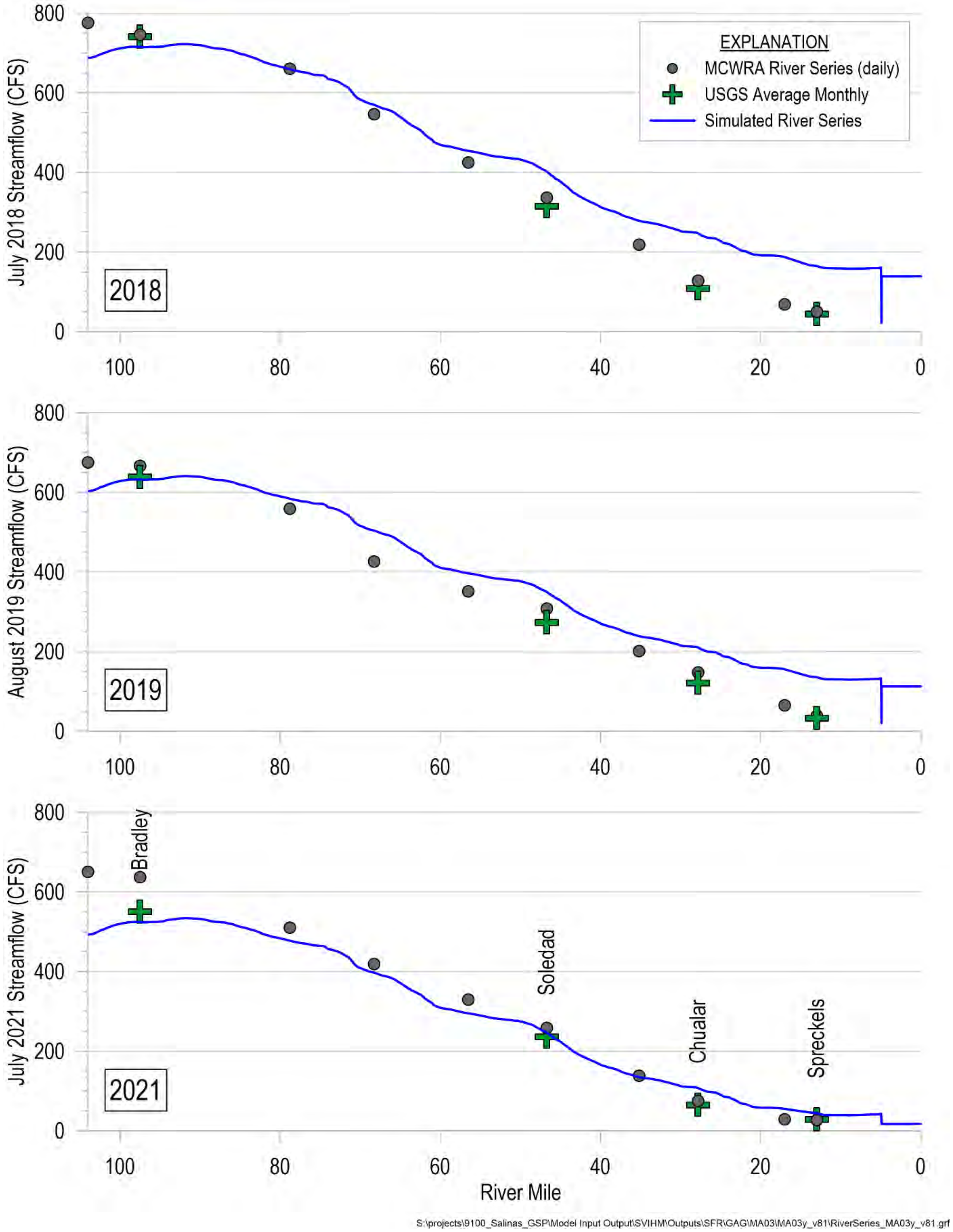

Figure 87. Observed and Simulated River Series Measurements

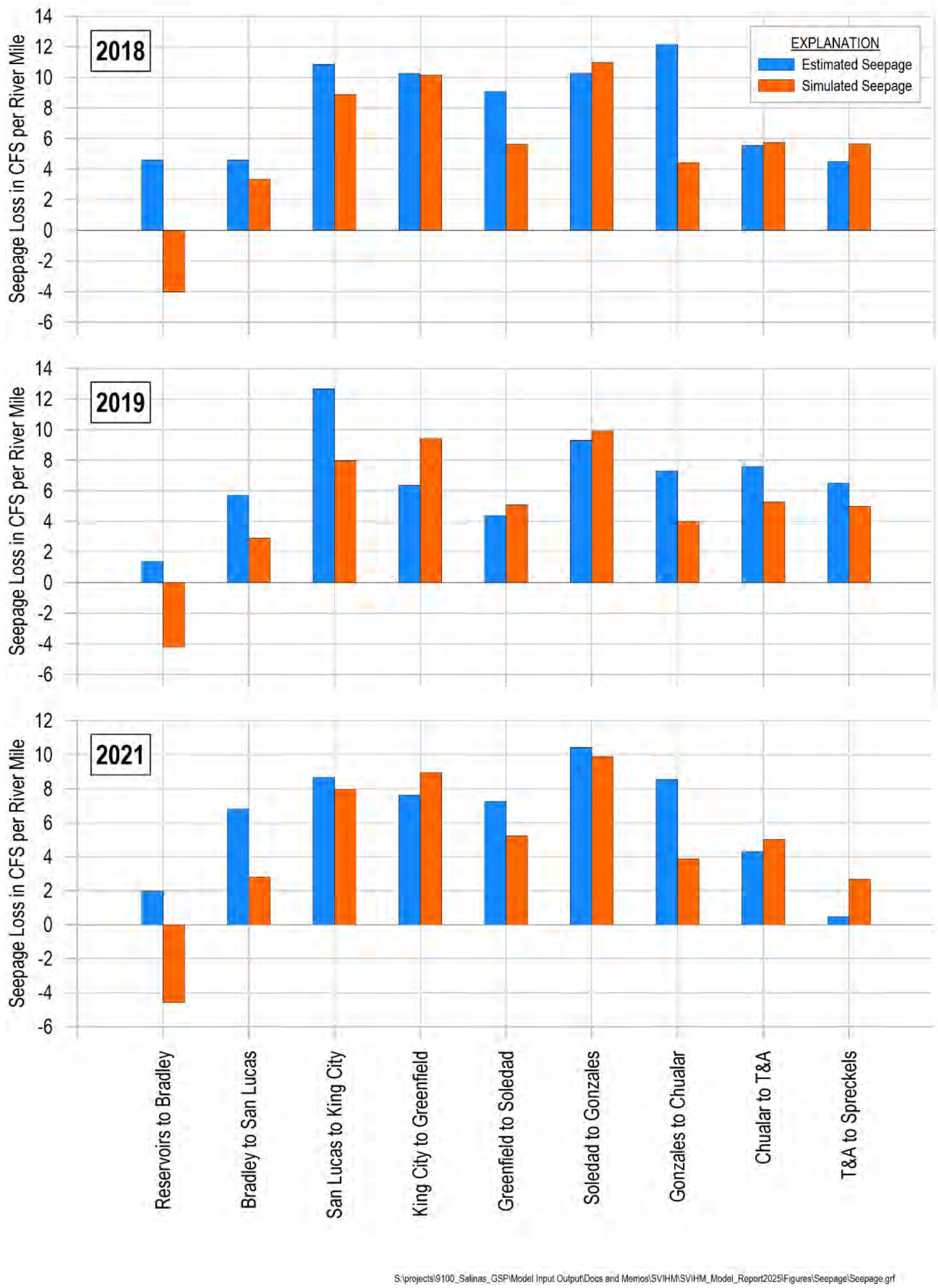

Figure 88. Observed and Estimated Seepage Along the Salinas River

5 SIMULATED WATER BUDGETS

One of the primary purposes of this model update is to develop historical water budgets. Simulation results from the historical model will be used directly for the historical and current water budgets in the 2027 GSP Periodic Evaluations. Reported water budgets were prepared based on post-processing output files from MODFLOW's ZoneBudget application, and represent the average over WY 2003-2022. This was selected as an updated representative period that includes a mix of wet, dry, and normal water year types. This water budget is relatively consistent with the water budget for WY 1995-2022, which is the focus of the calibration. Water budgets for 2003-2022 are displayed for consistency with the GSPs. For each subbasin, or column in the table, positive values represent an inflow to that subbasin, and negative values represent an outflow. For example, on average, 38,400 AF/yr of groundwater is flowing from the 180/400 Subbasin into the Eastside Subbasin. This value is negative in the 180/400 column, representing an outflow and positive in the Eastside column, representing an inflow. Dashed values indicate that that flow does not occur for that subbasin, whereas zero values indicate values less than 50 AF/yr. Rounding to the nearest 100 AF/yr in this table results in mass balance errors of 100 or 200 AF/yr for most subbasins. Cumulative mass balance error for the entire model is 0.0%, according to model output files. In this period, approximately 477,000 AF/yr pumping occurred within the basin boundary resulting in a net loss of groundwater storage of approximately 42,000 AF/year. The model is simulating a loss of groundwater storage in all subbasins, though the magnitude of the loss is variable.

Table 6. Annual Average Groundwater Budget by Subbasin for WY 2003-2022

Flow	180/400	Eastside	Forebay	Upper Valley	Monterey	Seaside	Langley
GW Extraction	-120,900	-86,300	-155,200	-104,500	-5,400	-2,400	-2,200
Net Stream Exchange	49,800	8,300	113,800	96,000	5,900	-200	700
Deep Percolation	53,700	24,100	57,400	58,000	11,500	4,500	5,700
Groundwater ET	-9,400	0	-17,800	-37,300	0	0	0
Net Seawater Exchange	4,900	-	-	-	-1,400	-1,800	-
Net Flow: Monterey	27,600	-	-	-	-	-5,600	-
Net Flow: Eastside	-38,400	-	-5,300	-	-	-	-4,400
Net Flow: Forebay	28,900	5,300	-	-25,800	-	-	-
Net Flow: Upper Valley	-	-	25,800	-	-	-	-
Net Flow: Langley	400	4,400	-	-	-	-	-
Net mountain front recharge	0	200	500	2,000	400	-100	0
Net Flow: Pajaro	-800	-	-	-	-	-	-100
Net Flow: 180-400 ft	-	38,400	-28,900	-	-27,600	-	-400
Net Flow: Paso Robles	-	-	-	6,300	-	-	-
Net Flow: Seaside	-	-	-	-	5,600	-	-
Net Storage Change	-4,100	-5,600	-9,800	-5,100	-11,200	-5,600	-800

All values are in AF/yr

Figure 89 through Figure 95 show the annual groundwater water budget and annual and cumulative change in groundwater storage for each of the subbasins in Salinas Valley, including Seaside, for 2003 through 2022. Cumulative change in storage is shown on the right y-axis; all other water budget components, including annual change in storage, are shown on the left y-axis. Each figure shows a water year classification in the background to show how hydrologic fluxes respond to different climate conditions. The y-axes on each graph vary to highlight the magnitudes of groundwater flows within a given subbasin.

Figure 89 shows the annual groundwater water budget for the 180/400 subbasin. Except for deep percolation of streamflow, most water budget components in this subbasin are relatively consistent year to year. As expected, groundwater pumping generally decreases in wetter years and is higher in "dry" and "normal" years. Groundwater storage in this subbasin is generally declining over the period, although storage increases occurred in response to wetter periods.

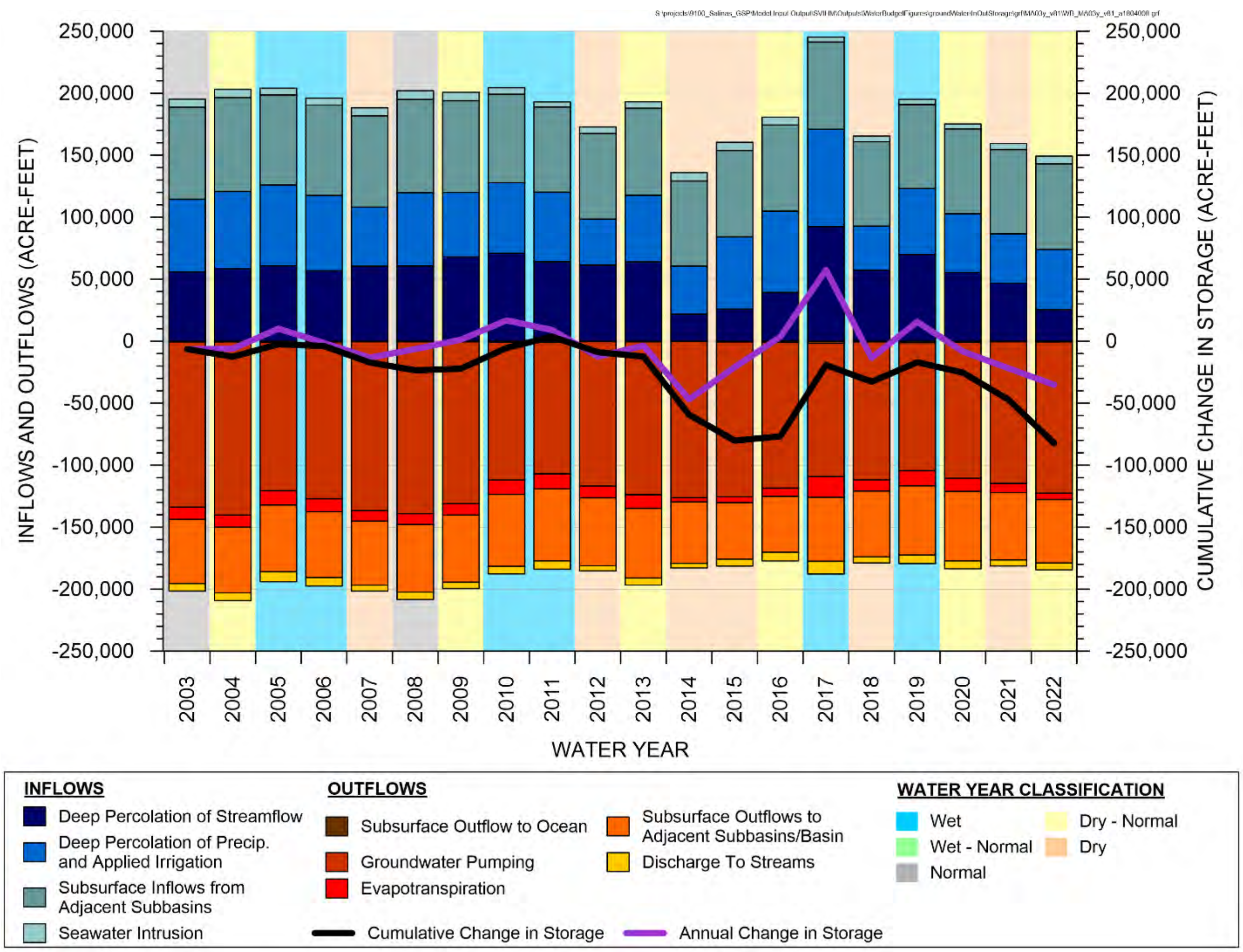

Figure 89. Annual Water Budget for the 180-400 Subbasin

Figure 90 shows the Eastside Subbasin annual groundwater water budget. Changes in groundwater storage are correlated with changes in deep percolation of precipitation and stream flows. For example, 2017 was the wettest year between 2003 and 2022 and represents the greatest increase in deep percolation and, correspondingly, the greatest increases in groundwater storage over this period. Estimated cumulative change in groundwater storage has generally declined over time.

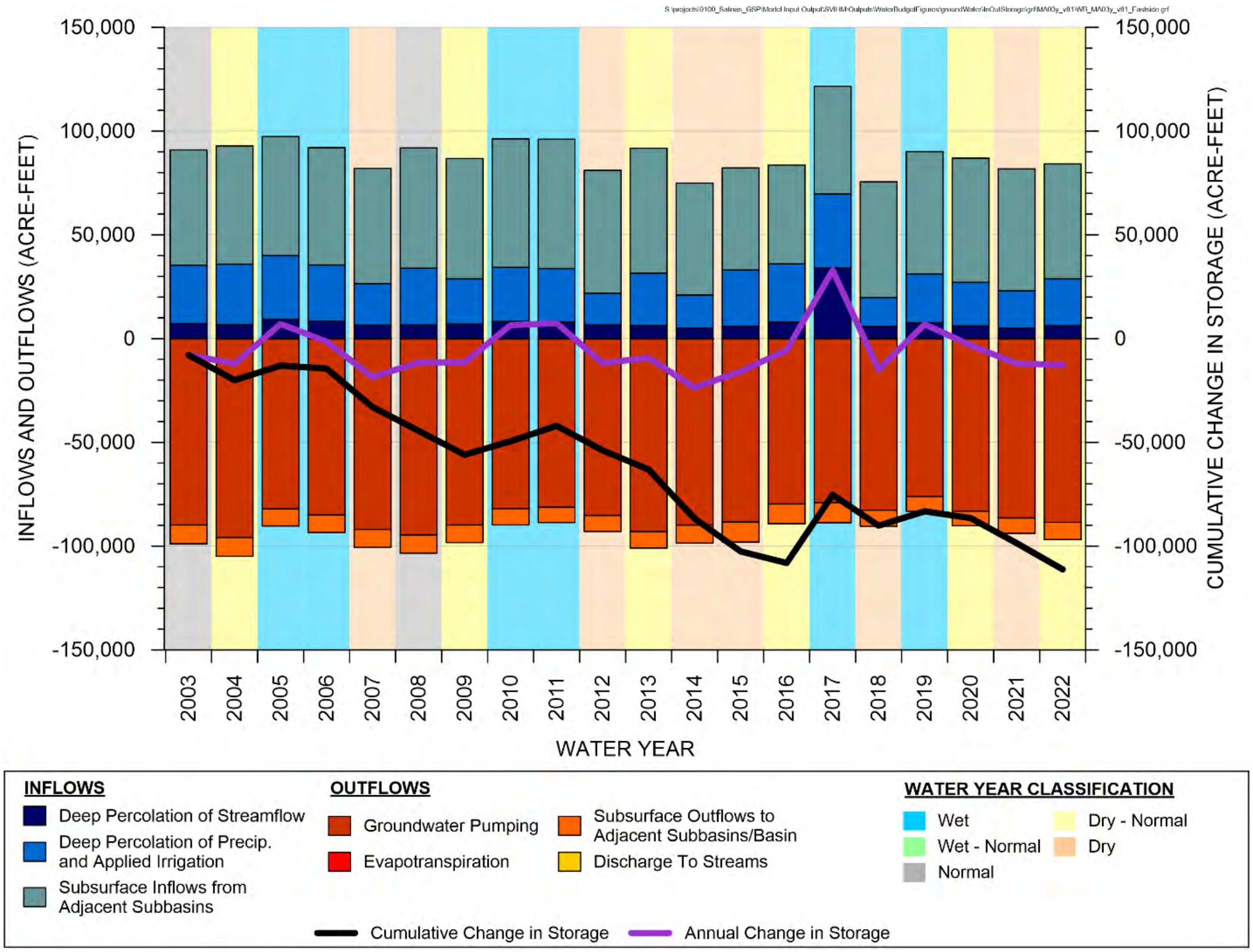

Figure 90. Annual Water Budget for the Eastside Subbasin

Figure 91 shows the annual water budget for the Forebay Subbasin. Deep percolation of streamflow is highly variable in the Forebay subbasin and is the primary driver for annual change in groundwater storage. Evapotranspiration makes up a larger percentage of the outflows in Forebay than in other subbasins. Groundwater storage is generally declining in this subbasin over the period.

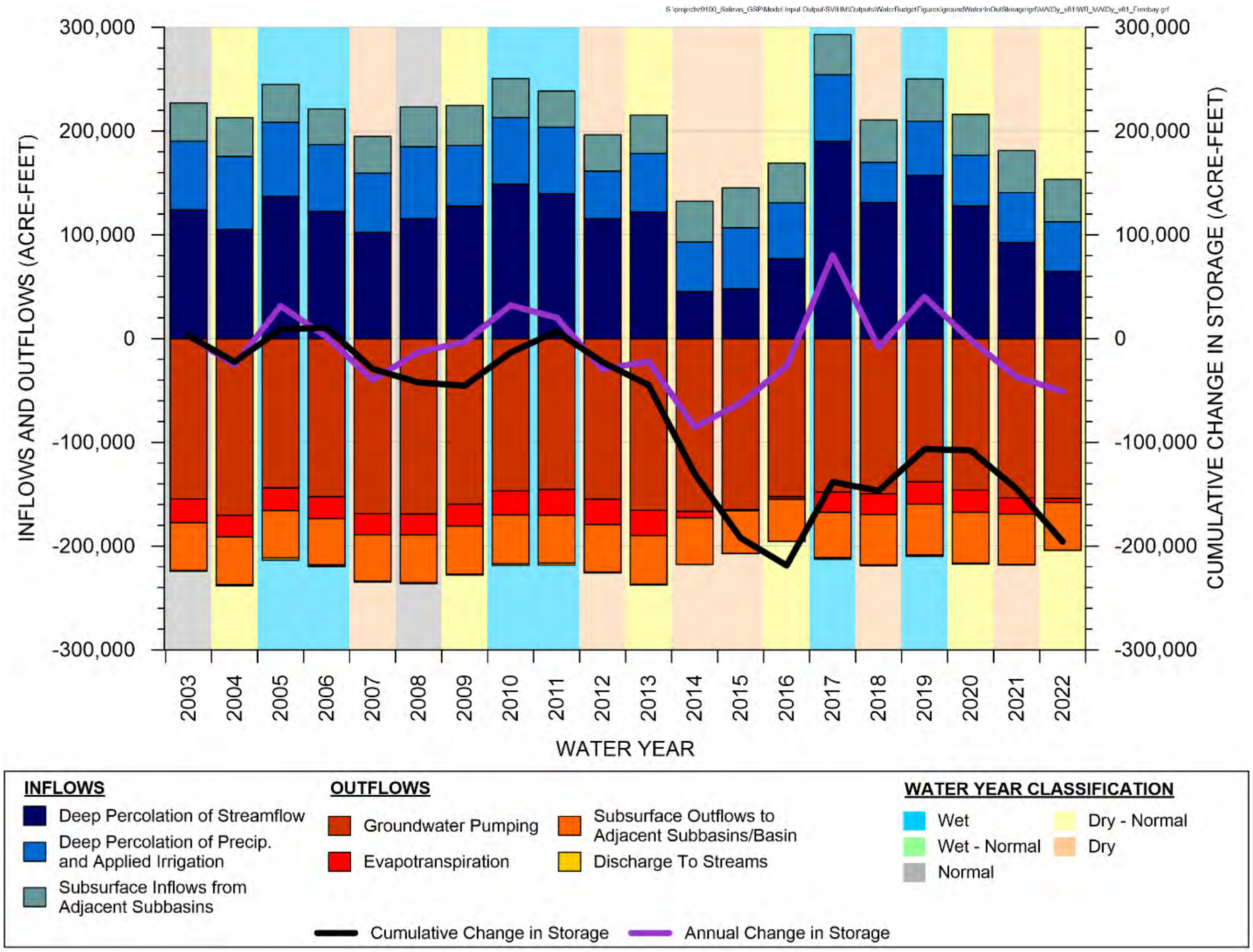

Figure 91. Annual Water Budget for the Forebay Subbasin

Figure 92 shows the annual water budget for the Langley subbasin. Groundwater storage is generally declining in this subbasin though the annual change in storage is only a loss of approximately 800 AF/yr. Deep percolation of precipitation and applied irrigation is the most variable component and is highly correlated with annual change in groundwater storage. Groundwater level calibration in the Langley Subbasin was a challenge, mainly due to limited data and groundwater flow complexities from the presence of fractured and decomposed granite.

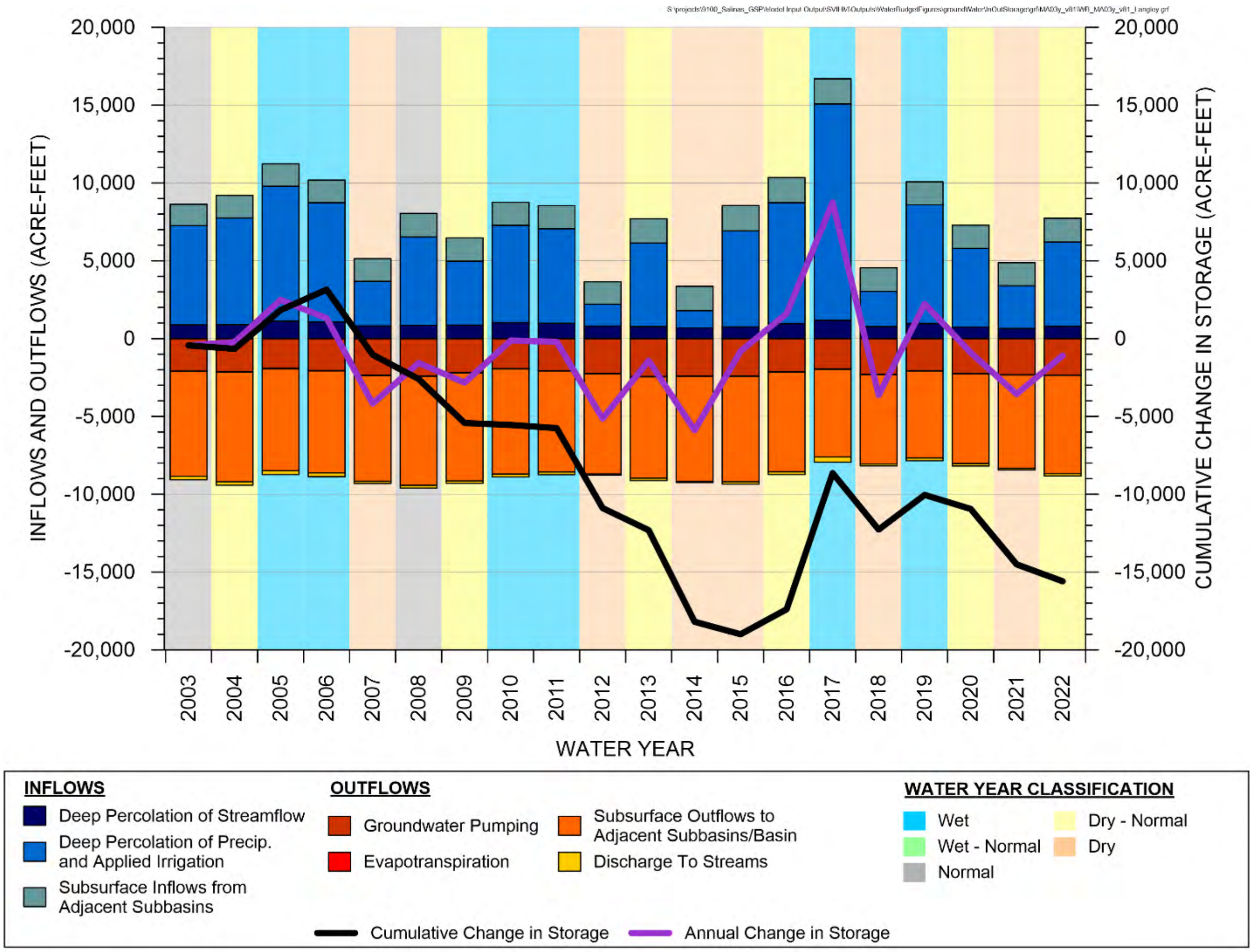

Figure 92. Annual Water Budget for the Langley Area Subbasin

Figure 93 shows annual change in groundwater storage for the Monterey subbasin. In this subbasin, groundwater pumping is primarily for municipal and industrial purposes, rather than for irrigation. As such, pumping is less correlated with climate than in the agricultural dominated subbasins. Subsurface inflows and outflows are relatively consistent in this subbasin across time. There are substantial differences between some SVIHM values in this table and other models in the groundwater basin. For example, in the Monterey Subbasin GSP (MCWD, 2022), the reported average annual outflows to the 180/400 Subbasin and storage losses are much lower than the updated SVIHM simulated outflows and storage losses. The relationship and interdependence between inter-basin inflows, outflows, and the Marina-Ord Area water balance zone water budget is an example of the need for coordinated sustainable groundwater management among all groundwater subbasins in the Salinas Valley. The SVIHM calibration within the Monterey Subbasin remains a subject for future model refinement. As such, water budget estimates for the Monterey subbasin are uncertain.

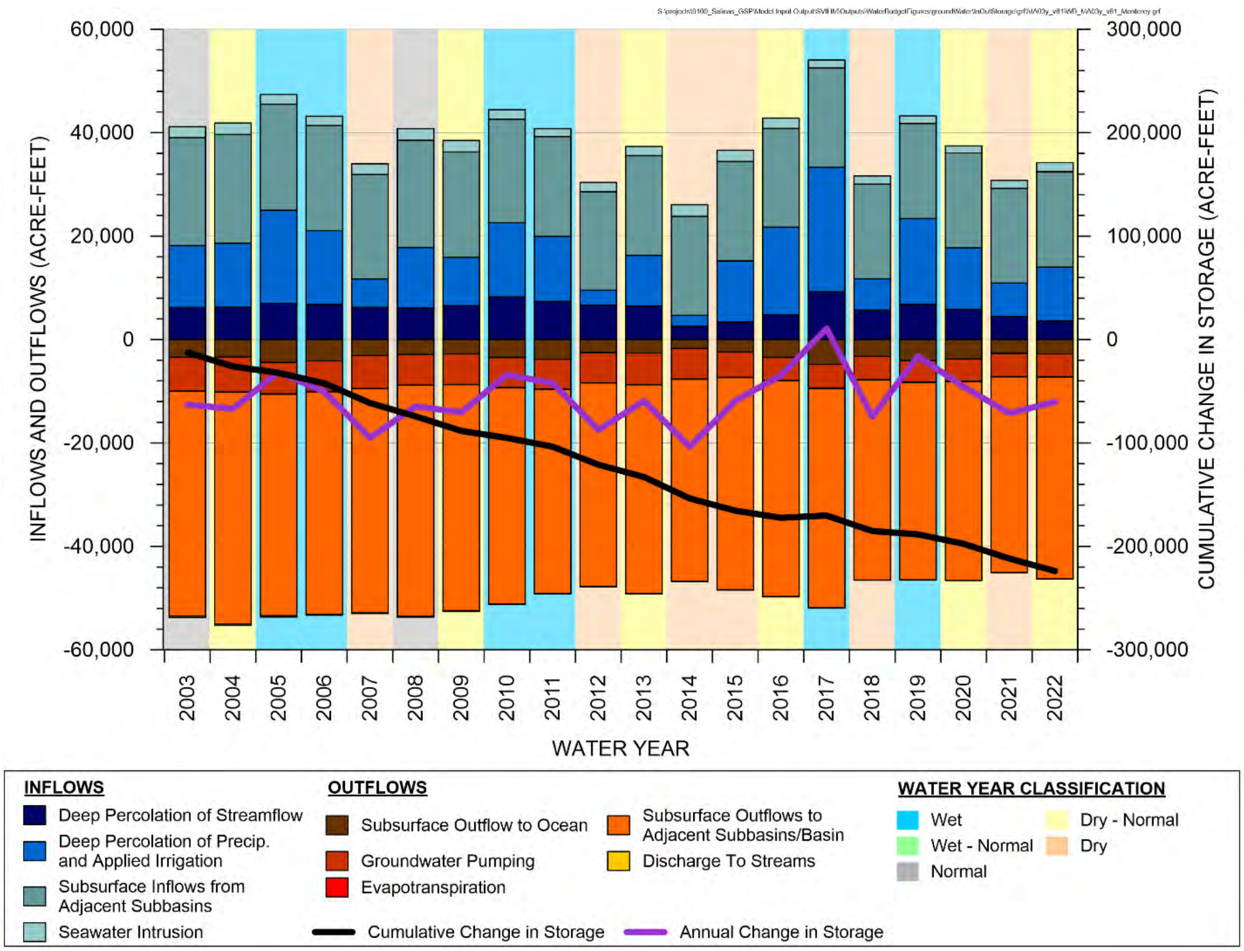

Figure 93. Annual Water Budget for the Monterey Subbasin

Figure 94 shows the annual water budget for the Seaside Subbasin. The subbasin has no simulated irrigation pumping. Groundwater storage is generally declining during the period, despite pumping generally declining. The Seaside Subbasin is still poorly calibrated. Water budget estimates for the subbasin are uncertain.

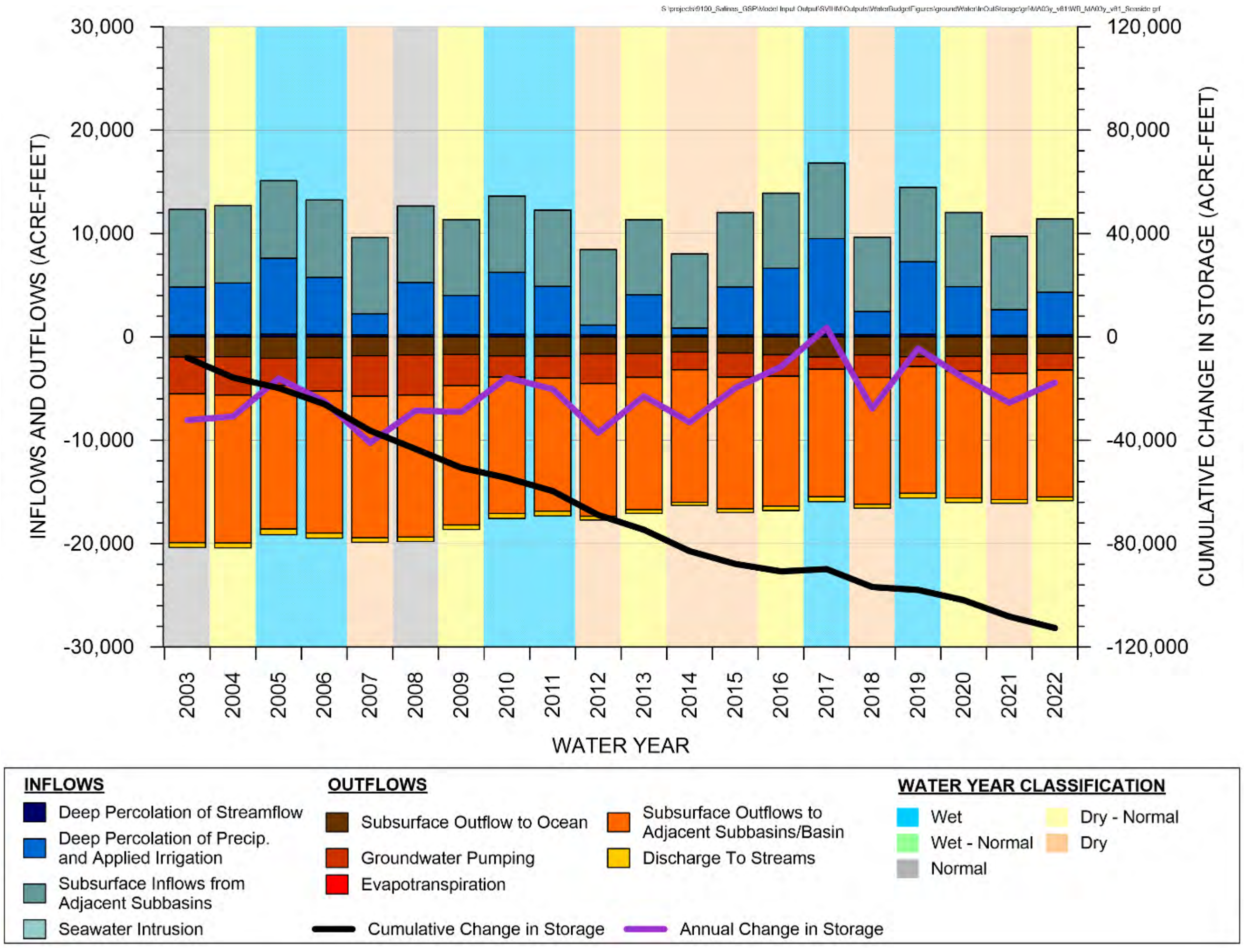

Figure 94. Annual Water Budget for the Seaside Subbasin

Figure 95 shows the annual water budget for the Upper Valley subbasin. Except for deep percolation from streams, precipitation, and irrigation, groundwater flows are generally consistent year to year. Deep percolation is highly correlated with change in groundwater storage. On average this subbasin is losing groundwater storage, though wetter years generally indicate storage gains.

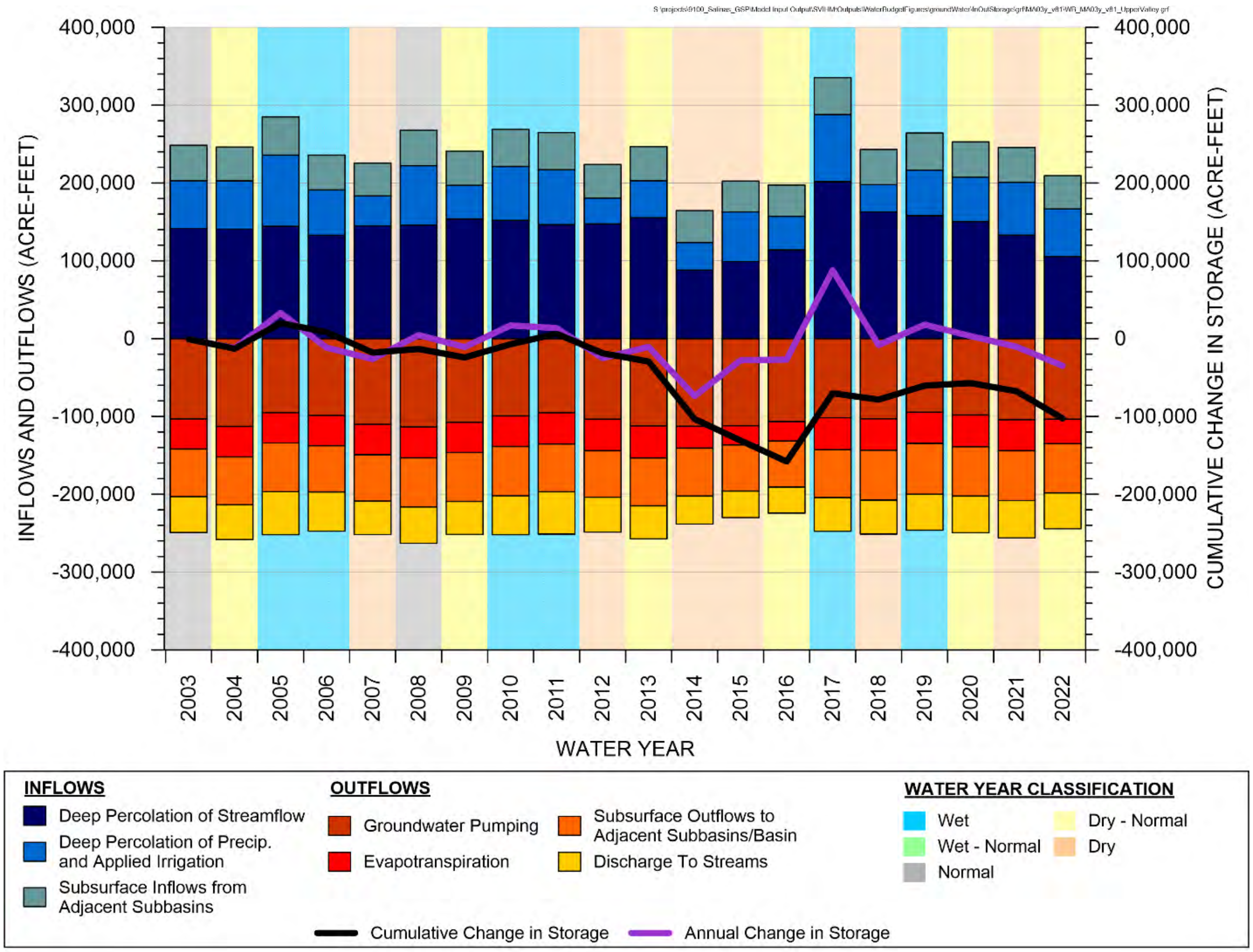

Figure 95. Annual Water Budget for the Upper Valley Subbasin

6 MODEL LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORK

6.1 Limitations

No model, regardless of its complexity, can fully replicate the intricacies of real-world systems. The model developed for this study is a mathematical approximation of real-world processes relying on input data, assumptions, and simplifications. These factors are necessary to make the problem tractable; however, they introduce a degree of uncertainty and limit the model's predictive accuracy; a summary of some limitations of this model are listed below.

