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May 28, 2026

VIA E-MAIL

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California Department of Water Resources
Sustainable Groundwater Management Office
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Re: Allocating responsibility to achieve sustainability in 5-year Evaluation of GSP for Salinas Valley's 180/400-Foot Aquifer Subbasin

Dear Ms. Salais:

These comments are submitted on behalf of the Salinas Valley Water Coalition ("Coalition") to help the California Department of Water Resources ("DWR") complete its review of the first Five-year Evaluation of the groundwater sustainability plan ("GSP") that the Salinas Valley Basin Groundwater Sustainability Agency ("SVBGSA") has approved for the 180/400-Foot Aquifer Subbasin ("180/400 Subbasin") pursuant to Water Code section 10733.8 and Title 23, Section 355.6 of the California Code of Regulations.

DWR previously designated the 180/400 Subbasin as critically overdrafted with a history of seawater intrusion that dates back to the 1930s. The 180/400 Subbasin is one of six subbasins that make up the Salinas Valley Groundwater Basin. Four of the six subbasins encompass the majority of commercial agricultural, municipal and industrial ("M&I") and other pumping from the Basin: 180/400; Eastside; Forebay; and Upper Valley. The remaining two subbasins, the Monterey Subbasin and the Langley Subbasin, involve largely non-commercial agricultural, domestic, and M&I pumping. These comments focus on pumping in the 180/400, Eastside, Forebay, and Upper Valley subbasins.

The status of those four subbasins is as follows:

- **Upper Valley ("UV"):** Medium priority; **GSP sustainability finding approved by DWR**; 5-year evaluation due in 2027; 2042 sustainability deadline.
- **Forebay ("FB"):** Medium priority; **GSP sustainability finding approved by DWR**; 5-year evaluation due in 2027; 2042 sustainability deadline.
- **Eastside ("ES"):** High priority; **GSP approved**; 5-year evaluation due 2027; 2042 sustainability deadline.

- **180/400:** High priority; designated by DWR as **critically overdrafted with seawater intrusion**; **2020 GSP approved by DWR with five recommended corrective actions**; 5-year evaluation submitted to DWR in 2025.

After DWR reviewed the SVBGSA's 5-year Evaluation of the 180/400 GSP, DWR requested further data about stopping seawater intrusion and achieving sustainability by the Sustainable Groundwater Management Act's ("SGMA") 2040 deadline. (December 1, 2025, DWR letter to SVBGSA and related slide-deck presentation.) On April 30, 2026, the SVBGSA submitted additional information to DWR in support of its 5-year Evaluation. We understand that certain stakeholders from the 180/400 Subbasin recently met with DWR and submitted additional information, while other stakeholders have submitted letters offering their views.

As DWR completes its 5-year Evaluation of the 180/400 GSP, and considers projects and management actions the SVBGSA and others have identified to achieve sustainability, it is critical for DWR to focus on projects and management actions that can be carried out by the pumpers who actually are causing seawater intrusion. DWR's 5-year Evaluation should not recommend or support projects and management actions that would impact pumpers in other subbasins who are not materially contributing to seawater intrusion. If DWR's 5-year Evaluation were to conclude that the 180/400 GSP is inadequate, then any probation and state-intervention proceeding must focus on the 180/400 Subbasin, where decades of critical overdraft pumping has caused the seawater intrusion problem.

Significant New Information From the SVBGSA's Lead Technical Consultant Shows the Impacts of Subbasin-Scale Pumping on Salinas Valley Hydrology and Seawater Intrusion

This letter submits significant new information developed by the SVBGSA's lead technical consultant, Montgomery & Associates ("M&A"), that shows how pumping in the Upper Valley, Forebay, Eastside and 180/400 subbasins affects groundwater conditions in these subbasins, river flows, and seawater intrusion. The SVBGSA received the new information from M&A during its January 5, 2026, Board of Directors meeting, so the information is part of the administrative record for the 180/400 GSP and its 5-year Evaluation. The Coalition now submits this information to DWR through this comment letter and its enclosures to ensure it becomes part of DWR's administrative record for the 180/400 GSP's 5-year Evaluation and the upcoming 2027 5-year Evaluations for the Upper Valley, Forebay, and Eastside GSPs. The significant new information includes the following:

- May 27, 2026, UES Technical Memorandum for Coalition re Salinas Valley Superposition Modeling Results, Key Observations on Subbasin Hydrologic Connections and Influences ("UES Key Observations Memo"), including Attachments 1 and 2 (attached as **Exhibit 1**);
- January 5, 2026, aquilogic, Inc. Memo for Salinas Basin Water Alliance ("SBWA") re Results of Inter-Subbasin Impact Modeling (attached as **Exhibit 2**);
- January 5, 2026, UES Memo for Coalition re Superposition Modeling—Summary Points (attached as **Exhibit 3**);
- December 19, 2025, Technical Memorandum from M&A re "Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and the Salinas Basin Water Alliance (SBWA)" ("M&A Superposition Memo") (attached as **Exhibit 4**);



- o Attachment 1 to M&A Superposition Memo re Valleywide Figures (included in Exhibit 4);
 - o Attachment 2 to M&A Superposition Memo re Groundwater Level Change Maps (included in Exhibit 4);
- December 19, 2025, M&A Letter re Response to Comments on Computer Modeling Draft Technical Memo (attached as **Exhibit 5**);
- December 2, 2025, aquilogic, Inc. Memo for SBWA re Comments on Montgomery & Associates draft memorandum, “*results of Computer Modeling Agreement for SVWC and SBWA*,” dated August 22, 2025 (attached as **Exhibit 6**);
- October 18, 2025, UES Memo for Coalition re Technical Review Comments on Montgomery & Associates’ Superposition Modeling Technical Memorandum dated August 22, 2025 (attached as **Exhibit 7**); and
- August 22, 2025, M&A Technical Memo re Results of Computer Modeling Agreement for SVWC and SBWA (attached as **Exhibit 8**).

Allocating sustainability burdens in proportion to pumping impacts: The new information developed by the GSA’s lead technical consultant arises from an agreement between two of the Salinas Valley’s principal agricultural stakeholder groups to fund superposition modeling work to show how pumping in each subbasin respectively affects seawater intrusion, groundwater levels, and river flows in the Salinas Valley. The Coalition’s purpose in jointly funding the work with the SBWA was to inform how the SVBGSA allocates responsibility for stopping seawater intrusion in the 180/400 Subbasin through funding new water projects, imposing demand management, or both.

The Salinas Valley’s subbasins are hydraulically connected, so some stakeholders have advocated that the Basin be managed like a bathtub in which all pumping in all subbasins significantly contributes to seawater intrusion in the 180/400 Subbasin. Based on the bathtub theory, the SBWA has contended that pumpers throughout the entire Basin should essentially bear the same burden to stop seawater intrusion as pumpers in the 180/400 Subbasin.

The Coalition submits that the Salinas Valley is not like a bathtub, because the best available science from the SVBGSA shows there are significant differences that cannot be ignored in how pumping in each subbasin affects groundwater conditions in other subbasins, including seawater intrusion in the 180/400 Subbasin. As a result, the burden of stopping seawater intrusion should be allocated in proportion to the impact of pumping on seawater intrusion. Pumpers that most contribute to seawater intrusion should proportionally bear most of the burden to stop seawater intrusion through projects and management actions, while pumpers that contribute little or nothing to seawater intrusion should bear little or no such burden.

Superposition modeling by the SVBGSA’s lead technical consultant shows the proportional contribution of individual subbasin pumping to seawater intrusion in the 180/400 Subbasin as follows:



- 180/400 Subbasin pumping causes 74.1 percent of seawater intrusion.
- Eastside Subbasin pumping causes 18.6 percent of seawater intrusion.
- Forebay Subbasin pumping causes 3.8 percent of seawater intrusion.
- Upper Valley Subbasin pumping causes 3.5 percent of seawater intrusion.

(See May 25, 2026, UES Key Observations Memo at p. 3 (Table 1 re Seawater Intrusion Caused by Historical Pumping by Subbasin).) The SBWA admits in writing that the best available science shows pumping in the 180/400 and Eastside (“ES”) is causing seawater intrusion (“SWI”) in the 180/400 and that Upper Valley (“UV”) and Forebay (“FB”) pumping does not:

- “Pumping in the 180/400 and ES causes the majority of SWI in the 180/400 (5,000 to 8,000 AFY and 1,000 to 2,000 AFY, respectively); and
- “Pumping in the UV and FB does not directly cause significant SWI in the 180/400”

(December 5, 2025, aquilogic, Inc. Memo to SVBGSA at p. 5.)

The Coalition submits that fundamental fairness, the Fifth Amendment to the U.S. Constitution, and public funding law, like Propositions 218 and 26, all require a proportional causal connection between burdens imposed on pumpers to stop seawater intrusion and the degree to which their pumping contributes to it. Under that controlling legal framework, the SVBGSA or the State through any future interim plan should impose the vast majority (92.7 percent) of the burden to stop seawater intrusion on pumpers in the 180/400 and Eastside subbasins, while Forebay and Upper Valley pumpers respectively contributing just 3.8 and 3.5 percent to seawater intrusion should bear little or no burden for resolving this long-standing undesirable effect of coastal pumping.

Impacts of subbasin pumping on groundwater flows between subbasins follows a similar pattern:

Upper Valley pumping causes insignificant changes in the volume of groundwater flowing into the 180/400 and Eastside subbasins. (UES Key Observations Memo, Table 3, at p. 4.) Forebay pumping causes modest changes to groundwater flow into the 180/400 and Eastside subbasins. (*Ibid.*). Meanwhile, Eastside pumping has caused a flow reversal of 49,265 AFA from the 180/400 Subbasin into the Eastside Subbasin, compared to pre-development conditions, which reflects that 32 percent of annual Eastside pumping is supported by subsurface inflow induced from the 180/400 Subbasin. (*Id.* at pp. 3-4.)

Meanwhile, 180/400 and Eastside pumping induces 2,600 AFA of *additional* subsurface groundwater outflow from the Forebay into these down-gradient subbasins. (January 5, 2026, UES Memo for Coalition to SVBGSA at p. 2.) That induced outflow is in addition to the 14,816 AFA of outflow from the Forebay under historical baseline conditions. (*Id.* at Figure 1.)

At bottom, the best available science shows that 180/400 and Eastside pumpers are causing the groundwater conditions that induce seawater intrusion into the 180/400 Subbasin, while the Forebay and Upper Valley subbasins contribute substantial groundwater inflow to the 180/400 and Eastside subbasins.



The Superposition Modeling Includes the Effect of Subbasin Pumping on Salinas River Flow and Related Recharge, Which Means 180/400 and Eastside Pumping Remain the Dominant Cause of Seawater Intrusion, While Upper Valley and Forebay Pumping Contribute Little to Nothing to Seawater Intrusion

The Salinas River runs through the Upper Valley, Forebay and 180/400 subbasins (but not through the Eastside Subbasin) and provides natural and artificial recharge to these subbasins. Natural clay layers significantly inhibit direct river recharge in the downstream two thirds of the 180/400 Subbasin closest to the ocean.

Flows in the Salinas River are affected by water released from Nacimiento and San Antonio reservoirs, natural inflow from tributaries like the Arroyo Seco, and groundwater pumping. The reservoirs were built and have been operated by the Monterey County Water Resources Agency ("MCWRA") for decades primarily to provide flood protection during the wet season and groundwater recharge for the irrigation season.

The water rights authorizing construction and operation of Nacimiento and San Antonio reservoirs expressly rely on river recharge supporting Salinas Valley wells to put developed water to beneficial use for irrigation and other purposes. (See, e.g., Water Right Permit Application No. 16124 for Nacimiento Reservoir describing Salinas Valley wells as points of re-diversion to beneficially use groundwater recharge from reservoir water releases.)

The superposition modeling shows that Upper Valley and Forebay pumping induce sufficient recharge to absorb 15-16 percent of average annual flows at the Spreckels gage located just 8-9 miles upstream from the ocean in an area where clay impairs river recharge. (UES Key Observations Memo at p. 5.) Meanwhile, an average of 246,000 AFA of Salinas River flow passes that Spreckels gage on its way to ocean discharge. (UES Key Observations Memo, Table 4 at p. 5.)

The impact of pumping-induced changes in river flows to seawater intrusion, inter-subbasin groundwater flows, and valley-wide groundwater elevations are all integrated into the superposition modeling results and are minor. (UES Key Observations Memo at p. 5.) In other words, absent pumping, the river flow captured by pumping in the Upper Valley, Forebay, and 180/400 subbasins would largely have wasted to the ocean. (*Ibid.*)

Upper Valley and Forebay pumping does not significantly and unreasonably deplete surface waters or meaningfully contribute directly or indirectly to seawater intrusion.



Conclusion

The Coalition thanks DWR for this opportunity to comment on the 5-year Evaluation for the 180/400 Subbasin GSP and respectfully requests that DWR consider the best available science from the superposition modeling results produced by the SVBGSA's lead technical consultant in determining the adequacy of the 180/400 Subbasin GSP and recommending any corrective actions.

Sincerely,

KRONICK, MOSKOVITZ, TIEDEMANN & GIRARD
A Professional Corporation



ERIC N. ROBINSON

ENR

Encls.:

Exhibit 1: May 27, 2026, UES Technical Memorandum re Salinas Valley Superposition Modeling Results, Key Observations on Subbasin Hydrologic Connections and Influences ("UES Key Observations Memo"), including Attachments 1 and 2;

Exhibit 2: January 5, 2026, aquilogic, Inc. Memo for SBWA re Results of Inter-Subbasin Impact Modeling;

Exhibit 3: January 5, 2026, UES Memo for Coalition re Superposition Modeling—Summary Points;

Exhibit 4: December 19, 2025, Technical Memorandum from M&A re "Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and the Salinas Basin Water Alliance (SBWA)" ("M&A Superposition Memo"), including Attachment 1 Valleywide Figures and Attachment 2 Groundwater Level Change Maps;

Exhibit 5: December 19, 2025, M&A Letter re Response to Comments on Computer Modeling Draft Technical Memo;

Exhibit 6: December 2, 2025, aquilogic, Inc. Memo for SBWA re Comments on Montgomery & Associates draft memorandum, "results of Computer Modeling Agreement for SVWC and SBWA," dated August 22, 2025;

Exhibit 7: October 18, 2025, UES Memo for Coalition re Technical Review Comments on Montgomery & Associates' Superposition Modeling Technical Memorandum dated August 22, 2025; and

Exhibit 8: August 22, 2025, M&A Technical Memo re Results of Computer Modeling Agreement for SVWC and SBWA.



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May 28, 2026
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cc: SVBGSA Board of Directors: clerk@svbgsa.org
SVBGSA Executive Director Piret Harmon: harmonp@svbgsa.org
SVWC President Nancy Isakson: nisakson@mbay.net



AMENDED EXHIBIT 1

MEMORANDUM

To: Nancy Isakson, Salinas Valley Water Coalition

CC: Eric Robinson, Kronick Moskovitz Tiedemann & Girard

From: Dwight L. Smith, PG, CHg, Principal Hydrogeologist

Date: May 27, 2026

Subject: **Salinas Valley Superposition Modeling Results, Key Observations on Subbasin Hydrologic Connections and Influences**

1.0 INTRODUCTION

This memorandum summarizes key observations about the impact of pumping at the subbasin scale on hydrology throughout the Salinas Valley. The four Salinas Valley subbasins analyzed were the Upper Valley, Forebay, Eastside and 180/400 Foot Aquifer, which contain the majority of groundwater users in the valley. To undertake this analysis, a superposition modeling approach was implemented whereby pumping in an entire subbasin was either turned off or turned on for the historical model period of 1967-2022, and the changes in the hydrologic system throughout the Salinas Valley observed, with key hydrologic observations made for:

- Water level changes throughout the valley,
- Groundwater flows between the subbasins,
- Seawater intrusion flows, and
- Salinas River flows.

The period of 1980-2022 is used for presentation of superposition modeling results in the M&A (2025) report for consistency with water balance computations time-frames used in the subbasin Groundwater Sustainability Plans (GSPs). Average annual values of model results over this timeframe are derived from the M&A (2025) reporting.

The superposition modeling utilizes the Salinas Valley Integrated Hydrologic Model (SVIHM) developed by the US Geological Survey (Henson, et al, 2025). The modeling was conducted by Montgomery & Associates (M&A) under contract with the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA), the costs of which were jointly funded by the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). The complete report of modeling results prepared by M&A is dated December 19, 2025 (M&A, 2025). Comments to the draft M&A superposition modeling report were prepared by UES on behalf of the SVWC dated October 17, 2025 (UES, 2025), and a summary of results was prepared by UES and submitted to the SVBGSA Board during a public meeting on January 8, 2026 (UES, 2026). This memorandum presents key points related to connectedness or lack of connection between pumping in each subbasin, focusing on the Upper Valley and Forebay subbasins pumping, and hydrologic conditions in the Salinas Valley.

Two superposition modeling approaches were implemented by M&A, one using the historical conditions as the baseline for comparison with model runs with pumping turned off per subbasin, and the second being a fictitious no-historic-pumping baseline or “full acquire” condition, with pumping then turned on by subbasin to make comparisons. Results of both baseline approaches produce similar results when viewed on a percentage-of-flow change from baseline conditions. This key-points memorandum concentrates on the results of the historical conditions baseline testing because it most closely represents the reality of how actual pumping in one subbasin affects hydrologic conditions in the other subbasins.

2.0 SEAWATER INTRUSION RELATIONSHIP TO SUBBASIN PUMPING

Historical pumping in the Upper Valley and Forebay Subbasins is observed to have had little effect on seawater intrusion. As simulated, pumping in each of these subbasins was turned off over the historical period of 1967 to 2022, resulting in only 4.4% and 4.9% reduction in the average annual seawater intrusion magnitude (**Table 1**). Viewed from a contribution of total seawater intrusion magnitude, historical pumping in the Upper Valley and Forebay Subbasins has been responsible for approximately 3.5% and 3.8%, respectively. This modeling observation is important to understand, as it relates directly to potential management actions that may be proposed to mitigate seawater intrusion near the coast. Notably, demand management (aka pumping reduction) in the Upper Valley and Forebay Subbasins would have no quantifiable effects on mitigating seawater intrusion, as there is no meaningful hydrologic connection between Upper Valley and Forebay Subbasin pumping and seawater intrusion.

In contrast, pumping in the 180/400 Subbasin has been dominantly responsible for historical seawater intrusion, and historical pumping in the Eastside Subbasin has significantly contributed to seawater intrusion. Pumping in the 180/400 Subbasin has caused 74.1% and pumping in the Eastside Subbasin has contributed 18.6% of seawater intrusion in the 180/400 Subbasin, respectively (**Table 1**). Demand management in the 180/400 and Eastside Subbasins would quantifiably help to mitigate seawater intrusion, although demand management alone cannot meet SGMA 2040 objectives for halting seawater intrusion, according to additional modeling by M&A (No Action Alternative Modeling, March 20, 2026).

Under historic conditions, turning off all pumping in the Eastside and 180/400 Subbasins reduced their collective contribution to seawater intrusion into the 180/400 Subbasin by 92.7 percent. In contrast, turning off all pumping in the Upper Valley and Forebay subbasins reduced their collective contribution to seawater intrusion into the 180/400 Subbasin by just 7.3 percent.

Table 1: Seawater Intrusion Caused by Historical Pumping by Subbasin (Averaged Values 1980-2022)

Model Scenario	Seawater Intrusion to 180/400 (AFA)	Change from Baseline (AFA)	Percentage Change over Historical Conditions	Percent Contribution to Seawater Intrusion ^b
Historical Conditions	8,603 ^c	NA	NA	NA
No Upper Valley Pumping ^a	8,221	-382 ^d	-4.4%	3.5%
No Forebay Pumping ^a	8,183	-420 ^e	-4.9%	3.8%
No Eastside Pumping ^a	6,555	-2,048 ^f	-23.8%	18.6%
No 180/400 Pumping ^a	456	-8,147 ^g	-94.7%	74.1%

Notes:

^a Historical pumping continues in all other subbasins.

^b Baseline change divided by the sum of all change

^c Under historic conditions with all subbasins pumping, more than 8,600 acre-feet of seawater intrusion occurred each year in the 180/400 Subbasin.

^d Under historic conditions, turning off all Upper Valley pumping reduced seawater intrusion into the 180/400 Subbasin by just 382 acre-feet per annum—representing only a 3.5 percent contribution to seawater intrusion.

^e Under historic conditions, turning off all Forebay pumping reduced seawater intrusion into the 180/400 Subbasin by just 420 acre-feet per annum—representing only a 3.8 percent contribution to seawater intrusion.

^f Under historic conditions, turning off all Eastside pumping reduced seawater intrusion into the 180/400 Subbasin by 2,048 acre-feet per annum—representing an 18.6 percent contribution to seawater intrusion.

^g Under historic conditions, turning off all 180/400 pumping reduced seawater intrusion into the 180/400 Subbasin by 8,147 acre-feet per annum—representing a 74.1 percent contribution to seawater intrusion.

3.0 GROUNDWATER FLOWS BETWEEN SUBBASINS

Inter-subbasin groundwater flows constitute a part of each subbasin’s water balance. **Figures 1-5** illustrate the simulated inter-subbasin groundwater flows for the historical conditions baseline superposition testing, and **Table 2** summarizes the flows for the historical baseline testing. Historical pumping from the Upper Valley is observed to have no appreciable impact to groundwater inflows from the Forebay to the 180/400 and Eastside Subbasins (**Table 3**). Historical Forebay Subbasin pumping is observed to result in 1,900 and 3,900 AFA of groundwater flow change to 180/400 and Eastside subbasins, respectively. This volume of change caused by Forebay historical pumping is small in contrast to the water budget and average annual magnitude of pumping from down-gradient subbasins—representing <2% of all pumping from the 180/400 Subbasin and <5% of all pumping from the Eastside Subbasin.

A notable observation from the superposition testing is the impact of Eastside Subbasin pumping on the 180/400 Subbasin. In the no-pumping baseline model (“aquifer full” generally representing pre-development conditions) it is predicted that 21,973 AFA on average flowed from the Eastside to the 180/400 Subbasin (M&A, 2025). **Figure 1** and **Table 2** illustrate that the under existing historical conditions, 27,292 AFA on average flows from the 180/400 Subbasin to the Eastside Subbasin; a *flow reversal* of 49,265 AFA. Historically, approximately 32 percent of the Eastside annual average pumping is supported by the induced subsurface inflow from the 180/400 Subbasin, and the reversal in subsurface

flow additionally means that a pre-development source of groundwater flow to the 180/400 Subbasin is absent.

Table 2: Summary of Subbasin Subsurface Flows (Averaged Values 1980-2022 in AFA)

Model Scenario	Upper Valley to Forebay	Forebay to Eastside	Forebay to 180/400	180/400 to Eastside
Historical Conditions	5,071	6,385	8,431	27,292
No Upper Valley Pumping ^a	10,050	6,412	8,434	28,890
No Forebay Pumping ^a	887	8,407	10,339	28,588
No Eastside Pumping ^a	5,013	3,751	6,815	10,566
No 180/400 Pumping ^a	5,005	5,251	5,766	52,324

Notes:

a Historical pumping continues in all other subbasins.

Table 3: Summary of Subbasin Subsurface Flow Changes from Baseline (Average Values 1980-2022 in AFA)

Model Scenario	Upper Valley to Forebay ^b	Forebay to Eastside ^b	Forebay to 180/400 ^b	180/400 to Eastside ^b
No Upper Valley Pumping ^a	4,979	26	3	29
No Forebay Pumping ^a	-4,185	2,022	1,908	3,930
No Eastside Pumping ^a	-58	-3,635	-1,616	-5,251
No 180/400 Pumping ^a	-67	-1,134	-2,665	-3,799

Notes:

a Historical pumping continues in all other subbasins.

b Positive value = increase over historical baseline flow; Negative value = decrease over historical baseline flow.

4.0 FLOWS IN THE SALINAS RIVER

Flows in the Salinas River are affected by water released by the Monterey County Water Resources Agency (MCWRA) from Nacimiento and San Antonio reservoirs, natural inflow from tributaries like the Arroyo Seco, and groundwater pumping. The reservoirs were built and have been operated primarily to provide flood protection during the wet season and groundwater recharge for the irrigation season. Historical groundwater pumping in the Upper Valley and Forebay subbasins has had an effect on the surface water flows of the Salinas River. If Upper Valley pumping had not historically occurred, it is predicted that about 35,900 AFA of increased river flow would have been observed at the Spreckels gage located in the 180/400 Subbasin (**Table 4**). Historical Forebay pumping is observed to reduce Salinas River flows at Spreckels by

about 39,300 AFA. These flow reductions represent just 15% to 16% of the average annual flows at the Spreckels gage simulated for the period of 1980-2022. Predicted Salinas River flow changes in the superposition model runs are illustrated in **Figures 6-10**.

The impact of pumping-induced changes in river flows to seawater intrusion, inter-subbasin groundwater flows, and valley-wide groundwater elevations are all integrated into the modeling results. Absent pumping, the Salinas River flow captured by historical pumping in the Upper Valley, Forebay and the 180/400 subbasins would largely have been discharged to the ocean. The majority of flows gaged at Spreckels that are not diverted downstream by the Salinas River Diversion Facility (SRDF) are understood to flow to the Pacific Ocean situated about 8-9 river miles downstream, due to limited river infiltration losses of the river below Spreckels (hydraulic disconnection with the primary aquifers at 180 and 400 ft in depth due to shallow clays).

Observations of river flows at the Chualar gage situated near the boundary between the Forebay and 180/400 Subbasins (see **Figure 6**), approximately 18-20 river miles from the Pacific Ocean, are similar to observed at the Speckels gage (**Table 4**) for superposition testing of flow effects from pumping in the Upper Valley and Forebay but are lower for pumping effects of the 180/400 Subbasin due the geographic location of the Chualar and Spreckels gages above the majority of 180/400 pumping. For either gage site, pumping effects of the Eastside Subbasin are minimal, as the Eastside has no geographic area containing the river.

Table 4: Summary of Salinas River Simulated Annual Flows and Changes at the Spreckels Gage (Average Values 1980-2022)

Model Scenario	Annual Average Flow (AFA)	Change in Annual Flow (AFA)	Percentage Change in Flow
Salinas River near Spreckels CA - USGS-11152500			
Simulated Flow with All Historical Pumping	246,536	--	--
Simulated Flow with Upper Valley Pumping Off	282,461	+35,904	14.6%
Simulated Flow with Forebay Pumping Off	285,866	+39,310	15.9%
Simulated Flow with Eastside Pumping Off	254,677	+8,121	3.3%
Simulated Flow with 180/400 Pumping Off	266,920	+20,364	8.3%
Salinas River near Chualar CA - USGS-11152300			
Simulated Flow with All Historical Pumping	244,400	--	--
Simulated Flow with Upper Valley Pumping Off	277,600	+33,200	13.6%
Simulated Flow with Forebay Pumping Off	282,600	+38,200	15.6%
Simulated Flow with Eastside Pumping Off	248,800	+4,400	1.8%
Simulated Flow with 180/400 Pumping Off	254,000	+9,600	3.9%

5.0 GROUNDWATER ELEVATIONS

Cumulative hydrologic effects of subsurface flow and river flow changes resulting from historical pumping by subbasin are observed in groundwater level change results in superposition modeling. Reference is made to the groundwater level change figures presented in **Attachments 1 and 2** of M&A superposition modeling report (M&A, 2025), and M&A (2025) **Attachment 2 Figures 2-1 through 2-4** are included with this memorandum. Historical pumping in the Upper Valley Subbasin has resulted in small (<1-5 ft) groundwater level changes in the downstream subbasins (**Table 5**). The Forebay Subbasin historical pumping has a little more water level impact (<5-20 ft) in the 180/400 and Eastside Subbasins, with the largest occurring in the southern parts of these subbasins that adjoin the Forebay Subbasin. Water level changes from historical pumping in the Forebay Subbasin are small in the coastal area, especially in contrast to the total historical drawdown that has occurred in the northern portions of the 180/400 and Eastside Subbasins (exceeds 60 ft).

Table 5: Simulated Water Level Rise in Elevation for Area of Greatest Change within the Subbasin (Average Values 1980-2022 in Feet)

Model Scenario	Upper Valley	Forebay	Eastside	180/400
Upper Valley Pumping Off	10-20	1-5	1-5	1-5
Forebay Pumping Off	10-20	20-40	10-20	5-10
Eastside Pumping Off	<1	5-10	>60	20-40
180/400 Pumping Off	<1	5-10	40-60	>60

Table 5 shows that turning off all pumping in the 180/400 Subbasin causes groundwater elevations to rise by more than 60 feet in some portions of the 180/400 Subbasin, by 40-60 feet in the Eastside Subbasin, by 5-10 feet in the Forebay Subbasin and by less than 1 foot in the Upper Valley Subbasin. Turning off all pumping in the Eastside causes groundwater elevations to rise by more than 60 feet in the Eastside Subbasin, by 20-40 feet in the 180/400 Subbasin, by 5-10 feet in the Forebay Subbasin, and by less than 1 foot in the Upper Valley Subbasin. Together, assuming effects are additive, turning off all pumping in the 180/400 and Eastside Subbasins would cause groundwater elevations to rise by 80 feet to more than 100 feet in some portions (most heavily pumping affected areas) of the 180/400 Subbasin and by more than 100 feet to more than 120 feet in some portions (most heavily pumping affected areas) of the Eastside Subbasin.

6.0 REFERENCES

Montgomery and Associates, 2025, Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and the Salinas Basin Water Alliance (SBWA), technical memorandum dated December 19, 2025, including Attachments 1 and 2 for groundwater level changes.

Henson, W.R., R. Hanson, S. Boyce, J. Hevesi, and E.R. Jachens. 2025 [pre-print]. Salinas Valley Integrated Hydrologic and Reservoir Operations Models, Monterey and San Luis Obispo Counties, California; prepared by United States Geological Survey in cooperation with Monterey County Resources Agency, Monterey County and the Salinas Valley Basin Groundwater Sustainability Agency, preprint version released April 2, 2025.

UES, 2025, Technical Review Comments on Montgomery & Associates' Superposition Modeling Technical Memorandum dated August 22, 2025, technical memorandum dated October 18, 2025.

UES, 2026, Superposition Modeling – Summary Points, technical memorandum dated January 5, 2026, addressed to the Salinas Valley Basin Groundwater Sustainability Agency Board Members.



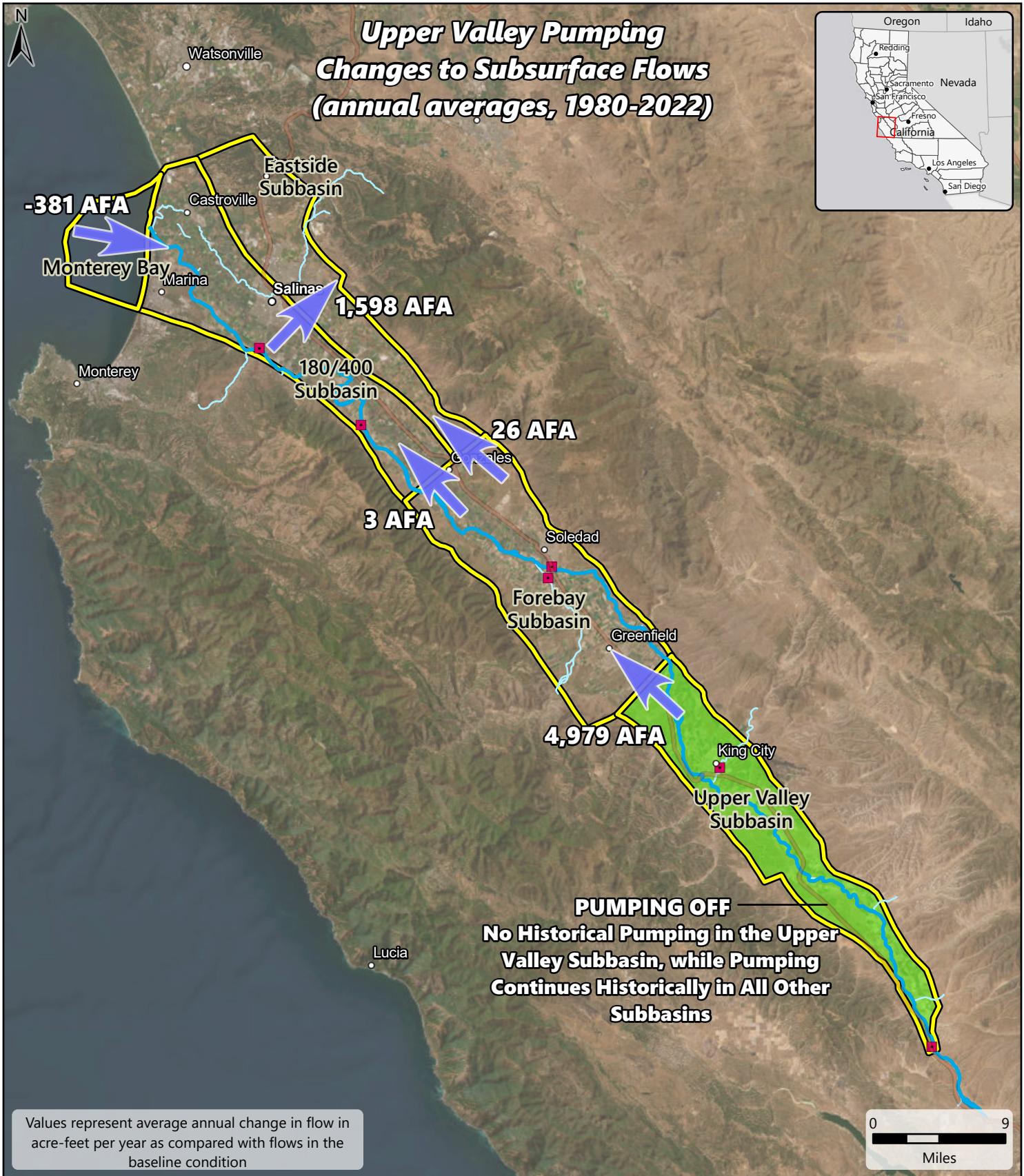
- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 1
Historical Baseline Map
Superposition Model Testing
Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: A20173.00038.000/HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 5/27/2026



Upper Valley Pumping Changes to Subsurface Flows (annual averages, 1980-2022)



Values represent average annual change in flow in acre-feet per year as compared with flows in the baseline condition

- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 2

Historical Upper Valley Pumping
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition

Project Code: A20173.00038.000/HLLF001

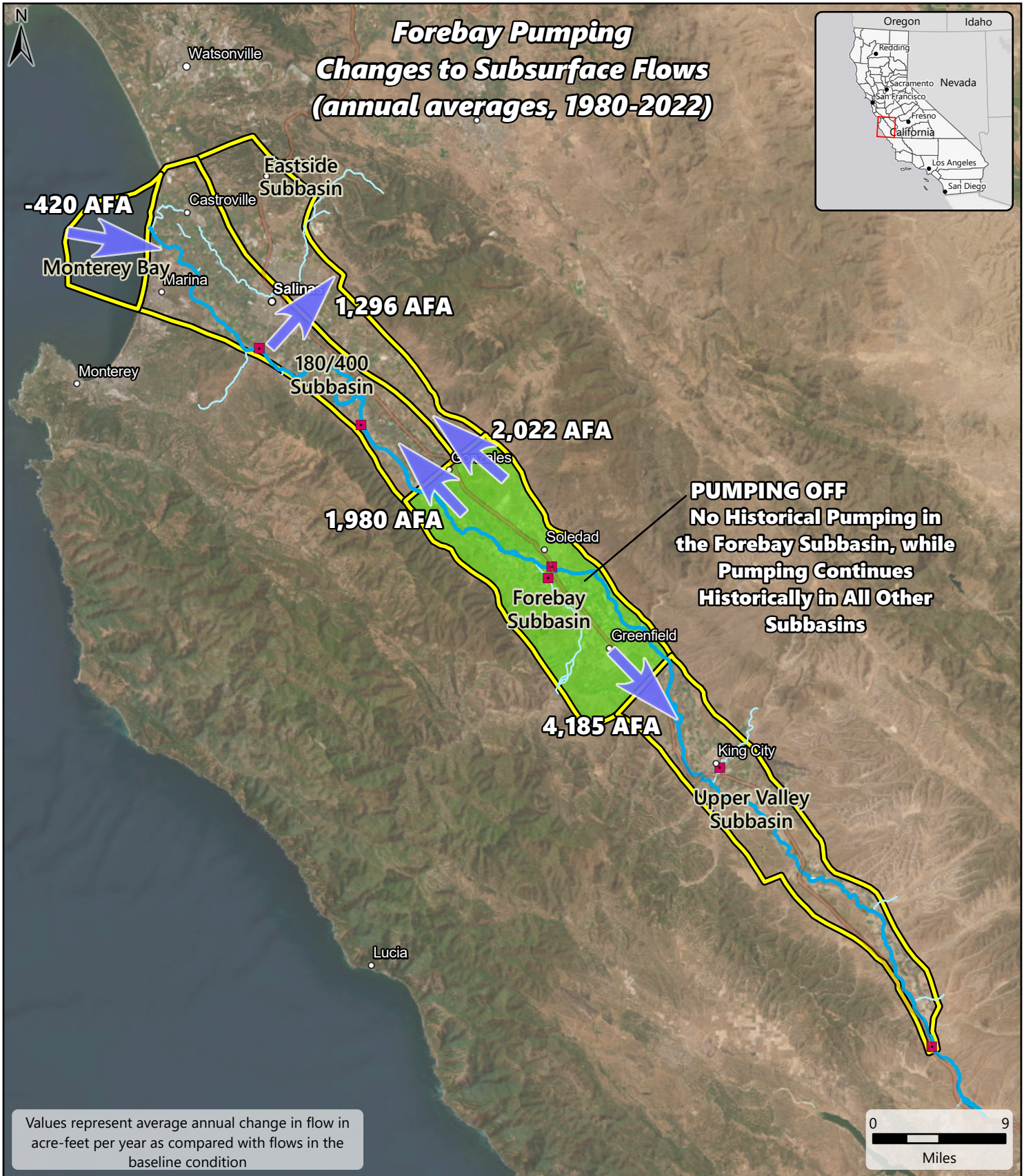
NAD 1983 UTM Zone 10N

H.Chambers

5/27/2026



Forebay Pumping Changes to Subsurface Flows (annual averages, 1980-2022)



Values represent average annual change in flow in acre-feet per year as compared with flows in the baseline condition

- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

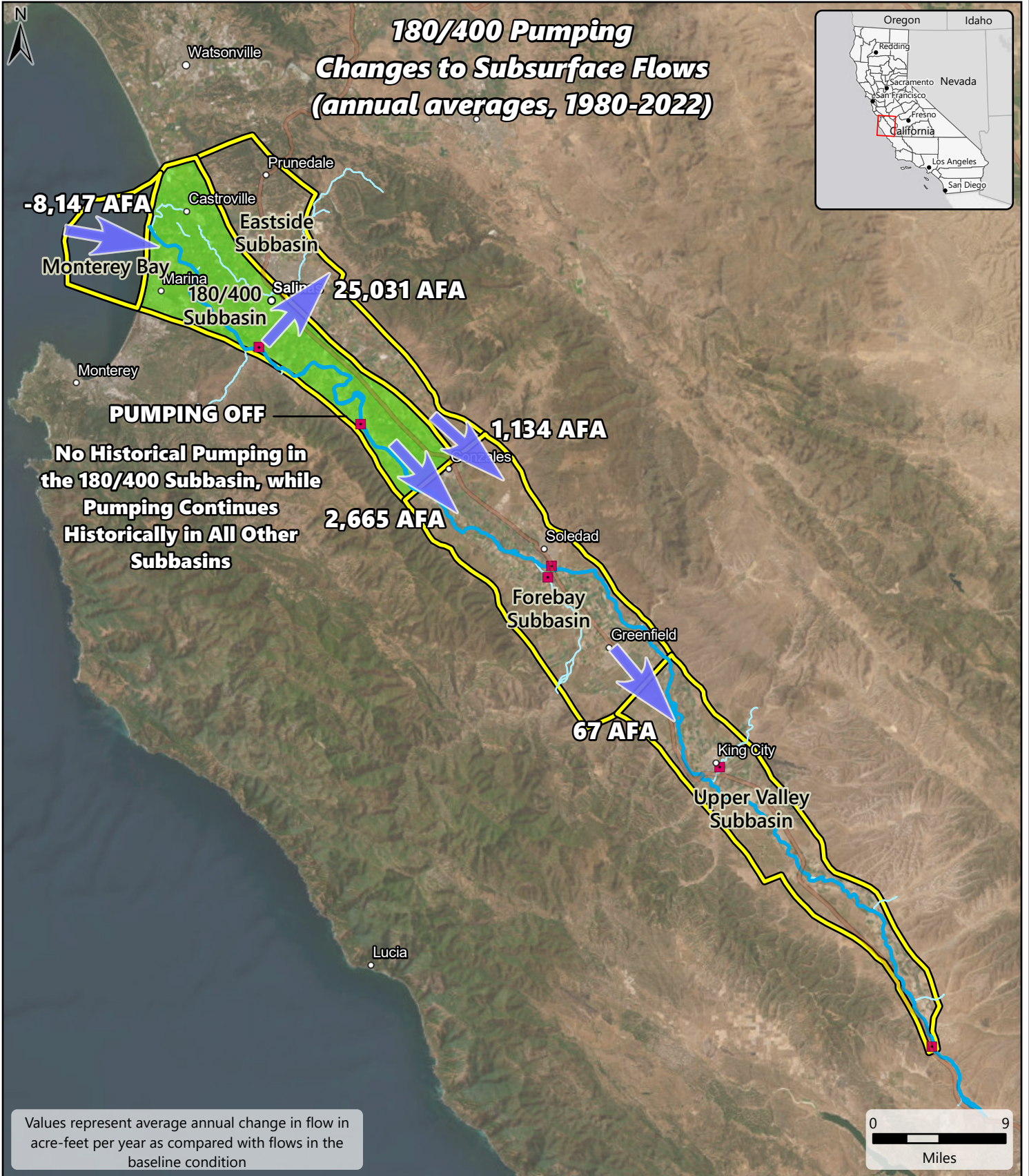
FIGURE 3
Historical Forebay Pumping
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: A20173.00038.000/HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 5/27/2026



180/400 Pumping Changes to Subsurface Flows (annual averages, 1980-2022)



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 4

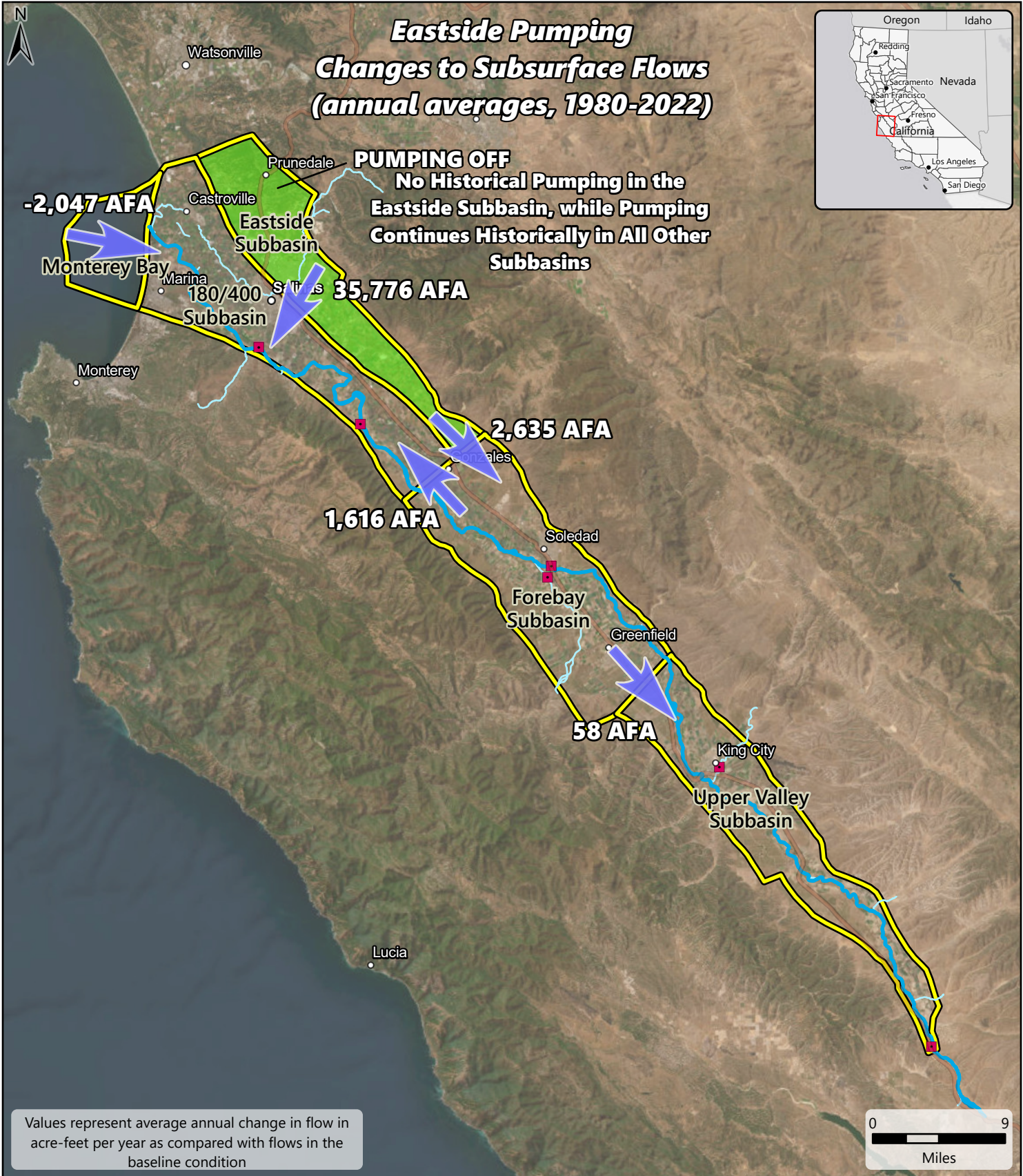
Historical 180/400 Pumping
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: A20173.00038.000/HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 5/29/2026



Eastside Pumping **Changes to Subsurface Flows** **(annual averages, 1980-2022)**



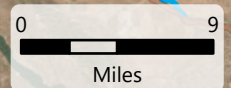
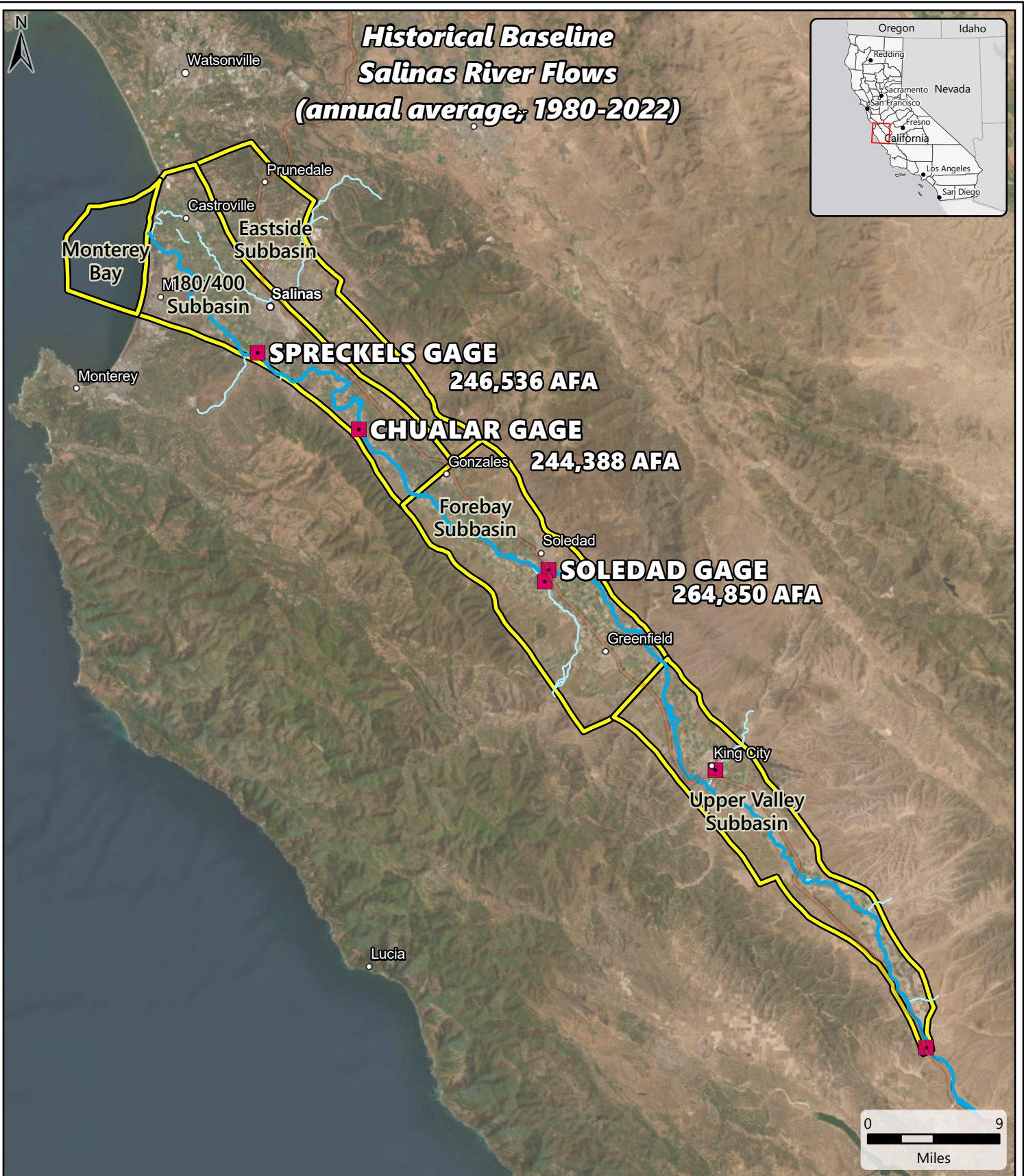
- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 5
 Historical Eastside Pumping
 Superposition Model Testing
 Salinas Valley, CA

Client: Salinas Valley Water Coalition
 Project Code: A20173.00038.000/HLLF001
 NAD 1983 UTM Zone 10N
 H.Chambers 5/27/2026



Historical Baseline Salinas River Flows (annual average, 1980-2022)



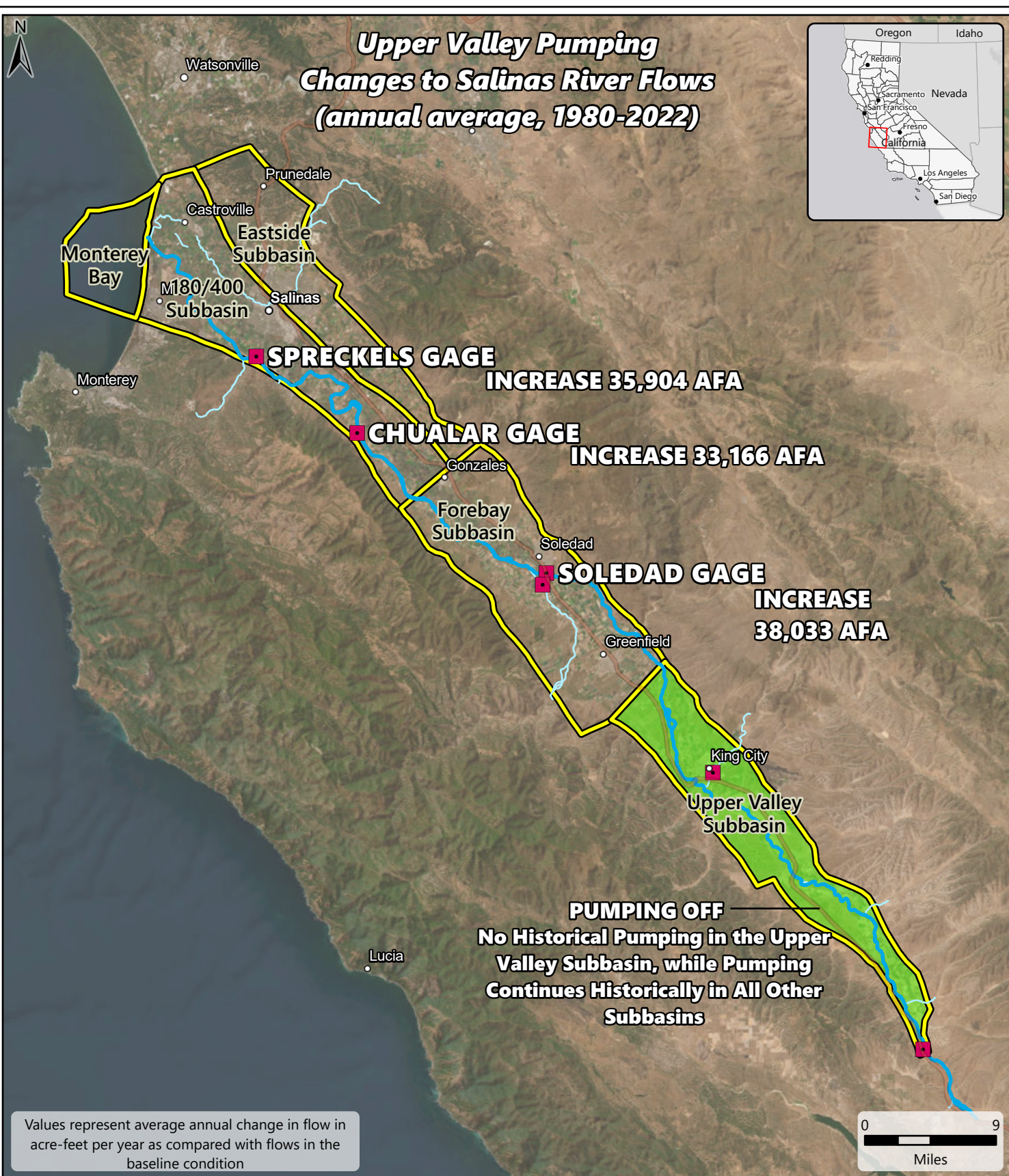
- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 6
Historical Baseline Map
Superposition Model Testing
Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: A20173.00038.000/HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 5/27/2026



Upper Valley Pumping Changes to Salinas River Flows (annual average, 1980-2022)



Values represent average annual change in flow in acre-feet per year as compared with flows in the baseline condition

- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 7

Historical Upper Valley - Gages
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition

