TECHNICAL MEMORANDUM

DATE: March 30, 2026 **PROJECT #:** 9100.76

TO: Salinas Valley Basin Groundwater Sustainability Agency

FROM: Victoria Hermosilla, P.G. and Staffan Schorr

REVIEWED BY: Abby Ostovar, Ph.D.

PROJECT: Round 2 Sustainable Groundwater Management Implementation Grant for the Salinas Valley

SUBJECT: Somavia Road Recharge Evaluation

INTRODUCTION AND PURPOSE

The Salinas River and underlying groundwater basin are dynamic and hydraulically connected. River flows contribute substantially to groundwater recharge, particularly in the Upper Valley and Forebay Subbasins where the Salinas Valley Aquitard (SVA) and other shallow clays are mostly non-existent under the river corridor. Farther downstream in the 180/400-Foot Aquifer (180/400) Subbasin, the presence of more shallow clays and the SVA impede recharge pathways. However, in areas near Somavia Road, the Salinas River is hypothesized to be in more direct connection with the principal aquifers through potential thin spots or gaps in the SVA.

The Somavia Road study area begins at the Chualar gage (USGS 11152300) and ends at Jenson's Bluff, and includes the area encompassing the Salinas River and 180-Foot Aquifer wells within 0.5 mile of the river. The study area is suspected to be 1 of the areas with more direct surface water-groundwater connection, and is shown on Figure 1. Salinas River flow losses have been recorded between the Chualar gage and the next downstream monitoring sites (T&A and Spreckels), as well as anecdotal observations from local stakeholders (MCWRA, 2024). However, these sites do not provide refined flow loss information within the specific area where SVA gaps are hypothesized.

The SVBGSA contracted Balance Hydrologics (Balance) to conduct a surface water study along the Salinas River corridor between the Chualar gage and Jenson's Bluff. The study analyzed the surface water-groundwater connection through this area to better understand the potential viability of proposed projects and management actions. The evaluation presented herein pairs Balance Hydrologics' data with nearby groundwater level data to determine if more direct local surface water-groundwater relationships may exist in the study area, which may result in increased recharge. If more direct recharge relationships are shown in the study area, proposed projects and management actions relating to induced recharge have the opportunity to be evaluated further.

The purpose of the data evaluation presented here is to investigate the extent of recharge—and if possible, recharge potential—from the Salinas River to the 180-Foot Aquifer in the Somavia Road area through the hypothesized gaps in the SVA. These hypothesized gaps are shown as underlying most of the Somavia Road study area, from just downstream of the Chualar gage to just past the Bend 1 station, and from the end of Somavia Road to just past Jenson's Bluff (Figure 1). If the surface water-groundwater relationship is more directly connected within the Study area, then recharge through gaps in the SVA is likely occurring. This relationship would imply that additional recharge from the river might be induced by increased local pumping in the 180-Foot Aquifer. This potential for induced recharge is the focus of an irrigation supply project listed in the 180/400 and Eastside Subbasin Groundwater Sustainability Plans (GSPs). This is based on a project proposed in Boyle, 1991, which would pump additional groundwater from the Somavia Road area for immediate irrigation use. The project is premised on increasing drawdown that could then induce additional recharge from the Salinas River through the hypothesized SVA gaps. An important factor for the viability of such a project is timing: when pumping and irrigation supply would occur, how long drawdown of the groundwater levels would last, and when additional recharge from the River would occur. This study provides a summary of potential relationships using existing monitoring data, with the goals of refining understanding of surface water-groundwater relationships in this area and helping to inform whether further project feasibility should be pursued.

Figure 1 shows the Somavia Road study area. In addition, it shows several spatial extents discussed below: the previously mapped extent of the Salinas Valley Aquitard and shallow clays, hypothesized gaps, and 2 bends in the river analyzed in the Balance study.

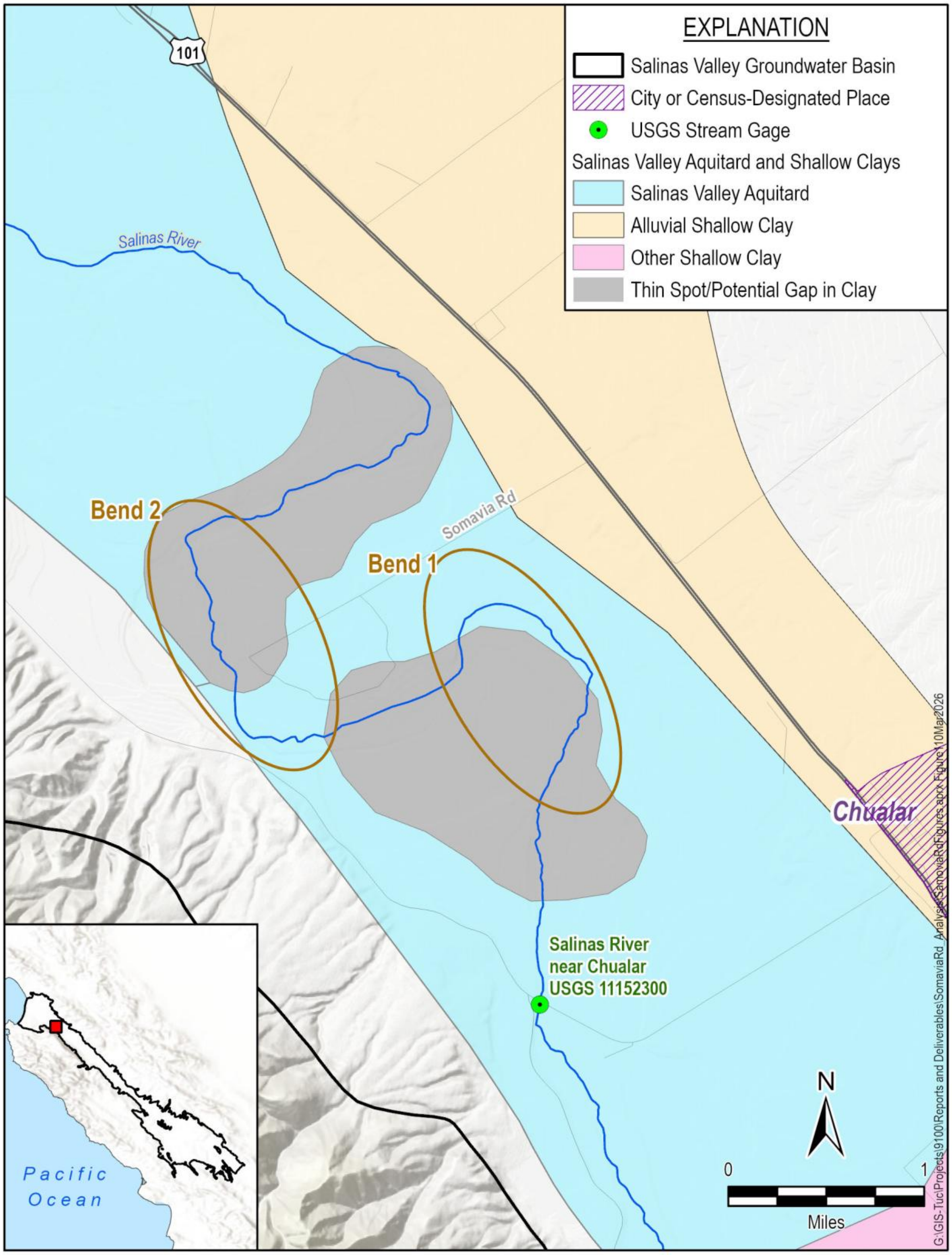

Figure 1. Somavia Road Study Area

BACKGROUND ON GROUNDWATER BASIN

In the study area, hydrostratigraphy plays an important role in how water infiltrates and moves through the subsurface. The hydrostratigraphy of the 180/400 Subbasin is described in greater detail in the 180/400 Subbasin GSP Amendment 1 and GSP 2025 Evaluation (SVBGSA, 2022a and 2025). The hydrostratigraphy of the 180/400 Subbasin is a layered aquifer/aquitard system built of sediments that were deposited from continental and marine sources over time. These sediments are a mix of sand, gravel, silt, and clay in varying amounts depending on the unit. Groundwater preferentially flows horizontally generally following the pattern of sediment deposition, but not all groundwater flows easily between different sediments or hydrostratigraphic units. Groundwater does not easily flow through clays; clay-rich layers may act as a barrier to flow. However, groundwater may flow more easily where coarse sediments are in contact with similarly coarse sediments, and there is a gradient for the water to follow.

From the surface and moving down, the hydrostratigraphy of the 180/400 Subbasin is:

1. Shallow Sediments (including river channel sediments): coarse sediments, typically 50 feet thick or less
2. Salinas Valley Aquitard: clay-rich sediments, typically within 100 feet of surface
3. 180-Foot Aquifer: coarse sediments, 50 to 150 feet thick
4. 180/400 Aquitard: clay-rich sediments, 50 to 150 feet thick
5. 400-Foot Aquifer: coarse sediments, 100 to 500 feet thick depending on location
6. 400/Deep Aquitard: clay-rich sediments, 100 to 400 feet thick depending on location
7. Deep Aquifers: intermittently coarse, several hundred feet thick
8. Basement: no-flow

Within the Somavia Road area there are some potential exceptions to the general 180/400 Subbasin hydrostratigraphy. Both well completion report lithology and airborne electromagnetic data from nearby transects suggest the Shallow Sediments may be contact with the 180-Foot Aquifer here by way of potential gaps in the SVA, and may allow for more downward movement of water from the surface.

The study area is primarily within the 180/400 Subbasin, but includes an area in the Forebay Subbasin as a point of comparison as well. The hydrostratigraphy of the Forebay Subbasin is described in greater detail in the Forebay Subbasin GSP (SVBGSA, 2022b). The hydrostratigraphy of the Forebay Subbasin is defined by the Basin Fill Aquifer, with sand, gravel, silt, and clay sediments present in varying amounts. The SVA is not present, but there are intermittent clays that may impact flows locally.

DATA AND METHODS

Surface water and groundwater level data from various sources were used for this investigation. The data selected are from 2024 and 2025, which is when the Somavia Road field study by Balance was conducted, when nearby wells were equipped with Well Bubbler monitoring systems, and when MCWRA conducted their last 2 synoptic flow surveys known as the Salinas River Discharge Measurement Series (River Series).

The data used in this evaluation are the following:

- Continuous USGS stream gage data (discharge, stage) from the Salinas River and Arroyo Seco (USGS, 2025)
- Continuous streamflow data from temporary gages installed along the river in the Somavia Road area by Balance (Balance, 2026)
- Monthly groundwater level measurements from nearby 180-Foot wells (data from wells monitored by MCWRA)
- Continuous groundwater level measurements from selected monitoring wells with Well Bubbler monitoring systems installed by the SVBGSA
- Continuous piezometer water level data to measure infiltration at both river bends (Balance, 2026)
- Reported Salinas River Series information from 2024 and 2025 (MCWRA, 2024 and 2025)
- Monthly total pumping by Subbasin for 2024 and 2025. Groundwater extractions are compiled using MCWRA's Groundwater Extraction Management System (GEMS) within Zones 2, 2A, and 2B

For comparison purposes, groundwater levels and surface water stage (water height) data were converted to water elevations using land surface elevations.