- The Salinas Valley model is a regional-scale model and is not designed to represent local-scale aquifer heterogeneities or variations in pumping patterns. Distributions in crop consumptive use, irrigation pumping, and irrigation return flows are resolved at the WBS scale. The most appropriate use for the model is regional-scale evaluations of groundwater sustainability, which is the primary objective for this modeling effort. It is not appropriate to use the model for studying local-scale conditions such as impacts from specific irrigation wells.
- The model simulates irrigation pumping based on the total water demand of each WBS and distributes to wells located within the WBS. This approach does not allow for simulating the actual pumping for any given irrigation well.
- Depths and pumping distributions of irrigation wells were assigned based on the best available public well construction datasets; however, some uncertainty remains as to the actual distribution of pumping from the aquifer layers.
- There are relatively few wells with groundwater level data available for calibration of the Deep Aquifers or the Corral de Tierra Area of the Monterey Subbasin. Additional wells are being added to monitoring programs as they become available.
- The model is poorly calibrated to groundwater levels in Langley Subbasin. The presence of shallow, fractured, and decomposed granite results in a more complex groundwater system than other parts of the Salinas Valley. This subbasin presents substantial challenges for model calibration. Additional groundwater monitoring wells could help characterize local flow paths; however, simulating groundwater flows in fractured rock can be difficult with MODFLOW.
- The model appears to overestimate groundwater ET in the 180/400 Subbasin due to simulated groundwater levels intersecting crop root depths. However, tile drains in this area of the valley are designed to prevent this occurring. This may impact the simulation of the shallow sediments and possibly groundwater-surface water interactions near the coast. No information on locations and characteristics of the tile drains were available

during this study. This is an information gap in the conceptual understanding of the groundwater system.

- Although there have been recent efforts to align the representation of subsurface properties, aquifer geometry, and recharge among the SVIHM and other models that are focused in the coastal region, the calibration of the SVIHM in the Monterey Subbasin and Seaside Subbasins will be a focus for future updates.

6.2 Recommendations

The updated SVIHM is improved over the original version and provides a well-calibrated base model for developing the SVOM for simulating future conditions. The following list of recommendations aims to guide further model refinement, and data collection to improve the model's accuracy, utility, and applicability.

- The original SVIHM was released with all model layers defined as confined layers despite the Salinas Valley containing unconfined hydrogeologic units. In this update, this was addressed by using high specific storage values to mimic an unconfined aquifer's response. Future model updates should consider using convertible model layers to reflect the current understanding of the HCM. Initial testing suggests that this may result in significant run time increases and mass balance issues and was not included in this update for those reasons.
- Due to the updates made to the grid and active extent, land use and climate input parameters are offset by up to 1 model grid cell along the margins of the basin. While this has limited impact on the model since FMP aggregates irrigation demands on a WBS scale, future updates should consider remapping these input data so that there is a direct spatial link between measured data and the model.
- The updated SVIHM struggles with the groundwater elevation calibration in the Deep Aquifers. This suggests uncertainty in the conceptual understanding of the Deep Aquifers. Further investigation and data collection for the Deep Aquifers may identify different flow pathways that could improve the calibration in the model.
- Further investigation and data collection for the shallow sediments between Gonzales and Chualar may provide information on how groundwater moves after infiltrating the river channel. This would help improve model simulation of stream channel seepage losses in this reach.
- Agricultural drains could be added to the model to simulate the control of groundwater levels underlying crop fields. Drains should be applied only in agricultural areas and not across the entire model domain. Simulated drain flows and groundwater ET will improve as additional information is collected on the agricultural drains in the valley.

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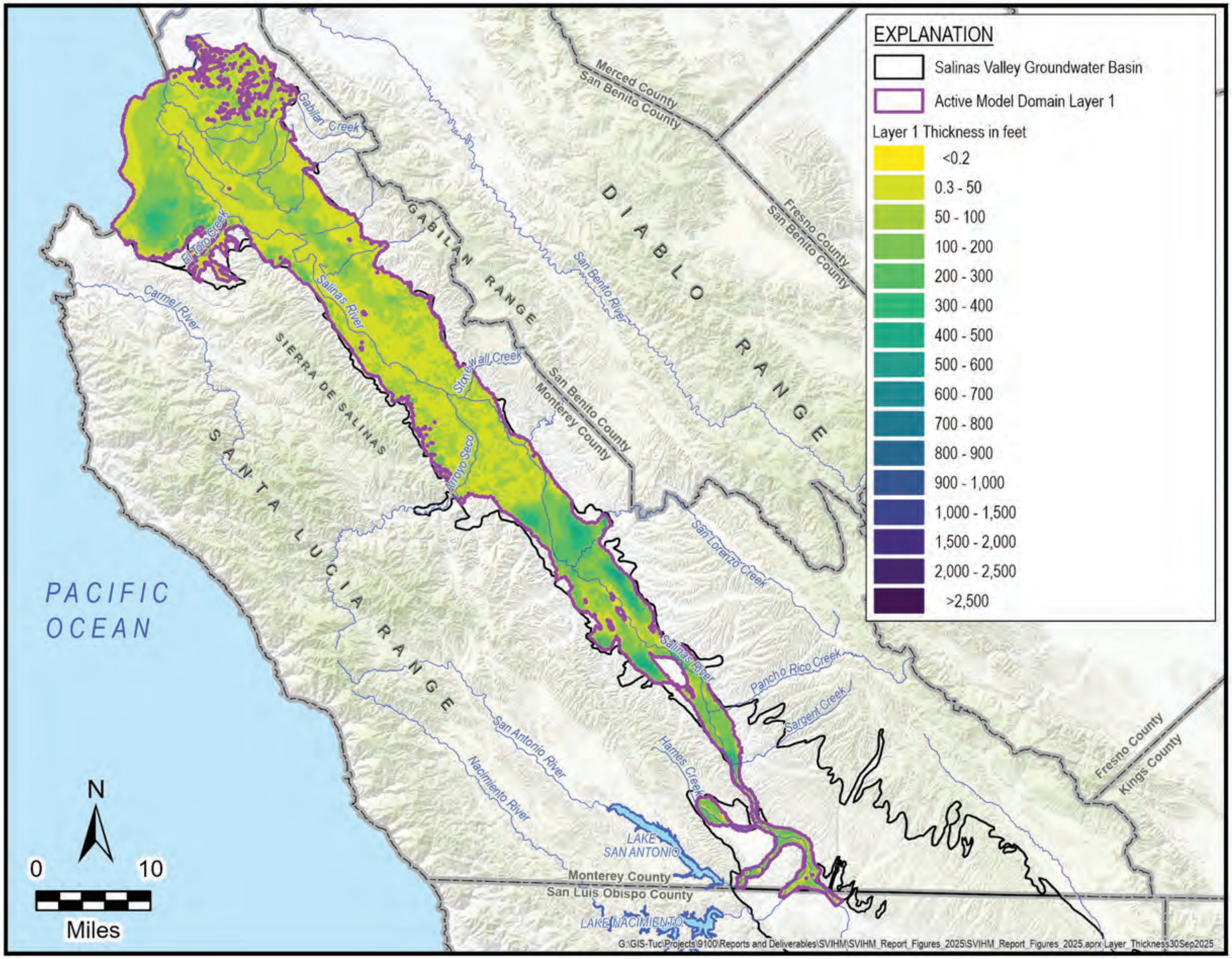
Appendix A

Simulated Model Thicknesses by Layer



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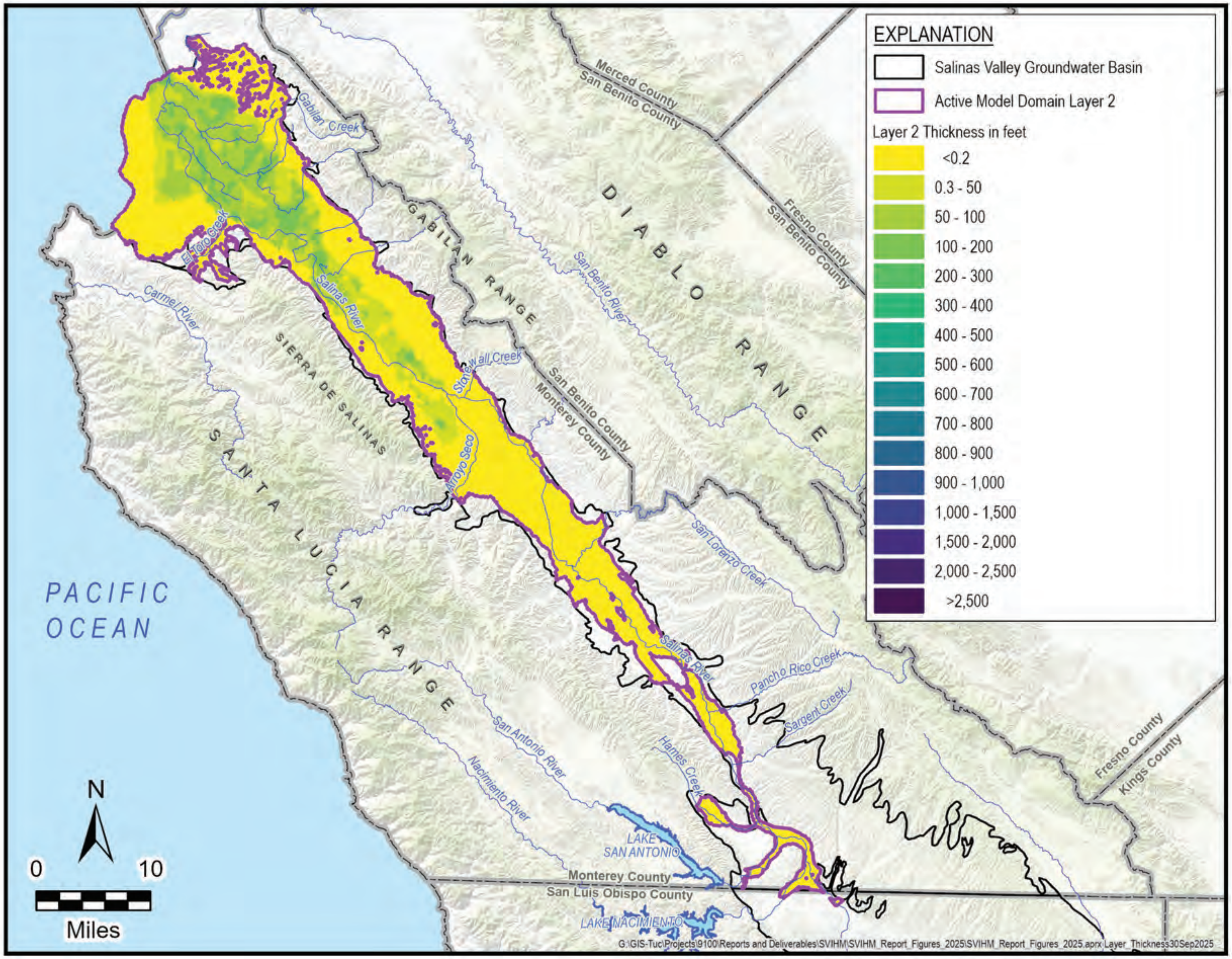

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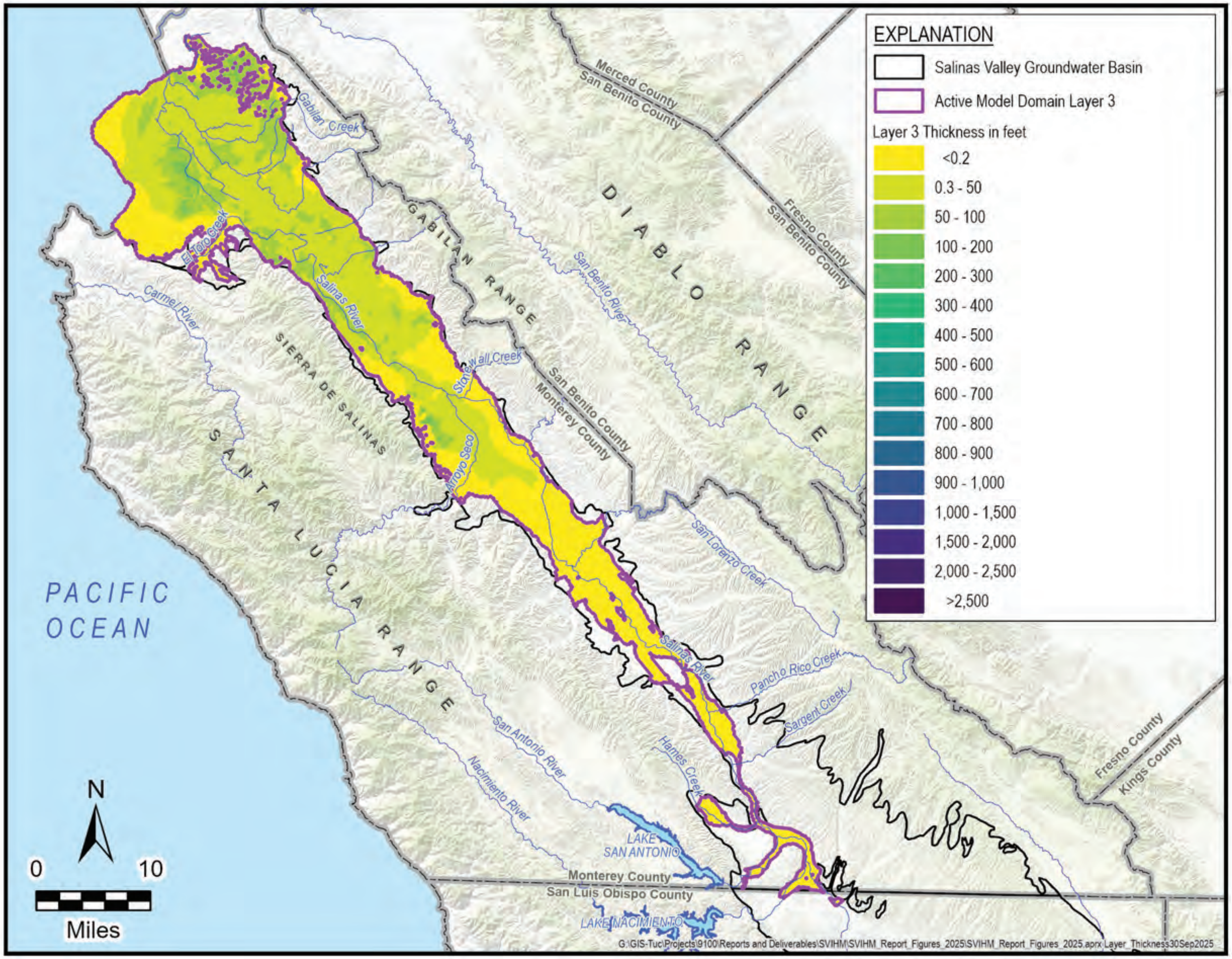

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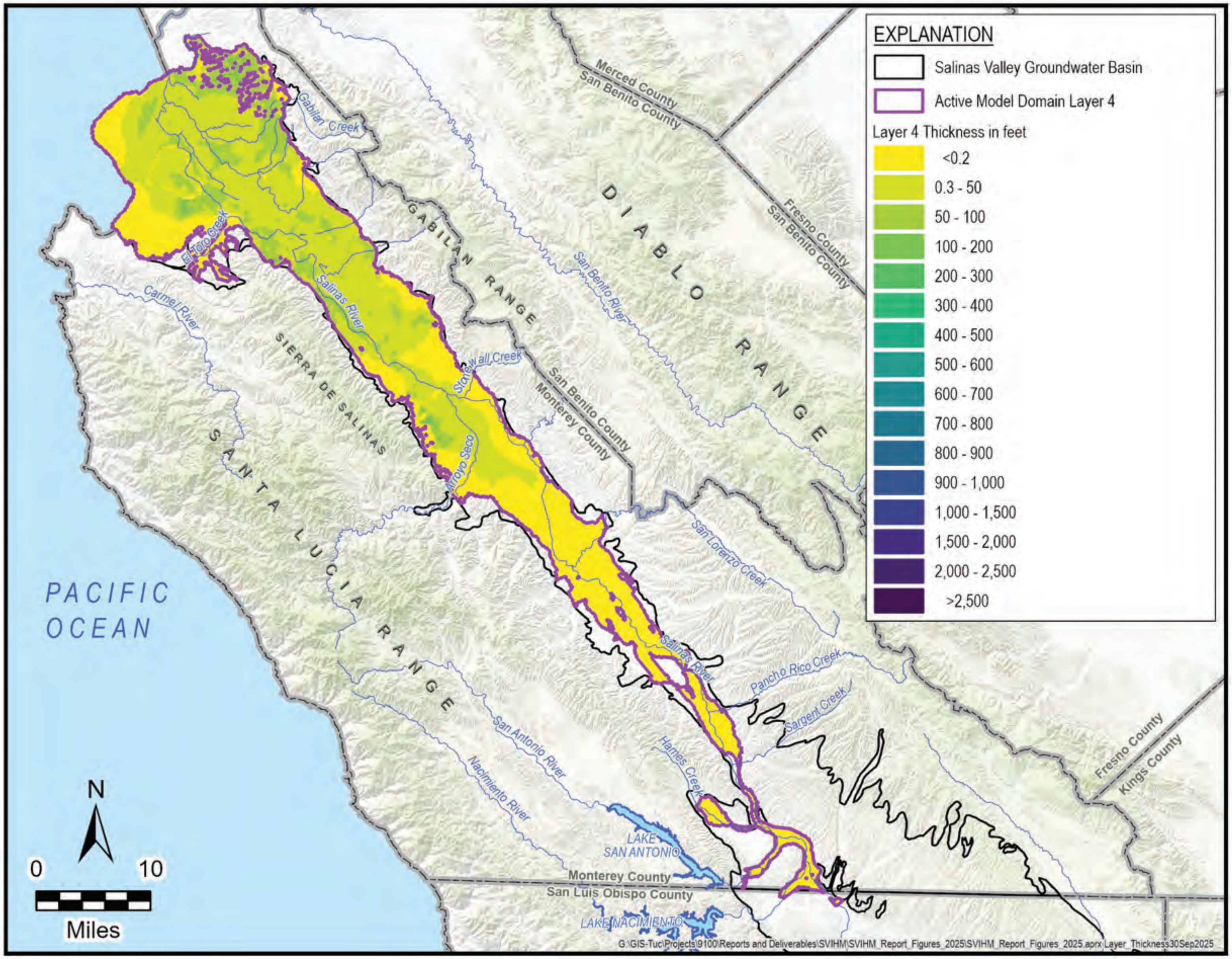

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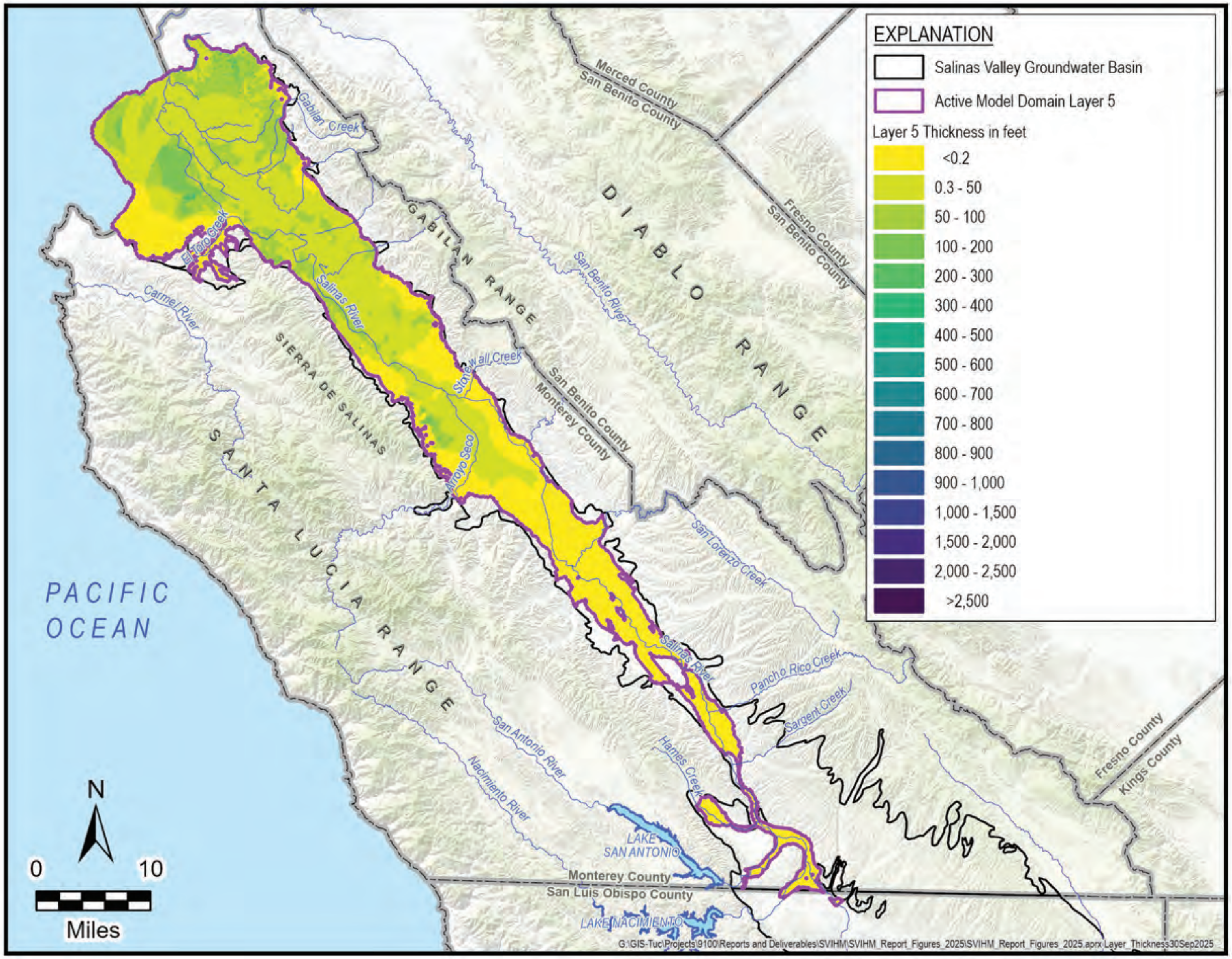

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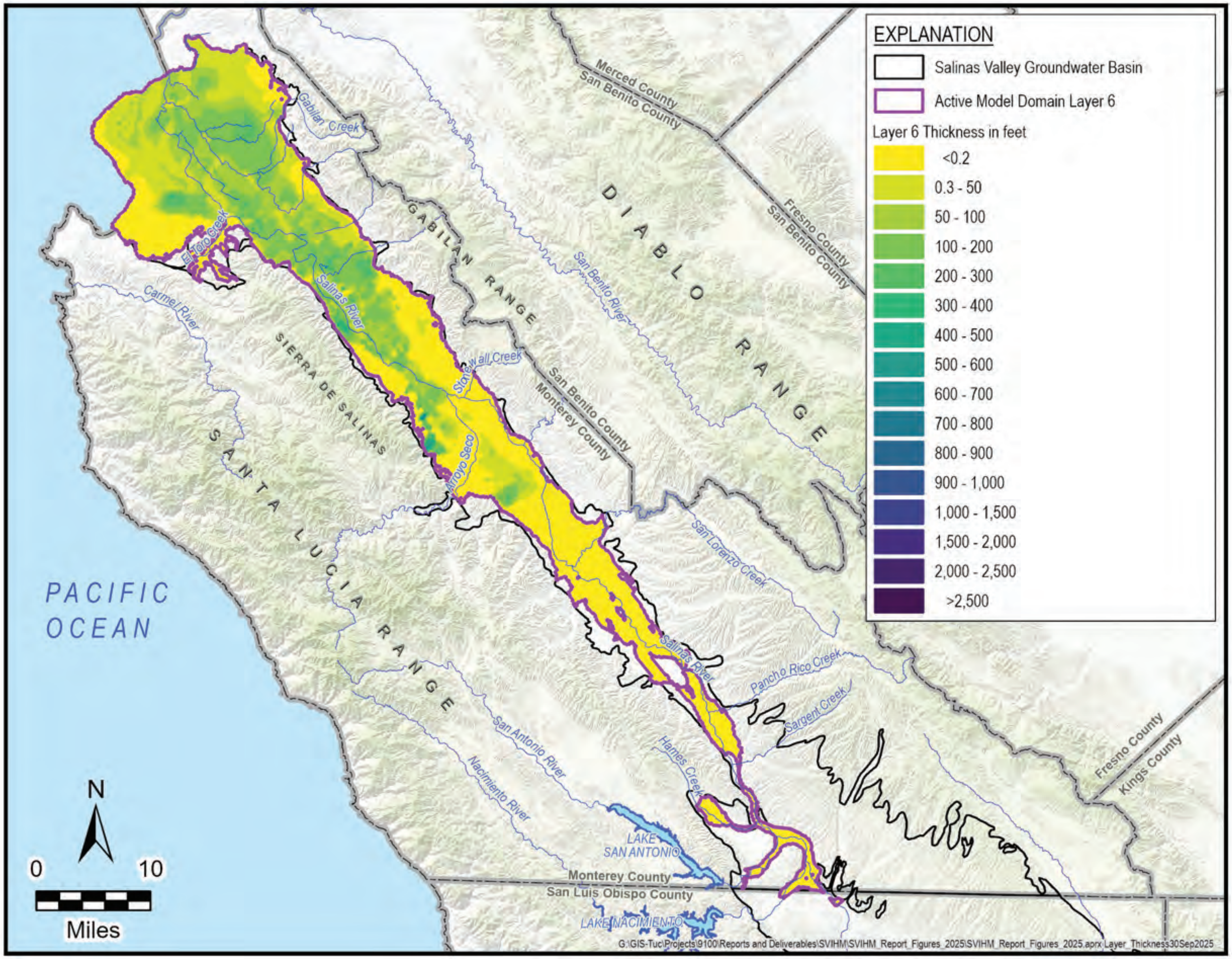

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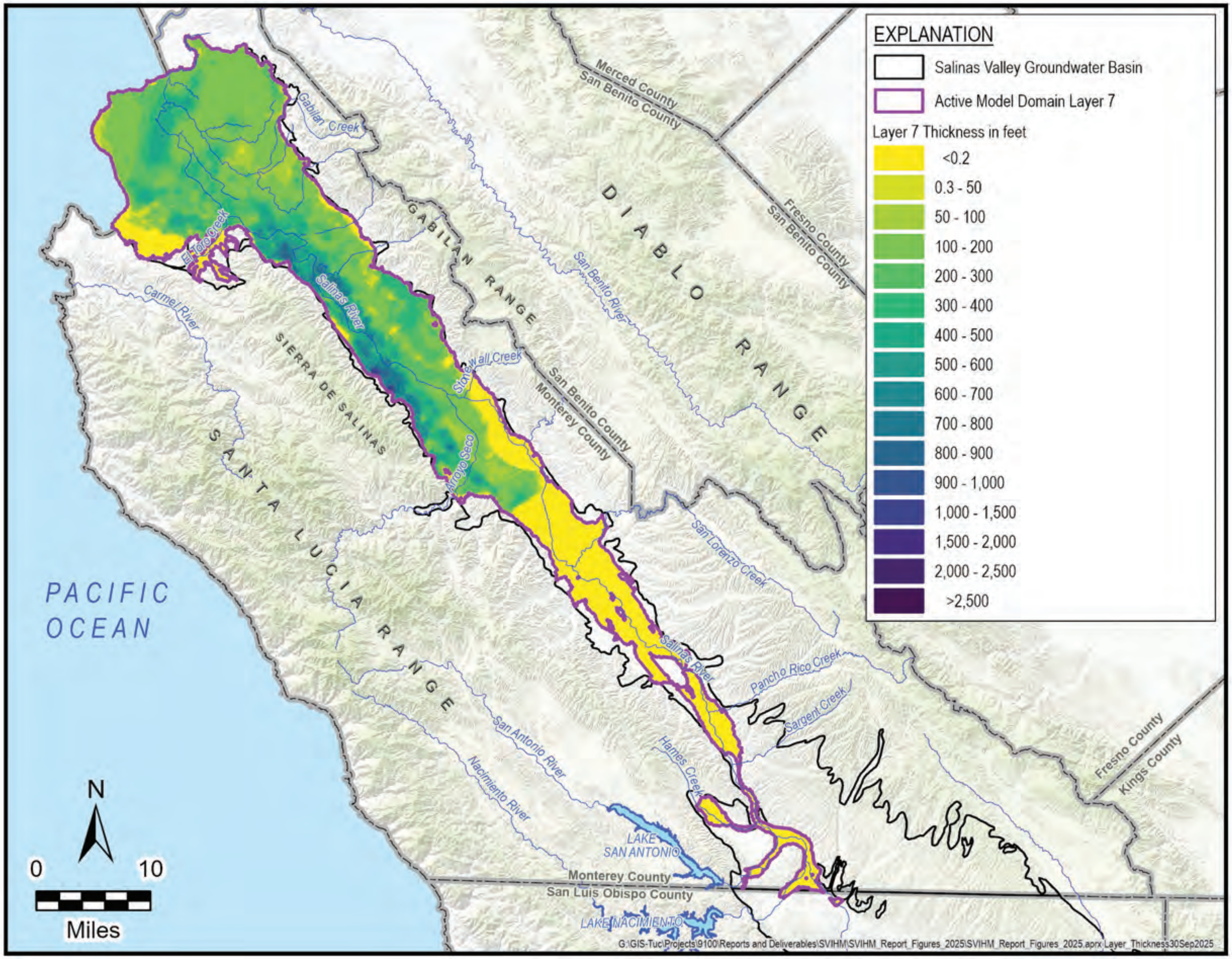

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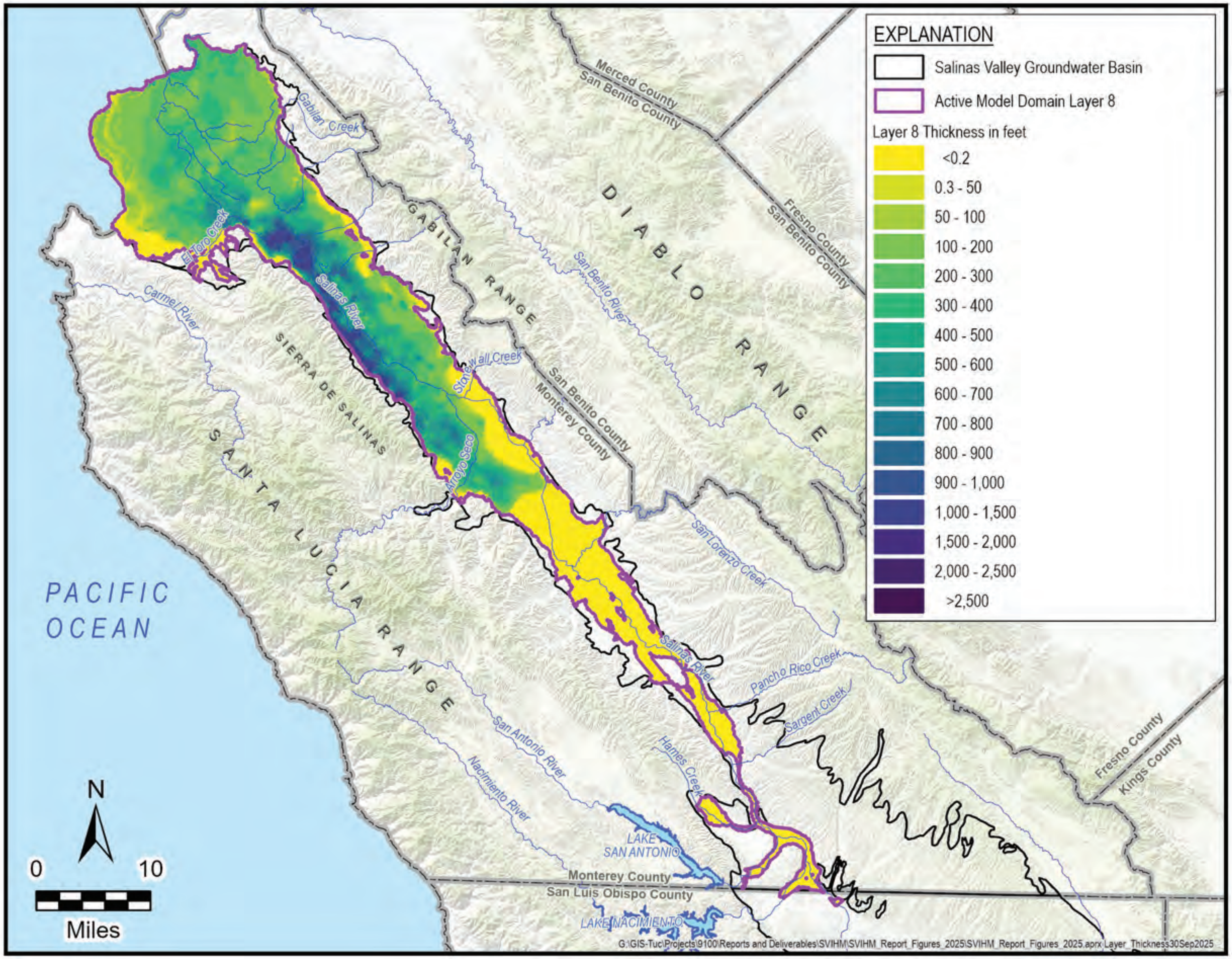

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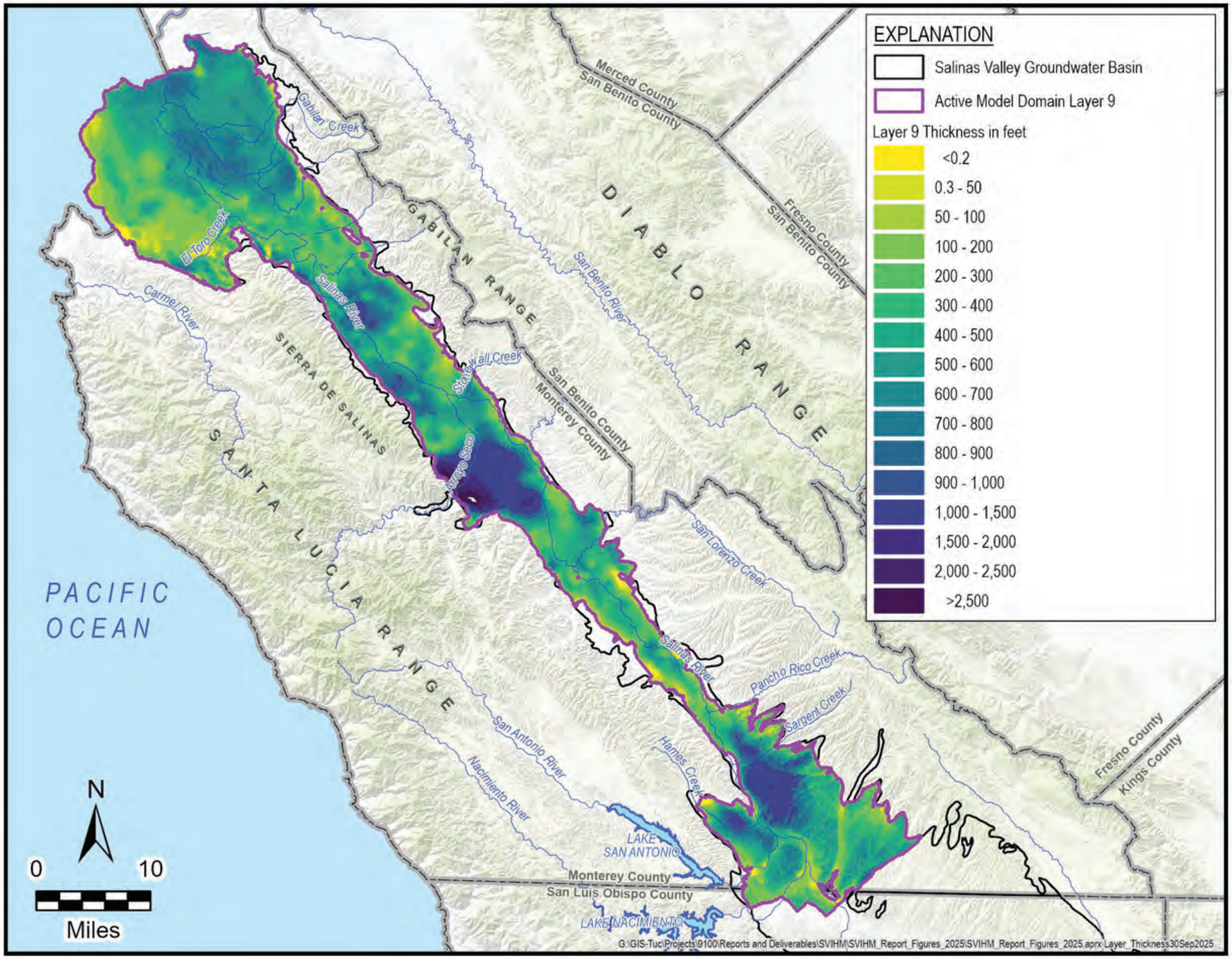

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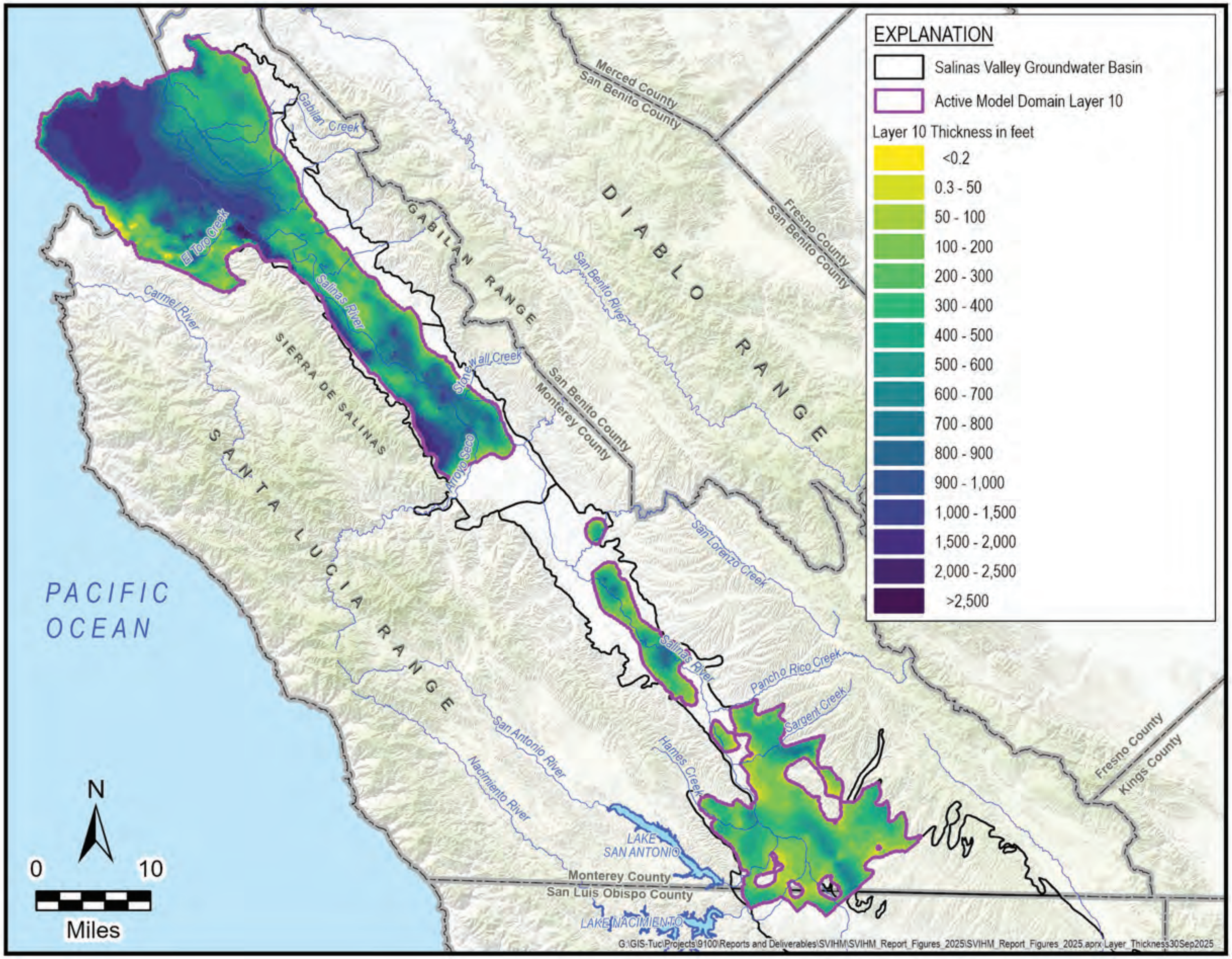

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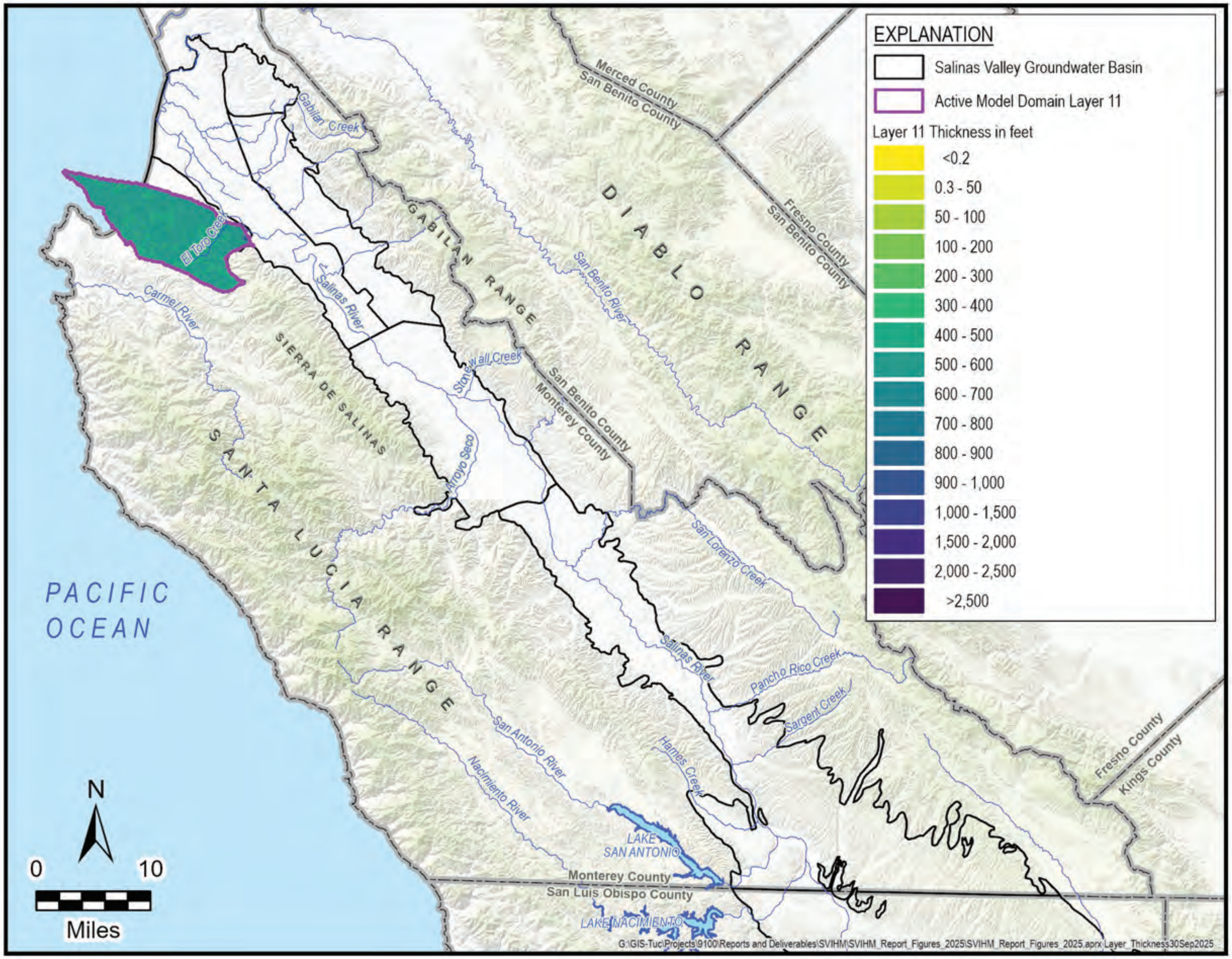

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Appendix B

Technical Memorandum

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26 September 2025

MEMORANDUM

To: Steffan Schorr, Montgomery and Associates

From: Wesley Henson, PhD (EKI Environment & Water, Inc. [EKI])
Aaron Lewis, PE, PG, EKI
Vera Nelson, PE, EKI

Subject: **Summary of Recent Updates to the Salinas Valley Integrated Hydrologic Model (SVIHM) within the Monterey Subbasin and Vicinity**
(B60094.22)

This technical memorandum (memo) provides a summary of the efforts made by EKI Environment & Water, Inc. (EKI) to improve the Salinas Valley Integrated Hydrologic Model (SVIHM) on behalf of the Marina Coast Water District (MCWD or District). This effort was completed pursuant to EKI's existing contract with MCWD in support of the ongoing *Monterey Subbasin Groundwater Sustainability Implementation Project*. The modifications performed to the SVIHM documented herein were completed in collaboration and coordination with Montgomery and Associates (M&A) staff through the consultant teams' regular regional modeling coordination and development meeting. A more detailed description of these efforts is provided below.