Project Code: A20173.00038.000/HLLF001

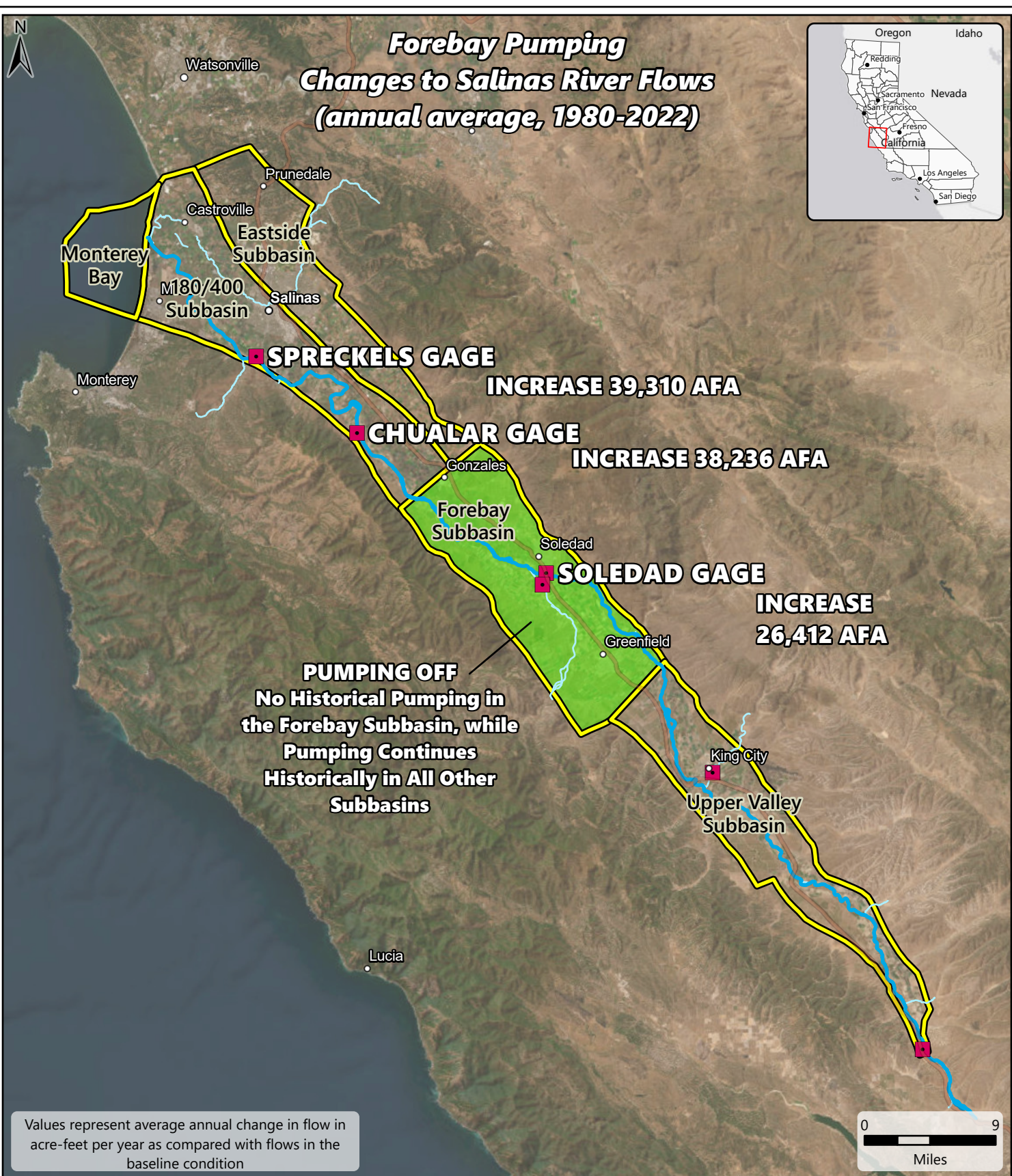
NAD 1983 UTM Zone 10N

H.Chambers

5/27/2026



Forebay Pumping Changes to Salinas River Flows (annual average, 1980-2022)



Values represent average annual change in flow in acre-feet per year as compared with flows in the baseline condition

- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

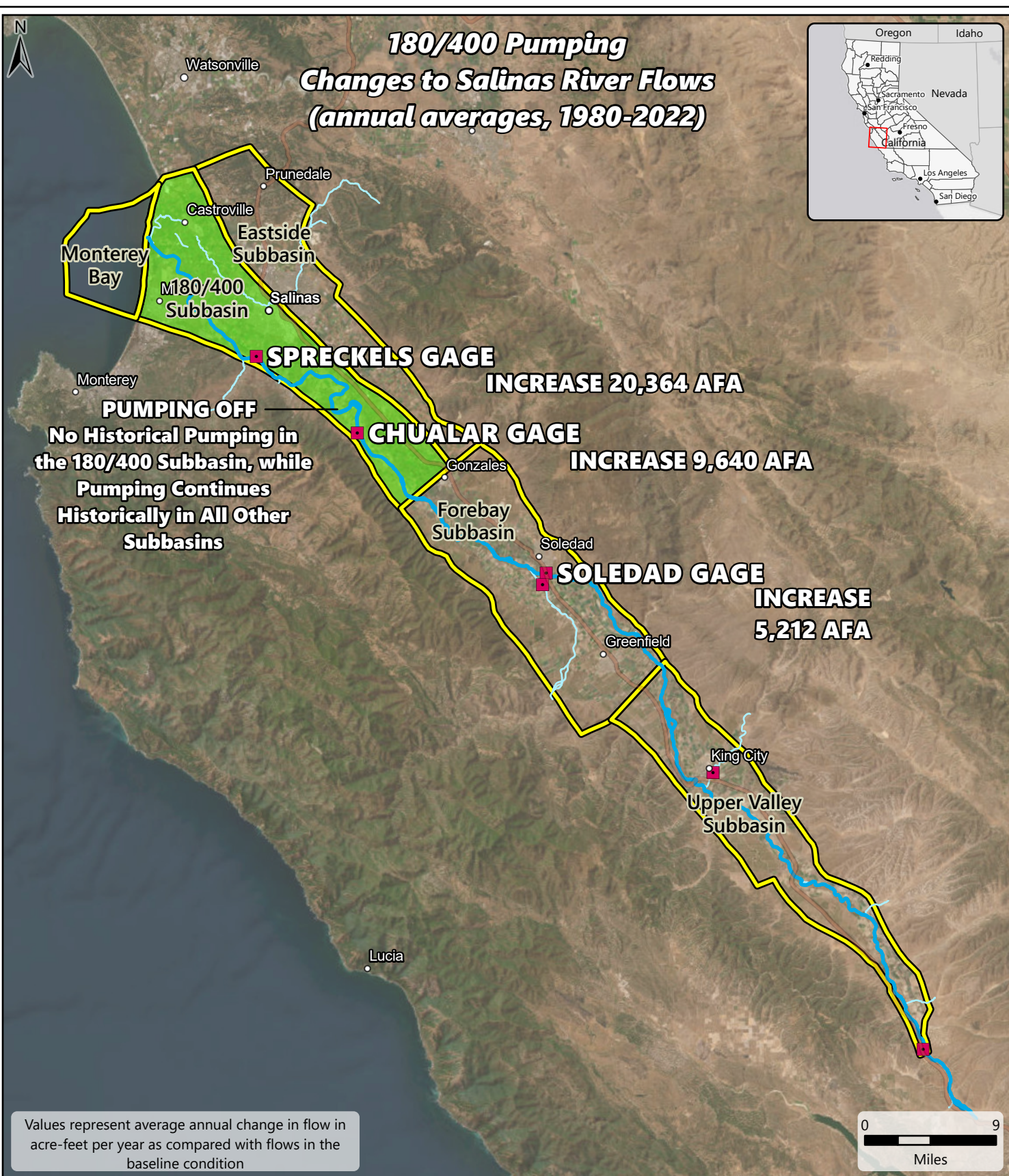
FIGURE 8
Historical Forebay - Gages
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: A20173.00038.000/HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 5/27/2026



180/400 Pumping Changes to Salinas River Flows (annual averages, 1980-2022)



Values represent average annual change in flow in acre-feet per year as compared with flows in the baseline condition

- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 9

Historical 180-400 - Gages
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition

Project Code: A20173.00038.000/HLLF001

NAD 1983 UTM Zone 10N

H.Chambers

5/27/2026



Eastside Pumping **Changes to Salinas River Flows** **(annual averages, 1980-2022)**



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

FIGURE 10
 Historical Eastside - Gages
 Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition
 Project Code: A20173.00038.000/HLLF001
 NAD 1983 UTM Zone 10N
 H.Chambers 5/27/2026



Attachment 2

Groundwater Level Change Maps – Valley Wide

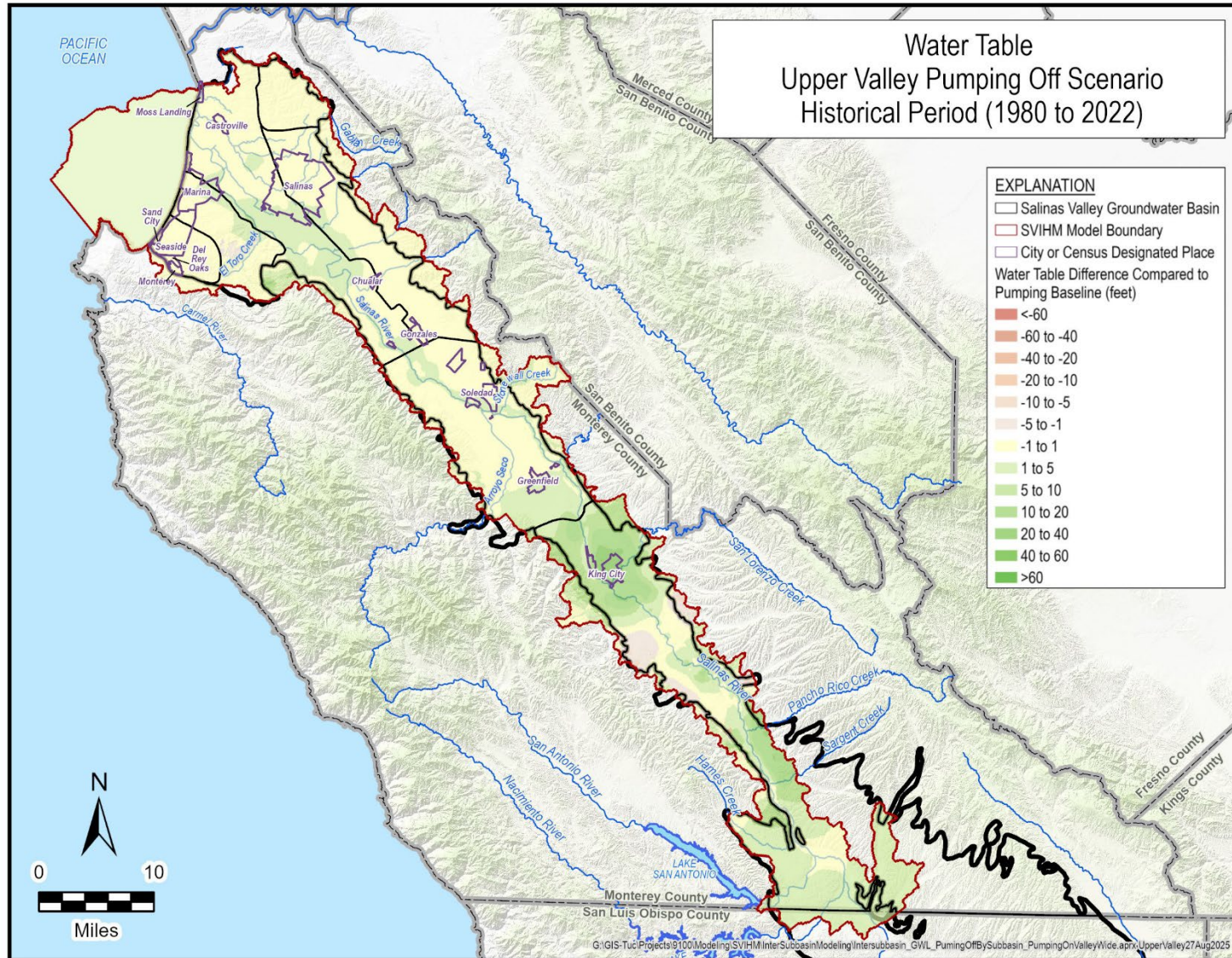


Figure 2-1. Upper Valley Pumping Off Scenario Compared to Pumping Baseline - Average Groundwater Level Difference for 1980-2022

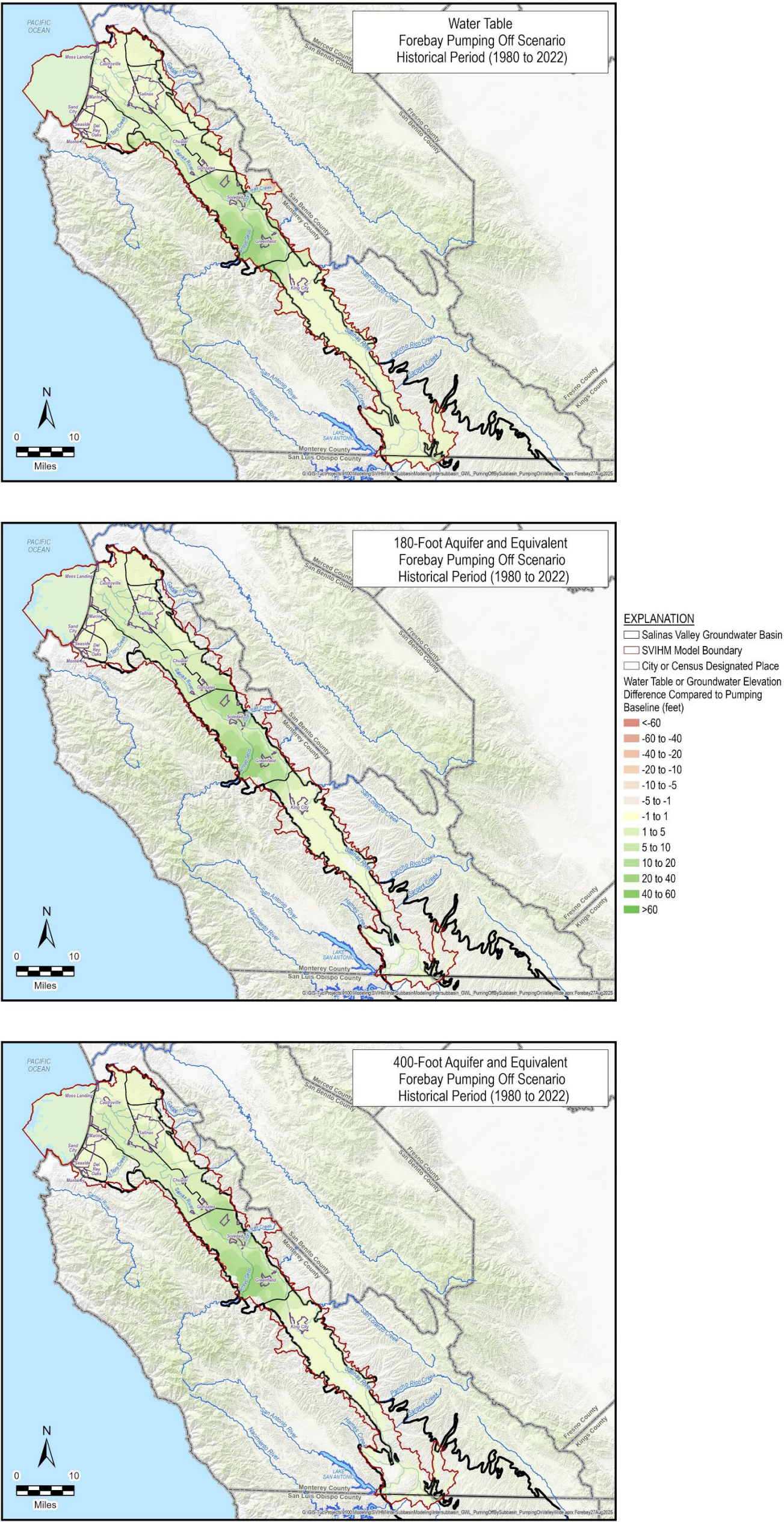


Figure 2- 2.Forebay Pumping Off Scenario Compared to Pumping Baseline – Average Groundwater Level Difference for 1980-2022

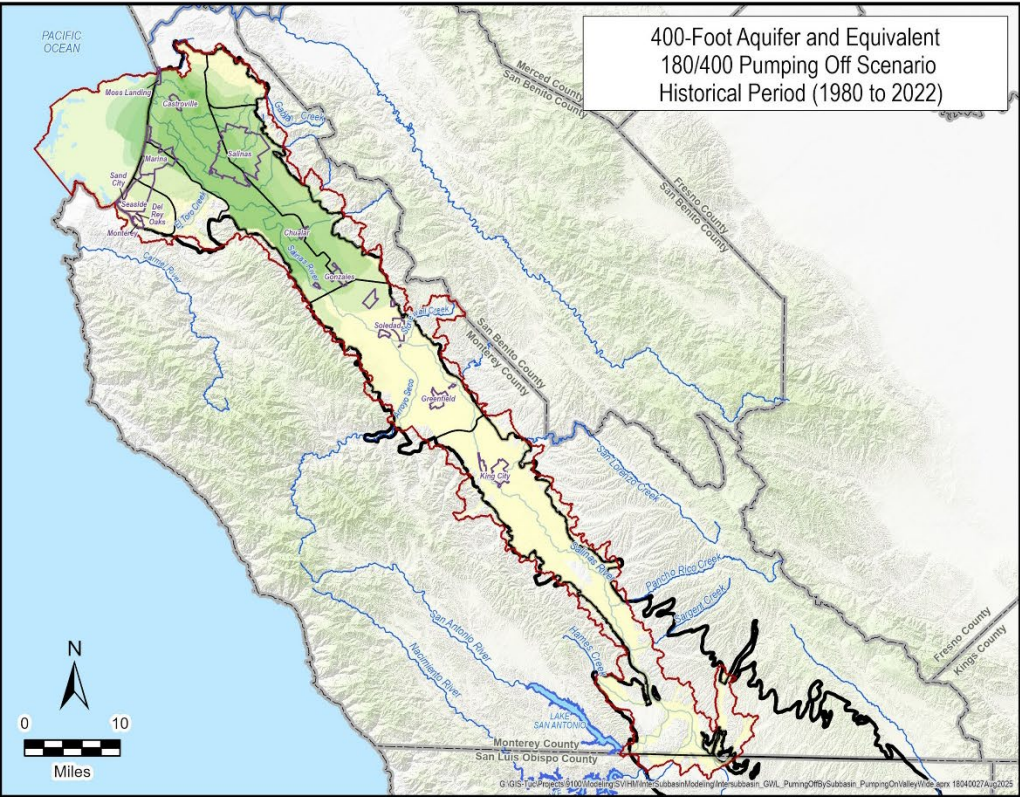
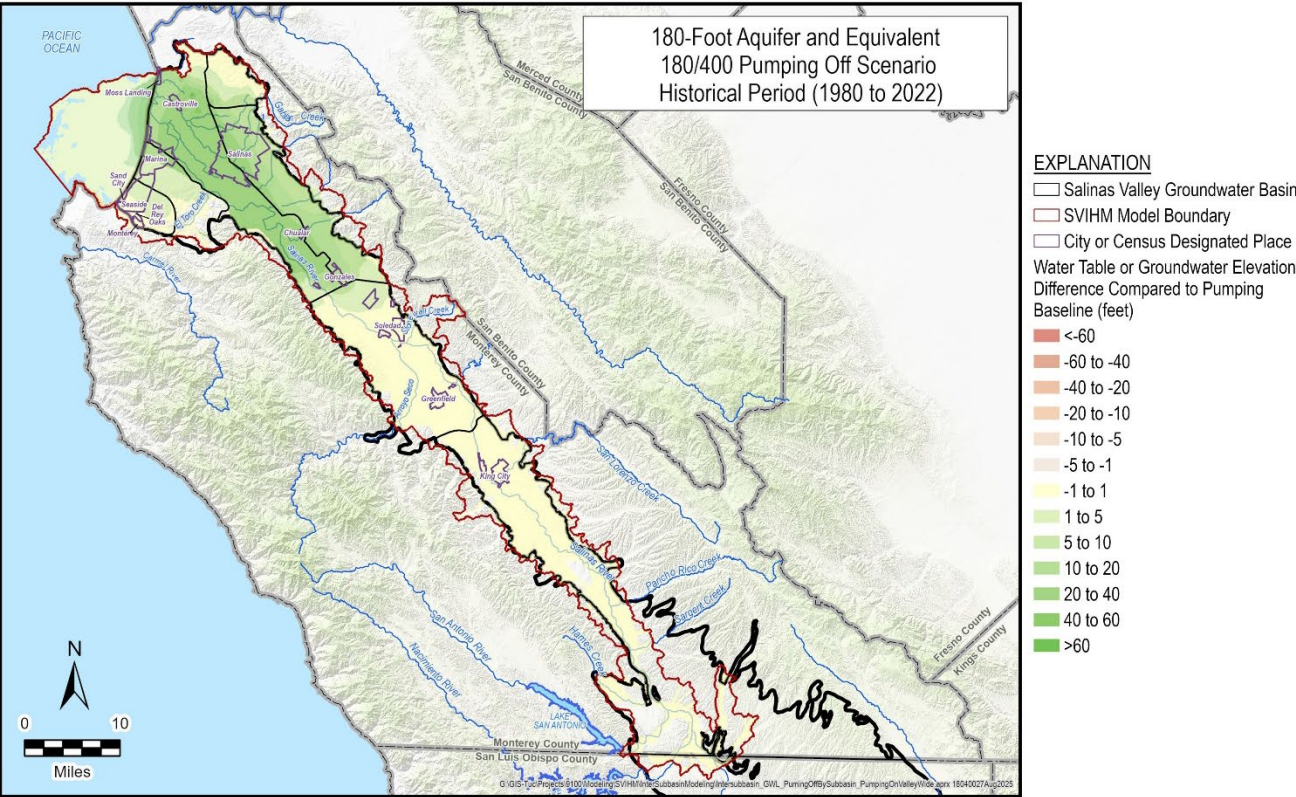
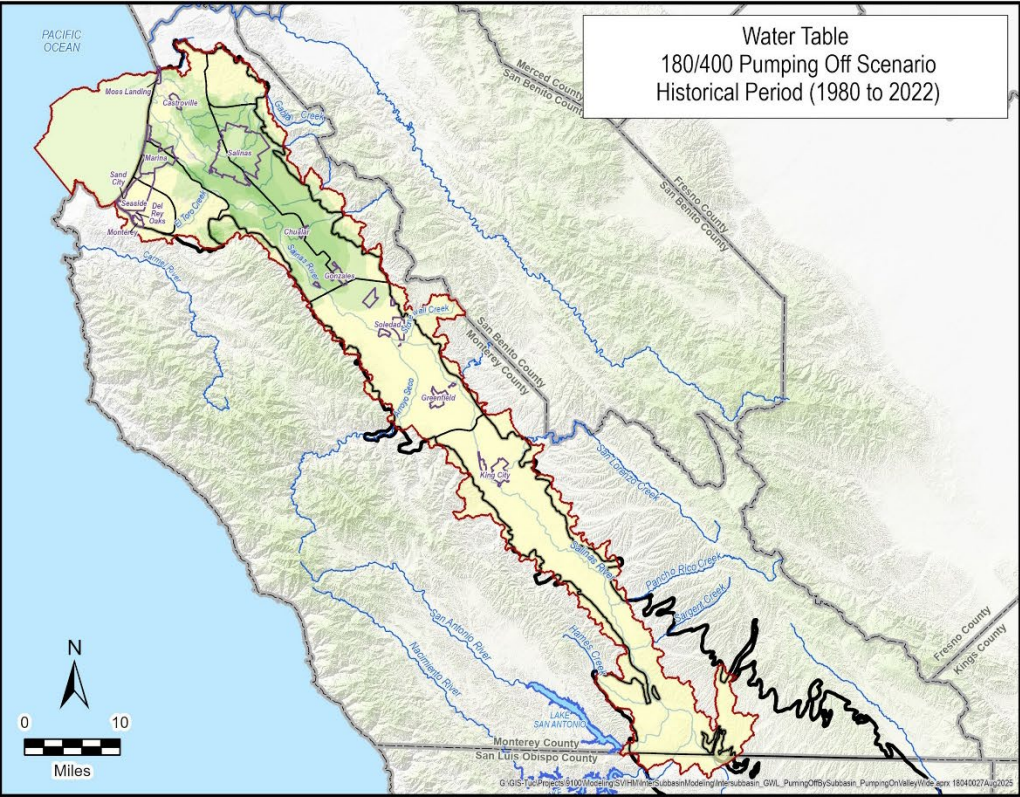


Figure 2-3. 180/400 Pumping Off Scenario Compared to Pumping Baseline – Average Groundwater Level Difference for 1980-2022

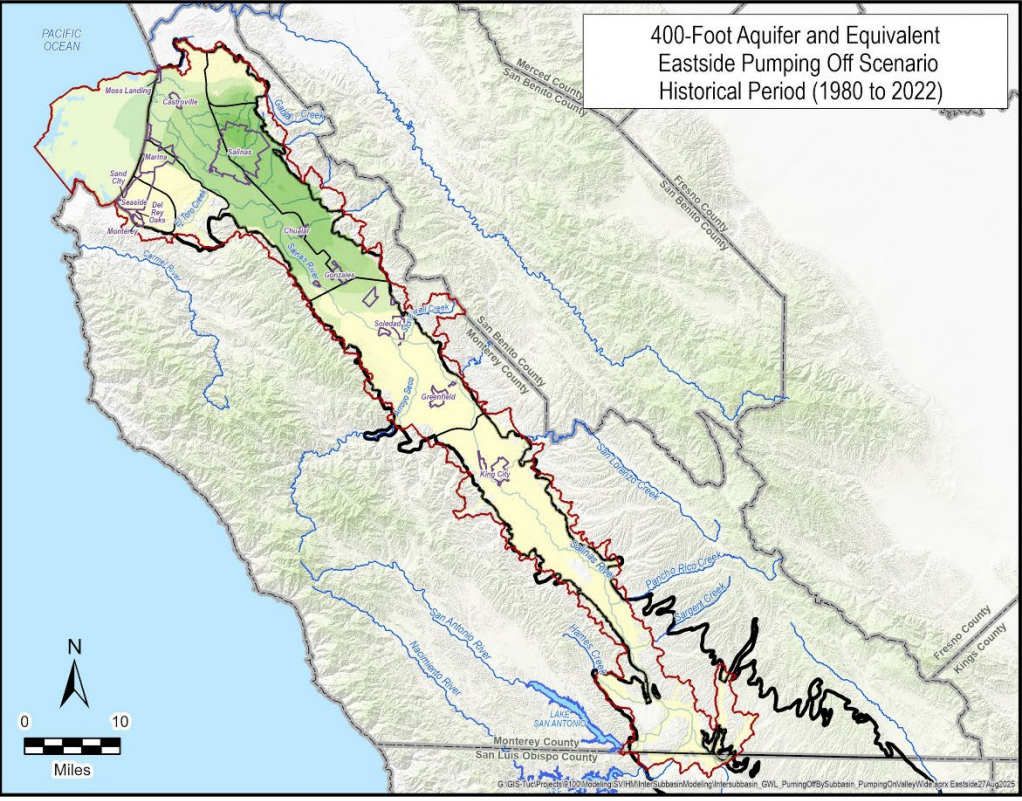
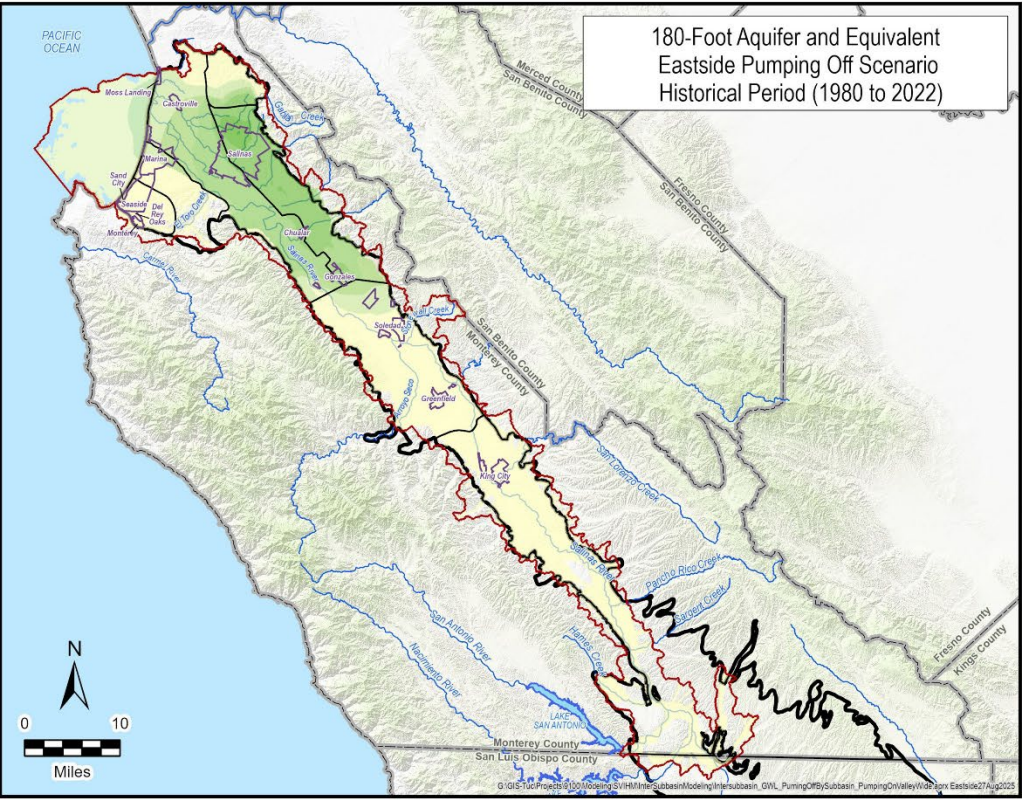
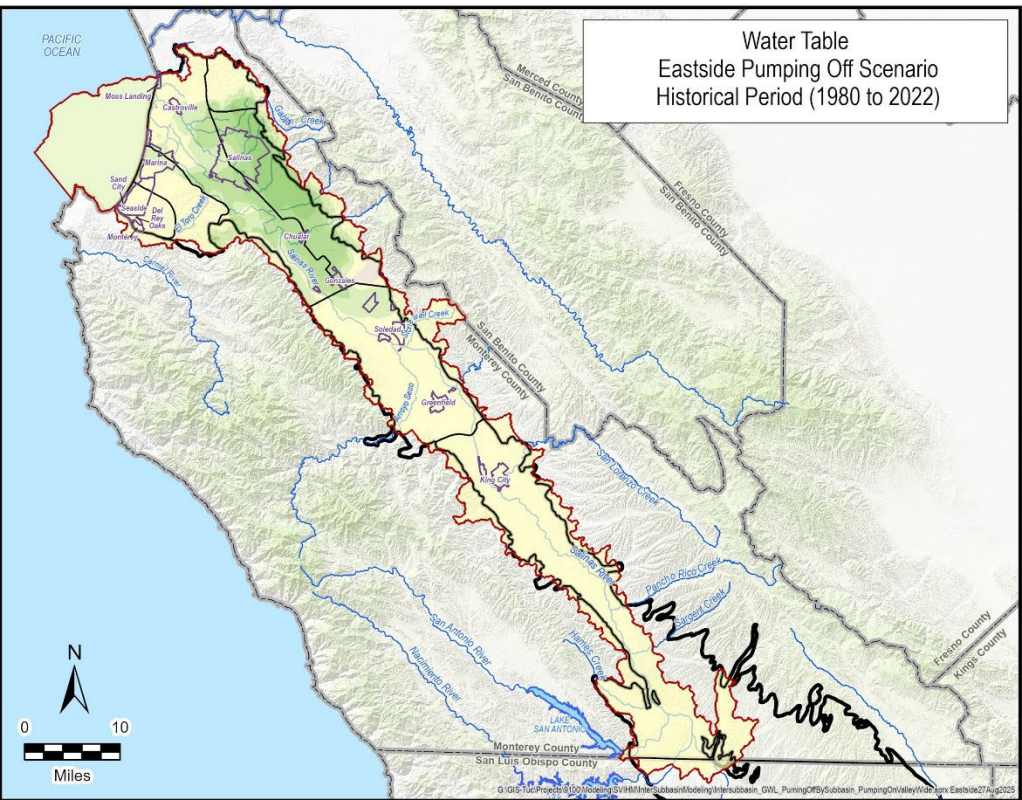


Figure 2-4. Eastside Pumping Off Scenario Compared to Pumping Baseline – Average Groundwater Level Difference for 1980-2022

EXHIBIT 2

MEMORANDUM

To: Board of Directors, Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA)

Cc: Piret Harmon and Emily Gardner, SVBGSA
Abby Ostovar and Derrik Williams, Montgomery & Associates
Amy Woodrow, Monterey County Water Resources Agency
Christopher Bunn, Salinas Basin Water Alliance
Stephanie Hastings and Chris Guillen, Brownstein Hyatt Faber Schrek, LLP

From: Anthony Brown, Principal-In-Charge, aquilogic, Inc.
Robert H. Abrams, PhD, PG, CHg, Senior Principal Hydrogeologist, aquilogic, Inc.

Date: January 5, 2026 – REVISED

Subject: **Results of Inter-Subbasin Impact Modeling**
Project No.: 018-09

Montgomery & Associates (M&A), on behalf of the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA), prepared a memorandum, “*Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA)*,” dated December 19, 2025. The M&A memorandum summarizes the results of a hydrologic modeling exercise (hereafter referred to as “inter-subbasin impact modeling”) designed to isolate and individually evaluate the impacts of pumping in the Upper Valley Aquifer Subbasin (UV), the Forebay Aquifer Subbasin (FB), the 180/400-Ft Aquifer Subbasin (180/400), and the East Side Aquifer Subbasin (ES), one subbasin at a time, on the water resources¹ of the other three subbasins.²

The inter-subbasin impact modeling was jointly requested by SBWA and SVWC. SVBGSA agreed that the modeling would be beneficial and instructed M&A to proceed. The M&A memorandum only presents a descriptive summary of the inter-subbasin impact modeling results. The purpose of this Aquilogic, Inc. (**aquilologic**) memorandum is to provide interpretation of the results, in the context of water availability, for the primary areas of Salinas Valley Groundwater Basin (SVGB) (i.e., UV, FB, 180/400, and ES).

The modeling described in the M&A memorandum is hypothetical in nature. The modeling was conducted in a “what if” (i.e., hypothesis testing) mode using the principle of superposition. As

¹ In this context, the term “water resources” has the same meaning as “water availability.” Water availability in the Salinas Valley Groundwater Basin (SVGB) primarily concerns both stream flows in the Salinas River and groundwater.

² The inter-subbasin impact modeling was conducted by M&A using the version of the Salinas Valley Hydrologic Model (SVIHM) released by the United States Geological Survey (USGS) in April 2025.

such, the modeling results were not expected to be precise. Instead, the results should be considered as “order-of-magnitude” accuracy (e.g., 10,000 to 15,000, instead of 13,051).

As described in the M&A memorandum, the modeling was conducted by: (1) turning pumping on in one subbasin at a time using a “full basin” as a starting point (i.e., the initial condition is no pumping anywhere); and (2) turning pumping off in one subbasin at a time using the simulated historical condition as a starting point (i.e., the initial condition is pumping everywhere).

For case (1), there were four separate simulations in addition to the no-pumping initial condition (i.e., pumping was on in only one subbasin in each subsequent simulation). For case (2), there were also four separate simulations in addition to the historical pumping initial condition (i.e., pumping was off in only one subbasin in each subsequent simulation). Thus, there were a total of ten simulations, which were run from water year (WY) 1967 through WY 2022. However, only the period WY 1980 through WY 2022 was considered for the analysis. For each of these scenarios, Salinas River flow and groundwater flow between the subbasins, as well as groundwater elevations and groundwater storage in all four subbasins, were then compared with the respective starting points to quantify approximately the impact caused by pumping.

GENERAL HYDROLOGY OF THE SVGB

Water in the SVGB is a resource shared by all beneficial users. The hydrology of the SVGB is highly integrated and essentially represents a single water resource composed of interconnected surface water and groundwater. The hydrology of the SVGB dictates that groundwater pumping can impact Salinas River stream flows and these stream flows can impact groundwater elevations.

Under current conditions, groundwater recharge in the SVGB is primarily derived from stream bed seepage. During the primary agricultural growing season, most of this recharge is derived from conservation releases from Nacimiento and San Antonio Reservoirs, which flow to the Salinas River. During the offseason, groundwater recharge in the SVGB is mostly derived from reservoir releases related to other factors such as bypass flows, environmental flows, and flood protection. Lesser amounts of recharge are derived from direct precipitation on the valley floor and bed seepage from smaller streams.

By volume, most reservoir releases occur during the primary agricultural growing season (e.g., March through October) (**Figure 1; Table 1**), when the Salinas River could be dry under natural conditions. Precipitation in the SVGB is minor to negligible during the primary agricultural growing season, compared with the offseason (e.g., November through February). Thus, flow in the Salinas River and groundwater recharge from stream bed seepage during the agricultural growing season are primarily controlled by reservoir conservation releases.

Figure 1 shows combined reservoir releases from Nacimiento and San Antonio Reservoirs for a normal WY (2003) and a wet-normal WY (2024).³ The majority of these releases occur during the primary agricultural growing season for these two example WYs.⁴ **Table 1** summarizes the results shown on **Figure 1** for the primary agricultural growing season and the offseason. As shown in **Table 1**, 97% of reservoir release occurred during the primary agricultural growing season in WY 2003. In WY 2024, 93% of reservoir release occurred during the primary agricultural growing season. Further, the average monthly combined reservoir releases during the primary agricultural growing season in WY 2003 were 19,044 acre-feet (AF), versus 1,175 AF during the offseason. For WY 2024, the average monthly combined reservoir releases during the primary agricultural growing season were 28,922 AF, versus 4,623 AF during the offseason.

Figure 2 shows the monthly distribution of groundwater extractions for WYs 2003 and 2024 in the Monterey County Water Resources Agency (MCWRA) designated subareas of the SVGB.⁵ Comparison of **Figures 1** and **2** illustrates the relationship between pumping and reservoir releases. As shown by these two figures, significant portions of the total annual groundwater pumping occur coincident with reservoir conservation releases during the primary agricultural growing season.

INTER-SUBBASIN IMPACT MODELING RESULTS AND DISCUSSION

Aquilologic has independently reviewed the inter-subbasin impact modeling results, which are summarized on **Figures 3** through **19**. It should be noted that changes in Salinas River stream flows from one subbasin to another caused by pumping in the various subbasins are approximated on **Figures 3** through **6** by changes in stream flows at the Soledad stream gage (UV to FB) and Chualar stream gage (FB to 180/400).

Changes in Inter-Subbasin Flows

Figure 3 shows the changes in Salinas River stream flows and groundwater flow between subbasins caused by pumping in the UV. **Figure 4** shows the changes in Salinas River stream flows and groundwater flow between the subbasins caused by pumping in the FB. **Figure 5** shows the changes in Salinas River stream flows and groundwater flow between the subbasins

³ Monterey County Water Resources Agency (MCWRA) designates water year type based on the average annual stream discharge measured at the Arroyo Seco near Soledad stream gage, as described in Appendix A of the [2005 Salinas Valley Water Project Flow Prescription for Steelhead Trout in the Salinas River](#).

⁴ Reservoir releases follow a complex set of operating guidelines, which as noted, include, but are not necessarily limited to, rules for bypass flows, environmental releases, flood control, and conservation releases (groundwater recharge). Thus, the distribution of releases throughout the year can vary year to year. The monthly distribution of reservoir releases for WY 2003 and WY 2024 are typical and represent two different water year types.

⁵ Data provided by MCWRA. Subareas designated by MCWRA are approximately coincident with the Upper Valley Aquifer Subbasin, the Forebay Aquifer Subbasin, the 180/400-Ft Aquifer Subbasin (Pressure Subarea), and the East Side Aquifer Subbasin designated by the California Department of Water Resources (DWR).

caused by pumping in the 180/400. **Figure 6** shows the changes in Salinas River stream flows and groundwater flow between the subbasins caused by pumping in the ES.

Figures 3 through 6 illustrate the following:

1. Changes in Salinas River stream flows are significantly larger than changes in groundwater flow between the UV, FB, and 180/400:
 - a. The Salinas River is a significant hydrologic connection between the UV, FB, and 180/400
 - b. Pumping in the UV removes approximately 40,000 acre-feet per year (AFY) from the Salinas River (caused by 105,370 AFY total UV groundwater pumping⁶), reducing water availability in the FB by approximately 40,000 AFY and in the 180/400 by approximately 35,000 AFY, some of which would replenish groundwater in those subbasins and ES (**Figure 3**)
 - i. Therefore, approximately 38% of the pumping in the UV is derived directly from the Salinas River via stream bed seepage of reservoir conservation releases during the primary agricultural growing season (**Table 2**)
 - c. Pumping in the FB removes approximately 40,000 AFY from the Salinas River (caused by 118,320 AFY total FB groundwater pumping⁷), reducing water availability in the 180/400, some of which would replenish groundwater in the 180/400 and ES (**Figure 4**)
 - i. Therefore, approximately 35% of the pumping in the FB is derived directly from the Salinas River via stream bed seepage of reservoir conservation releases during the primary agricultural growing season (**Table 2**), potentially with contributions from the Arroyo Seco early in the agricultural growing season
2. Together, pumping in the UV and FB removes approximately 80,000 AFY from the Salinas River (i.e., stream depletion), reducing water availability and groundwater replenishment in the 180/400
3. Pumping in the 180/400 reduces Salinas River flow in the 180/400 by approximately 10,000 AFY (caused by 103,980 AFY total 180/400 groundwater pumping⁸) (**Figure 5**)
 - a. Therefore, approximately 10% of the pumping in the 180/400 is derived directly from Salinas River via stream bed seepage of reservoir conservation releases during the primary agricultural growing season (**Table 2**), potentially with contributions from the Arroyo Seco early in the agricultural growing season

⁶ Water Year 2024 Annual Report, Upper Valley Aquifer Subbasin, Table 3-2, p. 16). https://svbgsa.org/wp-content/uploads/2025/04/UpperValley_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

⁷ Water Year 2024 Annual Report, Forebay Aquifer Subbasin, Table 3-2, p. 16. https://svbgsa.org/wp-content/uploads/2025/04/Forebay_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

⁸ Water Year 2024 Annual Report, 180/400-Ft Aquifer Subbasin, Table 3-1, p. 10. https://svbgsa.org/wp-content/uploads/2025/04/180400_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

4. Pumping in the ES removes approximately 35,000 AFY of groundwater from the 180/400 and less than 5,000 AFY of groundwater from the FB (caused by approximately 81,540 AFY total ES groundwater pumping⁹), reducing water availability in the 180/400 (**Figure 6**)
 - a. The 180/400 is a significant source of water for the ES
 - b. Approximately 45% of the pumping in the ES is supplied by groundwater from the 180/400
5. Pumping in the 180/400 reduces water availability in the FB by less than 5,000 AFY.
6. Pumping in the ES reduces water availability in the FB by approximately 2,500 AFY.

Changes in Groundwater Elevations

Groundwater elevations in the UV, FB, 180/400, and ES depend on several factors in addition to in-subbasin groundwater pumping. The results of the inter-subbasin impact modeling show that increases in groundwater elevations occur in multiple subbasins when pumping is turned off in one subbasin (i.e., with the simulated historical condition as the starting point) (**Figures 7 through 17**).¹⁰ For example, **Figures 7 and 8** show that for the modeling scenario in which UV pumping is turned off, groundwater elevations increase in the FB, 180/400, and ES, in addition to the UV. These increases occur at the water table (**Figure 7**, model layer 1) and in the 180-Ft Aquifer and equivalent (**Figure 8**, layer 3). M&A did not provide a map of groundwater elevation changes for the 400-Ft Aquifer and equivalent (layer 5).

The increases in 180/400 groundwater elevations occur when UV pumping is turned off because the large increase in Salinas River flow that occurs allows approximately 30,000 to 35,000 AFY of additional surface water to flow to the 180/400 (**Figure 3**). In turn, the increased Salinas River flow facilitates additional stream recharge in the 180/400. **Figures 7 and 8** show that the *average* changes in groundwater elevations generally range from 1 to 5 feet (ft). However, the *maximum* changes in groundwater elevations must therefore be greater than 1 to 5 ft, depending on hydrologic conditions in any given WY.

Figures 9 through 11 show the groundwater elevation changes for the FB pumping-off scenario. These results are similar to the results shown on **Figures 7 and 8**, in that groundwater elevations in the 180/400 increase by a similar amount. In the 180-Ft Aquifer and equivalent and the 400-Ft Aquifer and equivalent, the average changes in groundwater elevations in the southern portion of the ES are as high as 5 to 10 ft (**Figures 10 and 11**) (maximum changes would be higher). As with **Figures 7 and 8**, the large increase (approximately 40,000 AFY) in Salinas River

⁹ Water Year 2024 Annual Report, East Side Aquifer Subbasin, Table 3-1, p. 12. https://svbgsa.org/wp-content/uploads/2025/04/Eastside_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

¹⁰ Increases in groundwater elevations do not occur for the scenarios in which pumping is turned on because all subbasins are already “full.” Decreases in groundwater elevations in other subbasins when pumping is turned on in one subbasin are much less significant than the increases observed in the pumping-off scenarios. This is because groundwater levels in the pumped subbasin start off “full,” thereby reducing the impact on other subbasins.

flow between the FB and 180/400 (**Figure 4**) facilitates additional stream recharge in the 180/400. However, **Figures 9** through **11** also demonstrate the minimal increase in groundwater elevations in the upstream subbasin (i.e., the UV) when pumping is turned off in a downstream subbasin (i.e., the FB) and some increased groundwater elevations in the ES.

Figures 12 through **17** show the significant groundwater connections between the 180/400 and the ES. Pumping in either subbasin strongly impacts groundwater elevations in both the pumped subbasin and the adjacent subbasin. **Figures 12** through **17** also show the minimal increase in groundwater elevations in the upstream subbasins (i.e., the FB and UV) when pumping is turned off in a downstream subbasin.

Impact on Groundwater Storage in the 180/400

As noted, turning pumping off in the UV and FB allowed additional Salinas River water to reach the 180/400. Some of this water would remain surface water and continue flowing in the river channel, potentially discharging to Monterey Bay. However, some of this water would become stream recharge to groundwater in the 180/400, which increases groundwater elevations in the 180/400 and ES.

Figures 3 through **6** show the changes in groundwater flow across subbasin boundaries. For the pumping-off scenarios, these changes indicate increased flow to the 180/400. For the UV-off scenario, the increase in groundwater inflow to the 180/400 averaged less than 5 AFY. For the FB-off scenario, the increase in groundwater inflow to the 180/400 averaged approximately 1,900 AFY. However, these figures do not represent the change in groundwater storage in the 180/400 caused by pumping in the UV and FB, which can be estimated based on groundwater elevations.

Annual Reports for the 180/400 are submitted to California Department of Water Resources (DWR) to partially meet compliance requirements for the Sustainable Groundwater Management Act (SGMA). These reports include calculations of the change in groundwater storage based on changes in groundwater elevations. SVBGSA calculates storage change for individual aquifers in the 180/400, as well as for the subbasin as a whole.¹¹ This calculation estimates the groundwater storage change by using the estimated area of the subbasin over which the change in groundwater elevations occurred, an estimated storage coefficient, and the average change in groundwater elevation.

¹¹ https://svbgsa.org/wp-content/uploads/2025/04/180400_AnnualReport2024_Final-Cond.pdf, accessed 12/31/2025.

The groundwater storage change calculation for the 180/400 as a whole uses an estimated area of 76,000 acres and a storage coefficient of 0.078. It should be noted that the estimated area does not include the seawater intruded area.

Figures 18a, 18b, and 18c show the areal extents of the average increases in groundwater elevations for the water table, the 180-Ft Aquifer and equivalent, and the 400-Ft Aquifer and equivalent, respectively, for the 180/400 and ES, when UV pumping is turned off. Inspection of these figures shows that groundwater elevations increased by 1 to 5 ft across approximately 70% of the 180/400. A conservative estimate of the increase in groundwater storage in the 180/400 can be calculated as:

$$45,600 \text{ acres (60\% of 76,000)} \times 0.078 \times 1 \text{ ft}$$

This calculation yields an estimated change in groundwater storage in the 180/400 of approximately 3,500 AF. However, groundwater elevations increased by up to 5 ft over the areas shown in **Figures 18a, 18b, and 18c**. Therefore, a conservative estimate of the increase in groundwater storage in the 180/400 when UV pumping is turned off ranges from approximately 3,500 AFY to 17,000 AFY.

Figures 19a, 19b, and 19c show the areal extents of the average increases in groundwater elevations for the water table, the 180-Ft Aquifer and equivalent, and the 400-Ft Aquifer and equivalent, respectively, for the 180/400 and ES, when FB pumping is turned off. Inspection of these figures shows approximately the same range of increased groundwater elevations in the 180/400 as the UV-off scenario. Therefore, the same conservative estimate of increased groundwater storage of 3,500 AFY to 17,000 AFY occurs in the 180/400 when FB is turned off.

Thus, simulated pumping in the UV and FB reduces groundwater storage in the 180/400 by more than 7,000 AFY due to reduced flow in the Salinas River. Considering that the increased groundwater elevations shown on **Figures 18 and 19** represent a minimum increase of 1 ft across much of the 180/400, it is reasonable to conclude that the average increase would at least 2 ft. Some areas of the 180/400 would experience increases greater than 2 ft (up to 5 feet). Thus, a reasonable conservative estimate of the groundwater storage increase in the 180/400 is a minimum of 15,000 AFY.

Conclusions

The inter-subbasin impact modeling demonstrates that significant portions of the groundwater water extracted from upstream subbasins are derived directly from reservoir conservation releases during the primary agricultural growing season. The decreases in Salinas River flow between subbasins reduces water availability in the 180/400. This result is consistent with data provided by MCWRA Salinas River Discharge Measurements Series Results (River Series), which

show significant reductions in stream flow from north to south (i.e., stream losses to groundwater).¹² Pumping in the ES also reduces water availability in the 180/400.

The inter-subbasin impact modeling also demonstrates that pumping in any one of the subbasins in the SVGB impacts water availability in at least one other subbasin. Groundwater elevations in downstream subbasins increase when pumping in upstream subbasins is turned off (**Figures 7 through 19**). Thus, it is reasonable to conclude that groundwater elevations and groundwater storage in downstream subbasins would decrease with increased pumping in upstream subbasins, thereby reducing water availability in downstream subbasins. The decreases in water availability are most apparent in the changes in inter-subbasin Salinas River flows and groundwater elevations. The decreases in groundwater elevations and groundwater storage caused in downstream subbasins by pumping in upstream subbasins occur primarily because less water is available in the Salinas River for stream recharge in the downstream subbasins.

¹² <https://www.countyofmonterey.gov/government/government-links/water-resources-agency/documents/salinas-river-discharge-measurement-series>, accessed 12/31/2025.

Table 1: Comparison of Reservoir Releases**Salinas Basin Water Alliance**

Water Year	Water Year Type ¹	Annual Reservoir Releases (AF)	Primary Growing Season (March through October)			Off Season (November through February)		
			Reservoir Releases (AF)	Percentage of Annual Reservoir Releases	Monthly Average Reservoir Release (AF)	Reservoir Releases (AF)	Percentage of Annual Reservoir Releases	Monthly Average Reservoir Release (AF)
2003	Normal	157,050	152,349	97%	19,044	4,701	3%	1,175
2024	Wet-Normal	249,868	231,377	93%	28,922	18,490	7%	4,623

Notes:

AF: acre-feet

MCWRA: Monterey County Water Resources Agency

All reservoir release data are from <https://www.countyofmonterey.gov/government/government-links/water-resources-agency/projects-facilities/dams-and-reservoirs/historical-data>.

Data shown are the combined releases from Nacimiento and San Antonio Reservoirs

1. MCWRA designates water year type based on the average annual stream discharge measured at the Arroyo Seco near Soledad stream gage, as described in Appendix A of the 2005 Salinas Valley Water Project Flow Prescription for Steelhead Trout in the Salinas River (<https://www.countyofmonterey.gov/home/showdocument?id=19068>).

Table 2: Impacts of Pumping on Salinas River Flow**Salinas Basin Water Alliance**

		Change in Salinas River Flow UV to FB (AFY)				Change in Salinas River Flow FB to 180/400 (AFY)			
	WY 2024 Annual Report Total Pumping (AFY)	Pumping Turned On Decrease	Pumping Turned Off Increase	Average	Approximate Percent of UV Pumping Derived from Salinas River ¹	Pumping Turned On Decrease	Pumping Turned Off Increase	Average	Approximate Percent of FB Pumping Derived from Salinas River ¹
UV	105,370	41,942	38,033	39,988	38%	40,117	33,166	36,642	--
FB	118,320	28,169	26,412	27,291	--	43,747	38,236	40,992	35%
180/400	103,980	4,474	5,212	4,843	--	9,956	9,640	9,798	--
ES	81,540	2,860	2,366	2,613	--	6,026	4,423	5,225	--

Notes:

AFY: Acre-feet per year

UV: Upper Valley Aquifer Subbasin

FB: Forebay Aquifer Subbasin

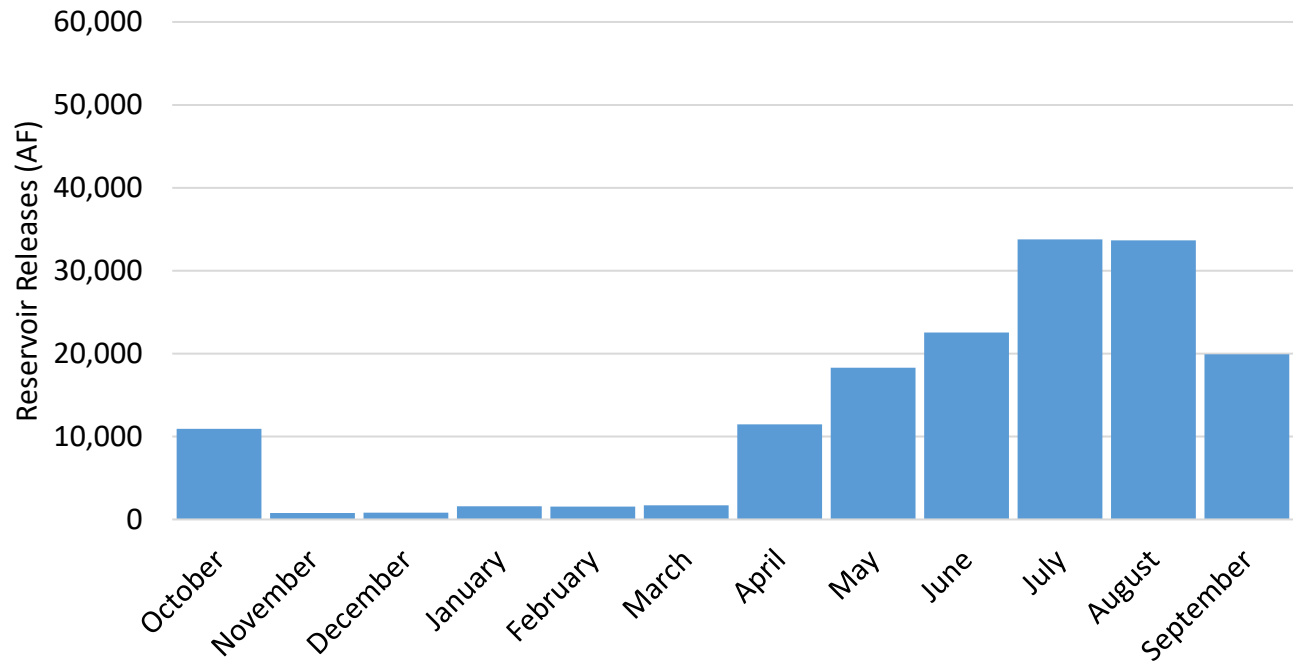
180/400: 180/400-Ft Aquifer Subbasin

ES: East Side Aquifer Subbasin

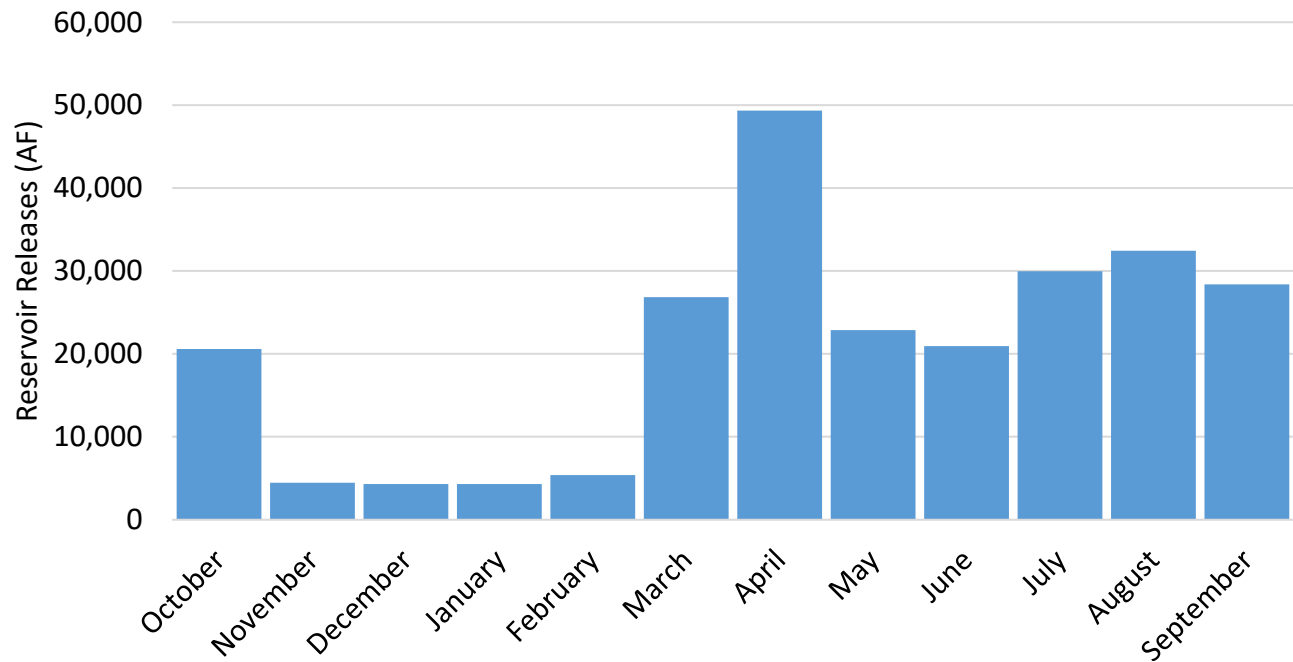
--: Not applicable

1. This represents extracted groundwater derived from bed seepage of reservoir conservation releases.

Water Year 2003: Normal



Water Year 2024: Wet-Normal



Notes:

AF: acre-feet

Graphs show the combined reservoir releases from Nacimiento and San Antonio Reservoirs.