The methods used in this evaluation are the following:

1. End-Member Evaluation: In order to better understand the surface water-groundwater relationship in the study area where the SVA may have some gaps, it is important to identify and evaluate surface water-groundwater relationships in areas with and without shallow clay—called end-members—for comparison. These are:

    a. End-Member 1, No Clay Layer Present. This is best encapsulated by the area in the Forebay Subbasin that has the Soledad (USGS 11151700) and Arroyo Seco (USGS 11152050) stream gages. There is no observed shallow clay layer present at this location. This site represents a point where surface water flows are established as being in hydraulic connection with the principal aquifer.

b. End-Member 2, Clay Layer Present. This is best encapsulated by the area in the 180/400 Subbasin that has the Spreckels (USGS 11152500) stream gage, where the SVA is present. This site represents a point where the surface water flows are established as being not in hydraulic connection with the principal aquifer.

These stream gages were paired with nearby 180-Foot Aquifer wells with monthly water level data to characterize their surface water-groundwater relationships. This was accomplished by comparing the water elevations in the river and in the wells.

2. Study Area Evaluation: This investigation involved reviewing and evaluating all available groundwater and surface water data in the study area to characterize surface water-groundwater relationships. Then compare these evaluations to the end members' evaluations for building context. This evaluation involved comparing stream gage data with groundwater level data collected at nearby wells and piezometers.

3. Flow Loss Evaluation: This investigation incorporated the findings from other surveys and studies to validate the results of the other evaluations. The data from the Balance study was used for a more refined view within the study area, and complemented several groundwater wells' data to better understand surface water-groundwater relationships by segment. The data from the MCWRA 2024 and 2025 River Series reports involved comparing their reach evaluations to the study area for broader context.

RESULTS & DISCUSSION

Below are the results of the 3 evaluations along with a brief discussion of the interpretations and meanings for this area. Present in all discussions is the impact of seasonal pumping in the Salinas Valley Basin. The irrigation season ramps up in April, and tapers down in October as shown on Figure 2.

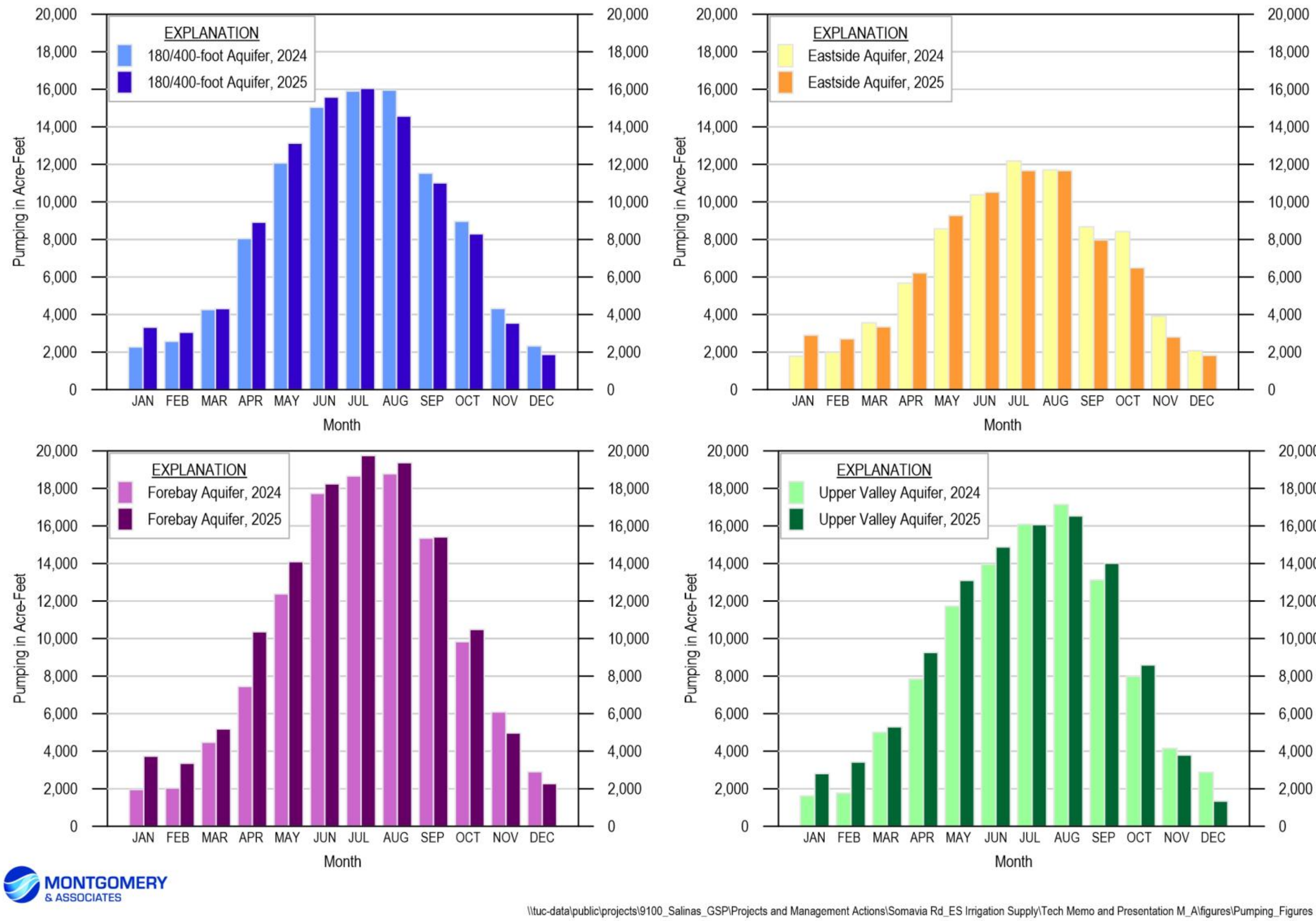

Figure 2. Subbasin Total Pumping by Month for 2024 and 2025

End-Member Evaluation

This evaluation was conducted to identify any surface water-groundwater relationships in areas along the Salinas River where shallow clay is absent and where it is present. The relationships provide baseline conditions with which to compare data collected at the Somavia Road study area.

End-Member 1: No Clay Layer Present, Soledad and Arroyo Seco Gages

The Soledad and Arroyo Seco stream gages are in the Forebay Subbasin and within a mile of each other and their confluence. The Forebay Subbasin is a primary recharge area for the North Valley because there are no observed shallow clays that act as barriers to the downward migration of surface water to the aquifer. The gages and nearby monitoring wells at this end-member location are important for understanding this more direct recharge relationship. The ground elevation of this gage is 155 feet above mean sea level (amsl). The Arroyo Seco gage used here is the most downstream gage on this stream, and generally measures remnant flows after recharging the aquifer space in the Arroyo Seco Cone. The ground elevation of this gage is 165.5 feet amsl.

The locations of these gages and their proximity to observed subsurface clays are shown on Figure 3, with the subsurface clays identified in pink and yellow. The yellow denotes clays derived from alluvial fan processes, while the pink denotes clays derived from other continental deposition processes. Although the shallow clays are differentiated by source, they behave as a unit to preclude direct recharge from the surface.

The wells selected for this end-member evaluation are a pair of nested wells: 17S/06E-33R01, drilled to 300 feet and screened from 200 to 250 feet; and 17S/06E-33R02, drilled to 150 feet and screened from 50 to 115 feet. Although historical drilling convention indicated these 2 wells as 400-Foot and 180-Foot Aquifer wells respectively, they both are completed in what is now considered the Basin Fill Aquifer due to the lack of laterally continuous clays that confine productive zones in the subsurface elsewhere. As such, both wells are considered to be in the same aquifer, which is in direct connection with the Salinas River in this area. These wells have monthly recorded water levels that are compared to the River water levels for this evaluation. Additionally, the ground surface elevation of both of these wells is 195 feet amsl, which is 40 feet higher than the Soledad gage and 30 feet higher than the Arroyo Seco gage. This is important to keep in mind when comparing elevations across the different data, and to also consider the horizontal distances between data locations.

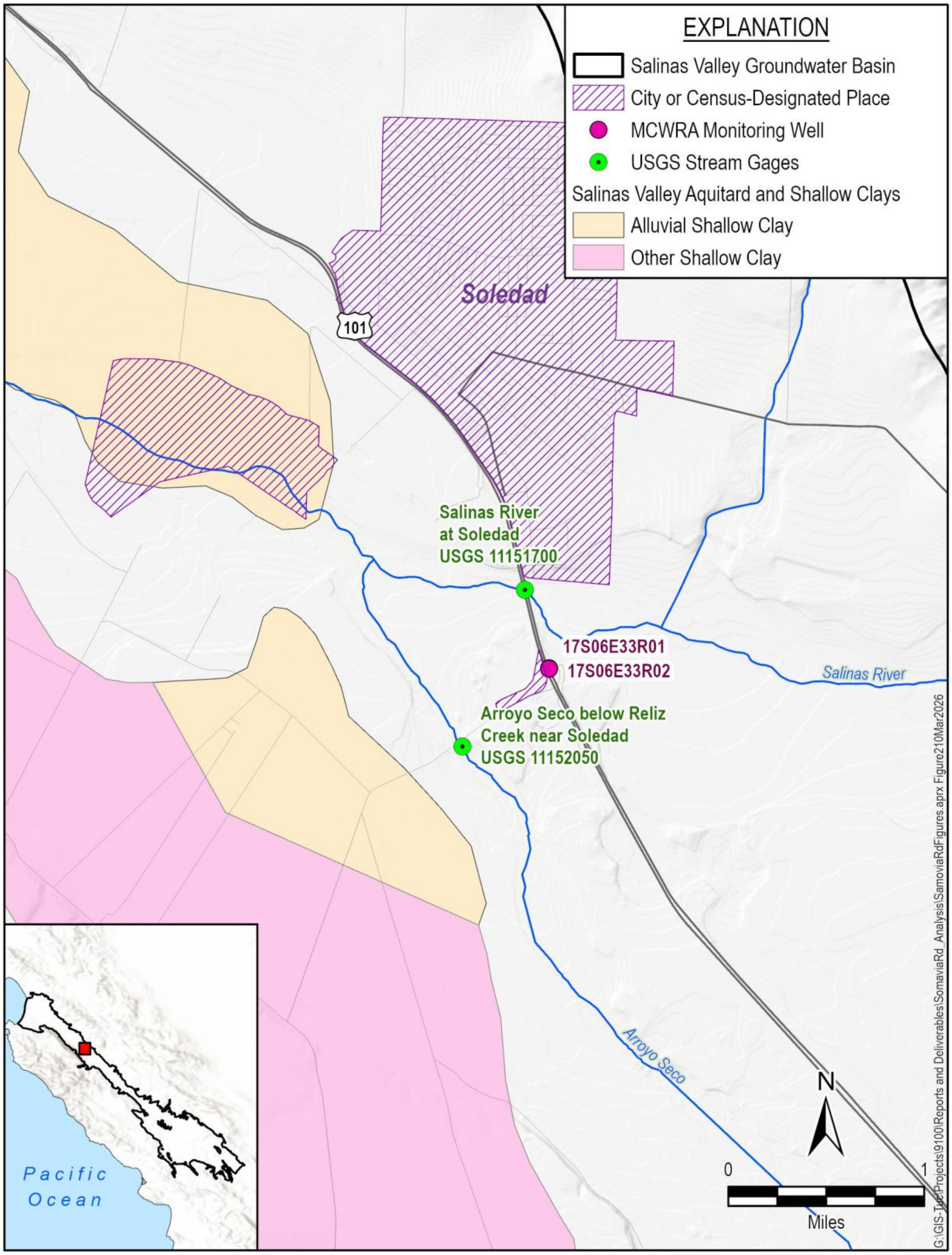

Figure 3. Location of End-Member 1 Evaluation

The Nacimiento and San Antonio watersheds are dammed near their confluences with the Salinas River. MCWRA operates the reservoirs for combined goals of water conservation, flood protection, groundwater recharge, environmental habitat, operation of the Salinas River Diversion Facility (SRDF), and dam safety and recreation. During the April through October conservation season, Salinas River flow is predominantly maintained by the modulated release of accumulated winter and spring inflow that is stored in Nacimiento and San Antonio Reservoirs (MCWRA, 2025). This management shift in April is shown on the Soledad gage (red) hydrograph on Figure 4, which illustrates both a sustained flow or increase in flows over the irrigation season and weekly peaks and troughs that likely correspond with pumping cycles. Pumping cycles are the regular intervals of pumping and no pumping related to irrigation schedules. Also shown are the nearby wells' monthly water level measurements, which show how groundwater levels drop in response to the start of seasonal pumping and rise when seasonal pumping stops. The monthly groundwater level measurements do not capture short term fluctuations resulting from weekly pumping cycles.