BACKGROUND

There are several hydrologic models within the Salinas Valley Groundwater Basin (Basin). Hydrologic models that cover the Marina Coast Water District (MCWD) service area include:

- The Seawater Intrusion Model (**SWI Model**), used to simulate seawater intrusion processes in the coastal region of the Basin.
- The historical calibrated **SVIHM**, used to evaluate historical hydrologic budgets for the entire Salinas Valley.
- The Salinas Valley Operational Model (**SVOM**), used to evaluate the integration of reservoir operations and projects within the Salinas Valley.
- The Monterey Subbasin Groundwater Flow Model (**MBGWFM**), used to evaluate groundwater budgets and Sustainable Groundwater Management Act (SGMA) compliance scenarios within the Monterey Subbasin as part of the 2022 Monterey Groundwater Sustainability Plan (GSP).

Each of these models were developed by different entities for a specific purpose and reflect unique design features and functionalities. However, the models at least partially overlap regionally (including within the MCWD service area) and temporally, and thus should be aligned to the greatest extent possible in terms of their underlying hydrogeologic framework, aquifer properties, and hydrologic and aquifer stress assumptions (e.g., recharge and pumping rates) so that they can reasonably and consistently reflect the best available data and information within MCWD and vicinity and can continue to serve as useful tools for coordinated, regional SGMA planning and implementation actions within greater Salinas Valley Basin.

DESCRIPTION OF SVIHM UPDATES

MCWD has previously invested considerable resources into refining estimates of aerial recharge within its service area and surrounding Dune Sand surficial soils complex ("Dune Sands") in both the MBGWFM and SWI Model. Under the current effort, EKI evaluated and updated the SVIHM to improve its consistency in estimating aerial recharge rates with analogous outputs from the SWI Model and MBGWFM. This was achieved by making the following specific updates to the Farm Process (FMP) package of the SVIHM:

- Three new water balance subregions (WBS, fig. 1) were added to the FMP in the Monterey Subbasin to represent: (1) the Armstrong Ranch agricultural area within the extent of the Dune Sands (WBS 37); (2) MCWD's service area within the City of Marina urban footprint (WBS 38) and undeveloped (i.e. native) areas within the extent of the Dune Sands (WBS 39).
- Two additional WBS were added to the FMP in the Seaside Subbasin to represent the City of Seaside urban footprint (WBS 40) and the surrounding undeveloped (native) areas within the Seaside Subbasin (WBS 41) to enable future refinement of FMP properties within the Seaside Subbasin, per request of the Seaside Watermaster.
- A new "Marina urban" land use category (land use code 60) was specified for urban lands within the City of Marina (WBS 38) that reflect the additional recharge potential owing to the City's ongoing stormwater capture and re-infiltration program.
- Land use categories were modified for each of the updated WBS based upon majority coverage area within each model cell, using the new "Marina urban" land use category (code 60) within the City of Marina (WBS 38) and the "beach/dunes" (code 55) category for native lands within the Dune Sands area (WBS 39).
- The "Precipitation availability coefficient" is a model parameter in the SVIHM/SVOM that limits the amount of precipitation that can be used to meet landscape water demands. This parameter assumes that the unused precipitation is routed as runoff only. This physically makes sense for many surfaces; however, observed runoff events within the Dune Sands are extremely rare owing to its exceptionally high infiltration potential, as documented extensively in previous reports prepared by MCWD and the City of Marina. Therefore, precipitation availability coefficients were updated within WBS 37, 38, and 39 to reflect the increased recharge potential within the urban, agricultural and native areas of the Dune Sands. For the months of October through April, the precipitation availability coefficient was set to 0.85 in the Dune Sands and was set at 0.6 for the rest of the active model domain consistent with the original published version of the SVIHM.
- Other mechanical properties of the FMP packages, such as agricultural well and streamflow routing linkages, were updated to be compatible with and appropriately attributed to the five new WBS incorporated into the model.

Figure 1 illustrates the five updated WBS within the revised version of SVIHM (SVIHM - EKI 2025). **Figure 2** presents a graph comparing annual recharge rate estimates from the original SVIHM (SVIHM – Published; Henson and others, 2025), SVIHM - EKI 2025, and the SWI Models for all farms encompassing the Dune Sands and greater Monterey Subbasin (i.e., WBS 7, 37, 38 and 39).

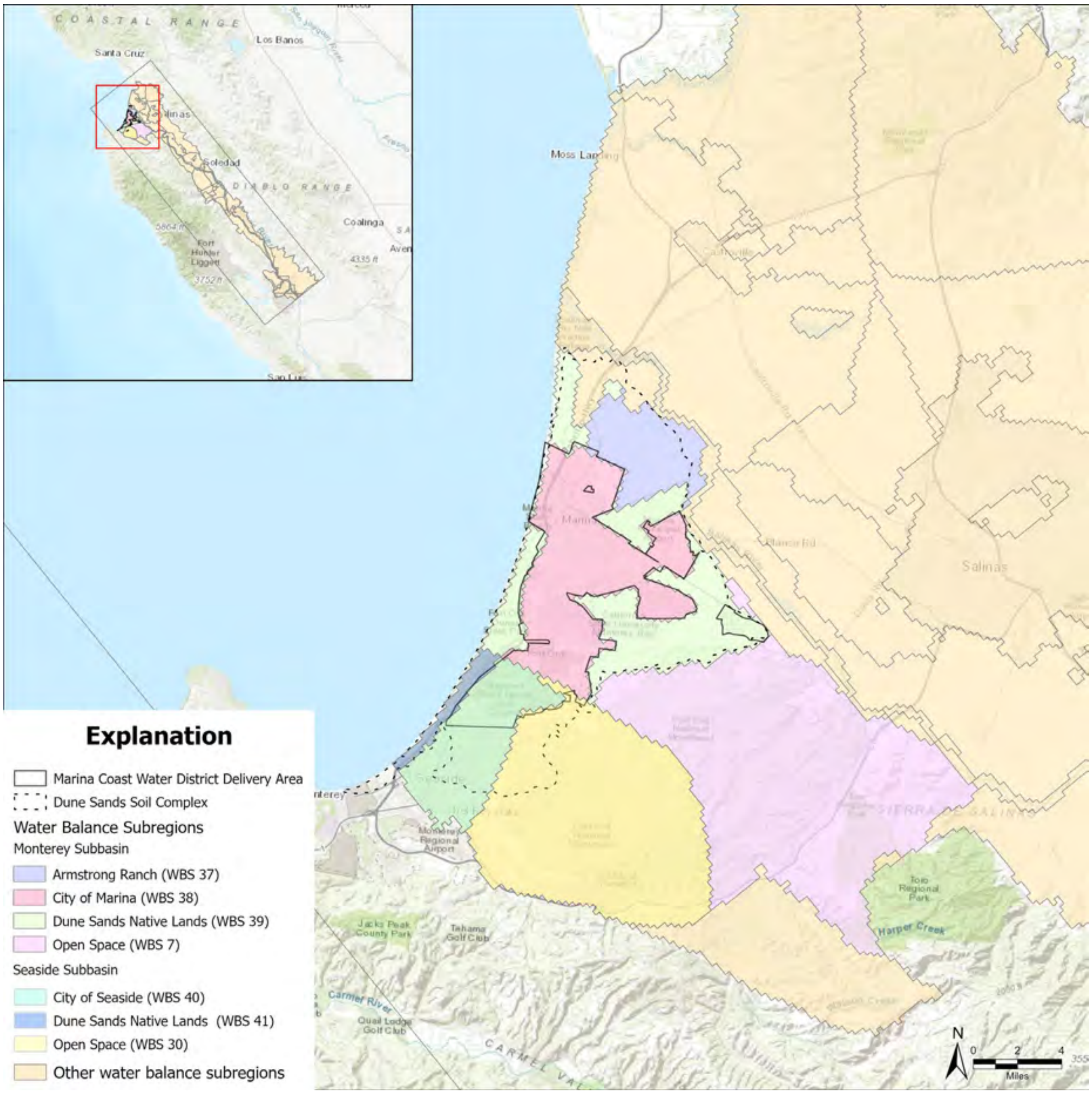

Figure 1: Updated water balance subregions in the Salinas Valley Integrated Hydrologic Model

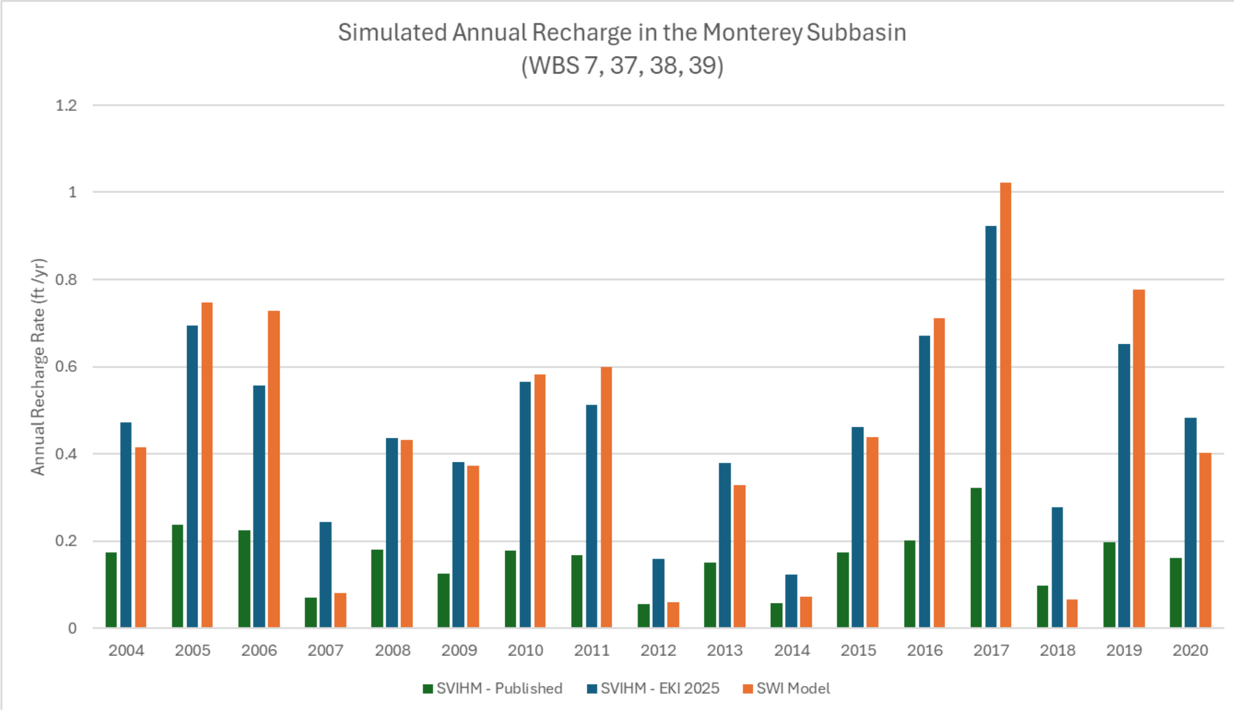

Figure 2: Comparison of annual recharge rates within the Dune Sands and greater Monterey Subbasin (WBS 7, 37, 28, 39).

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Appendix C

Simulated Crop Coefficients

Table C-1. Crop Coefficients

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Celery Coastal	0.76	0.60	0.71	0.78	0.75	0.83	1.18	1.18	1.16	1.15	0.78	0.77
Celery Inland	0.79	0.64	0.66	0.69	0.68	0.76	1.18	1.18	1.16	1.15	0.65	0.81
Cucumber Melons Squash Coastal	0.55	0.48	0.47	0.60	0.95	0.90	0.86	0.87	0.84	0.48	0.36	0.54
Cucumber Melons Squash Inland	0.55	0.50	0.49	0.58	0.97	0.90	0.86	0.87	0.84	0.51	0.36	0.54
Legumes Coastal	0.57	0.50	0.48	0.57	0.62	0.78	0.86	0.87	0.76	0.58	0.45	0.56
Legumes Inland	0.60	0.55	0.54	0.54	0.59	0.74	0.86	0.87	0.72	0.55	0.38	0.57
Lettuce Coastal	0.77	0.67	0.70	0.80	1.05	1.15	1.32	1.31	1.18	0.90	0.63	0.77
Lettuce Inland	0.98	0.84	1.05	1.24	1.20	1.09	1.20	1.33	1.43	1.43	1.02	1.03
Rotational 30-Day Coastal	0.93	0.74	0.84	0.88	0.98	0.91	0.87	0.87	0.85	0.92	0.96	0.96
Rotational 30-Day Inland	0.92	0.77	0.84	0.92	1.06	0.98	0.94	0.95	0.92	0.69	0.63	0.84
Crucifers Cabbages Coastal	0.79	0.70	0.77	0.85	1.03	1.11	1.25	1.22	1.16	0.95	0.69	0.79
Crucifers Cabbages Inland	0.81	0.69	0.87	0.98	0.92	1.04	1.08	1.19	1.39	1.35	0.95	0.98
Unspecified Irrigated Row Crops Coastal	0.77	0.67	0.73	0.73	0.84	0.90	1.03	0.98	0.93	0.78	0.65	0.77
Unspecified Irrigated Row Crops Inland	0.57	0.49	0.53	0.57	0.54	0.48	0.46	0.49	0.55	0.53	0.41	0.50
Carrots Coastal	0.61	0.57	0.68	0.98	0.94	0.87	0.86	0.87	0.85	0.80	0.84	0.61
Carrots Inland	0.66	0.62	0.68	0.73	0.74	0.76	0.86	0.87	0.85	0.61	0.63	0.65
Onions Garlic Coastal	0.72	0.57	0.62	0.55	0.84	0.83	0.84	0.93	0.91	0.77	0.75	0.71
Onions Garlic Inland	0.74	0.70	0.56	0.68	0.84	0.83	0.84	0.93	0.91	0.69	0.58	0.73
Root Vegetables Coastal	0.79	0.59	0.55	0.93	1.48	1.69	1.08	1.02	0.97	1.19	0.46	0.78
Root Vegetables Inland	0.57	0.44	0.44	0.73	1.10	1.07	0.52	0.51	0.57	0.87	0.41	0.50
Tomato Peppers Coastal	0.79	0.59	0.55	0.60	1.23	1.56	1.00	0.98	0.81	1.11	0.61	0.78
Tomato Peppers Inland	0.60	0.46	0.44	0.65	0.82	0.84	0.41	0.49	0.45	0.81	0.58	0.52
Strawberries Coastal	0.43	0.42	0.44	0.56	0.76	0.83	0.97	0.88	0.73	0.51	0.36	0.41
Strawberries Inland	1.26	1.38	1.29	1.43	2.15	1.65	1.93	1.76	2.07	0.67	0.72	0.87
Corn Coastal	0.46	0.36	0.34	0.73	1.06	0.99	0.94	0.95	0.93	0.90	0.30	0.45
Corn Inland	0.48	0.37	0.34	0.76	1.18	1.13	1.07	1.08	1.05	0.94	0.31	0.47
Field Crops Coastal	1.54	1.21	1.17	0.71	0.60	0.45	0.43	0.43	0.34	0.34	0.66	1.21
Field Crops Inland	1.54	1.21	1.17	0.67	0.56	0.36	0.34	0.35	0.34	0.34	0.63	1.15
Grain Crops Coastal	0.83	1.19	1.15	0.84	0.58	0.36	0.34	0.35	0.34	0.34	0.35	0.52
Grain Crops Inland	0.78	1.19	1.15	0.83	0.58	0.36	0.34	0.35	0.34	0.34	0.35	0.52
Cane Bush Berries Coastal	0.53	0.52	0.48	0.90	0.97	0.90	0.86	0.87	0.85	0.84	0.88	1.35

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cane Bush Berries Inland	0.53	0.54	0.50	0.94	0.97	0.90	0.86	0.87	0.85	0.84	0.88	1.41
Deciduous Fruits and Nuts Coastal	0.47	0.37	0.36	0.48	0.73	0.78	0.79	0.83	0.76	0.66	0.42	0.46
Deciduous Fruits and Nuts Inland	0.47	0.37	0.37	0.60	0.92	0.86	0.82	0.83	0.81	0.83	0.49	0.46
Citrus And Subtropical Coastal	0.53	0.42	0.41	0.48	0.77	0.73	0.70	0.70	0.69	0.61	0.47	0.52
Citrus And Subtropical Inland	0.63	0.54	0.53	0.52	0.50	0.73	0.70	0.70	0.69	0.50	0.45	0.67
Vineyards Coastal	0.77	0.69	0.77	0.79	0.83	0.82	0.92	0.90	0.82	0.80	0.71	0.71
Vineyards Inland	0.49	0.44	0.47	0.51	0.54	0.55	0.59	0.58	0.56	0.50	0.38	0.47
Nurseries Outdoor Coastal	0.53	0.46	0.52	0.62	0.90	1.12	1.06	1.07	0.85	0.75	0.51	0.60
Nurseries Outdoor Inland	0.53	0.47	0.55	0.65	0.95	1.12	1.06	1.07	0.67	0.59	0.50	0.62
Nurseries Indoor	1.66	1.31	1.27	1.26	1.20	1.12	1.07	1.08	1.05	1.05	1.09	1.64
Artichokes	0.85	0.71	0.98	0.97	0.92	0.86	0.82	0.83	0.81	0.81	0.60	0.90
Pasture	0.63	0.63	0.79	0.79	0.74	0.48	0.38	0.38	0.56	0.74	0.63	0.63
Lettuce Coastal 2	0.80	0.61	0.65	0.64	0.83	0.92	0.79	0.79	0.71	0.72	0.58	0.71
Semiagricultural	0.52	0.52	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.52	0.52
Idle Fallow	0.35	0.35	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.35	0.35
Crucifers Cabbages Coastal	0.63	0.67	0.81	0.66	0.79	0.86	0.97	0.94	0.90	0.90	0.67	0.63
Golf Course Turf / Parks	0.78	0.78	0.98	0.98	1.10	1.10	1.10	1.10	0.98	0.98	0.78	0.78
Urban	0.38	0.38	0.64	0.64	0.64	0.64	0.75	0.75	0.56	0.48	0.38	0.38
Quarries	0.29	0.29	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.29	0.29
Water	0.88	0.88	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.88	0.88
Riparian	1.00	1.00	1.25	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.00	1.00
Upland Grasslands/Shrub Lands 1	1.14	1.14	1.42	1.15	1.03	0.66	0.53	0.53	0.78	1.03	1.05	1.05
Woodlands	0.88	0.88	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.88	0.88
Beach Dunes	0.29	0.29	0.37	0.37	0.25	0.25	0.25	0.25	0.37	0.37	0.29	0.29
Barren Burned	0.29	0.29	0.37	0.37	0.25	0.25	0.25	0.25	0.37	0.37	0.29	0.29
Upland Grasslands/Shrub Lands 2	1.14	1.14	1.42	1.15	1.03	0.66	0.53	0.53	0.78	1.03	1.05	1.05
Upland Grasslands/Shrub Lands 3	1.14	1.14	1.42	1.15	1.03	0.66	0.53	0.53	0.78	1.03	1.05	1.05
Upland Grasslands/Shrub Lands 4	1.14	1.14	1.42	1.15	1.03	0.66	0.53	0.53	0.78	1.03	1.05	1.05
City of Marina Urban	0.38	0.38	0.64	0.64	0.64	0.64	0.75	0.75	0.56	0.48	0.38	0.38

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Appendix D

Simulated Irrigation Efficiencies by Irrigation Type

Appendix D. Updated SVIHM Irrigation Efficiencies by Irrigation Type

Sprinkler 1 Irrigation Efficiencies

	WBS																	
Range	2	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	37	38
Oct 1967 - Oct 1983	0.529	0.529	0.529	0.529	0.663	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
Nov 1983 - Sep 1985	0.709	0.709	0.709	0.709	0.889	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
Oct 1985 - Apr 2000	0.709	0.709	0.709	0.709	0.889	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
May 2000 - Dec 2000	0.684	0.709	0.709	0.684	0.889	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
Jan 2001 - Apr 2001	0.684	0.709	0.709	0.684	0.889	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
May 2001 - Dec 2001	0.684	0.709	0.709	0.684	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
Jan 2002 - Apr 2005	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.709	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684
May 2005 - Dec 2005	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.709	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684
Jan 2006 - Dec 2011	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.709	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684
Jan 2012 - Apr 2012	0.684	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.778	0.724	0.724	0.724	0.684	0.724	0.724	0.724	0.724
May 2012 - Dec 2012	0.684	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.796	0.724	0.724	0.724	0.684	0.724	0.724	0.724	0.724
Jan 2013 - Aug 2017	0.684	0.724	0.724	0.724	0.748	0.724	0.724	0.724	0.724	0.796	0.724	0.724	0.724	0.684	0.724	0.724	0.724	0.724
Sep 2017 - Apr 2018	0.724	0.796	0.796	0.724	0.843	0.796	0.750	0.796	0.796	0.796	0.796	0.796	0.796	0.719	0.796	0.796	0.796	0.796
May 2018 - Sep 2022	0.724	0.796	0.796	0.724	0.821	0.796	0.750	0.796	0.796	0.796	0.796	0.796	0.796	0.724	0.796	0.796	0.796	0.796

Sprinkler 2 Irrigation Efficiencies

	WBS																	
Range	2	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	37	38
Oct 1967 - Oct 1983	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
Nov 1983 - Sep 1985	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
Oct 1985 - Apr 2000	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
May 2000 - Dec 2000	0.684	0.709	0.709	0.684	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
Jan 2001 - Apr 2001	0.684	0.709	0.709	0.684	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
May 2001 - Dec 2001	0.684	0.709	0.709	0.684	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709	0.709
Jan 2002 - Apr 2005	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.709	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684
May 2005 - Dec 2005	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.709	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684
Jan 2006 - Apr 2006	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.709	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684
May 2006 - Apr 2012	0.684	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.778	0.724	0.724	0.724	0.684	0.724	0.724	0.724	0.724
May 2012 - Dec 2012	0.684	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.796	0.724	0.724	0.724	0.684	0.724	0.724	0.724	0.724
Jan 2013 - Aug 2017	0.684	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.796	0.724	0.724	0.724	0.684	0.724	0.724	0.724	0.724
Sep 2017 - Apr 2018	0.724	0.796	0.796	0.724	0.796	0.796	0.750	0.796	0.796	0.796	0.796	0.796	0.796	0.719	0.796	0.796	0.796	0.796
May 2018 - Sep 2022	0.724	0.796	0.796	0.724	0.796	0.796	0.750	0.796	0.796	0.796	0.796	0.796	0.796	0.724	0.796	0.796	0.796	0.796

Appendix D. Updated SVIHM Irrigation Efficiencies by Irrigation Type

Drip 1 Irrigation Efficiencies

	WBS																	
Range	2	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	37	38
Oct 1967 - Oct 1983	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618
Nov 1983 - Sep 1985	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772
Oct 1985 - Apr 2000	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772
May 2000 - Dec 2000	0.746	0.772	0.772	0.746	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772
Jan 2001 - Apr 2001	0.746	0.772	0.772	0.746	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772
May 2001 - Dec 2001	0.746	0.772	0.772	0.746	0.969	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772
Jan 2002 - Apr 2005	0.746	0.746	0.746	0.746	0.969	0.746	0.746	0.746	0.746	0.772	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746
May 2005 - Dec 2005	0.746	0.746	0.746	0.746	0.969	0.746	0.746	0.746	0.746	0.772	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746
Jan 2006 - Apr 2006	0.746	0.746	0.746	0.746	0.969	0.746	0.746	0.746	0.746	0.772	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746
May 2006 - Apr 2012	0.746	0.790	0.790	0.790	0.969	0.790	0.790	0.790	0.790	0.849	0.790	0.790	0.790	0.746	0.790	0.790	0.790	0.790
May 2012 - Dec 2012	0.746	0.790	0.790	0.790	0.969	0.790	0.790	0.790	0.790	0.868	0.790	0.790	0.790	0.746	0.790	0.790	0.790	0.790
Jan 2013 - Aug 2017	0.746	0.790	0.790	0.790	0.943	0.790	0.790	0.790	0.790	0.868	0.790	0.790	0.790	0.746	0.790	0.790	0.790	0.790
Sep 2017 - Apr 2018	0.790	0.868	0.868	0.790	0.919	0.868	0.825	0.868	0.868	0.868	0.868	0.868	0.868	0.785	0.868	0.868	0.868	0.868
May 2018 - Sep 2022	0.790	0.868	0.868	0.790	0.941	0.868	0.825	0.868	0.868	0.868	0.868	0.868	0.868	0.790	0.868	0.868	0.868	0.868

Drip 2 Irrigation Efficiencies

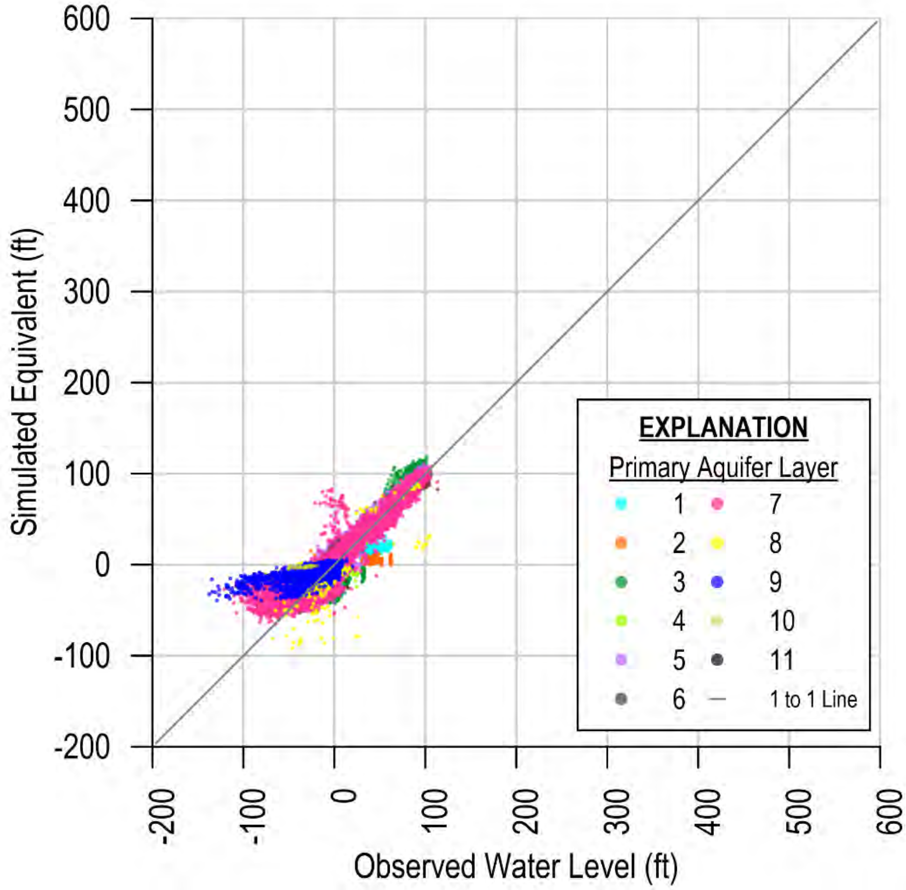
	WBS																	
Range	2	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	37	38
Oct 1967 - Oct 1983	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618	0.618
Nov 1983 - Sep 1985	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772
Oct 1985 - Apr 2000	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.768	0.772	0.772	0.772	0.772
May 2000 - Dec 2000	0.749	0.772	0.772	0.746	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.604	0.772	0.772	0.772	0.772
Jan 2001 - Apr 2001	0.746	0.772	0.772	0.746	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.604	0.772	0.772	0.772	0.772
May 2001 - Dec 2001	0.746	0.772	0.772	0.746	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.772	0.604	0.772	0.772	0.772	0.772
Jan 2002 - Apr 2005	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.772	0.746	0.746	0.746	0.604	0.746	0.746	0.746	0.746
May 2005 - Dec 2005	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.772	0.746	0.746	0.746	0.604	0.746	0.746	0.746	0.746
Jan 2006 - Apr 2006	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.746	0.772	0.746	0.746	0.746	0.604	0.746	0.746	0.746	0.746
May 2006 - Apr 2012	0.746	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.849	0.790	0.790	0.790	0.604	0.790	0.790	0.790	0.790
May 2012 - Dec 2012	0.746	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.868	0.790	0.790	0.790	0.604	0.790	0.790	0.790	0.790
Jan 2013 - Aug 2017	0.746	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.868	0.790	0.790	0.790	0.604	0.790	0.790	0.790	0.790
Sep 2017 - Apr 2018	0.790	0.868	0.868	0.790	0.868	0.868	0.825	0.868	0.868	0.868	0.868	0.868	0.868	0.604	0.868	0.868	0.868	0.868
May 2018 - Sep 2022	0.790	0.868	0.868	0.790	0.868	0.868	0.825	0.868	0.868	0.868	0.868	0.868	0.868	0.604	0.868	0.868	0.868	0.868