The terms "Normal" and "Wet-Normal" refer to water year types as designated by Monterey County Water Resources Agency.



aquilologic, Inc.

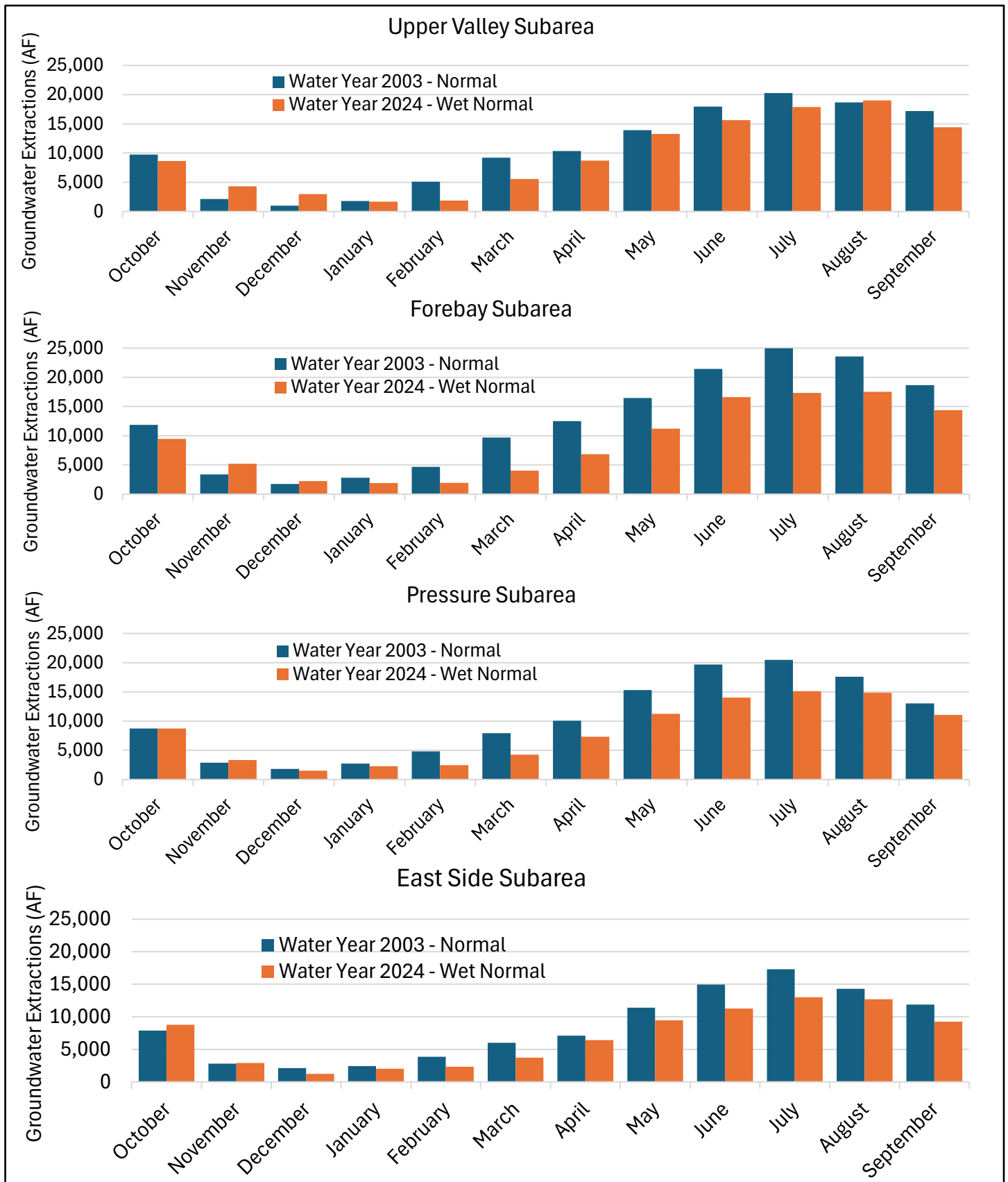
Salinas Basin Water Alliance

Reservoir Releases

Date: 1/8/2026

Project #: 018-09

Figure 1



Notes:

AF: acre-feet.

Data provided by Monterey County Water Resources Agency (MCWRA). Subareas designated by MCWRA are approximately coincident with the Upper Valley Aquifer Subbasin, the Forebay Aquifer Subbasin, the 180/400-Ft Aquifer Subbasin (Pressure Subarea), and the East Side Aquifer Subbasin designated by the California Department of Water Resources (DWR).



Salinas Basin Water Alliance

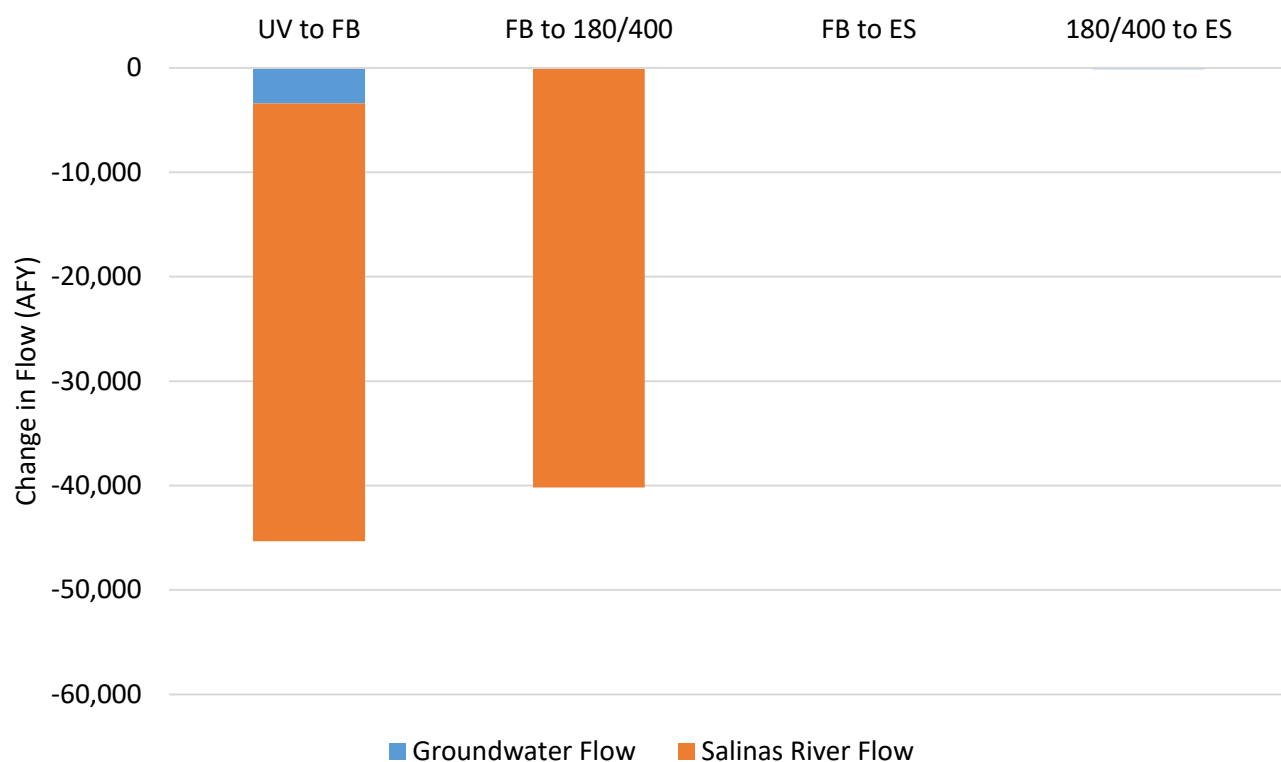
Groundwater Extractions

Date: 1/8/2026

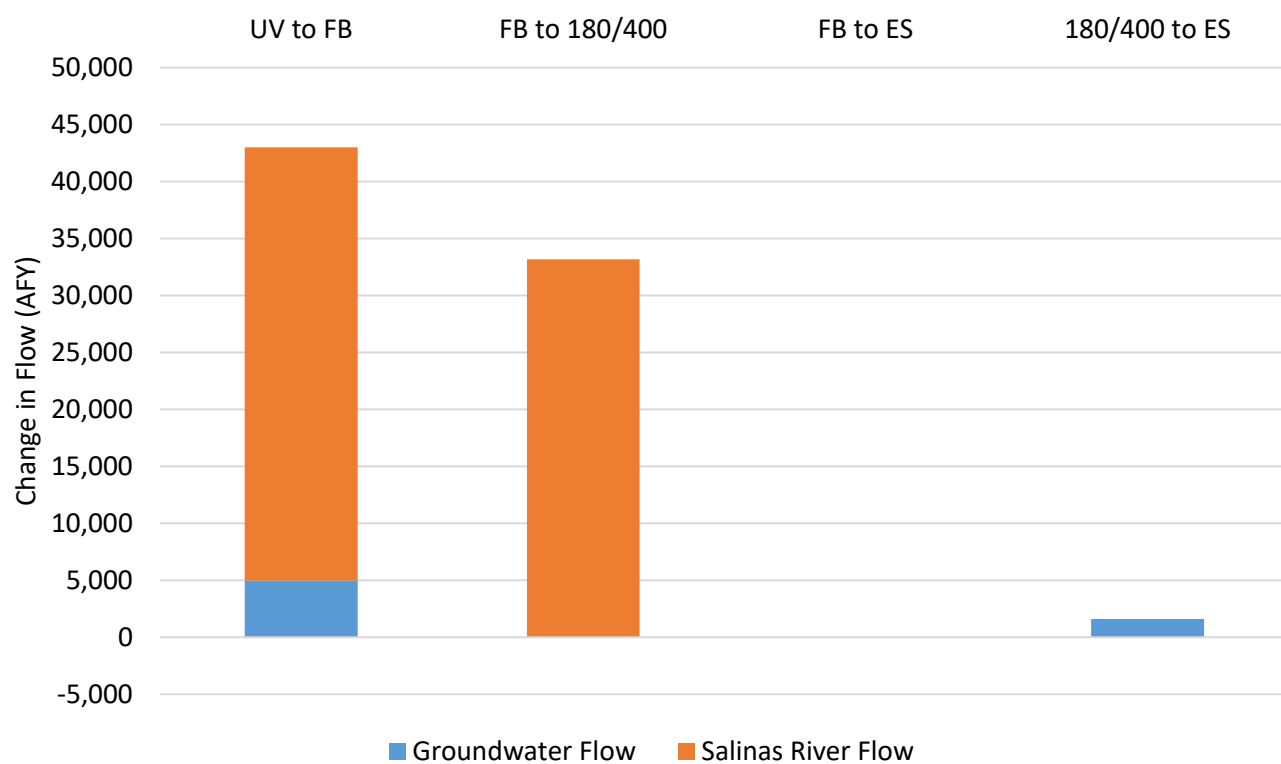
Project #: 018-09

Figure 2

Upper Valley Pumping Turned On



Upper Valley Pumping Turned Off



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: acre-feet per year



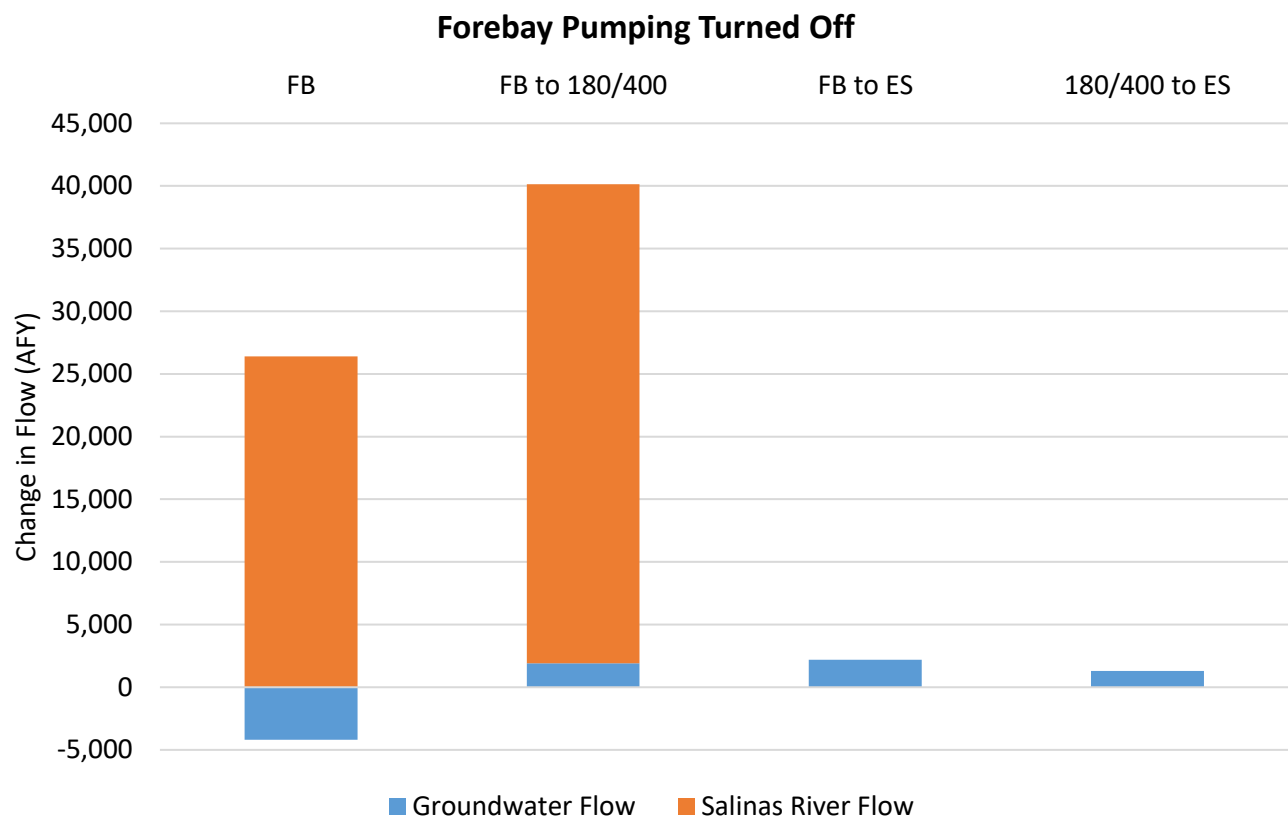
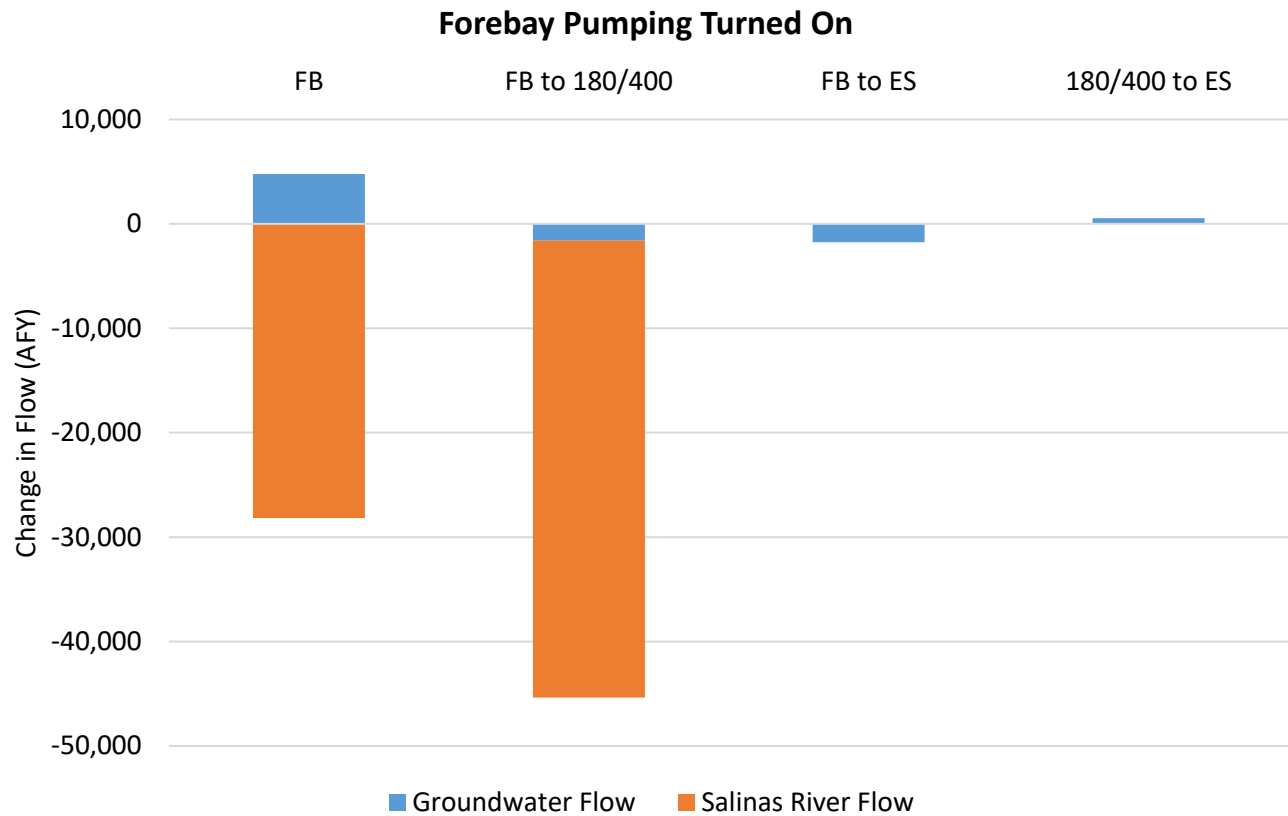
Salinas Basin Water Alliance

Upper Valley Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/8/2026

Project #: 018-09

Figure 3



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year

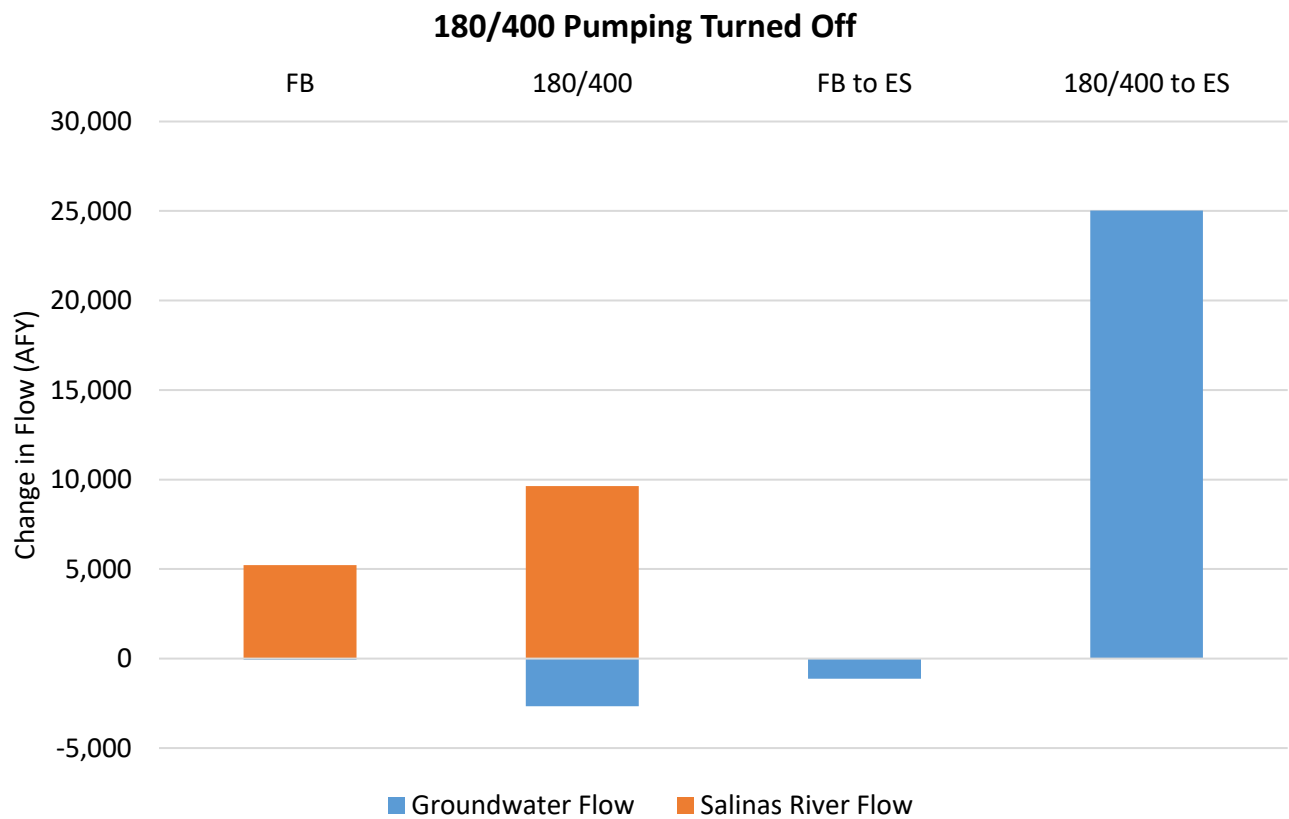
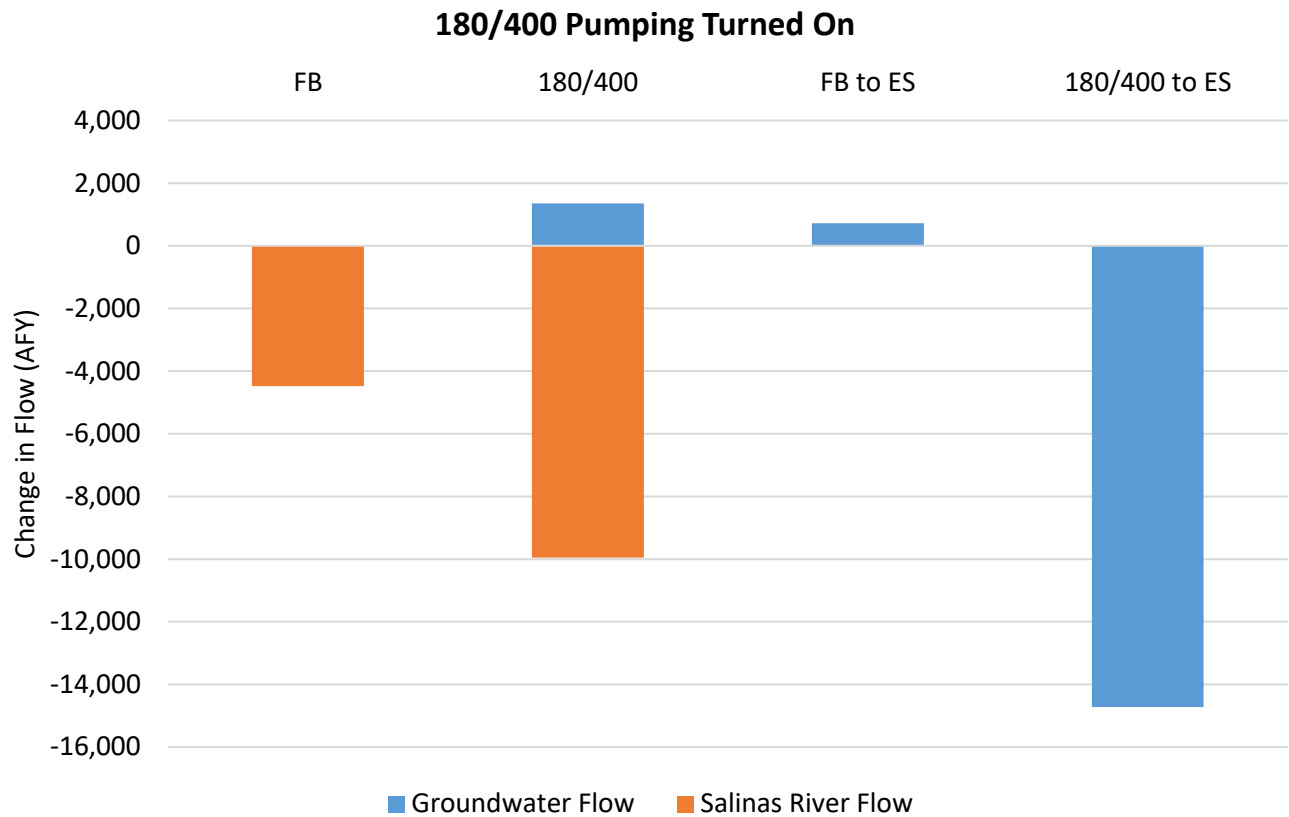
Salinas Basin Water Alliance

Forebay Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/8/2026

Project #: 018-09

Figure 4



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year



Salinas Basin Water Alliance

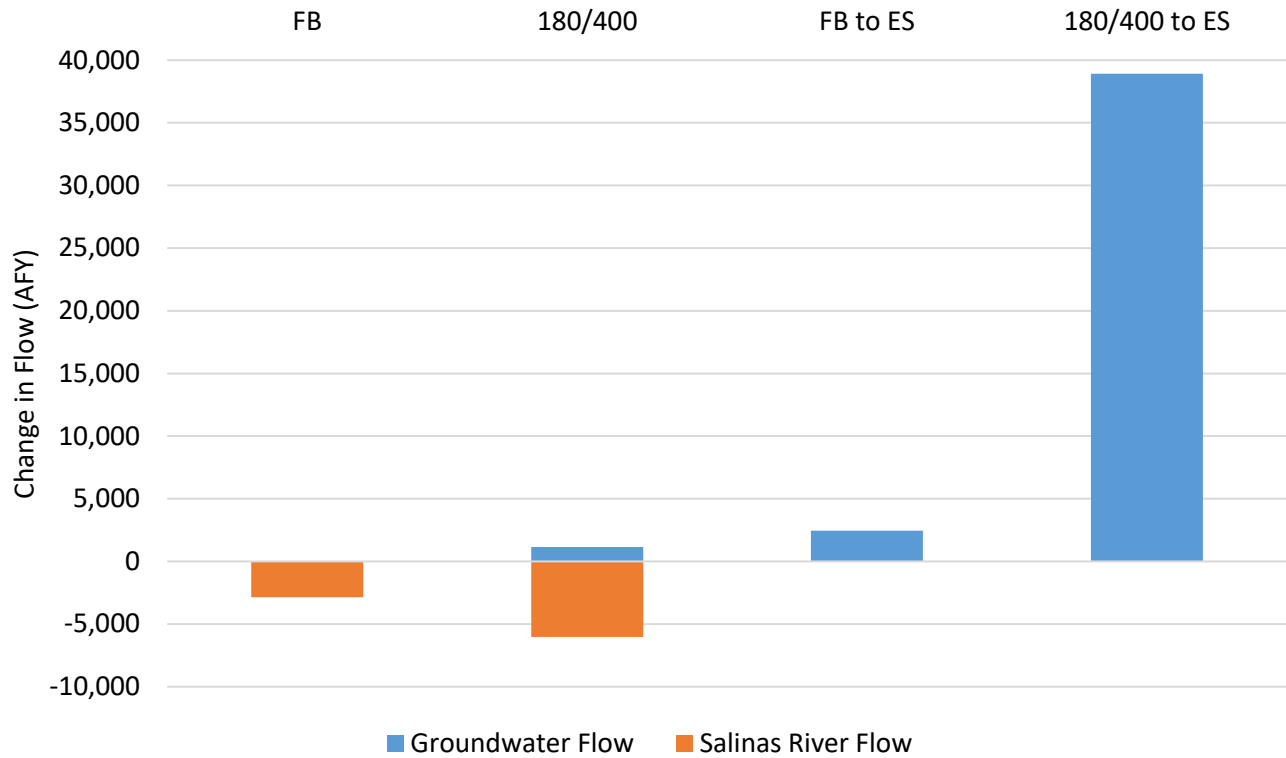
180/400-Ft Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/8/2026

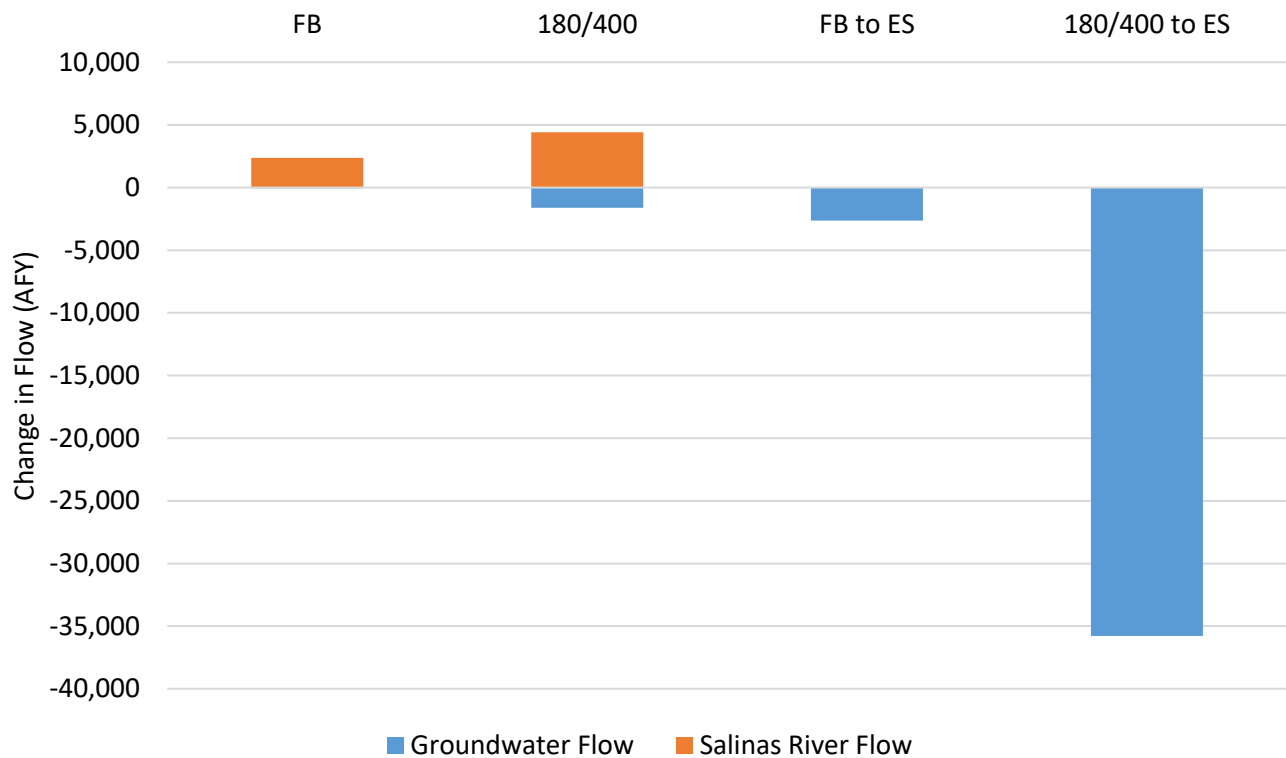
Project #: 018-09

Figure 5

East Side Pumping Turned On



East Side Pumping Turned off



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year



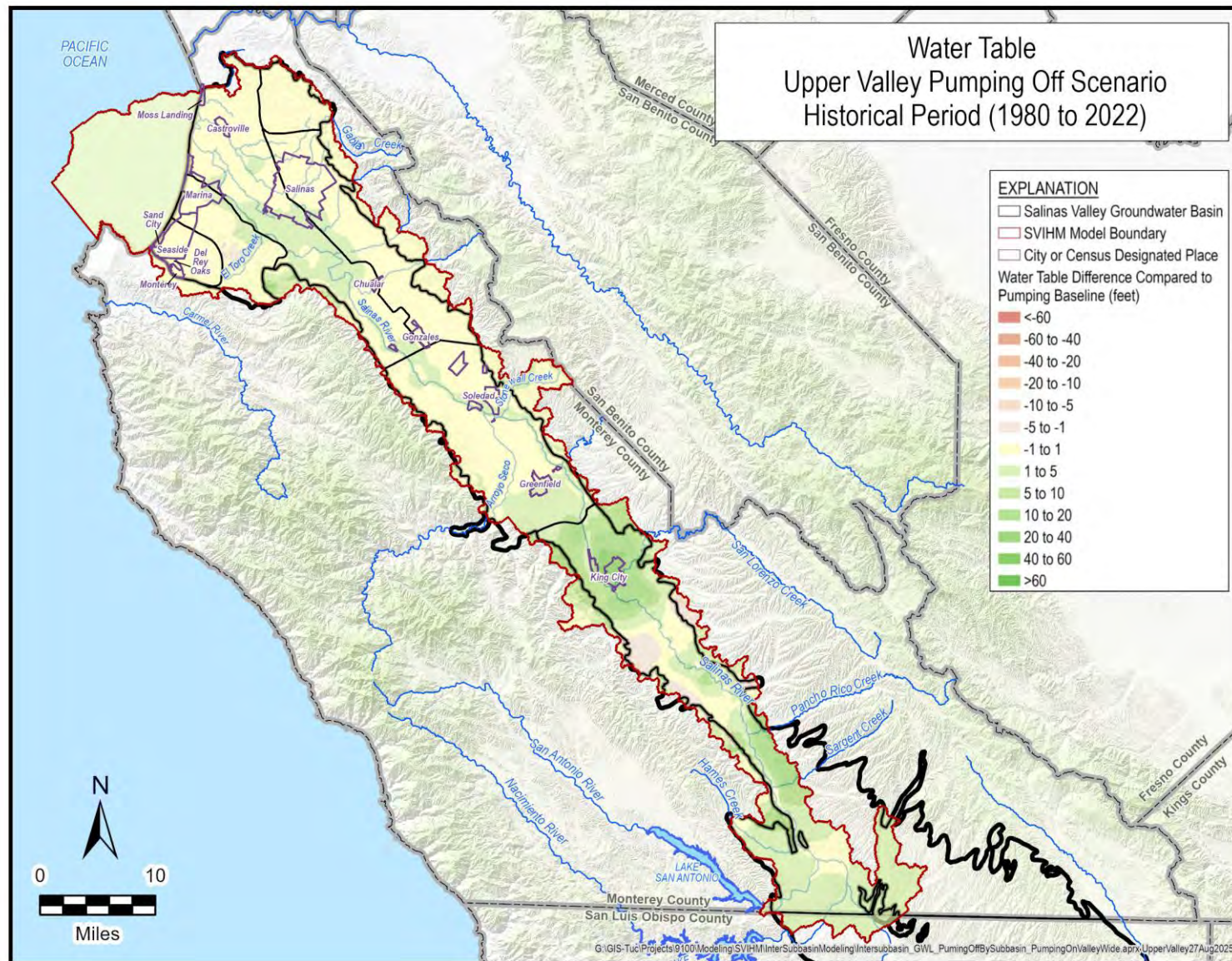
Salinas Basin Water Alliance

East Side Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/8/2026

Project #: 018-09

Figure 6



Average change in water table elevations.

From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Revised figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

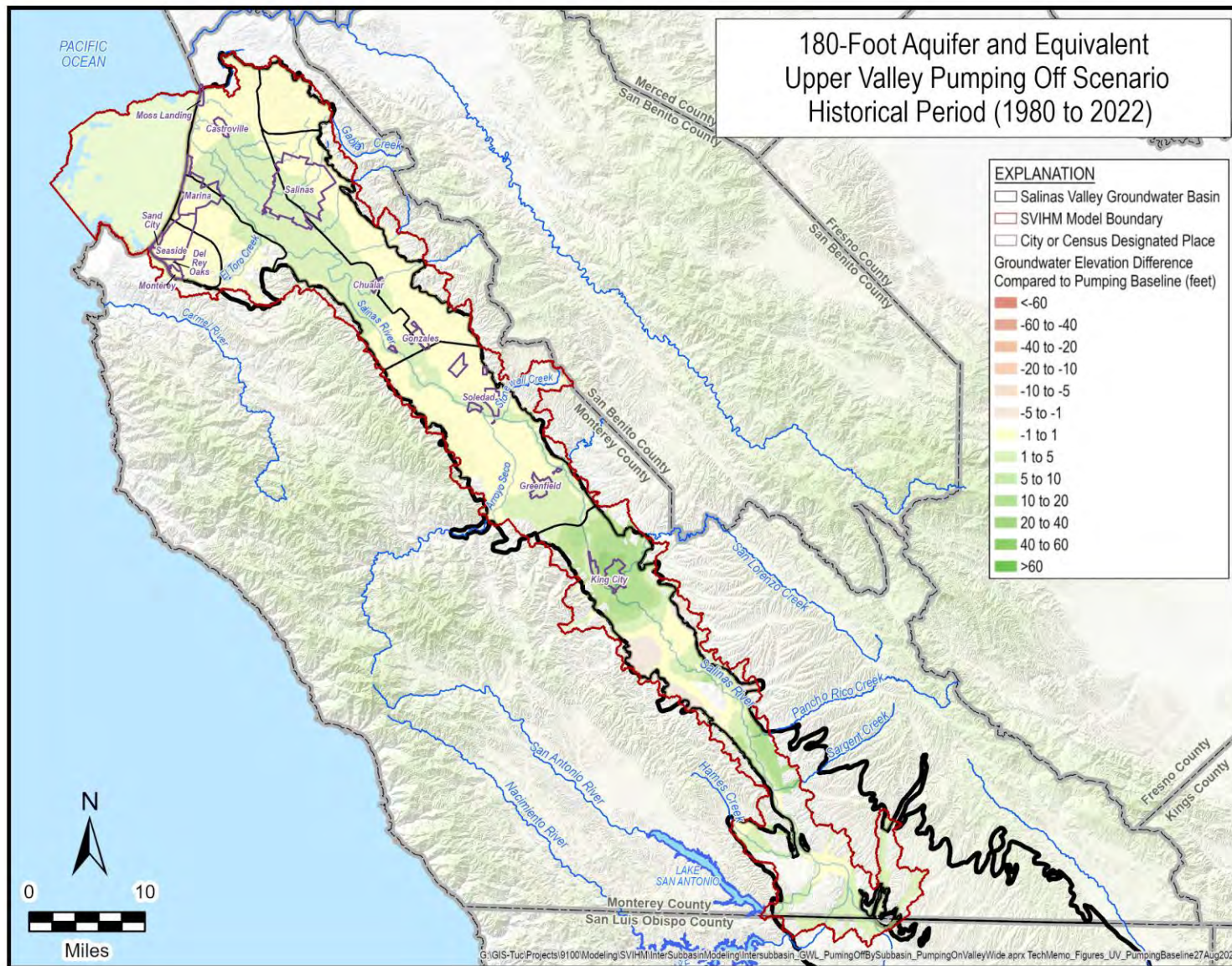
aquilogic, Inc. Salinas Basin Water Alliance

Upper Valley Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/4/2026

Project #: 018-09

Figure 7



Average change in groundwater elevations in model layer 3 (180-Ft Aquifer and equivalent) From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

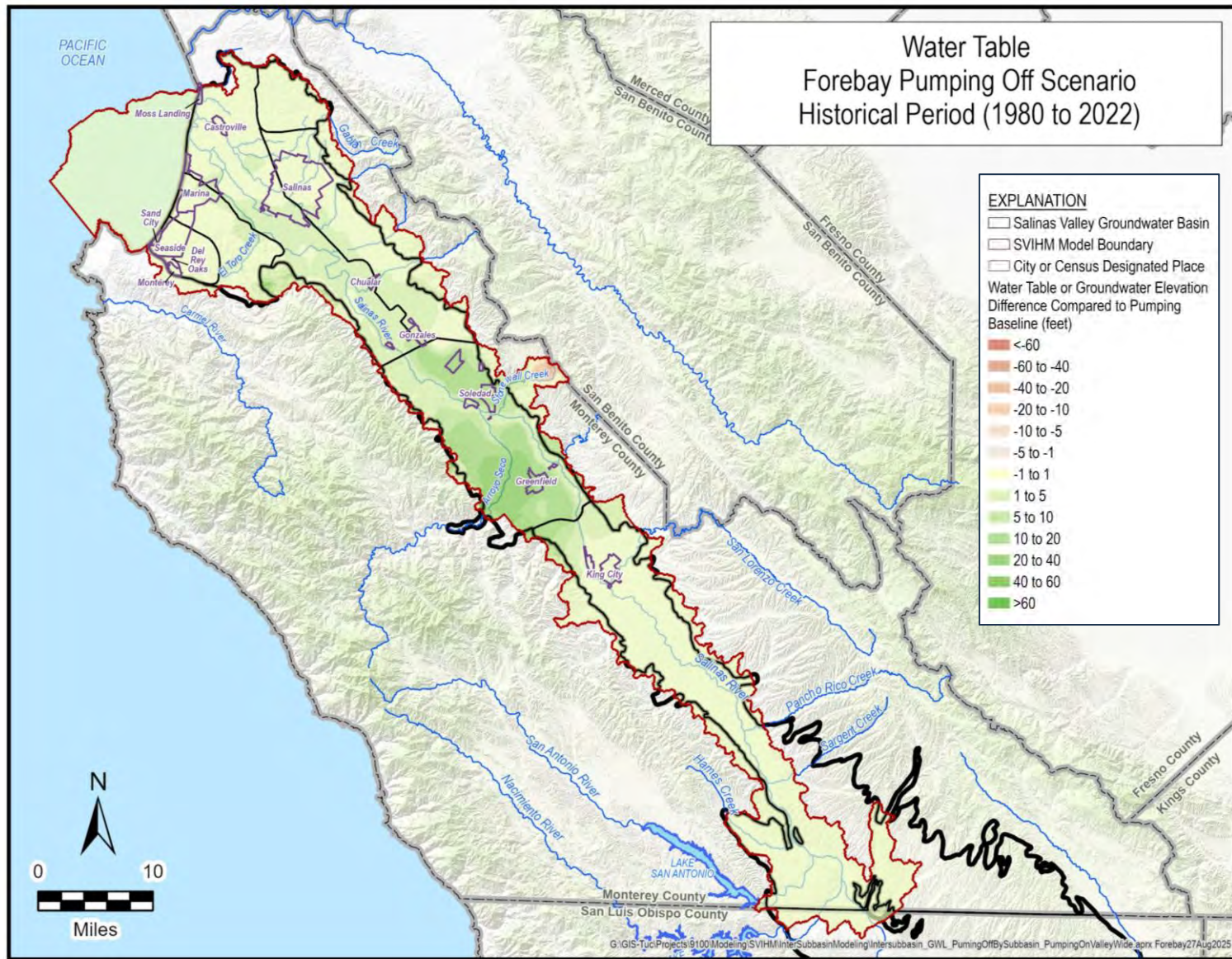
aquilogic, Inc. Salinas Basin Water Alliance

Upper Valley Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/4/2026

Project #: 018-09

Figure 8



Average change in water table elevations.

From M&A (2025a). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.



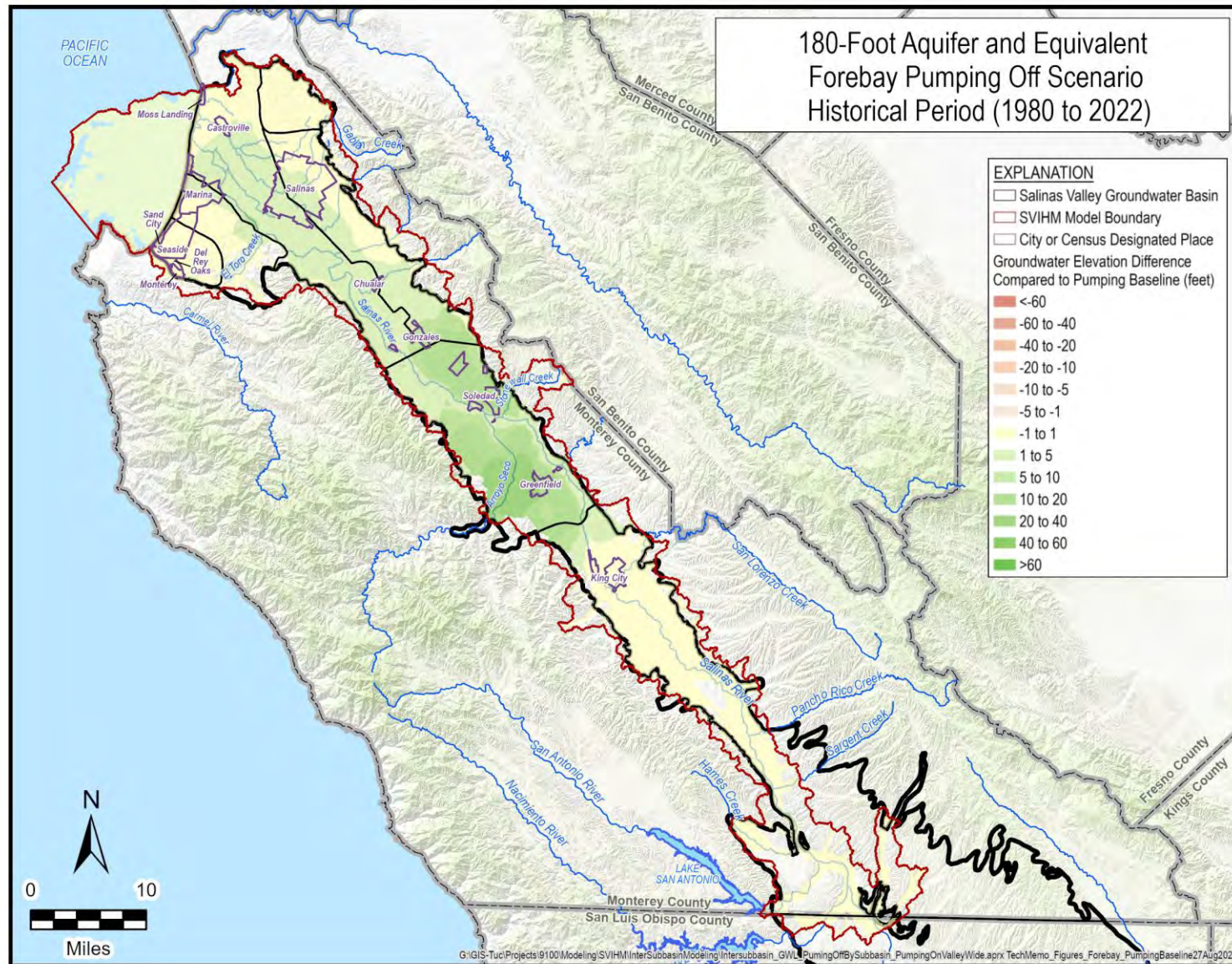
Salinas Basin Water Alliance

Forebay Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/4/2026

Project #: 018-09

Figure 9



Average change in groundwater elevations in model layer 3 (180-Ft Aquifer and equivalent) From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Revised figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

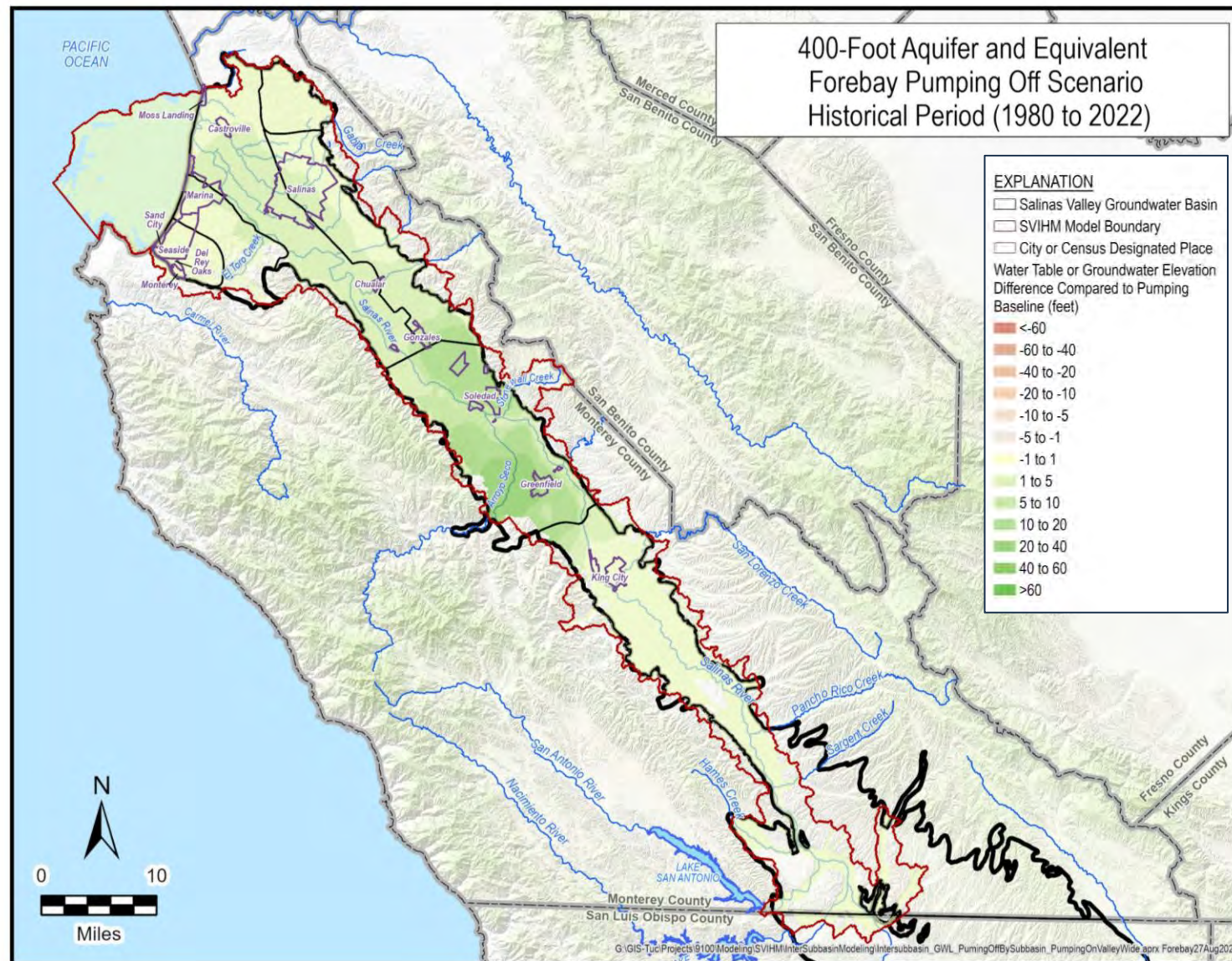
aquilogic, Inc. Salinas Basin Water Alliance

Forebay Aquifer Subbasin Pumping Impacts on Other Subbasins

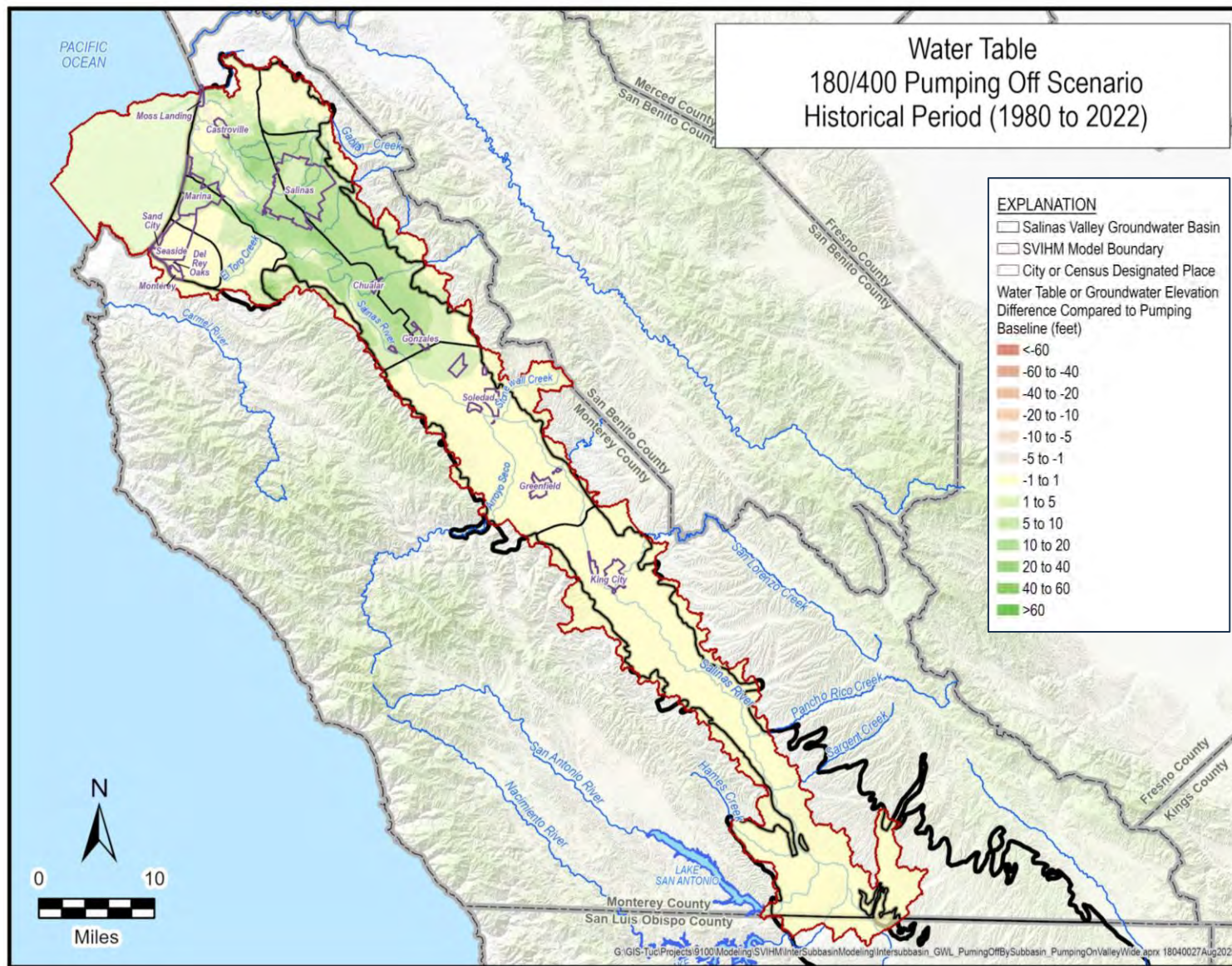
Date: 1/4/2026

Project #: 018-09

Figure 10



Average change in groundwater elevations in model layer 5 (400-Ft Aquifer and equivalent) From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.