Streamflow data collected at both gages identify 2 storms in mid-February 2025 with the largest being February 14, and another storm at the end of March 2025. This is reflected in the hydrograph peaks within those same timeframes, shown on Figure 4. Both wells show a rise in water levels near the beginning of March, and a decline in water levels beginning in April. The February water level measurements in both wells are on the rising limb of the hydrograph shown on Figure 4, suggesting recharge is already occurring. The initial rise might be from a combination of the lack of winter pumping and other precipitation events that lead to runoff. The next storm on February 14 contributed to the rising trend, and a groundwater hydrograph peak related to this storm was likely in mid-March.

Water levels in the shallow well (-33R02) rose from January to March, then declined from March to August, or through the irrigation season. Water levels in the deep well (-33R01) rose from January to March, then declined from March to June. The sudden rise in water level in August in the deep well appears to be anomalous and is not considered reliable for this investigation. More likely, the water level declined through the season as shown by the lower September data point.

Water elevations in the Salinas River and the nearby shallow well are very close, ranging from about 163 feet to about 166 feet, as shown on Figure 4. The vertical gradient is small, indicating hydraulic connection due to the absence of a separating mechanism like a clay layer. The groundwater level in the deeper well (blue line), shows a stronger response to recharge mechanisms, and a groundwater level that is higher than that of the River water level for 4 months of the year. This suggests that, during this period, the Salinas River functions as a gaining stream in this area, as indicated by the gradient direction toward the river. Further, the deeper well has a higher water level than the shallower well, indicating an upward groundwater gradient. This difference in water levels could be due to influence from groundwater in the

Arroyo Seco Cone, which is also recharging during the same season. However, the water level difference is under 3 feet, which is fairly minimal, reduced throughout irrigation season, and not significant.

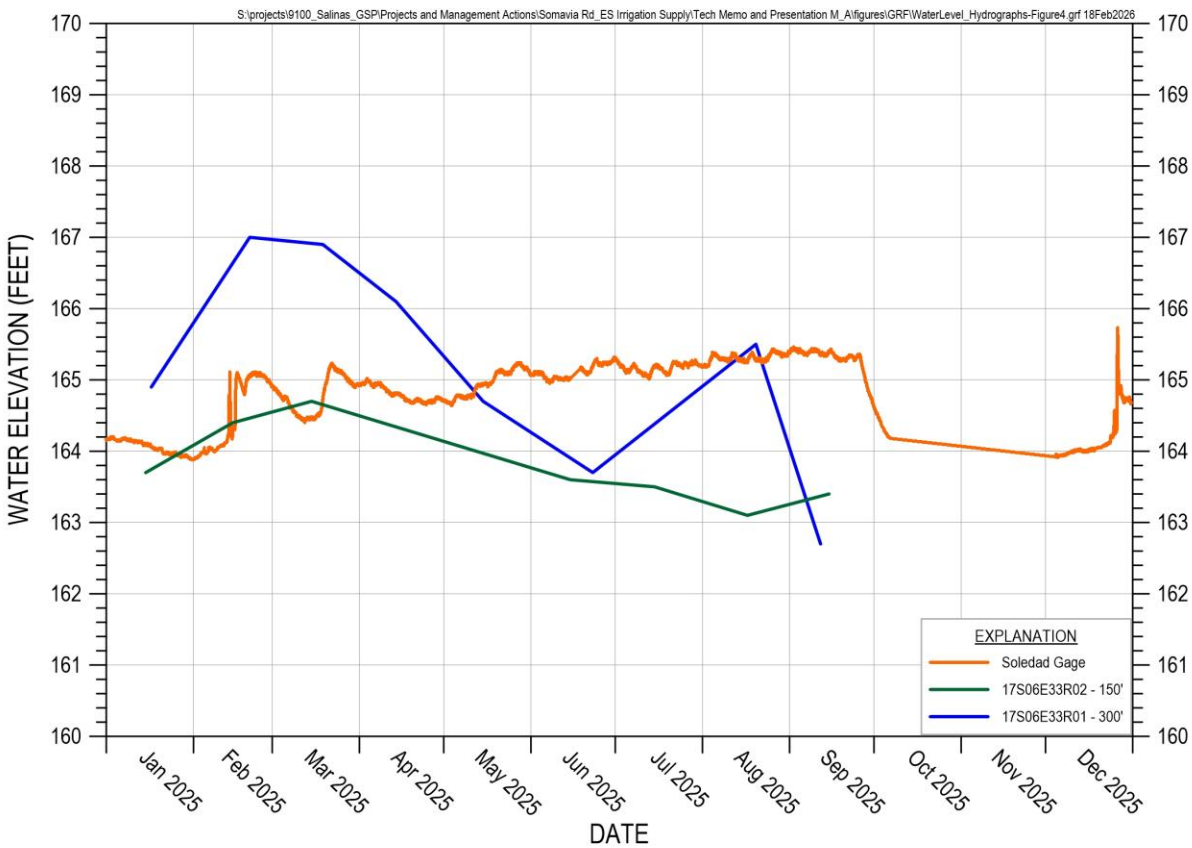

Figure 4. Groundwater and Surface Water Elevations at Soledad Stream Gage and Nearby Monitoring Wells

End-Member 2: Clay Layer Present, Spreckels Gage

The Spreckels gage is in the 180/400 Subbasin, which is primarily defined by the presence of the SVA. The SVA acts as a barrier to the downward migration of surface water to the aquifer, preventing direct recharge. Recharge occurs as water that infiltrates outside of the SVA makes its way into the confined aquifers of the 180/400 Subbasin. The gage at this end-member location is important for understanding this indirect recharge relationship.

The location of this gage and its proximity to observed subsurface clays is shown on Figure 5. The SVA is shown in blue on this figure. The Spreckels gage on the Salinas River is the last surface flow gage before the SRDF where river water is diverted to support the Castroville Seawater Intrusion Project (CSIP). The ground elevation of this gage is 22 feet amsl.

The well selected for this end-member evaluation is 15S/03E-17M01, drilled to 271 feet and screened from 128 to 180 feet. This well is completed in the 180-Foot Aquifer, which is the shallowest defined principal aquifer and confined by the SVA. This well has monthly recorded water levels that are compared to the River water levels for this evaluation. The ground surface of this well is 49 feet amsl—27 feet higher than the Spreckels gage—which is important when comparing elevations across the different data considering the horizontal distance between data locations.

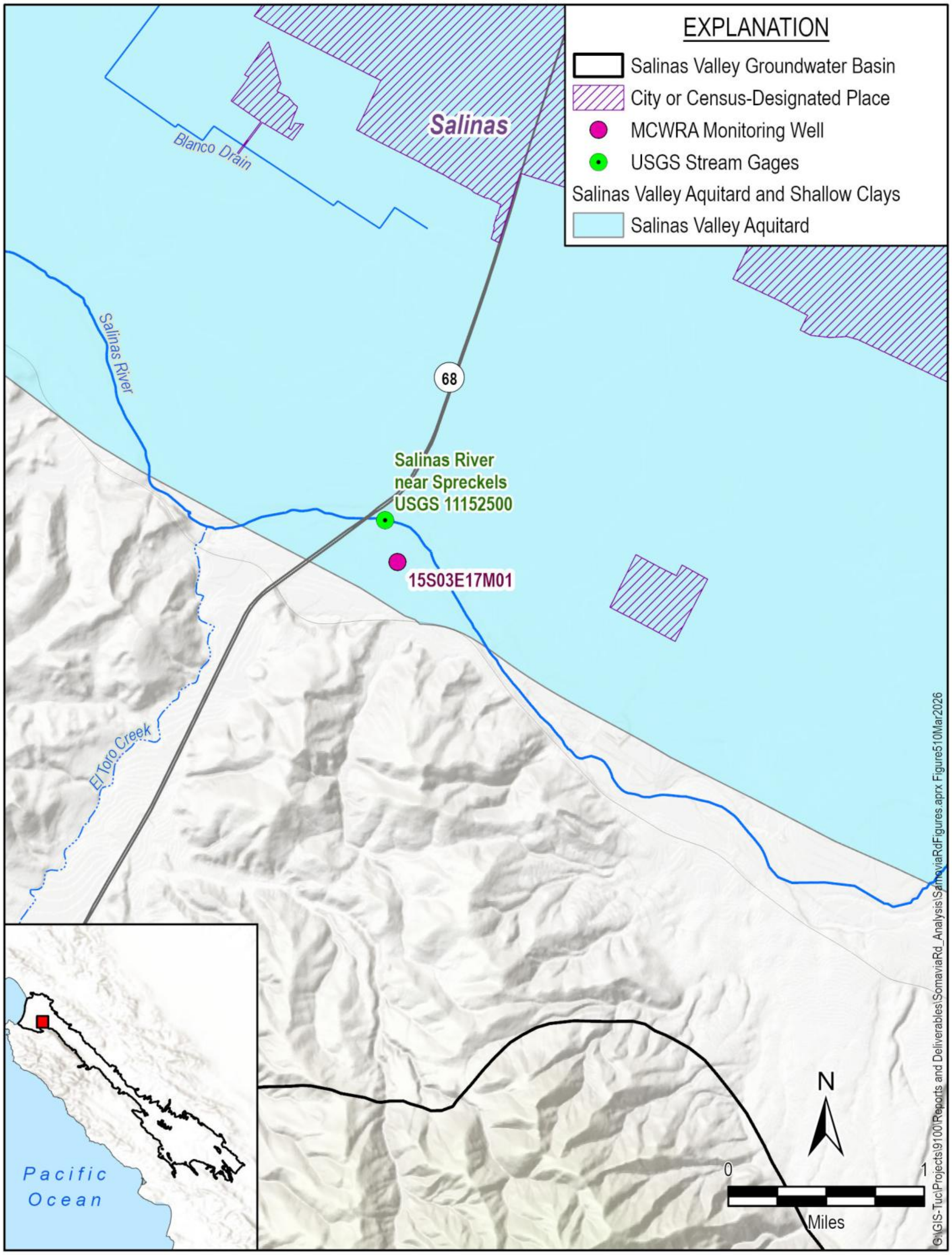

Figure 5. Location of End-Member 2 Evaluation

As mentioned above, MCWRA has several management goals and obligations which guide reservoir releases. The managed Salinas River flow is reflected in the Spreckels hydrograph (red) on Figure 6. The Spreckels measurements began in February 2025 when flows began at this location. Similar to the Soledad gage, data show 2 winter storms in February, and an early spring storm at the end of March as shown in the hydrographs peaks on Figure 6. With the change in Salinas River management regime, the hydrograph drops and maintains a relatively stable level throughout the irrigation season. Small peaks and troughs in river elevations could be remnants of the pumping cycles affecting river flows upgradient in the southern portions of the 180/400 and Forebay Subbasins, and being carried down the River.

The well shows a rise in water levels January to March, and a decline until August corresponding to the irrigation season (Figure 6). The groundwater level rises again between August and September, due to a decrease in irrigation pumping at the end of the season. Although this evaluation focuses on the year 2025, similar general trends in stream flows and groundwater levels appear in previous years.