Notes:
WBS = Water Balance Subregion

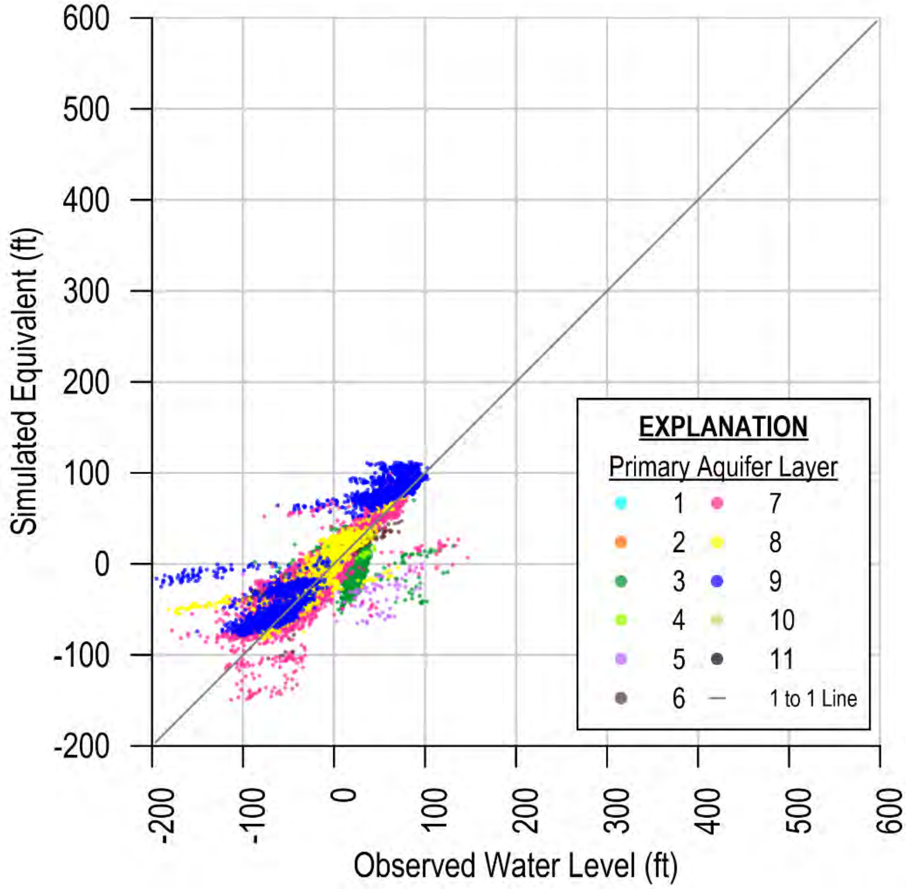
Appendix E

1:1 Groundwater Elevation Plots by Subbasin

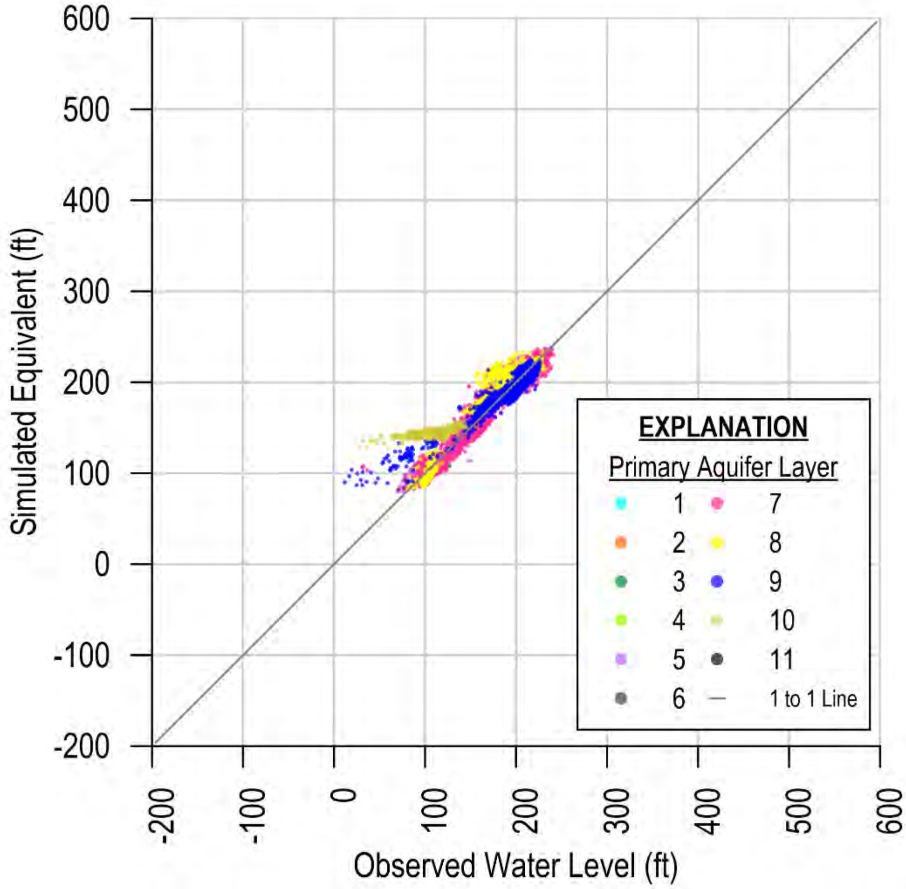
180/400 Subbasin



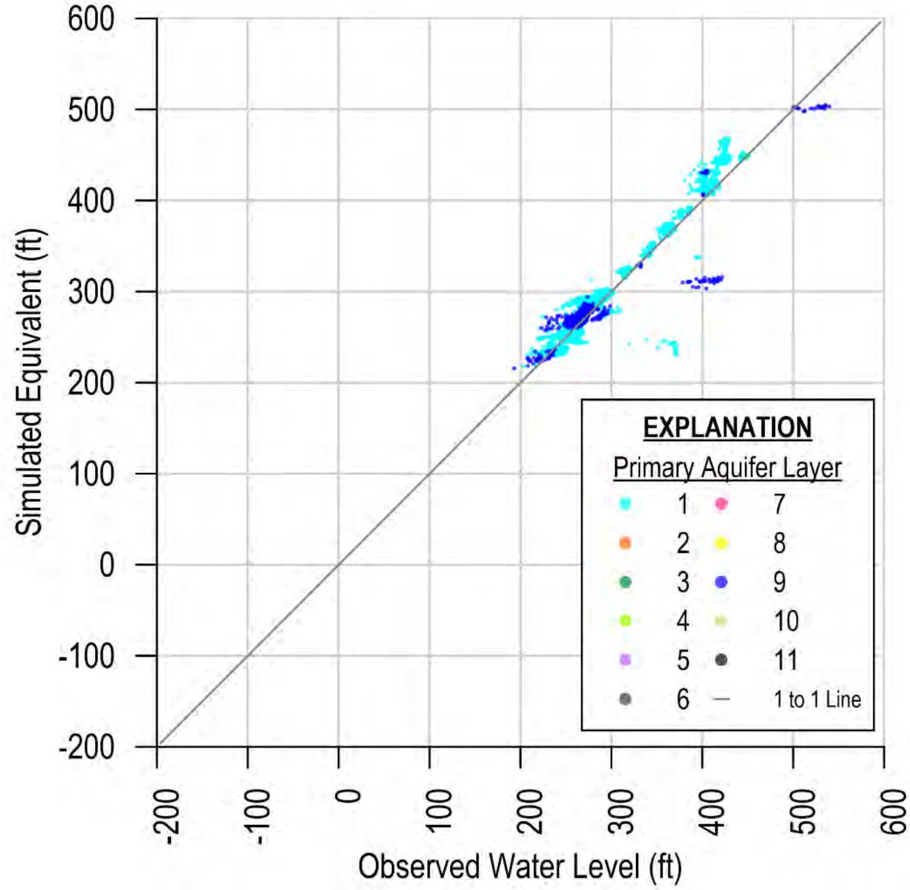
Eastside Subbasin



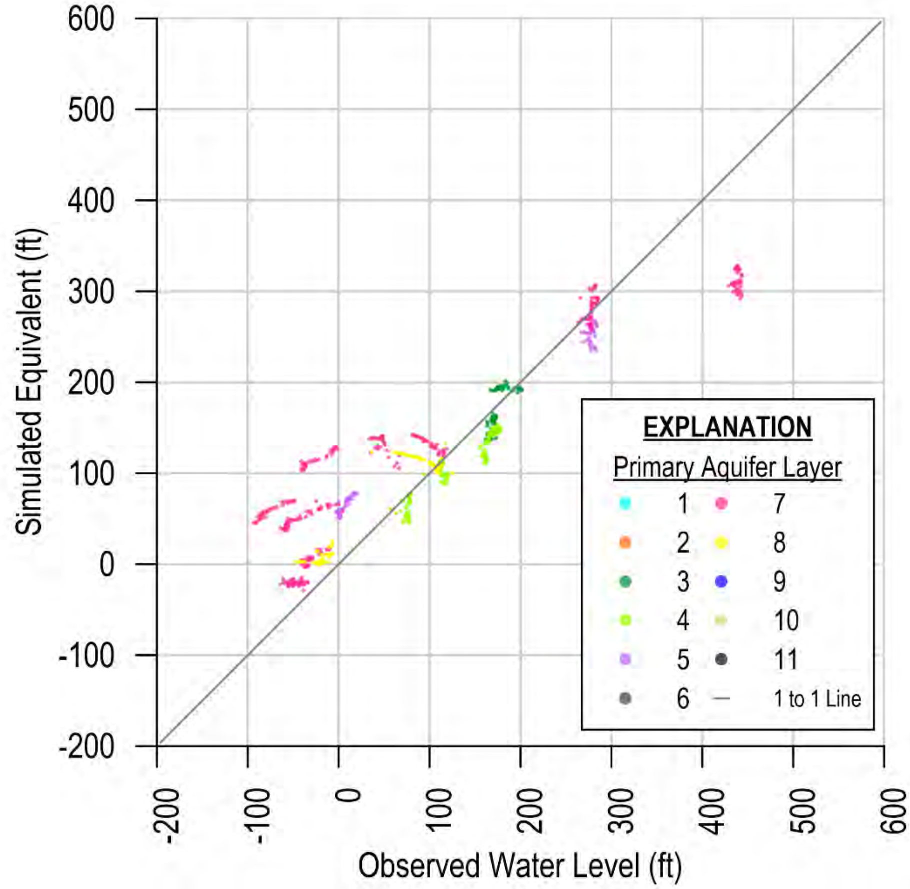
Forebay Subbasin



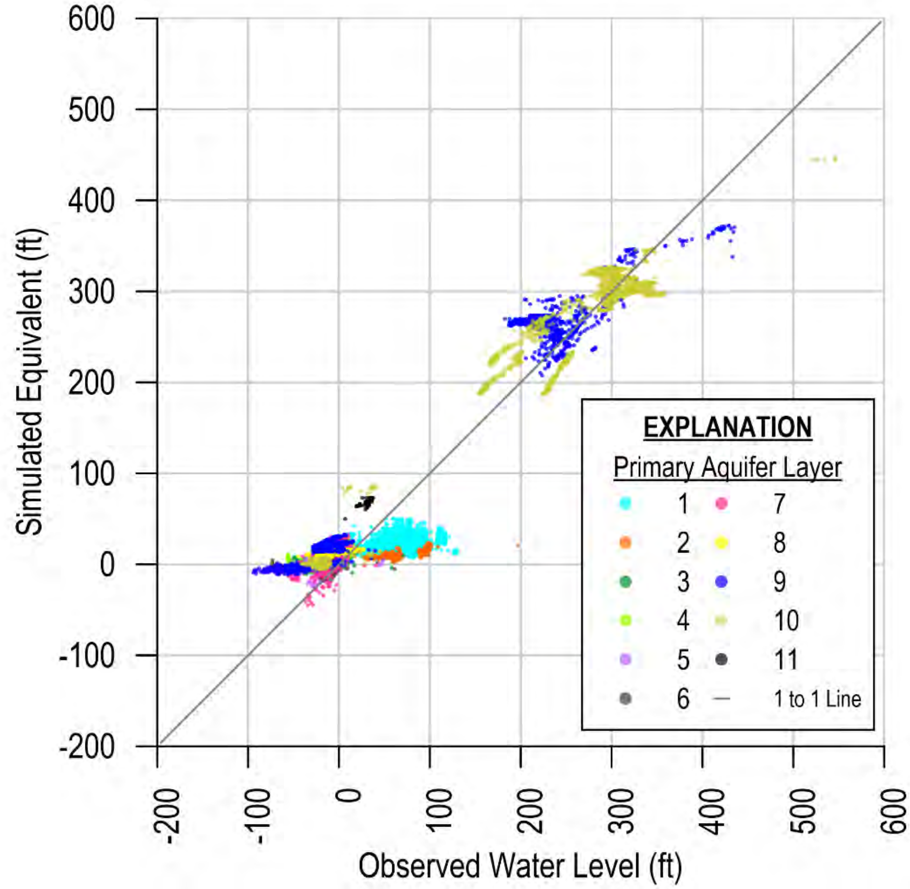
Upper Valley Subbasin



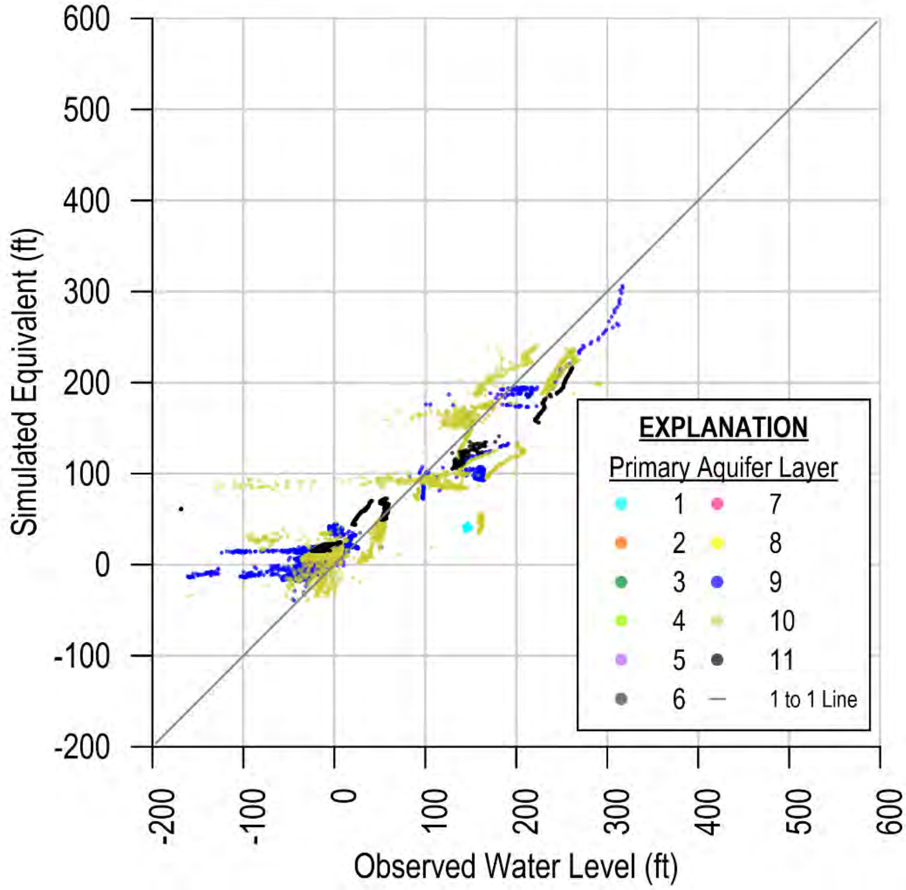
Langley Subbasin



Monterey Subbasin



Seaside Subbasin



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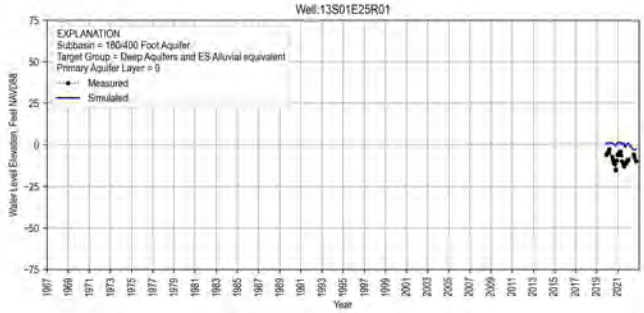
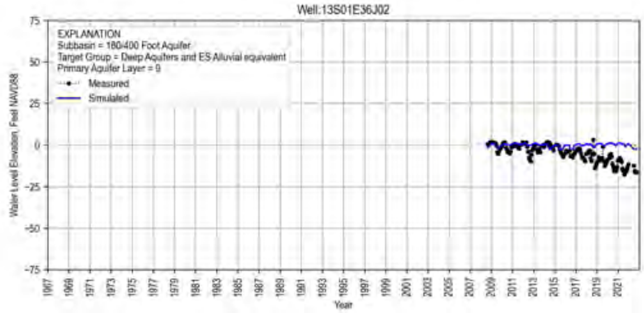
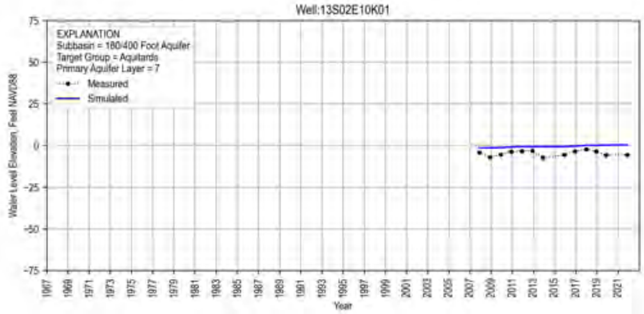
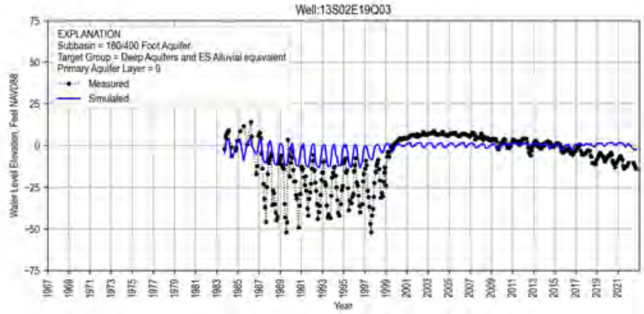
Appendix F

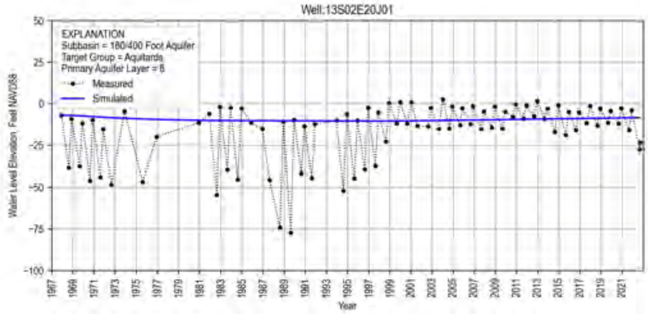
Comparison of Observed and Simulated Groundwater Levels for RMS Wells

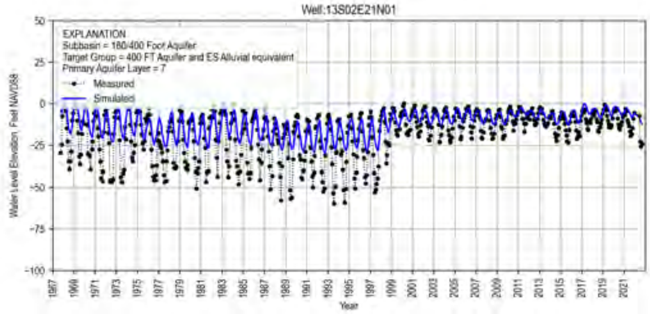


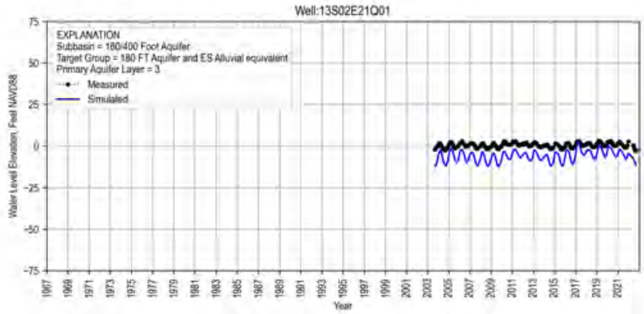


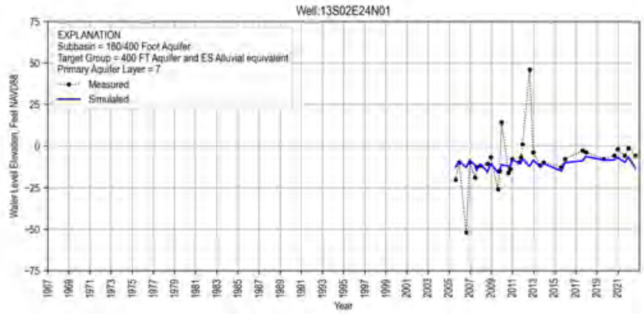


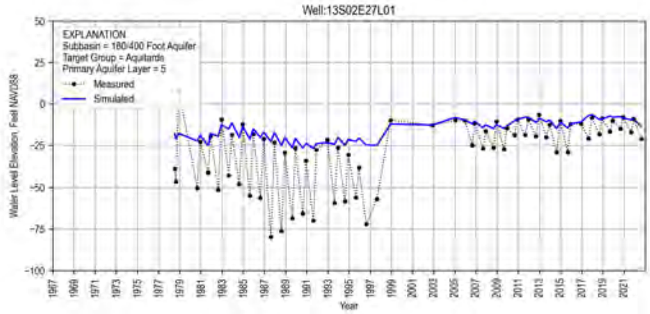












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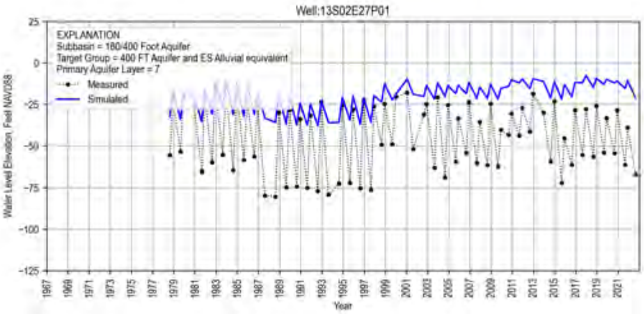
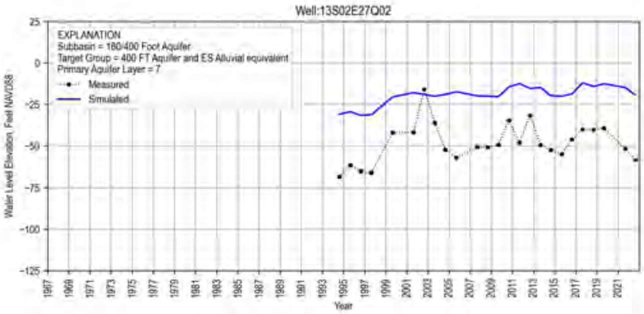
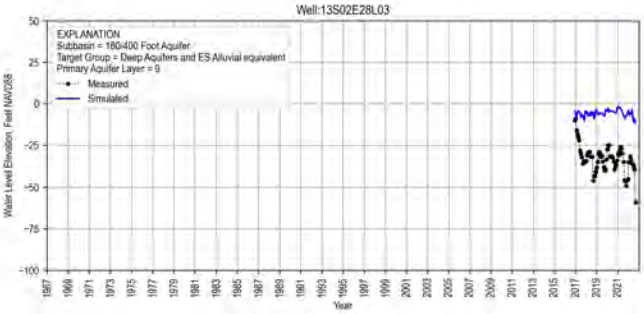
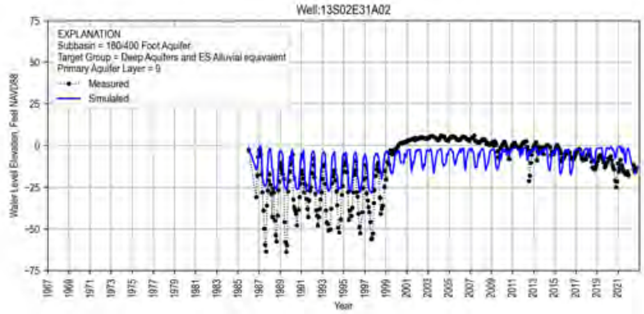
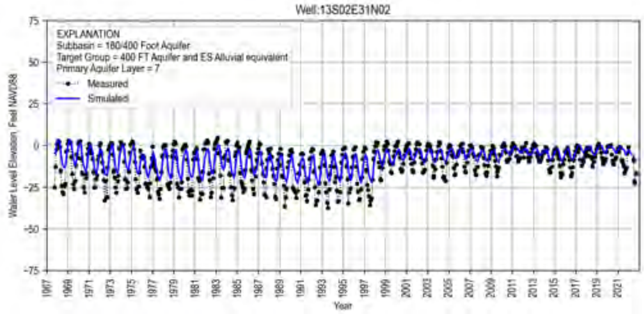
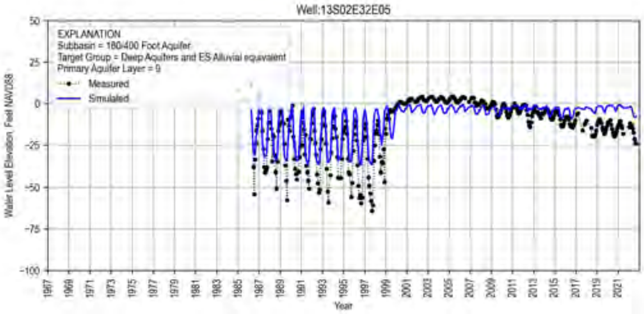

Well:13S02E27P01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

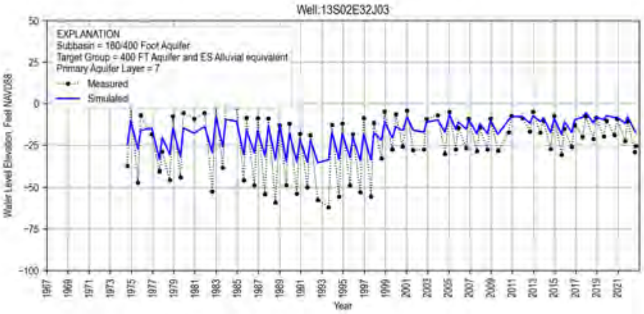

Well:13S02E27Q02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

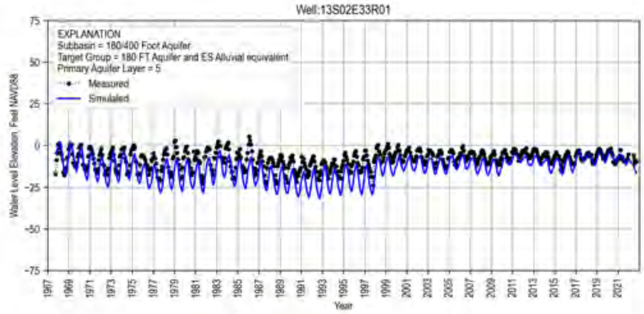

Well:13S02E28L03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

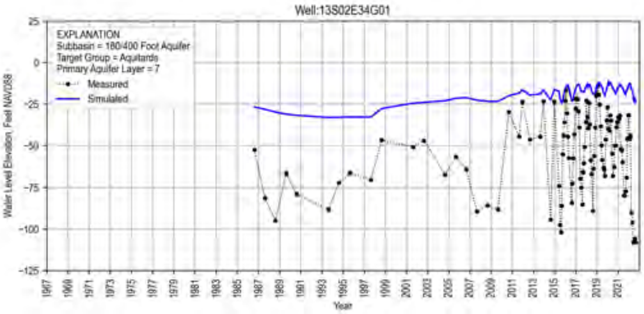

Well:13S02E31A02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:13S02E31N02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

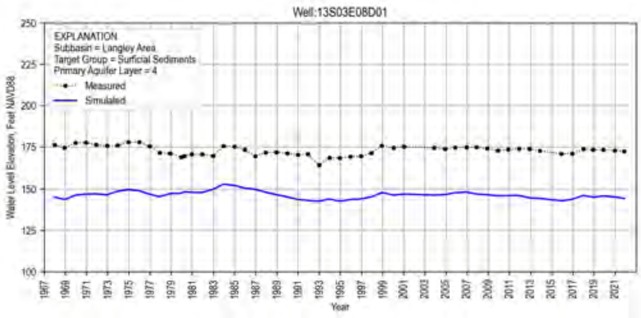

Well:13S02E32E05
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

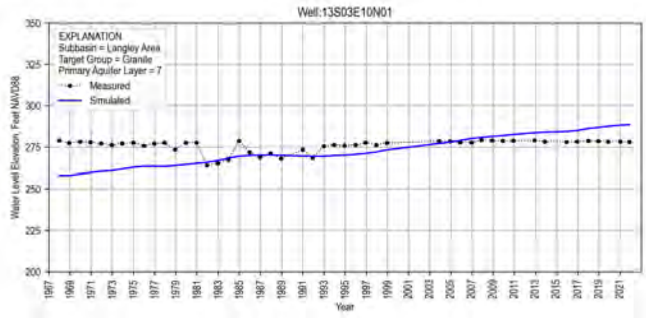

Well:13S02E32J03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

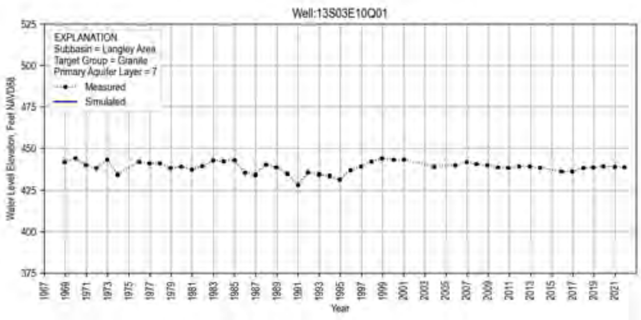

Well:13S02E33R01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:13S02E34G01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

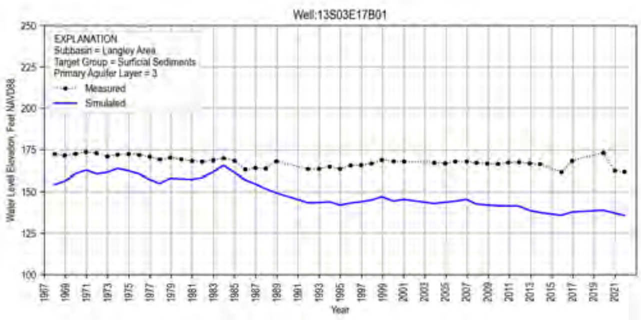

Well:13S02E34M01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

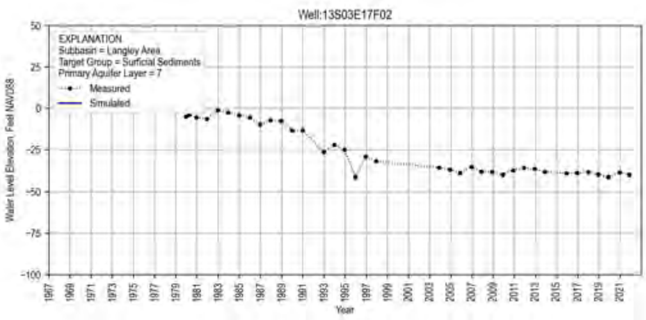

Well:13S03E08D01
EXPLANATION
Subbasin = Langley Area
Target Group = Surficial Sediments
Primary Aquifer Layer = 4
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

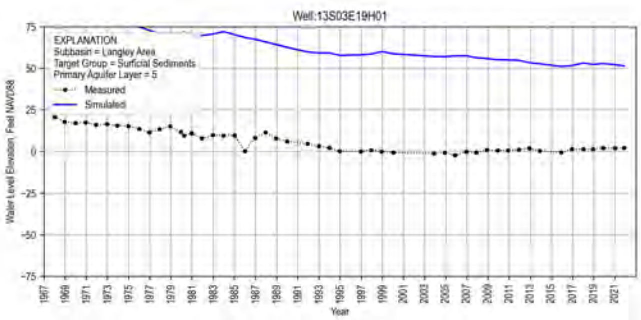

Well:13S03E10N01
EXPLANATION
Subbasin = Langley Area
Target Group = Granite
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

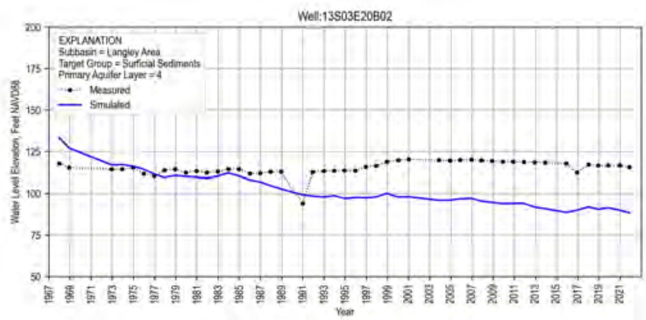

Well:13S03E10Q01
EXPLANATION
Subbasin = Langley Area
Target Group = Granite
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

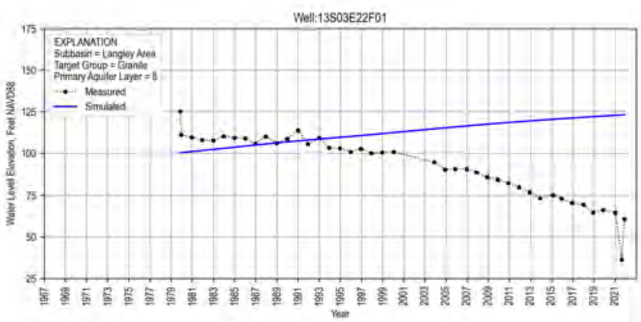

Well:13S03E16J01
EXPLANATION
Subbasin = Langley Area
Target Group = Granite
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:13S03E17B01
EXPLANATION
Subbasin = Langley Area
Target Group = Surficial Sediments
Primary Aquifer Layer = 3
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

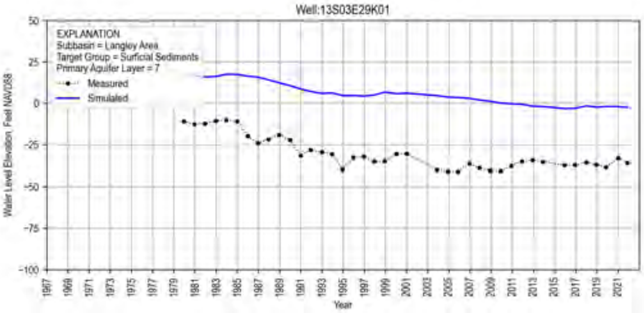

Well:13S03E17F02
EXPLANATION
Subbasin = Langley Area
Target Group = Surficial Sediments
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

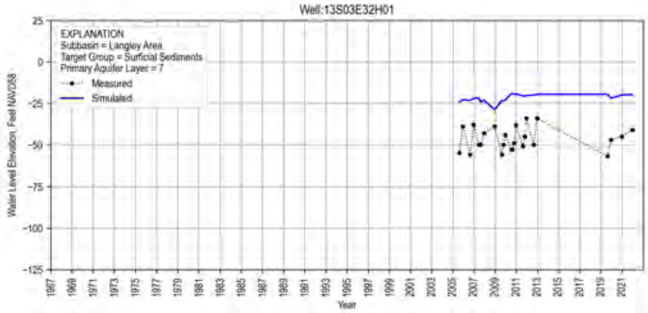

Well:13S03E19H01
EXPLANATION
Subbasin = Langley Area
Target Group = Surficial Sediments
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

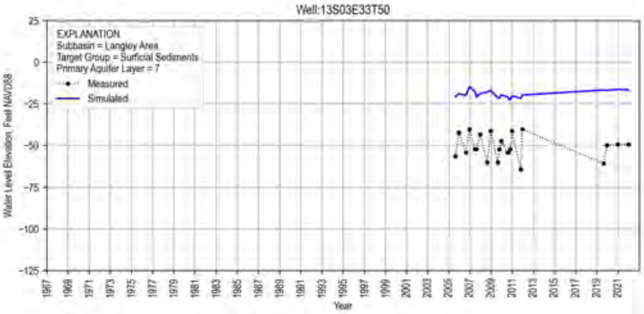

Well:13S03E20B02
EXPLANATION
Subbasin = Langley Area
Target Group = Surficial Sediments
Primary Aquifer Layer = 4
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

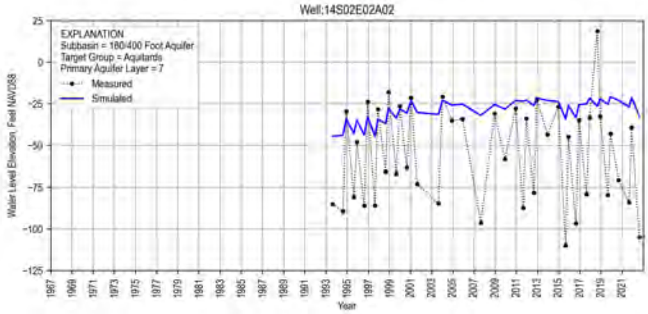

Well:13S03E22F01
EXPLANATION
Subbasin = Langley Area
Target Group = Granite
Primary Aquifer Layer = 8
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

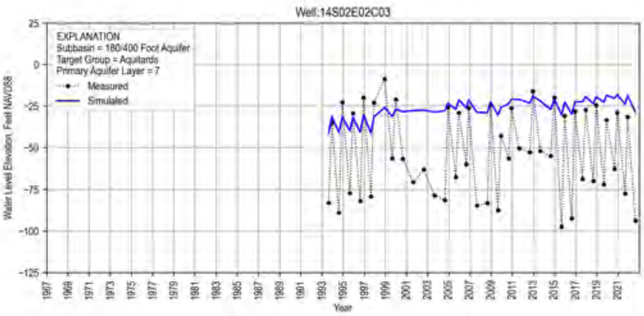

Well:13S03E29A01
EXPLANATION
Subbasin = Langley Area
Target Group = Surficial Sediments
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

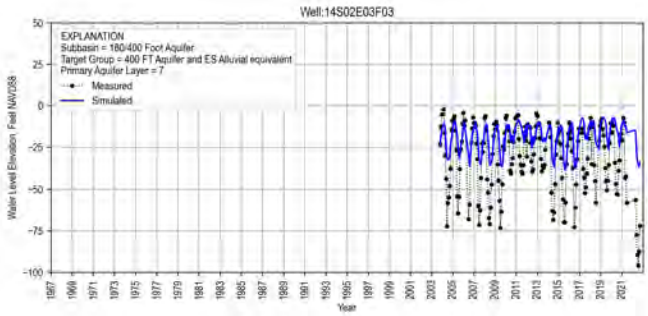


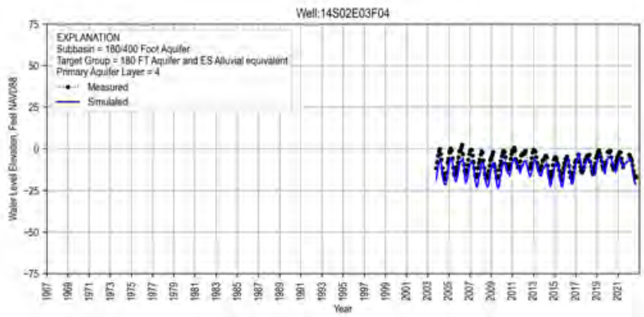


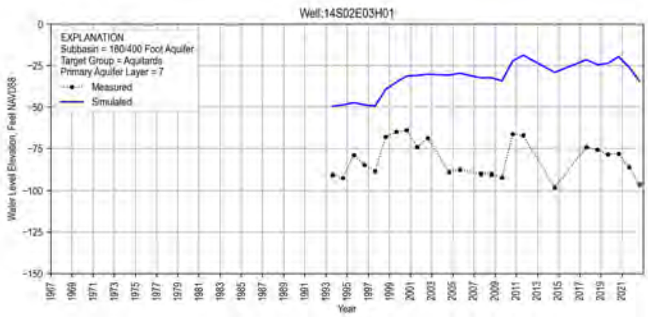


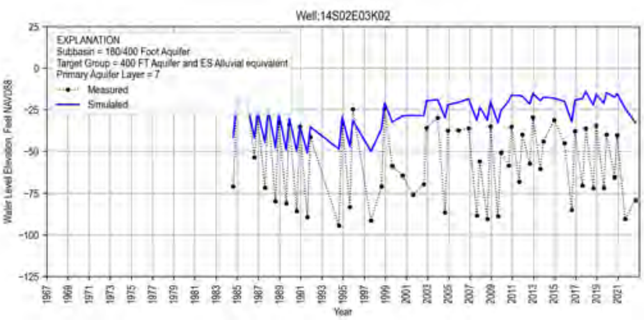


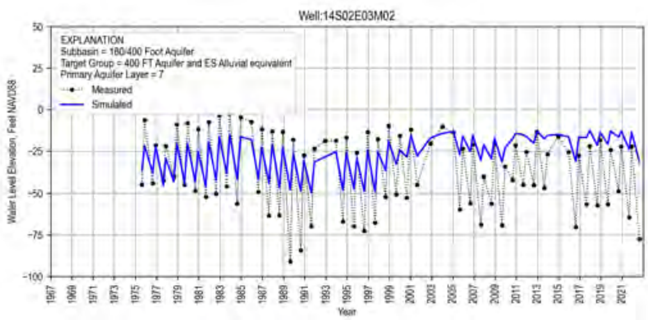












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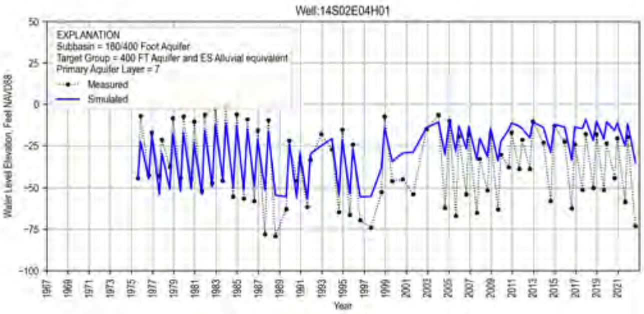
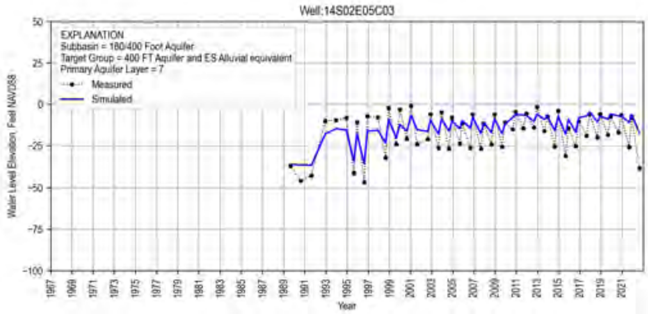
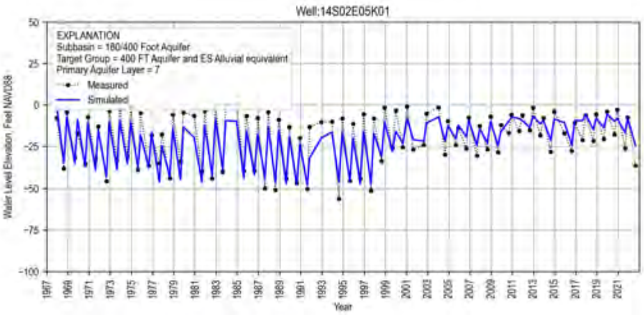
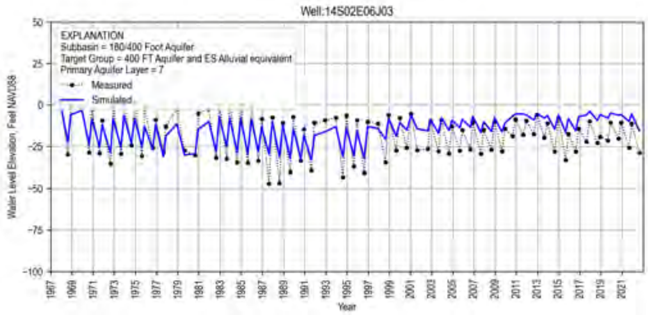
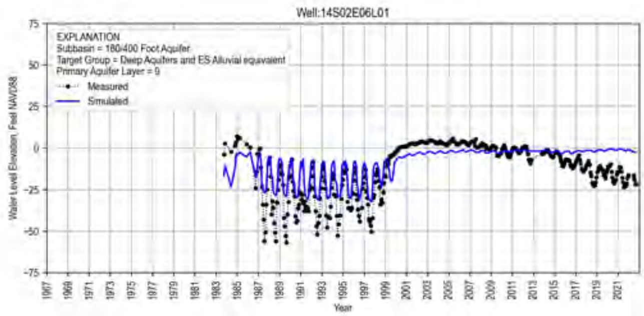
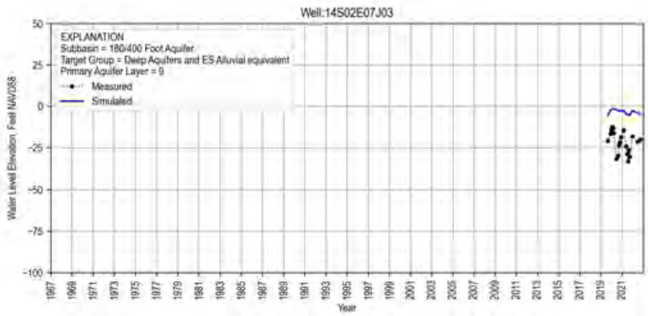