Average change in water table elevations.

From M&A (2025a). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

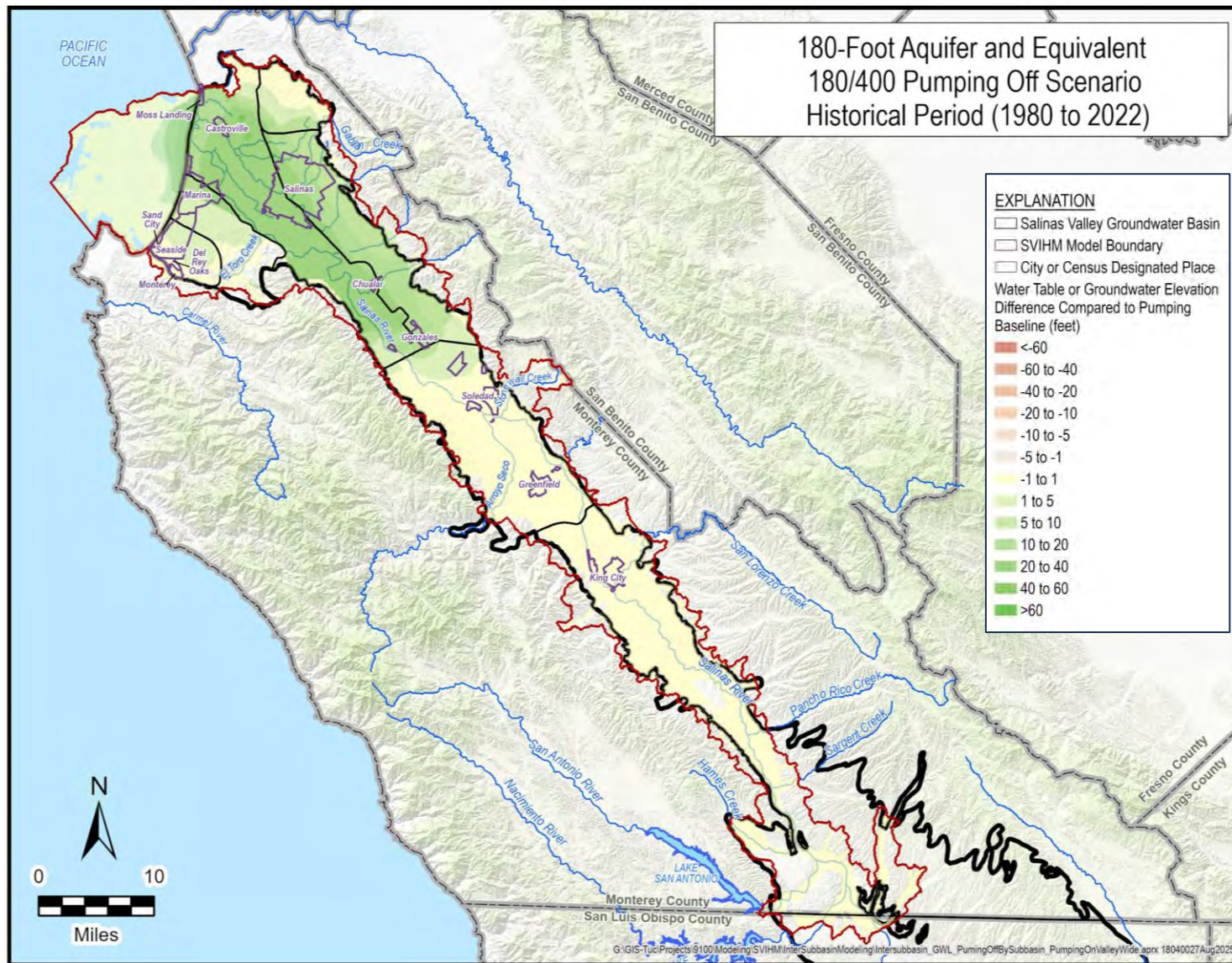
aquilogic, Inc. Salinas Basin Water Alliance

180/400-Ft Aquifer Subbasin Pumping Impacts on Other Subbasins

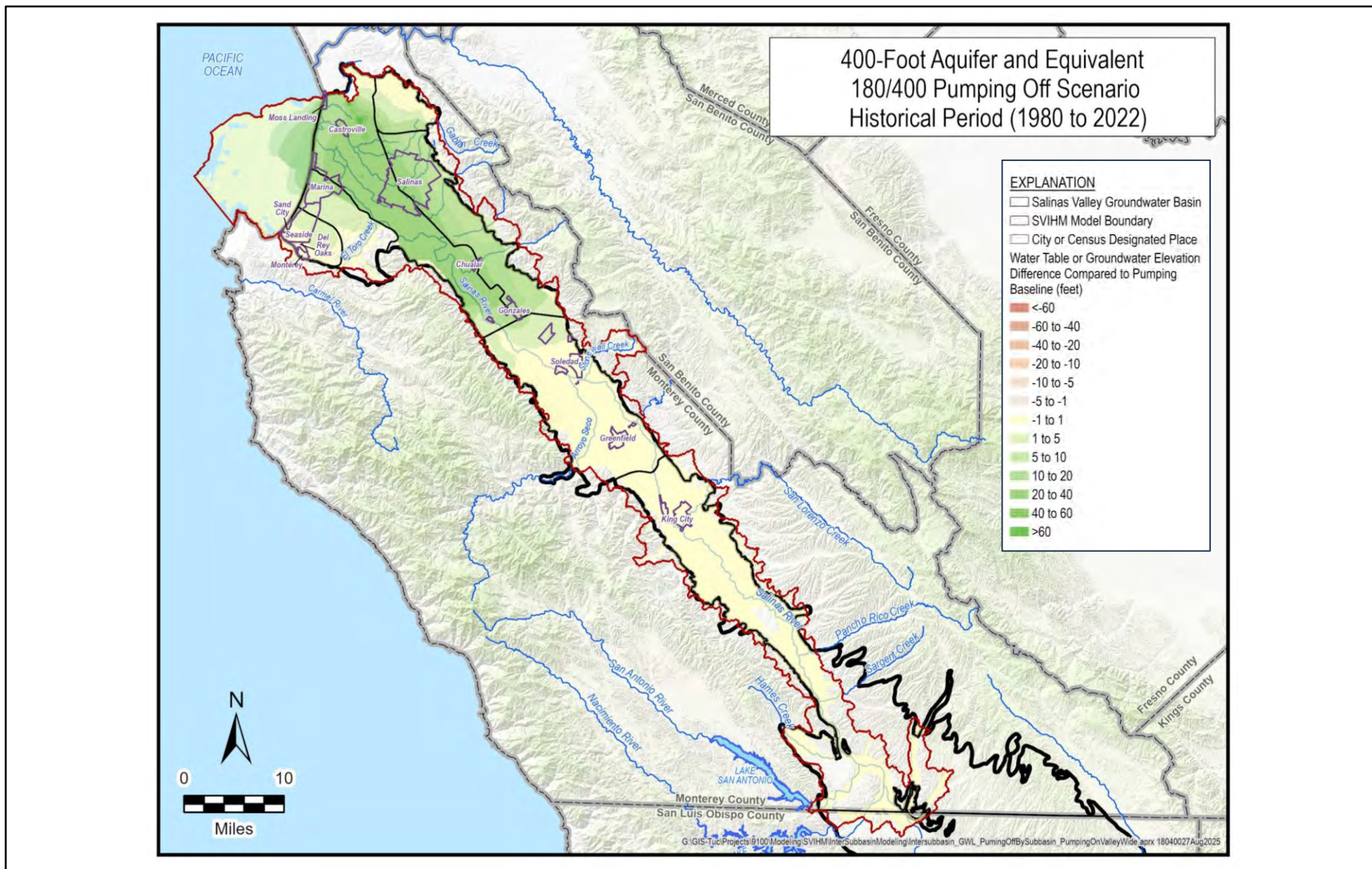
Date: 1/4/2026

Project #: 018-09

Figure 12



Average change in groundwater elevations in model layer 3 (180-Ft Aquifer and equivalent)
From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC)
and Salinas Basin Water Alliance (SBWA). Revised figures for draft memorandum prepared by Montgomery
and Associates (M&A). August 22.



Average change in groundwater elevations in model layer 5 (400-Ft Aquifer and equivalent) From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

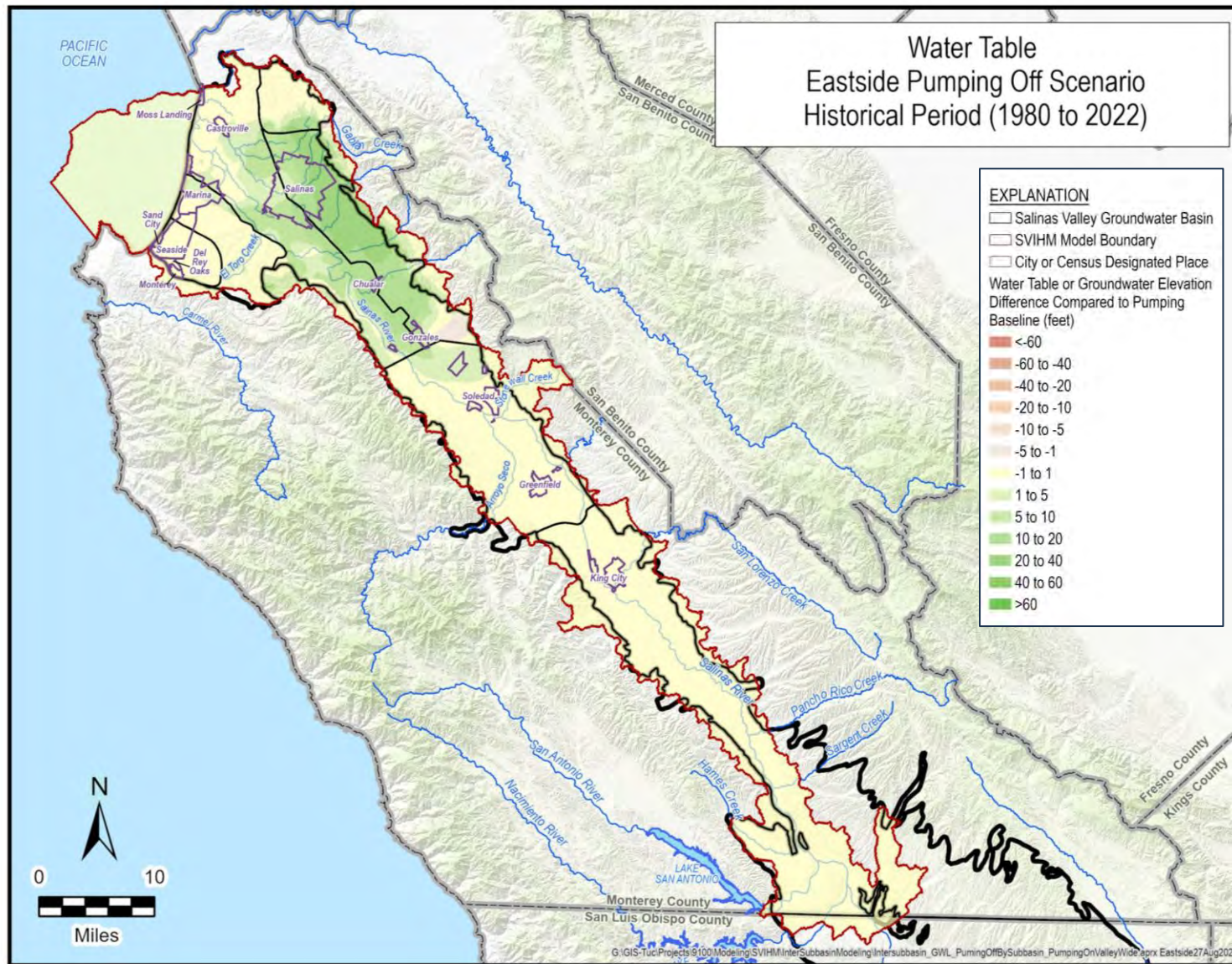
aquilogic, Inc. Salinas Basin Water Alliance

180/400-Ft Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/4/2026

Project #: 018-09

Figure 14



Average change in water table elevations.

From M&A (2025a). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.



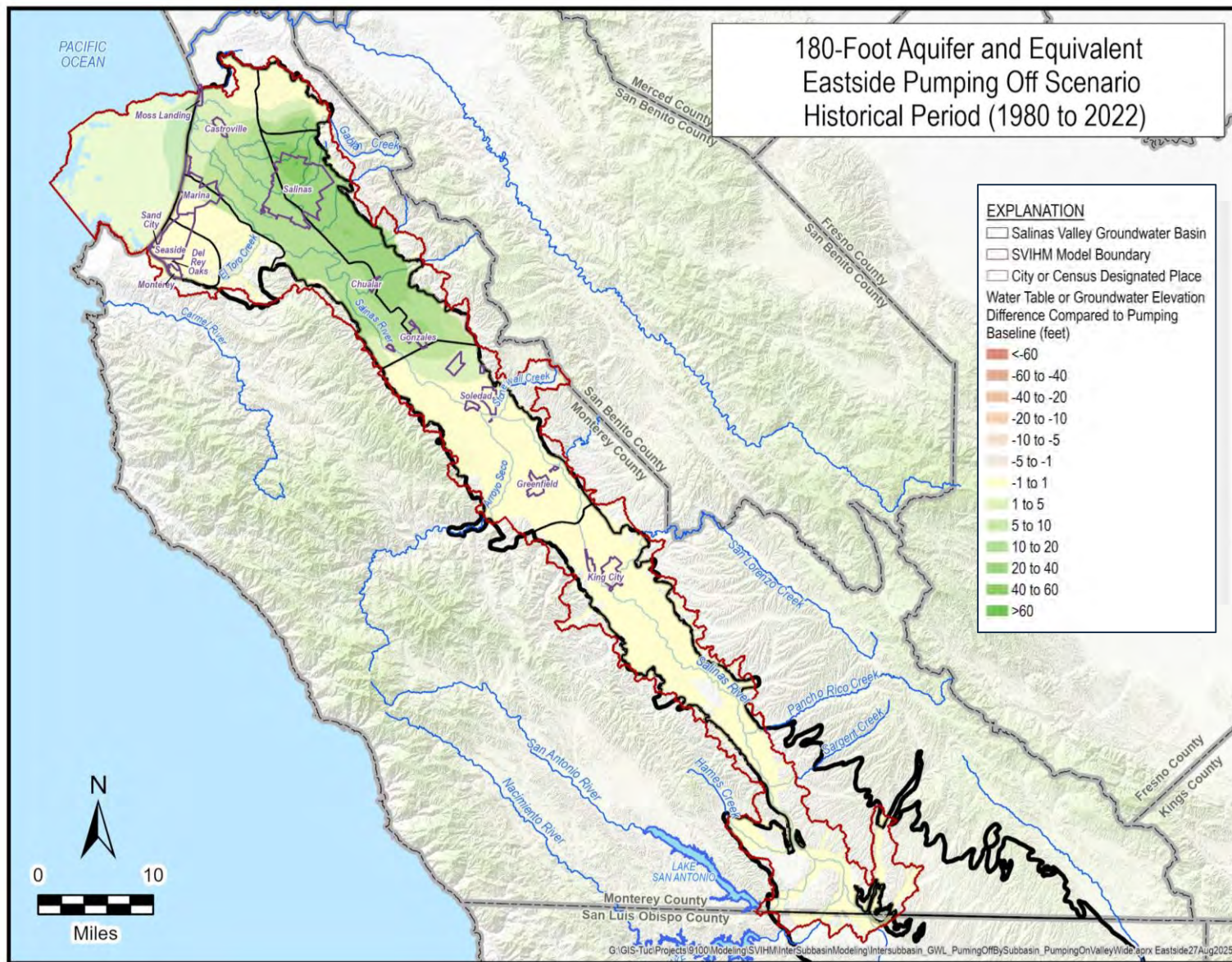
Salinas Basin Water Alliance

East Side Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/4/2026

Project #: 018-09

Figure 15



Average change in groundwater elevations in model layer 3 (180-Ft Aquifer and equivalent) From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Revised figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

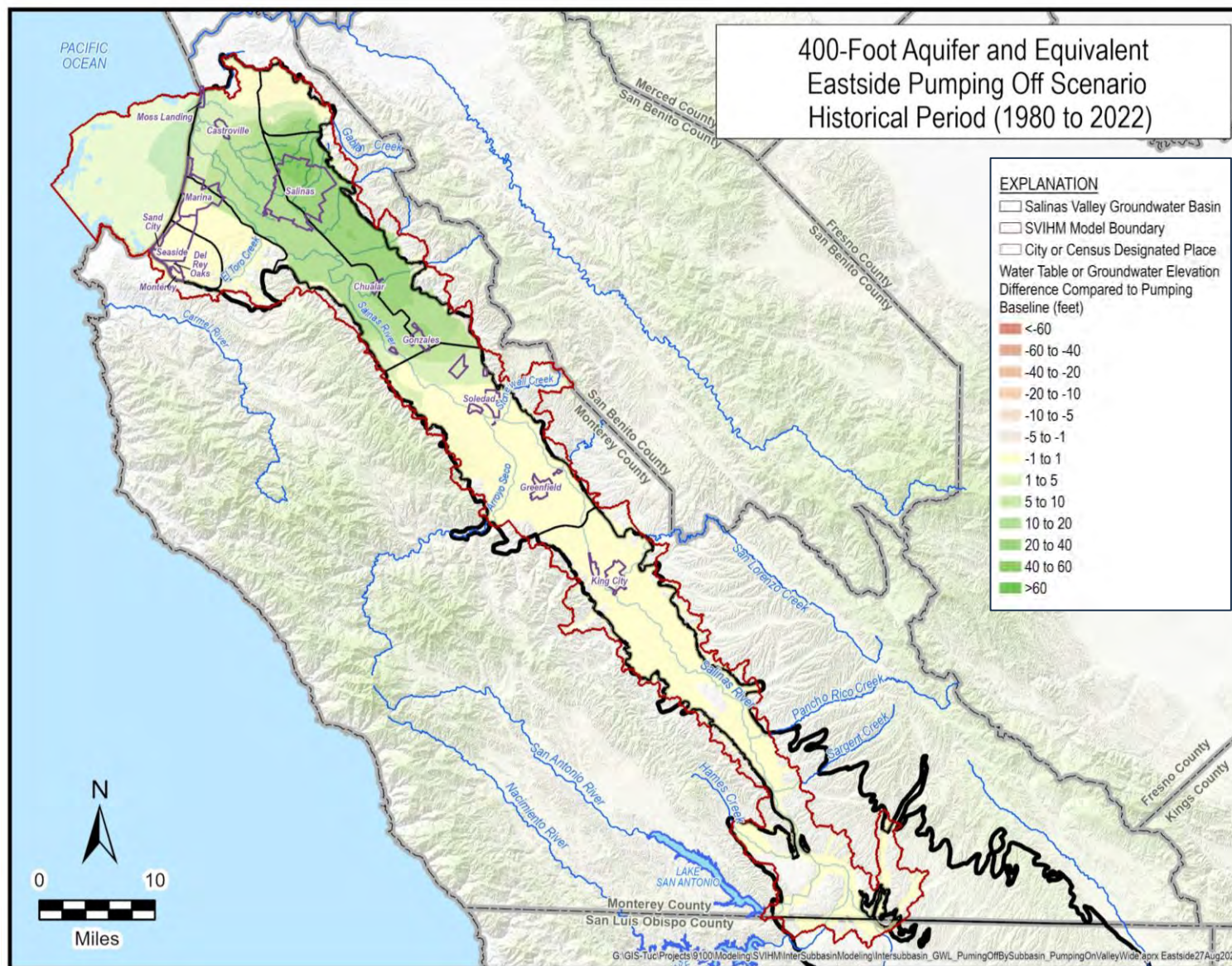
aquilogic, Inc. Salinas Basin Water Alliance

East Side Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 1/4/2026

Project #: 018-09

Figure 16



Average change in groundwater elevations in model layer 5 (400-Ft Aquifer and equivalent) From M&A (2025b). Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA). Appendix figures for draft memorandum prepared by Montgomery and Associates (M&A). August 22.

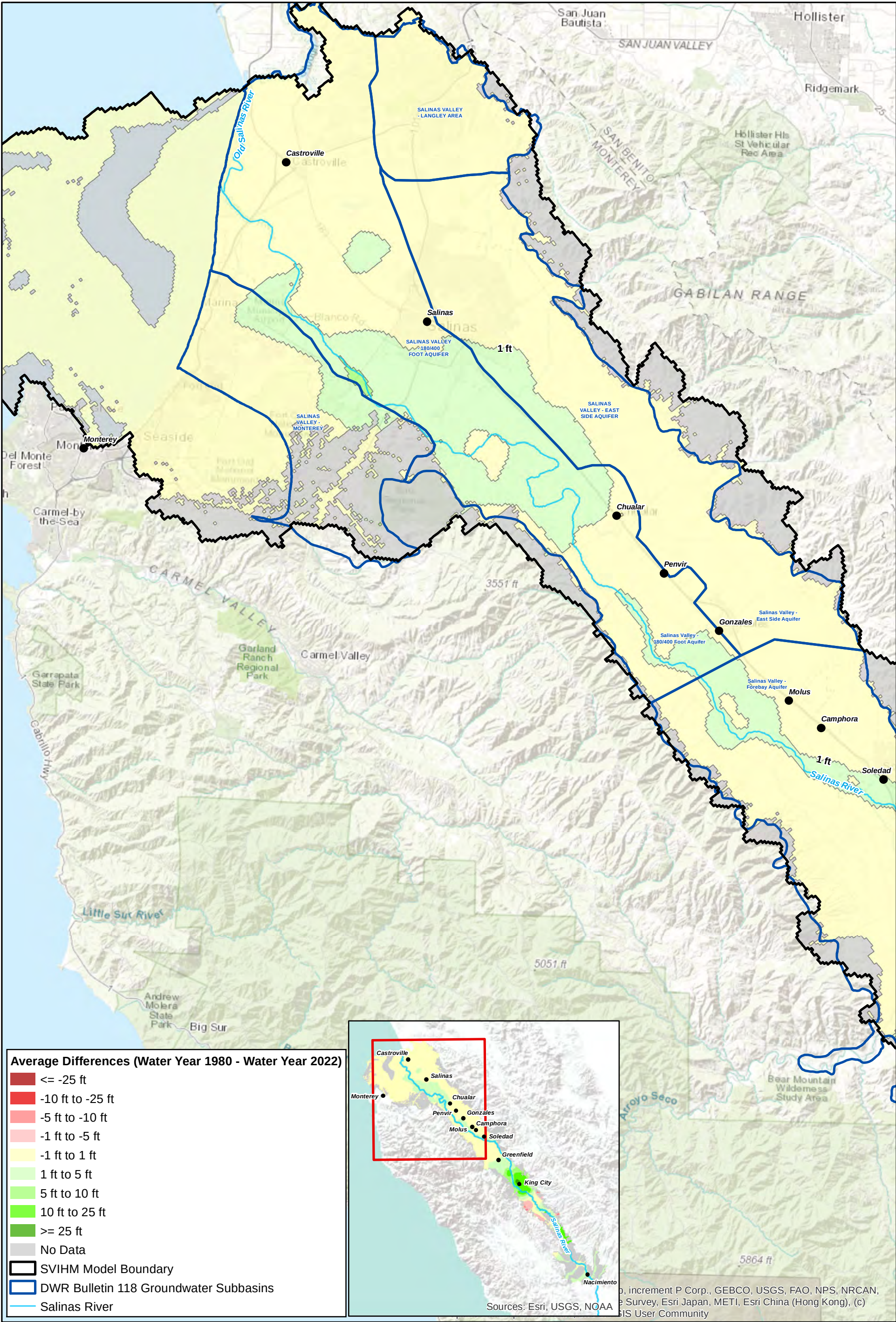
aquilogic, Inc. Salinas Basin Water Alliance

East Side Aquifer Subbasin Pumping Impacts on Other Subbasins

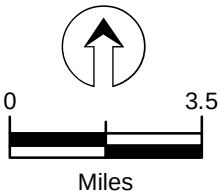
Date: 1/4/2026

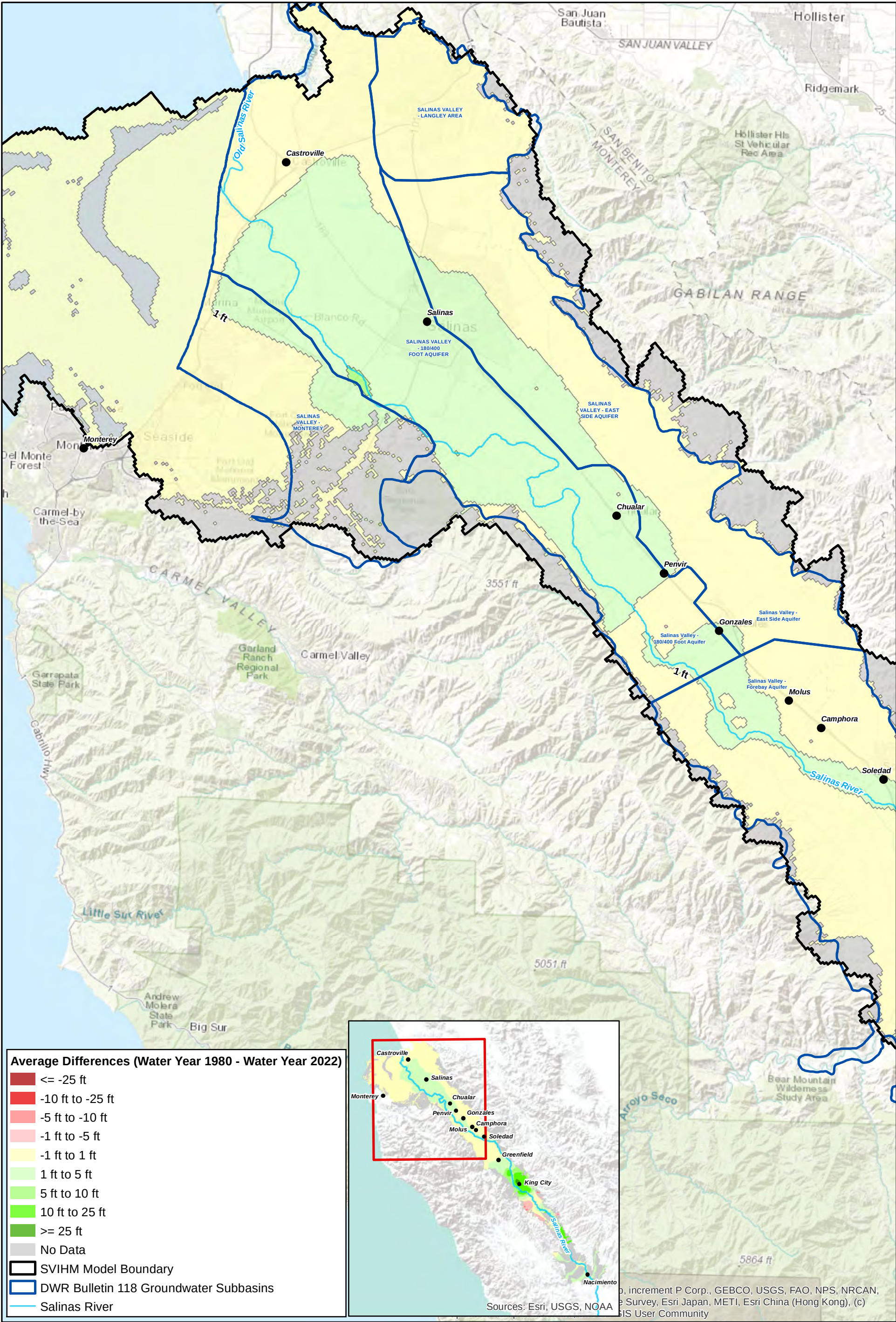
Project #: 018-09

Figure 17

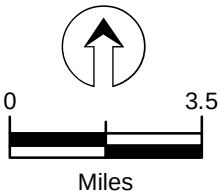


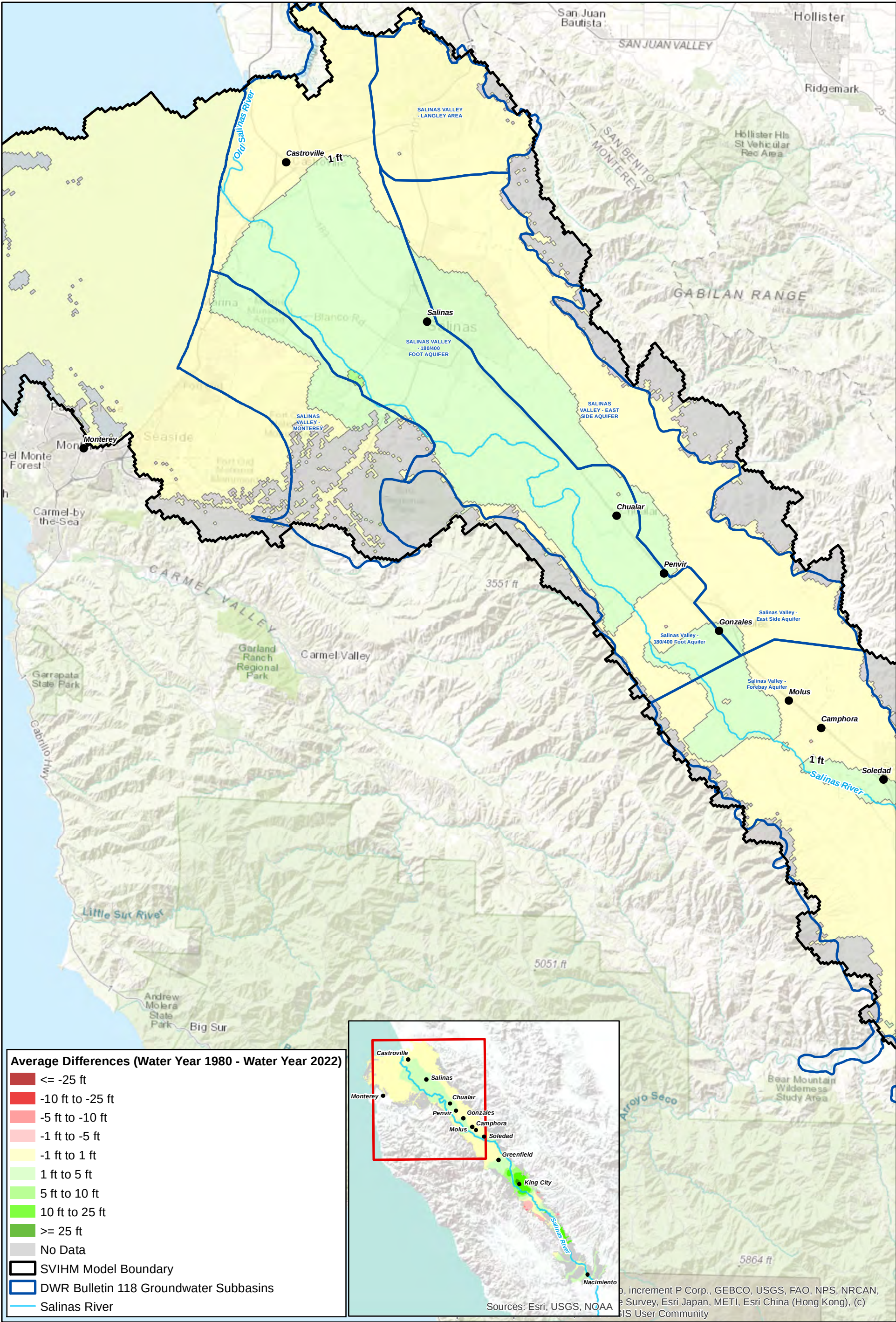
Notes:
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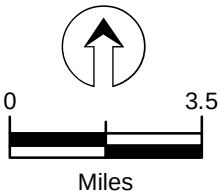


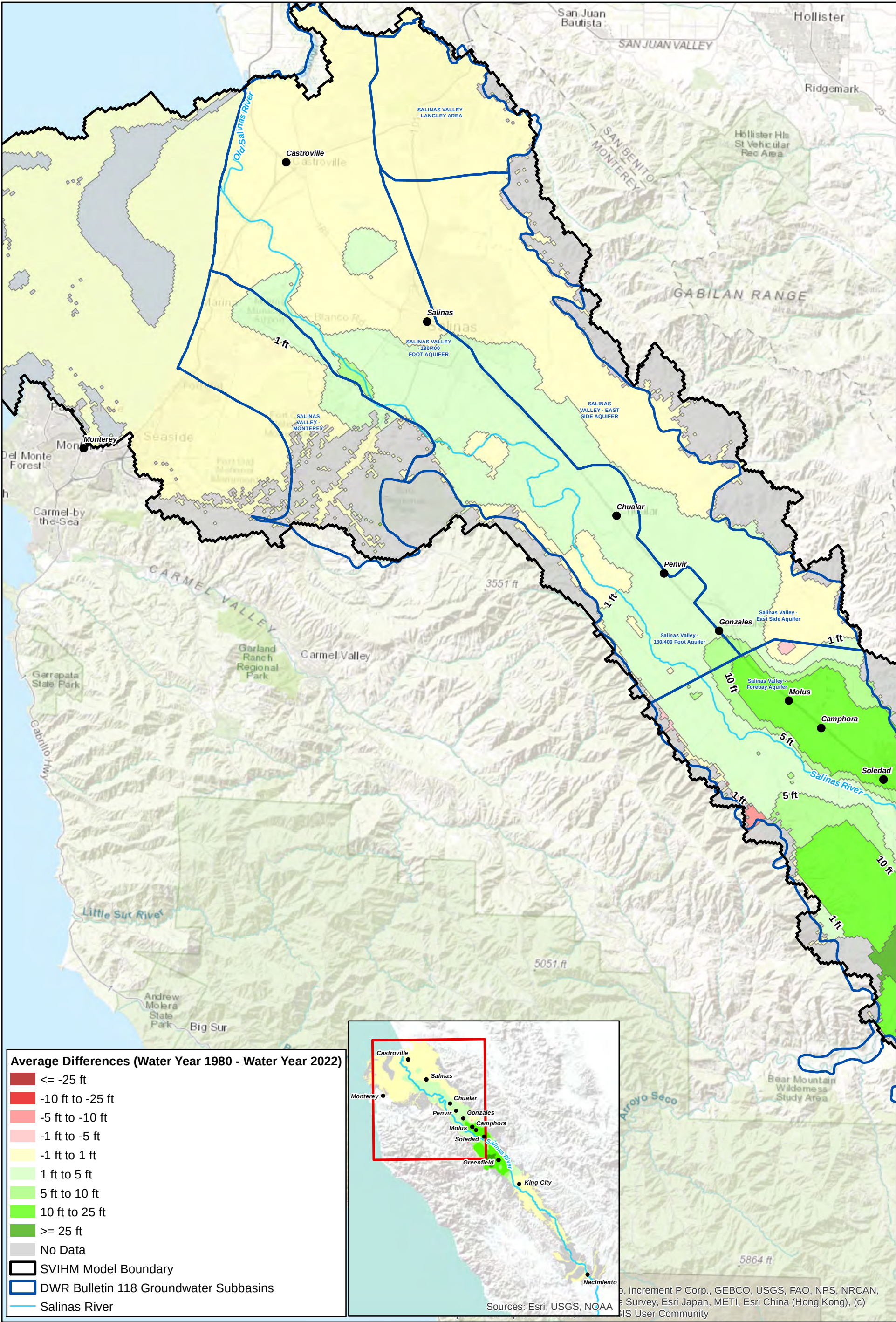
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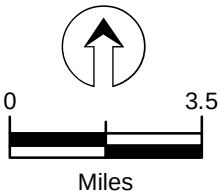


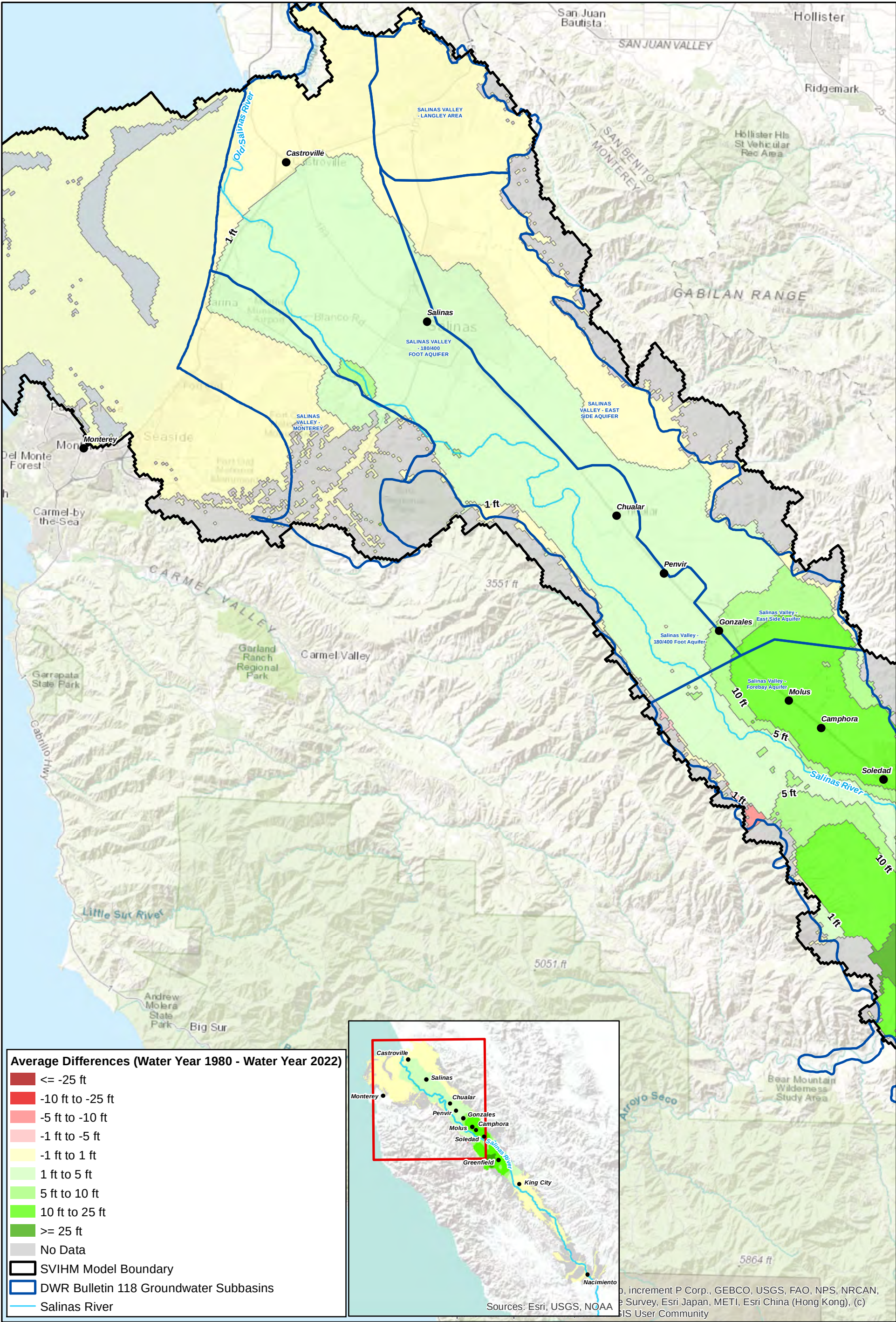
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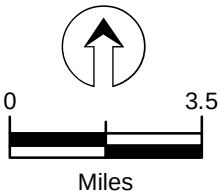


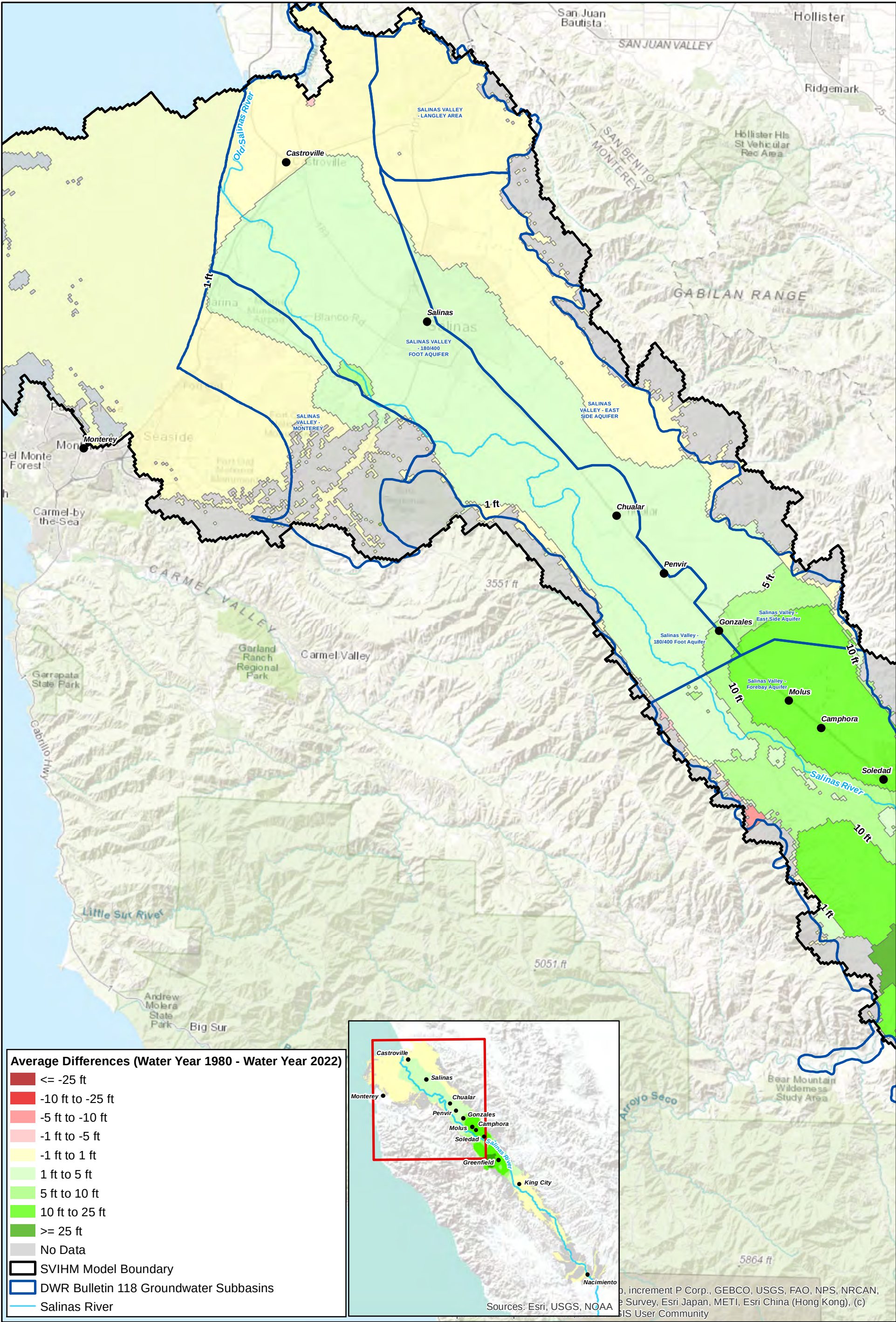
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Notes:
All locations approximate.





Notes:
All locations approximate.

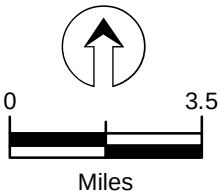


EXHIBIT 3

MEMORANDUM

To: Salinas Valley Basin Groundwater Sustainability Agency – Board Members

CC: Piret Harmon and Emily Gardner, SVBGSA
Nancy Isakson, Salinas Valley Water Coalition
Eric Robinson, Kronick Moskovitz Tiedemann & Girard

From: Dwight L. Smith, PG, CHg, Principal Hydrogeologist

Date: January 5, 2026

Subject: Superposition Modeling – Summary Points

What is the Superposition Testing Method Accomplishing?

- Turning off or on an attribute in the regional flow model to see how other aspects of the hydrologic system respond.

In our case, turn off pumping by subbasin and observing the simulated responses in water levels, subsurface flows between subbasins, magnitudes of seawater intrusion, and flows in the Salinas River.

This method of evaluation is used commonly in modeling to analyze specific effects of historical projects or management actions, and for impact analyses for proposed projects. Local examples:

- Hydrologic Effects of Historical Operation of the Reservoirs (HBA)
- Hydrologic Effects of the Proposed Interlake Tunnel (EIS)
- Hydrologic Changes associated with Proposed Reservoir Operational Change (HCP)

This method is also commonly used in modeling to gain a general understanding of how hydrologically connected certain attributes are to each other within the model, in this instance, impacts of pumping in one subbasin on the other subbasins in the valley.

- During model calibration to identify key calibration parameters
- For reporting of sensitivities to calibrated parameters

Appropriate Use of Superposition Testing Results

- *Improve the general understanding of hydrological degrees of connection* (strong or weak) associated with historical (and future) groundwater pumping in each subbasin over the entire Salinas Valley hydrologic system, and/or individual subbasins.
- Potentially provide some insights into proposed management actions by a subbasin that might involve curtailment of pumping (demand management), and its impact/effect on other subbasins.

Not be used or confused with:

- Review of project-specific proposed management actions.

- A precise simulation. In this case, the modeling completed is a fictitious / hypothetical exercise of full on or off pumping by subbasin to examine the extremes in hydrologic connection responses, but without consideration of how historical water management actions or land use actions may have changed if pumping was theoretically not present in a subbasin (historical reservoir releases and land uses are held constant during the modeling).
- An interpretation of “available water” impacts. The reality is that groundwater pumping evolved in all subbasins concurrently based on suitability of lands for agriculture and access to water.

Key Observations of Superposition Testing Results

- Historical pumping in the Upper Valley and Forebay Subbasins has had little effect on historical magnitudes of seawater intrusion into the 180/400 Subbasin (380 and 420 AFA average annual change, or 4.4% and 4.9% of the historical baseline conditions). Reference **UES Table 2, Figure 2, and M&A Table 1** (values rounded to 400 AFA).
- Historical pumping in the Upper Valley has had little effects on groundwater outflows into the 180/400 and Eastside Subbasins (3 AFA and 26 AFA to 180/400 and Eastside, respectively). Reference **UES Table 2, Figure 2, and M&A Table 1** (values rounded to zero).
- Historical pumping in the Forebay Subbasin has had moderate effects on groundwater outflows into the 180/400 and Eastside Subbasins (1910 AFA and 2020 AFA to 180/400 and Eastside, respectively). Reference **UES Table 2, Figure 3, and M&A Table 1** (values rounded to 1900 and 2000 AFA).
- Historical pumping in the 180/400 and Eastside Subbasins has induced greater subsurface flows out of the Forebay and into these down-gradient subbasins, of about 2600 AFA. Reference **UES Table 2, Figures 4 and 5, and M&A Table 1**.
- Groundwater level elevation changes observed throughout the Salinas Valley as a result of Upper Valley and Forebay Pumping have been historically mild, as contrasted with the locally caused drawdown averaging about 1-5 ft. Reference **M&A Figures in Attachment 2**.
- Historical Eastside Subbasin pumping has a significant effect on groundwater flow to the 180/400 Subbasin – natural flow gradient was about 22,000 AFA to the 180/400, which has been reversed to approximately 27,000 AFA from the 180/400 (*represents a 49,000 AFA subsurface flow reversal*). Reference **UES Figure 1 and M&A Table 1** (baseline values for 180/400 to Eastside).
- Historical pumping from the Upper Valley and Forebay Subbasins has caused historical reduction in flows in the Salinas River (36,000 and 39,000 AFA, respectively) of about a 14.6% and 15.9% of the total flow simulated at the Spreckels gage. Reference **UES Table 5 and M&A Table 2** (values 33,200 and 38,200 AFA for pumping off, and -40,100 and 43,700 AFA for pumping on). The river is the primary recharge source to the aquifer in the Upper Valley and Forebay Subbasins, and retention of a portion of the river sourced water is in keeping with conservation practices for uses of Salinas River flows and reservoir management of flows under permitted water rights for the reservoirs.
- Salinas River flow reductions as a result of historical pumping in the Upper Valley and Forebay Subbasins should not be confused with or implied as a reduction in “water availability”, as stated in aqilogic, Inc. December 2, 2025 memorandum (Section 1a, 1b). “Water availability” is a complex term and infers permitted access to water without harming the environment or causing overdraft, and placement of water to a defined beneficial use. In the case of hypothetical beneficial uses in the

180/400 or Eastside Subbasins, surface “water availability” would also be highly dependent on reservoir management actions, which have historically occurred to accommodate timing and magnitude of delivery to a down-stream permitted diversion point, such as the Salinas River Diversion Facility (SRDF), for the purpose of stopping/halting seawater intrusion.

- The historical flow reduction in the Salinas River flow caused by pumping from the Upper Valley and Forebay Subbasins is more appropriately and technically viewed as “salvaged” surface water that has been placed to a reasonable beneficial use consistent with water right permits for the reservoirs, the surface water of which would otherwise have historically flowed out to the ocean.

Conclusion:

Bottom line, pumping in the Upper Valley and Forebay Subbasins has little to no effect on helping to stop seawater intrusion, or improving groundwater levels in the critically over-drafted 180/400 Subbasin.

References

Aquilogic, Inc., December 2, 2025, Comments on Montgomery & Associates draft Memorandum, “Results of Computer Modeling Agreement for SVWC and SBWA,” dated August 22, 2025, Project No.: 018-09, 6 pages plus table and figures.

UES, October 18, 2025, Technical Review Comments on Montgomery & Associates’ Superposition Modeling Technical Memorandum dated August 22, 2025, 8 pages plus figures.

GSA 2025 Superposition Modeling – Summary

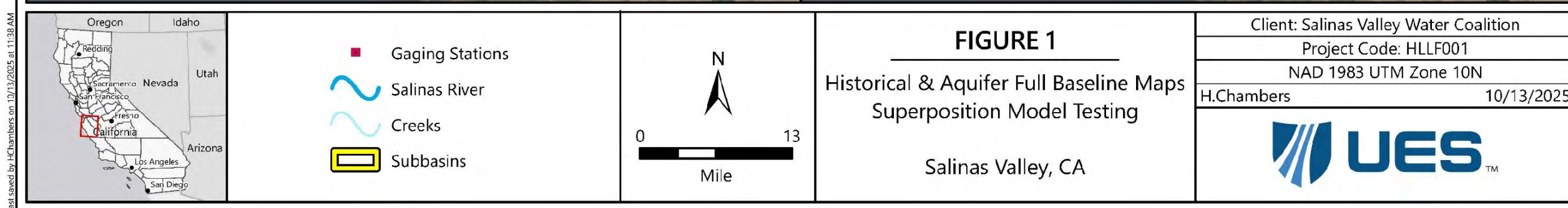
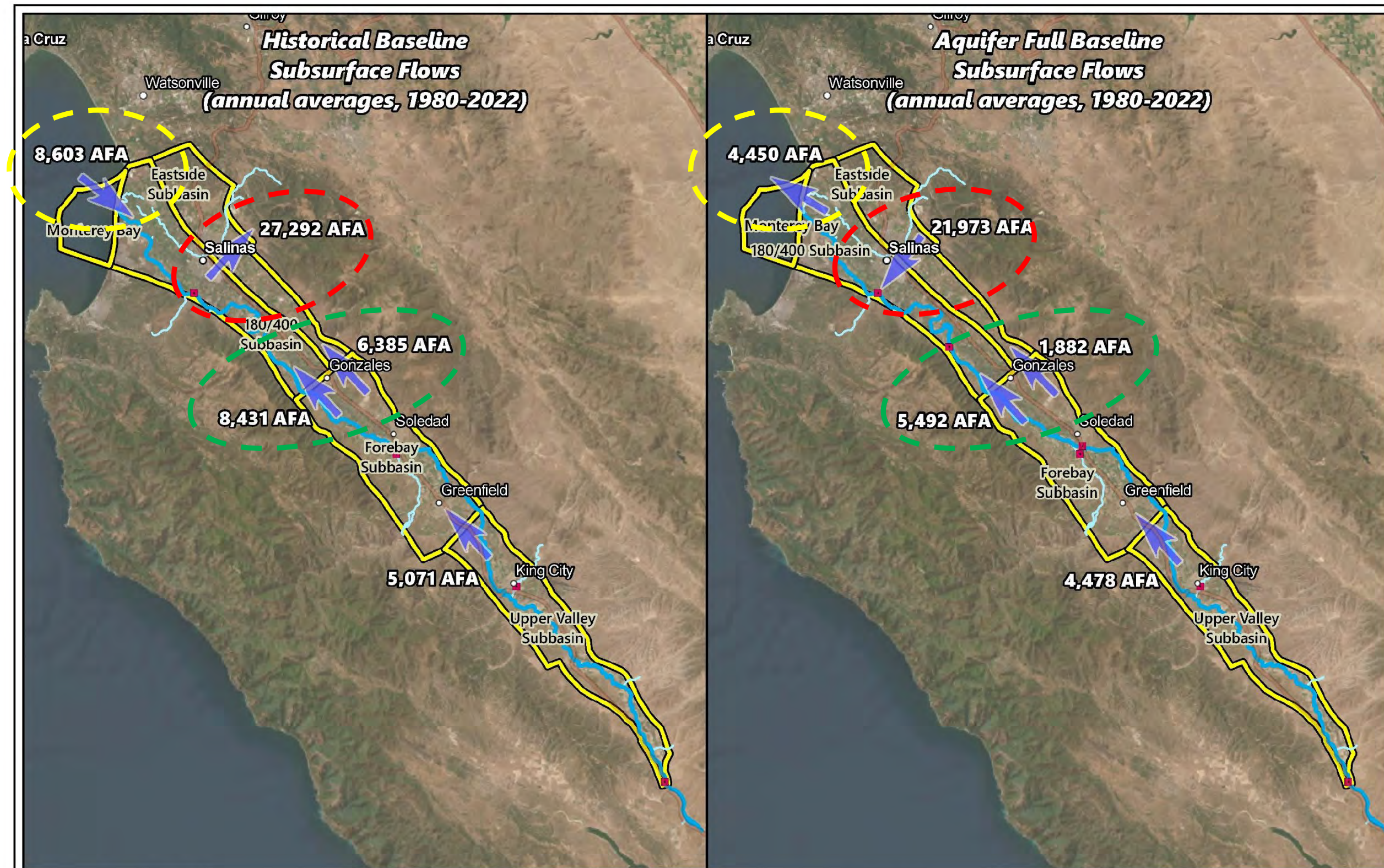
What is the Superposition Testing Method Accomplishing?