The water elevations in the Salinas River and the nearby shallow well are approximately 16 feet apart at the start of the irrigation pumping season, and increase to almost 37 feet apart at the peak of irrigation pumping in August. The vertical gradient is downward, from the River to the principal aquifer. However, there is no direct hydraulic connection between the River and the principal aquifer for recharge at this point due to the SVA. The rise in water levels in the well after August appear to have no correlation with the water level in the River, which is held steady until the beginning of October. There is no direct recharge to the groundwater from the Salinas River here; recharge to the 180-Foot Aquifer likely occurs outside of the extents of the SVA.

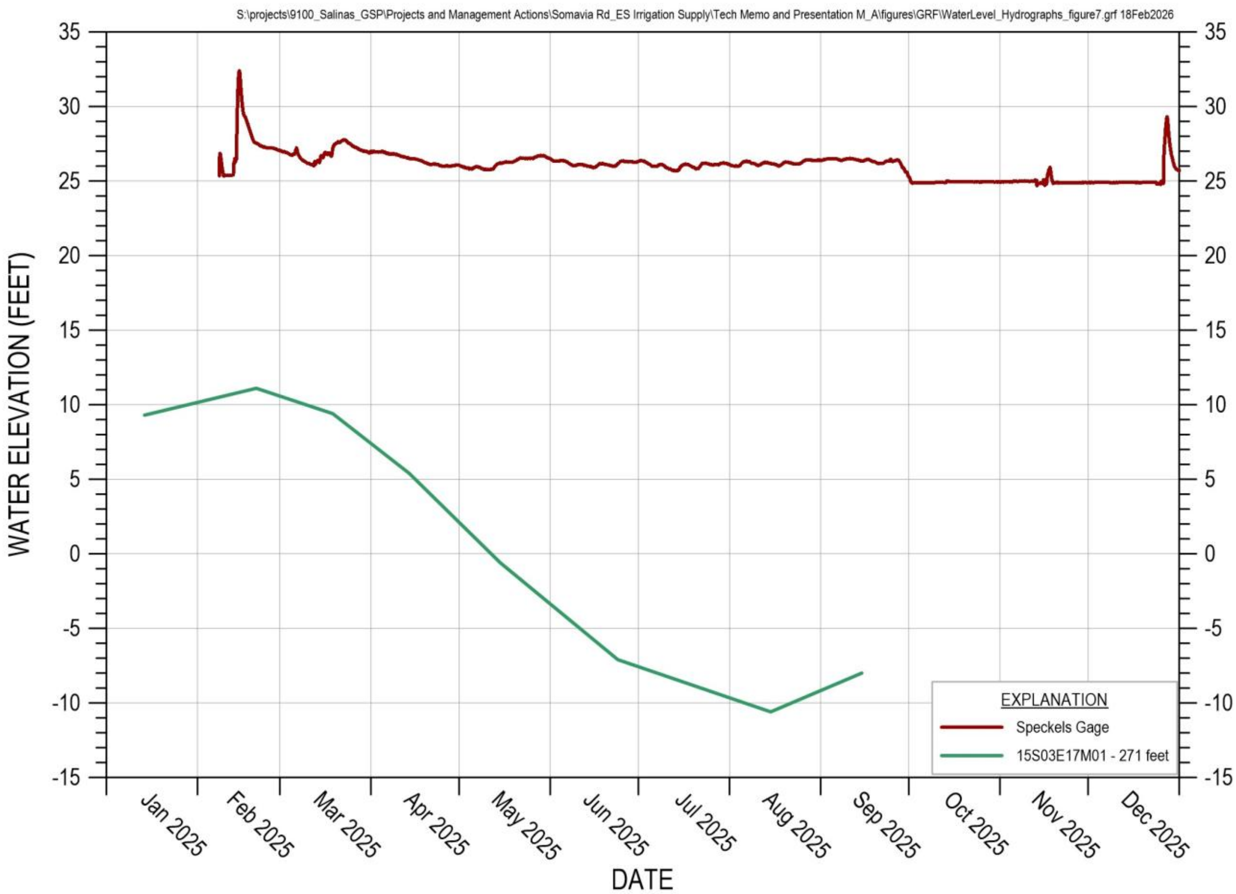

Figure 6. Groundwater and Surface Water Elevations near Spreckels Stream Gage

Study Area Evaluation

The Somavia Road study area, which is in the 180/400 Subbasin, begins at the Chualar gage, ends at Jenson's Bluff, and includes the area encompassing the Salinas River and shallow wells within 0.5 mile of the river. The study area was selected in part due to data indicating potential gaps in the SVA, which may allow for more direct recharge paths to the principal aquifers. The study area, SVA, and hypothesized gaps are shown on Figure 7. The SVA is blue, shallow clays deposited by alluvial fans are yellow, other shallow clays are pink, and the hypothesized gaps are gray. Although the clay units are differentiated on Figure 7, they act together to form a barrier to the downward migration of water into the aquifers.

This recharge evaluation builds on the 2024-2025 infiltration study done by Balance by adding more context to riverbed seepage within the study area. Balance surveyed the study area to assess riverbed sediments and other characteristics that impact infiltration, installed temporary river flow gages and hand-driven piezometers, and conducted ring infiltrometer testing to collect data from late 2024 through September 2025. The data, analyses, and conclusions of the study are described in more detail by Balance (2026) and included here when pertinent. The data from the

Balance study highlights how water infiltrates the riverbed and recharges the Shallow Sediments, and the data evaluated here highlight how water may or may not recharge the principal aquifers.

The data used in this evaluation include:

- Streamflow gages: The streamflow gages used are the permanent USGS Chualar stream gage (11152300), and the 2 temporary stream gages named Bend 1 and Bend 2, installed by Balance Hydrologic. All stream gages recorded continuous stream flows for the duration of the infiltration study. Stream flows are expressed as surface water elevations for more equivalent comparison to other elevation data.
- Shallow piezometers: The piezometers used are the temporary piezometers installed by Balance Hydrologic at depths of approximately 10 feet at each of the respective bends, and were installed with water level data collection instrumentation. These piezometers also collected continuous data for the duration of the infiltration study, with the exception of the 10 foot piezometer at Bend 2 for a few months due to instrument malfunction. The deeper piezometers were used in this recharge evaluation to calculate vertical gradients and evaluate potential direct recharge relationships. However, the data from the deeper piezometers are still considered with caution as the 10-foot depth is still within the Shallow Sediments.
- Bubblers: Three wells were selected to have Well Bubblers (Bubblers) water level data collectors installed for a period of time that overlapped with the infiltration study. These wells are shown on Figure 7. They are from upstream to downstream: #1 (with an unknown screen interval), #2(drilled to 460 feet but with no screen information), #3 (with screen at 232 to 340 feet below land surface), and GDE-1 (with a screen from 15 to 35 feet below land surface). The GDE-1 well data was not used in this evaluation as the well was dry. The Well Bubblers collected continuous data at 15-minute intervals.
- MCWRA water level monitoring wells: Monitoring wells within the study area that are identified as being in the 180-Foot Aquifer and having recorded monthly water levels were selected for this evaluation. There are only 3 of these wells, and 2 are nested near the Chualar gage: 16S/04E-08H03 with screened interval 240 to 290 feet and 16S/04E-08H04 with no screen information but installed to 140 feet. The other well, near Bend 2, is 15S/03E-25Q01 with no screen or depth information, but listed as a 180-Foot Aquifer well.

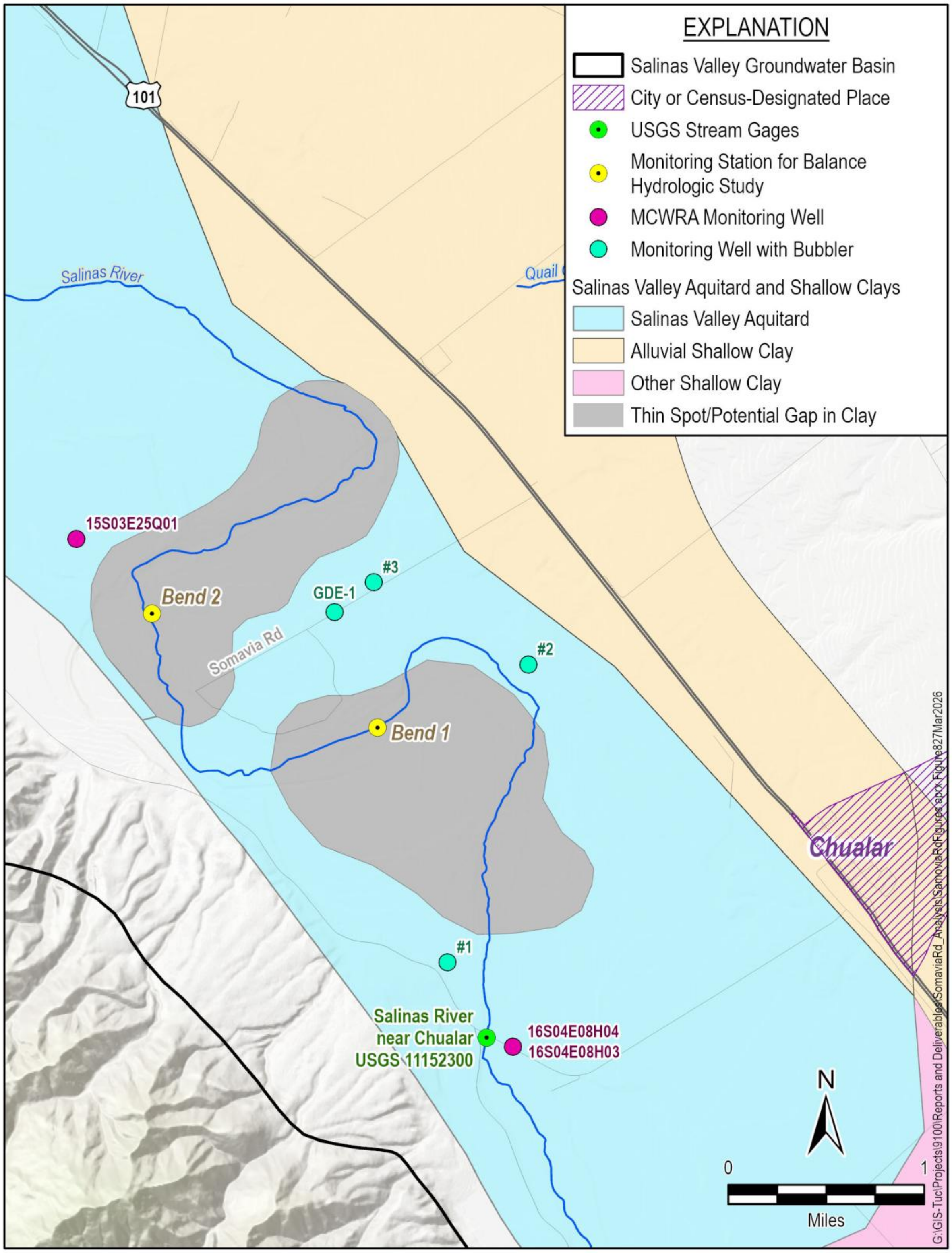

Figure 7. Locations of Selected Monitoring Locations in Somavia Road Study Area

The study area was divided into 3 segments to compare surface water and groundwater elevations to evaluate potential direct recharge relationships. Each segment is represented by monitoring stations for stream flows/elevations and groundwater elevations. Measured river water elevations for these segments are shown together on Figure 8. Water elevations at the Chualar gage and at Balance's temporary flow gages show winter storms in February 2025, and an early spring storm at the end of March. Weekly peaks and troughs in the surface water elevation are likely the result of regional pumping cycles during irrigation season. The Chualar gage shows relatively steady stream flows from the beginning of April to the middle of October due to seasonal reservoir releases. After this time, the Salinas River management regime changes when the conservation releases end, and stream flows drop effectively to zero as seen by the sudden decline in water elevation in the Chualar gage measurements on Figure 8. Data from the temporary river gages were not available after mid-September so the response to change in river management is not captured.