Well:14S02E04H01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

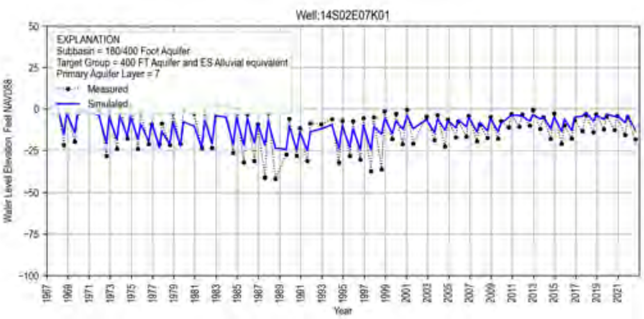

Well:14S02E05C03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

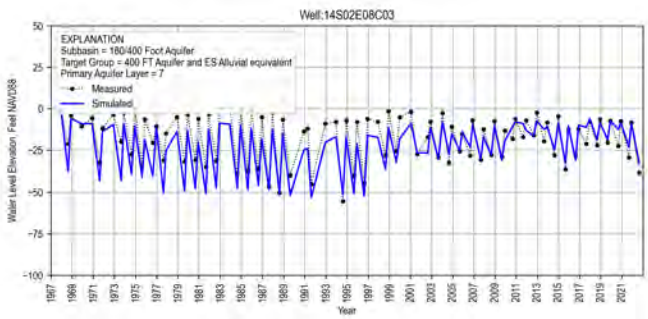

Well:14S02E05K01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

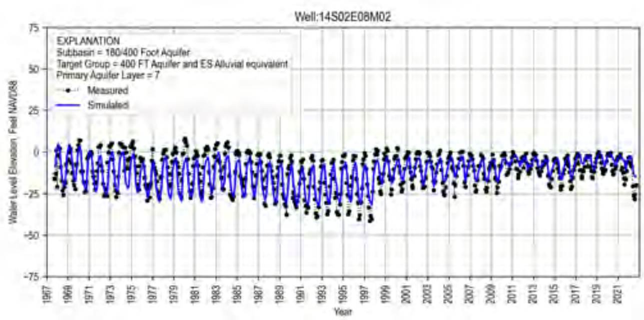

Well:14S02E06J03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

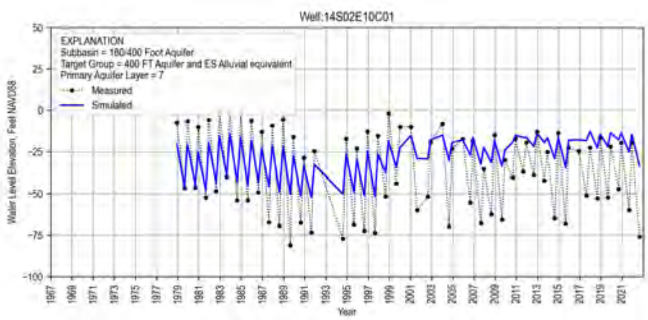

Well:14S02E06L01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

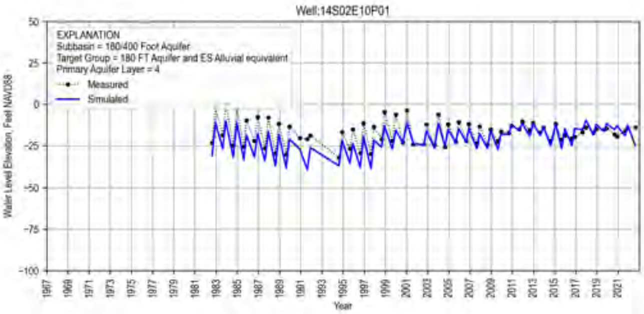

Well:14S02E07J03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

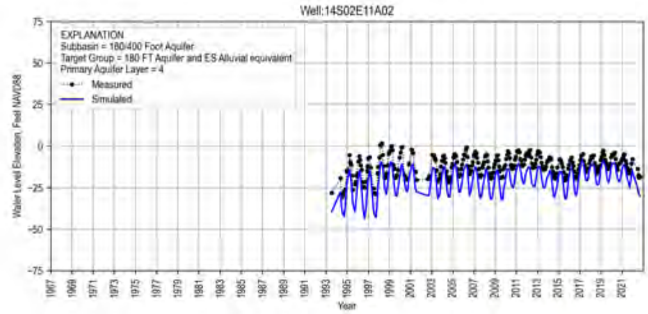

Well:14S02E07K01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

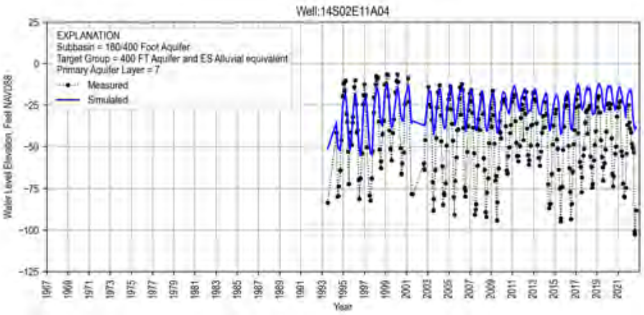

Well:14S02E08C03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

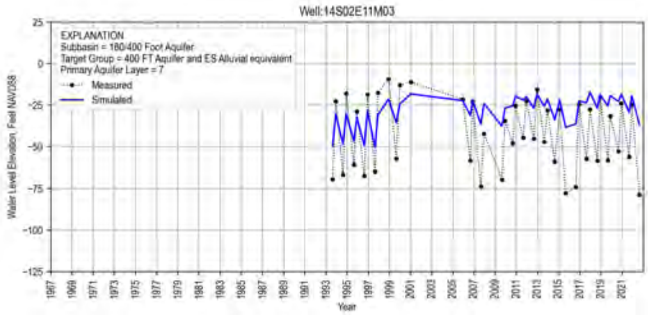

Well:14S02E08M02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

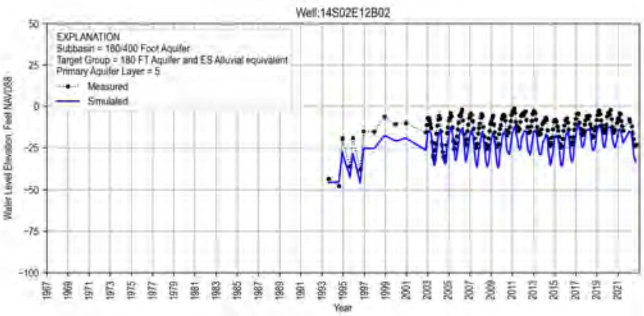

Well:14S02E10C01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

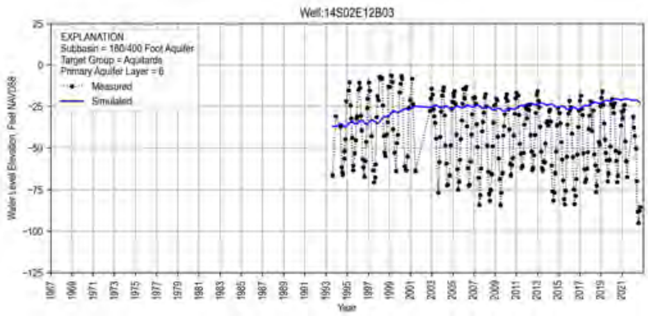


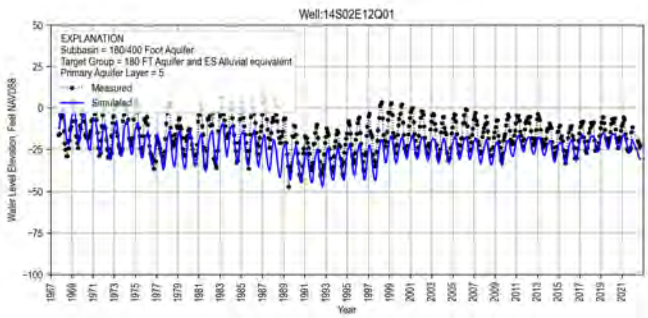


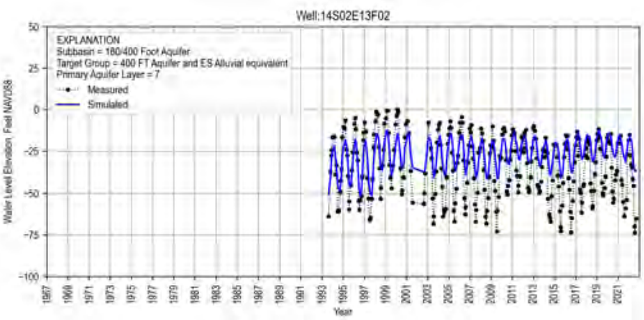


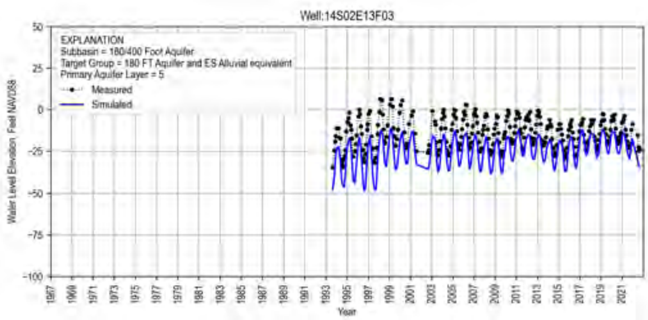












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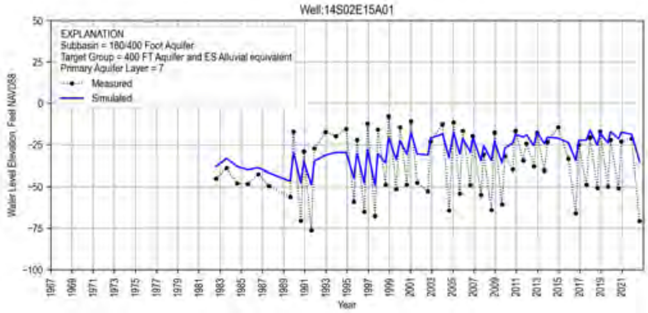
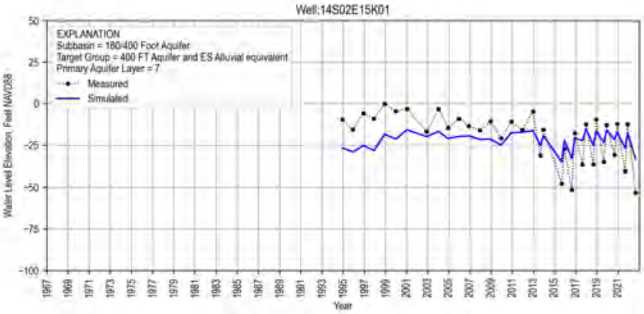
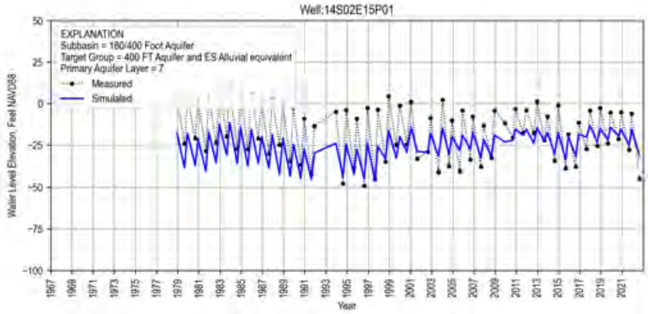
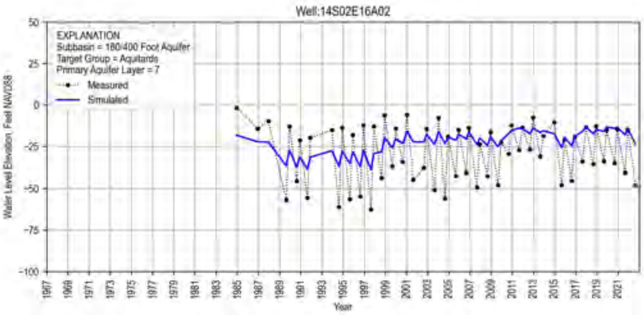
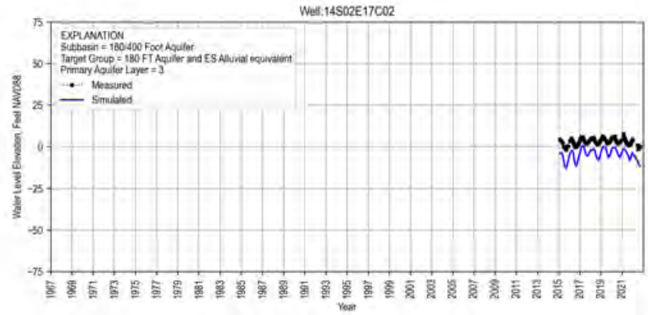
Well:14S02E14R02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

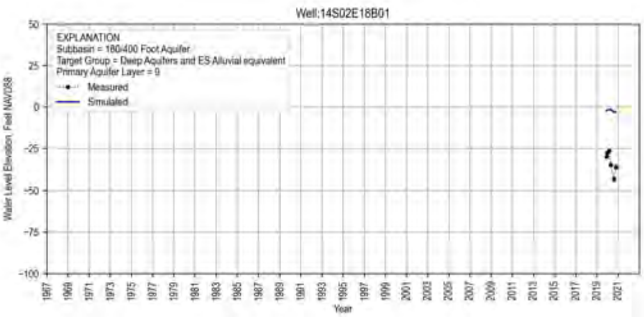

Well:14S02E15A01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

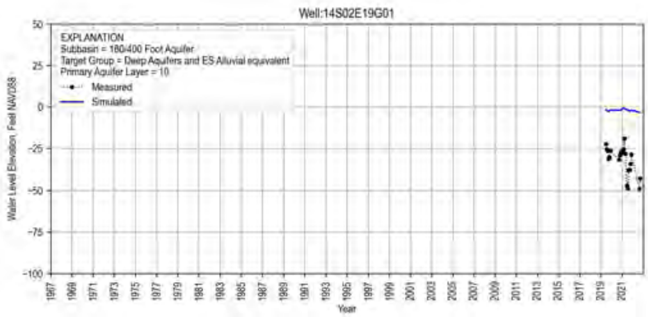

Well:14S02E15K01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

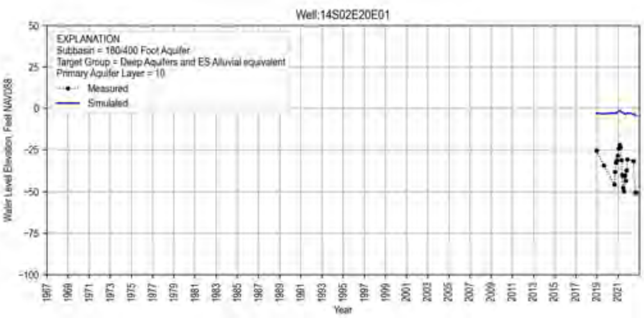

Well:14S02E15P01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

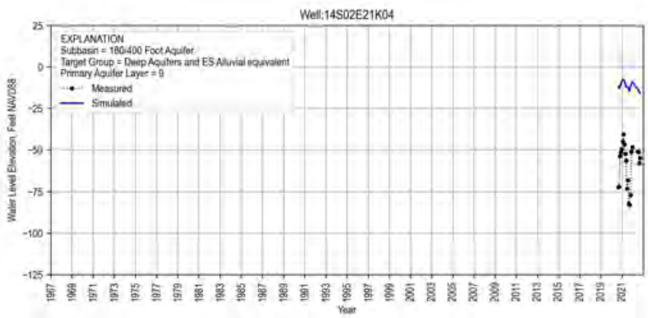

Well:14S02E16A02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

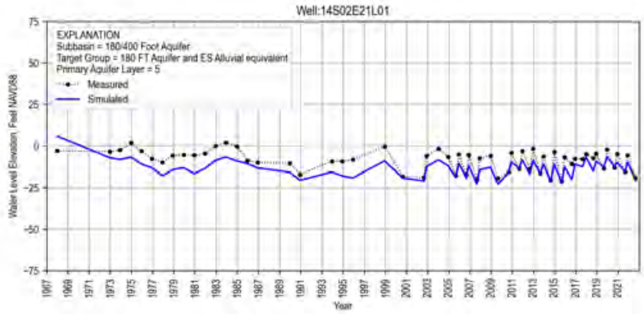

Well:14S02E17C02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 3
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

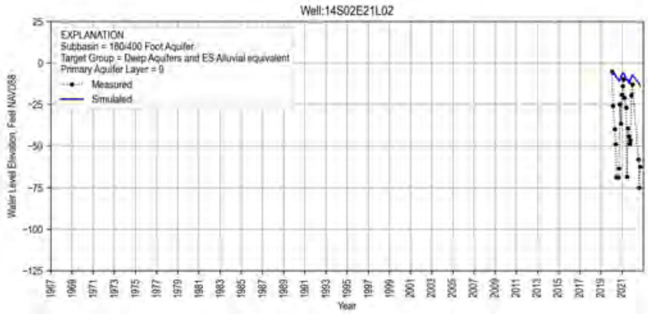

Well:14S02E18B01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

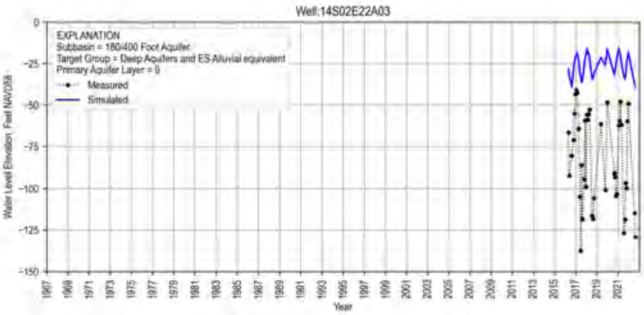

Well:14S02E19G01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

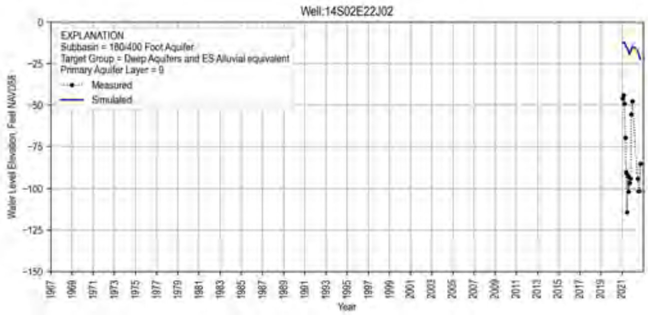

Well:14S02E20E01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

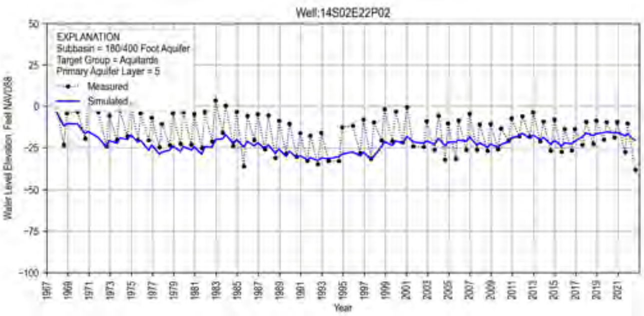

Well:14S02E21K04
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:14S02E21L01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

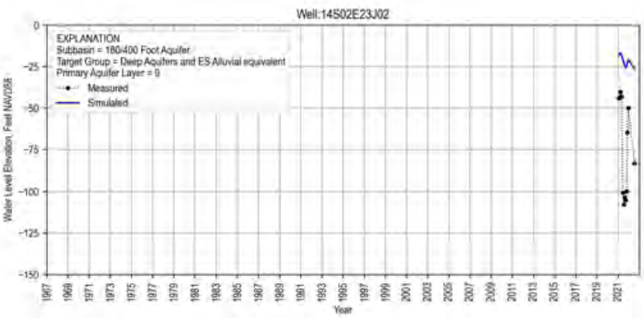

Well:14S02E21L02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

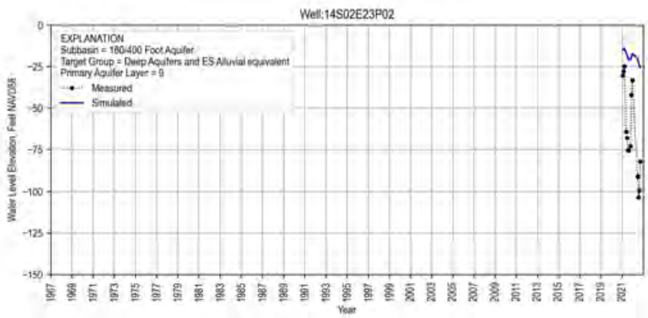

Well:14S02E22A03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:14S02E22J02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:14S02E22P02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

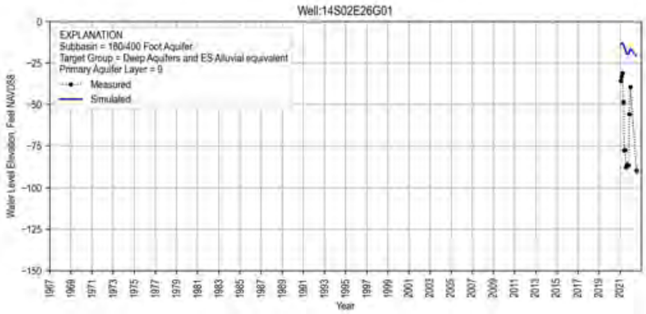

Well:14S02E23A02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

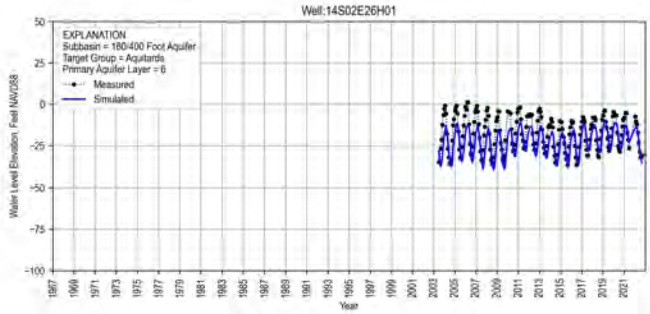

Well:14S02E23J02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

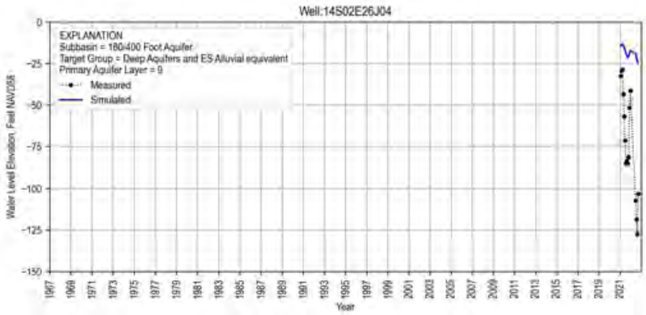

Well:14S02E23P02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

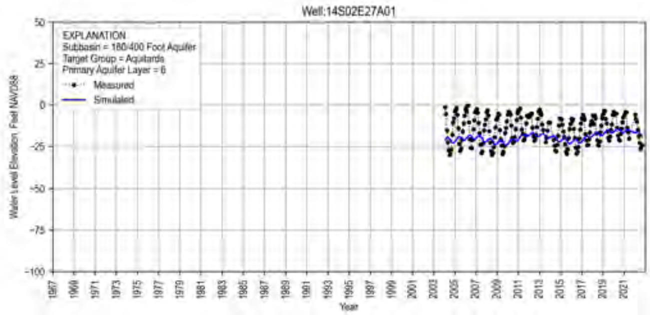

Well:14S02E25A03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

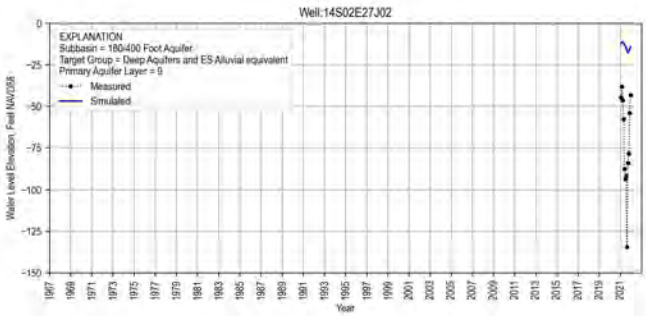

Well:14S02E26A10
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

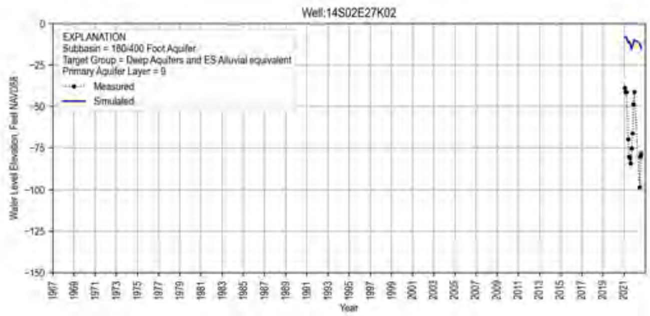


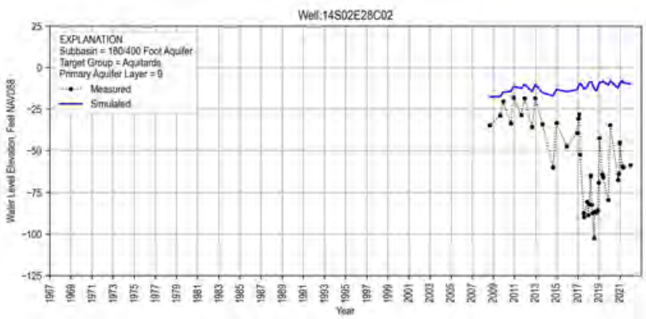


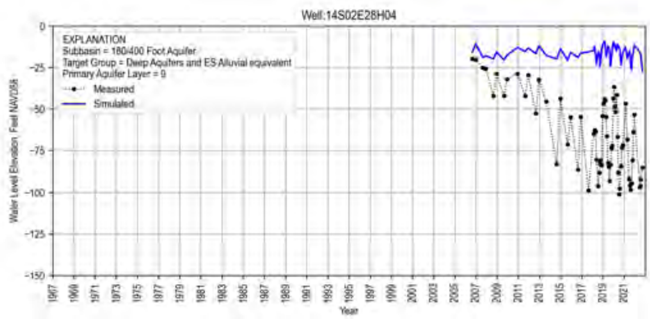


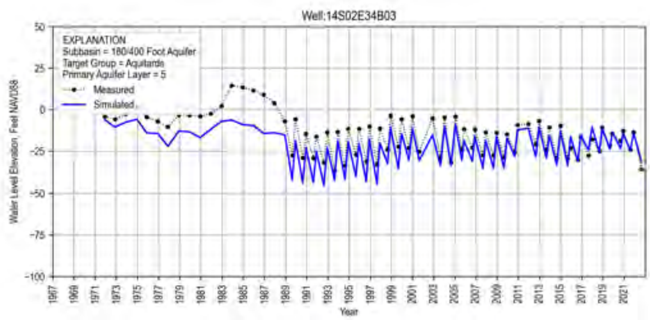












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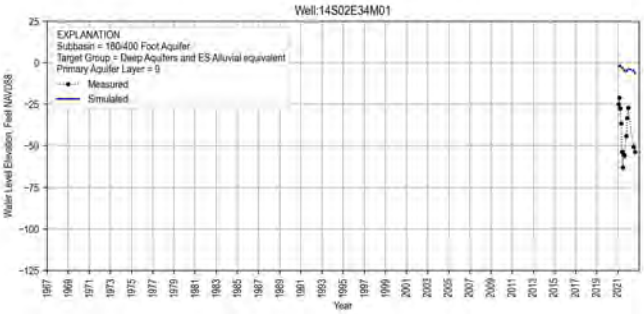
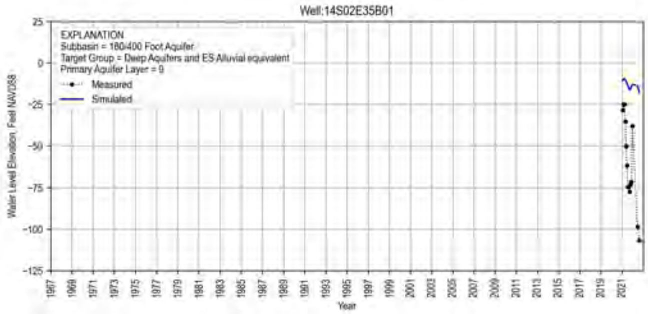
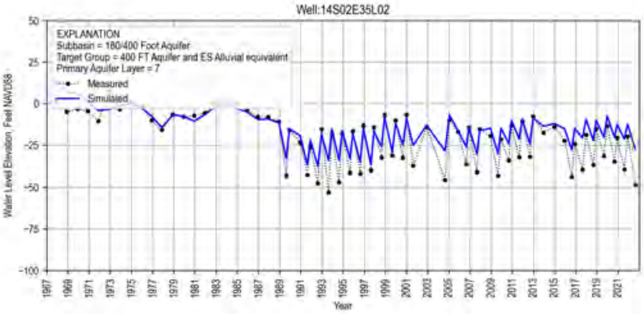
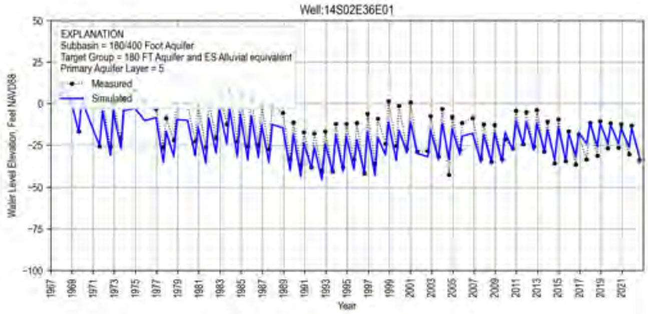
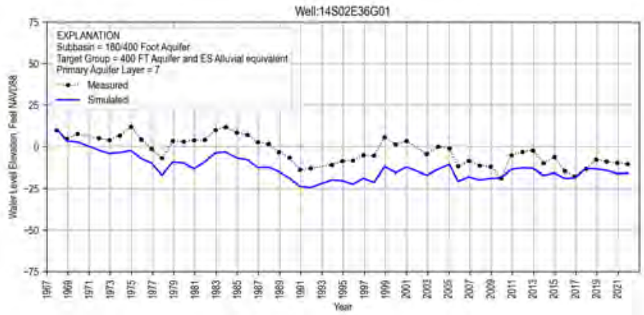
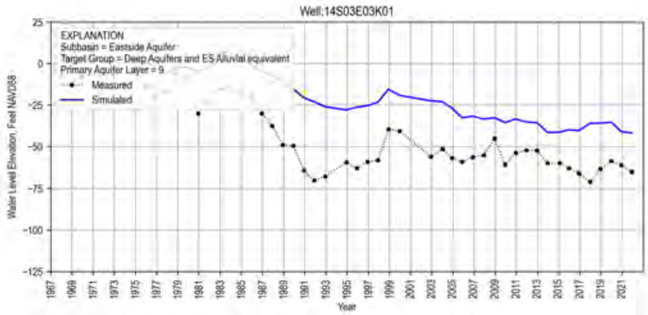

Well:14S02E34M01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

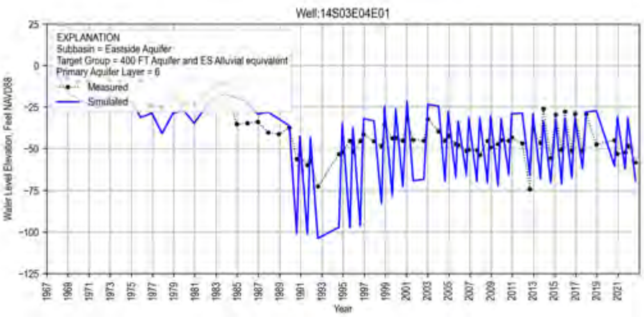

Well:14S02E35B01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

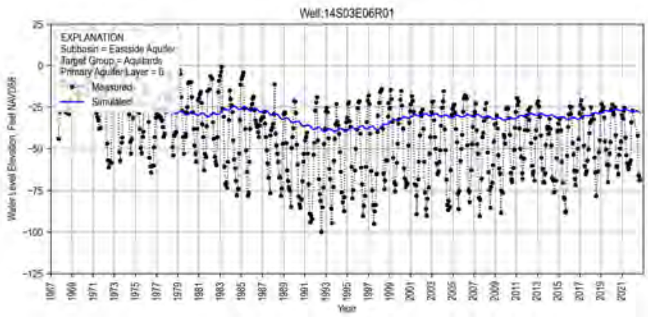

Well:14S02E35L02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

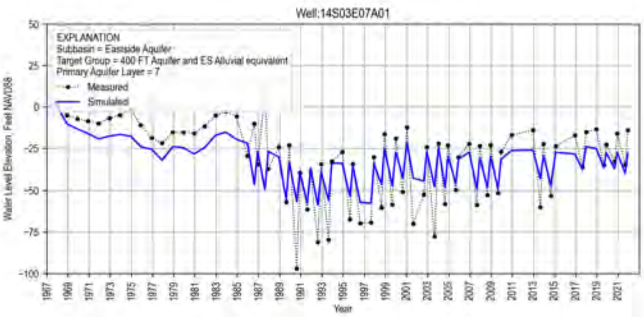

Well:14S02E36E01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

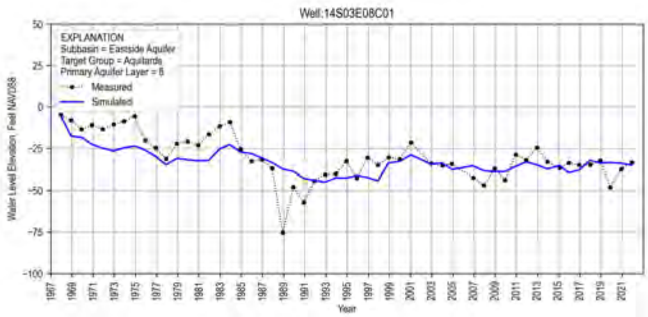

Well:14S02E36G01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

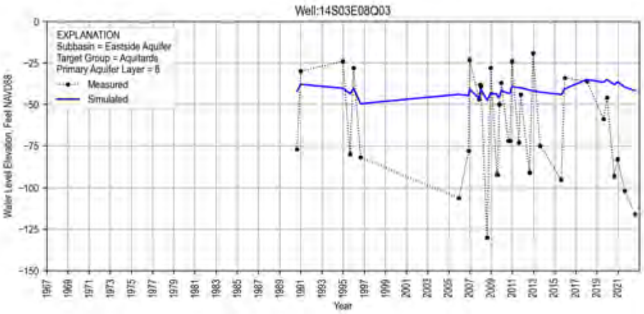

Well:14S03E03K01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:14S03E04E01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

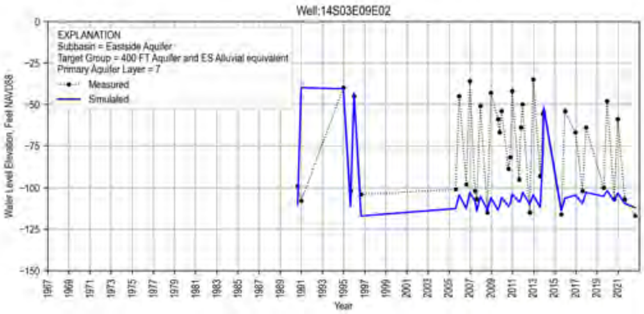

Well:14S03E06R01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:14S03E07A01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

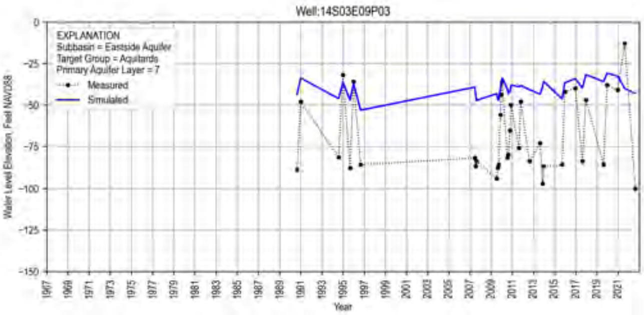

Well:14S03E08C01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 8
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year



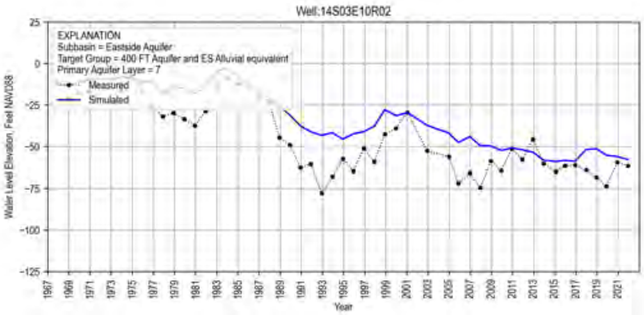
Well:14S03E08Q03
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 8
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year



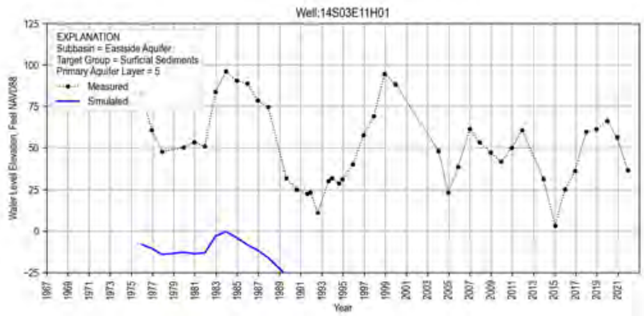
Well:14S03E09E02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year



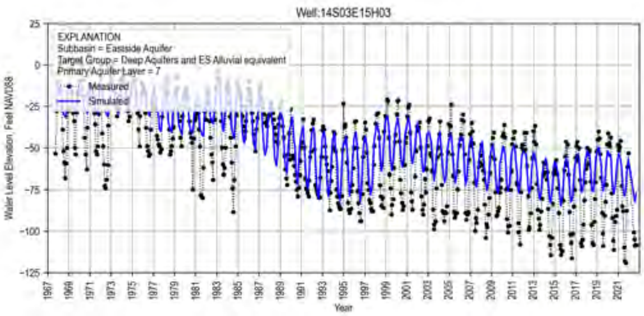
Well:14S03E09P03
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year



Well:14S03E10R02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

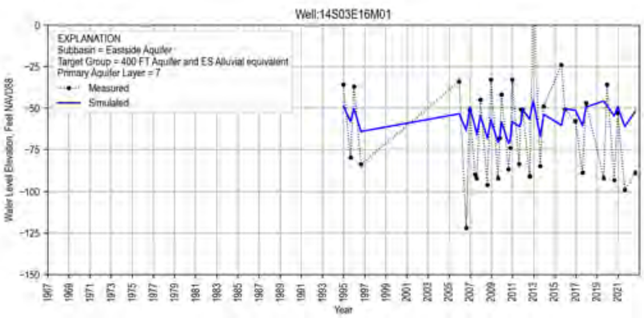


Well:14S03E11H01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

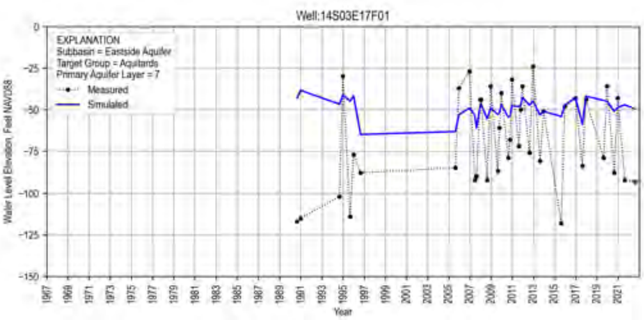


Well:14S03E15H03
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

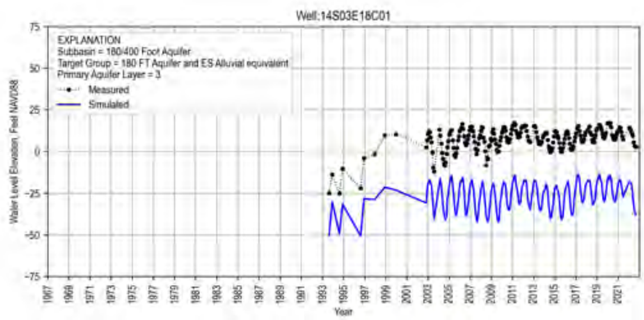
Well:14S03E16E02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year



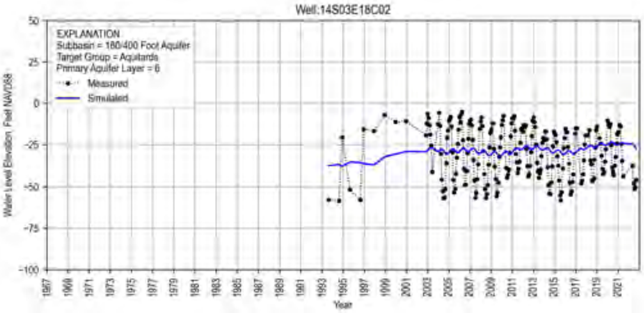
Well:14S03E16M01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

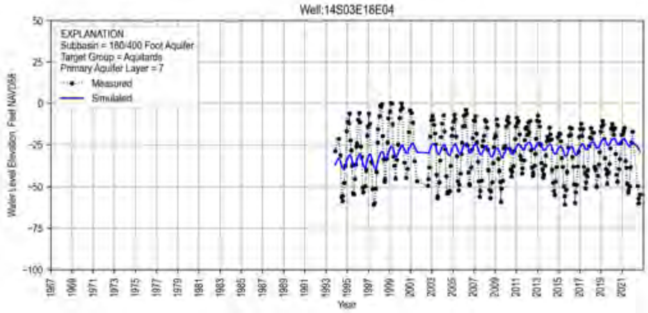


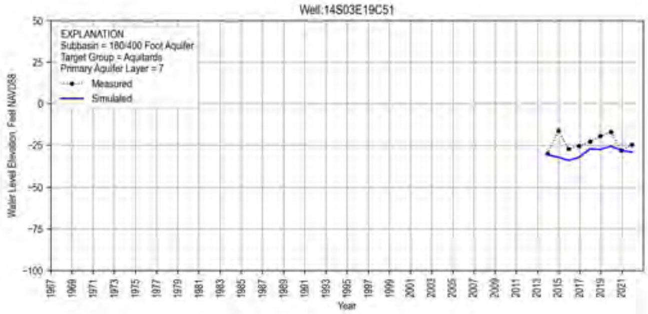
Well:14S03E17F01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

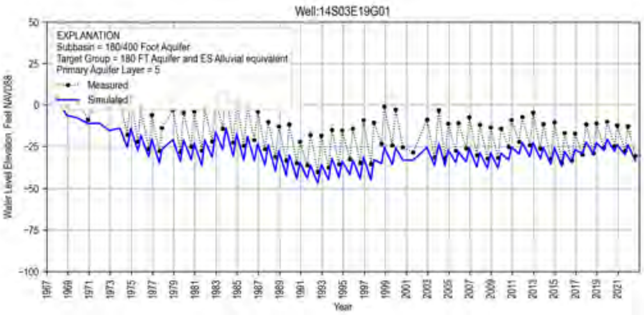


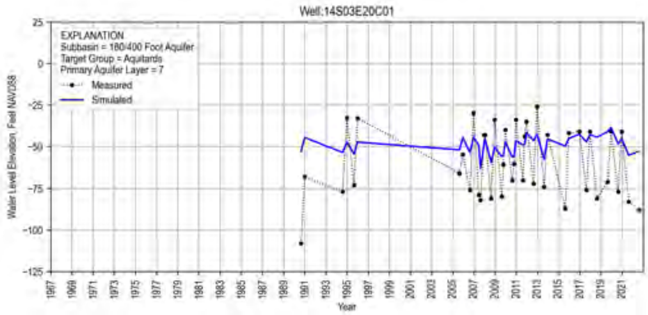
Well:14S03E18C01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 3
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