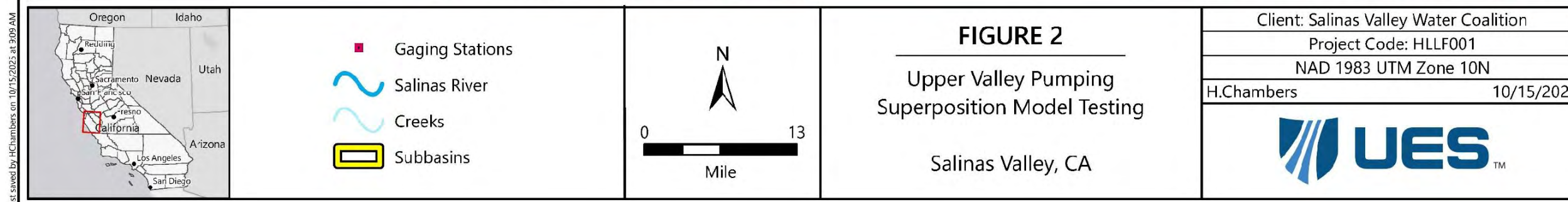
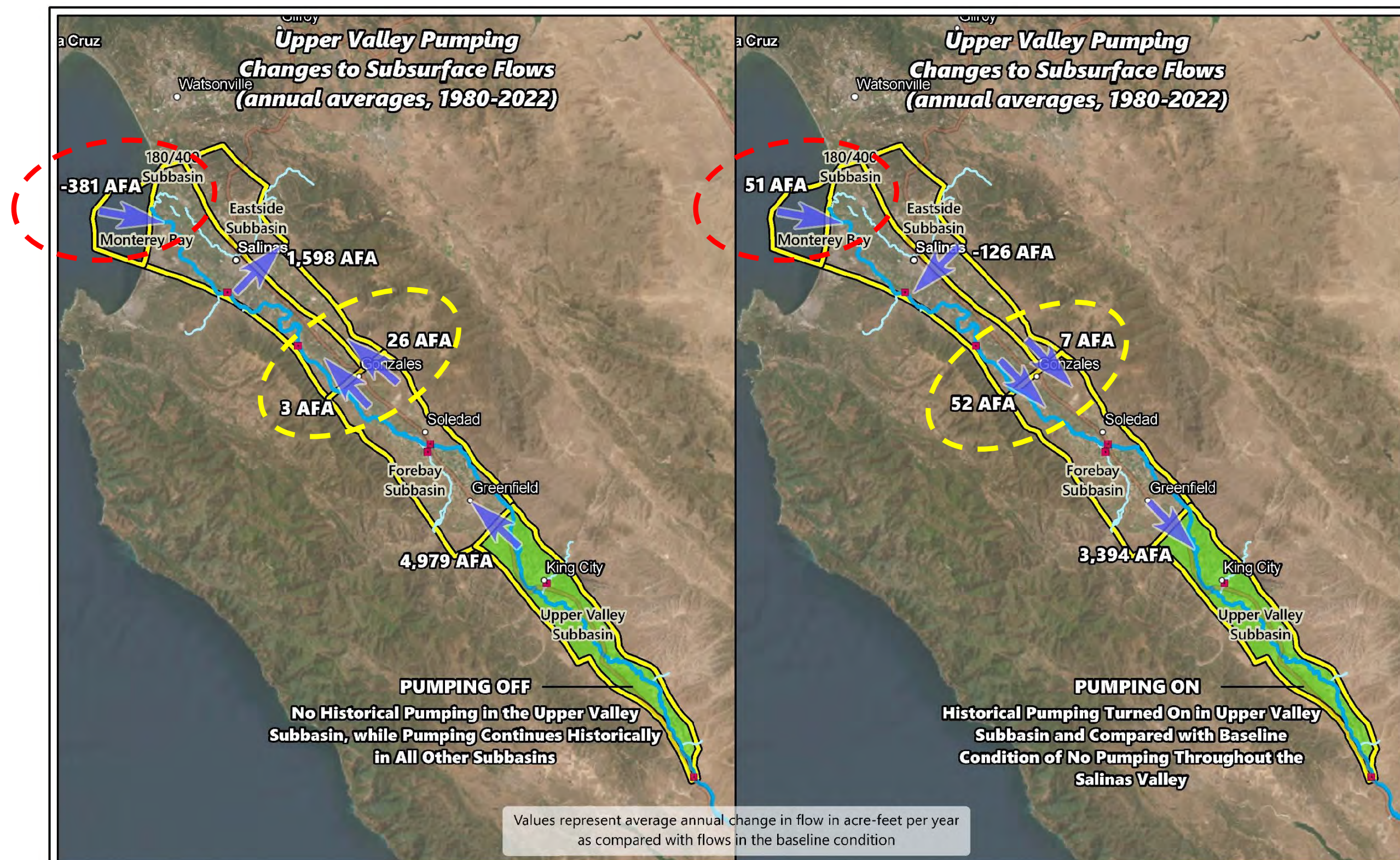
Turning off or on an attribute in the regional flow model to see how other aspects of the hydrologic system respond.

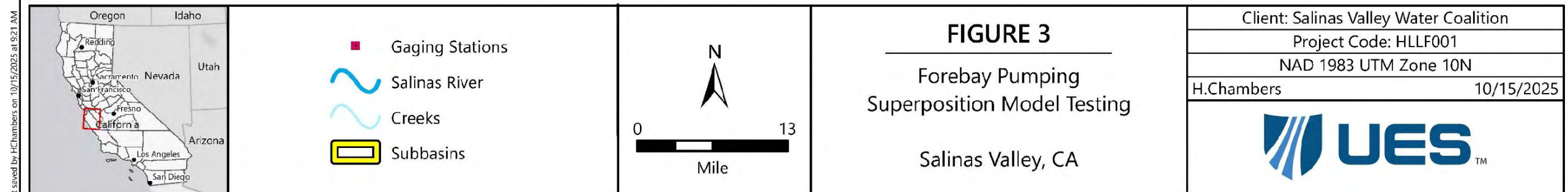
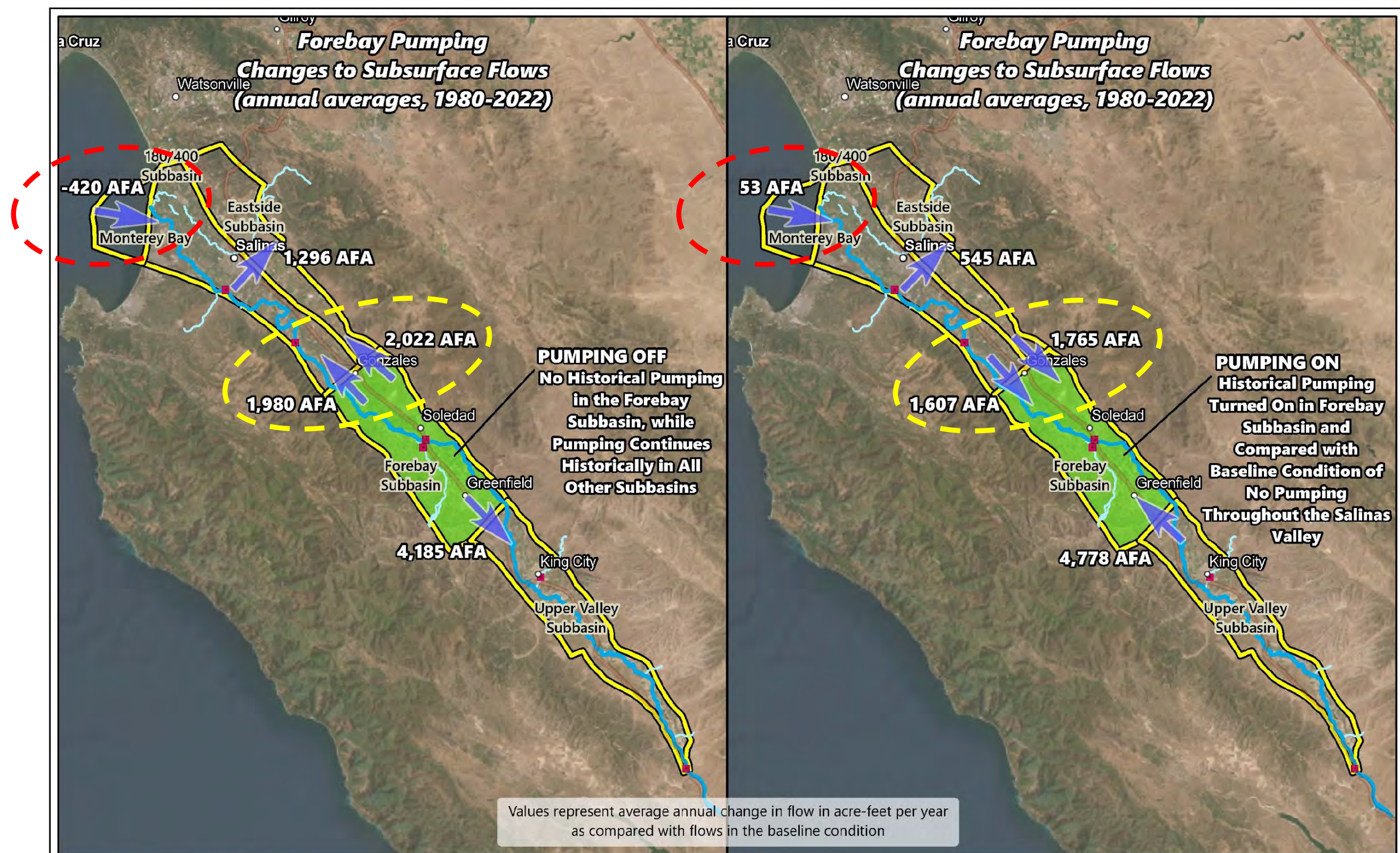
Appropriate Use of Superposition Testing Results

Improve the general understanding of hydrological degrees of connection (strong or weak) associated with historical (and future) groundwater pumping in each subbasin over the entire Salinas Valley hydrologic system, and/or individual subbasins.

Potentially provide some insights into proposed management actions by a subbasin that might involve curtailment of pumping (demand management), and its impact/effect on other subbasins.







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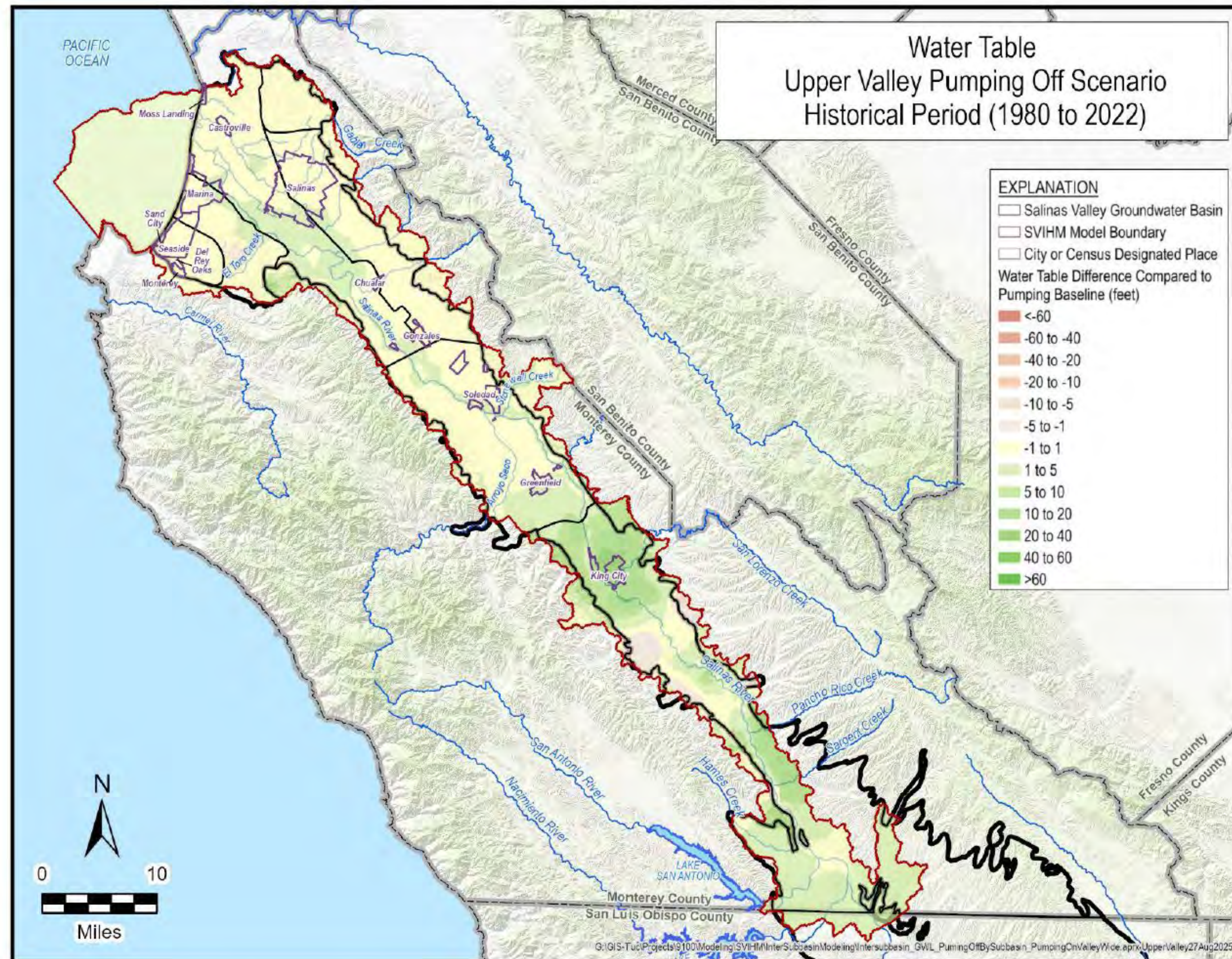


Figure 2-1. Upper Valley Pumping Off Scenario Compared to Pumping Baseline - Average Groundwater Level Difference for 1980-2022

From M&A Memorandum

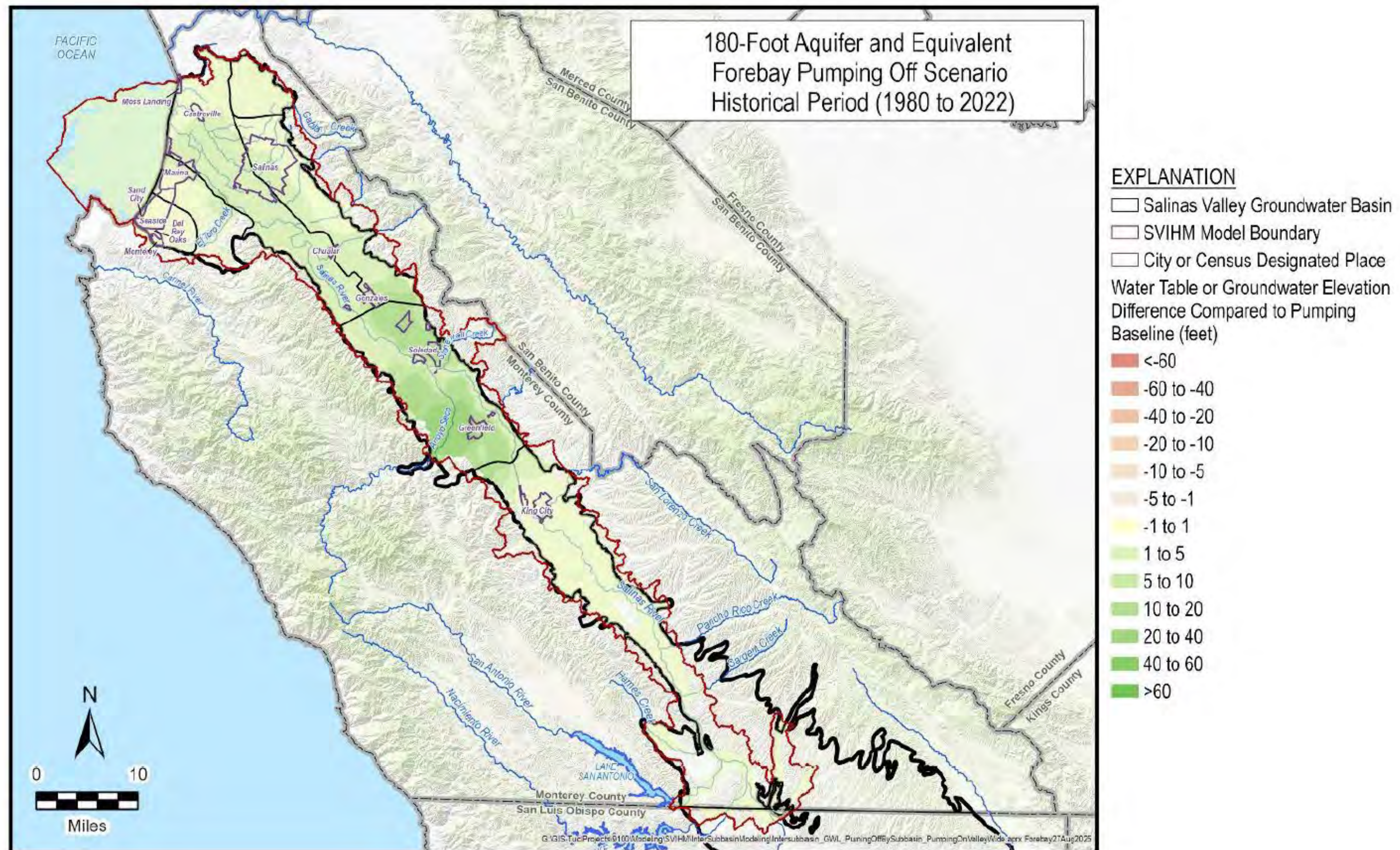


Figure from M&A Memorandum - Figure 2.2

Table 2. Summary of Surface Water Flows

Baseline Pumping Status	Simulation	Chualar Gage	Chualar Gage
		Annual Flow (AF/yr)	Change in Annual Flow (AF/yr)
Pumping On	Simulated Flow with all Historical Pumping	244,400.00	-
	Simulated Flow with Upper Valley Pumping Off ¹	277,600.00	33,200.00
	Simulated Flow with Forebay Pumping Off ¹	282,600.00	38,200.00
	Simulated Flow with 180/400 Pumping Off ¹	254,000.00	9,600.00
	Simulated Flow with Eastside Pumping Off ¹	248,800.00	4,400.00
Pumping Off	Simulated Flow with all Historical Pumping	376,800.00	-
	Simulated Flow with Upper Valley Pumping On ²	336,700.00	-40,100
	Simulated Flow with Forebay Pumping On ²	333,000.00	-43,700
	Simulated Flow with 180/400 Pumping On ²	366,800.00	-10,000
	Simulated Flow with Eastside Pumping On ²	370,700.00	-6,000

Notes:

¹ Pumping in all other subbasins

² No pumping in other subbasins

Table from M&A Memorandum

GSA 2025 Superposition Modeling – Summary

Key Conclusions

- Pumping in the Upper Valley and Forebay Subbasins has little to no effect on seawater intrusion, and minor effects on groundwater levels in the 180/400 and Eastside Subbasins
- There has been a substantial reversal of flows to the 180/400 Subbasin because of pumping in the Eastside Subbasin
- The most dominant effect of pumping in the Upper Valley and Forebay Subbasins is reduction in Salinas River flows by ~15% entering the 180/400 Subbasin, and under conservation principles, this represents salvage of freshwater resources that otherwise would have discharged to the ocean.

MEMORANDUM

To: Abby Ostovar and Derrik Williams, Montgomery & Associates
CC: Nancy Isakson, Salinas Valley Water Coalition
Eric Robinson, Kronick Moskovitz Tiedemann & Girard
Piret Harmon and Emily Gardner, SVBGSA
Bob Abrams, Aquilogic
From: Dwight L. Smith, PG, CHg, Principal Hydrogeologist
Date: October 18, 2025
Subject: **Technical Review Comments on Montgomery & Associates' Superposition Modeling
Technical Memorandum dated August 22, 2025**

1.0 INTRODUCTION

Montgomery & Associates (M&A) has conducted superposition modeling to examine subbasin water balance interactions in accordance with a written funding agreement executed by the Salinas Valley Water Coalition (SVWC), the Salinas Basin Water Alliance (SBWA), and the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA). The Work Plan attached to the funding agreement was developed in 2023, but superposition modeling was not conducted until after the U.S. Geological Survey published the Salinas Valley Integrated Hydrologic Model (SVIHM) in April of 2025. While an update to the 2025 published SVIHM is currently being worked on by the SVBGSA, the associated improvements expected to be forthcoming in the SVIHM v2 are not expected to significantly change the superposition modeling results produced by using the SVIHM v1 (2025).

In the context of hydrologic modeling, superposition testing is a method of examination used to evaluate the impact of one hydrologic parameter, or variable, on other attributes within a complex and interconnected hydrologic system. In numerical flow modeling, superposition testing is used during model calibration to examine the sensitivity of parameter values to achieving calibration and to direct calibration to the most meaningful parameters. Superposition testing is also used on calibrated models to examine effects of project-specific actions amongst cumulative actions, and to examine hydrologic effects of differing assumed input parameters, such as variables associated with climate change or varying conceptual flow models. In this case, superposition modeling was requested by SVWC and SBWA to aid in the understanding of pumping influences on a subbasin scale on primary attributes of Salinas Valley hydrology, including groundwater elevations, subsurface groundwater flows between the subbasins, flows in the Salinas River, and the magnitude of seawater intrusion along the coast. As implemented, large changes to pumping were input into the model, and the model-predicted hydrologic effects throughout the Salinas Valley's subbasins were then examined. Although this testing is fictitious in the sense that the pumping changes do not reflect proposed management actions, it is insightful for understanding the magnitude of presence or absence of hydrologic connections throughout the valley. Simply put, the superposition modeling reveals whether pumping in one subbasin affects groundwater conditions in other subbasins and, if so, how strongly.

The completed superposition modeling work is consistent with the Work Plan, and the documentation provided by M&A is thorough. The modeling meets the expectations of requested work by SVWC, but I do have a few suggestions that relate to the need for a clear and concise summary of the results. As agreed by the SVBGSA, interpretation of the results may be left to the reader, but the results are to be presented

to the SVBGSA's Board of Directors, so clearly summarizing the purpose of superposition testing and the key results is important. These comments focus on the need for a clearer summary of the results, so they can be readily understood.

2.0 M&A MEMORANDUM REVIEW RECOMMENDATIONS

2.1 DEFINE SUPERPOSITION MODELING FOR THE AUDIENCE

The M&A technical memorandum is thorough but needs an introduction describing superposition modeling. Something like the description provided above should be added to M&A's final technical memorandum.

2.2 SUMMARY OF RESULTS NEEDED

The final M&A memorandum should include a "Summary" section presenting highlights of the superposition test results, not just "Summary Notes" stating caveats and limitations. The Summary should present a clear and concise overview of superposition testing results that an interested layperson can easily understand.

2.2.1 Subsurface Flow Observations

A primary interest for SVWC is the subsurface flow relationships between the Upper Valley, Forebay, Eastside and 180/400 Subbasins. While documentation of subsurface flow changes is complete, the tables within the M&A memorandum are complex and results are unnecessarily difficult to decipher. The new Summary section should include tables such as those presented below (**Tables 1-4**) and figures such as **Figures 1-5** presented below. Those tables and figures present the primary superposition test results in a format this is more easily understood by the SVBGSA's Board of Directors and interested lay people. Some description of the information in the tables and text should help guide the reader. For example:

Figure 1 illustrates the model simulated subsurface flows between the Upper Valley, Forebay, Eastside and 180/400 subbasins for the two baseline conditions from which superposition testing is compared. The left pane shows the simulated average annual subsurface flows between subbasins that has historically occurred. The right pane shows the simulated subsurface flows between subbasins for a baseline condition where no pumping has occurred in any subbasins. All values are in units of acre-feet per year (AFA) as averaged over the modeled years of 1980-2022. Under the historical baseline, an average of 5,071 AFA flows from the Upper Valley to the Forebay Subbasin; 8,431 AFA flow from the Forebay to the 180/400 Subbasin, and 6385 AFA flows from the Forebay to the Eastside Subbasin; 27,292 AFA flows from the 180/400 to the Eastside Subbasin; and 8603 AFA flows from the bay into the 180/400 Subbasin as seawater intrusion.

The **Figure 2** left pane illustrates how much the subsurface flows are simulated to change if there had been no pumping from the Upper Valley Subbasin over the entire historical period. There is a simulated increase in subsurface flow from the Upper Valley to the Forebay Subbasin of 4,979 AFA; a simulated increase in subsurface flow from the Forebay to the 180/400 and Eastside Subbasins of 3 and 26 AFA, respectively; a simulated increase in subsurface flow from the 180/400 to the Eastside Subbasin of 1,598 AFA; and a reduction in seawater intrusion to the 180/400 Subbasin of 381 AFA. The changes under the "full aquifer" baseline where the starting point is no pumping anywhere in the valley, then pumping is

turned on in the Upper Valley produces comparable results, but the direction of subsurface flows comparison are presented changes (note direction of arrows in the figures).

Results of the superposition testing may be made for changes to pumping in the Forebay, Eastside, and 180/400 Subbasins using Figures 3-5. Values for subsurface flows in the baseline conditions, and then the changes observed by testing pumping in each subbasin are summarized in the **Tables 1-4**. **Table 1** summarizes the superposition results from the scenario in which pumping in each subbasin is successively turned off, while pumping in all the other subbasins remains on for the hydrologic testing period 1980-2022. The first row shows the baseline amounts of annual groundwater flow between subbasins and seawater intrusion with actual historic pumping turned on in all subbasins. The second row shows the impact on inter-subbasin flows if actual historic Upper Valley pumping were turned off. For example, turning off Upper Valley pumping would reduce seawater intrusion into the 180/400 Subbasin to 8,221 AFA (down 382 AFA). Meanwhile, the bottom row shows that turning off 180/400 Subbasin pumping would reduce seawater intrusion into the 180/400 Subbasin to 456 AFA (down 8,147 AFA). Those and all the other net changes in inter-subbasin flows and seawater intrusion are summarized below in **Table 2**.

Table 3 summarizes the superposition results from the scenario in which pumping in each subbasin is successively turned on, while pumping in all the other subbasins remains off for the hydrologic testing period 1980-2022. The first row shows the baseline amounts of annual groundwater flow between subbasins and 4,450 AFA of groundwater discharge to the ocean with actual historic pumping turned off in all subbasins. The second row shows the impact on inter-subbasin flows and ocean discharge if actual historic Upper Valley pumping were turned on. For example, turning on Upper Valley pumping would reduce ocean discharge from the 180/400 Subbasin to 4,339 AFA (down 51 AFA). Meanwhile, the bottom row shows that turning on 180/400 Subbasin pumping would reduce ocean discharge from the 180/400 Subbasin to 3 AFA (down 4,447 AFA) while turning on Eastside Subbasin pumping would reduce ocean discharge from the 180/400 Subbasin to 3,515 AFA (down 935 AFA). Those and all the other net changes in inter-subbasin flows and ocean discharge are summarized below in **Table 4**.

Table 1 – Summary of Subbasin Subsurface Flows – Historical Baseline Superposition Modeling
(Average Values 1980-2022 in AFA)

Model Scenario	Upper Valley to Forebay	Forebay to Eastside	Forebay to 180/400	180/400 to Eastside	Seawater Intrusion to 180/400
Historical Conditions	5,071	6,385	8,431	27,292	8,603
No Upper Valley Pumping ^a	10,050	6,412	8,434	28,890	8,221
No Forebay Pumping ^a	887	8,407	10,339	28,588	8,183
No Eastside Pumping ^a	5,013	3,751	6,815	10,566	6,555
No 180/400 Pumping ^a	5,005	5,251	5,766	52,324	456

Notes:

a Historical pumping continues in all other subbasins.

Table 2 – Summary of Subbasin Subsurface Flow Changes from Baseline – Historical Baseline Superposition Modeling
(Average Values 1980-2022 in AFA)

Model Scenario	Upper Valley to Forebay ^b	Forebay to Eastside ^b	Forebay to 180/400 ^b	180/400 to Eastside ^b	Seawater Intrusion to 180/400
No Upper Valley Pumping ^a	4,979	26	3	29	-381 ^c
No Forebay Pumping ^a	-4,185	2,022	1,908	3,930	-420 ^c
No Eastside Pumping ^a	-58	-3,635	-1,616	-5,251	-2,047 ^c
No 180/400 Pumping ^a	-67	-1,134	-2,665	-3,799	-8,147 ^c

Notes:

a Historical pumping continues in all other subbasins.

b Positive value = increase over historical baseline flow; Negative value = decrease over historical baseline flow.

c Negative value = less seawater intrusion.

Table 3 – Summary of Subbasin Flows – Full Aquifer Baseline Superposition Modeling
(Average Values 1980-2022 in AFA)

Model Scenario	Upper Valley to Forebay	Forebay to Eastside	Forebay to 180/400	Eastside to 180/400	Seawater Intrusion to 180/400
Full Aquifer Conditions (No Historical Pumping)	4,478	1,822	5,492	21,973	-4,450 ^b
Upper Valley Pumping On ^a	1,084	1,815	5,440	22,100	-4,339 ^b
Forebay Pumping On ^a	9,256	57	3,884	21,429	-4,397 ^b
Eastside Pumping On ^a	4482	4266	6632	-16,941	-3,515 ^b
180/400 Pumping On ^a	4,484	2,547	6,841	36,700	-3 ^b

Notes:

a No pumping in all other subbasins.

b Negative value for seawater intrusion = subsurface outflow to the ocean

Table 4 – Summary of Subbasin Flow Changes from Baseline – Full Aquifer Baseline Superposition Modeling

(Average Values 1980-2022 in AFA)

Model Scenario	Upper Valley to Forebay ^b	Forebay to Eastside ^b	Forebay to 180/400 ^b	Eastside to 180/400 ^b	Seawater Intrusion to 180/400
Upper Valley Pumping On ^a	-3,394	-7	-52	127	51 ^c
Forebay Pumping On ^a	4,778	-1,765	-1,608	-544	53 ^c
Eastside Pumping On ^a	4	2,444	1,140	-38,914	935 ^c
180/400 Pumping On ^a	6	725	1,349	14,727	4,447 ^c

Notes:

a No pumping in all other subbasins.

b Positive value = increase over historical baseline flow, Negative value = decrease over historical baseline flow.

c Positive value = less outflow to the ocean.

2.2.2 Salinas River Flow Observations

Simulated flow changes in the Salinas River should also be summarized in the new Summary text. Average annual discharge at key gages in units of acre-feet per year (AFA) would suffice. M&A Tables 7 and 14 are relatively easy to understand and probably do not need to be repeated in the Summary, but general average annual magnitudes of change in flow in the superposition testing should be simply and clearly described, and a complementary summary figures are suggested, such as the **Figures 6-10**. **Figure 6** shows the simulated baseline flows at three key gages on the Salinas River, in units of AFA, averaged over the 1980-2022 simulation period. **Figures 7-10** then show the simulated changes in flows resulting from subbasin pumping turned off while other pumping continues (historical baseline – left side pane) and pumping turned on by subbasin at historical rates for the “aquifer full” baseline condition (right side pane). **Tables 5 and 6** summarizes the simulated Salinas River flow changes, for both the historical baseline testing and the “full aquifer” baseline testing for the most down-stream gage Spreckels.

For example, Salinas River average annual flow at the Spreckels gage for historical pumping baseline is simulated at 246,536 AFA (left pane, **Figure 6**). When all historical pumping in the Upper Valley Subbasin is turn off for the simulation period, there is an increase in average annual flow at the Spreckels gage of 35,904 AFA (left pane, **Figure 7**), or an approximate flow increase of 14.6% (**Table 5**). For the “full aquifer” baseline conditions, historical pumping turned on in the Upper Valley Subbasin is simulated to decrease the average annual flow at the Spreckels gage from 423,519 AFA to 378,498 AFA, or a reduction in flow of 45,020 AFA or 10.6% of the total annual flow at Spreckels (refer to **Figure 7** right pane, and **Table 6**).

Table 5 – Summary of Salinas River Simulated Annual Flows and Changes at the Spreckels Gage for Historical Baseline Superposition Modeling

(Average Values 1980-2022)

Model Scenario	Annual Flow (AFA)	Change in Annual Flow (AFA)	Percentage Change in Flow
Simulated Flow with All Historical Pumping	246,536	--	--
Simulated Flow with Upper Valley Pumping Off	282,461	+35,904	14.6%
Simulated Flow with Forebay Pumping Off	285,866	+39,310	15.9%
Simulated Flow with Eastside Pumping Off	254,677	+8,121	3.3%
Simulated Flow with 180/400 Pumping Off	266,920	+20,364	8.3%

Table 6 – Summary of Salinas River Simulated Annual Flows and Changes at the Spreckels Gage for the “Full Aquifer” Baseline Superposition Modeling

(Average Values 1980-2022)

Model Scenario	Annual Flow (AFA)	Change in Annual Flow (AFA)	Percentage Change in Flow
Simulated Flow with No Historical Pumping (“Full Aquifer” Condition)	423,519	--	--
Simulated Flow with Upper Valley Pumping On	378,498	-45,020	14.6%
Simulated Flow with Forebay Pumping On	376,506	-47,013	15.9%
Simulated Flow with Eastside Pumping On	409,221	-14,298	3.3%
Simulated Flow with 180/400 Pumping On	397,481	-26,038	8.3%

2.2.3 Regional Groundwater Level Changes

Regional water level elevation changes are relatively easy to visualize in color-flood maps in the M&A memorandum. Some complimentary Summary text and tables are needed to describe the magnitude and geographic distribution of average responses by subbasin. **Tables 7 and 8** are examples of this type of summary table, where maximum water level changes by subbasin (1980-2022, average change) are presented.

Table 7 shows water levels resulting from successively turning pumping off in each subbasin. For example, the first row shows turning Upper Valley Subbasin pumping off would increase Upper Valley water levels by 20-40 feet while increasing water levels elsewhere by 1-5 feet. The bottom row shows turning 180/400 Subbasin pumping off would increase water levels in the Forebay Subbasin by 5-10 feet, in the Eastside Subbasin by 40-60 feet, and in the 180/400 Subbasin by more than 60 feet.

Table 8 shows water levels resulting from successively turning pumping on in each subbasin. For example, the first row shows turning Upper Valley Subbasin pumping on would reduce Upper Valley water levels by 20-40 feet while reducing Forebay Subbasin water levels elsewhere by 1-5 feet, and water levels every else by less than 1 foot The bottom row shows turning the 180/400 Subbasin pumping on would reduce water levels in the Forebay Subbasin by 1-5 feet, in the Eastside Subbasin by 40-60 feet, and in the 180/400 Subbasin by more than 60 feet.

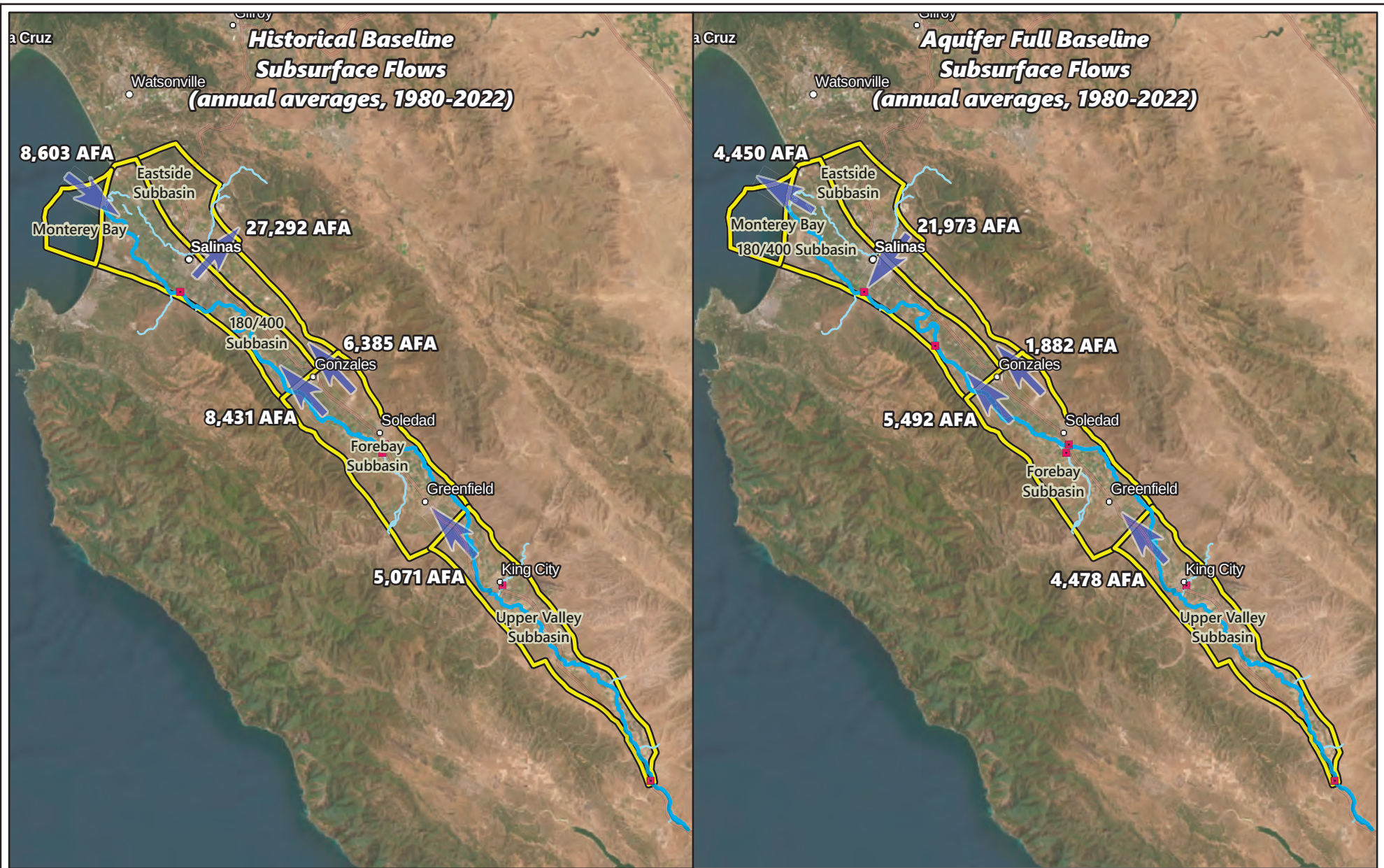
Table 7 – Summary of Maximum Water Level Changes – Historical Baseline Superposition Modeling
(Average Values 1980-2022 in Feet)

Model Scenario	Upper Valley	Forebay	Eastside	180/400
Upper Valley Pumping Off	20-40	1-5	1-5	1-5
Forebay Pumping Off	1-5	20-40	10-20	5-10
Eastside Pumping Off	<1	5-10	>60	20-40
180/400 Pumping Off	<1	5-10	40-60	>60

Table 8 – Summary of Maximum Water Level Changes – Full Aquifer Baseline Superposition Modeling
(Average Values 1980-2022 in Feet)

Model Scenario	Upper Valley	Forebay	Eastside	180/400
Upper Valley Pumping On	20-40	1-5	<1	<1
Forebay Pumping On	<1	20-40	10-20	1-5
Eastside Pumping On	<1	5-10	>60	20-40
180/400 Pumping On	<1	1-5	40-60	>60

Note: **Tables 7 and 8** above might present more accurately if average water level change over the subbasin is used in addition to maximum values presented from color flood figures (subbasin averages are not presented in the M&A memorandum, so not used in these example tables).



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- ▭ Subbasins

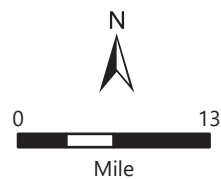
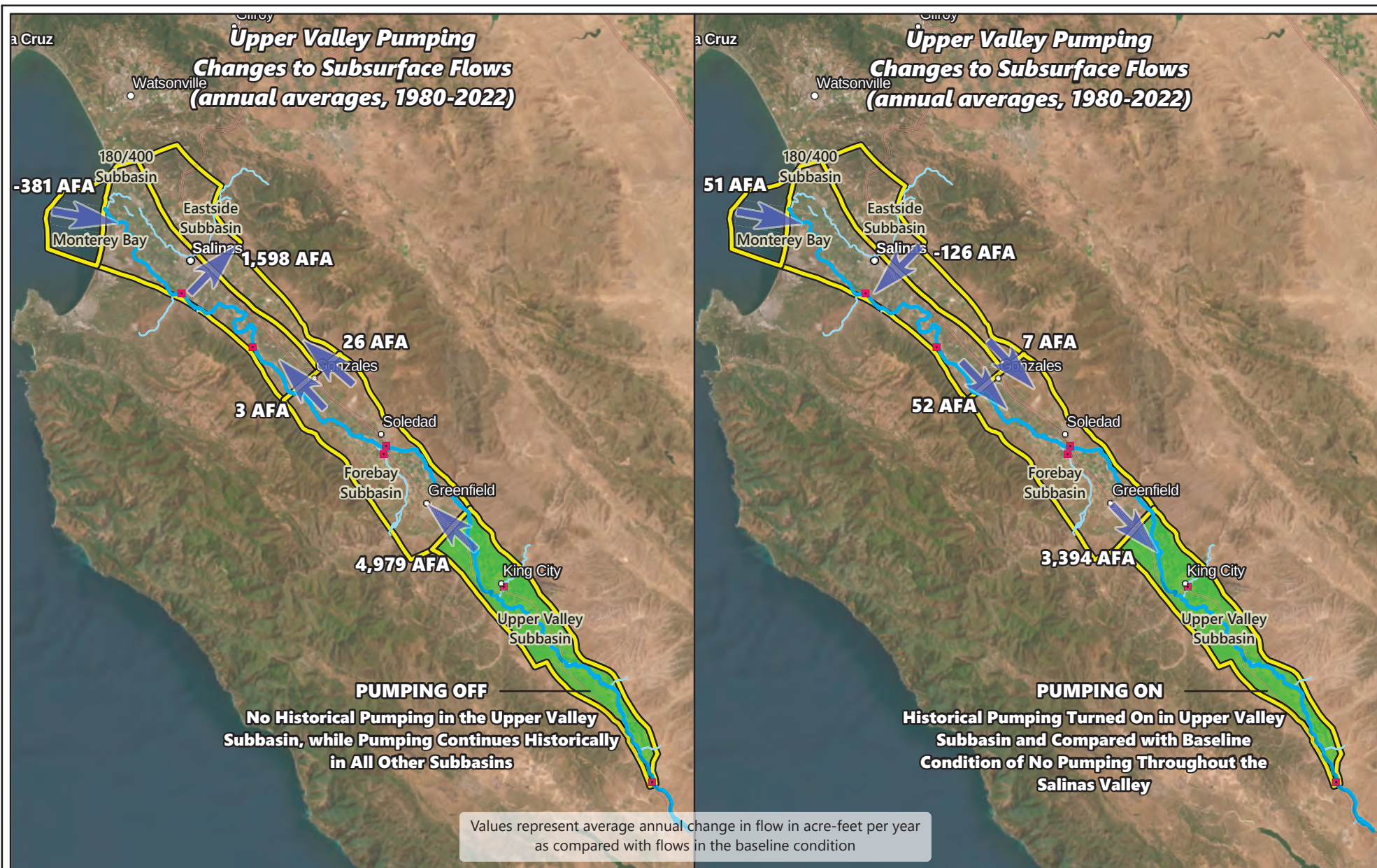


FIGURE 1
Historical & Aquifer Full Baseline Maps
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 10/13/2025





- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

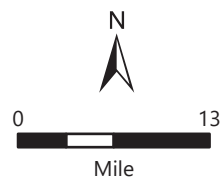
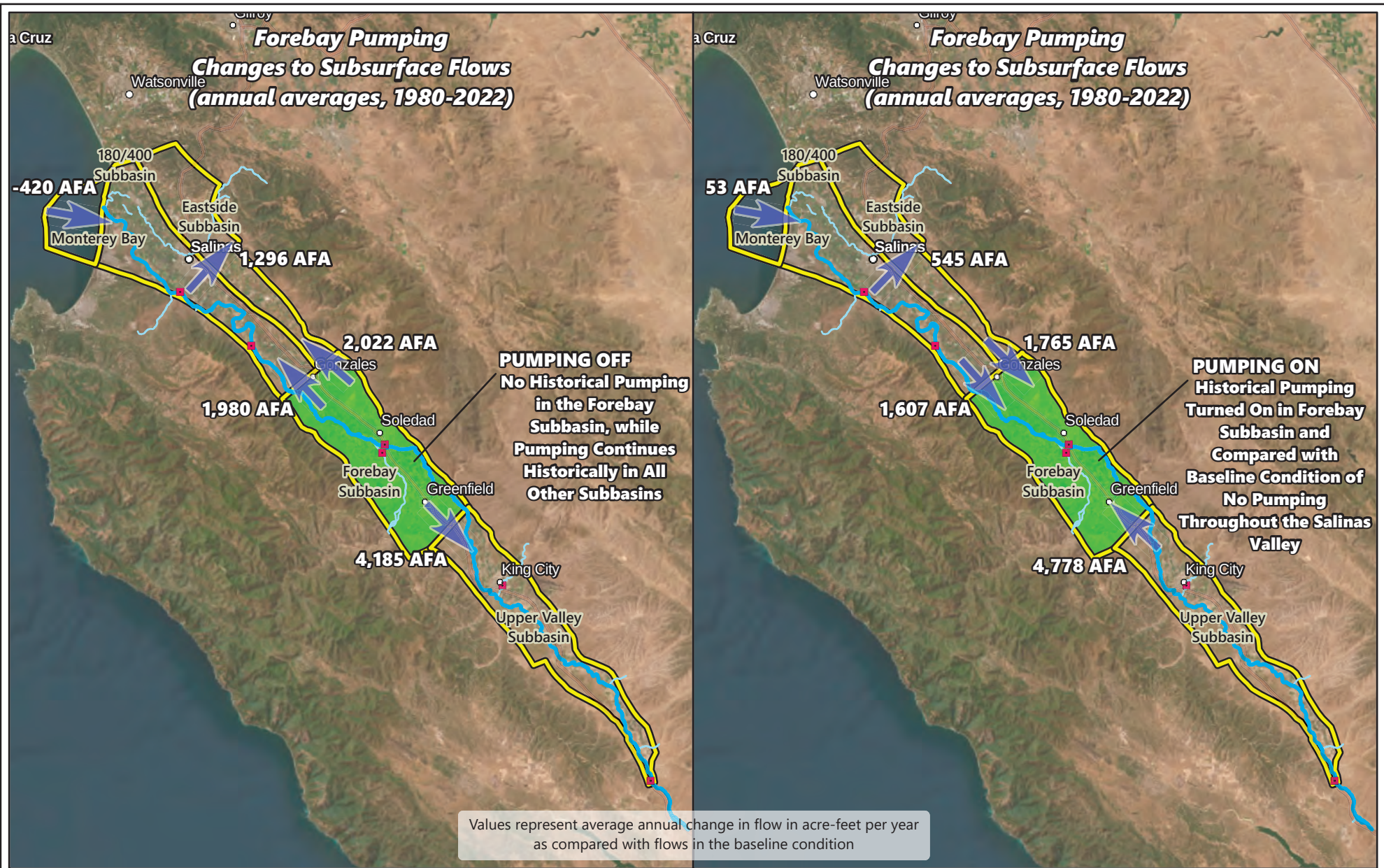


FIGURE 2
Upper Valley Pumping
Superposition Model Testing
Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 10/15/2025





- Gaging Stations
- ~ Salinas River
- ~ Creeks
- ▭ Subbasins

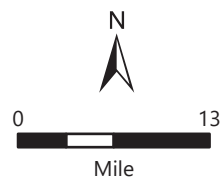
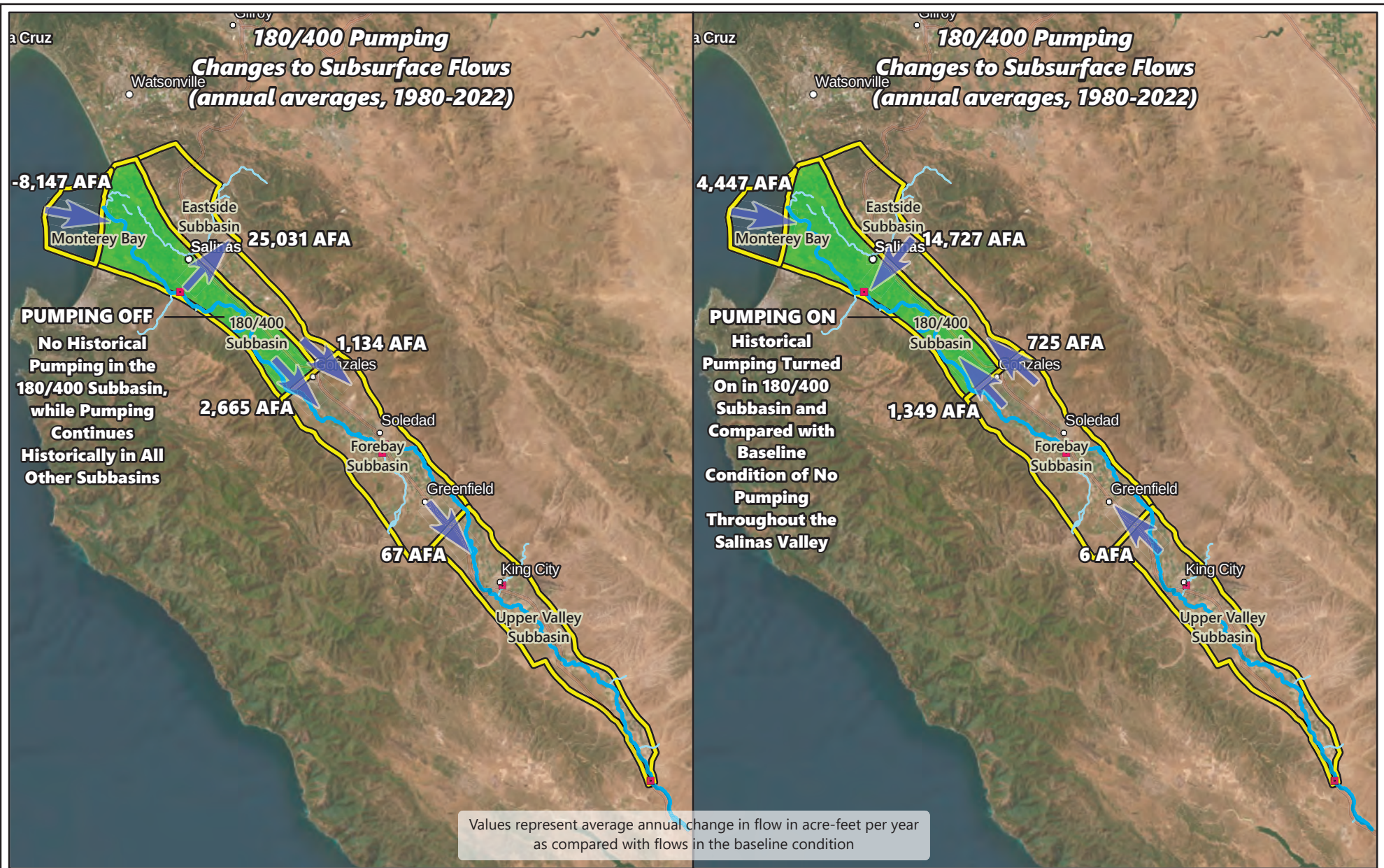


FIGURE 3
Forebay Pumping
Superposition Model Testing
Salinas Valley, CA

Client: Salinas Valley Water Coalition
Project Code: HLLF001
NAD 1983 UTM Zone 10N
H.Chambers 10/15/2025





- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

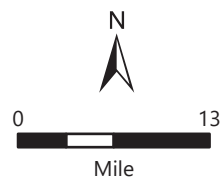
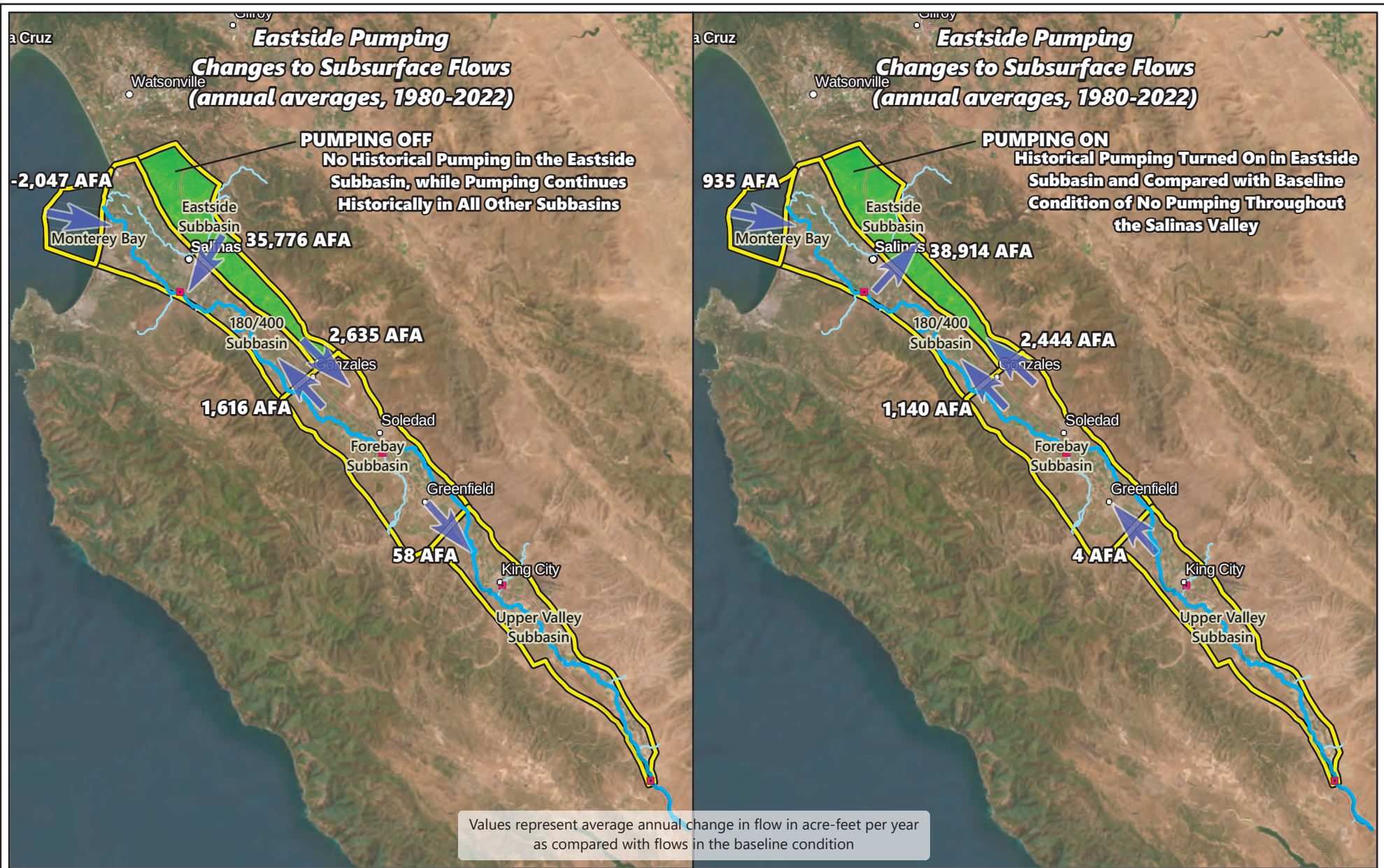