For the recharge evaluation, the segments and their respective groundwater data comparisons are as follows:

- Chualar gage: This segment is from the Chualar gage to Bend 1. Chualar gage data are compared to monthly water levels collected at wells 16S/04E-08H03 and 16S/04E-08H04, and bubbler well #1.
- Bend 1: This segment is from Bend 1 to Bend 2. Bend 1 stream data are compared to measured water levels at the Deep Piezometer at Bend 1, and bubbler wells #2 and #3.
- Bend 2: This segment is from Bend 2 to Jenson's Bluff. Bend 2 stream data are compared to measured water levels at the Deep Piezometer at Bend 2, and the monthly water level well 15S/03E-25Q01. No wells with Well Bubblers are present near this segment.

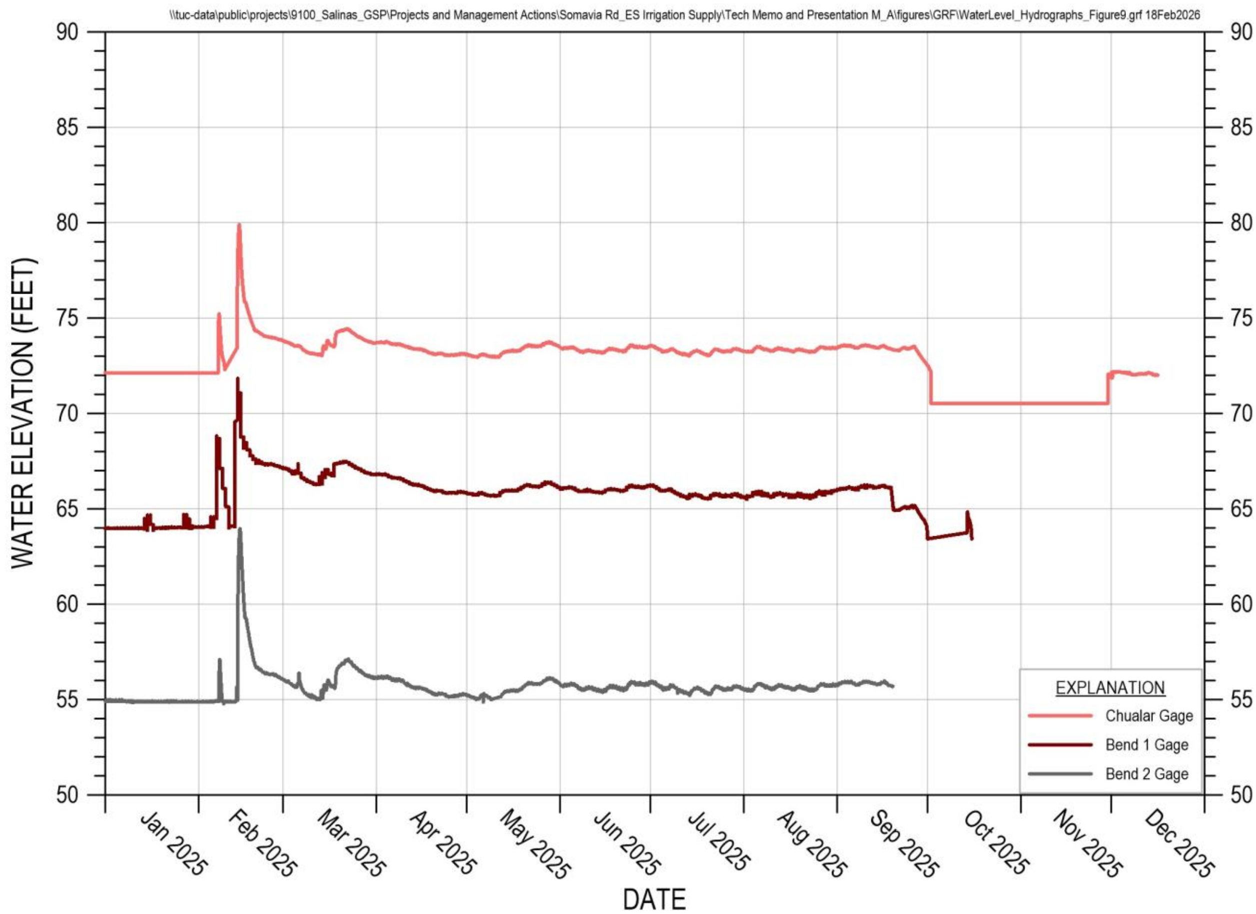

Figure 8. Measured Surface Water Elevations at Flow Gages in the Study Area

Chualar Gage Segment

There are 2 MCWRA monthly water level monitoring wells installed in the principal aquifer within 0.5 mile of the Chualar gage (Figure 7): 16S/04E-08H04 with a screen interval of 85-135 feet, and 16S/04E-08H03 with a screen interval of 240-290 feet. Also within 0.5 mile of this gage is the bubbler well #1 (16S/04E-08B01), which has no screen information available. Monitoring stations for this segment are shown on Figure 7.

The nested wells show a rise of about 5 feet in groundwater levels from January to March, then a decline of about 9 feet from March to August, as shown on Figure 9. The deeper well has a September recorded water level that shows a 1-foot rise from August to September. An upward vertical hydraulic gradient occurs at the nested wells. Bubbler well #1 shows a groundwater level rise of about 6 feet from February to March, likely due to recharge from the storm flows, then a decline of 10 feet from March to August, which correlates to the irrigation pumping season. The groundwater level rises from August to December by about 5 feet, likely due to the decrease in groundwater pumping after the irrigation season. The groundwater elevations of all 3 wells follow similar trends within around 8 feet of one another, with minor variations throughout the year.

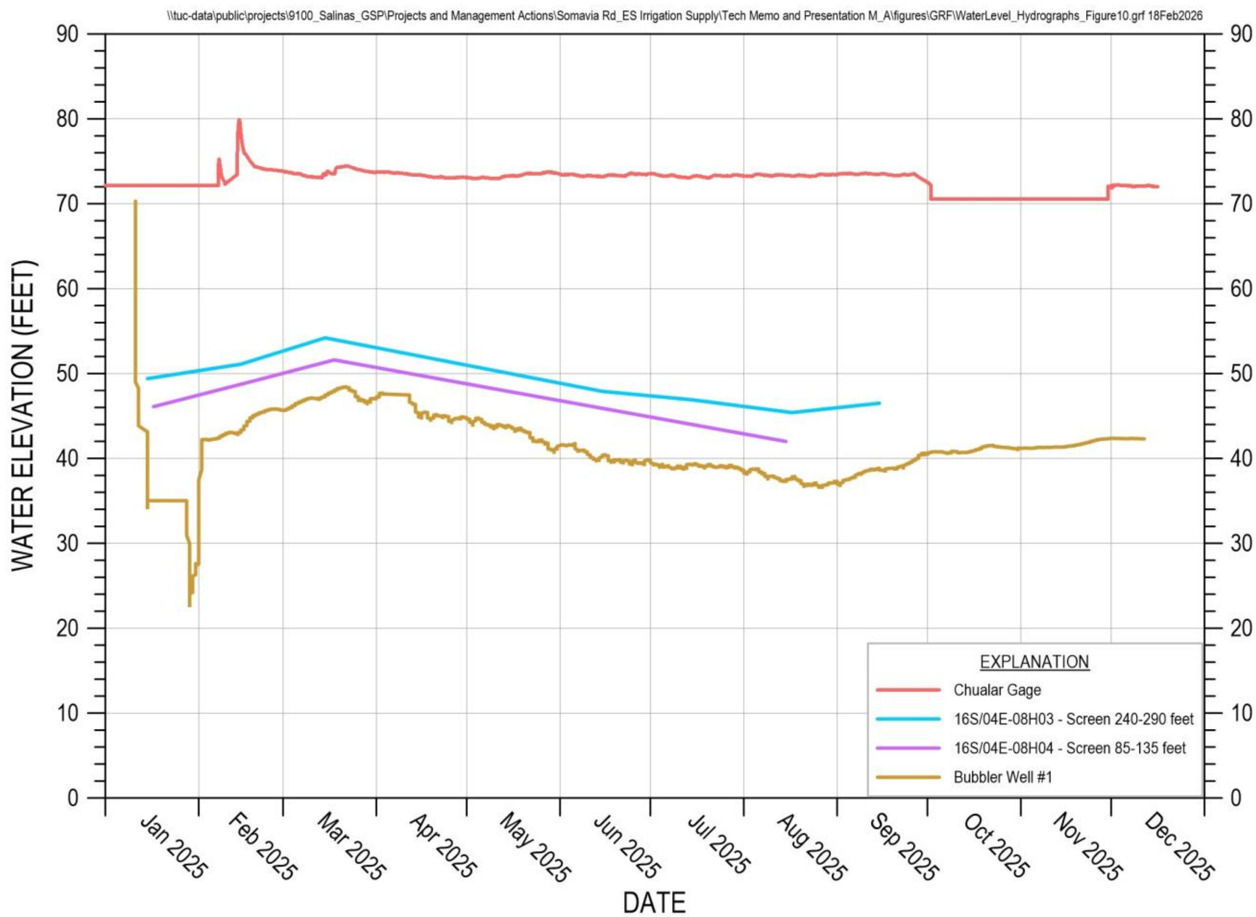

Figure 9. Groundwater and Surface Water Elevations at Monitoring Wells near Chualar Stream Gage

Data from all 3 monitoring wells located close to the Chualar gage show an increase in water levels from January until March, with the hydrographs recording highest peaks in mid-March in response to the mid-February storm. The recorded peaks in the nested wells occur in mid-March, however these are monthly recordings and do not capture the true peak after the February storm. The February storm flows peaked on February 14, and the wells generally peaked 5 weeks later. The water elevation in the Salinas River is around 20 feet higher than in the nearby wells in the early parts of the year, and increases to over 30 feet during the August trough (Figure 9). Both the delay in groundwater level peaks and the large difference in water levels between the River and nearby wells suggest that it takes time for water to recharge the principal aquifer at this location. Therefore, in this instance, groundwater level rises indicate recharge is occurring in response to the winter storms. However, the rate and locations of recharge are difficult to determine due to data limitations. It is unclear whether recharge is occurring at the segment or somewhere upgradient. Additionally, the SVA is present under this segment, and could be acting as a barrier to more direct downward migration of water into the subsurface. Further, the groundwater level in bubbler well #1 begins to increase immediately when irrigation season stops. The gradual decline in water levels at this well during the irrigation season followed by an immediate rebound of water levels indicates the influence of regional pumping. Together, the data suggest that recharge is more likely occurring farther upstream of this segment where the SVA is not present. However, some recharge could be occurring along this segment.

Bend 1 Segment

There are 2 wells with bubblers installed within 0.5 mile of the Salinas River, and within 1 mile of the Bend 1 temporary stream gage (Figure 7): bubbler well #2 (15S/04E-32H01), drilled to 460 feet and with no screen information, and bubbler well #3 (15S/04E-32D02), screened from 232 to 340 feet. The Bend 1 Deep piezometer was installed to a depth of 10 feet near the temporary stream gage. Monitoring stations for this segment are shown on Figure 7.