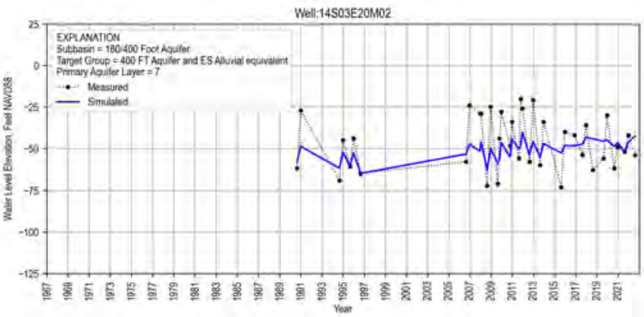


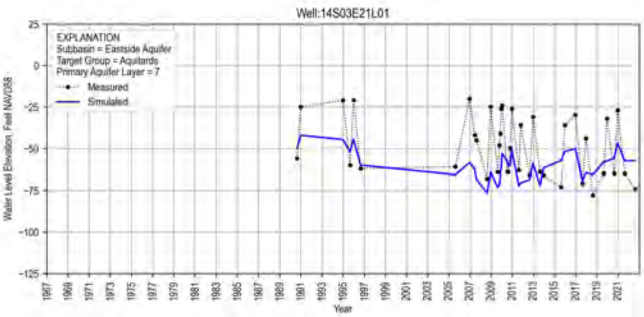


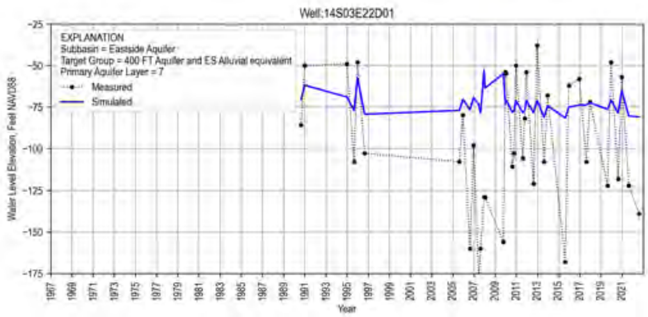












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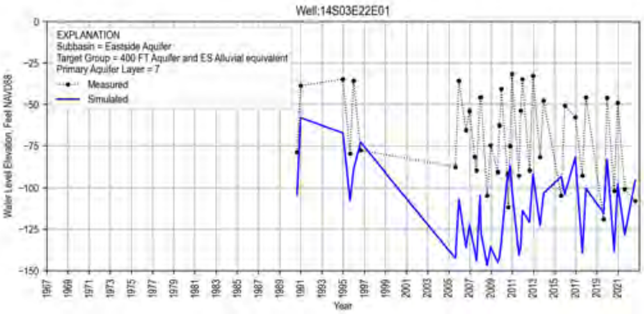
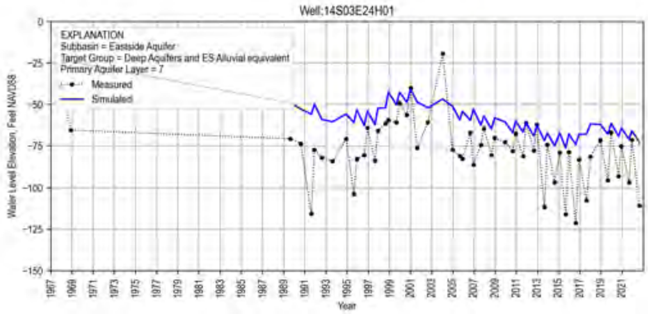
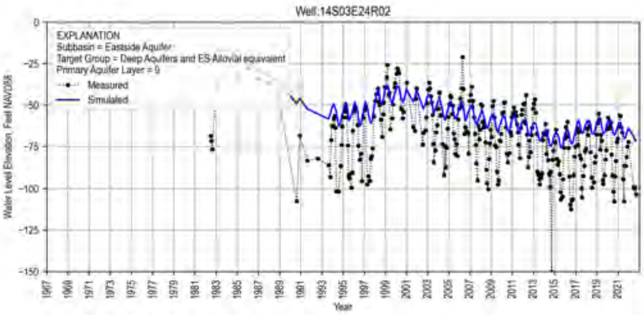
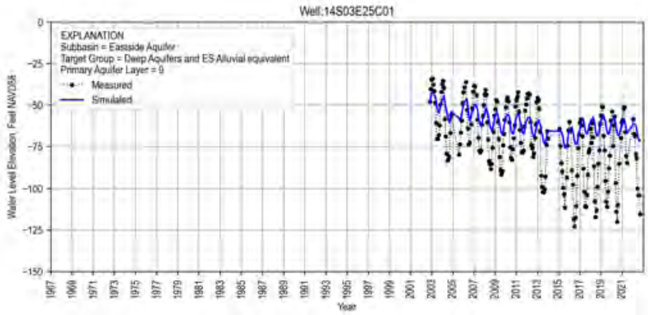
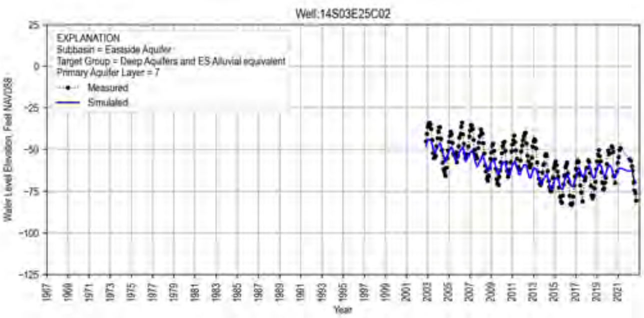
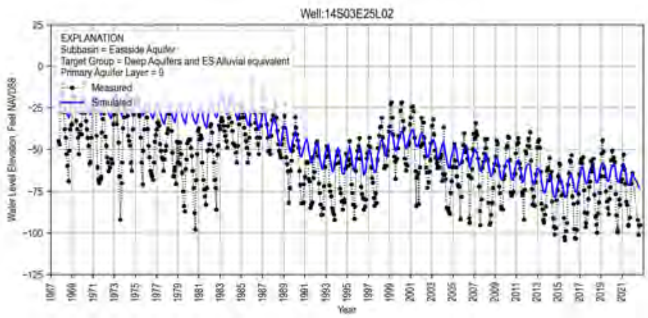

Well:14S03E22E01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

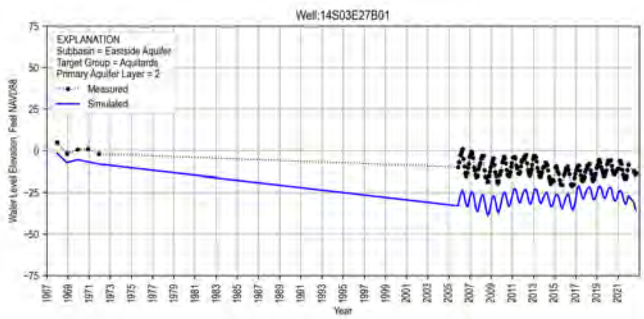

Well:14S03E24H01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

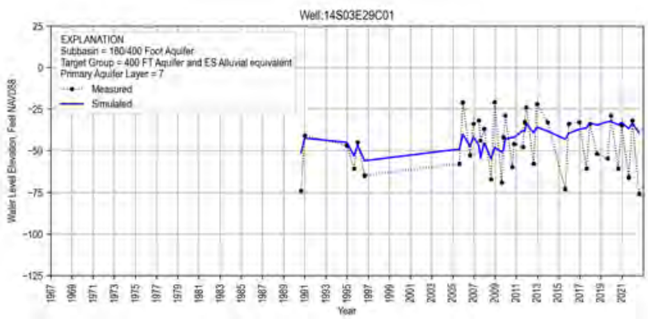

Well:14S03E24R02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

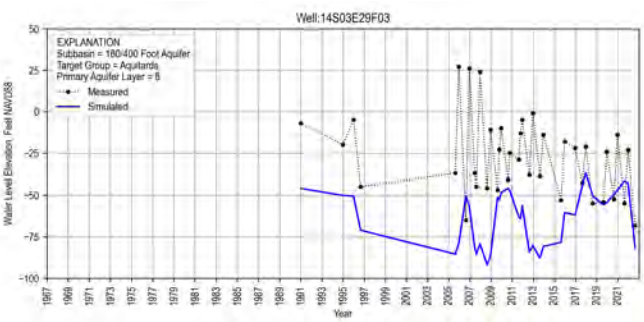

Well:14S03E25C01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

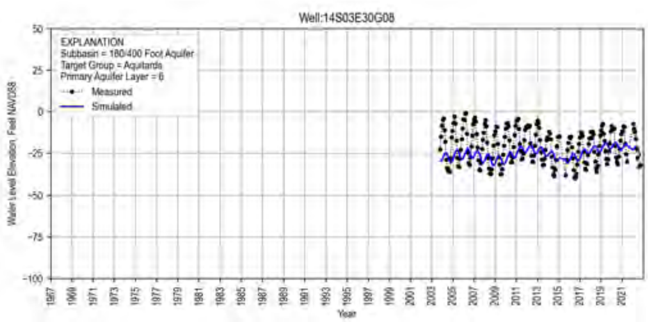

Well:14S03E25C02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

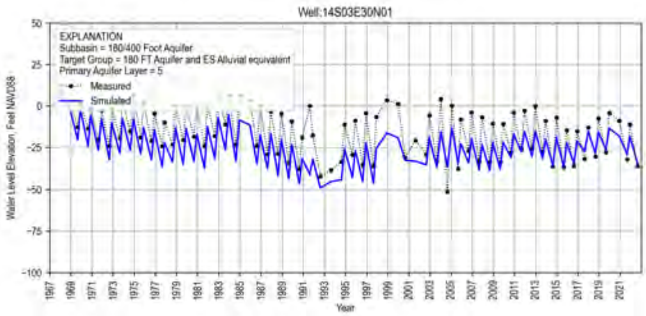

Well:14S03E25L02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

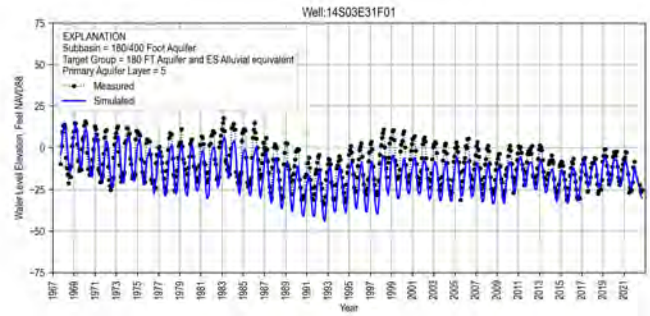

Well:14S03E27B01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 2
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

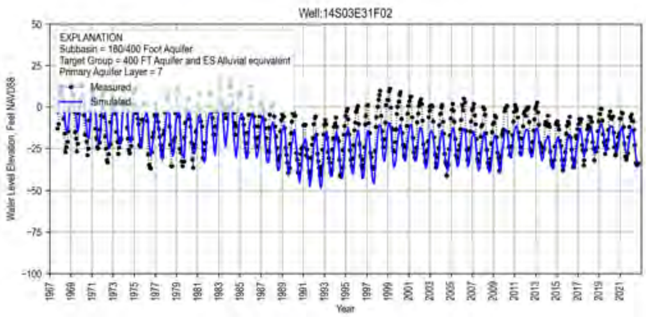

Well:14S03E29C01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

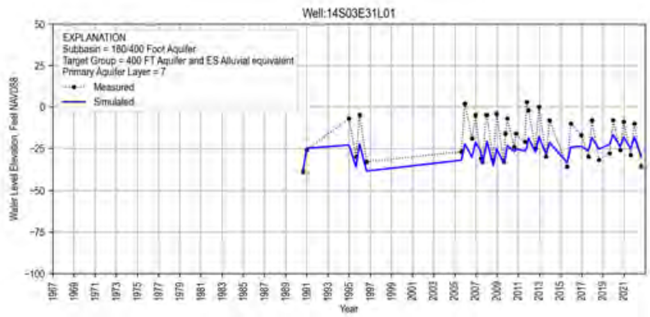

Well:14S03E29F03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

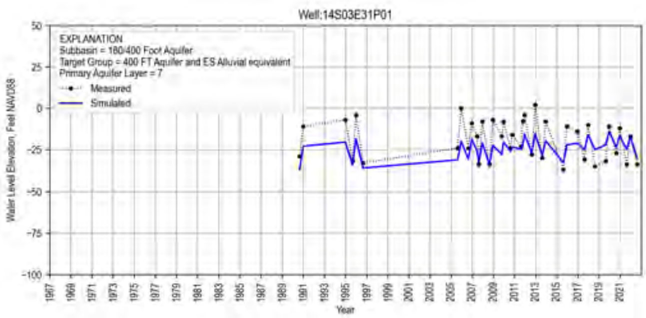

Well:14S03E30G08
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

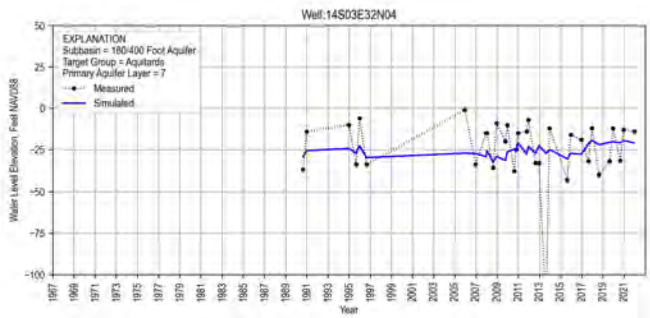


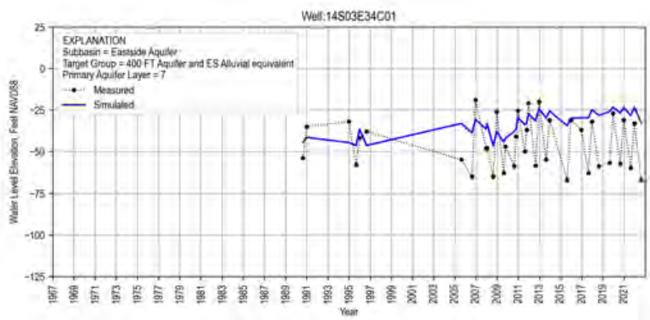


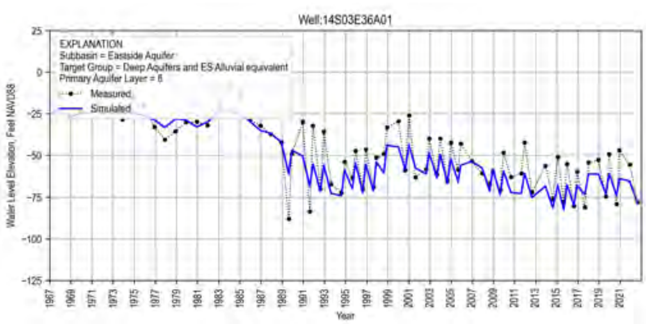


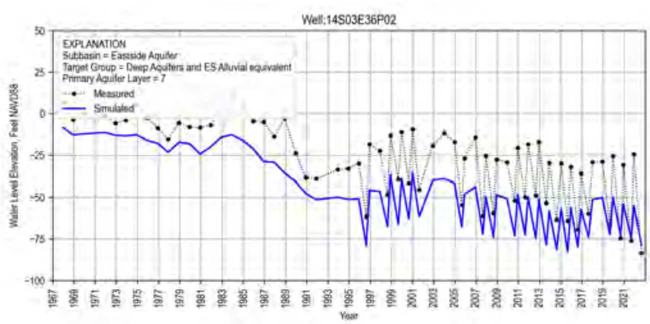












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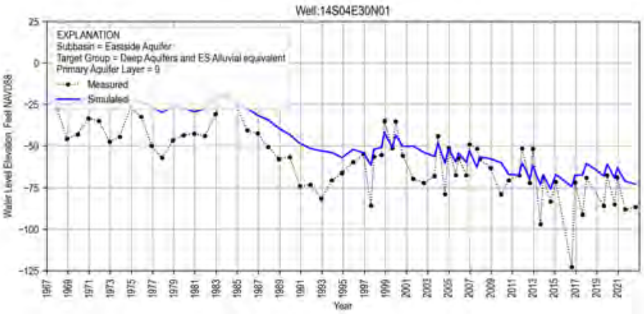

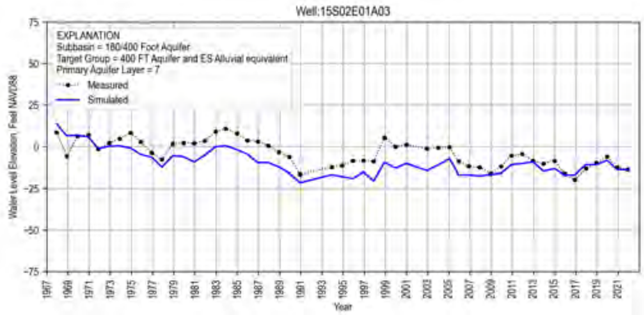

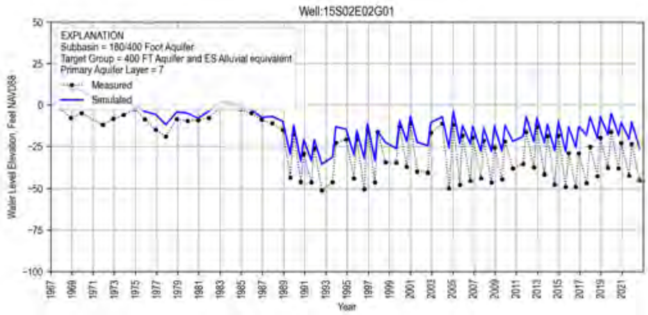

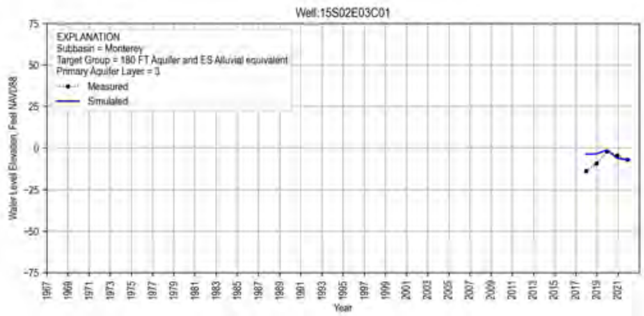

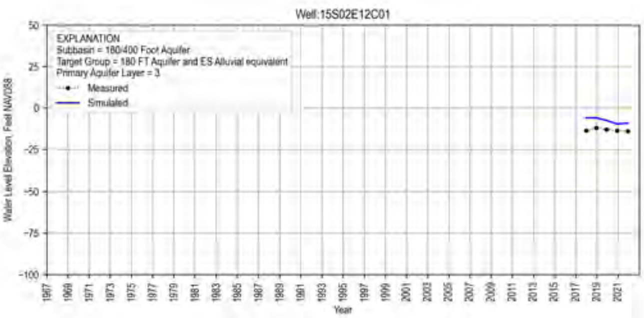

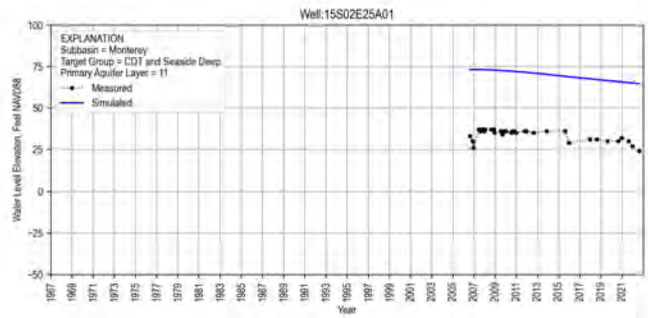

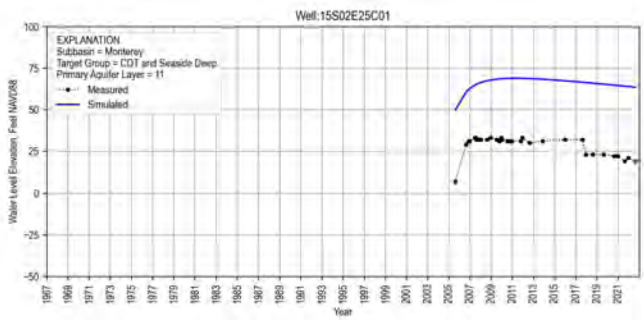

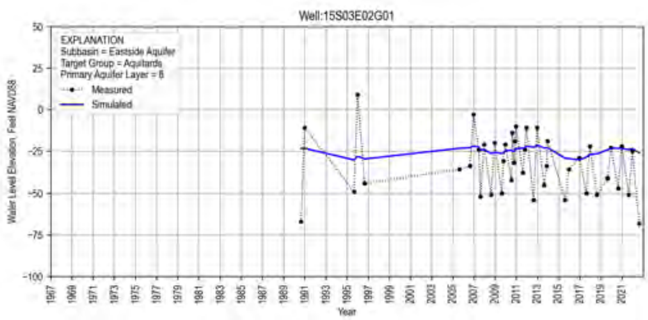

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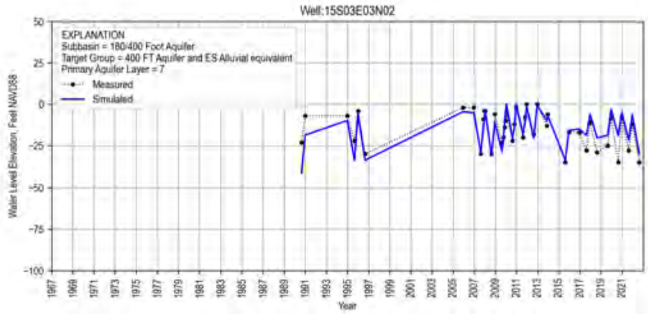
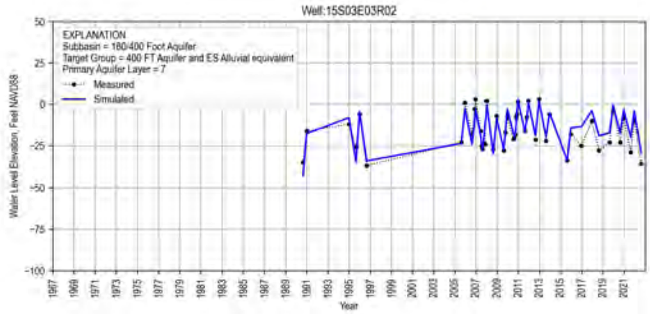
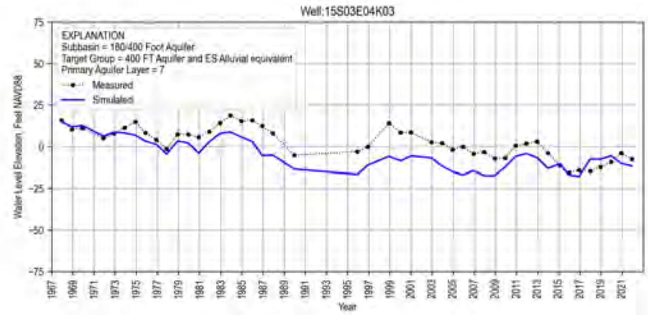
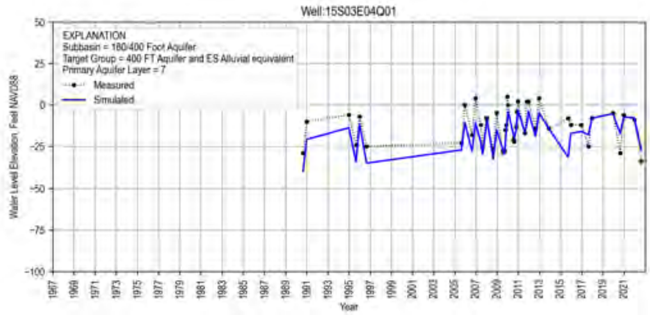
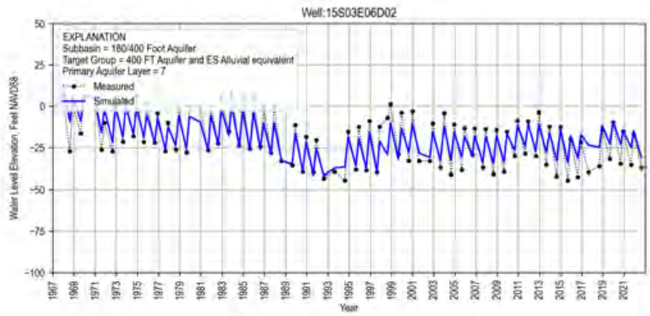

Well:15S03E03N02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

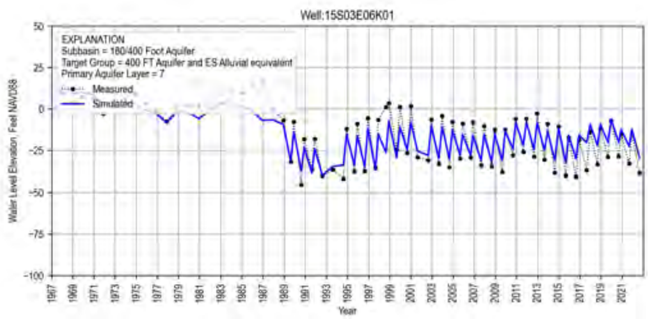

Well:15S03E03R02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E04K03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

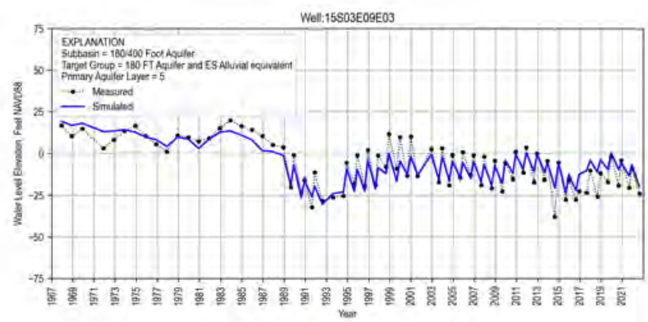

Well:15S03E04Q01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

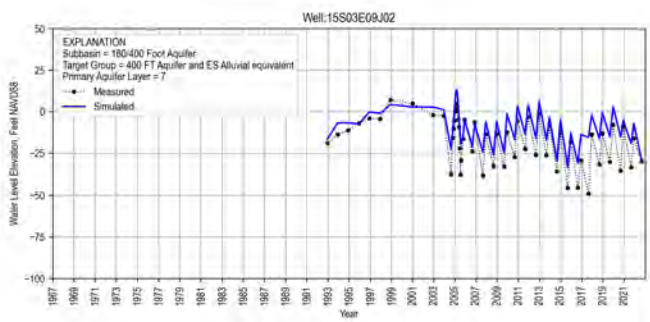

Well:15S03E05C02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

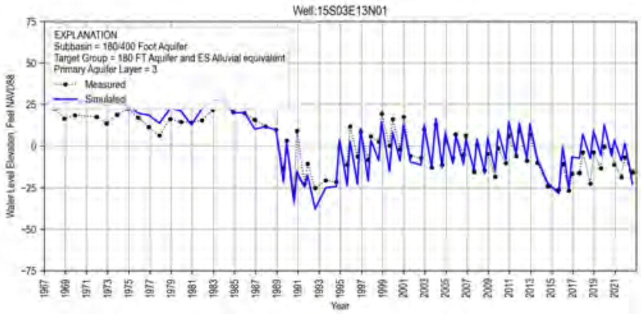

Well:15S03E06D02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

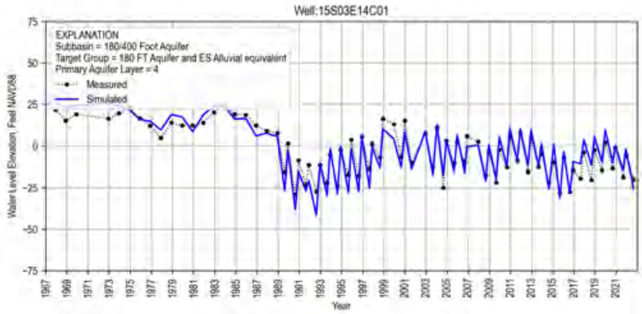

Well:15S03E06K01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

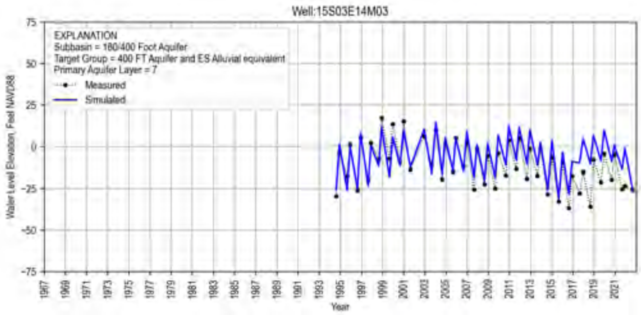

Well:15S03E08F01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

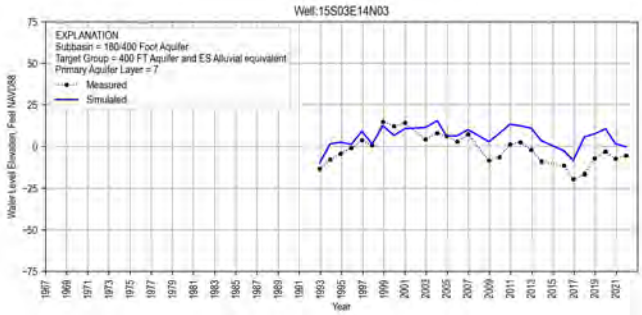

Well:15S03E09E03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

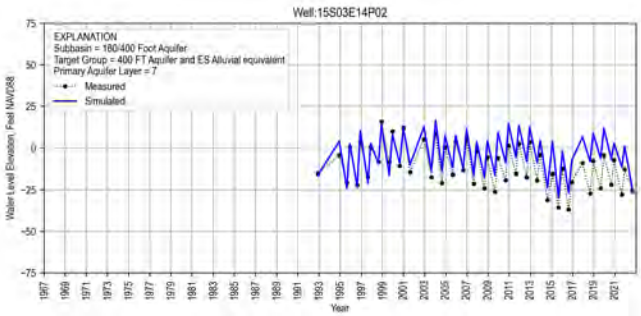

Well:15S03E09J02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

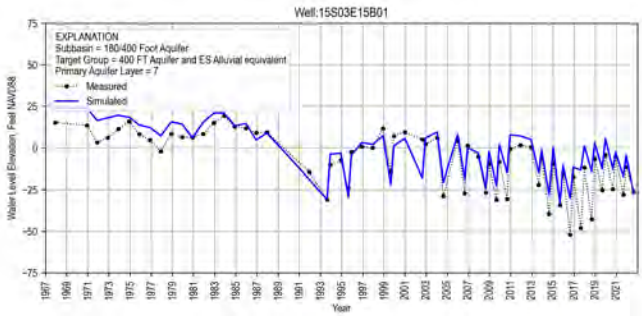

Well:15S03E13N01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 3
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

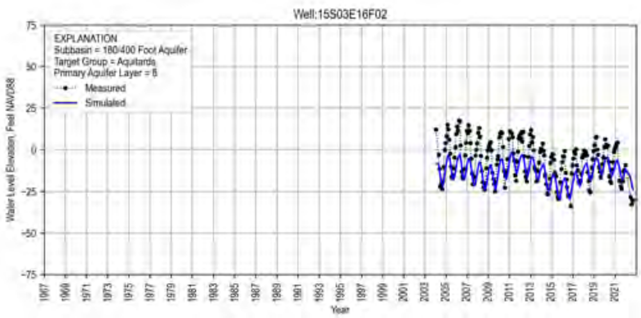

Well:15S03E14C01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 4
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

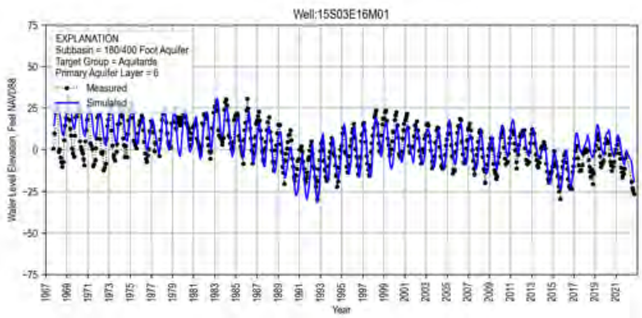

Well:15S03E14M03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

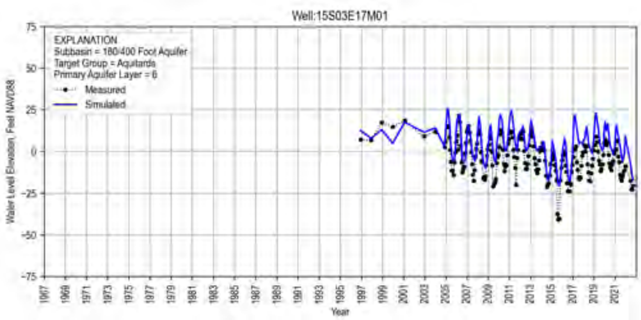

Well:15S03E14N03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

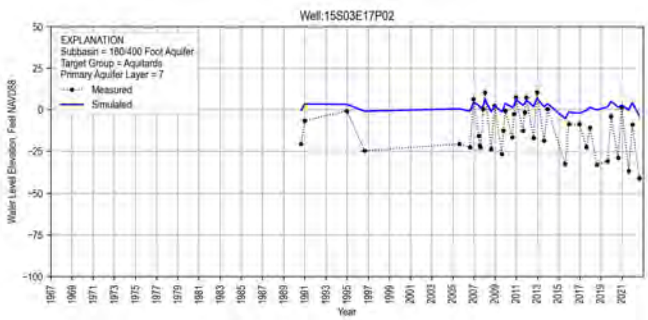

Well:15S03E14P02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

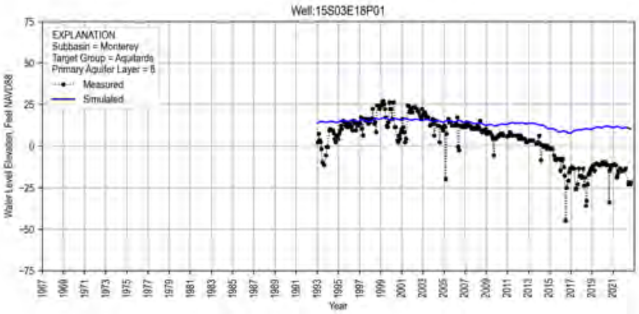

Well:15S03E15B01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

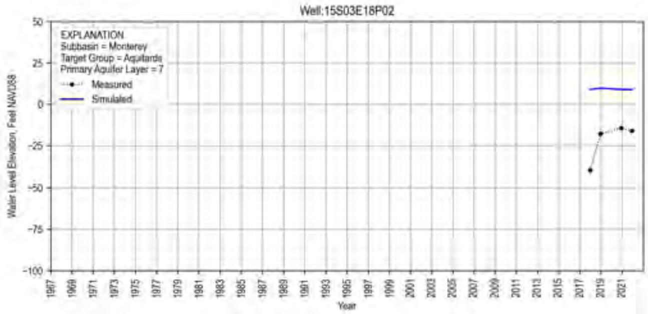

Well:15S03E16F02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 8
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

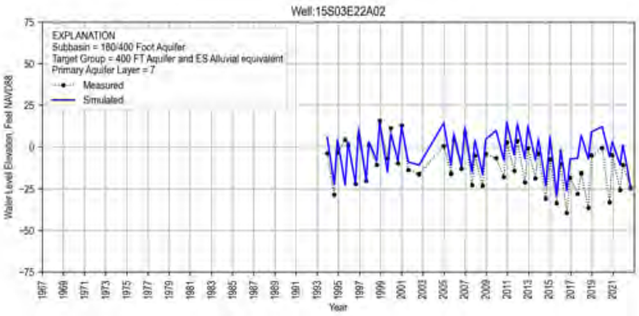

Well:15S03E16M01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E17M01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

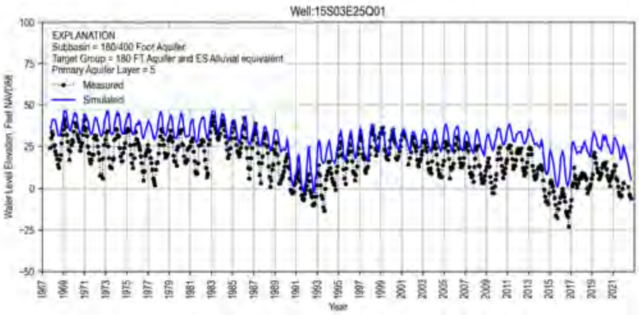

Well:15S03E17P02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

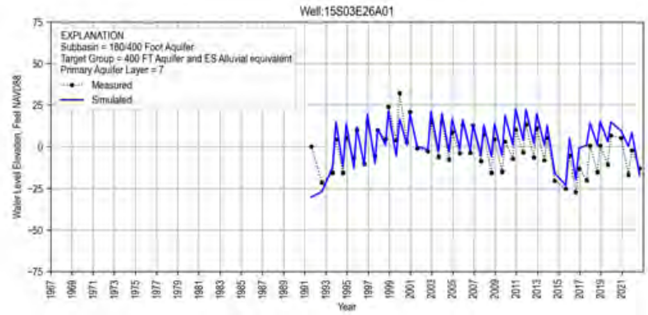

Well:15S03E18P01
EXPLANATION
Subbasin = Monterey
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

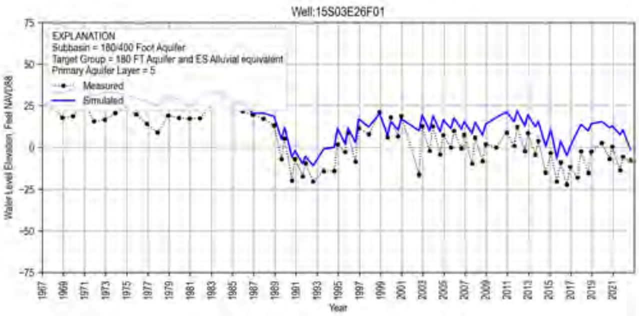

Well:15S03E18P02
EXPLANATION
Subbasin = Monterey
Target Group = Aquitards
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E22A02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E22G01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E25Q01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E26A01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:15S03E26F01
EXPLANATION
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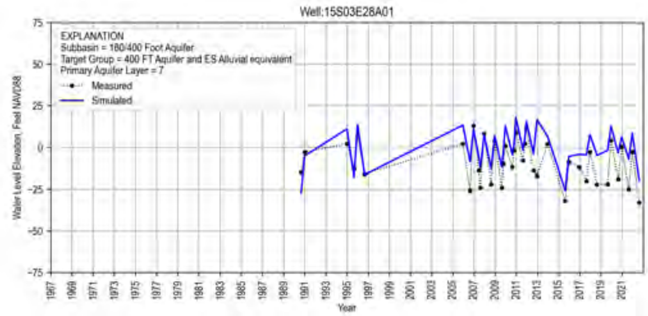
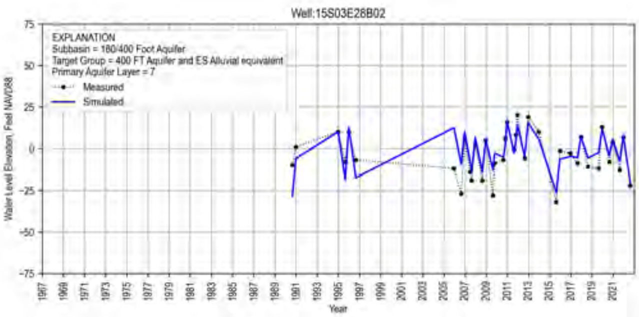
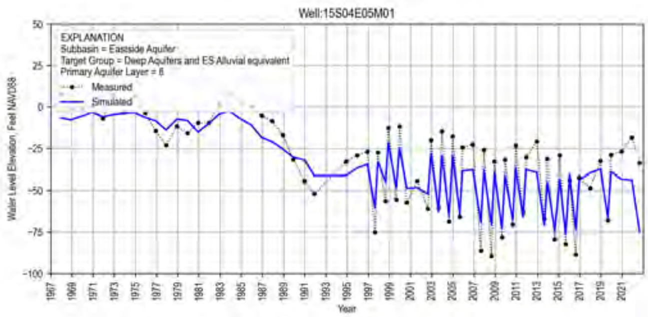
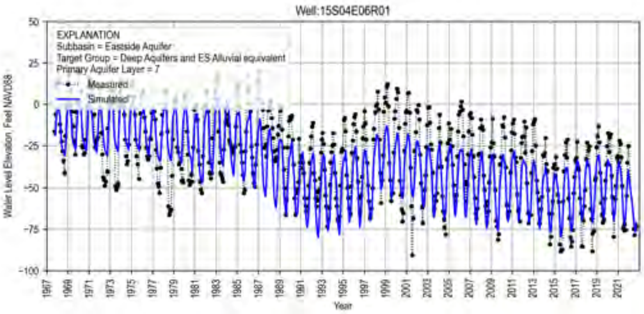
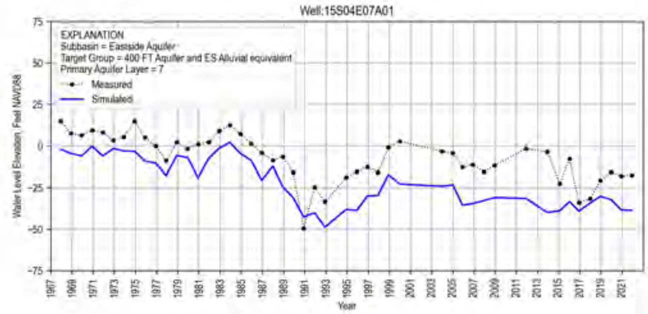
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