FIGURE 4
180/400 Pumping
Superposition Model Testing
Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/15/2025





- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

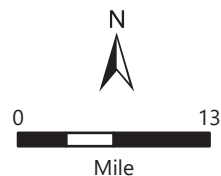
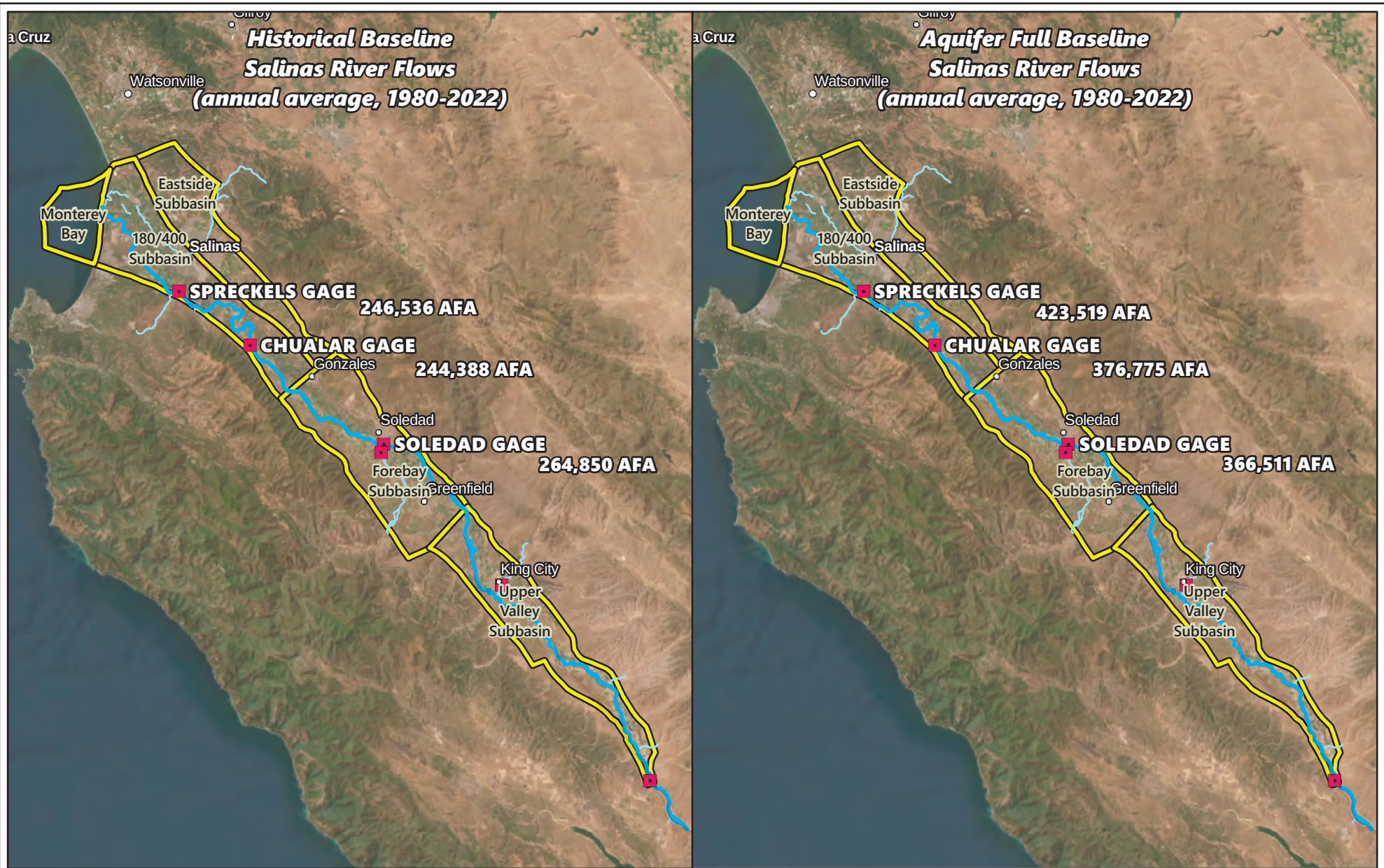


FIGURE 5
Eastside Pumping
Superposition Model Testing
Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/15/2025



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

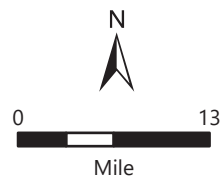
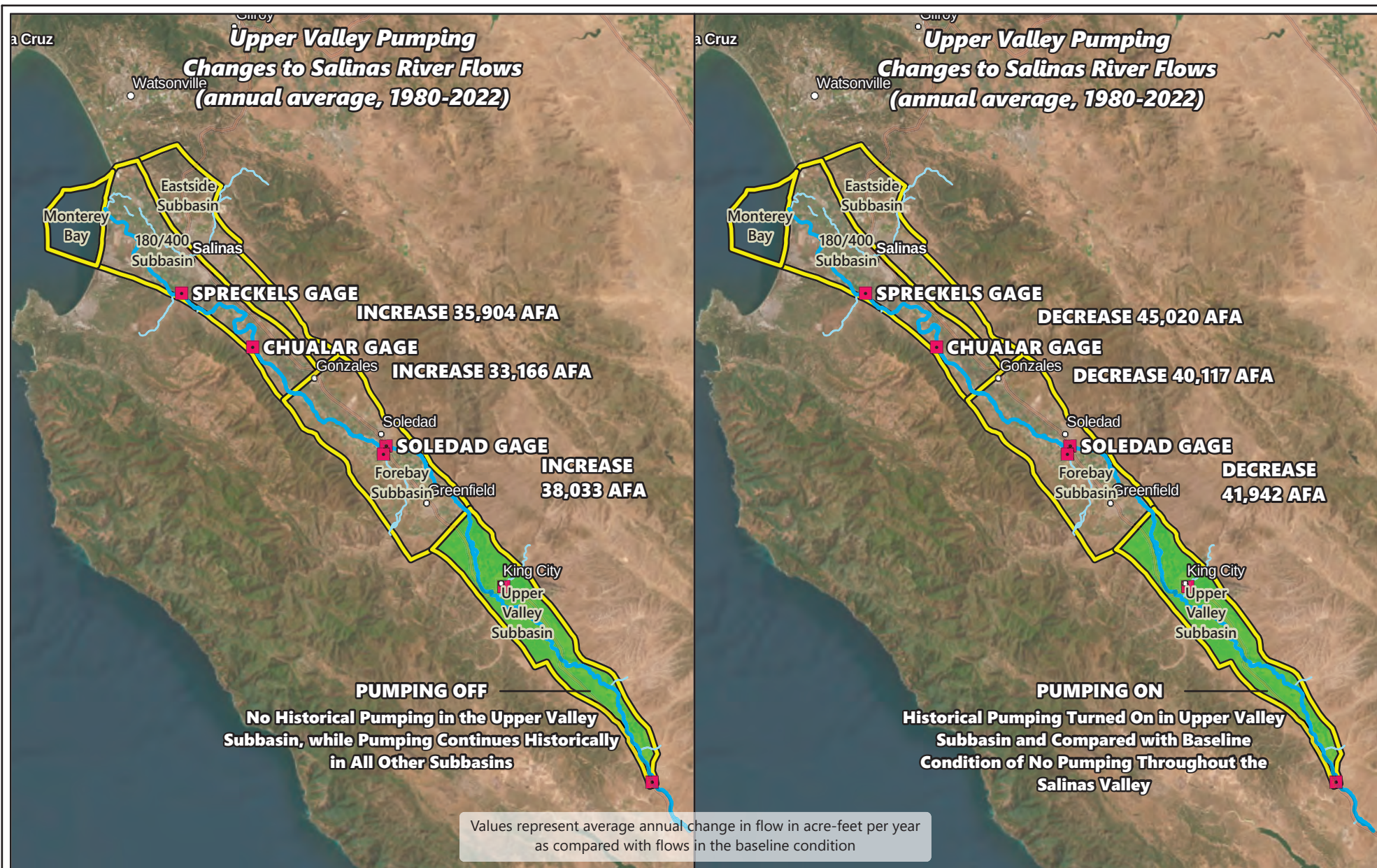


FIGURE 6
Historical & Aquifer Full Baseline Maps
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/17/2025





- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

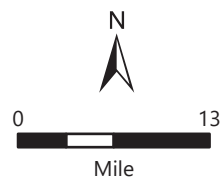
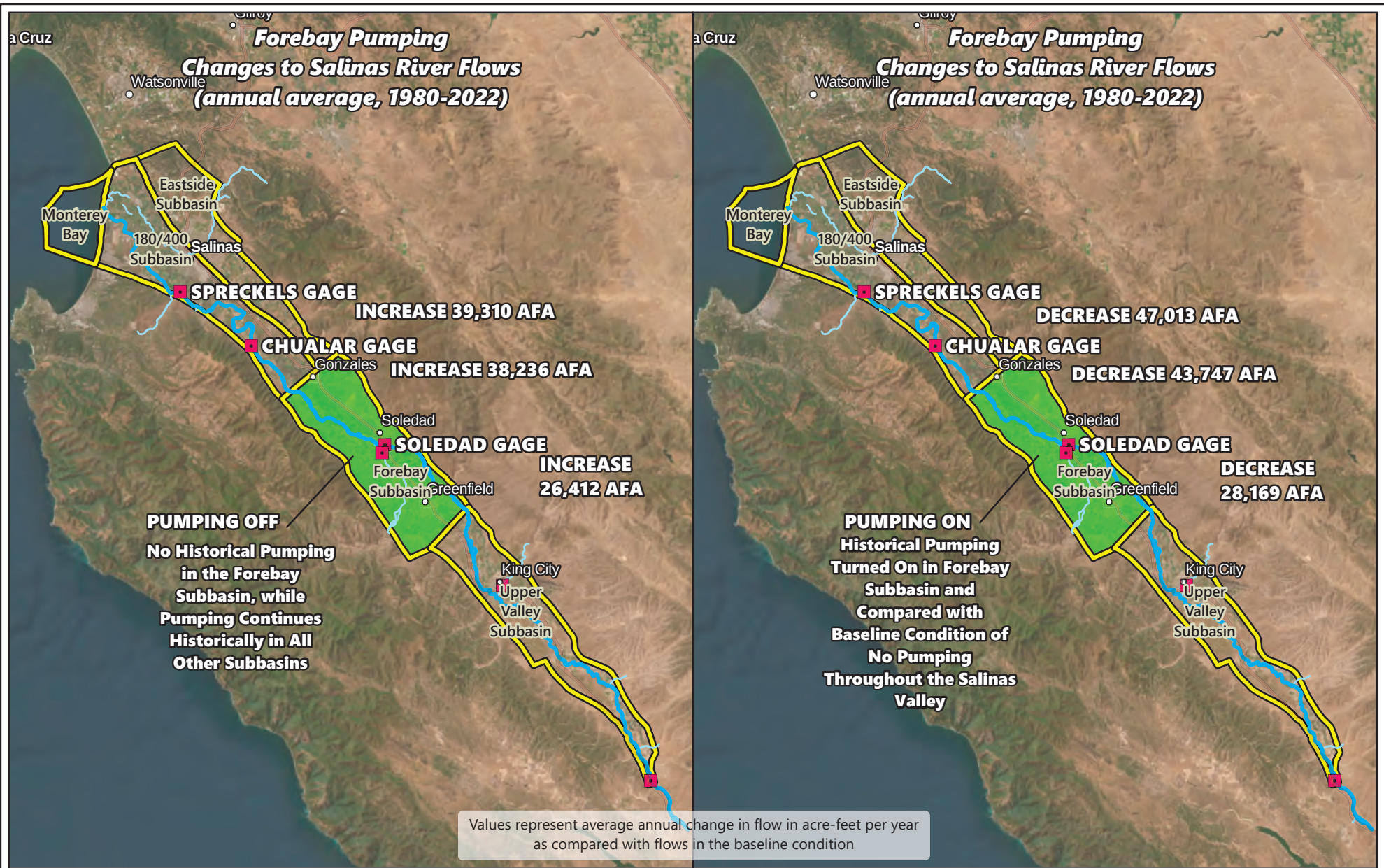


FIGURE 7
 Upper Valley - Gages
 Superposition Model Testing
 Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/17/2025



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

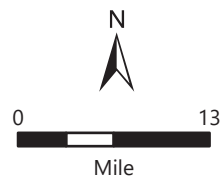
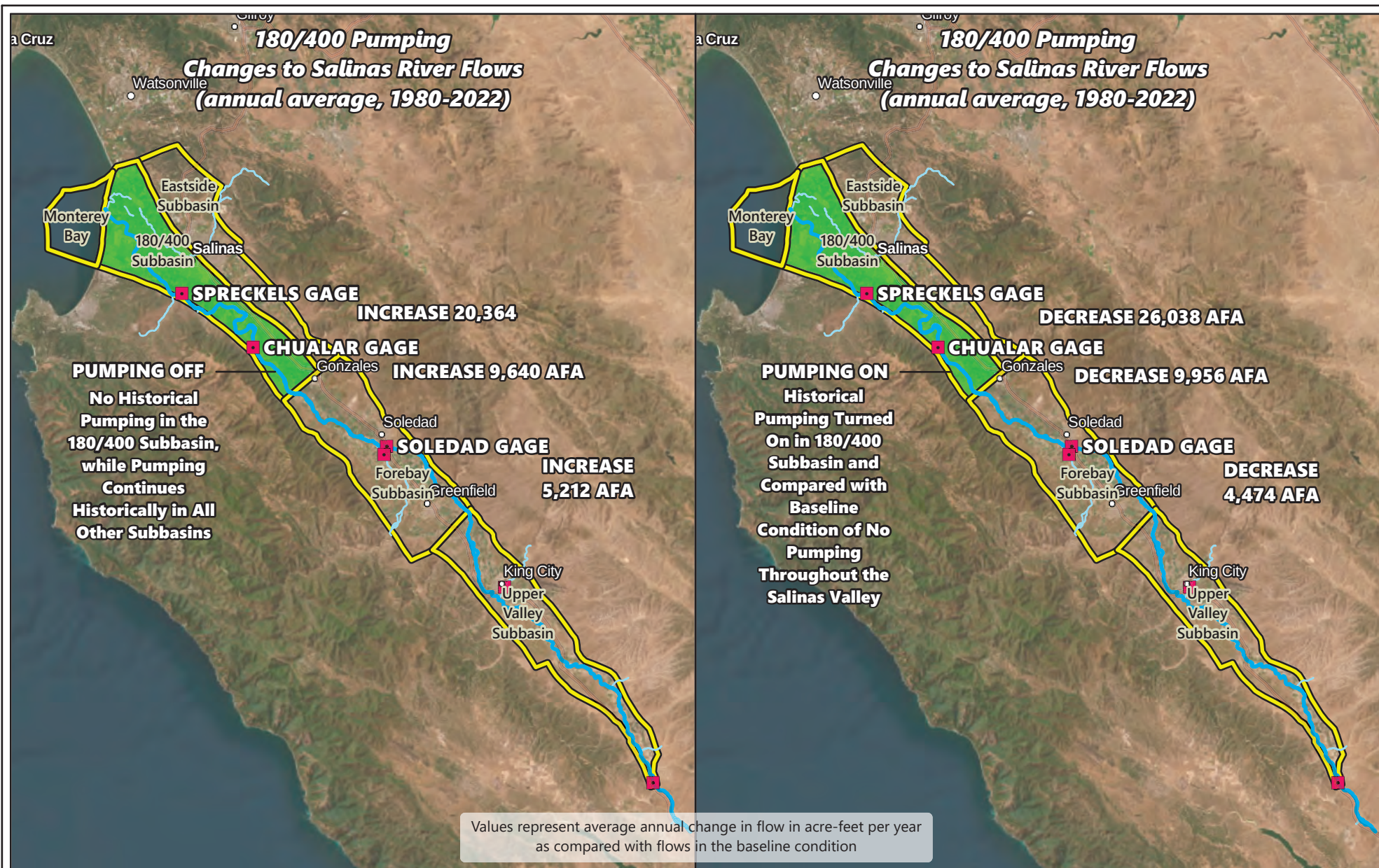


FIGURE 8

Forebay - Gages
Superposition Model Testing

Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/17/2025



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

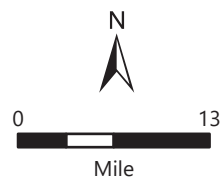
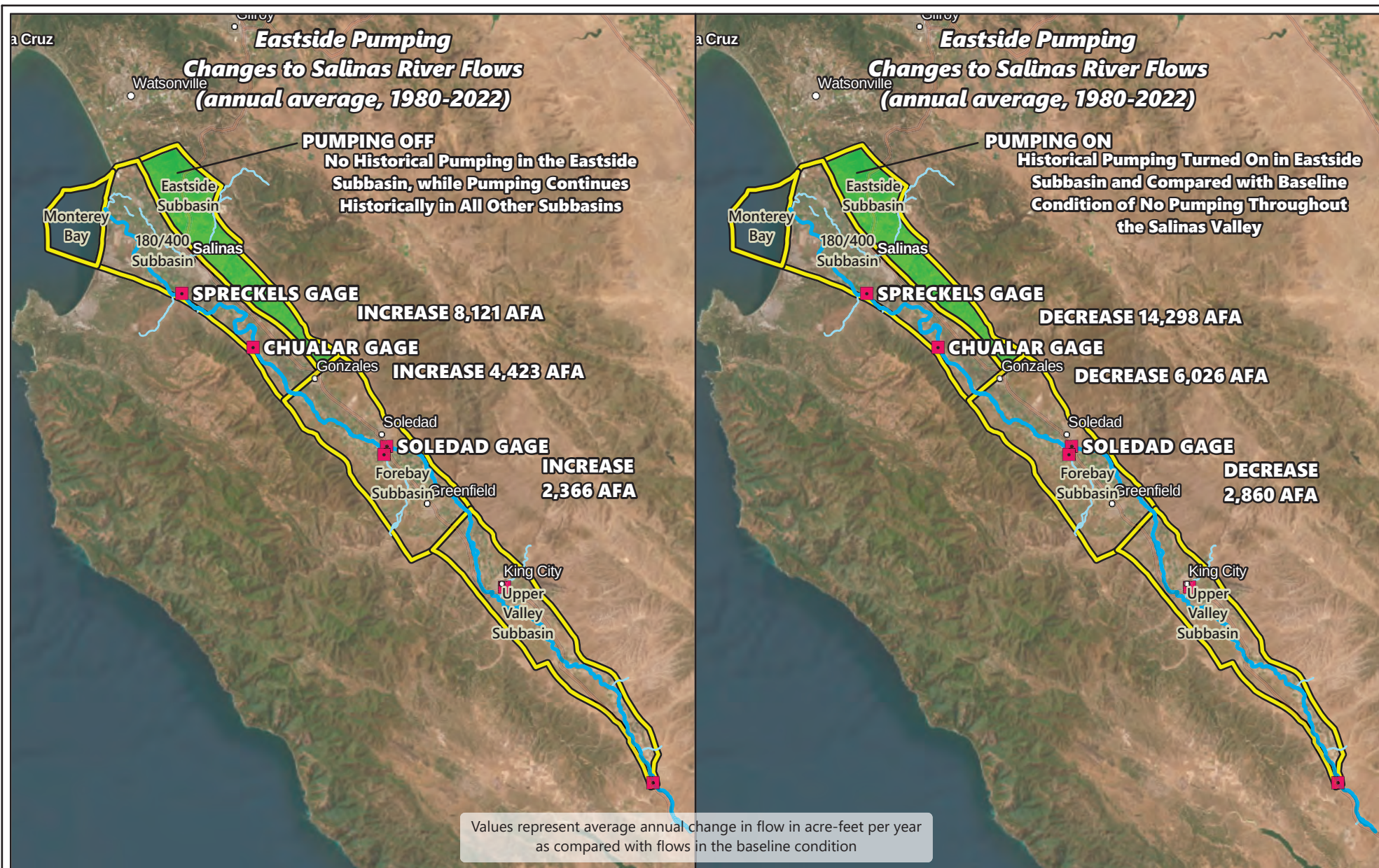


FIGURE 9
 180/400 - Gages
 Superposition Model Testing
 Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/17/2025



- Gaging Stations
- ~ Salinas River
- ~ Creeks
- Subbasins

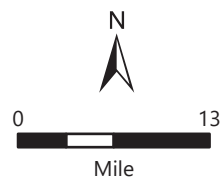


FIGURE 10
 Eastside - Gages
 Superposition Model Testing
 Salinas Valley, CA

Client: Salinas Valley Water Coalition	
Project Code: HLLF001	
NAD 1983 UTM Zone 10N	
H.Chambers	10/17/2025
	

MEMORANDUM

To: Abby Ostovar and Derrik Williams, Montgomery & Associates
Cc: Piret Harmon and Emily Gardner, Salinas Valley Basin Groundwater Sustainability Agency
Christopher Bunn, Salinas Basin Water Alliance
Stephanie Hastings, Brownstein Hyatt Faber Schrek, LLP
Dwight Smith, UES

From: Anthony Brown, Principal-In-Charge, aquilogic, Inc.
Bob Abrams, PhD, PG, CHG, Senior Principal Hydrogeologist, aquilogic, Inc.
Date: December 2, 2025

Subject: **Comments on Montgomery & Associates draft Memorandum, “Results of Computer Modeling Agreement for SVWC and SBWA,” dated August 22, 2025**
Project No.: 018-09

Montgomery & Associates (M&A), on behalf of the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA), prepared a draft memorandum, “*Results of Computer Modeling Agreement for SVWC and SBWA*,” dated August 22, 2025. The M&A draft memorandum summarizes results of a hydrologic modeling exercise (hereafter referred to as inter-subbasin impact modeling) designed to isolate and individually evaluate the impacts of pumping in the Upper Valley Aquifer Subbasin (UV), the Forebay Aquifer Subbasin (FB), the 180/400-Ft Aquifer Subbasin (180/400), and the East Side Aquifer Subbasin (ES), one subbasin at a time, on the water resources¹ of the other three subbasins.²

The inter-subbasin impact modeling was jointly requested by the Salinas Basin Water Alliance (SBWA) and the Salinas Valley Water Coalition (SVWC). SVBGSA agreed that the modeling would be beneficial and instructed M&A to proceed. The M&A draft memorandum presents a summary of the results of the inter-subbasin impact modeling, which was conducted by M&A. The purpose of this **aquilogic** memorandum is to provide comments on, and recommendations for revisions of, the M&A draft memorandum, so that any final iteration is more easily understood by readers who may lack a technical background, including stakeholders.³

¹ In this context, the term “water resources” has the same meaning as “water availability.” Water availability in the Salinas Valley Groundwater Basin (SVGB) concerns both groundwater and stream flows in the Salinas River.

² The inter-subbasin impact modeling was conducted by M&A using the version of the Salinas Valley Hydrologic Model (SVIHM) released by the United States Geological Survey (USGS) in April 2025.

³ **Aquilogic** will provide further independent comments on the model results to the SVBGSA Board of Directors, under separate cover.

As described in the M&A draft memorandum, the modeling was conducted by: (1) sequentially turning pumping on in one subbasin at a time using a “full basin” as a starting point (i.e., no pumping anywhere); and (2) sequentially turning pumping off in one subbasin at a time using the simulated historical condition as a starting point (i.e., pumping everywhere). Changes in groundwater flow and Salinas River flow between the subbasins, as well as changes in groundwater elevations in all four subbasins, were then evaluated and compared to the respective starting points.

The modeling described in the M&A memorandum is hypothetical in nature. The modeling was conducted in a “what if” (i.e., hypothesis testing) mode using the principle of superposition. As such, the modeling results were not expected to be precise. Instead, the results should be considered as “order-of-magnitude” accuracy (e.g., 10,000 to 15,000, instead of 13,051).⁴

CHRONOLOGY OF INTER-SUBBASIN IMPACT MODELING DEVELOPMENT

Aquilologic, Inc. (**aquilologic**), on behalf of SBWA, and McGinley & Associates (now UES), on behalf of SVWC (collectively, the stakeholder team), requested that SVBGSA conduct the inter-subbasin impact modeling in a memorandum, *“Assessment of Groundwater Flows between Subbasins of the Salinas Valley Groundwater Basin (SVGB),”* dated June 21, 2022, to Donna Myers, then General Manager of SVBGSA. The purpose of the June 21, 2022 memorandum was to, *“jointly submit a set of proposed simulation scenarios, developed by aquilologic and McGinley & Associates, to the SVBGSA to run and evaluate.”* Importantly, the June 21, 2022 memorandum noted the integral role the Salinas River plays in SVGB water availability.

M&A responded to the stakeholder team’s June 21, 2022 memorandum by preparing a letter to Ms. Myers, *“Cost Estimate for Salinas Basin Water Alliance and Salinas Valley Water Coalition Modeling Request,”* dated August 24, 2022. Ms. Myers, SVBGSA, and M&A agreed that the inter-subbasin impact modeling would enhance the scientific understanding of SVGB hydrology. The June 21, 2022 letter was followed by a memorandum from M&A to the stakeholder team, *“Summary of Modeling Approach,”* dated June 16, 2023.

Taken together, the three documents described above provided the “roadmap” for the modeling to be conducted by M&A, and the resulting August 22, 2025 M&A draft memorandum. All of these documents acknowledge that the hydrology of the Salinas Valley is highly integrated and essentially represents a single water resource composed of both groundwater and surface water (e.g., potential capture of Salinas River water by pumping and the need to evaluate changes in Salinas River flow resulting from such pumping are acknowledged). The hydrology of

⁴ After completing the inter-subbasin impact modeling, M&A updated the version of SVIHM released in April 2025 by the USGS. **Aquilologic** expects that modeling results obtained from using the updated SVIHM would be consistent with the results discussed herein and in the M&A draft memorandum.

the SVGB dictates that groundwater pumping necessarily impacts Salinas River stream flows and these stream flows necessarily impact groundwater levels. Not surprisingly, the summary modeling results presented by M&A in their draft memorandum emphasize the strong connection between the groundwater system and the Salinas River.

The M&A draft memorandum provides summaries of simulated Salinas River flows and changes in flows at the Soledad, Chualar, and Spreckels stream gages. However, it should be noted that it would also be useful to include similar information at all other Salinas River stream gages, in a revised M&A memorandum.

RECOMMENDED REVISIONS TO THE M&A DRAFT MEMORANDUM

Aquilogic recommends the following revisions be made to the introductory text, figures, and tables of the M&A draft memorandum.

Introduction Section

M&A's summary memorandum is well written, clear, and easily understood by technical experts with knowledge of the SVBG and the inter-subbasin impact modeling. However, it may not be well understood by laypersons, including stakeholders. Accordingly, we recommend that the introductory discussion provide sufficient background and context to enable the reader to understand why the modeling was undertaken.

Figures

Changes in Groundwater Elevations, Figures 2 through 5 and Figures 9 through 12

The figures in the draft M&A memorandum are generally informative. However, Figures 2 through 5 and Figures 9 through 12 do not show the results of interest. These figures show the groundwater elevation changes in the subbasin for which pumping was turned on or off. They do not show the impact of pumping in one subbasin on water availability in adjacent and downgradient subbasins. M&A provided draft "replacement figures" at **aquilogic's** request but did not update their draft memorandum.

Further, the color ramps used for Figures 2 through 5 and Figures 9 through 12 make it difficult to understand the modeling results, because the shades of green or red are nearly identical for several of the contour intervals. For example, these figures make clear that pumping in the UV and FB lowers groundwater levels in the 180/400. However, the magnitude of the impacts cannot easily be discerned. We suggest here that labeled contour lines be superimposed on the color shading.

The replacement figures are particularly difficult to decipher, due to the issues noted above with the color ramp, as well as the scale of maps. **Aquilologic** suggests that each figure should be split into three parts. These parts should zoom in on: (1) the 180/400 and ES; (2) the FB; and (3) the UV. The revised replacement figures should be included in a revised draft of the M&A August 25, 2025 draft memorandum.

Additional Figures

The tables in the M&A draft memorandum do a good job of summarizing the modeling results. However, most of the same information can and should be displayed on a few graphs, which would make it much easier to understand the results.

Aquilologic has independently reviewed the model results and summarized the results in the attached **aquilologic Figures 1** through **4**. It should be noted that changes in Salinas River stream flows from one subbasin to the others are approximated in **Figures 1** through **4** by the changes in stream flows at the Soledad stream gage (UV to FB) and Chualar stream gage (FB to 180/400) caused by pumping in the various subbasins.

Aquilologic Figure 1 shows the changes in Salinas River stream flows and groundwater flow between subbasins caused by pumping in the UV. **Aquilologic Figure 2** shows the changes in Salinas River stream flows and groundwater flow between the subbasins caused by pumping in the FB. **Aquilologic Figure 3** shows the changes in Salinas River stream flows and groundwater flow between the subbasins caused by pumping in the 180/400. **Aquilologic Figure 4** shows the changes in Salinas River stream flows and groundwater flow between the subbasins caused by pumping in the ES. All four figures also show the impact on seawater intrusion (SWI) caused by pumping in each subbasin.

Aquilologic's figures illustrate the modeling results, specifically:

1. Changes in Salinas River stream flows are significantly larger than changes in groundwater flow between the UV, FB, and 180/400:
 - a. Pumping in the UV removes approximately 40,000 acre-feet per year (AFY) from the Salinas River (predominantly growing season reservoir releases), **reducing water availability and groundwater replenishment in the FB and 180/400** (compared to 105,370 AFY total UV groundwater pumping⁵)
 - i. Therefore, approximately 38% of the pumping in the UV is derived directly from the Salinas River (i.e., growing season reservoir releases)

⁵ Water Year 2024 Annual Report, Upper Valley Aquifer Subbasin, Table 3-2, p. 16). https://svbgsa.org/wp-content/uploads/2025/04/UpperValley_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

- b. Pumping in the FB removes approximately 40,000 AFY from the Salinas River (predominantly growing season reservoir releases), reducing water availability in the 180/400 (compared to 118,320 AFY total FB groundwater pumping⁶)
 - i. Therefore, approximately 35% of the pumping in the FB is derived directly from the Salinas River (i.e., growing season reservoir releases), potentially with contributions from the Arroyo Seco early in the growing season
2. Pumping in the UV and FB removes approximately 80,000 AFY from the Salinas River (i.e., stream depletion)
3. Pumping in the 180/400 reduces Salinas River flow from the FB to the 180/400 by approximately 10,000 AFY (compared to 103,980 AFY total 180/400 groundwater pumping⁷)
 - a. Therefore, approximately 10% of the pumping in the 180/400 is derived directly from Salinas River (i.e., growing season reservoir releases), potentially with contributions from the Arroyo Seco early in the growing season
4. Pumping in the ES removes approximately 35,000 AFY of groundwater from the 180/400 and less than 5,000 AFY from the FB (compared to approximately 81,540 AFY total ES groundwater pumping⁸)
 - a. Therefore, approximately 45% of the pumping in the ES is supplied by groundwater from the 180/400
5. Pumping in the 180/400 does causes minor impacts on water availability in the UV and FB (i.e., approximately 5,000 to 10,000 AFY)
6. Pumping in the ES does not cause significant impacts on water availability in the UV and FB (i.e., approximately 2,500 to 5,000 AFY)
7. Pumping in the UV and FB does not directly cause significant SWI in the 180/400, although it does reduce water availability in the 180/400
8. Pumping in the 180/400 and ES causes the majority of SWI in the 180/400 (5,000 to 8,000 AFY and 1,000 to 2,000 AFY, respectively)⁹

Additional Table

To better illustrate the model results – specifically, changes in Salinas River stream flows caused by pumping – we recommend including the attached **Table 1**. **Aquilologic's Table 1** shows the relevance of the modeling requested by the stakeholder team by comparing the pumping-induced Salinas River depletion to water year (WY) 2024 total pumping.

⁶ Water Year 2024 Annual Report, Forebay Aquifer Subbasin, Table 3-2, p. 16. https://svbgsa.org/wp-content/uploads/2025/04/Forebay_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

⁷ Water Year 2024 Annual Report, 180/400-Ft Aquifer Subbasin, Table 3-1, p. 10. https://svbgsa.org/wp-content/uploads/2025/04/180400_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

⁸ Water Year 2024 Annual Report, East Side Aquifer Subbasin, Table 3-1, p. 12. https://svbgsa.org/wp-content/uploads/2025/04/Eastside_AnnualReport2024_Final-Cond.pdf, accessed October 27, 2025.

⁹ Presumably, pumping closer to the coast has a larger impact on SWI than pumping in distal portions of the 180/400

Conclusion

The inter-subbasin impact modeling results demonstrate that pumping in each of the upstream subbasins within the SVGB decreases water availability in downstream subbasins. The model results also demonstrate that water produced in upstream subbasins is mostly derived from growing season reservoir releases. This result is consistent with data provided by the Monterey County Water Resources Agency (MCWRA) Salinas River Discharge Measurements Series Results (River Series).¹⁰ M&A's draft memorandum should be updated to more clearly reflect the model results.

¹⁰ <https://www.countyofmonterey.gov/government/government-links/water-resources-agency/documents/salinas-river-discharge-measurement-series>, accessed October 27, 2025.

Table 1: Impacts of Pumping on Salinas River Flow**Salinas Basin Water Alliance**

		Change in Salinas River Flow UV to FB (AFY)				Change in Salinas River Flow FB to 180/400 (AFY)			
	WY 2024 Annual Report Total Pumping (AFY)	Pumping Turned On Decrease	Pumping Turned Off Increase	Average	Approximate Percent of UV Pumping Derived from Salinas River	Pumping Turned On Decrease	Pumping Turned Off Increase	Average	Approximate Percent of FB Pumping Derived from Salinas River
UV	105,370	41,942	38,033	39,988	38%	40,117	33,166	36,642	--
FB	118,320	28,169	26,412	27,291	--	43,747	38,236	40,992	35%
180/400	103,980	4,474	5,212	4,843	--	9,956	9,640	9,798	--
ES	81,540	2,860	2,366	2,613	--	6,026	4,423	5,225	--

Notes:

AFY: Acre-feet per year

UV: Upper Valley Aquifer Subbasin

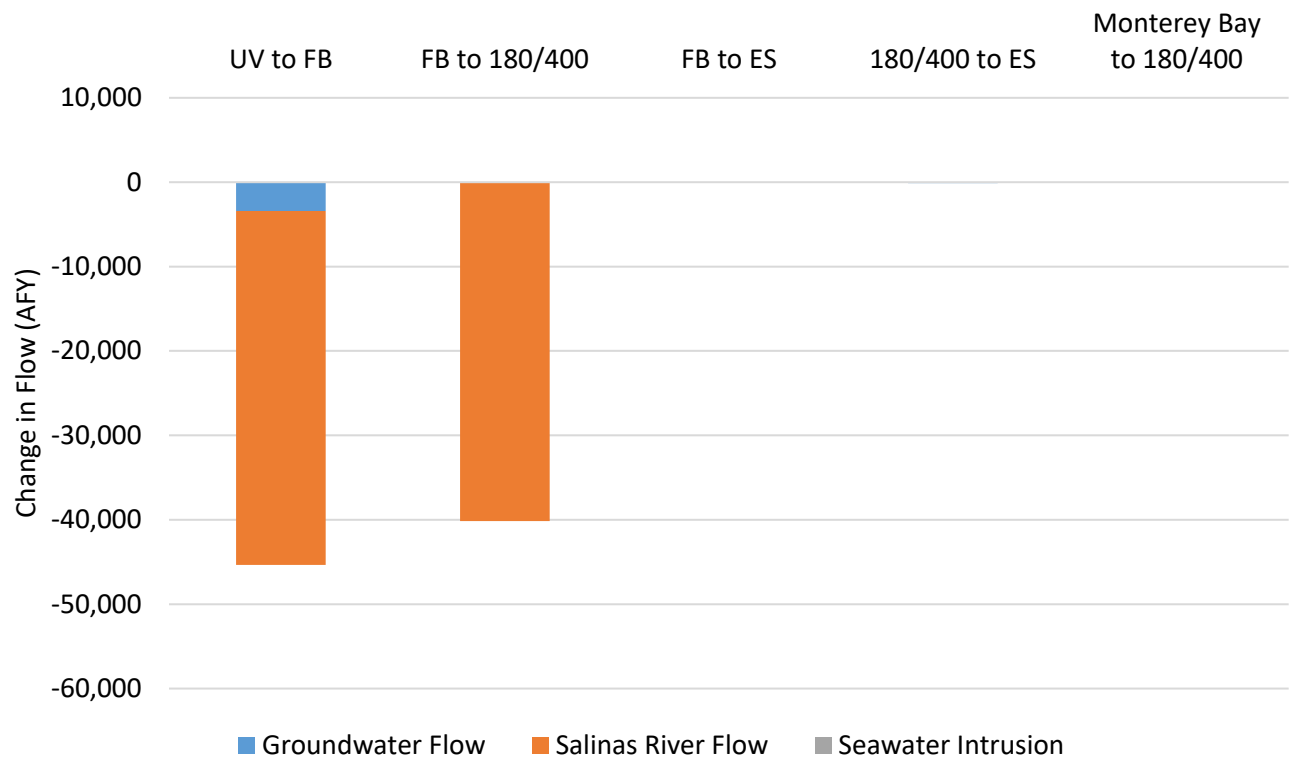
FB: Forebay Aquifer Subbasin

180/400: 180/400-Ft Aquifer Subbasin

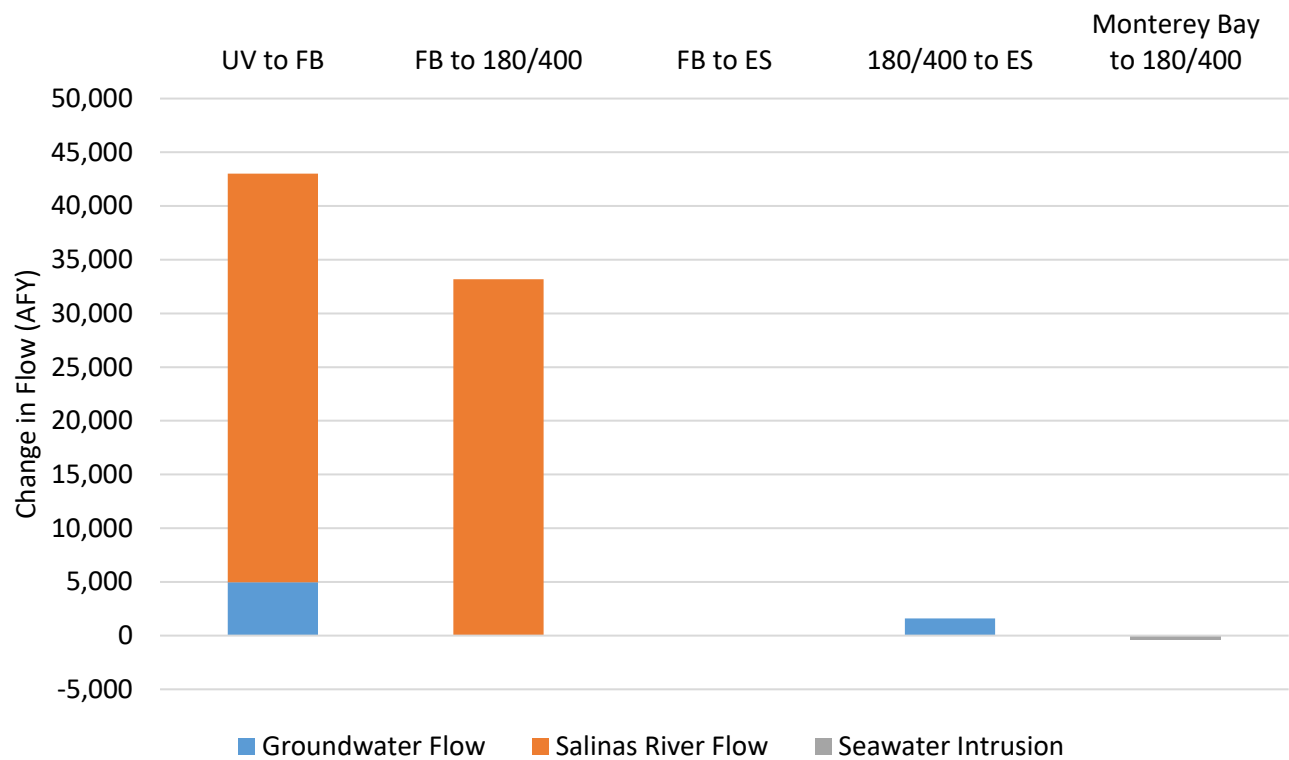
ES: East Side Aquifer Subbasin

--: Not applicable

Upper Valley Pumping Turned On



Upper Valley Pumping Turned Off



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year



Salinas Basin Water Alliance

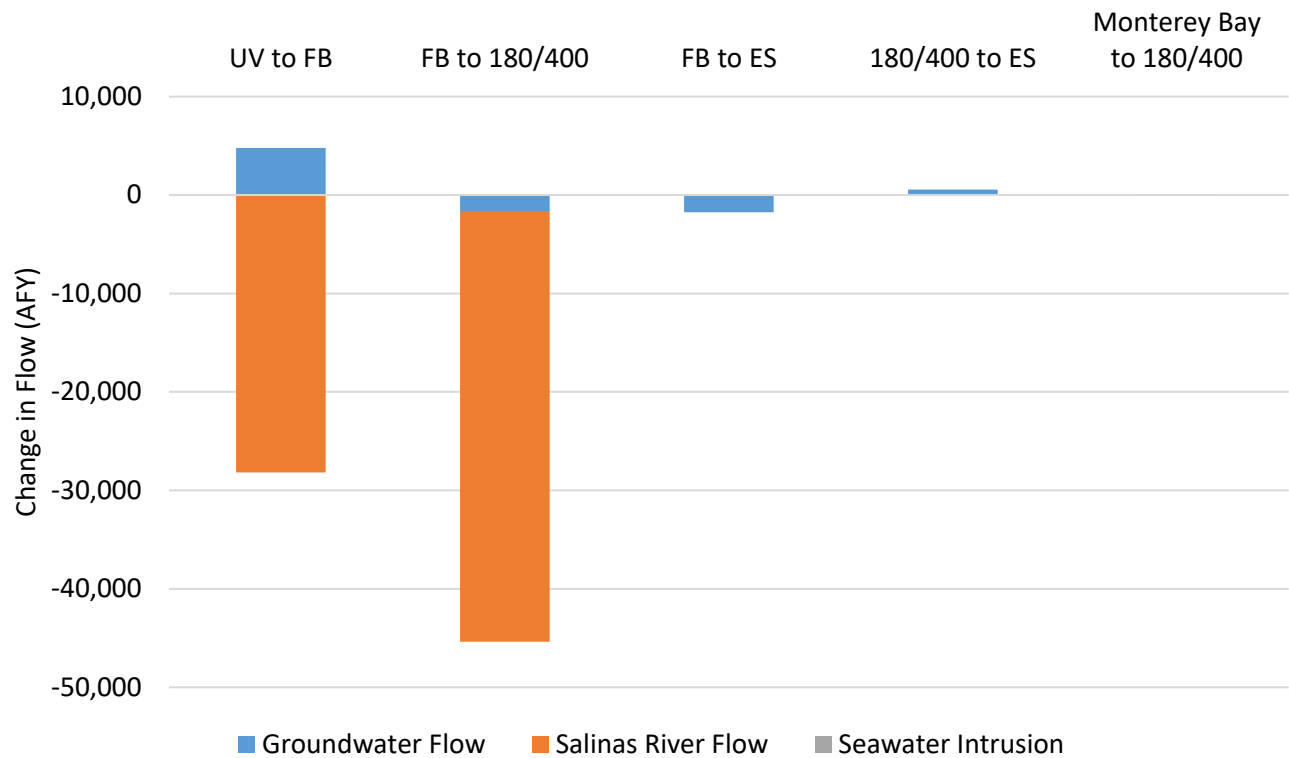
Upper Valley Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 10/29/2025

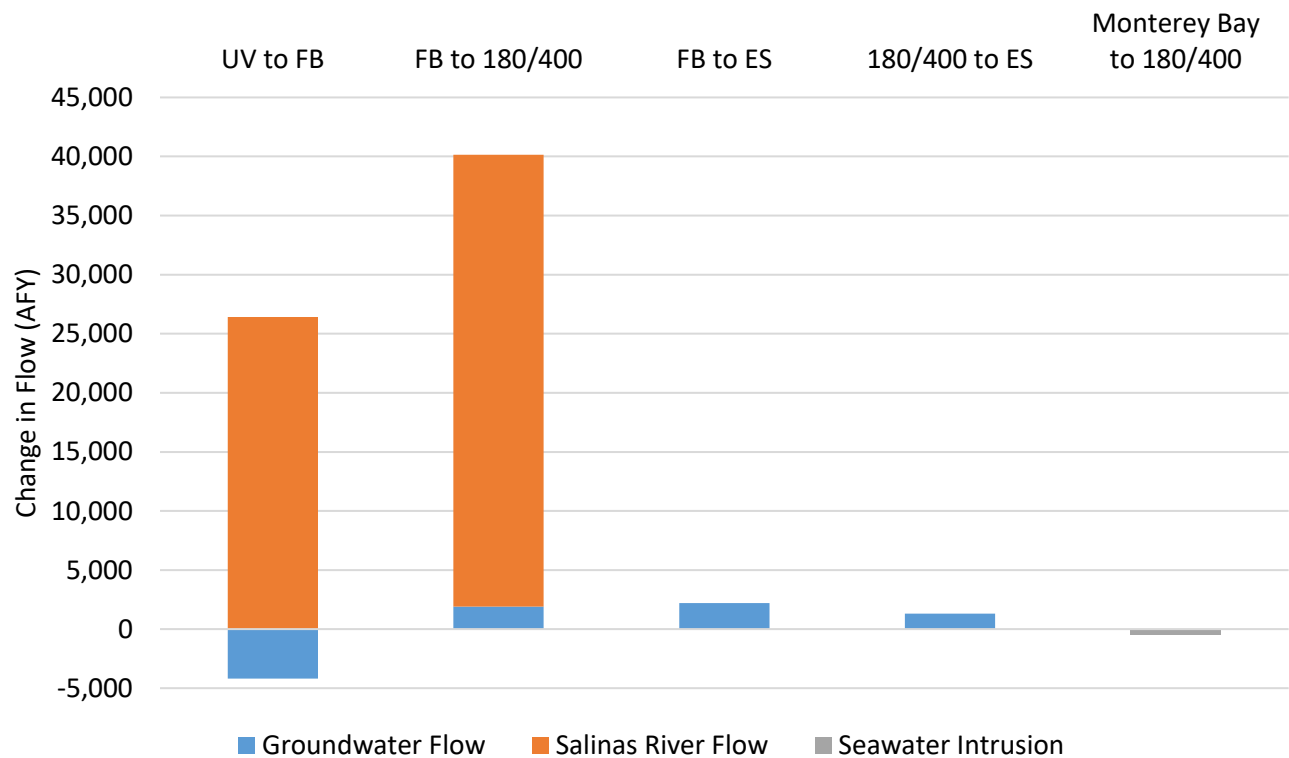
Project #: 018-09

Figure 1

Forebay Pumping Turned On



Forebay Pumping Turned Off



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year



Salinas Basin Water Alliance

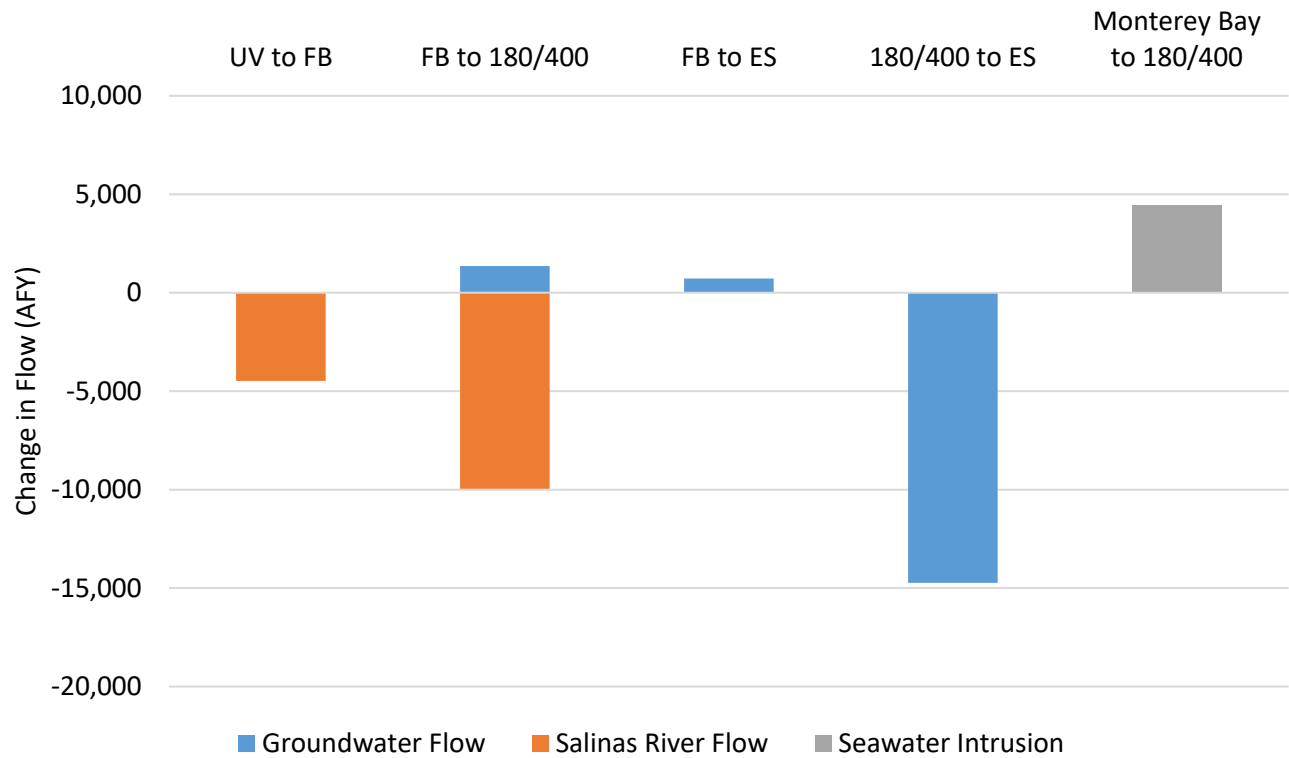
Forebay Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 10/29/2025

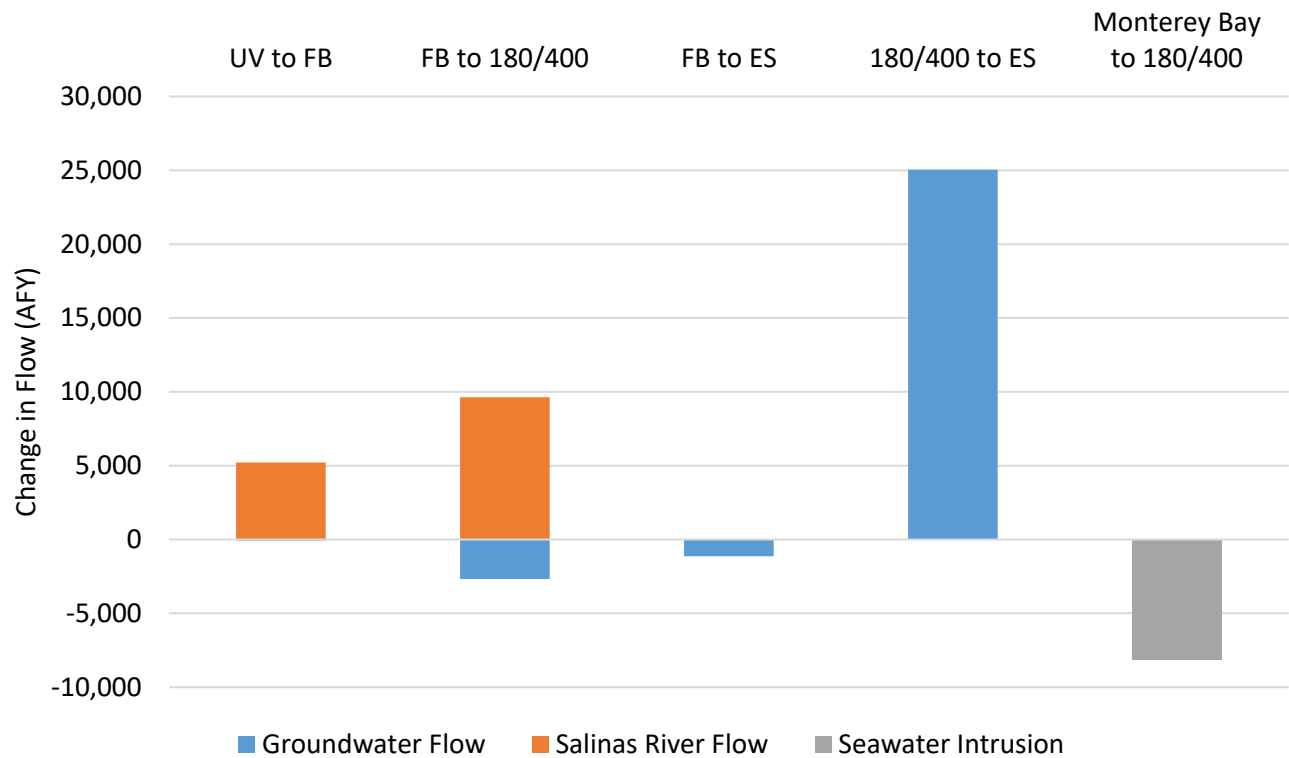
Project #: 018-09

Figure 2

180/400 Pumping Turned On



180/400 Pumping Turned Off



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year



Salinas Basin Water Alliance

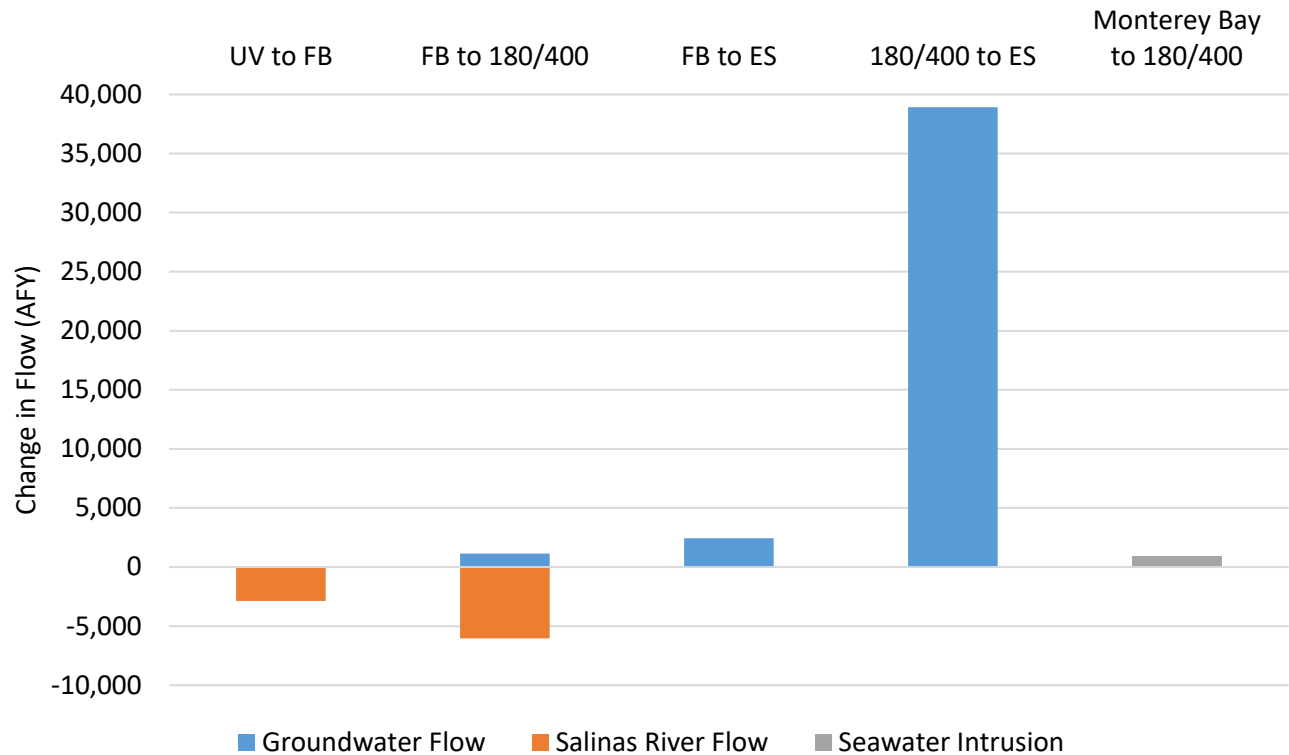
180/400-Ft Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 10/29/2025

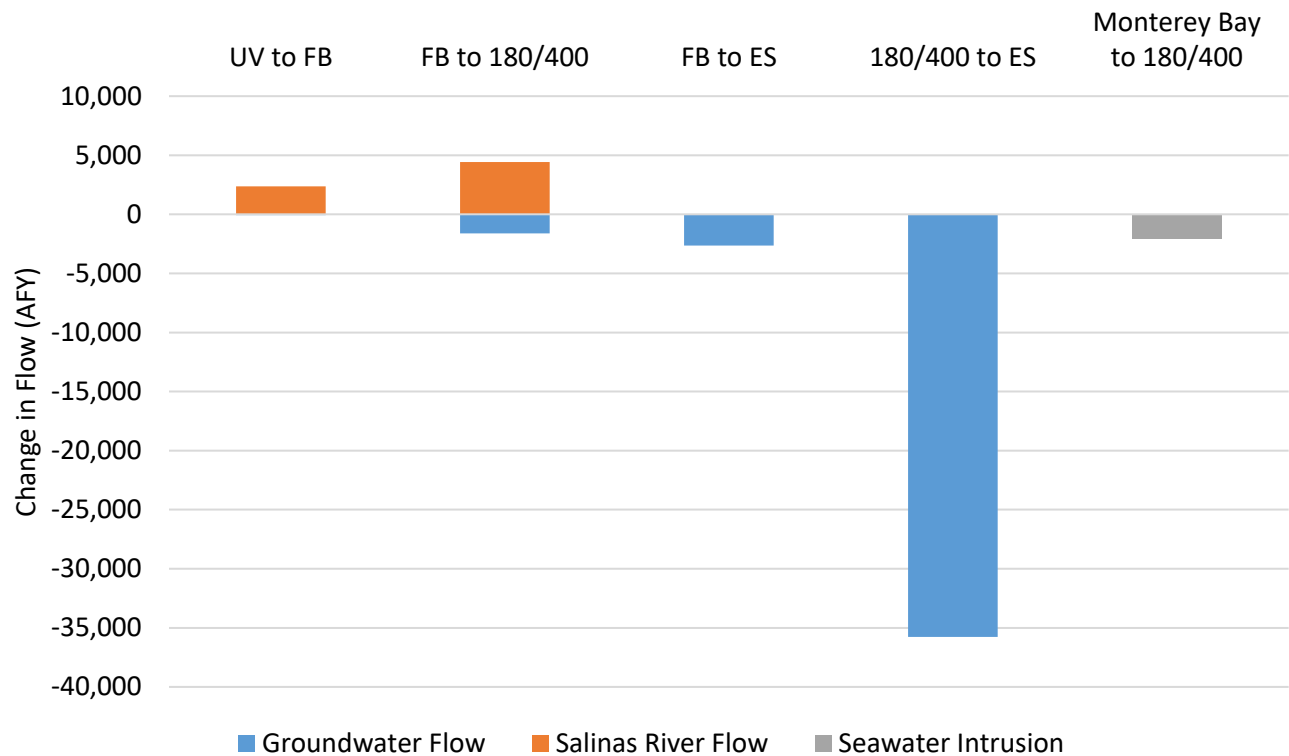
Project #: 018-09

Figure 3

East Side Pumping Turned On



East Side Pumping Turned off



UV: Upper Valley Aquifer Subbasin
 FB: Forebay Aquifer Subbasin
 180/400: 180/400-Ft Aquifer Subbasin
 ES: East Side Aquifer Subbasin
 AFY: Acre-feet per year

aquilogic, Inc. Salinas Basin Water Alliance

East Side Aquifer Subbasin Pumping Impacts on Other Subbasins

Date: 10/29/2025

Project #: 018-09

Figure 3

EXHIBIT 4

TECHNICAL MEMORANDUM

DATE: December 19, 2025 **PROJECT #:** 9100

TO: Dwight Smith, McGinley & Associates, on behalf of the Salinas Valley Water Coalition (SVWC)
Bob Abrams, Aquilogic, on behalf of the Salinas Basin Water Alliance (SBWA)

CC: Piret Harmon and Emily Gardner, Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA)
Amy Woodrow, Monterey County Water Resources Agency (MCWRA)

FROM: Hanni Blair; Kayla Bicknell, Abby Ostovar, Ph.D.; Staffan Schorr; and
Derrik Williams, P.G., C.Hg.