Water elevation data from the Bend 1 deep piezometer tracks closely with the Bend 1 stream gage; the February storms are mirrored in both hydrographs recording an 8-foot rise shown on Figure 10. This suggests that recharge to the Shallow Sediments does occur from storm flows along this reach. However, the Bend 1 deep piezometer shows a sharp decline in water levels where the stream gage shows a tapering down of water levels starting in March. Water elevations at the Bend 1 deep piezometer then show another rise until finally tapering down in mid-April. It is unclear whether the response at the deep piezometer is due solely to infiltration of surface water, or if it reflects a pulse of water in the Shallow Sediments from upgradient reaches of the river channel. The piezometer data show an average water level difference of about 13 feet between the surface water and Bend 1 deep piezometer water level and a downward gradient. Additionally, the Bend 1 gage and deep piezometer show a slight rise in levels in mid-October, which is not reflected in other stream flow gages. As this occurs after the end of conservation flows, and is not reflected in other data, this data is considered an error and not considered further.

Measured water levels at the bubbler wells closely mirror one another, showing an approximate 4-foot rise in water levels from the beginning of February to mid-March. Water levels then decline approximately 20 feet from mid-March to the end of August, reflecting impacts from groundwater pumping during the irrigation season. Groundwater levels rose about 13 feet from August to December, even though the Salinas River flows were reduced to zero in October with the change in management regime (Figure 10). The rise in water levels is most likely the result of reduced groundwater pumping after irrigation season.

Bubbler well #2 and the Salinas River have a water level difference of about 30 feet in March, and increases to about 45 feet by the end of August. The water elevation at bubbler well #3 tracks approximately 3 feet below bubbler well #2 and follows the same pattern (Figure 10). Large differences in water elevation between the surface water and groundwater may indicate less direct hydraulic connection resulting from the presence of clays, groundwater pumping, or a combination of both. Although these monitoring wells are used to evaluate recharge to the 180-Foot Aquifer, the lack of well construction information prevents the determination of whether they are screened in solely the 180-Foot Aquifer or if they extend into the underlying 400-Foot Aquifer too, as many nearby wells do. However, these are the best available data for this investigation.

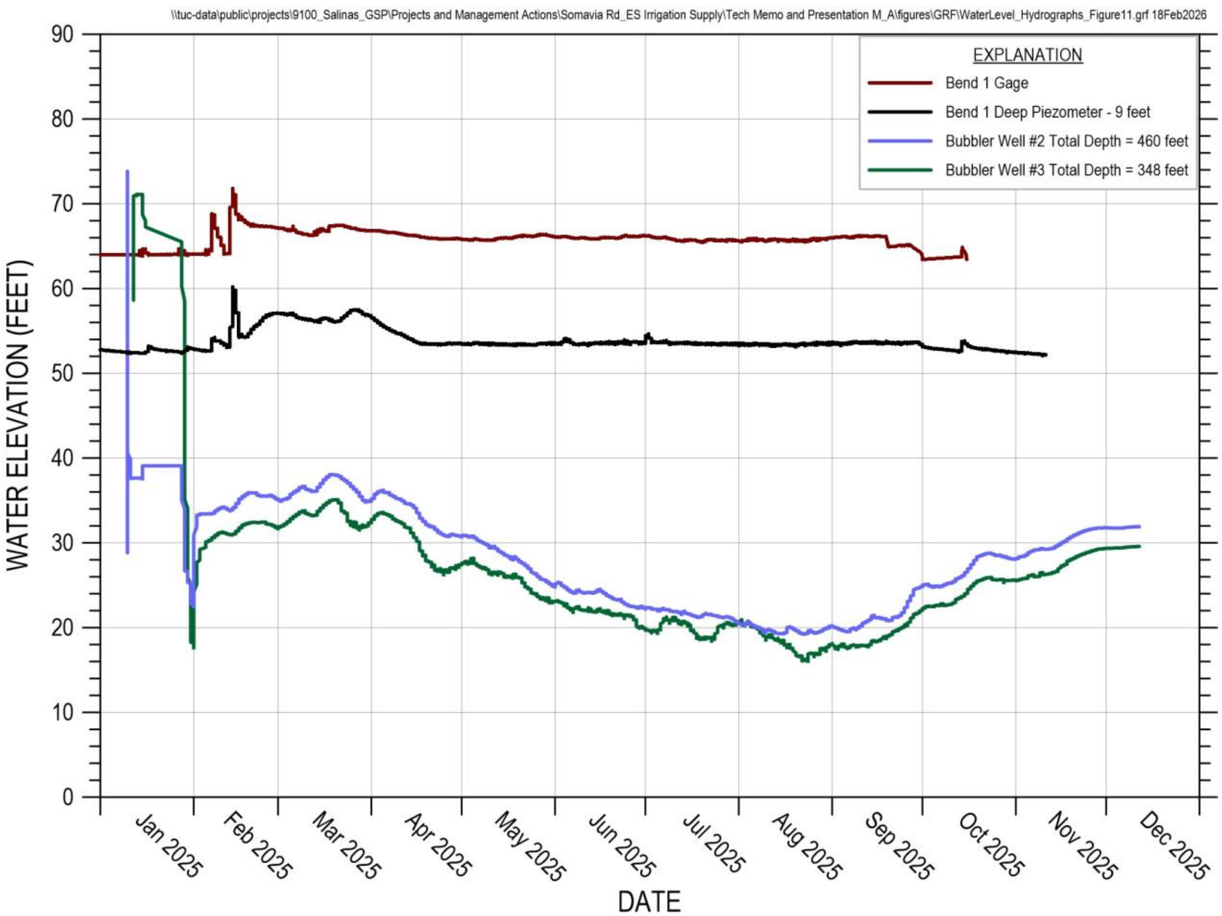

Figure 10. Bend 1 Streamflow, Piezometer, and Nearby Groundwater-level Data

Like other monitoring stations along the river in the Basin, there is a rise in both river flows and groundwater levels in the February-March timeframe. However, the correlated rises do not specifically denote direct recharge relationships at specific locations; rather the correlated rises might reflect recharge occurring in upgradient from this segment. The rates and locations of recharge are difficult to determine for this location. Additionally, the SVA is noted in the lithology of the bubbler wells in this vicinity, which impacts direct downward migration of water into the subsurface where the wells are situated.

The immediate rebound of water levels at the end of irrigation season is more of an indicator of the influence of pumping on the groundwater system. The water levels rise around 10 feet between August and October, and then around 4 feet between October and December. October is notable as an inflection point in the rate of water level rise because that is when managed releases from the reservoirs are stopped, as shown on Figure 10. The first post-irrigation season rise of 10 feet over 2 months is more than twice that of the second post-irrigation season rise of 4 feet over 2 months. The quicker rebound of groundwater levels could reflect the confined, pressurized character of the 180-Foot Aquifer, whereas the later groundwater level rises could reflect longer regional recharge mechanisms.

The rates of recharge—direct or indirect and particularly through irrigation season—do not meet the rates of extraction. As water levels decline from pumping and the Salinas River is held at relatively constant flows, the widening gap through irrigation season points more to disparate rates of aquifer inflows and outflows. This is further validated with the quick rebound in water levels when pumping stops, indicating that water already on its downward path to the aquifers is given the opportunity to recharge.

The data for the deep piezometer illustrated on Figure 10 shows a nearly flat water level throughout the irrigation season, even though there are slight increases and decreases in the Salinas River Bend 1 Gage and decreases in groundwater levels over the same period. This could be due to a few reasons: the water level in the piezometer is approaching the bottom of the screen and is being sustained by downward unsaturated flow, the clay lenses beneath the Shallow Sediments are limiting the upward migration of the drawdown in the 180-Foot Aquifer, or the increasing downward seepage from the Shallow Sediments to the 180-Foot Aquifer is offset by increased flow losses to the Shallow Sediments. It is likely a combination of all of these reasons, and parsing out their influences is beyond the scope of the available data. Regardless, the water level in the deep piezometer does show a downward vertical gradient from the Salinas River to the Shallow Sediments in this vicinity.

The only indication that there might be more direct hydraulic connection to the 180-Foot Aquifer in the Bend 1 area is that the peak of groundwater levels from the winter storms in the #2 and #3 bubbler wells is 3 days sooner than the groundwater level peak in the #1 bubbler well by the Chualar gage (Figure 9 and Figure 10). However, the rising limb of the bubbler wells' hydrographs still more strongly points to overall recharge from greater regional precipitation and lack of pumping in the winter season than to direct recharge at Bend 1.

Bend 2 Segment

Only 1 groundwater monitoring well exists in the Bend 2 segment of the study area to accompany the Bend 2 temporary stream gage: 15S/03E-25Q01 has no screen or depth information but is listed as a 180-Foot Aquifer well. The Bend 2 deep piezometer was installed near the temporary stream gage. Monitoring stations for this segment are shown on Figure 7.

Water elevation data from the Bend 2 deep piezometer tracks almost identically with the Bend 2 stream gage with the February storms mirrored in both hydrographs shown on Figure 10. After the February storms, the hydrographs record almost identical water elevations. This suggests that the Bend 2 stream gage and piezometer are both above a clay unit that does not allow for the downward migration of water; rather it keeps the water perched in this location. There is no observable gradient between the Bend 2 temporary stream gage and its respective piezometer.

The nearby well shows a rise from January to March, then a decline from March to August (Figure 11). The groundwater level rises from August to September by about 1 foot in response to the end of irrigation season pumping.

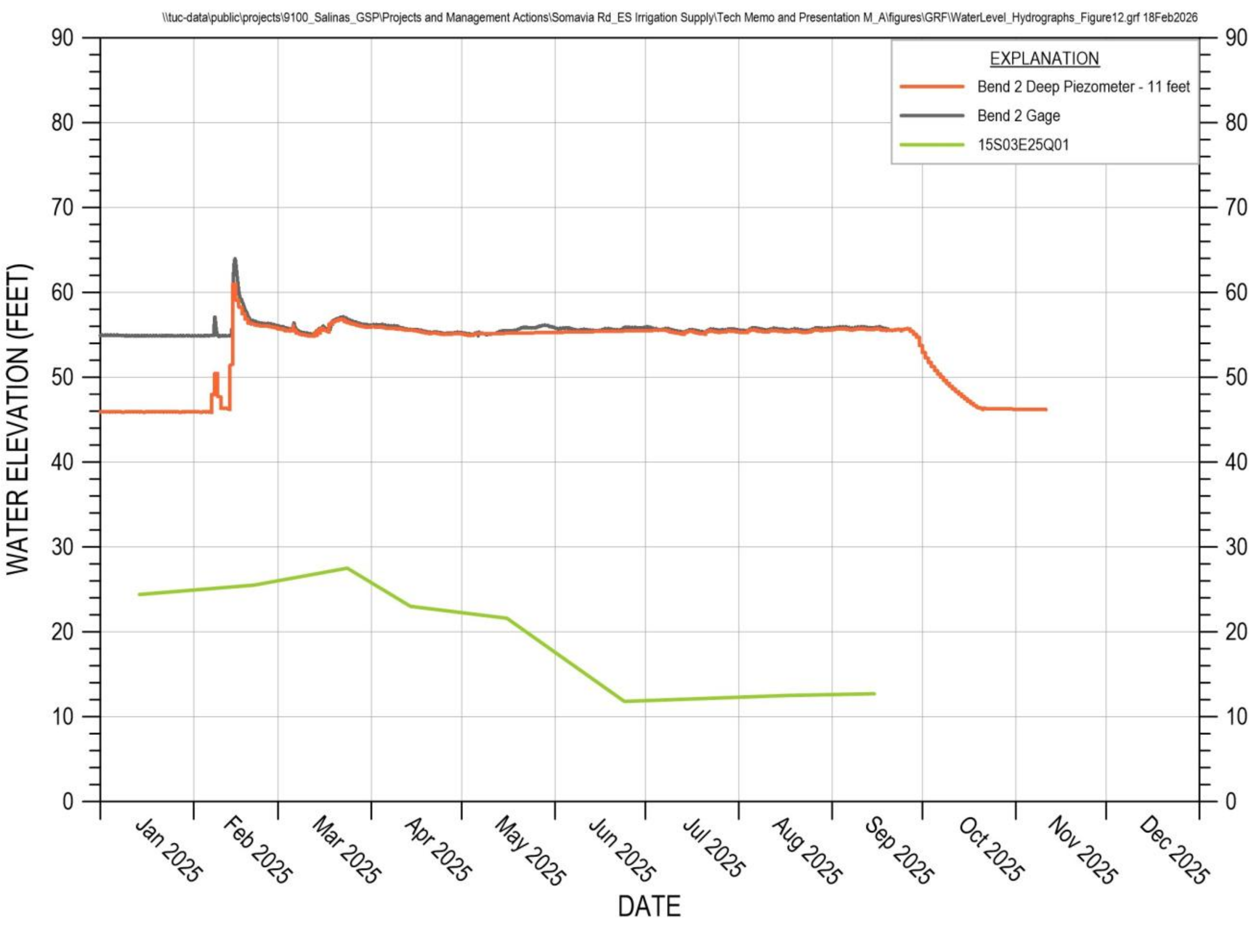

Figure 11. Bend 2 Streamflow and Nearby Groundwater-level Data

The rising limb in the early part of the year follows the same pattern as observed in other wells, with a water level rise from January to March, recording its highest peak in late March. This is more indicative of upgradient basin recharge rather than direct recharge at this location.