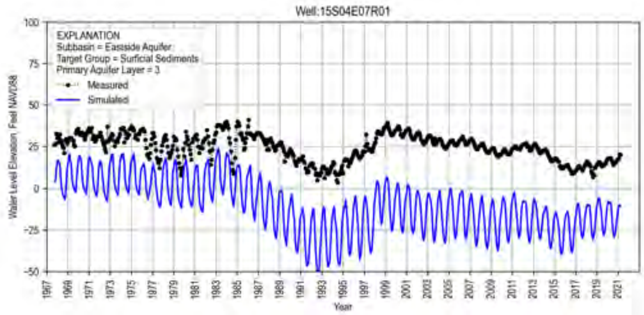

Well:15S03E28A01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

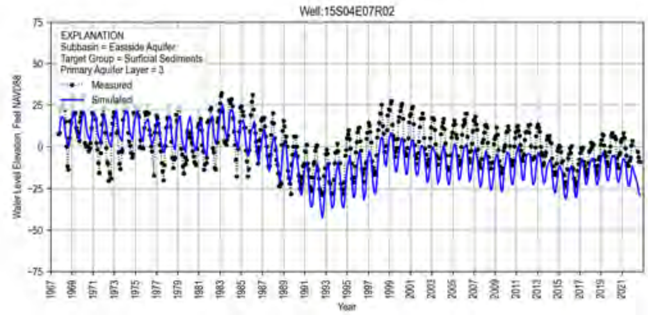

Well:15S03E28B02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

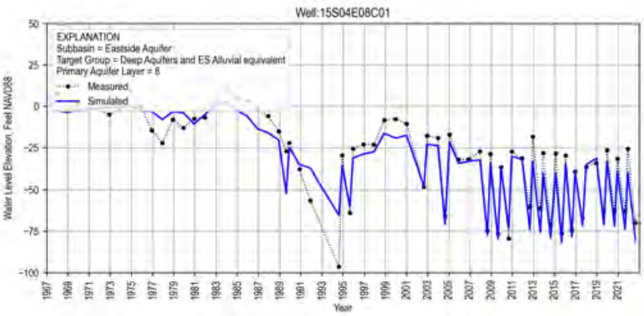

Well:15S04E05M01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 8
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

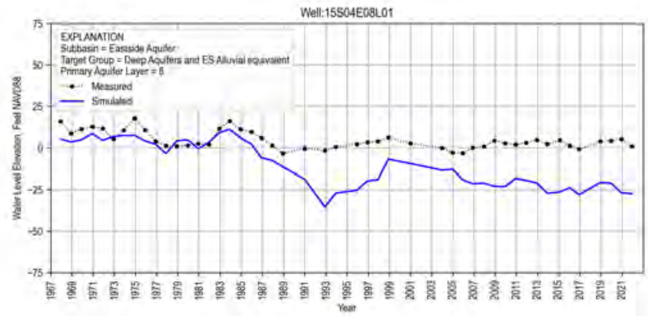


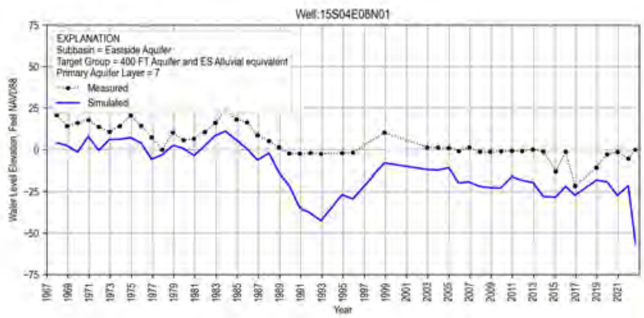


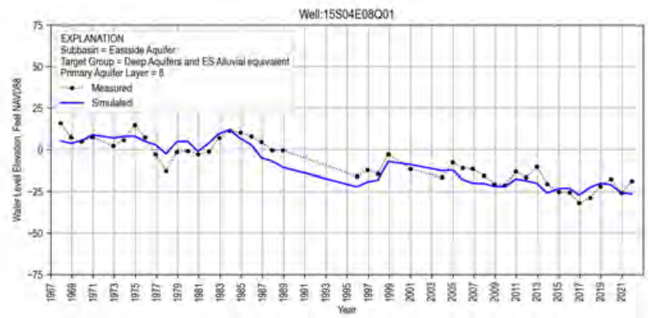


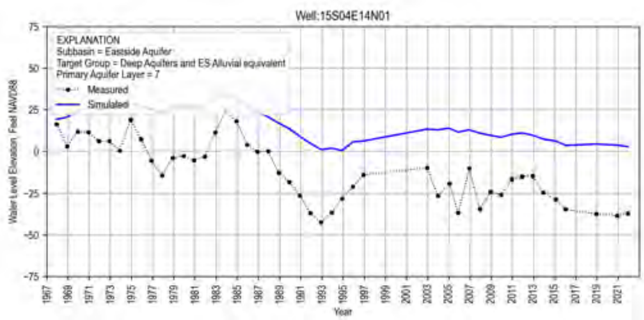


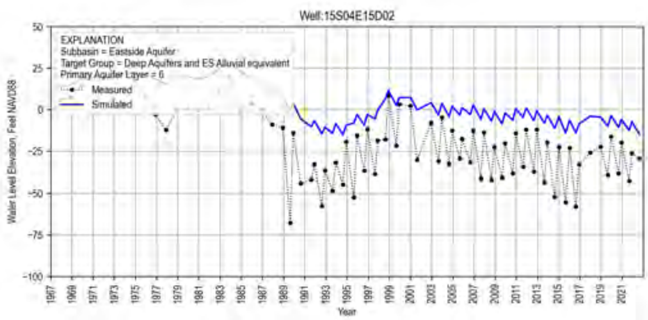












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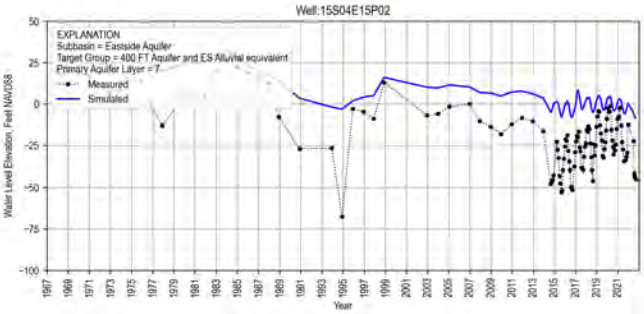

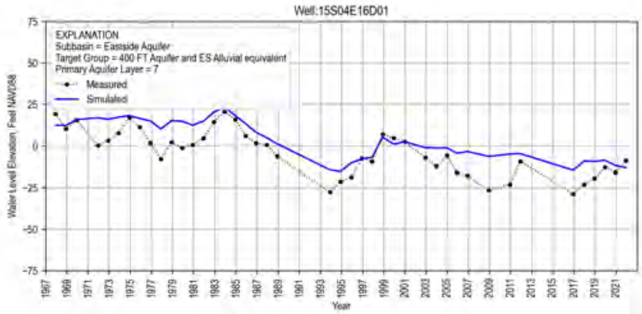

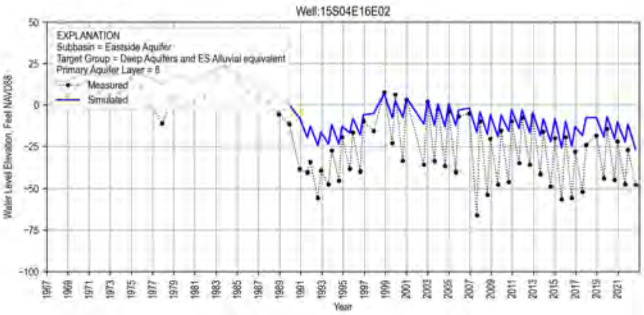

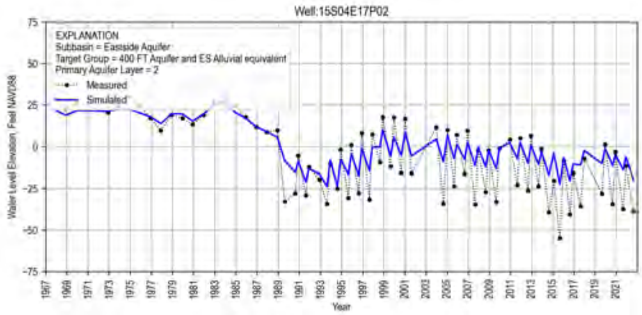

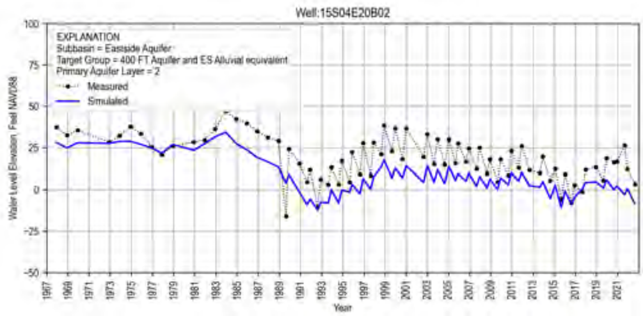

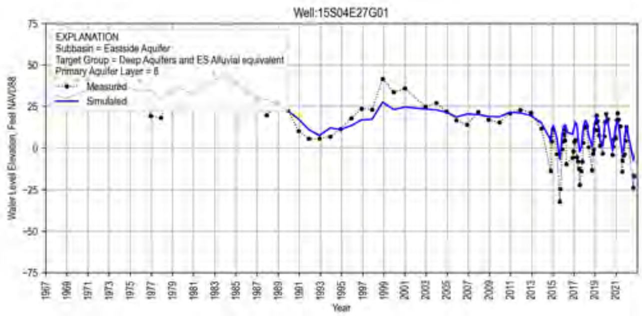

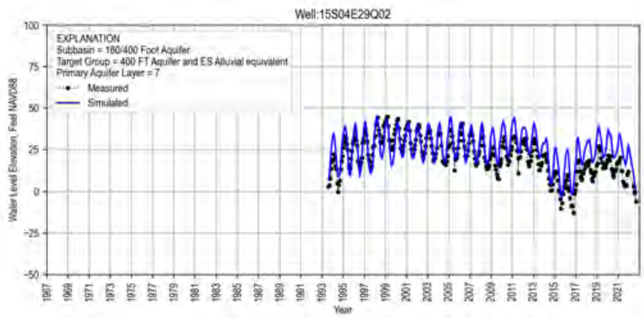

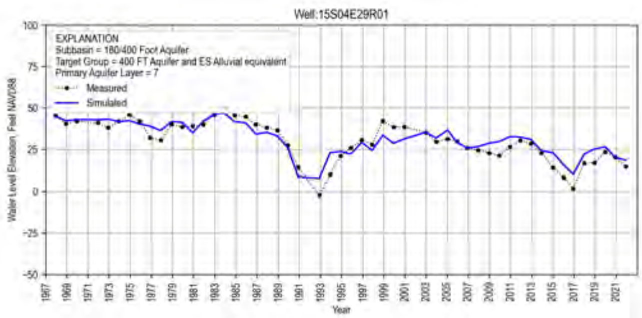

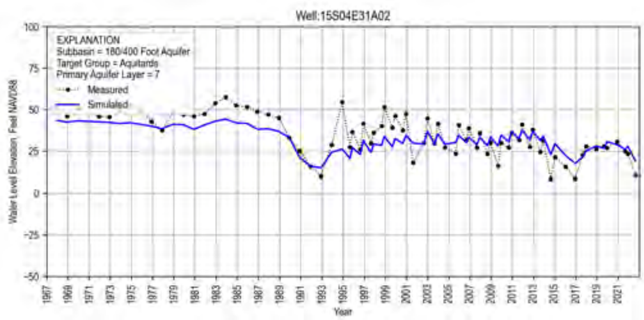

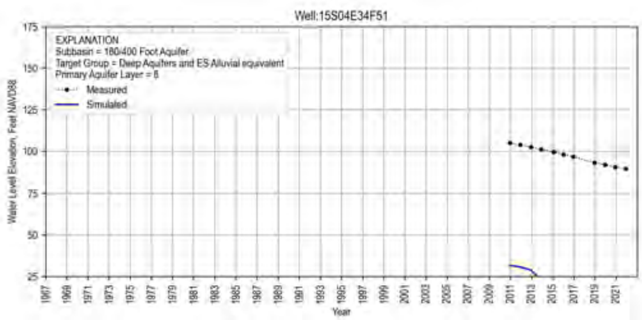

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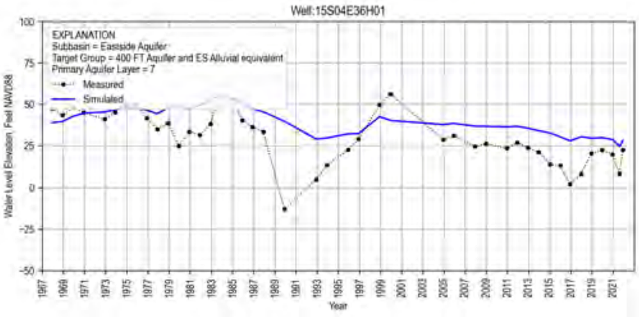
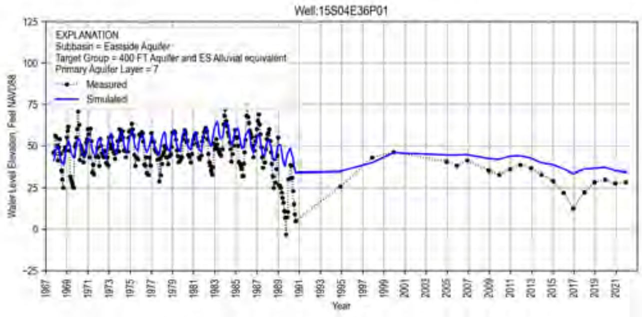
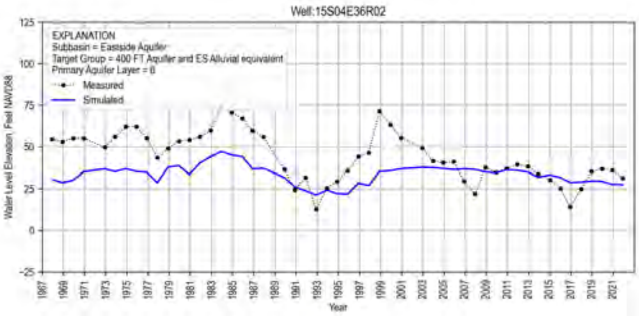
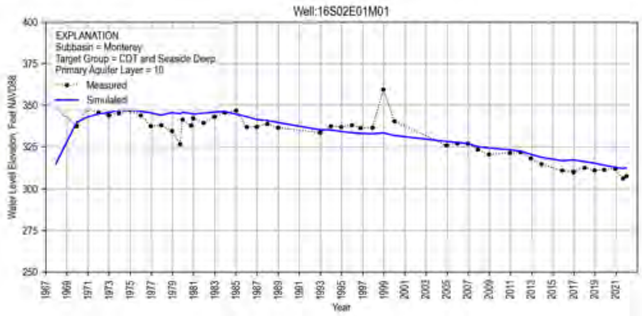
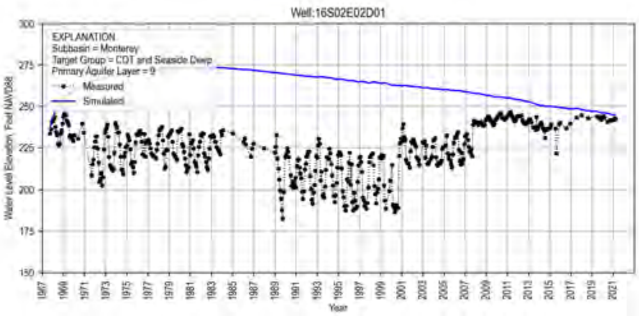
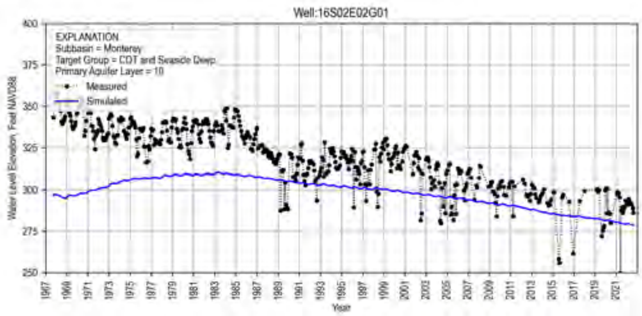

Well:15S04E36H01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

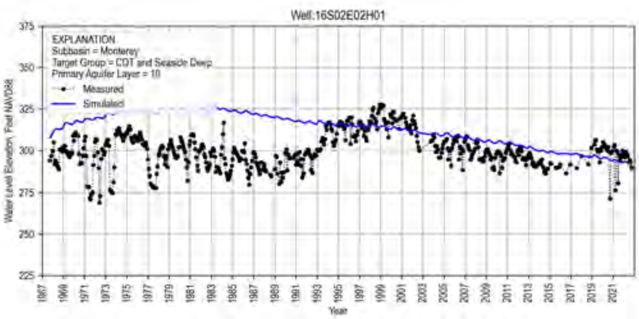

Well:15S04E36P01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

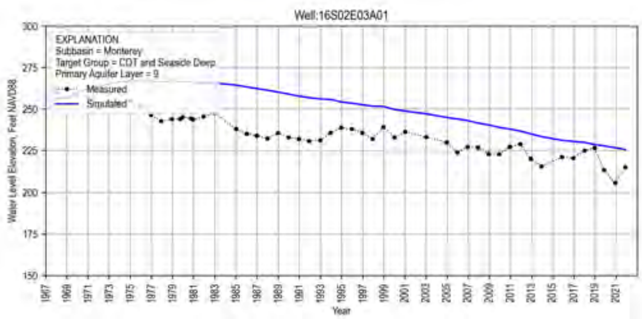

Well:15S04E36R02
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

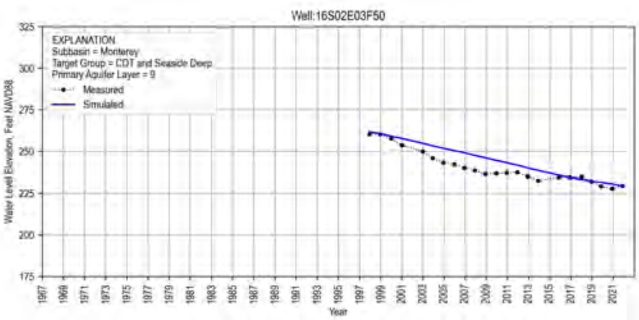

Well:16S02E01M01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

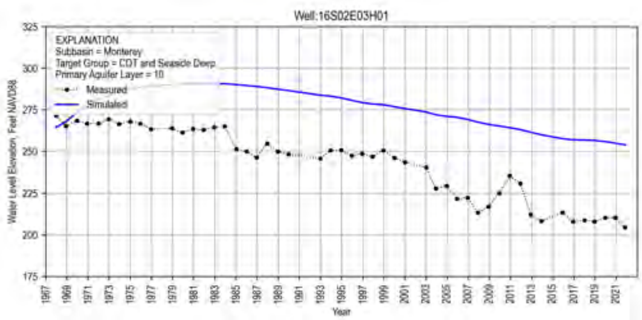

Well:16S02E02D01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

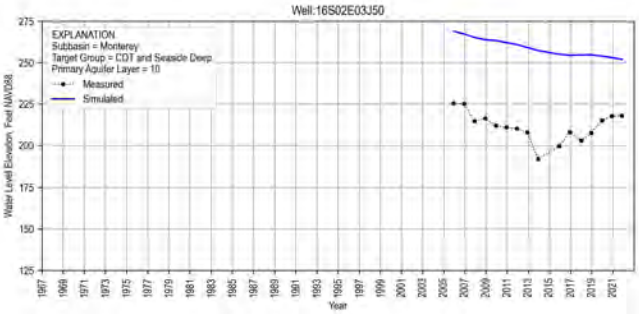

Well:16S02E02G01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

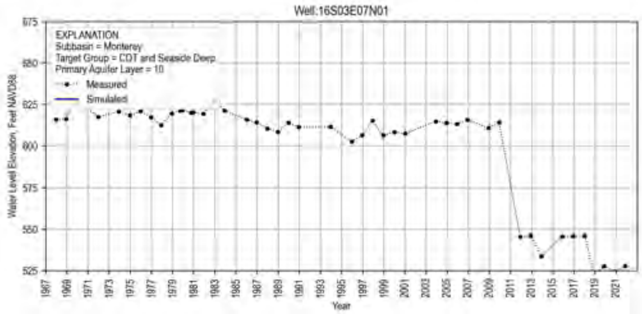

Well:16S02E02H01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:16S02E03A01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:16S02E03F50
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

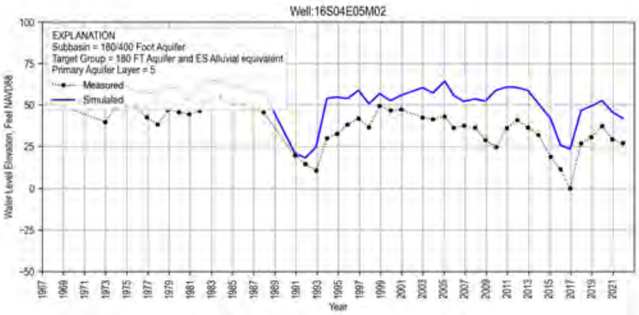

Well:16S02E03H01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

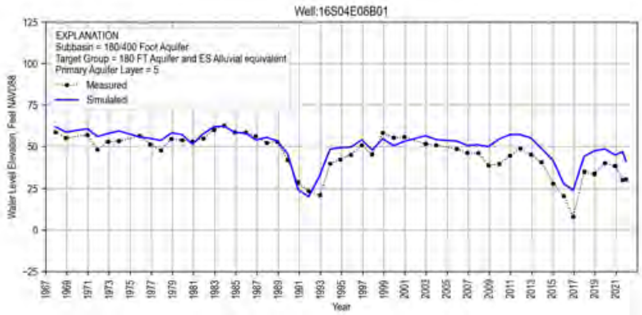

Well:16S02E03J50
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

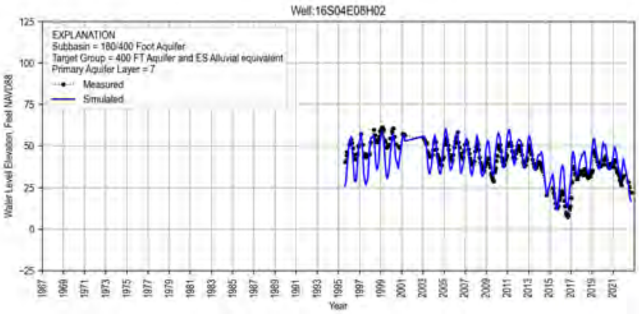

Well:16S03E07N01
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

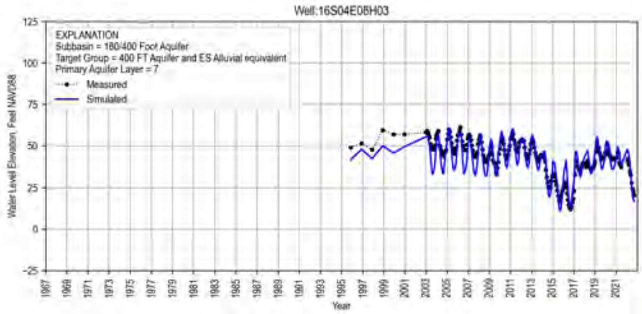

Well:16S04E02Q03
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

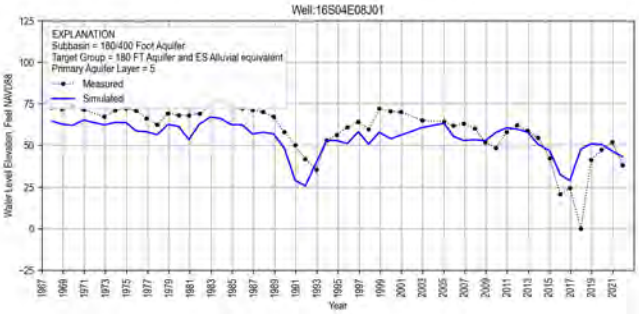

Well:16S04E04C01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Aquitards
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

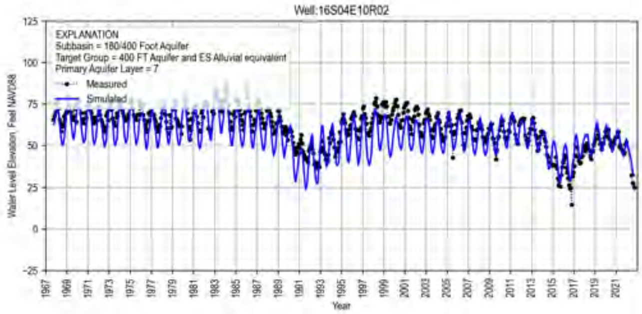

Well:16S04E05M02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

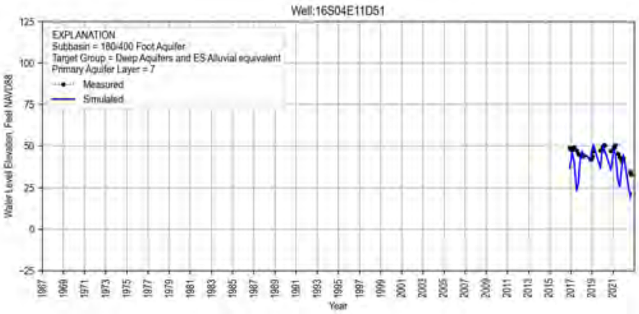

Well:16S04E06B01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

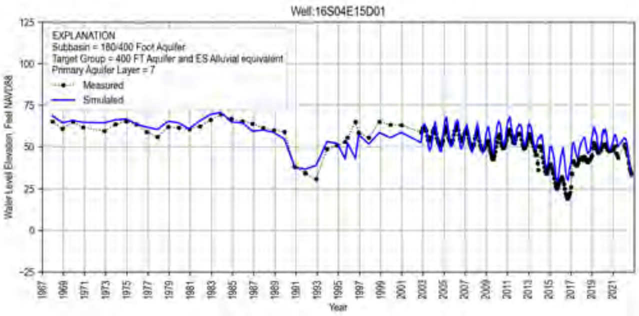

Well:16S04E08H02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

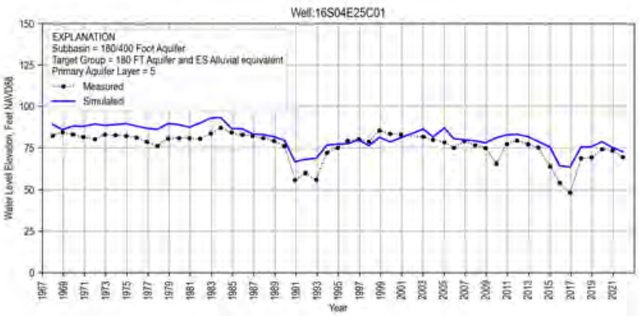

Well:16S04E08H03
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

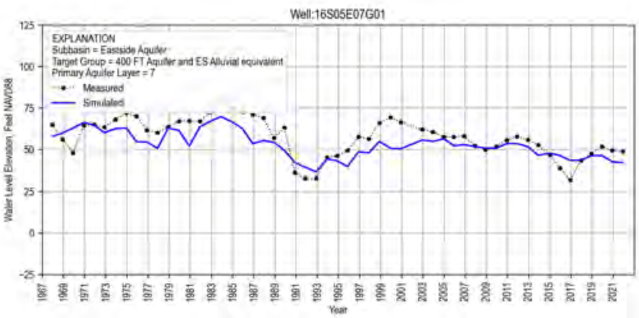

Well:16S04E08J01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

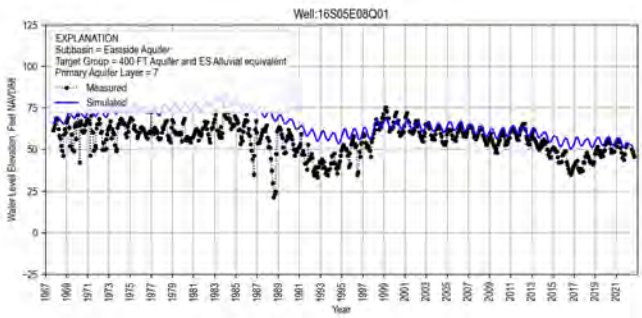

Well:16S04E10R02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

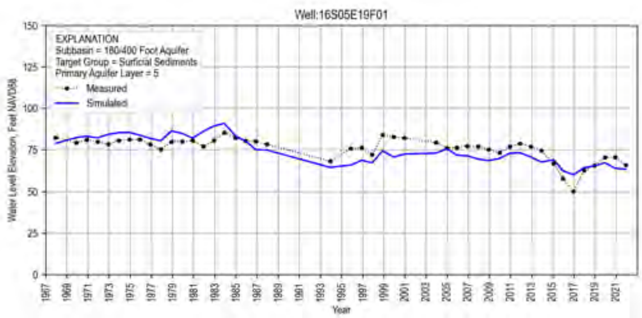












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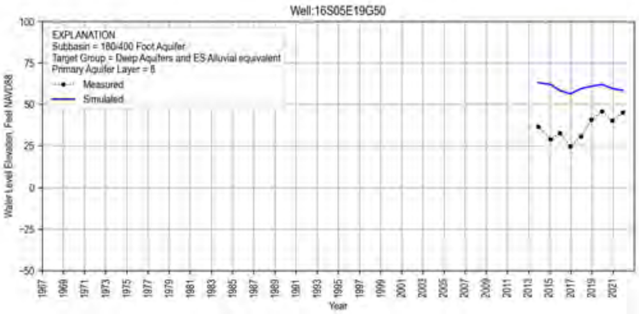
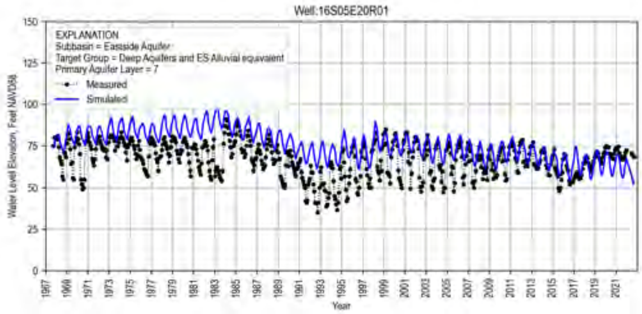
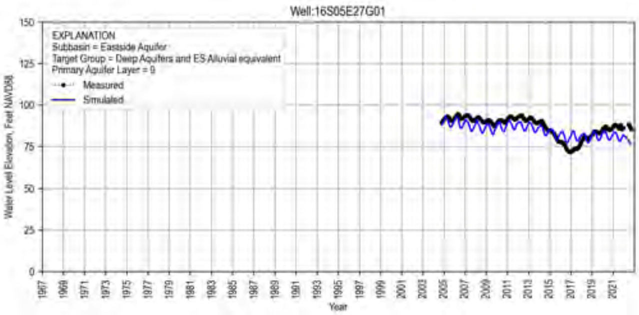
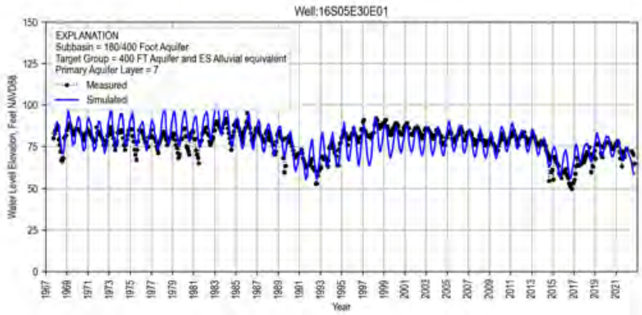
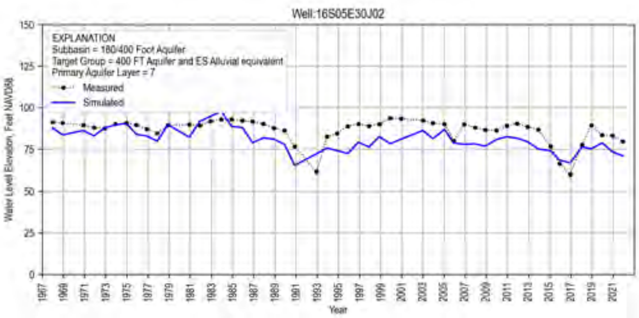
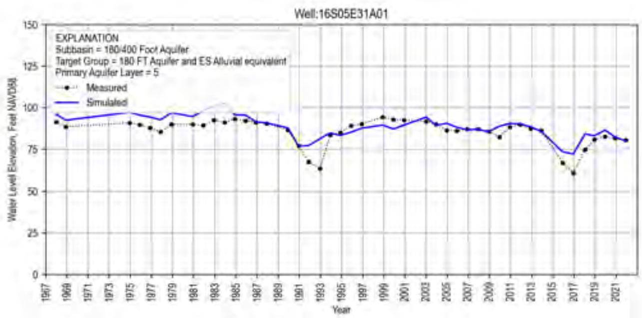

Well:16S05E19G50
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 8
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:16S05E20R01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

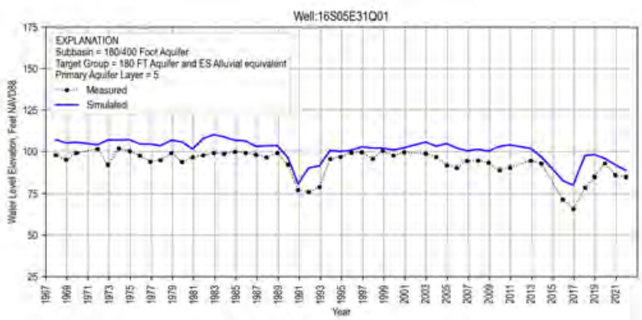

Well:16S05E27G01
EXPLANATION
Subbasin = Eastside Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

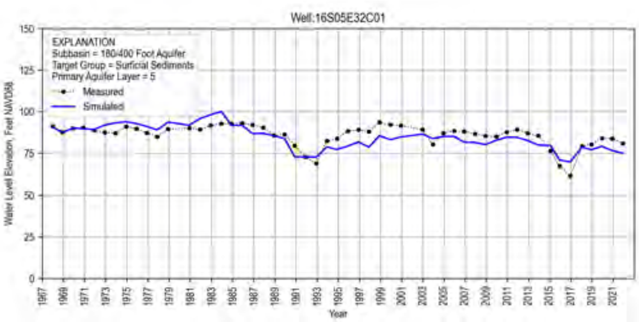

Well:16S05E30E01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

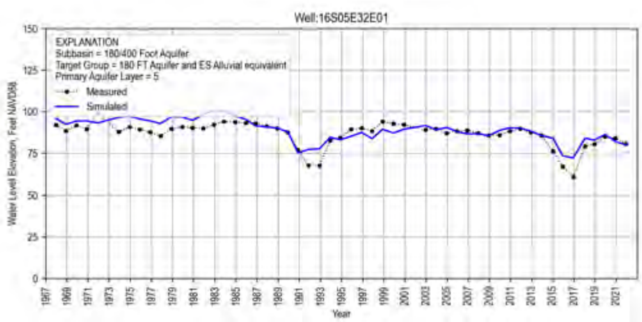

Well:16S05E30J02
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

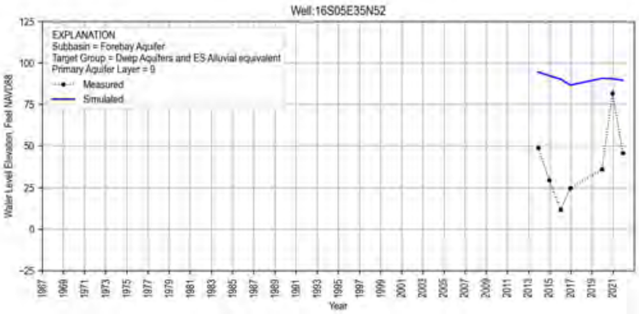

Well:16S05E31A01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

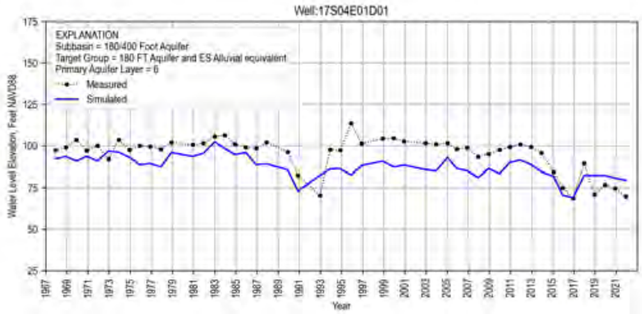

Well:16S05E31M01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

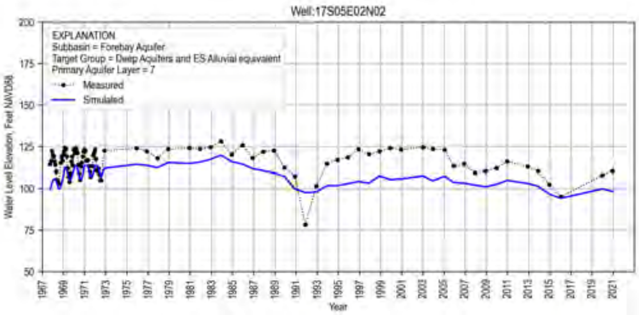

Well:16S05E31Q01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

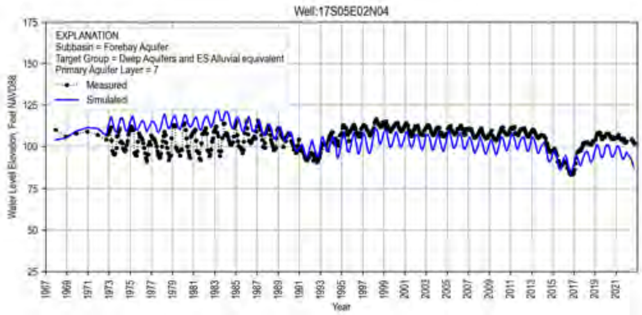

Well:16S05E32C01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

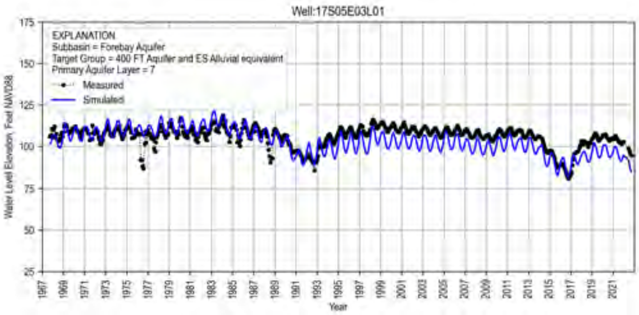

Well:16S05E32E01
EXPLANATION
Subbasin = 180/400 Foot Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