PROJECT: Computer Modeling Agreement

SUBJECT: Results of Computer Modeling Agreement for the Salinas Valley Water Coalition (SVWC) and the Salinas Basin Water Alliance (SBWA)

INTRODUCTION

The Salinas Valley Water Coalition (SVWC) and Salinas Basin Water Alliance (SBWA) jointly requested that the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) complete groundwater model runs that would enable them to conduct a superposition analysis of pumping effects on intersubbasin flow. At the time of the request, the Salinas Valley Integrated Hydrologic Model (SVIHM) was provisional and under development by the U.S. Geological Survey (USGS). Montgomery & Associates (M&A) had permission to run the model through the SVBGSA Cooperation Agreement with the USGS. Although USGS published the SVIHM in April 2025, SBWA and SVWC decided to continue to have M&A run the modeling simulations with the published version.

SVBGSA, SVWC, and SBWA developed the Computer Modeling Agreement, under which the modeling was completed. Aquilogic, Inc. (Aquilogic)—on behalf of SBWA—and McGinley & Associates (now UES)—on behalf of SVWC—detailed the requested modeling in a memorandum to SVBGSA, *Assessment of Groundwater Flows between Subbasins of the Salinas Valley Groundwater Basin (SVGB)*, dated June 21, 2022.

On behalf of SVBGSA, Montgomery & Associates (M&A) completed the modeling simulations. Working closely with Aquilogic and McGinley & Associates, Phase I of this project consisted of

developing the modeling approach, which is outlined in the *Summary of Modeling Approach Technical Memorandum* (Approach TM) dated June 16, 2023. Phase II consisted of running the simulations and summarizing the results in this memorandum. After an executive summary of the results, the memorandum briefly describing the SVIHM and relevant changes made to conduct the simulations, documents the modeling approach, and presents the requested results for each set of simulations. Aquilogic and McGinley & Associates are responsible for interpreting the significance of the results; however, the summary section includes notes and cautions to guide that interpretation.

SUMMARY OF RESULTS

M&A completed the 10 model simulations according to the approaches defined by Aquilogic and McGinley & Associates in their June 21, 2022 memorandum. The first approach used the existing historical model simulation as the baseline condition and then turned off pumping in each of the Upper Valley Aquifer (Upper Valley), Forebay Aquifer (Forebay), Eastside Aquifer (Eastside), and 180/400-Foot Aquifer (180/400) Subbasins in 4 separate model simulations. The second approach was to develop a no-pumping baseline condition simulation for the Valley and then turn pumping on for the same 4 subbasins, each in a separate model simulation. Including the baseline simulations, each approach consisted of 5 model simulations for a total of 10 simulations. This memorandum relays the results requested by Aquilogic and McGinley & Associates, which provide the basis for Aquilogic and McGinley & Associates to complete a superposition analysis of intersubbasin subsurface flow.

For clarity, the results are separated into sections for each group of model simulations:

Pumping Turned Off by Subbasin	Pumping Turned On by Subbasin
<i>Compared to the historical SVIHM baseline, pumping is turned off one subbasin at a time</i>	<i>Compared to a no-pumping baseline scenario, pumping is turned on by one subbasin at a time</i>
Upper Valley Off	Upper Valley On
Forebay Off	Forebay On
180/400 Off	180/400 On
Eastside Off	Eastside On

All model simulations were completed with the published version of the SVIHM. Reservoir releases are specified according to historical releases and do not change based on basin conditions. The Langley, Monterey, and Seaside Subbasins are not well calibrated in this model version. While all subbasins and boundary segments are included in the results, these simulations focus on the 4 agricultural subbasins in the Salinas Valley.

Table 1 summarizes the net subsurface flows between the 4 agricultural subbasins for all simulations for the historical period of 1980 to 2022. In addition, it shows the difference between each simulation and either the pumping baseline or no pumping baseline. Simulations are listed in the rows, and each column corresponds with a subbasin boundary segment. Columns are also included for the subsurface flow across the coastal boundary from the Monterey Bay. This is not indicative of the advancement of seawater intrusion, as measured by the 500 mg/L chloride isocontour, as the SVIHM does not simulate chloride movement.

Figures showing the groundwater level difference for each simulation compared to the corresponding baseline are included in the results sections of this memorandum for the historical period of 1980 to 2022. Attachments 1 and 2 also include figures for the recent period of 2018 to 2022. Figures in the attachments include average groundwater level differences for the summer, winter, and entire year. Attachment 1 shows figures zoomed in to the subbasin where pumping is turned on or off, and Attachment 2 shows the same set of figures for the entire Valley.

Groundwater typically flows from the Upper Valley Subbasin to the Forebay Subbasin and then to the 180/400 and Eastside Subbasins. In the first set of simulations, when pumping is turned off in a subbasin, groundwater levels are higher there than in the baseline. This decreases the groundwater gradient from the up-valley subbasin, which reduces inflow from the up-valley subbasin to the subbasin where pumping was turned off. It also increases the gradient with the down-valley subbasin, which increases outflow to other subbasins from the subbasin where pumping was turned off. Conversely, in the second set of simulations, when pumping is turned on in a subbasin, groundwater levels are lower there than in the no-pumping baseline. This increases the gradient from the up-valley subbasin, which increases inflow into the subbasin where pumping was turned on. It also decreases the gradient to the down-valley subbasin, which reduces outflow from the subbasin where pumping was turned off. In general, the largest magnitude flow differences from baseline occur between subbasins immediately adjacent to the subbasin where pumping is turned on or off.

In the pumping on baseline, groundwater flows from the 180/400 Subbasin into the Eastside Subbasin. When pumping is turned off in the 180/400 Subbasin, 180/400 Subbasin groundwater levels are higher than in the baseline, the groundwater gradient with the Eastside Subbasin increases, and the subsurface flow to the Eastside Subbasin increases. When the Eastside Subbasin pumping is turned off, Eastside Subbasin groundwater levels rise enough above the baseline to reverse the groundwater gradient so that the net subsurface flow is from the Eastside to 180/400 Subbasin. In the no pumping baseline, groundwater flows from the Eastside to the 180/400 Subbasin. When pumping is turned on in the 180/400 Subbasin, its groundwater levels are lower than in the baseline, the groundwater gradient from the Eastside Subbasin becomes steeper, and the inflow from the Eastside Subbasin into the 180/400 Subbasin is greater than in the baseline. When pumping is turned on in the Eastside Subbasin, groundwater levels in the

Eastside Subbasin are lower than in the baseline, the groundwater gradient reverses relative to the no pumping baseline, and groundwater flows from the 180/400 Subbasin into the Eastside Subbasin.

The simulations that show the greatest magnitude of difference in intersubbasin groundwater flow is when pumping in either the 180/400 or Eastside Subbasin is turned on or off; the subsurface flow that changes the most is between those 2 subbasins. Pumping affects the groundwater levels the most in the subbasin where pumping is turned off or on, and then other subbasins to a lesser extent. Pumping changes in the 180/400 and Eastside Subbasins appear to result in the greatest impact on groundwater levels to the adjacent subbasin.

Net subsurface flow across the 180/400 Subbasin coastal boundary changes the most with the 180/400 Subbasin pumping off scenario. In the pumping on scenarios, turning pumping on in either the 180/400 or Eastside Subbasin affect subsurface flow across the coastal boundary to approximately the same magnitude.

Table 1. Summary of Net Subsurface Flow and Differences from Baseline

Simulation	Net Subbasin Subsurface Flows ³					Net Difference from Baseline ⁴				
	Upper Valley to Forebay	Forebay to Eastside	Forebay to 180/400	180/400 to Eastside	Net Flow from Monterey Bay to 180/400 ⁵	Upper Valley to Forebay	Forebay to Eastside	Forebay to 180/400	180/400 to Eastside	Net Flow from Monterey Bay to 180/400 ⁵
Pumping Baseline	5,000	6,400	8,400	27,300	8,600	--	--	--	--	--
Upper Valley Pumping Off ¹	10,100	6,412	8,400	28,900	8,200	5,000	0	0	1,600	-400
Forebay Pumping Off ¹	922	8,400	10,300	28,600	8,200	-4,200	2,000	1,900	1,300	-400
180/400 Pumping Off ¹	5,000	5,300	5,800	52,300	500	-100	-1,100	-2,700	25,000	-8,000
Eastside Pumping Off ¹	5,000	3,800	6,800	-8,500	6,600	-100	-2,600	-1,600	-35,800	-2,000
No Pumping Baseline	4,500	1,800	5,100	-22,000	-4,500	--	--	--	--	--
Upper Valley Pumping On ²	1,100	1,800	5,400	-22,100	-4,400	-3,400	0	-100	-100	-500
Forebay Pumping On ²	9,300	100	3,900	-21,400	-4,400	4,800	-1,800	-1,600	500	-700
180/400 Pumping On ²	4,500	2,500	6,800	-36,700	0	0	700	1,300	-14,700	-6,000
Eastside Pumping On ²	4,500	4,300	6,600	16,900	-3,500	0	2,400	1,100	38,900	-5,900

Notes:

¹ Pumping in all other subbasins

² No pumping in all other subbasins

³ Positive value indicates net positive flow; Negative value indicates net negative flow (e.g., net flow is in the opposite direction as listed)

⁴ Positive value indicates value is greater than baseline flow; Negative value indicates value is less than baseline flow

⁵ Positive value indicates net inflow from Monterey Bay into 180/400 Subbasin across coastal boundary. Negative value indicates net outflow from 180/400 Subbasin into Monterey Bay across coastal boundary. Values are not indicative of the advancement of seawater intrusion, as measured by the 500 mg/L chloride isocontour, as this model does not simulate chloride.

Table 2 summarizes the annual average Salinas River surface water flow at the Chualar stream gage for each simulation, as well as the difference from the pumping or no-pumping baseline simulation. It shows that in both the pumping off and pumping on sets of simulations, the pumping changes in Forebay Subbasin have the greatest effect on Salinas River surface water flow, followed closely by the Upper Valley Subbasin. The 180/400 Subbasin has greater effect than the Eastside Subbasin on Salinas River surface water flows because the Salinas River does not flow through the subbasin.

Table 2. Summary of Surface Water Flows

Baseline Pumping Status	Simulation	Chualar Gage	Chualar Gage
		Annual Flow (AF/yr)	Change in Annual Flow (AF/yr)
Pumping On	Simulated Flow with all Historical Pumping	244,400.00	-
	Simulated Flow with Upper Valley Pumping Off ¹	277,600.00	33,200.00
	Simulated Flow with Forebay Pumping Off ¹	282,600.00	38,200.00
	Simulated Flow with 180/400 Pumping Off ¹	254,000.00	9,600.00
	Simulated Flow with Eastside Pumping Off ¹	248,800.00	4,400.00
Pumping Off	Simulated Flow with all Historical Pumping	376,800.00	-
	Simulated Flow with Upper Valley Pumping On ²	336,700.00	-40,100
	Simulated Flow with Forebay Pumping On ²	333,000.00	-43,700
	Simulated Flow with 180/400 Pumping On ²	366,800.00	-10,000
	Simulated Flow with Eastside Pumping On ²	370,700.00	-6,000

Notes:

¹ Pumping in all other subbasins

² No pumping in other subbasins

Figure 1 provides a visual representation of the difference between the baseline simulations for both surface water and groundwater. The river flow at the Soledad gage is included as a proxy for the Upper Valley to Forebay surface water flows, and the river flow at the Chualar gage is used as a proxy for Forebay to 180/400 flows, although neither is located exactly on the subbasin boundary. This shows that turning pumping on in any of the 4 subbasins have approximately the same magnitude of effect in the opposite direction as turning pumping off in the same subbasin, although exact values vary. When the Upper Valley or Forebay pumping is turned on or off, surface water is affected to a greater extent than groundwater flows. Turning pumping on or off in the 180/400 Subbasin affects both surface water and groundwater flows. Turning off pumping in the Eastside affects primarily groundwater flows.

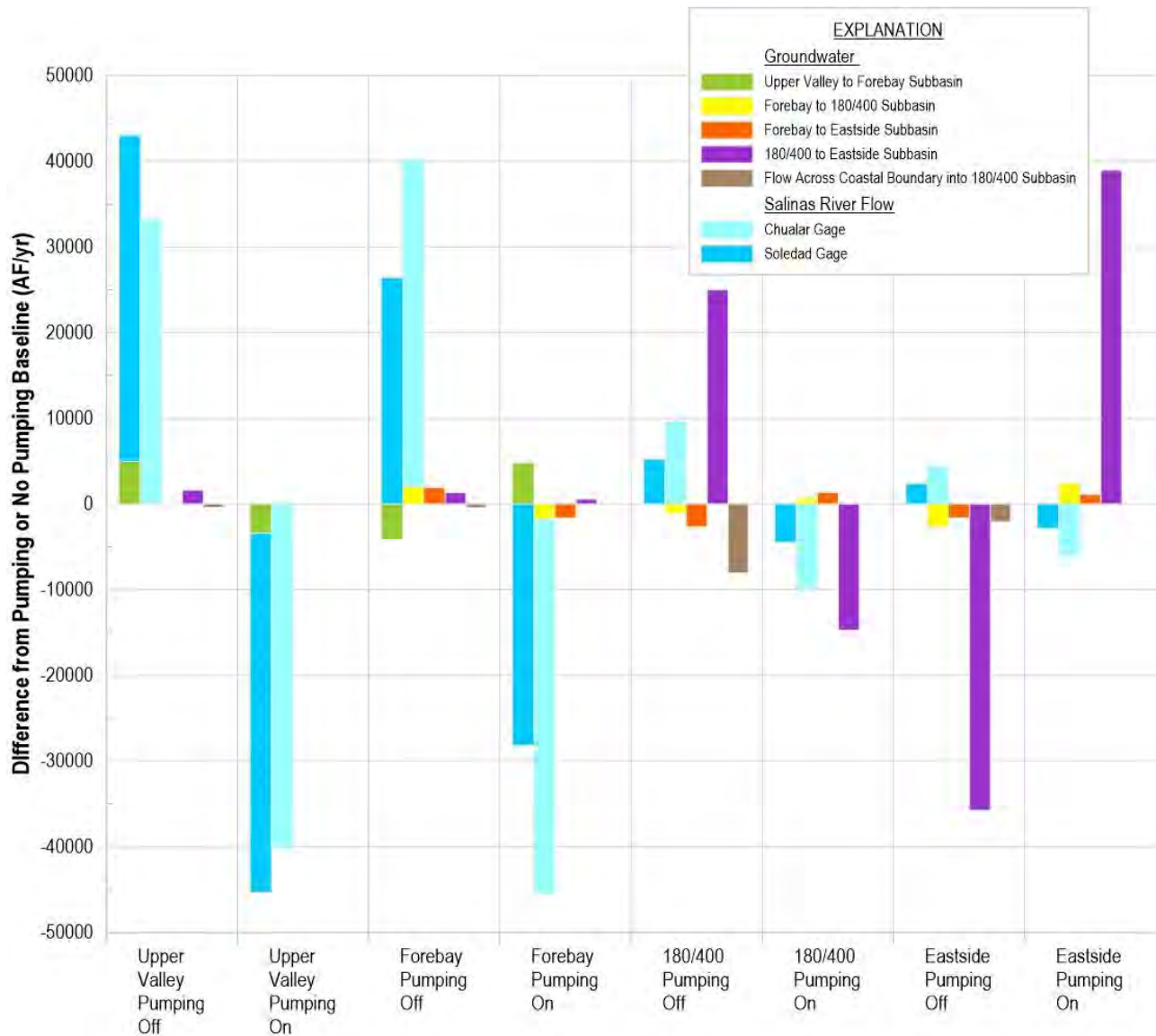


Figure 1. Summary of Salinas River Surface Water and Groundwater Flows Between Subbasin

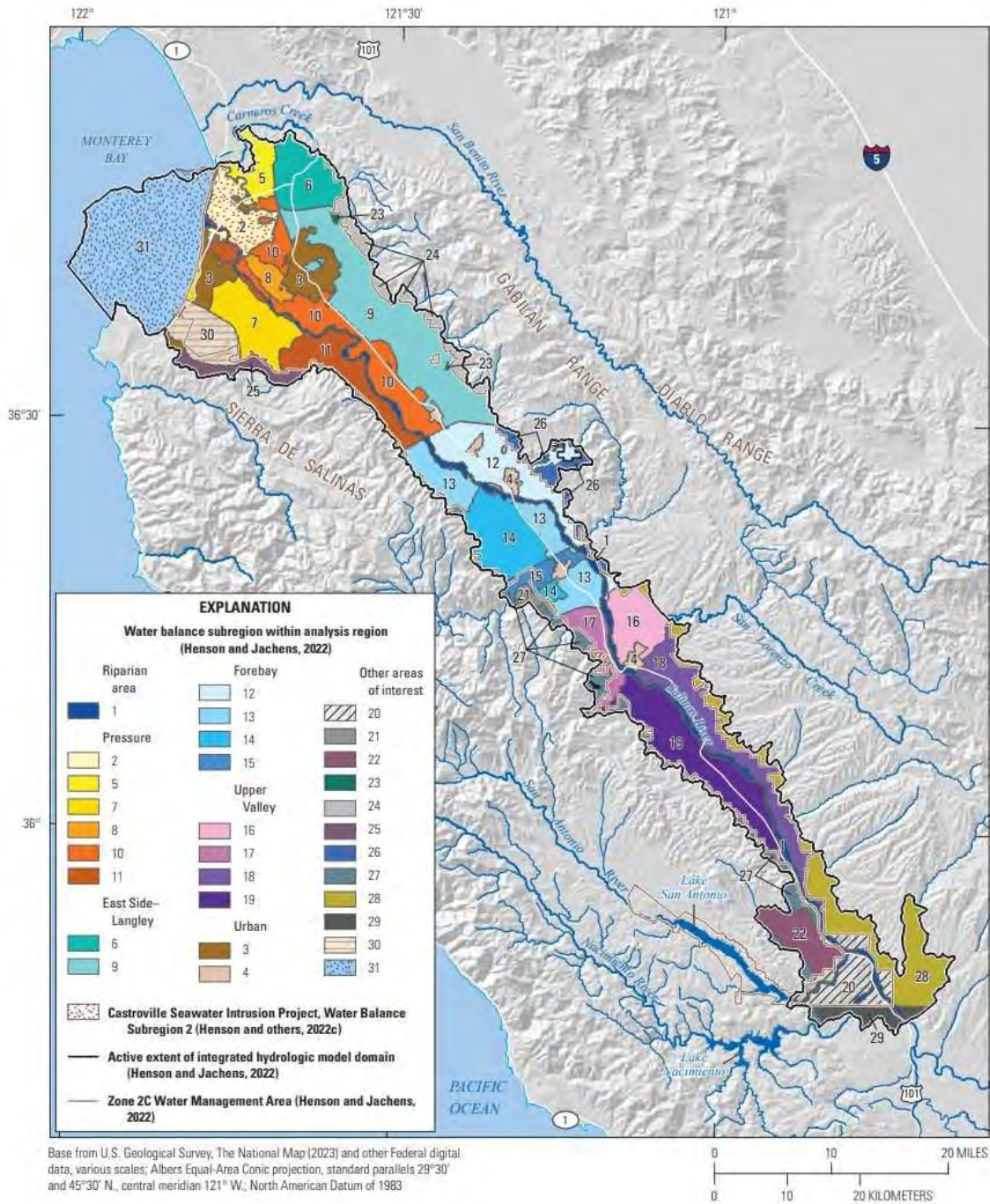
GROUNDWATER FLOW MODEL

The SVIHM is a numerical groundwater flow model developed to simulate groundwater and surface water conditions in the Salinas Valley under historical conditions. It is part of a larger suite of models that includes a geologic model and a watershed model. The SVIHM is built using the most recent version of the USGS MODFLOW One Water Hydrologic Flow Model (OWHM) code.

The SVIHM has 9 layers representing principal aquifers and aquitards in the Salinas Valley. The Farm Process in the SVIHM—which is unique to MODFLOW OWHM—estimates demand-based agricultural pumping. Municipal, industrial, and domestic pumping are specified based on historical records and estimates. Reclaimed water supply, diversions to the Castroville Seawater Improvement Project (CSIP) from the Salinas River Diversion Facility, and surface water flows including releases from the Nacimiento and San Antonio Dams, are specified based on historical records. Runoff, agricultural return flows, and recharge are simulated flows that vary in time and space in the SVIHM in response to climate, land use, and groundwater elevations. Further description of the SVIHM can be found in the USGS model summary report by Henson and others (2025 [pre-print]).

The USGS made a few notable changes in the final version of the SVIHM, as compared to the version reviewed when developing the modeling approach for this project:

1. **Temporal Update:** The final SVIHM was updated to run from 1967 to 2022.
2. **Flooding of Layer 1:** The USGS added a layer of drain cells across layer 1 to address simulated water levels above the ground surface (flooding). With the addition of drains, any groundwater flow into model cells that would increase the head above the top elevation of the cell is routed to nearby streamflow. This computer modeling task was previously paused in 2024 due to observed simulated flooding of layer 1, for which the USGS added the drain later in 2024 as a preventative measure.
3. **Water Balance Subregion (WBS) Adjustment:** The SVIHM is divided into WBSs, or farms, as shown on Figure 2, which is reproduced from the USGS model report (Henson and others, 2025 [pre-print]). The agricultural water demand and supply are calculated by the SVIHM at the WBS level. When the approach to this project was developed, the WBS boundaries specified in the SVIHM did not correspond with Bulletin 118 subbasin boundaries used for groundwater sustainability plans (GSPs), and they were not necessarily contiguous. In the final version of the SVIHM, the USGS adjusted those boundaries to align better with the subbasin boundaries.



(reproduced from Henson and others, 2025 [pre-print])

Figure 2. Water Balance Subregion Grouping for Results

MODELING APPROACH

The proposed superposition analysis requires that groundwater pumping be removed from or turned off in individual subbasins in the SVIHM, or be turned on again after being turned off for the no-pumping baseline. Wells were turned off by subbasin through the following methods:

- **Urban wells**, which have specified pumping rates (municipal, industrial, and domestic wells), were turned off by specifying a rate of zero for the affected wells in the MNW package input files.
- **Agricultural wells** have pumping rates calculated internally in the SVIHM Farm Process according to land use and crop demand. Groundwater pumping was eliminated as a potential source of water that the model can use to meet demand. Wells were “turned off” by setting the maximum pumping rate of the wells located within the subbasin of interest to zero in the farm package input files. Historical surface water deliveries continue for irrigation. Without additional water sources, demand was partially met (deficit irrigation). Land use demand remained unchanged. This approach, selected by the SBWA and SVWC hydrologists, also eliminated any recharge from return flow of excess agricultural irrigation sourced from groundwater since there was no groundwater supplied for irrigation.

CSIP deliveries are determined based on demand in the CSIP area: first, the model attempts to meet CSIP crop demand using natural sources (precipitation and groundwater root uptake); second, it uses prescribed non-routed delivery of recycled water; third, it attempts to divert surface water at the SRDF; and finally, it pumps groundwater to make up any demand shortfall. At Clark Colony, it follows the same progression without recycled water. The model simulates the historical diversion amounts as a specified diversion from the main channel (Salinas River for CSIP and Arroyo Secco for Clark Colony). The specified diversion goes into a side channel from which the associated farm (water balance subregion) is allowed to draw to meet its demand. In the public release version of the SVIHM from the USGS, any diverted water that is not used by the farm is returned to the main channel. This allows the farm to use up to the historical diversion but does not guarantee that the historical diversion will be completely removed from the system.

For the stream diversions to be consistent between the model runs, a change was implemented to the stream flow routing package to disconnect the return of the diversion side channels from the main channel. With this change, the historical diversion amount is always diverted from the main channel and if there is any unused portion it disappears from the model domain. Without groundwater as a water supply, irrigation decreases and deficit irrigation results in reduced

evapotranspiration from crops. The other anticipated impacts on the water budget from this approach are reduced return flows and reduced deep percolation from farms.

This memorandum provides model simulation outputs according to the Summary of Modeling Approach Technical Memorandum. In addition, M&A shared the raw output files with the SBWA and SVWC hydrologists. These include the model input files (discretization data), the groundwater elevation difference outputs compared to the baseline model, groundwater cell-by-cell flow budget files, and modeled Salinas River flow output.

MODEL RESULTS FOR TURNING OFF PUMPING BY SUBBASIN

For this set of simulations, M&A used the historical model with the stream diversion modifications noted above as the pumping baseline. Pumping was turned off for each of the Upper Valley, Forebay, Eastside, and 180/400 Subbasins in 4 separate model simulations. The results for the individual subbasin “off” simulations are compared to the pumping baseline simulation. This section focuses on the first set and organizes results by the key outputs.

Groundwater Level Changes

Groundwater level change is calculated as the difference between the pumping baseline simulation and each subbasin pumping off scenario. The difference is averaged over 2 periods: 1980-2022 for the historical period and 2018-2022 for the recent period. Dry cells were excluded from the calculation. The average difference was calculated for the water table, 180-Foot Aquifer or equivalent (model layer 3), and the 400-Foot Aquifer or equivalent (model layer 5). In the Upper Valley, only the results for the water table are presented because the aquifer is unconfined and model layers 3 and 5 pinch out near the Forebay and Upper Valley border. Note that the water table crosses multiple layers, especially near the valley margins, and is represented as the simulated groundwater elevation in the topmost partially saturated cell. The FloPy python water table function was used to calculate the water table elevation. These average water level differences are presented spatially as color-flooded maps.

Figure 3 through Figure 6 show examples of groundwater level change differences between the pumping baseline and pumping off scenarios for key aquifers in each subbasin for the historical period. Each figure is focused on the subbasin of the adjustments; figures with groundwater level changes across the entire Valley are included in Attachment 2.

Maps were also prepared to represent average groundwater level changes over time for either the wet (December to March) or dry (June to August) season. The water level difference between the pumping baseline and each scenario was calculated for only the months defined in the wet or dry season. It was then averaged across the same 2 periods mentioned above.

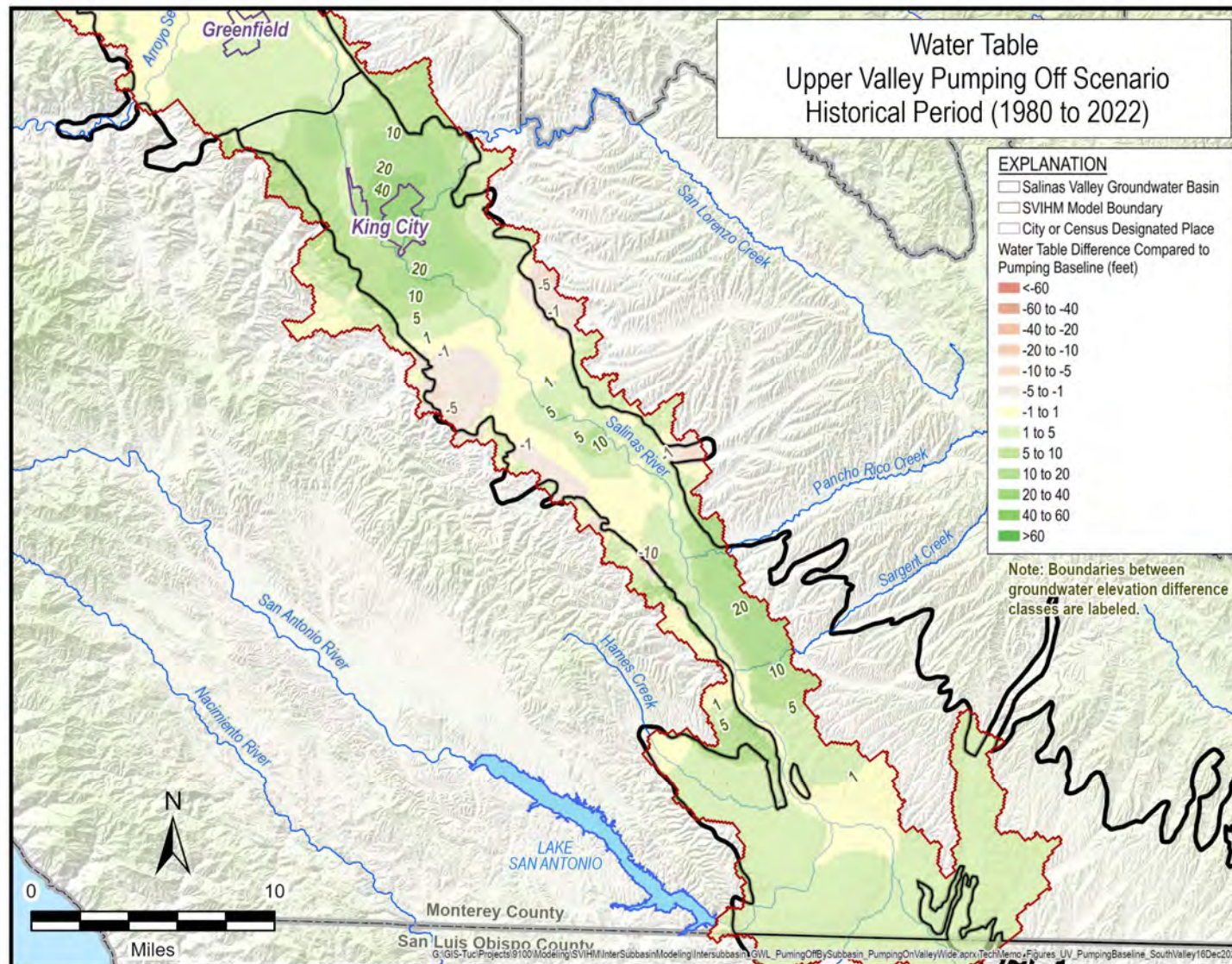


Figure 3. Upper Valley Pumping Off Scenario Compared to Pumping Baseline – Average Groundwater Level Difference for 1980-2022
Focused on Upper Valley Subbasin for the Water Table

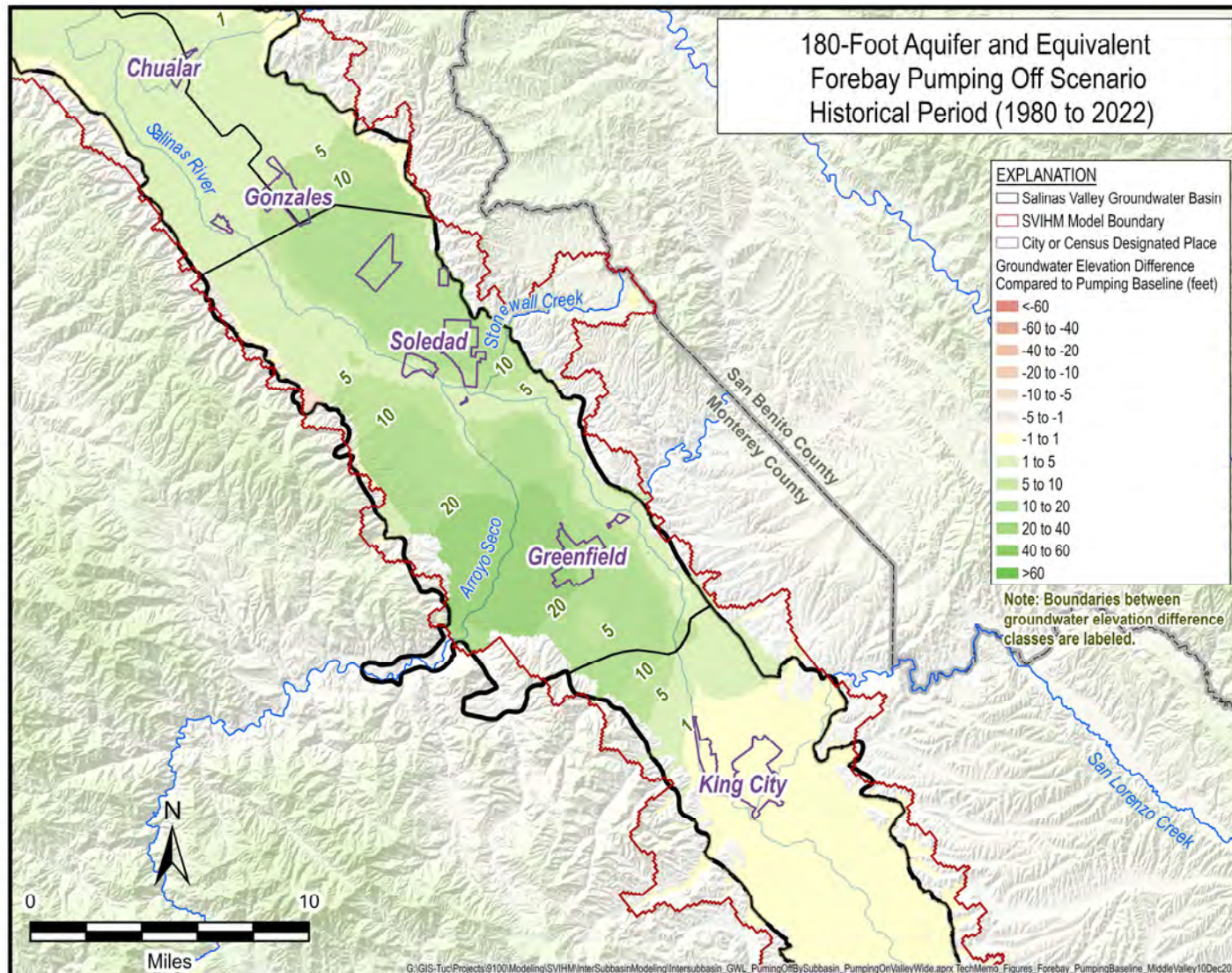


Figure 4. Forebay Pumping Off Scenario Compared to Pumping Baseline – Average Groundwater Level Difference for 1980-2022
Focused on Forebay Subbasin for the 180-Foot Aquifer and Equivalent

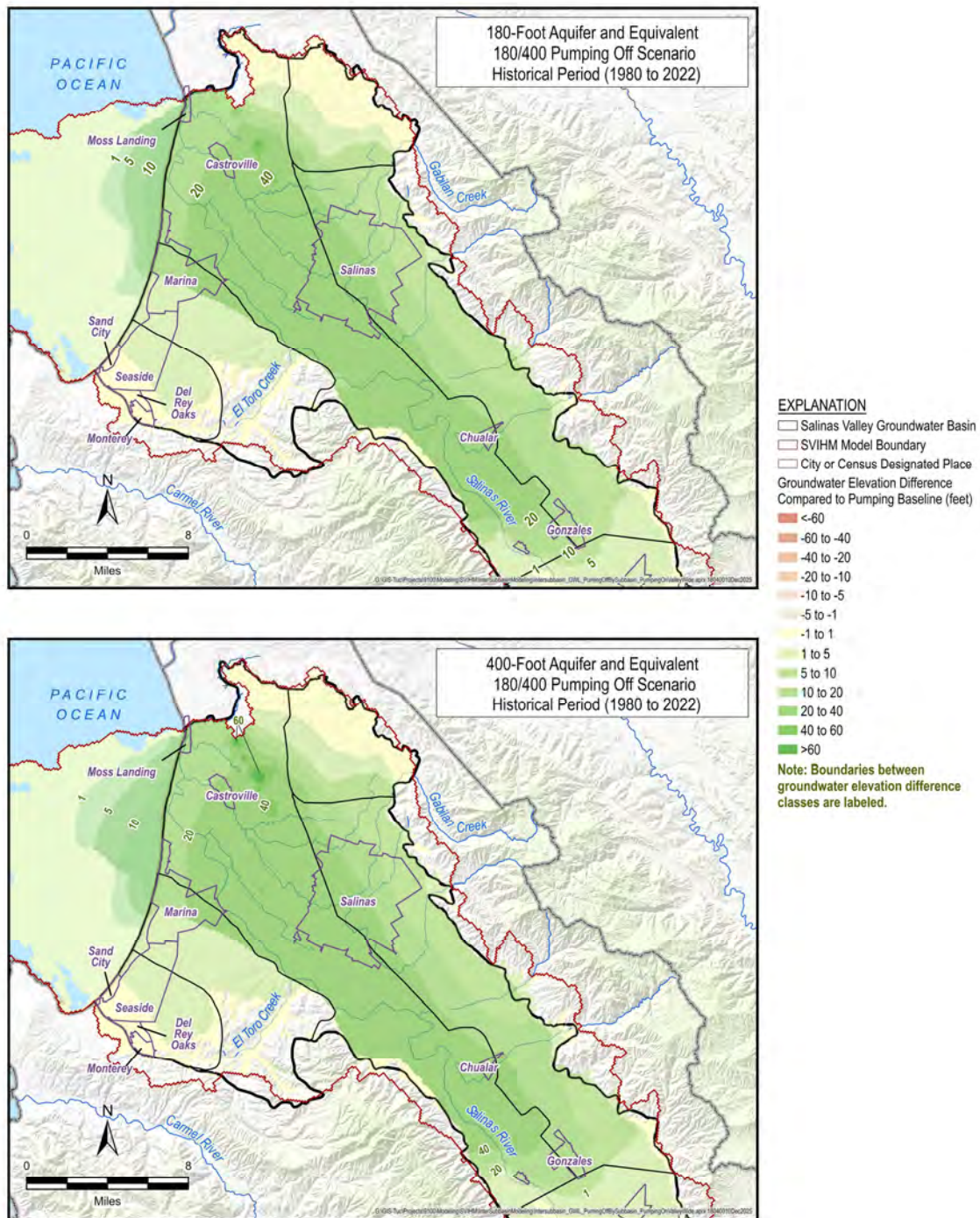


Figure 5. 180/400 Pumping Off Scenario Compared to Pumping Baseline -
Average Groundwater Level Difference for 1980-2022
Focused on North Valley for the 180-Foot Aquifer, 400-Foot Aquifers, and Equivalents

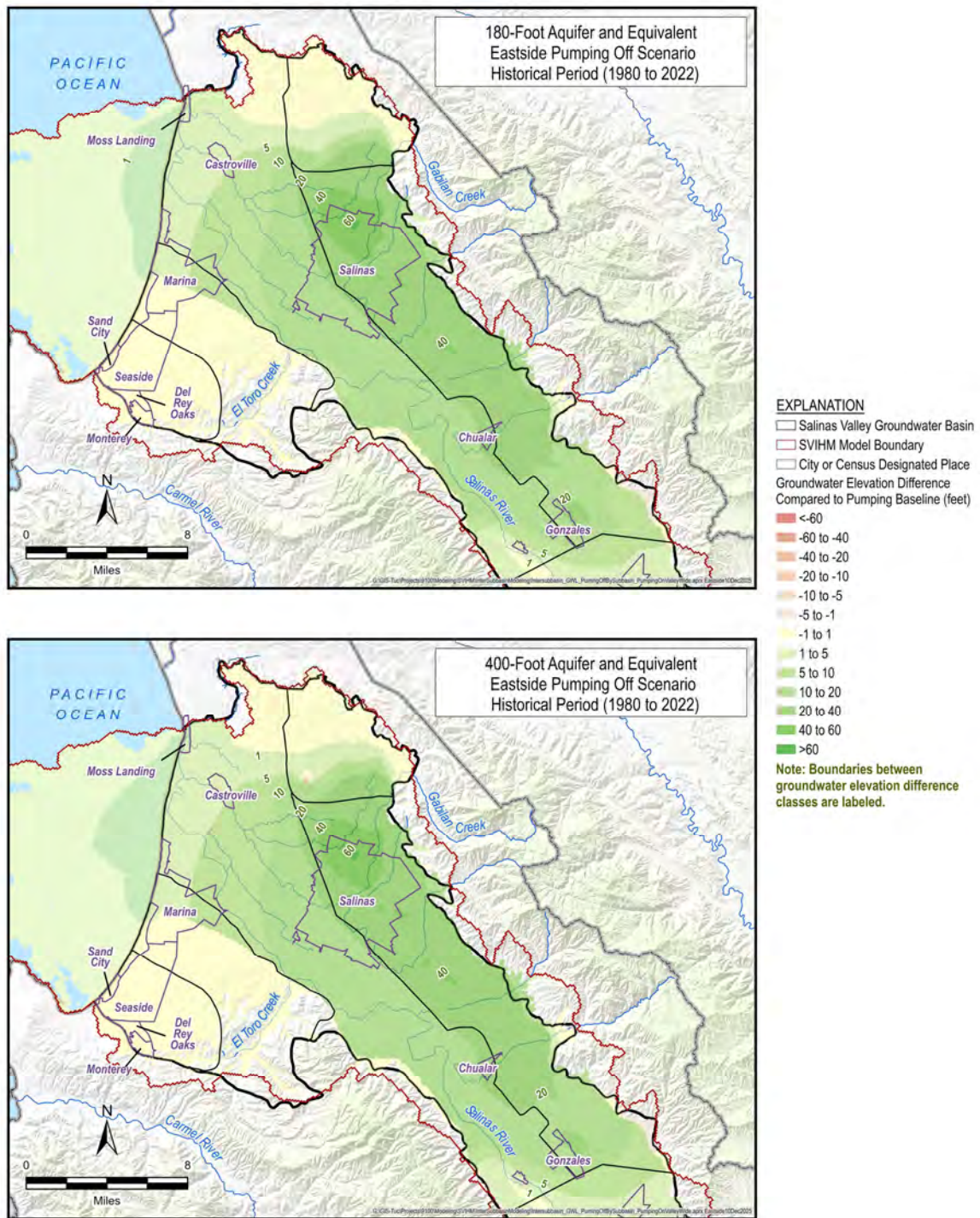


Figure 6. Eastside Pumping Off Scenario Compared to Pumping Baseline -
Average Groundwater Level Difference for 1980-2022
Focused on North Valley for the 180-Foot Aquifer, 400-Foot Aquifers, and Equivalents

Intersubbasin Subsurface Flows

Annual subsurface flows between each subbasin are averaged over the historical period (1980-2022). Results for the pumping baseline are presented in Table 3. Results for each model scenario and the difference between the scenarios and baseline are presented in Table 4 through Table 7. In addition, annual intersubbasin subsurface flows will be provided to the hydrologists as part of model outputs.

Table 3. Annual Intersubbasin Subsurface Flows Pumping Baseline

	NET FLOW ¹						
	PUMPING BASELINE						
PUMPING BASELINE	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Seaside
From Upper Valley to	0	5,071	0	0	0	0	0
From Forebay to	-5,071	0	8,431	6,385	0	0	0
From 180/400 to	0	-8,431	0	27,292	-449	2,270	0
From Eastside to	0	-6,385	-27,292	0	-4,489	0	0
From Langley to	0	0	449	4,489	0	0	0
From Monterey to	0	0	-2,270	0	0	0	290
From Pajaro Valley to	0	0	-229	0	-360	0	0
From Paso Robles to	-93	0	0	0	0	0	0

¹ Positive value indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow.

Table 4. Annual Intersubbasin Subsurface Flows – Upper Valley Pumping Off Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM PUMPING BASELINE ²					
	UPPER VALLEY OFF						UPPER VALLEY OFF					
UPPER VALLEY OFF	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	10,050	0	0	0	0	0	4,979	0	0	0	0
From Forebay to	-10,050	0	8,434	6,412	0	0	-4,979	0	3	26	0	0
From 180/400 to	0	-8,434	0	28,890	-444	2,918	0	-3	0	1,598	6	648
From Eastside to	0	-6,412	-28,890	0	-4,479	0	0	-26	-1,598	0	10	0
From Langley to	0	0	444	4,479	0	0	0	0	-6	-10	0	0
From Monterey to	0	0	-2,918	0	0	0	0	0	-648	0	0	0
From Pajaro Valley to	0	0	-241	0	-360	0	0	0	-11	0	0	0
From Paso Robles to	-152	0	0	0	0	0	-59	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Table 5. Annual Intersubbasin Subsurface Flows – Forebay Pumping Off Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM PUMPING BASELINE ²					
	FOREBAY OFF						FOREBAY OFF					
FOREBAY OFF	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	887	0	0	0	0	0	-4,185	0	0	0	0
From Forebay to	-887	0	10,339	8,407	0	0	4,185	0	1,908	2,022	0	0
From 180/400 to	0	-10,339	0	28,588	-443	2,991	0	-1,908	0	1,296	6	721
From Eastside to	0	-8,407	-28,588	0	-4,472	0	0	-2,022	-1,296	0	16	0
From Langley to	0	0	443	4,472	0	0	0	0	-6	-16	0	0
From Monterey to	0	0	-2,991	0	0	0	0	0	-721	0	0	0
From Pajaro Valley to	0	0	-245	0	-360	0	0	0	-16	0	0	0
From Paso Robles to	-105	0	0	0	0	0	-12	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Table 6. Annual Intersubbasin Subsurface Flows – 180/400 Pumping Off Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM PUMPING BASELINE ²					
	180/400 OFF						180/400 OFF					
180/400 OFF	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	5,005	0	0	0	0	0	-67	0	0	0	0
From Forebay to	-5,005	0	5,766	5,251	0	0	67	0	-2,665	-1,134	0	0
From 180/400 to	0	-5,766	0	52,324	-238	8,892	0	2,665	0	25,031	211	6,622
From Eastside to	0	-5,251	-52,324	0	-3,612	0	0	1,134	-25,031	0	876	0
From Langley to	0	0	238	3,612	0	0	0	0	-211	-876	0	0
From Monterey to	0	0	-8,892	0	0	0	0	0	-6,622	0	0	0
From Pajaro Valley to	0	0	-501	0	-363	0	0	0	-272	0	-3	0
From Paso Robles to	-97	0	0	0	0	0	-4	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Table 7. Annual Intersubbasin Subsurface Flows – Eastside Pumping Off Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM PUMPING BASELINE ²					
	EASTSIDE OFF						EASTSIDE OFF					
EASTSIDE OFF	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	5,013	0	0	0	0	0	-58	0	0	0	0
From Forebay to	-5,013	0	6,815	3,751	0	0	58	0	-1,616	-2,635	0	0
From 180/400 to	0	-6,815	0	-8,483	-658	4,279	0	1,616	0	-35,776	-208	2,009
From Eastside to	0	-3,751	8,483	0	-1,305	0	0	2,635	35,776	0	3,183	0
From Langley to	0	0	658	1,305	0	0	0	0	208	-3,183	0	0
From Monterey to	0	0	-4,279	0	0	0	0	0	-2,009	0	0	0
From Pajaro Valley to	0	0	-403	0	-364	0	0	0	-174	0	-4	0
From Paso Robles to	-95	0	0	0	0	0	-2	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Subsurface Outflow To and Inflow From Monterey Bay

Subsurface outflow to and inflow from Monterey Bay is averaged over the historical period in Table 8 for the pumping baseline and each pumping off scenario. In addition, the annual outflows and inflows are provided as part of model outputs.

Table 8. Net Average Annual Flows To/From Monterey Bay for WY 1980-2022 (AF/WY)

	Net Average Annual Flow		
Subbasin	180/400	Monterey	Seaside
Pumping Baseline	8,603	2,967	1,660
Upper Valley Pumping Off	8,221	2,682	1,629
Forebay Pumping Off	8,183	2,664	1,629
180/400 Pumping Off	456	-64	1,546
Eastside Pumping Off	6,555	2,139	1,633
	Difference Compared to Pumping Baseline		
	180/400	Monterey	Seaside
Upper Valley Pumping Off	-381	-285	-31
Forebay Pumping Off	-420	-303	-31
180/400 Pumping Off	-8,147	-3,031	-114
Eastside Pumping Off	-2,047	-828	-27

Note: Positive value indicates inflow into subbasin.

Simulated Salinas River Streamflow Changes

Changes in simulated Salinas River streamflow at Soledad (USGS gage 11151700), Chualar (USGS gage 11152300), and Spreckels (USGS gage 11152500) are summarized in Table 9. Results for each model simulation are presented for comparison between scenarios. In addition, Figure 7, Figure 8, and Figure 9 show the Salinas River flow over time at the Soledad, Chualar, and Spreckels gages, respectively, for each model run.