The large difference in water levels between the River and the nearby well indicates that it takes longer for water to recharge the principal aquifer at this location. There is recharge occurring, based on the existing rise in groundwater levels prior to the February and March storms. However, the groundwater level in this well drops throughout irrigation season and increases only a couple of feet when irrigation season stops. Recharge is more likely occurring farther upstream of this location where the SVA is absent, and not directly at this location. The hypothesized SVA gap in this area is unlikely to be present based on the hydraulic data evaluated here.

Study Area Summary

All water elevation data for the study area are shown together on Figure 12. One notable trend is the post-irrigation season rate of recovery in the groundwater wells. Water level data collected at the bubbler wells #2 and #3, associated with Bend 1, show a faster recovery than bubbler well #1, or the monthly groundwater level wells associated with the Chualar gage and Bend 2 locations. This is particularly concentrated in the immediate 2 months post-irrigation, which is more indicative of reduced pumping in a confined, pressurized system. Continued water level rises after this time period are more indicative of river recharge, due to the lower rate of rise. Regardless of primary driver, the rising water levels cannot point to specific recharge locations, only that river recharge is occurring within the Basin. Bubbler wells #2 and #3 show an approximately 12-foot rise over 3 months after irrigation season, whereas the #1 bubbler well shows an approximate 6-foot rise over the same period. However, the rate of extraction seemed to overwhelm the rate of recharge at all locations in the study area, whether that recharge was directly or indirectly occurring at the study area. This obscures any potential conclusions about direct recharge or inducing recharge to the 180-Foot Aquifer in this area. The data do indicate downward gradients in the Bend 1 area from the Salinas River to the Shallow Sediments, but do not provide insights into direct recharge relationships with the underlying 180-Foot Aquifer. This indicates sediment permeability is the controlling factor in the infiltration and aquifer recharge rates, rather than drawdown, such that recharge is not likely to increase, regardless of additional pumping. Additionally, the data at Bend 2 reflect perched water and more distance between the surface water and groundwater levels. This indicates shallow clay is likely present, negating the hypothesized SVA gap in this area and shrinking the overall hypothesized gap for the Study area.

The end-member evaluations provided some insight into the surface water-groundwater relationships along the Salinas River, with End-Member 1 (Soledad) showing a direct connection and End-Member 2 (Spreckels) showing indirect connection. The direct connection is due to a lack of clays separating the river from the basin sediments, and the indirect connection is due to the presence of the SVA. These connections are based on comparing the water elevations between the Salinas River and nearby wells, with End-Member 1 showing water elevations within 3 feet and End-Member 2 showing water elevations separated over 20 feet. The water elevations' relationships within all segments of the Study area more closely resemble End-Member 2, where clays separate the surface water from the groundwater and any recharge signal is the result of indirect mechanisms.

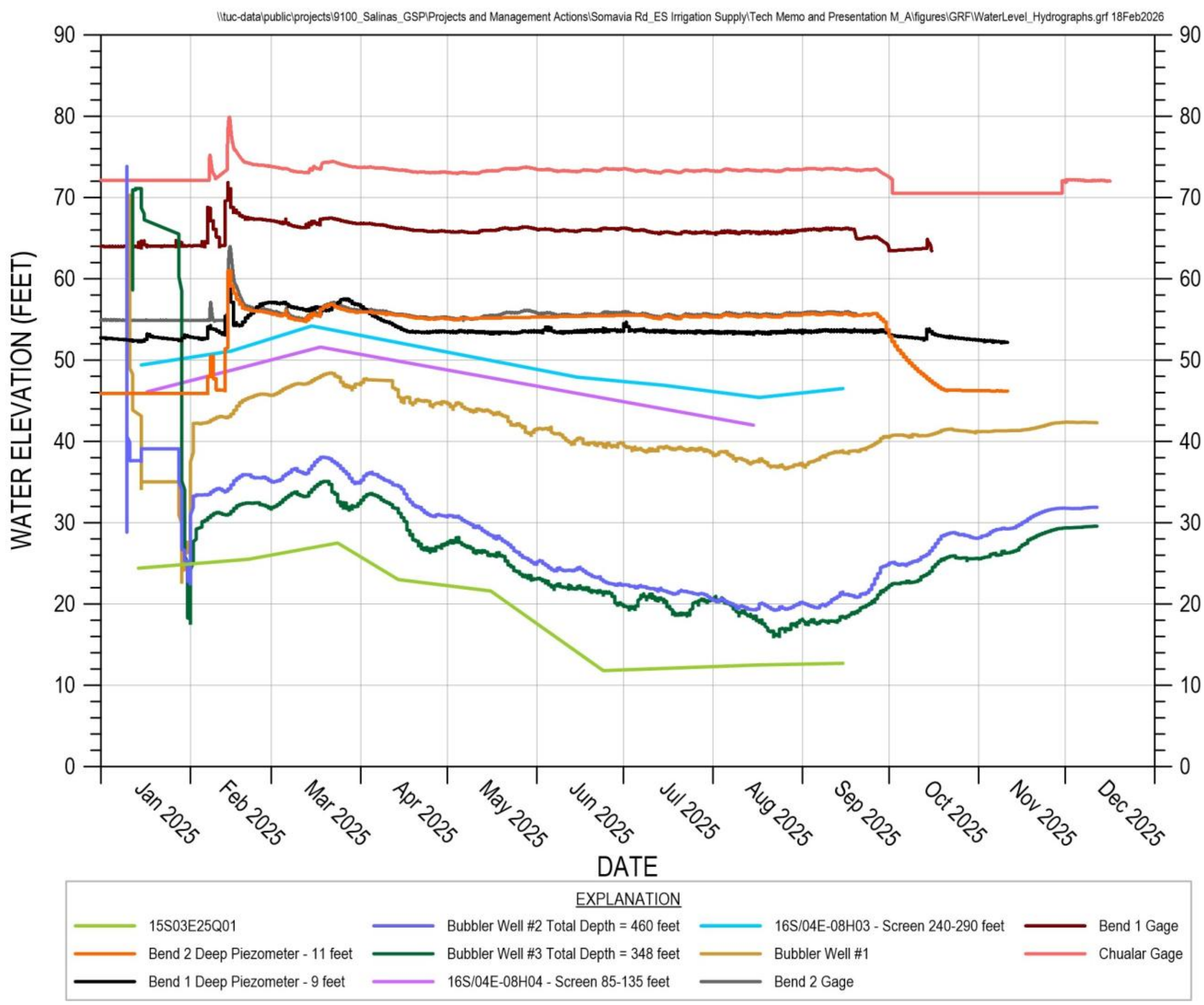

Figure 12. All Study Area Data

Flow Loss Evaluation

Balance Hydrologics Study

Balance Hydrologics conducted a surface water infiltration study in 2025 to better understand riverbed sediments in the Salinas River through the study area, as well as understand potential infiltration rates along specific reaches (Balance, 2025). Balance included an evaluation of USGS gage data for the Chualar and Spreckels gages and the MCWRA River Series survey, as well as conducting dry-season synoptic flow surveys. In addition, they conducted infiltrometer tests on multiple channel and bank locations, collected streamflow measurements at 2 temporary locations within the study area, installed 2- and 10- foot piezometers to accompany the streamflow measurements and took temperature data with the streamflow and piezometers to calculate riverbed flux. There were 7 data collection locations through the reach, shown below on Figure 13.

Balance found that in the 6-mile reach of the study area, the area with the highest infiltration was between Chualar bridge and Bend 1 (not the Bend 1 stream gage location), where flow losses were approximately 10 to 16 cfs/rm (cubic feet per second per river mile). This flow loss rate is much higher than the average flow loss of 3.4 cfs/rm observed between the Chualar gage and the Spreckels gage as reported in the 2024 MCWRA survey. Flow loss rates decrease after Bend 1, as shown in Table 1 (Balance, 2026).

Table 1. Summary of Balance Hydrologics Study Flow Loss Results by Salinas River Reach

Reach	Synoptic Flow Loss Rate (cfs/rm)	Gaged Flow Loss Rate (cfs/rm)
Chualar Bridge to Bend 1	10-16	11
Bend 1 to Jenson's Bluff (Bend 2)	3.4-6.8	3.4
Chualar to Spreckels	3.4	1