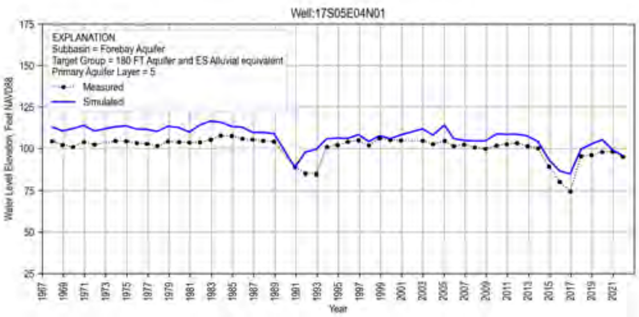


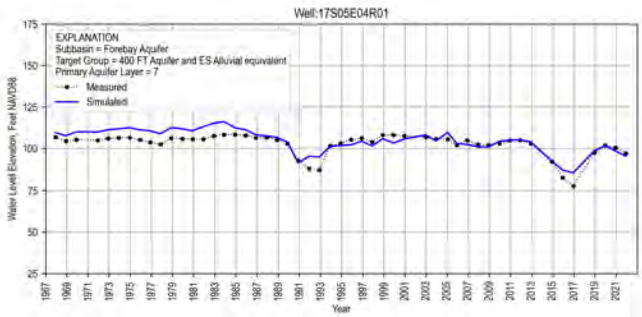


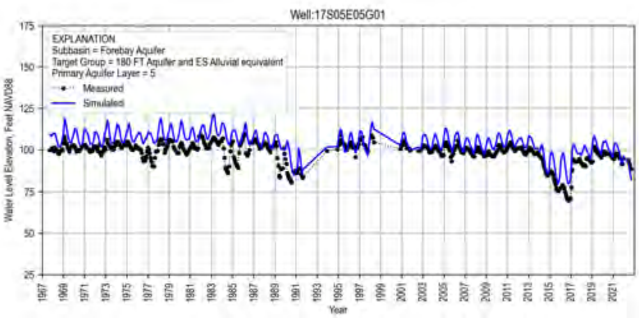


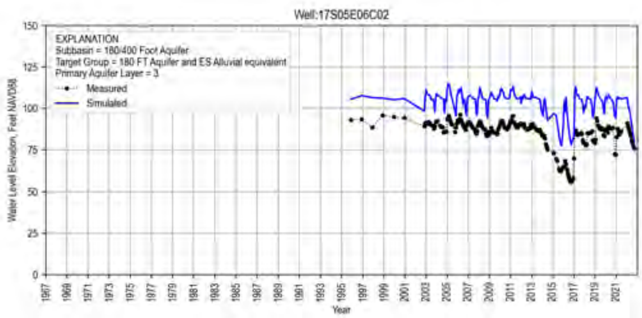












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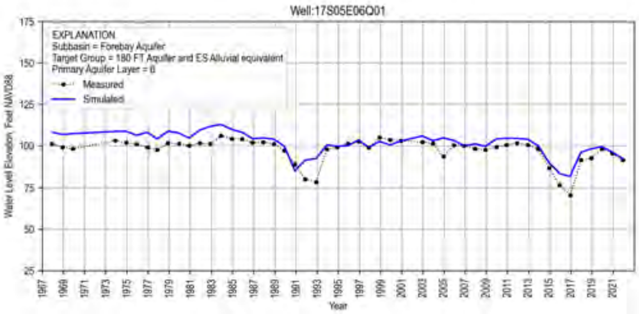
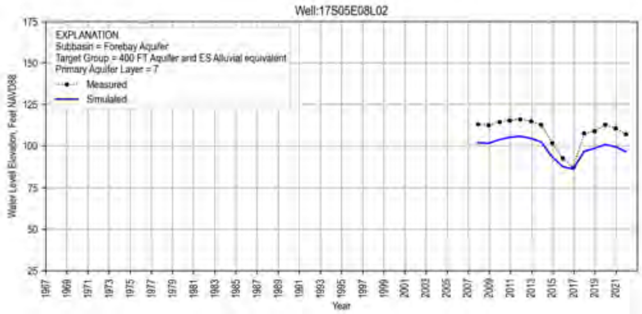
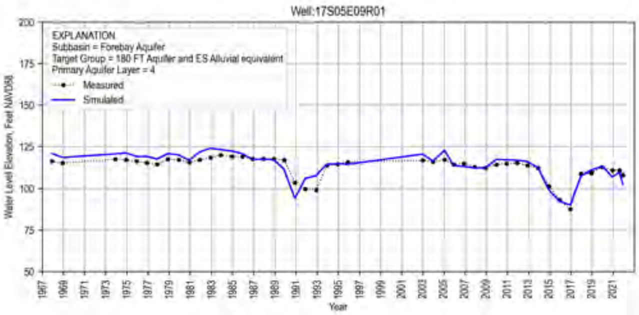
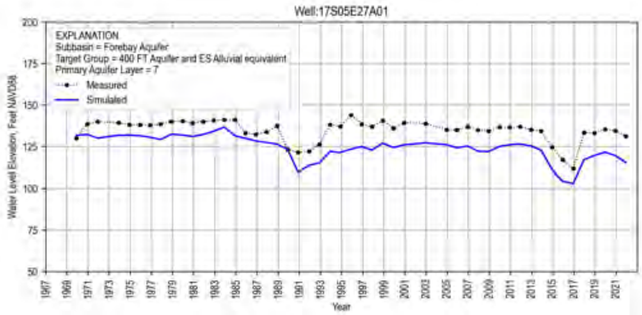
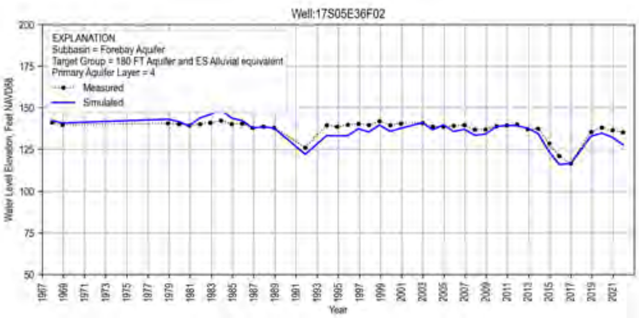
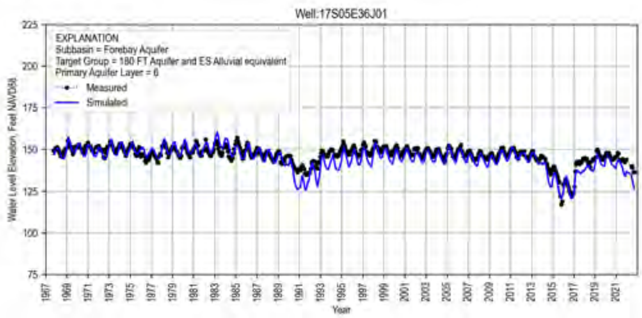

Well:17S05E06Q01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

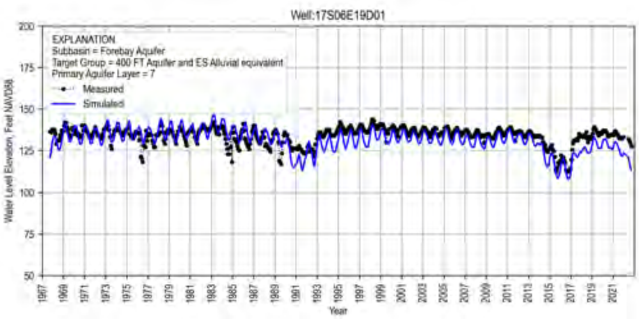

Well:17S05E08L02
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:17S05E09R01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 4
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:17S05E27A01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

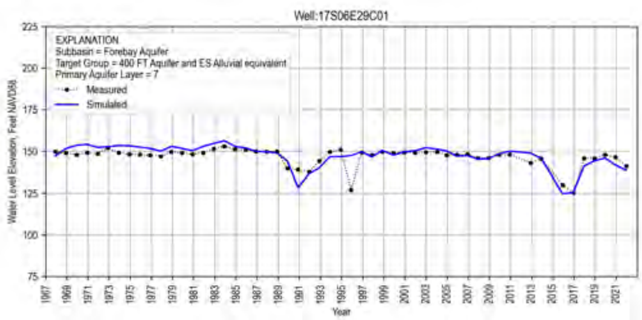

Well:17S05E36F02
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 4
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:17S05E36J01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 180 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 6
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

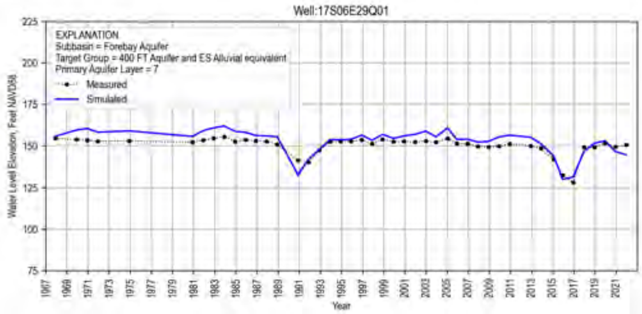

Well:17S06E19D01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

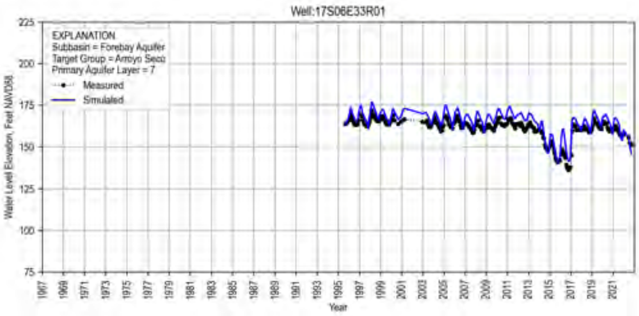

Well:17S06E20E02
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

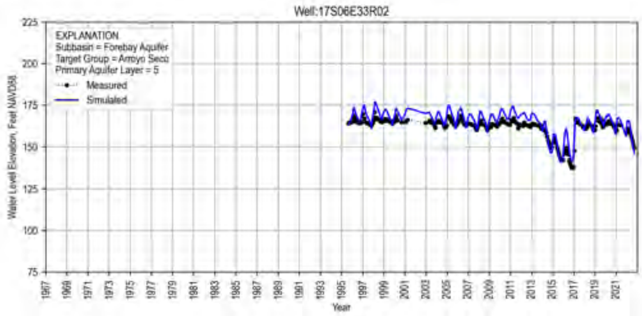

Well:17S06E27K01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:17S06E29C01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

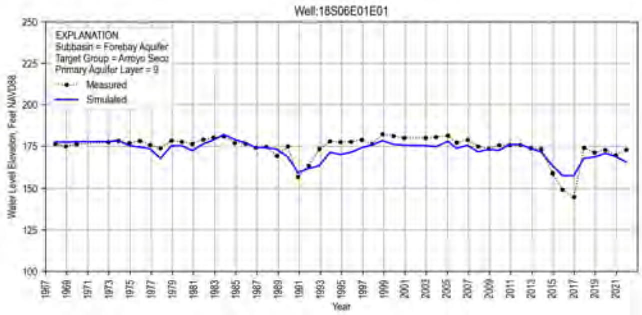

Well:17S06E29K01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

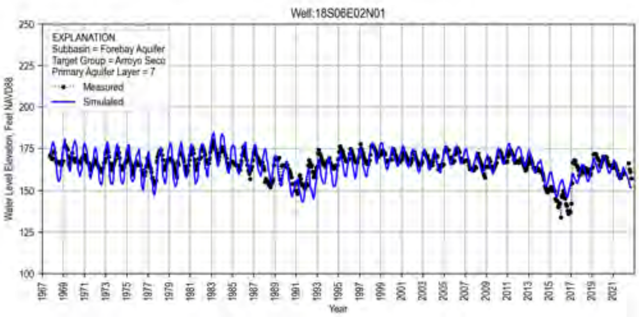

Well:17S06E29Q01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

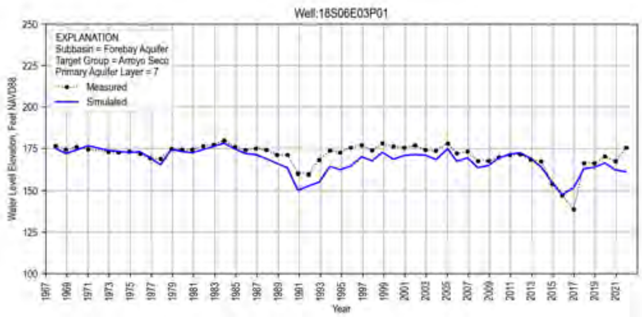

Well:17S06E33R01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Arroyo Seco
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

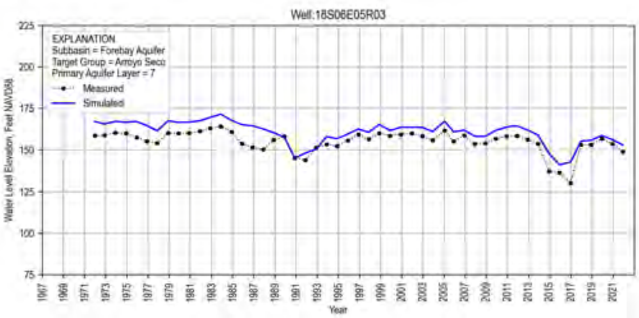

Well:17S06E33R02
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Arroyo Seco
Primary Aquifer Layer = 5
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

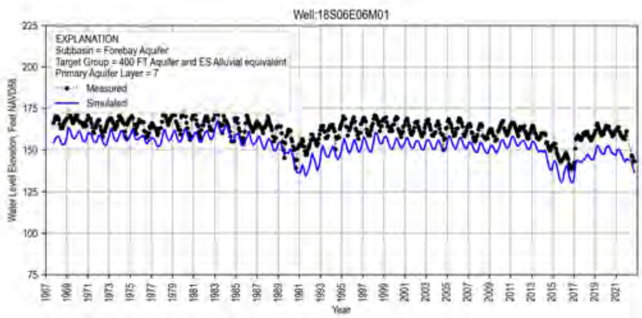

Well:17S06E35J01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Deep Aquifers and ES Alluvial equivalent
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

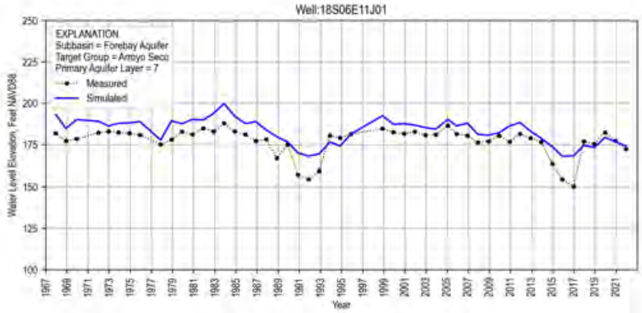

Well:18S06E01E01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Arroyo Seco
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

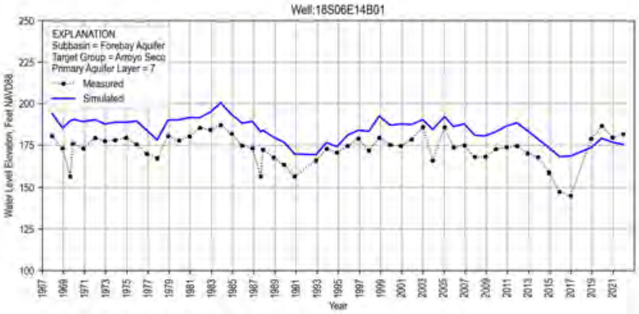

Well:18S06E02N01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Arroyo Seco
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

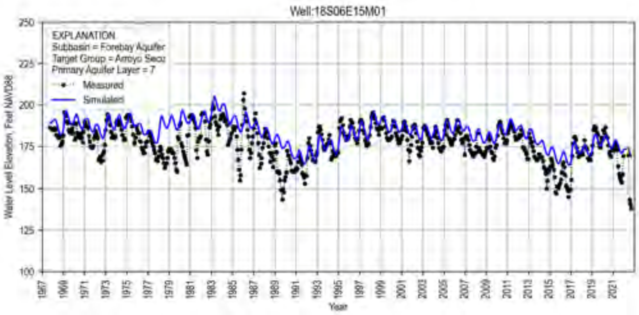

Well:18S06E03P01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Arroyo Seco
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

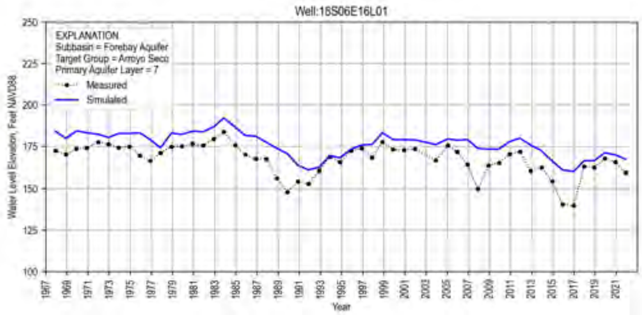

Well:18S06E05R03
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = Arroyo Seco
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

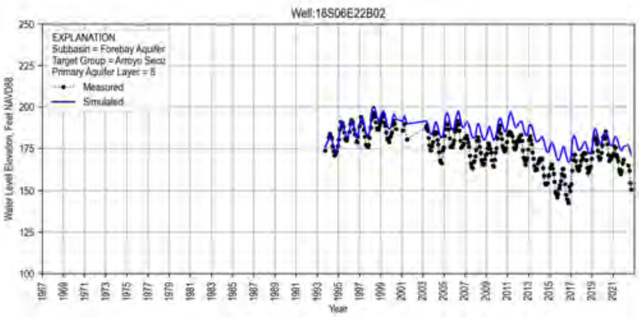

Well:18S06E06M01
EXPLANATION
Subbasin = Forebay Aquifer
Target Group = 400 FT Aquifer and ES Alluvial equivalent
Primary Aquifer Layer = 7
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

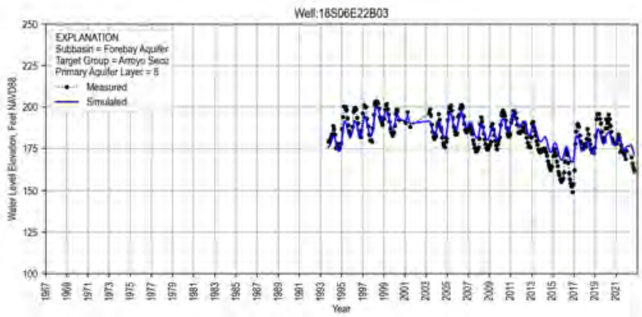


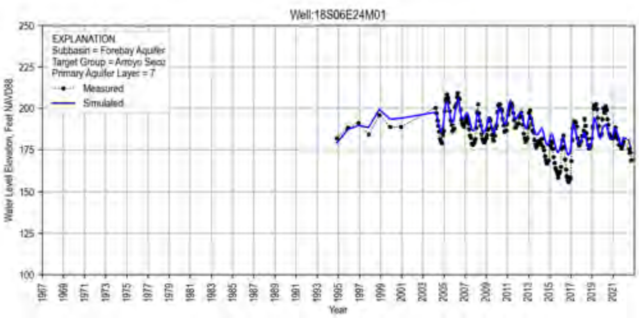












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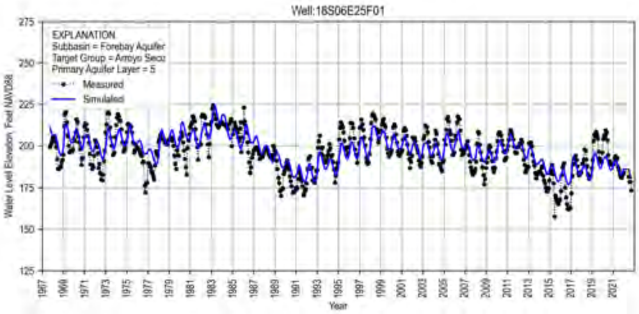

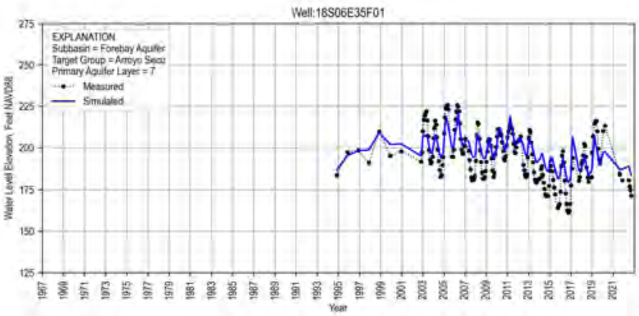

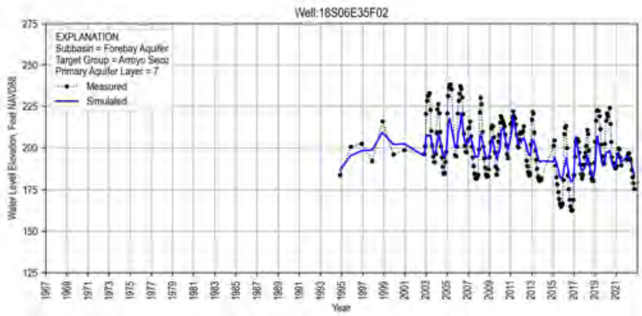

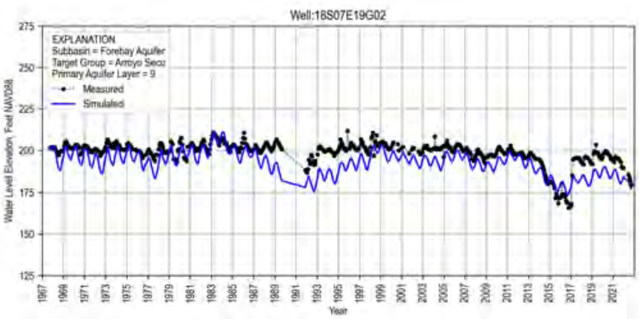

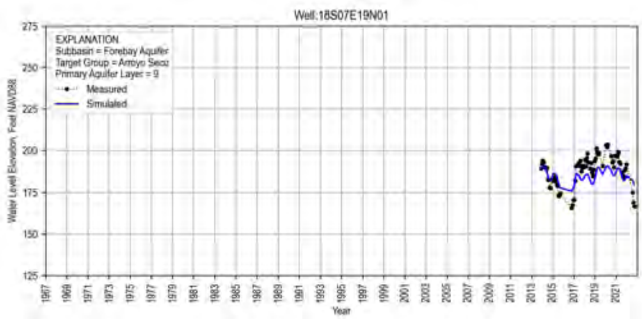

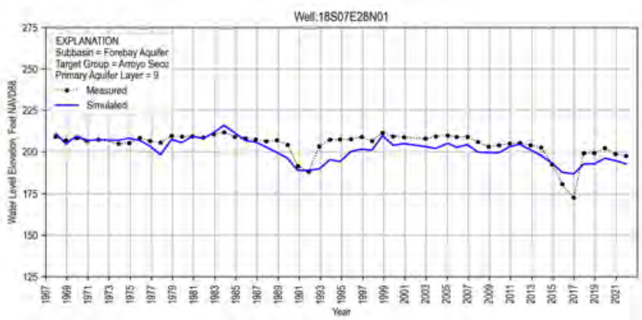

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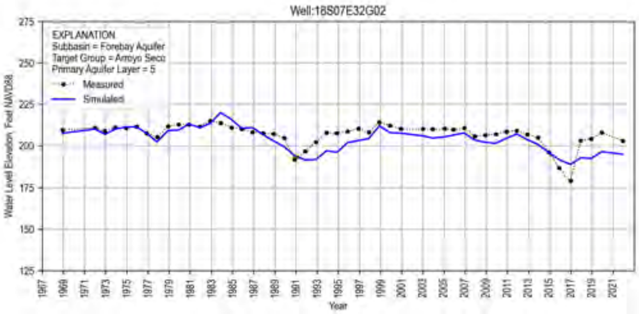

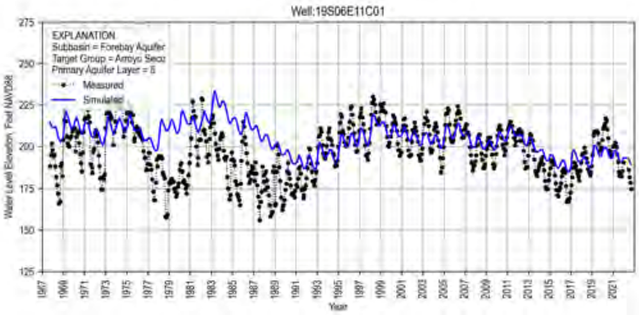

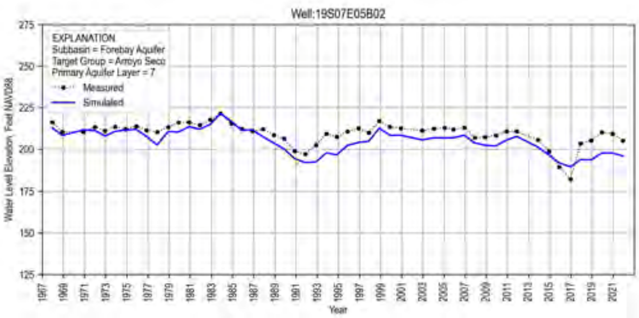

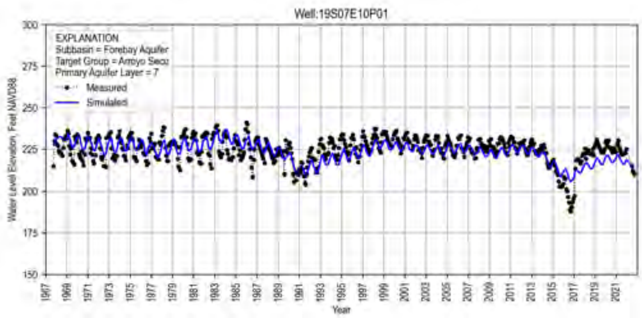

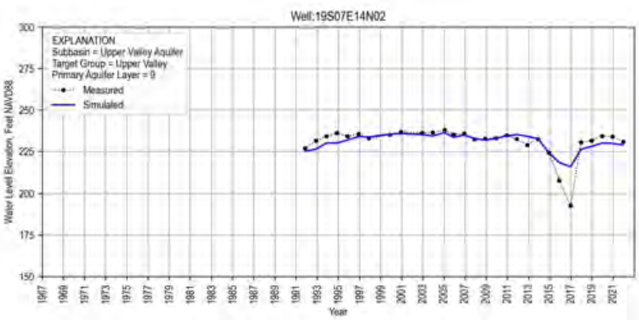

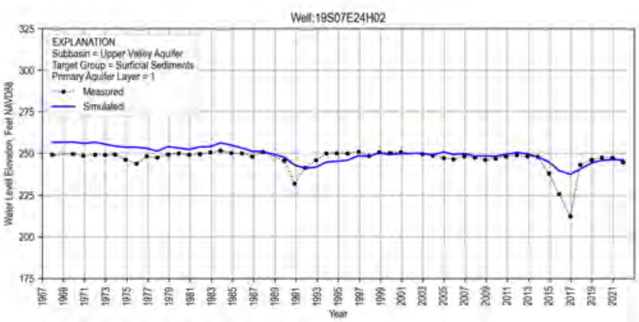

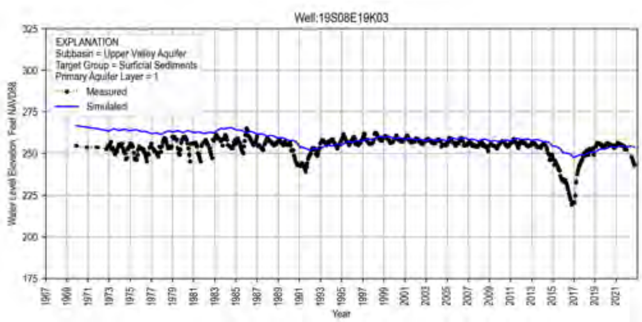

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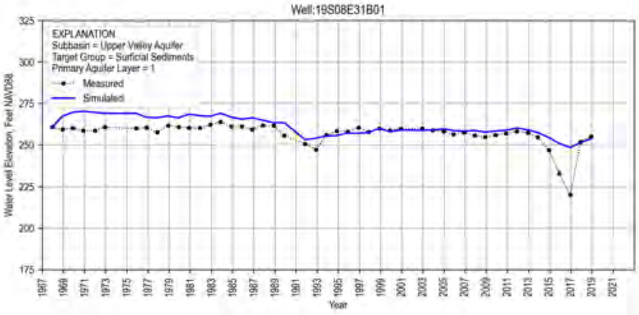
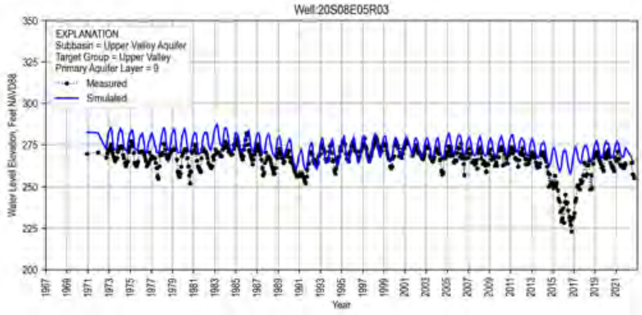
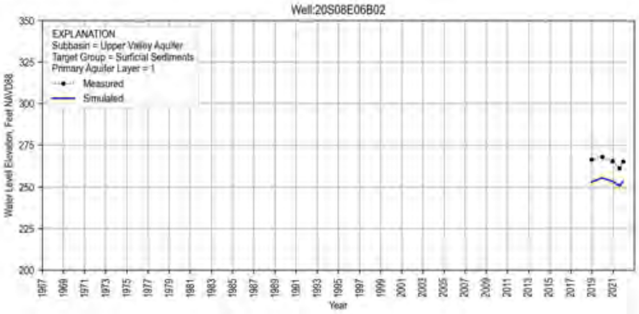
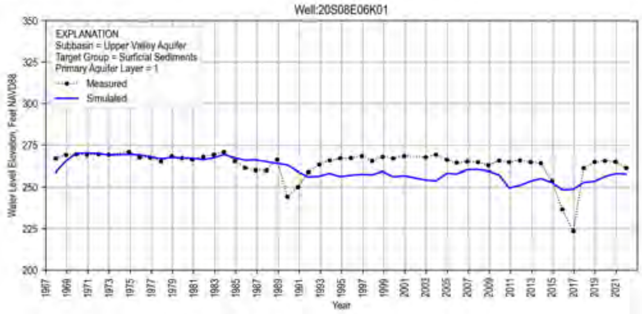
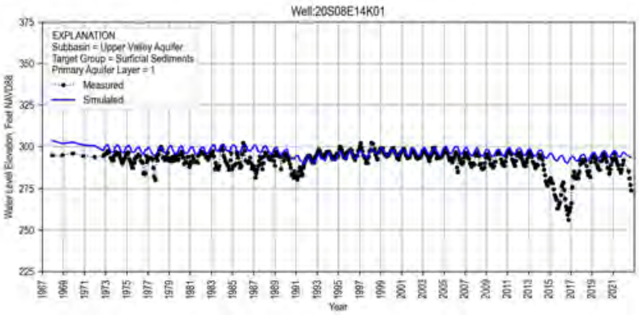
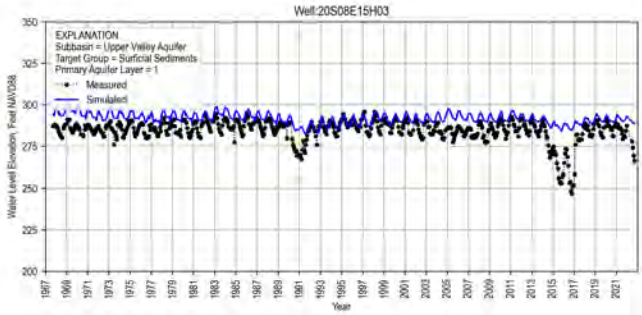

Well:19S08E31B01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

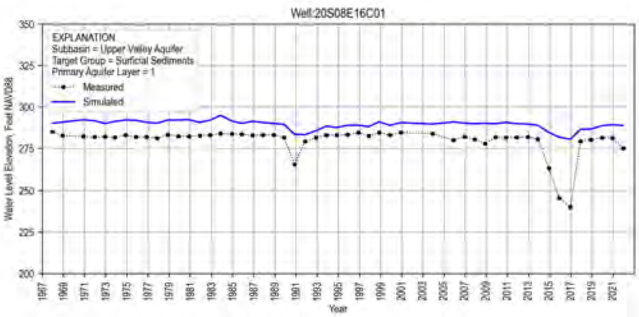

Well:20S08E05R03
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Upper Valley
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

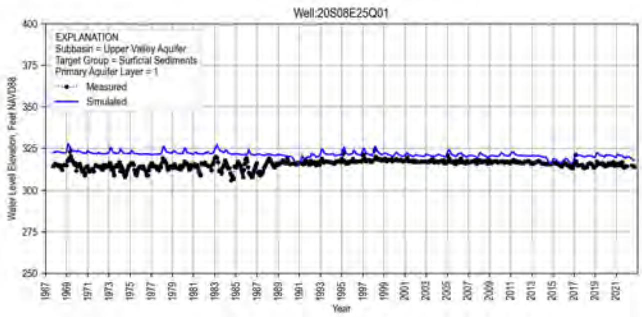

Well:20S08E06B02
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

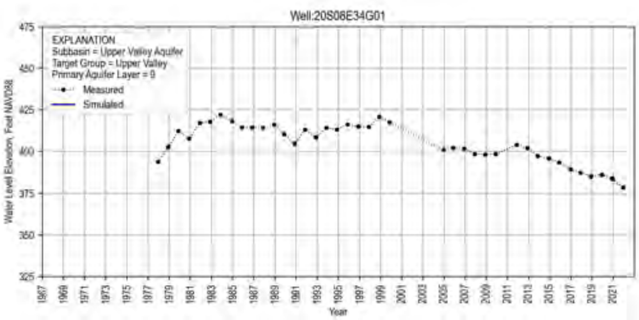

Well:20S08E06K01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

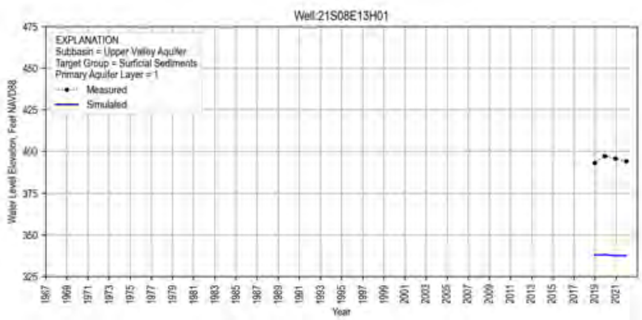

Well:20S08E14K01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

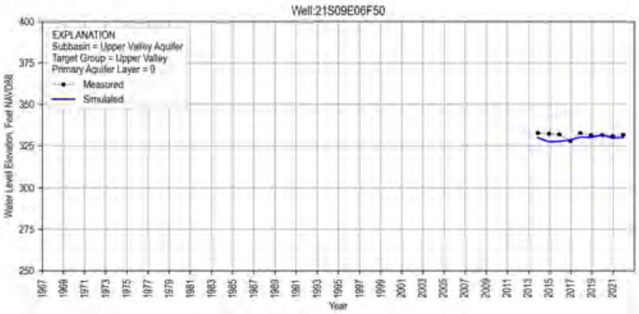

Well:20S08E15H03
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

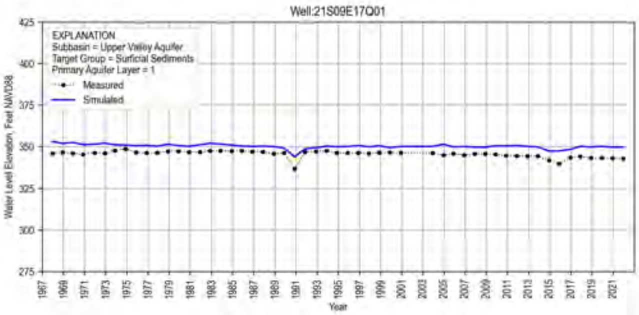

Well:20S08E16C01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

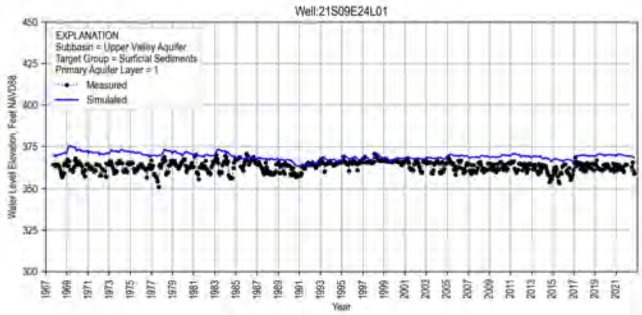

Well:20S08E25Q01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

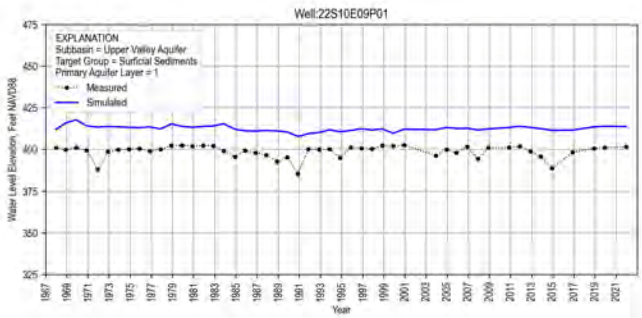

Well:20S08E34G01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Upper Valley
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

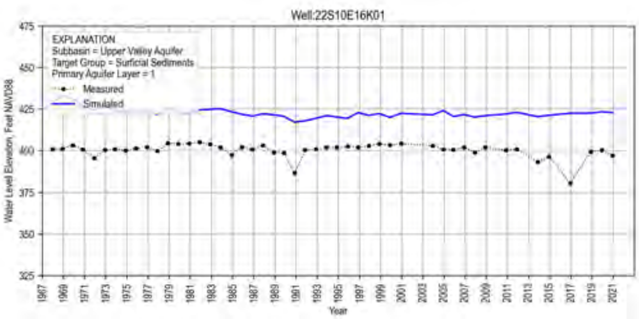

Well:21S08E13H01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year

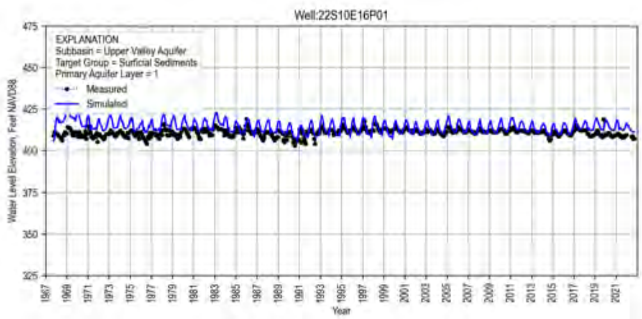


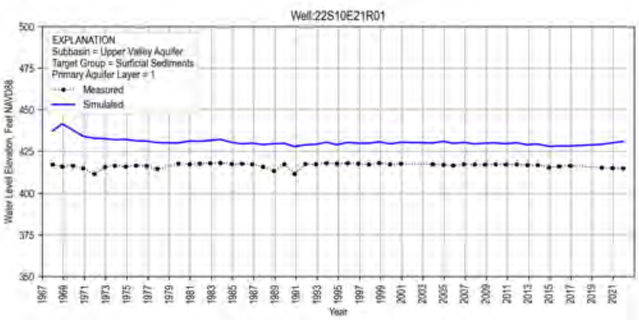


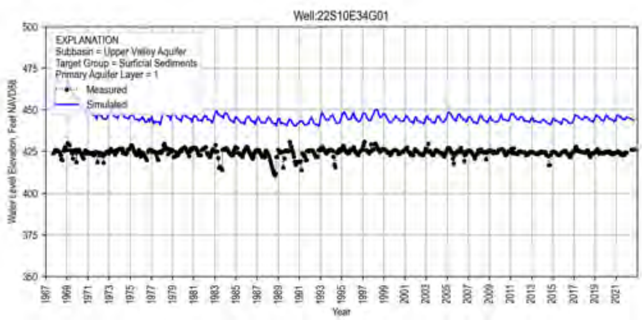












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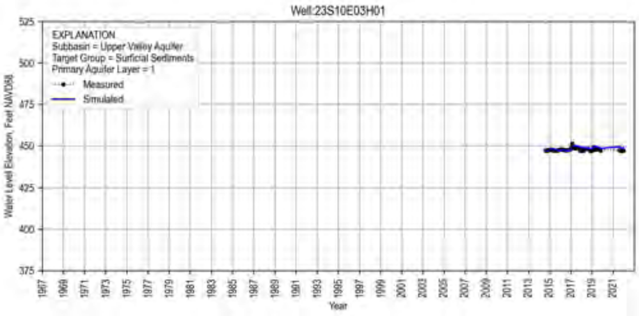
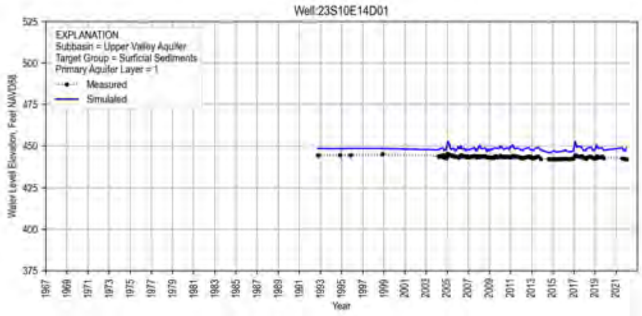
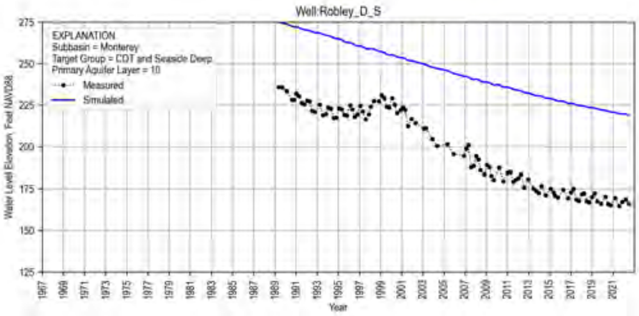
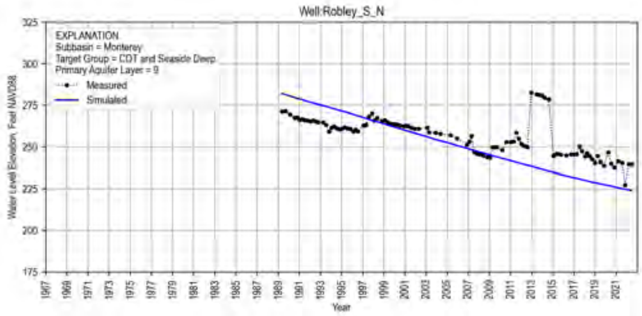

Well:23S10E03H01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:23S10E14D01
EXPLANATION
Subbasin = Upper Valley Aquifer
Target Group = Surficial Sediments
Primary Aquifer Layer = 1
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:Robley_D_S
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 10
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year


Well:Robley_S_N
EXPLANATION
Subbasin = Monterey
Target Group = CDT and Seaside Deep
Primary Aquifer Layer = 9
Measured
Simulated
Water Level Elevation, Feet NAVD88
Year