Table 9. Pumping Off Scenarios - Average Annual Salinas River Flow at the Soledad, Chualar, and Spreckels Gages

	Average Annual Flow (AF/yr)			Change in Average Annual Flow from Baseline to Model Run (AF/yr)		
	Soledad Gage	Chualar Gage	Spreckels Gage	Soledad Gage	Chualar Gage	Spreckels Gage
Pumping Baseline	264,850	244,388	246,536			
Upper Valley Off	302,883	277,554	282,461	38,033	33,166	35,904
Forebay Off	291,262	282,624	285,866	26,412	38,236	39,310
180/400 Off	270,062	254,028	266,920	5,212	9,640	20,364
Eastside Off	267,216	248,811	254,677	2,366	4,423	8,121

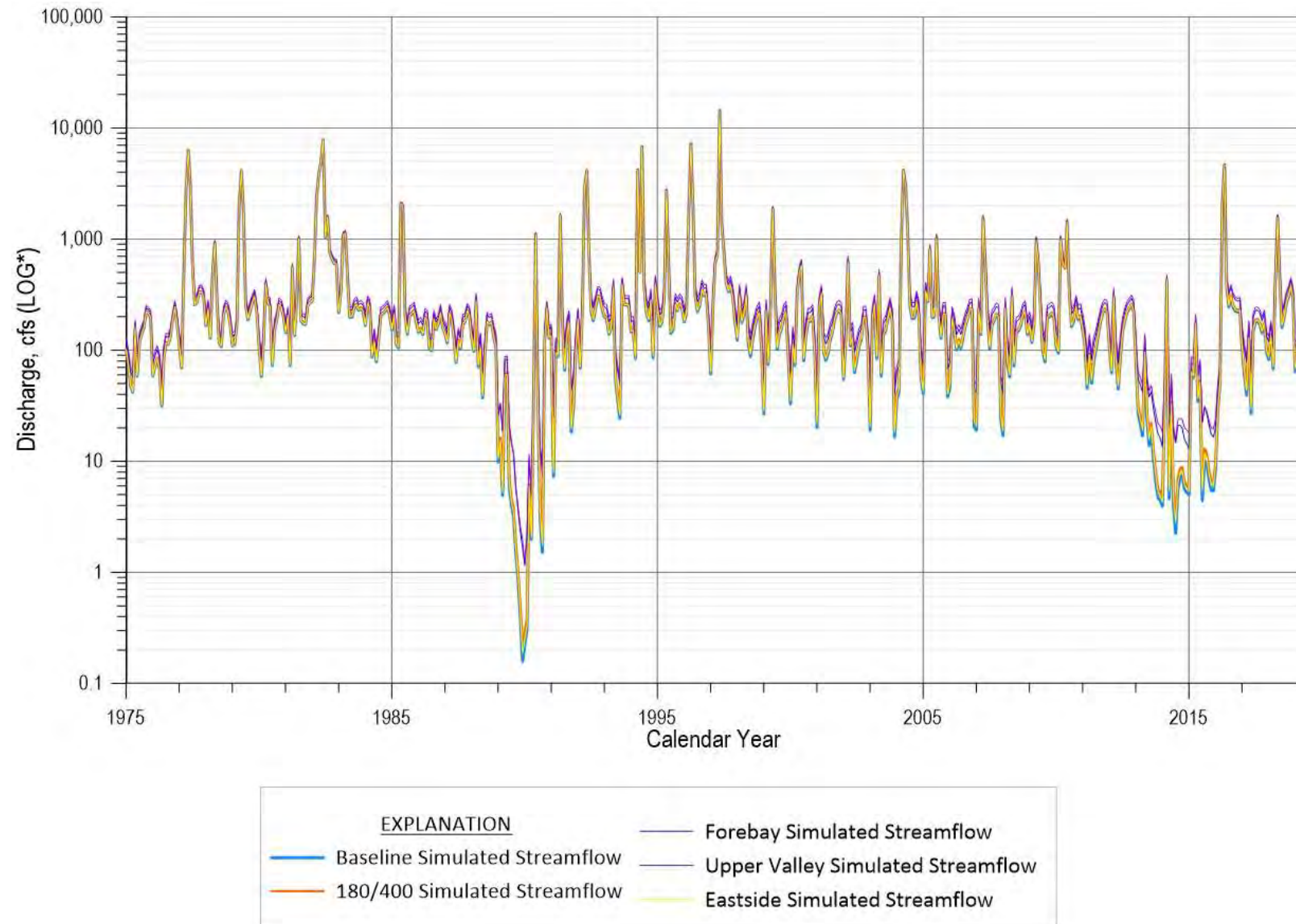


Figure 7. Pumping Off Scenarios – Simulated Salinas River Streamflow at the Soledad Gage

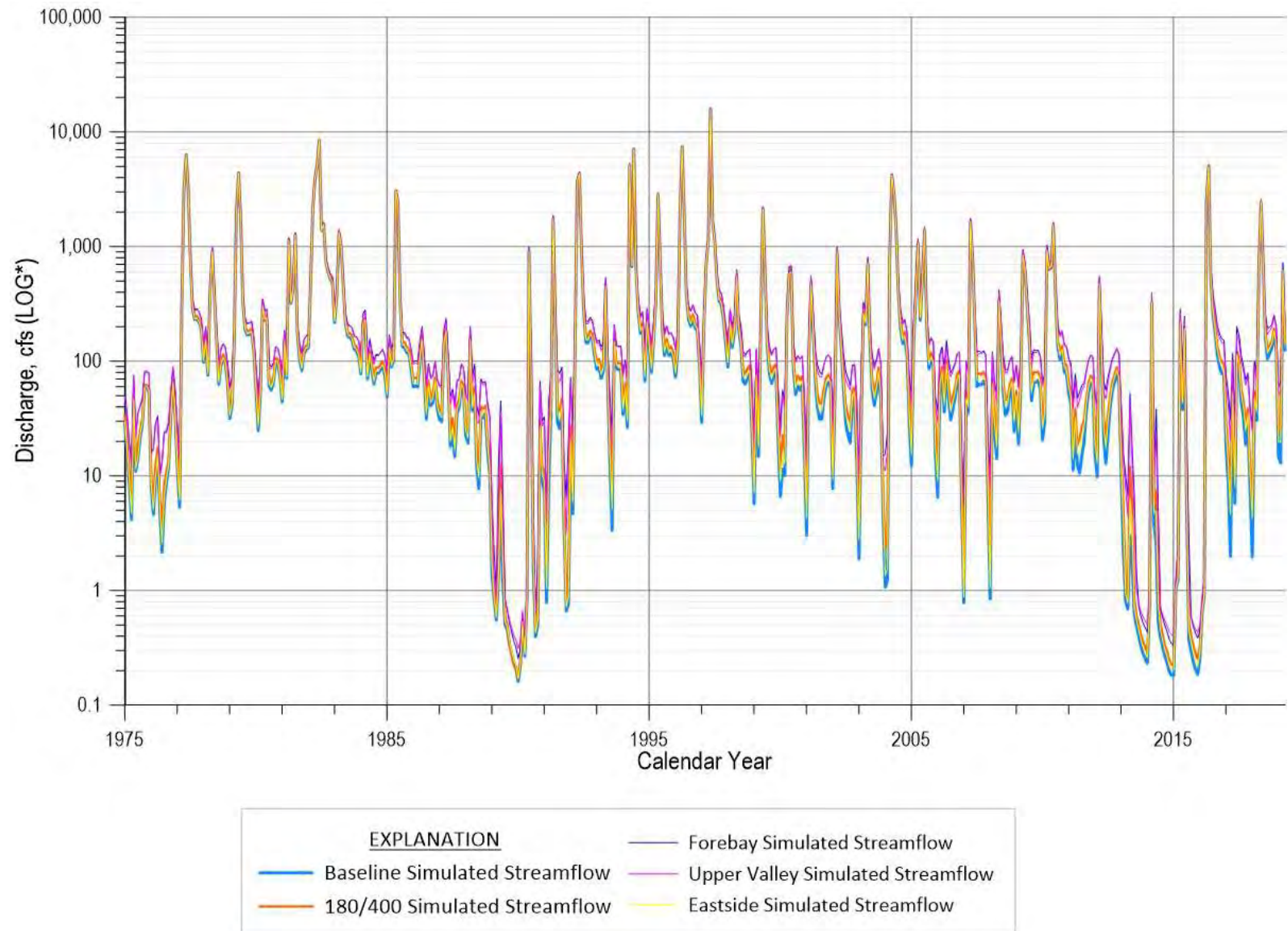


Figure 8. Pumping Off Scenarios – Simulated Salinas River Streamflow at the Chualar Gage

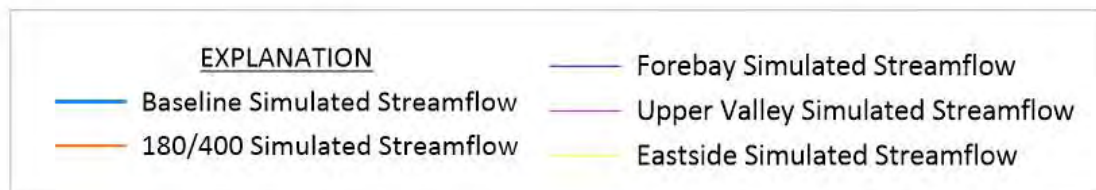
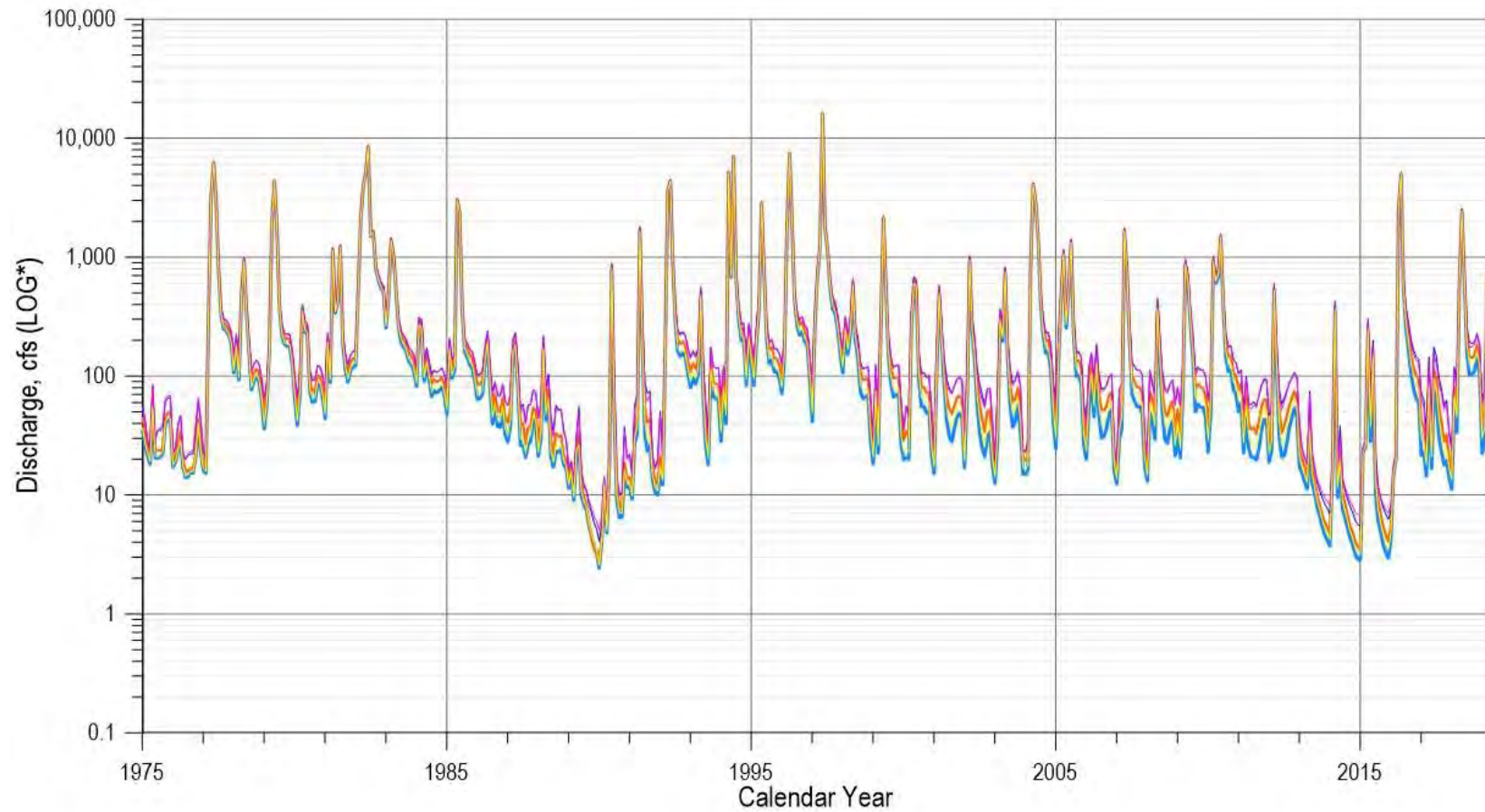


Figure 9. Pumping Off Scenarios – Simulated Salinas River Streamflow at the Spreckels Gage

MODEL RESULTS FOR TURNING ON PUMPING BY SUBBASIN

For this set of scenarios, M&A developed a no-pumping baseline as the baseline condition and then added and allowed for pumping for each of the Upper Valley, Forebay, Eastside, and 180/400 Subbasins in 4 separate model simulations. The no-pumping baseline consisted of the historical period of the model running 6 times. Each time, the final stress period heads from 2022 were used as the initial heads for the next iteration. Heads increased following each iteration. After the first iteration, heads in Eastside subbasin increased by up to approximately 50 feet. By the end of the second iteration heads in Eastside increased by up to 20 feet and the groundwater gradient switched directions and started flowing from the Eastside subbasin toward the 180/400 Subbasin. In the following iteration, the head difference was less than 10 feet and the difference diminished with subsequent iterations. By the sixth iteration, groundwater levels had equilibrated.

Groundwater Level Changes

Groundwater level change is calculated using the same method as previously described for the pumping baseline set of simulations. The difference between the no-pumping baseline model and each subbasin pumping on scenario is calculated first. Then, the difference is averaged over the historical period (1980-2022) and the recent period (2018-2022). Dry cells were excluded from the calculation. The average difference was calculated for the water table, 180-Foot Aquifer or equivalent (model layer 3), and the 400-Foot Aquifer or equivalent (model layer 5). The 180-Foot and 400-Foot Aquifers are not present in Upper Valley; therefore, only the results for the water table are presented. These average water level differences are presented spatially as color-flooded maps.

As an example, Figure 9 shows groundwater level change differences between the Upper Valley pumping on scenario compared to the no-pumping baseline for the water table. Figure 10, Figure 11, and Figure 12 show similar figures for the pumping on scenarios in Forebay, 180/400, and Eastside Subbasin, respectively. Each figure is focused on the subbasin of the adjustments; figures with groundwater level changes across the whole Valley are included in Attachment 2. Average water level differences for the wet season and dry season were also prepared for the same 2 periods mentioned above. Attachment 1 includes all figures.

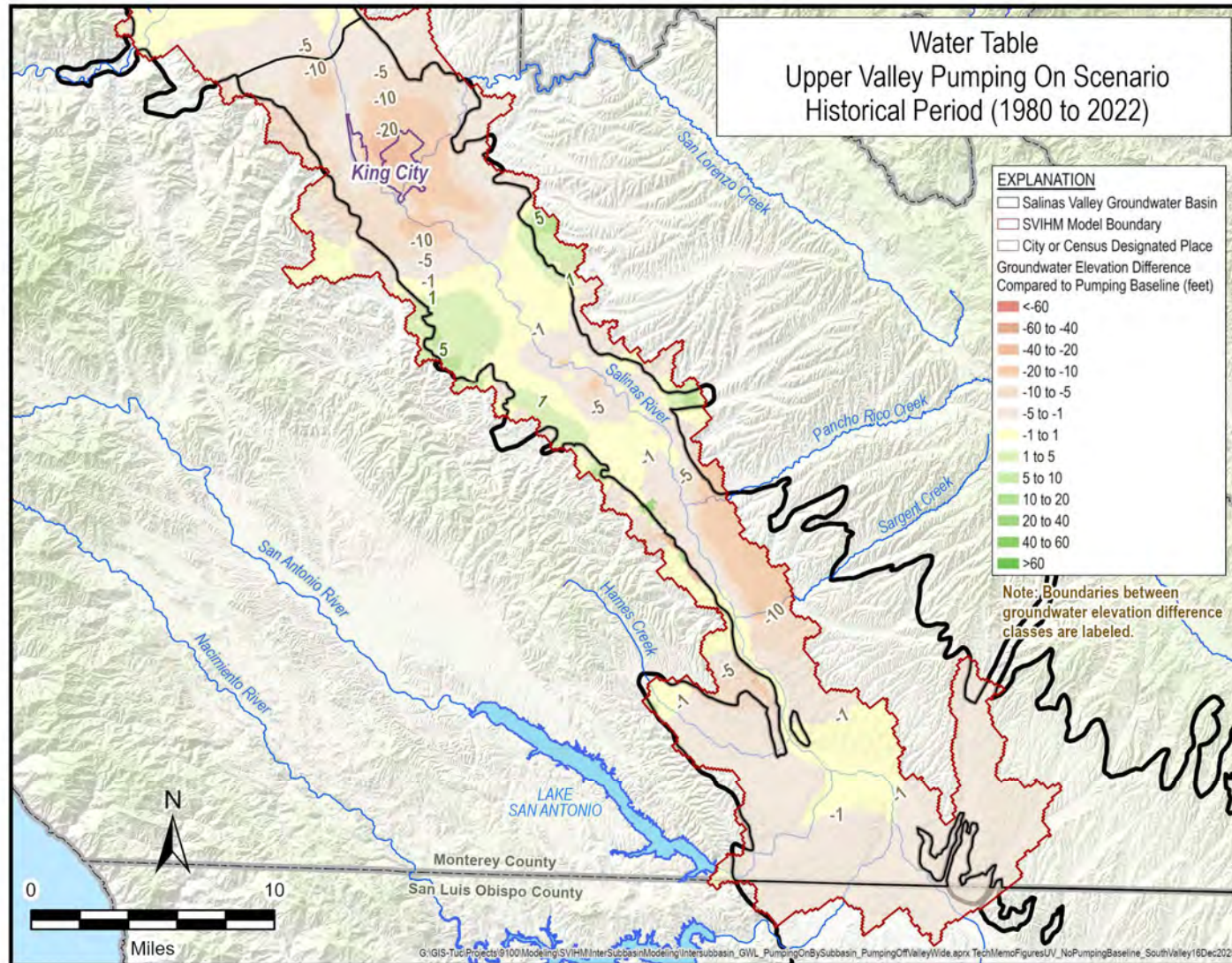


Figure 9. Upper Valley Pumping On Scenario Compared to No-pumping Baseline – Average Groundwater Level Difference for 1980-2022
Focused on Upper Valley Subbasin for the Water Table

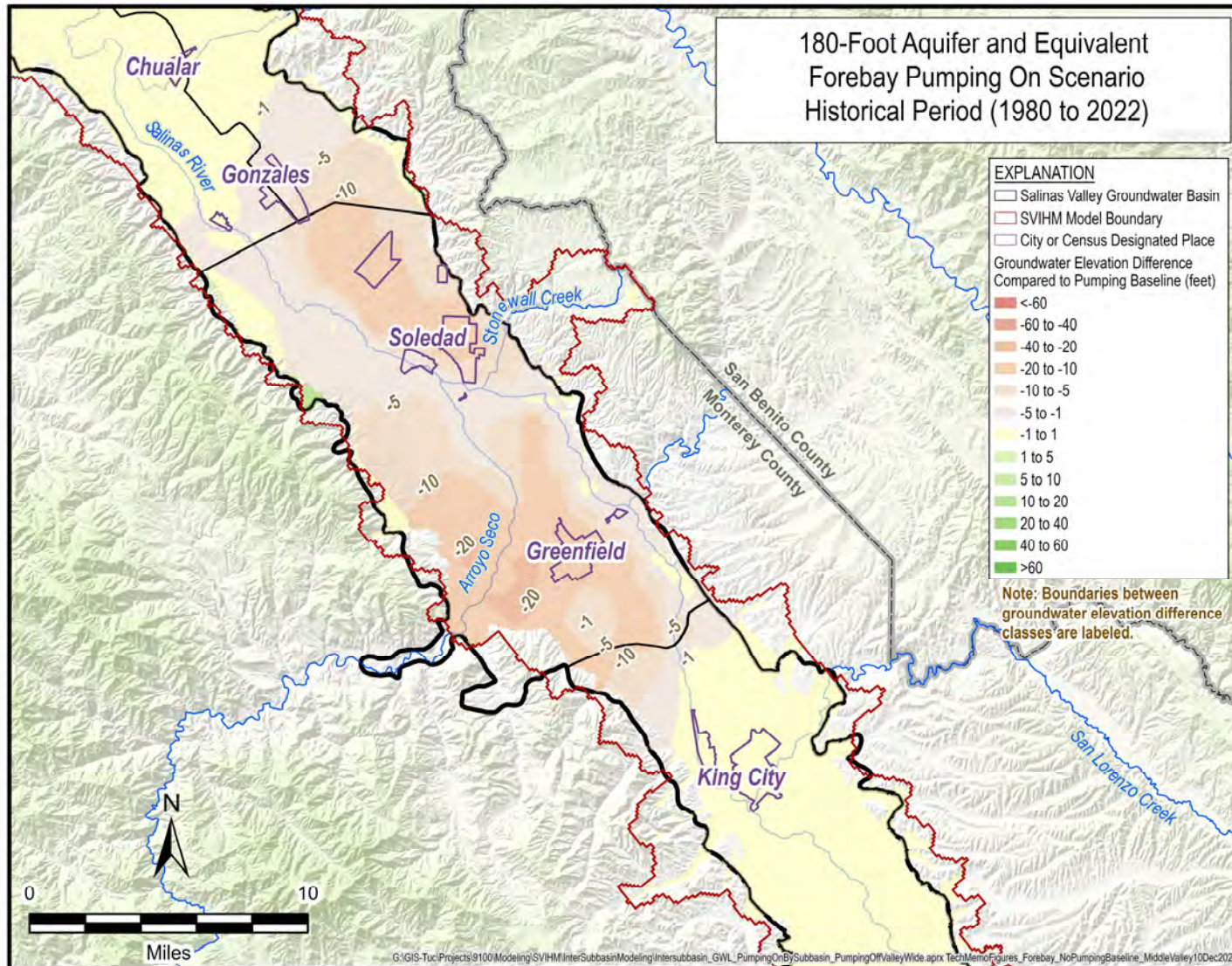


Figure 10. Forebay Pumping On Scenario Compared to No-pumping Baseline - Average Groundwater Level Difference for 1980-2022 Focused on Forebay Subbasin for the 180-Foot Aquifer and Equivalent

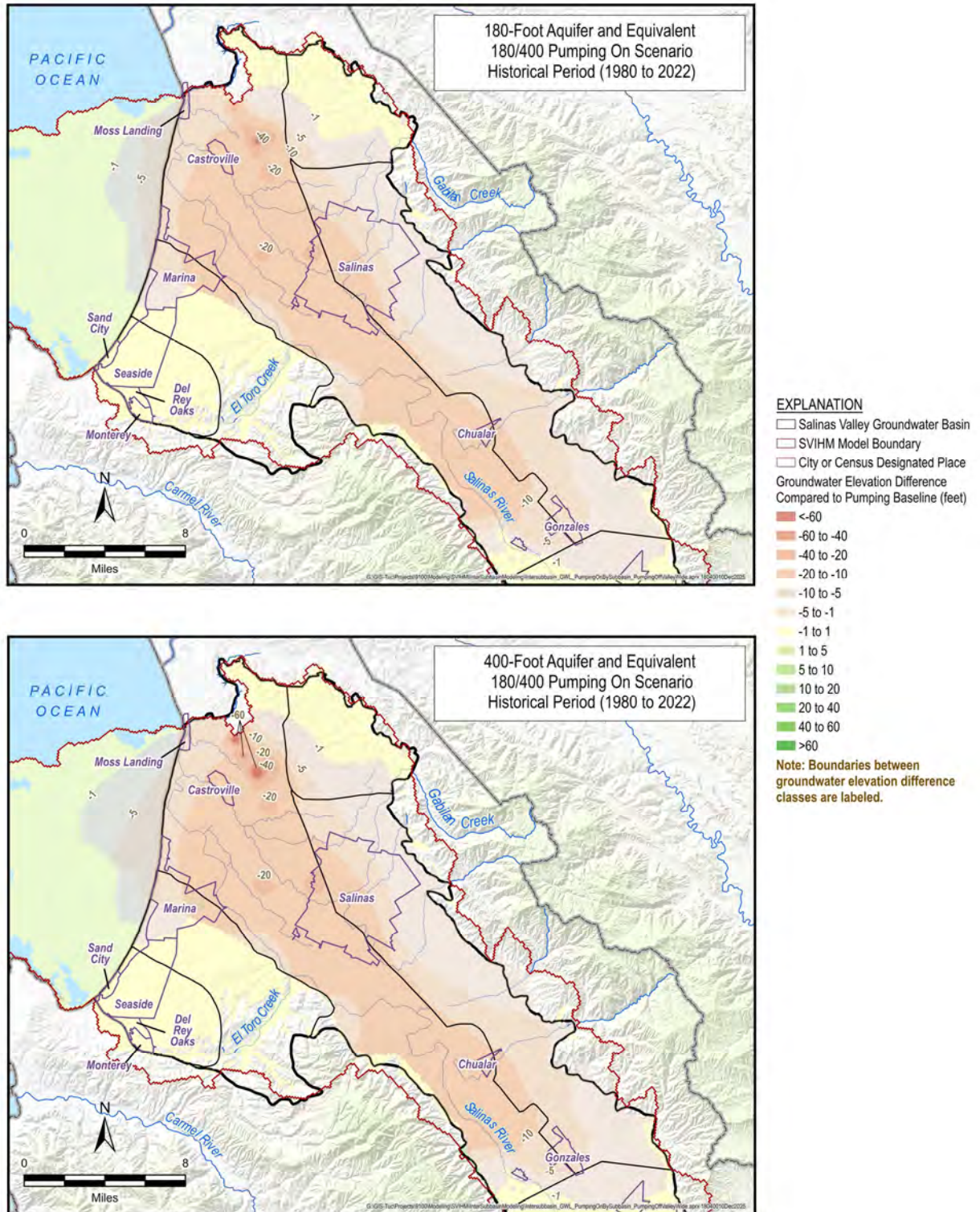


Figure 11. 180/400 Pumping On Scenario Compared to No-pumping Baseline -
Average Groundwater Level Difference for 1980-2022
Focused on North Valley for the 180-Foot Aquifer, 400-Foot Aquifers, and Equivalents

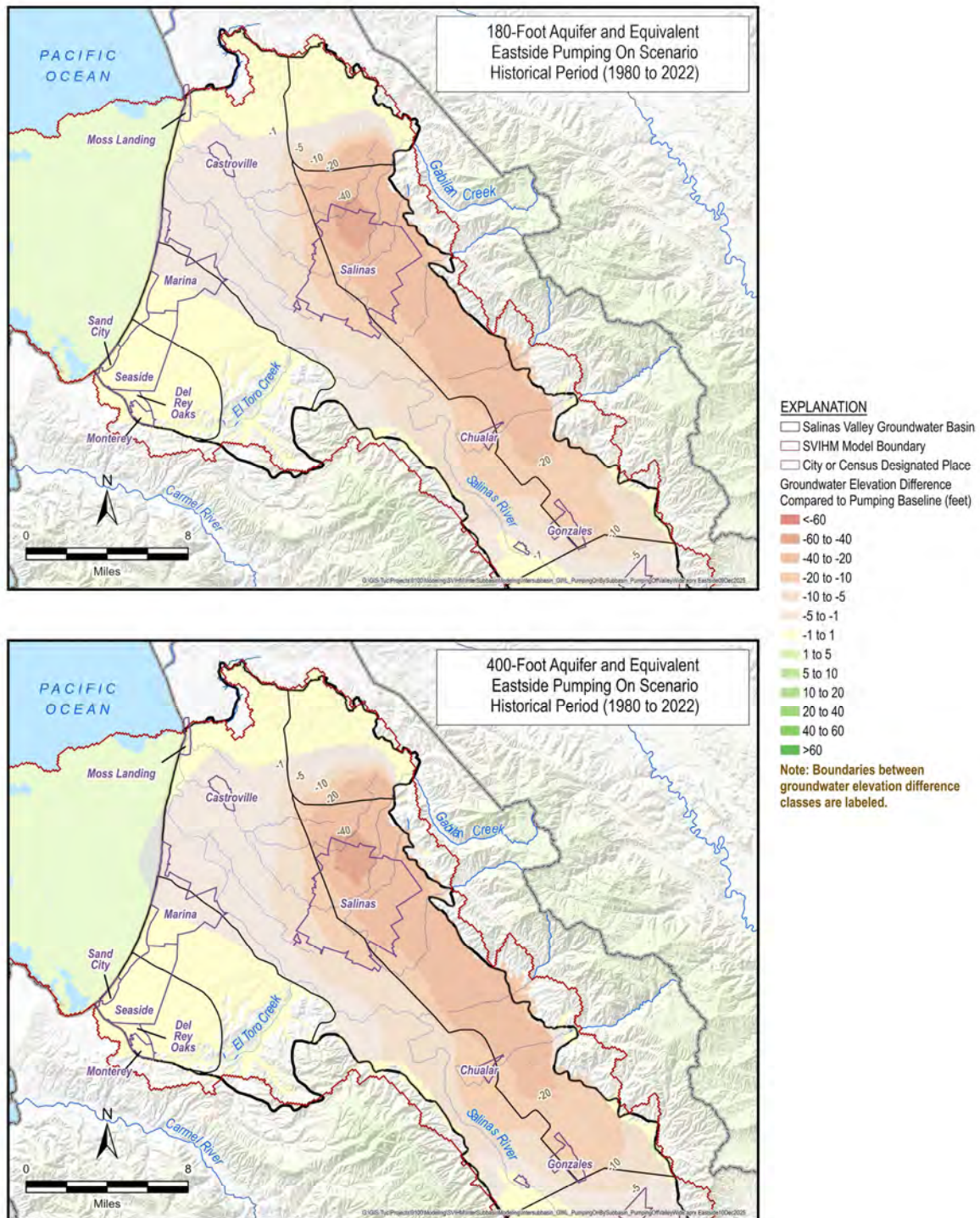


Figure 12. Eastside Pumping On Scenario Compared to No-pumping Baseline –
Average Groundwater Level Difference for 1980-2022
Focused on North Valley for the 180-Foot Aquifer, 400-Foot Aquifers, and Equivalents

Intersubbasin Subsurface Flows

Annual subsurface flows between each subbasin are averaged over the historical period (1980-2022). Results for the no-pumping baseline are presented in Table 10. Results for each model scenario and the difference between the scenarios and no-pumping baseline are presented in Table 11 through Table 14. Results for each model simulation are presented in a table for comparison between models. In addition, annual intersubbasin subsurface flows will be provided to the hydrologists as part of model outputs.

Table 10. Annual Intersubbasin Subsurface Flows for No-Pumping Baseline

No-Pumping Baseline	NET FLOW ¹						
	No-Pumping Baseline						
	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Seaside
From Upper Valley to	0	4,478	0	0	0	0	0
From Forebay to	-4,478	0	5,492	1,822	0	0	0
From 180/400 to	0	-5,492	0	-21,973	-762	2,982	0
From Eastside to	0	-1,822	21,973	0	-822	0	0
From Langley to	0	0	762	822	0	0	0
From Monterey to	0	0	-2,982	0	0	0	-208
From Pajaro Valley to	0	0	-1,321	0	-450	0	0
From Paso Robles to	826	0	0	0	0	0	0

¹ Positive value indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow.

Table 11. Annual Intersubbasin Subsurface Flows – Upper Valley Pumping On Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM NO-PUMPING BASELINE ²					
	UPPER VALLEY ON						UPPER VALLEY ON					
UPPER VALLEY ON	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	1,084	0	0	0	0	0	-3,394	0	0	0	0
From Forebay to	-1,084	0	5,440	1,815	0	0	3,394	0	-52	-7	0	0
From 180/400 to	0	-5,440	0	-22,100	-762	2,811	0	52	0	-126	0	-171
From Eastside to	0	-1,815	22,100	0	-827	0	0	7	126	0	-5	0
From Langley to	0	0	762	827	0	0	0	0	0	5	0	0
From Monterey to	0	0	-2,811	0	0	0	0	0	171	0	0	0
From Pajaro Valley to	0	0	-1,320	0	-450	0	0	0	1	0	0	0
From Paso Robles to	876	0	0	0	0	0	50	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Table 12. Annual Intersubbasin Subsurface Flows – Forebay Pumping On Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM NO-PUMPING BASELINE ²					
	FOREBAY ON						FOREBAY ON					
FOREBAY ON	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	9,256	0	0	0	0	0	4,778	0	0	0	0
From Forebay to	-9,256	0	3,884	57	0	0	-4,778	0	-1,607	-1,765	0	0
From 180/400 to	0	-3,884	0	-21,429	-762	2,801	0	1,607	0	545	0	-181
From Eastside to	0	-57	21,429	0	-827	0	0	1,765	-545	0	-6	0
From Langley to	0	0	762	827	0	0	0	0	0	6	0	0
From Monterey to	0	0	-2,801	0	0	0	0	0	181	0	0	0
From Pajaro Valley to	0	0	-1,319	0	-450	0	0	0	2	0	0	0
From Paso Robles to	832	0	0	0	0	0	6	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Table 13. Annual Intersubbasin Subsurface Flows – 180//400 Pumping On Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM NO-PUMPING BASELINE ²					
	180/400 ON						180/400 ON					
180/400 ON	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	4,484	0	0	0	0	0	6	0	0	0	0
From Forebay to	-4,484	0	6,841	2,547	0	0	-6	0	1,349	725	0	0
From 180/400 to	0	-6,841	0	-36,700	-931	125	0	-1,349	0	-14,727	-170	-2,857
From Eastside to	0	-2,547	36,700	0	-1,323	0	0	-725	14,727	0	-501	0
From Langley to	0	0	931	1,323	0	0	0	0	170	501	0	0
From Monterey to	0	0	-125	0	0	0	0	0	2,857	0	0	0
From Pajaro Valley to	0	0	-1,164	0	-448	0	0	0	156	0	2	0
From Paso Robles to	824	0	0	0	0	0	-2	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Table 14. Annual Intersubbasin Subsurface Flows – Eastside Pumping On Scenario

	NET FLOW ¹						NET FLOW DIFFERENCE FROM NO-PUMPING BASELINE ²					
	EASTSIDE ON						EASTSIDE ON					
EASTSIDE ON	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey	Upper Valley	Forebay	180/400	Eastside	Langley	Monterey
From Upper Valley to	0	4,482	0	0	0	0	0	4	0	0	0	0
From Forebay to	-4,482	0	6,632	4,266	0	0	-4	0	1,140	2,444	0	0
From 180/400 to	0	-6,632	0	16,941	-552	2,104	0	-1,140	0	38,914	209	-878
From Eastside to	0	-4,266	-16,941	0	-3,446	0	0	-2,444	-38,914	0	-2,624	0
From Langley to	0	0	552	3,446	0	0	0	0	-209	2,624	0	0
From Monterey to	0	0	-2,104	0	0	0	0	0	878	0	0	0
From Pajaro Valley to	0	0	-1,194	0	-446	0	0	0	126	0	3	0
From Paso Robles to	824	0	0	0	0	0	-2	0	0	0	0	0

¹ Positive value (red) indicates positive net flow from the subbasin in the rows to the subbasin in the columns; negative value indicates negative net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

² Positive value (red) indicates increase in net flow from the subbasin in the rows to the subbasin in the columns; negative value (blue) indicates decrease in net flow. Dark red indicates the greatest positive number in the specified simulation; dark blue indicates the greatest negative number.

Subsurface Outflow To and Inflow From Monterey Bay

Subsurface outflow to and inflow from Monterey Bay is averaged over the historical period in Table 15 for the no-pumping baseline and each pumping on scenario. In addition, the annual outflows and inflows are provided as part of model outputs.

Table 15. Net Subsurface Flows To/From Monterey Bay for WY 1980-2022 (AF/yr)

	Net Average Annual Flow		
Subbasin	180/400	Monterey	Seaside
No-Pumping Baseline	-4,450	-8,253	-3,077
Upper Valley Pumping On	-4,399	-8,194	-3,069
Forebay Pumping On	-4,397	-8,191	-3,069
180/400 Pumping On	-3	-6,722	-3,027
Eastside Pumping On	-3,515	-7,900	-3,066
	Difference Compared to No-Pumping Baseline		
	180/400	Monterey	Seaside
Upper Valley Pumping On	51	59	8
Forebay Pumping On	53	62	8
180/400 Pumping On	4,447	1,531	50
Eastside Pumping On	935	353	11

Note: Positive value indicates inflow into subbasin.

Simulated Salinas River Streamflow Changes

Changes in simulated Salinas River streamflows at the Soledad, Chualar, and Spreckels gages are included in Table 16, and results for each model run are presented for comparison between models. In addition, Figure 10, Figure 11, and Figure 12 show the Salinas River flow over time at the Soledad, Chualar, and Spreckels gages for each model simulation, respectively.

Table 16. Pumping On Scenarios - Average Annual Salinas River Flow at the Soledad, Chualar, and Spreckels Gages

	Average Annual Flow (AF/yr)			Change in Average Annual Flow from Baseline to Model Run (AF/yr)		
	Soledad Gage	Chualar Gage	Spreckels Gage	Soledad Gage	Chualar Gage	Spreckels Gage
No-Pumping Baseline	366,511	376,775	423,519			
Upper Valley On	324,569	336,658	378,498	-41,942	-40,117	-45,020
Forebay On	338,343	333,028	376,506	-28,169	-43,747	-47,013
180/400 On	362,037	366,819	397,481	-4,474	-9,956	-26,038
Eastside On	363,652	370,749	409,221	-2,860	-6,026	-14,298

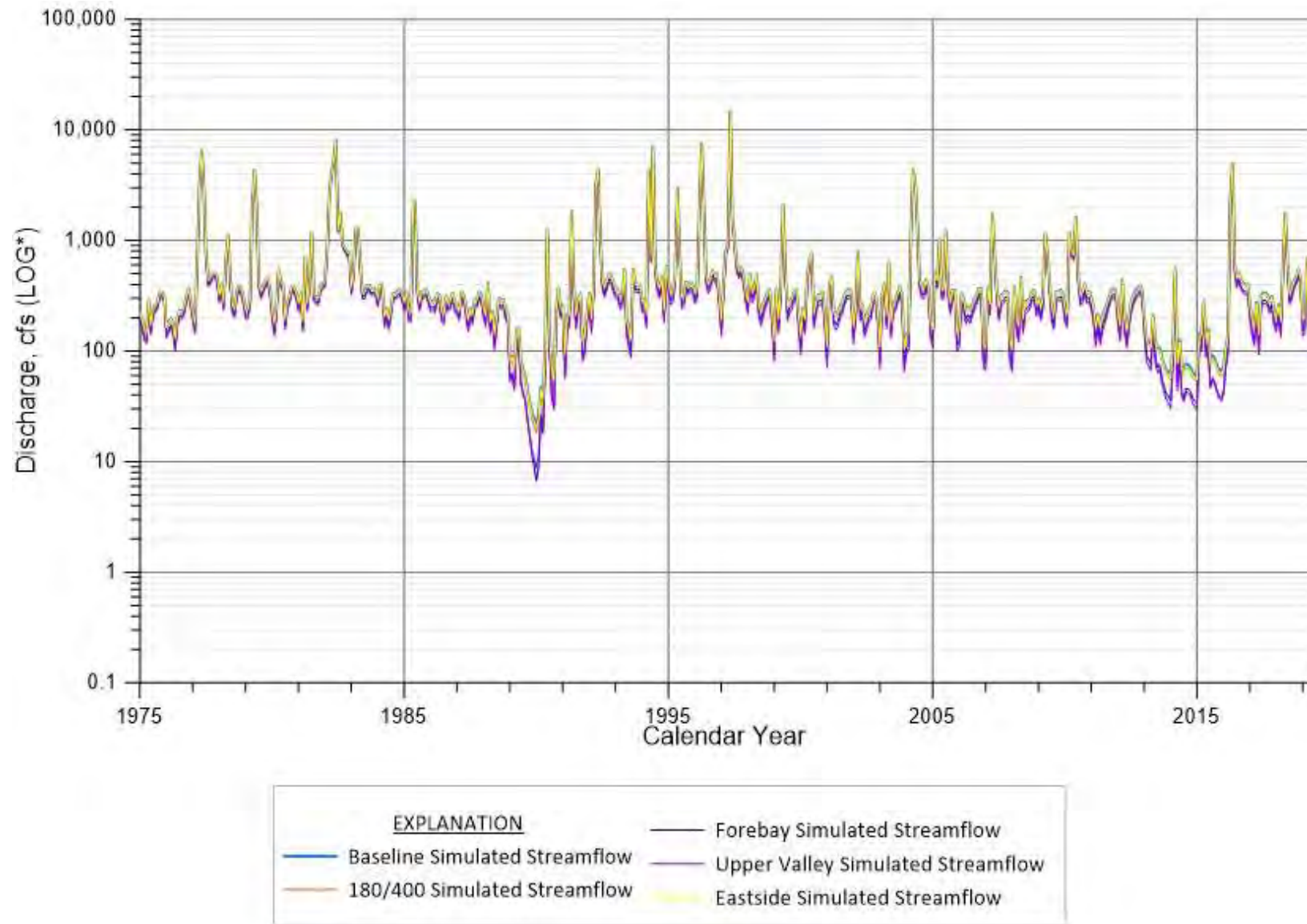


Figure 10. Pumping On Scenarios – Simulated Salinas River Streamflow at the Soledad Gage

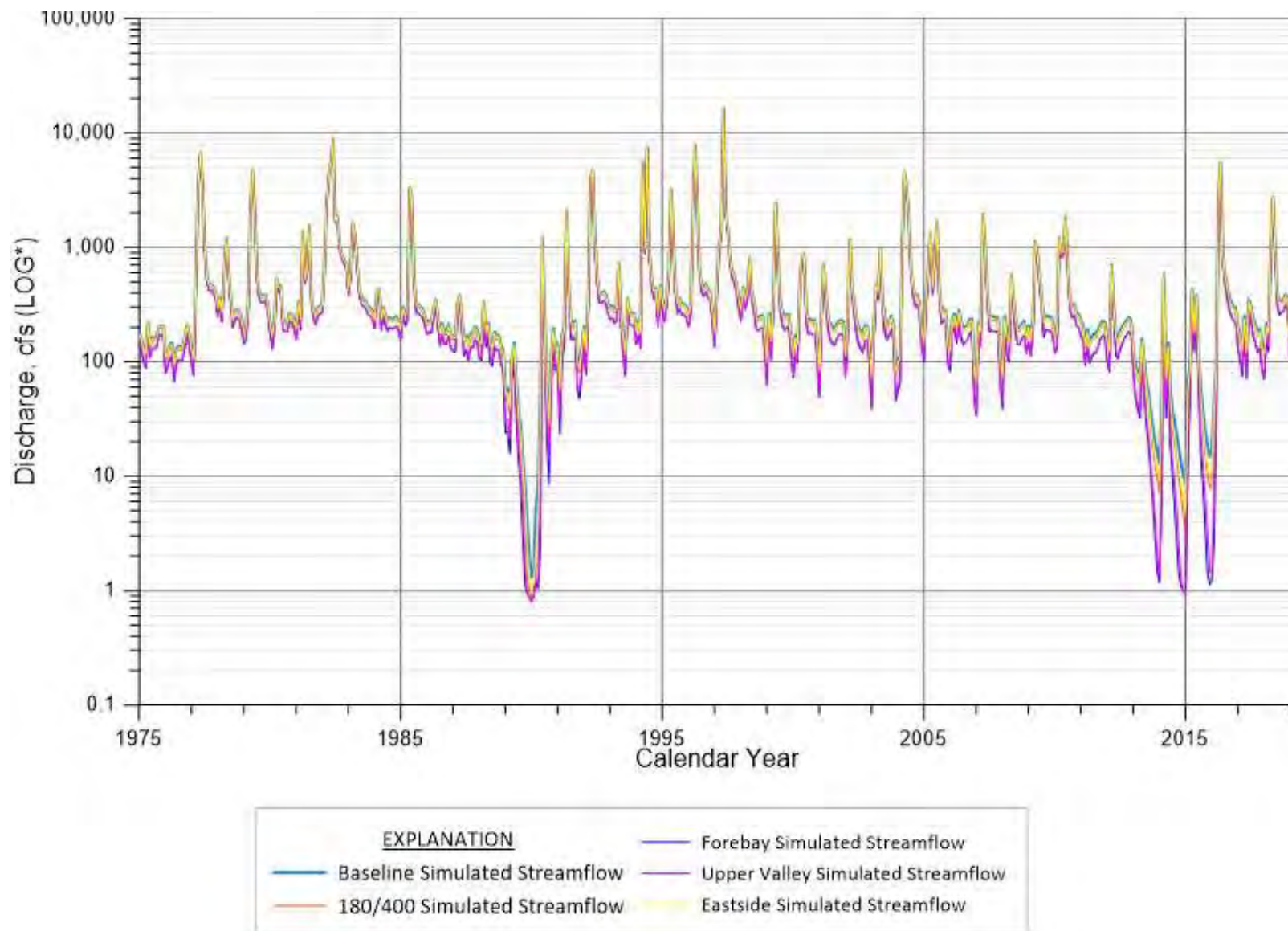


Figure 11. Pumping On Scenarios – Simulated Salinas River Streamflow at the Chualar Gage

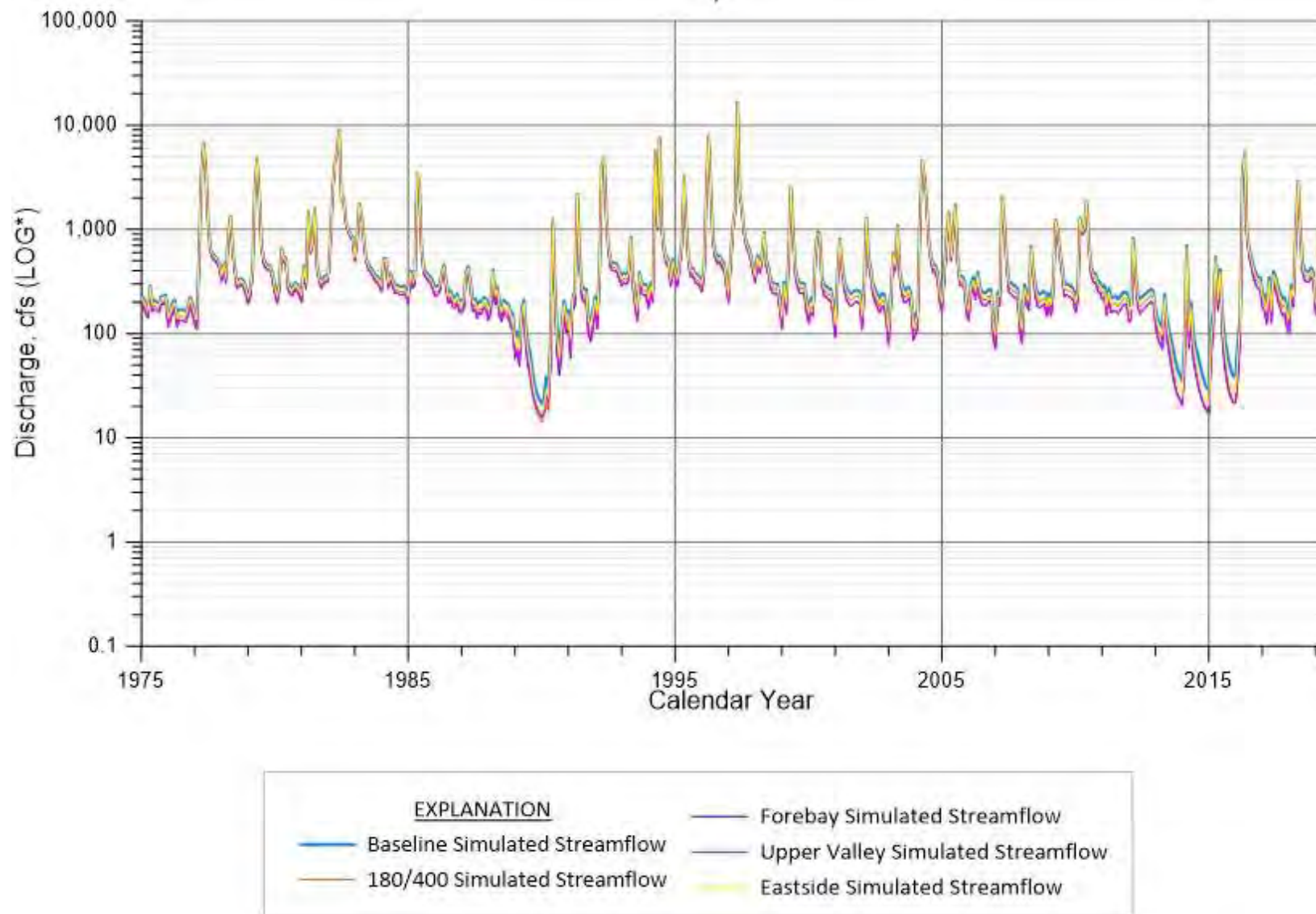


Figure 12. Pumping On Scenarios – Simulated Salinas River Streamflow at the Spreckels Gage

SUMMARY NOTES

As noted in the Approach TM, modifications to the SVIHM beyond those explicitly outlined in this project were outside the scope of work. Therefore, the resulting model outputs and interpretations presented herein should be considered with caution.

The Approach TM noted that the no pumping scenarios had the potential to flood large portions of the model area. The addition of drains to layer 1 by the USGS in the public release version of the SVIHM prevented flooding of layer 1. The water budgets indicate drain flows increased from minus 256,012 acre-feet per year (AF/yr) to minus 610,967 AF/yr between the pumping baseline and no-pumping baseline.

In general, turning off pumping in the pumping baseline scenarios resulted in an increase in water levels compared to the baseline. Turning on pumping in the no-pumping baseline scenarios generally resulted in a decrease in water levels compared to the baseline. In some localized areas the opposite trend was observed (i.e., water levels decreased in the subbasin when the pumping was turned off, and vice versa). Nuances of the Farm Process may be the cause of the counterintuitive simulated water level changes. In the SVIHM Farm Process, any active well assigned to the WBS can supply water to meet the aggregate crop demand of the entire WBS. Groundwater pumping in one part of a WBS may be used to meet crop demand in another part of the WBS. This can exacerbate spatial differences between groundwater pumping and deep percolation during the summer from irrigation. Additionally, it was observed that in the public release version of the SVIHM a small number of groundwater wells were assigned to supply water for a WBS in which it was not physically located.

As outlined in the Approach TM, reservoir releases were kept specified at historical rates. Therefore, the simulations do not reflect that when pumping is turned off, stream infiltration may decrease, resulting in less water needing to be released from the reservoirs to achieve the same diversion at the Salinas River Diversion Facility. In predictive modeling with the Salinas Valley Operational Model, the Surface Water Operations package accounts for this by changing reservoir releases according to the Nacimiento Dam Operation Policy.

M&A is currently undertaking an update and recalibration of the SVIHM. This effort includes revising the model layering to align with recent updates to the basin's hydrogeologic conceptual model, which will improve the accuracy of future simulations and analyses. The update also includes revising the distribution of groundwater pumping based on the revised layering and updated well locations. These updates may result in different simulated results than presented in this memorandum.

REFERENCES

Henson, W.R., R. Hanson, S. Boyce, J. Hevesi, and E.R. Jachens. 2025 [pre-print]. Salinas Valley Integrated Hydrologic and Reservoir Operations Models, Monterey and San Luis Obispo Counties, California; prepared by United States Geological Survey in cooperation with Monterey County Resources Agency, Monterey County and the Salinas Valley Basin Groundwater Sustainability Agency, preprint version released April 2, 2025.

EXHIBIT 5

December 19, 2025

**SUBJECT: RESPONSE TO COMMENTS ON COMPUTER MODELING
DRAFT TECHNICAL MEMORANDUM**

Dear Mr. Abrams and Mr. Smith,

Thank you for your thoughtful review and comments on the technical memorandum summarizing the results of the Computer Modeling Agreement prepared for the Salinas Valley Water Coalition (SVWC) and the Salinas Basin Water Alliance (SBWA). We have carefully considered your feedback and addressed those comments that fall within the scope and budget of this project.

Several of your suggestions included additions beyond the results outlined in the Phase 1 technical memorandum, which was developed according to the results you requested. Nonetheless, in the interest of ensuring the memorandum is as useful to you as possible, we have incorporated many of your recommendations. The table below summarizes if and/or how we address your recommendations. We also provided you the model outputs so you may produce additional figures/summaries as you see fit.

While the majority of the results are technical in nature—as was specified to be provided in the deliverable—we recognize the importance of providing a clear summary. In response to your request for summary tables and statements, we have added a Summary of Results at the beginning of the document, trying to meet requests from both of you without being overly cumbersome. This section highlights the key findings; however, it does not include interpretation of the significance of the results. As agreed upon at the outset of this project, Montgomery & Associates' role is to provide but not interpret the results of the modeling simulations and to revise the memorandum at our discretion, consistent with the scope of work. We hope this provides the information you need for your hypothesis testing.

We appreciate your engagement in this process and hope the revisions enhance the utility of the memorandum for your purposes.

Sincerely,
MONTGOMERY & ASSOCIATES



Abby Ostovar

<i>Section of Document</i>	<i>Summary of Comment</i>	<i>Response and Revisions Made</i>
Summary	Include summary highlighting results that a layperson can understand	Key results are added to the summary section, without interpretation of their meaning or significance. M&A's TM is a deliverable to the hydrology consultants, and therefore is written with an appropriate style and level of detail for that audience. M&A's role is to provide results, not interpretation. This and other additions to a summary are now in a Summary of Results section.
Summary – Subsurface Flows	Provide simplified tables and maps, as recommended	Summary table of subsurface flows added to Summary of Results section. M&A provided the results as scoped, and consultants can simplify or produce other figures as they see fit.
Summary – Salinas River Flow	Add summary statements about Salinas River flow differences, as well as summary tables and maps	Summary table of Salinas River flows added to Summary of Results section (results, not percentage calculations). M&A provided the results as scoped; consultants can simplify or produce other figures as they see fit.
Groundwater Level Changes	Add summary text and tables to describe the magnitude and geographic distribution of average responses by subbasin.	Summary statements on results added. It was not in scope to provide tables of the average responses by subbasin.
Introduction	Recommend adding background and context on why modeling was undertaken	Revision added to reference the SVWC and SBWA memorandum. M&A's TM is a deliverable to the hydrology consultants, and therefore is written with an appropriate style and level of detail for that audience. M&A's role is not to describe what SBWA and SVWC aim to achieve with the modeling, but rather to produce results.
Figures 2-5 and 9-12	To be able to better discern the magnitude of change, suggest adding labeled contour lines to the revised Valley-wide figures, splitting them into 3 parts, and updating them in the TM	This concern was why the maps were initially zoomed in to the relevant subbasin. Figures 2-5 and 9-12 are updated with labeled contour lines. Splitting them into 3 parts was too confusing in the memo given that different model layers/aquifers are relevant for different subbasins. Valley-wide figures of the water table, 180-Foot Aquifer, and 400-Foot Aquifer are available in Appendix 2.
Summary	Add bar charts adding surface water and groundwater differences between scenarios, including inflow/outflow from Monterey Bay	One condensed bar chart provided in summary. Note inflow across the coastal boundary is different from the advancement of seawater intrusion, as measured by the 500 mg/L chloride isocontour line. M&A provided the results as scoped.
Observed Pumping	Include a table comparing simulated pumping changes to WY 2024 observed pumping	This is outside of scope. The scope was to provide certain results to consultants and consultants can use or compare to other values as they see fit.