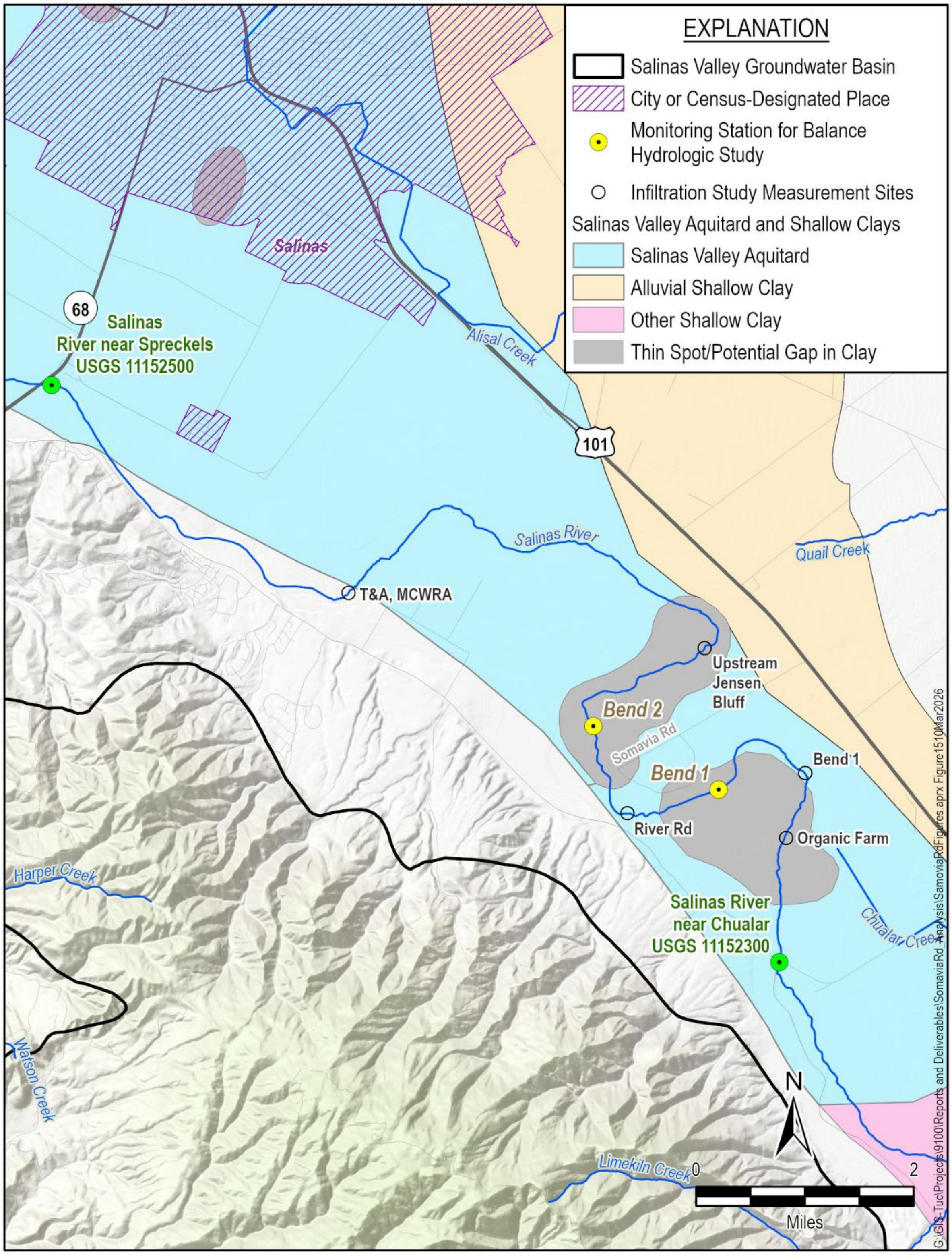

Figure 13. Balance Hydrogeologic Study Area Data Collection Sites

MCWRA River Series

Every year, MCWRA conducts its Salinas River Discharge Measurement Series (River Series) to provide information about the hydrologic conditions at multiple locations along the Salinas River in August, and evaluate the surface water-groundwater interactions along the channel during a period of steady reservoir releases for consistent data (MCWRA, 2024). During this period, the Salinas River is an entirely losing stream, with some reaches losing more than others. The USGS operates several gages along the Salinas River, and MCWRA supplements these gages with additional data collection sites during the River Series, as shown on Figure 14.

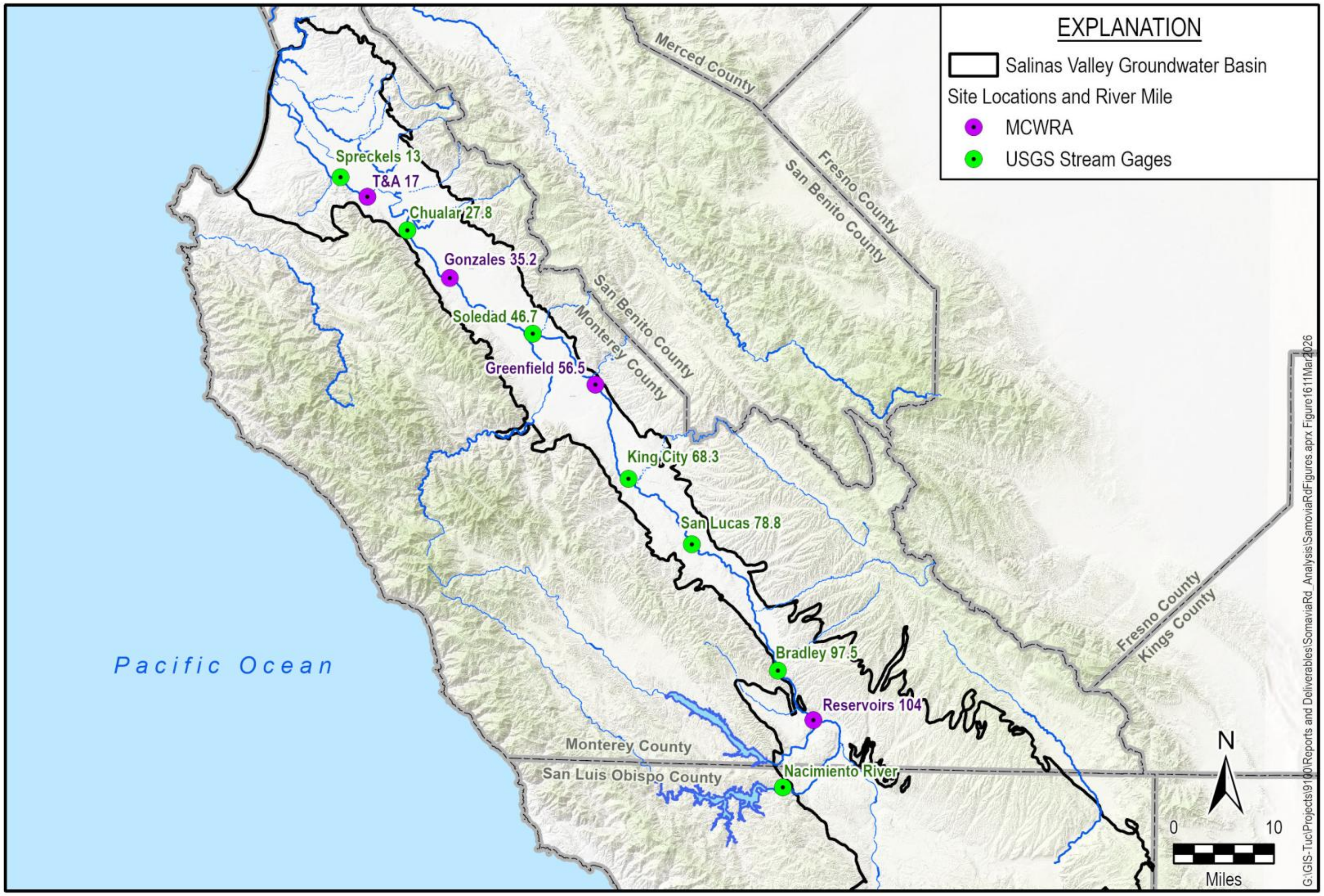

Figure 14. Locations of River Series Data Collection Points

Flow losses among the 10 studied reaches ranged from 0.9 cfs/rm and 9.7 cfs/rm during the 2024 series, and 2.4 cfs/rm and 13.2 cfs/rm in the 2025 series (MCWRA, 2024; MCWRA, 2025). The reach between Chualar (USGS 11152300) and the T&A site (MCWRA), which more closely corresponds with the Study area corridor (Figure 13) experienced a flow loss of 4.1 cfs/rm in 2024, and 5.4 cfs/rm in 2025 (MCWRA, 2024; MCWRA, 2025). For comparison, the 2024 River Series determined a flow loss of 3.3 cfs/rm in the reach between Chualar and Spreckels, which agrees with the 2026 Balance study's calculated flow loss of 3.4 cfs/rm for the same reach. The shorter river reach (Chualar to T&A) has a higher flow loss than the longer river reach (Chualar to Spreckels), which means there is a segment somewhere between Chualar and the T&A site that increases the average flow. Based on the Balance study, it is likely that this segment is the Chualar gage to Bend 1 reach of the River, which has a flow loss rate 3 times that of the Chualar to Spreckels reach, shown in Table 1.

Flow Loss Summary

The water loss in Bend 1 infiltrates locally into the Shallow Sediments, as demonstrated in the associated deep piezometer and discussed above. It is unknown whether this water percolates down into the 180-Foot Aquifer and provides local recharge.

Flow loss is also relevant to the Irrigation Supply Project concept described in the GSPs. The project is premised on increasing drawdown that could then induce additional recharge from the Salinas River. Since irrigation demand is during the summer months, it is assumed that pumping would occur during summer months. Such a project would need to show that it does not harm groundwater-dependent ecosystems or downstream users, such as diversion at the Salinas River Diversion Facility. If it were to capture additional winter recharge, the drawdown would need to persist until additional river flows results from winter storms, which are typically between January and March. While full assessment of that timing is beyond its scope, this analysis does provide initial insights. Groundwater levels come back up in the fall from a combination of rebound after the cessation of pumping and indirect recharge from up-valley of the SVA, thus indicating that drawdown would not persist until winter recharge. Additionally, as shown by groundwater levels declining during the growing season, pumping outpaces recharge, indicating infiltration rates are controlled by sediment permeability and are not likely to increase beyond their physical limits, regardless of additional pumping.

CONCLUSIONS

The available data through the study area starting at the Chualar gage (USGS 11152300) and ending at Jenson's Bluff, indicate there is a surface water-groundwater relationship between the Salinas River flows and the underlying Shallow Sediments. The surface water data suggest that river losses in the study area are highest along the reach between the Chualar gage and Bend 1; however, the extent of recharge into the underlying 180-Foot Aquifer is less clear.

Data show groundwater level rises in the 180-Foot Aquifer occurring throughout the wet winter season at all wells at all locations, indicating recharge. However, the rate and location of recharge is uncertain. Trends in the data suggest recharge to the 180-Foot Aquifer could be occurring in upgradient areas of the groundwater basin instead of at the Somavia Road study area itself. Although river losses are occurring, the ultimate fate of that water is unclear due to the lack of sufficient data for the Shallow Sediments. All wells showed the impact of irrigation season with clear declines in groundwater levels through the month of August. The Salinas River was maintained at relatively constant water elevations through the study area during this time, even as groundwater elevations at the wells declined, as shown on several of the hydrographs in this tech memo. This means the rate of pumping exceeded the rate of recharge through irrigation season.

Once irrigation season ended, all wells showed groundwater elevation rises at first due to rebound, and later due to recharge processes. The quicker rebound of groundwater levels reflects the confined, pressurized character of the 180-Foot Aquifer, whereas the later groundwater level rises reflect the longer recharge mechanisms. The fastest post-irrigation season groundwater elevation increase was observed in the #2 and #3 bubbler wells, which might indicate slightly more direct recharge pathways in their vicinity, as also found in the flow loss evaluation. However, data limitations prevent any definitive statements about whether the Bend 1 area experiences direct recharge from the River. All of the groundwater data suggest that recharge to the 180-Foot Aquifer is occurring in the locations where shallow clays are not present, which is primarily in the Forebay Subbasin. Regional recharge is likely impacting groundwater elevations in the study area, and the data signal cannot be differentiated from potential direct local recharge occurring at the same time. Therefore, the potential for more rapid recharge in the study area is still not fully verified.

The purpose of the data evaluation presented here was to determine whether recharge to the 180-Foot Aquifer occurs at the Somavia Road area through gaps in the SVA for a proposed induced recharge project (e.g. pumping more from the 180-Foot Aquifer to induce additional recharge). This study found that while data does not conclusively point to direct or indirect recharge, additional pumping during the growing season is unlikely to result in greater infiltration or recharge rates. The feasibility of a future project, including evaluating whether drawdown can persist long enough to increase winter recharge, was outside the scope of this study but would likely include groundwater model simulations.

Key takeaways

- **Recharge Signal Challenges:** Identifying direct recharge to the 180-Foot Aquifer at specific locations is difficult in winter due to widespread recharge occurring, and in summer because pumping rates outpace any local recharge signal.

- **Influence of subsurface clays:** Subsurface clays inhibit downward movement of water, and any SVA gaps in the Somavia Road area are likely smaller than previously estimated.
- **Limits on induced recharge:** Infiltration rates are controlled by sediment permeability and are not likely to increase beyond their physical limits, regardless of additional pumping.

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