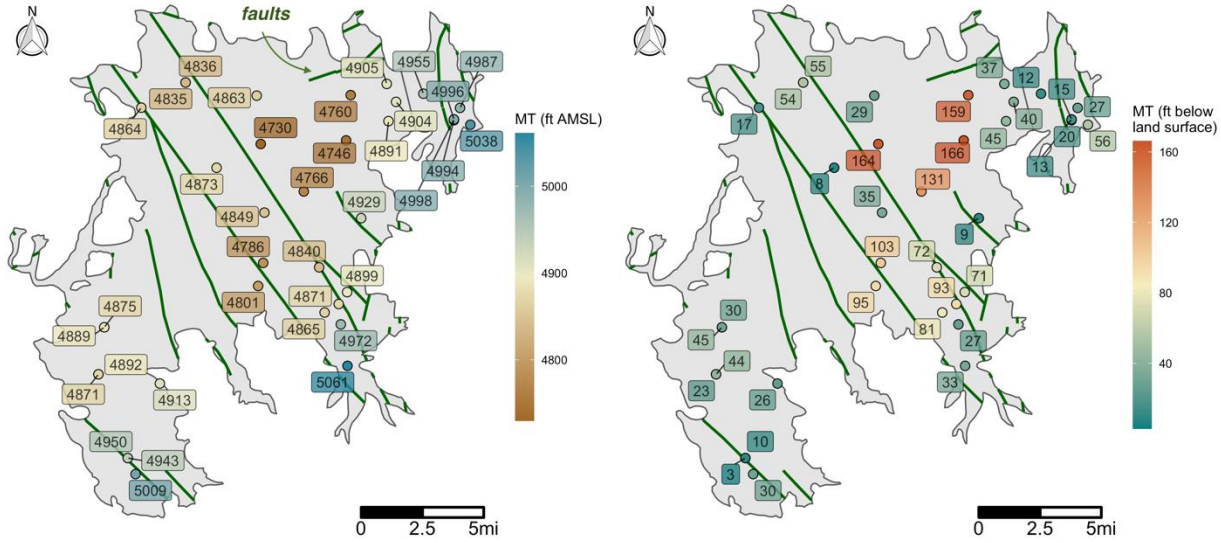
RMP ID	Site Code	Ground Surface (ft AMSL)	Last Measured Date	Last measured Water Surface[(1)] (ft AMSL)	MO (ft AMSL)	MT (ft AMSL)
301	398170N1203478W001	4,890.48	2020-10-21	4,851.75	4,856	4,836
302	398170N1203478W002	4,890.48	2020-10-21	4,860.68	4,865	4,835

Notes:

- Water surface at last available measurement in 2020. Data collected in 2021 will be include in the first year report.
- RMP locations shown in Figure 3.3.1-3.

Figure 3.3.1-5: Minimum Thresholds for the Representative Monitoring Points



Notes:
- Minimum Thresholds in elevation above mean sea level (left)
- Minimum Thresholds in elevations below land surface (right) for the Representative Monitoring Points (duplicate labels indicate nested monitoring wells

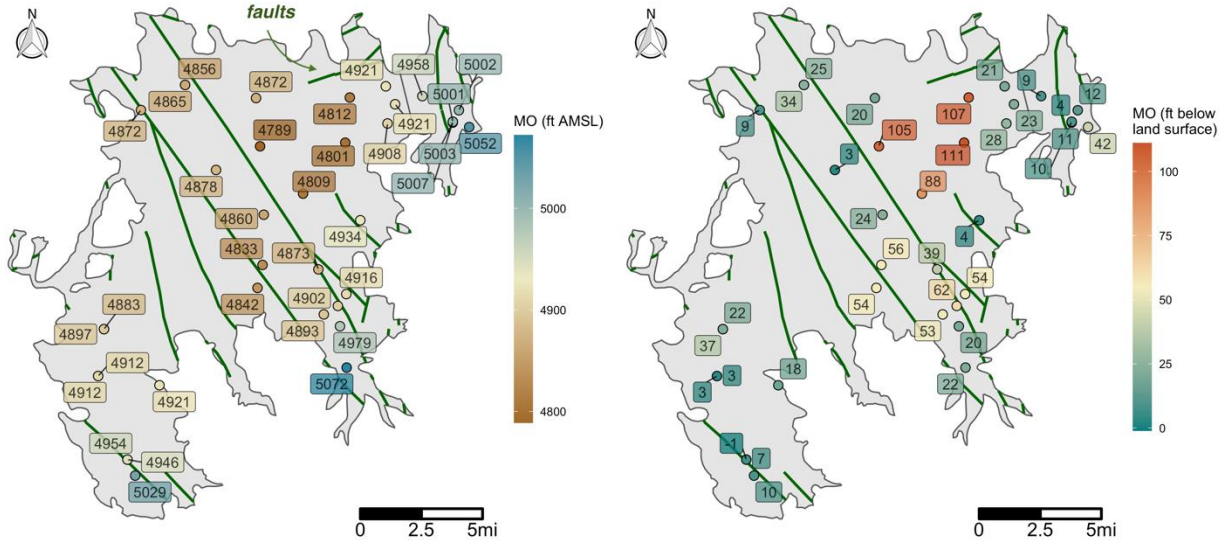
3.3.1.5 Measurable Objectives

The groundwater elevation MOs for the SV Subbasin are set to represent the current condition of the Subbasin and correspond to management goals that maintain these levels.

3.3.1.5.1 Description of Measurable Objectives

For all RMPs, MOs are set to the average water level observed from January 2015 to October 2020. Each MO was rounded to the nearest integer to ease interpretation. The MOs are listed for each RMP in Table 3.3.1-1 and presented in Figure 3.3.1-6.

Figure 3.3.1-6: Measurable Objectives for the Representative Monitoring Points



Notes:
- Measurable Objectives in elevation above mean sea level (left)
- Measurable Objectives in elevation below land surface (right)
- Duplicate labels indicate shallow and deep wells at the same location

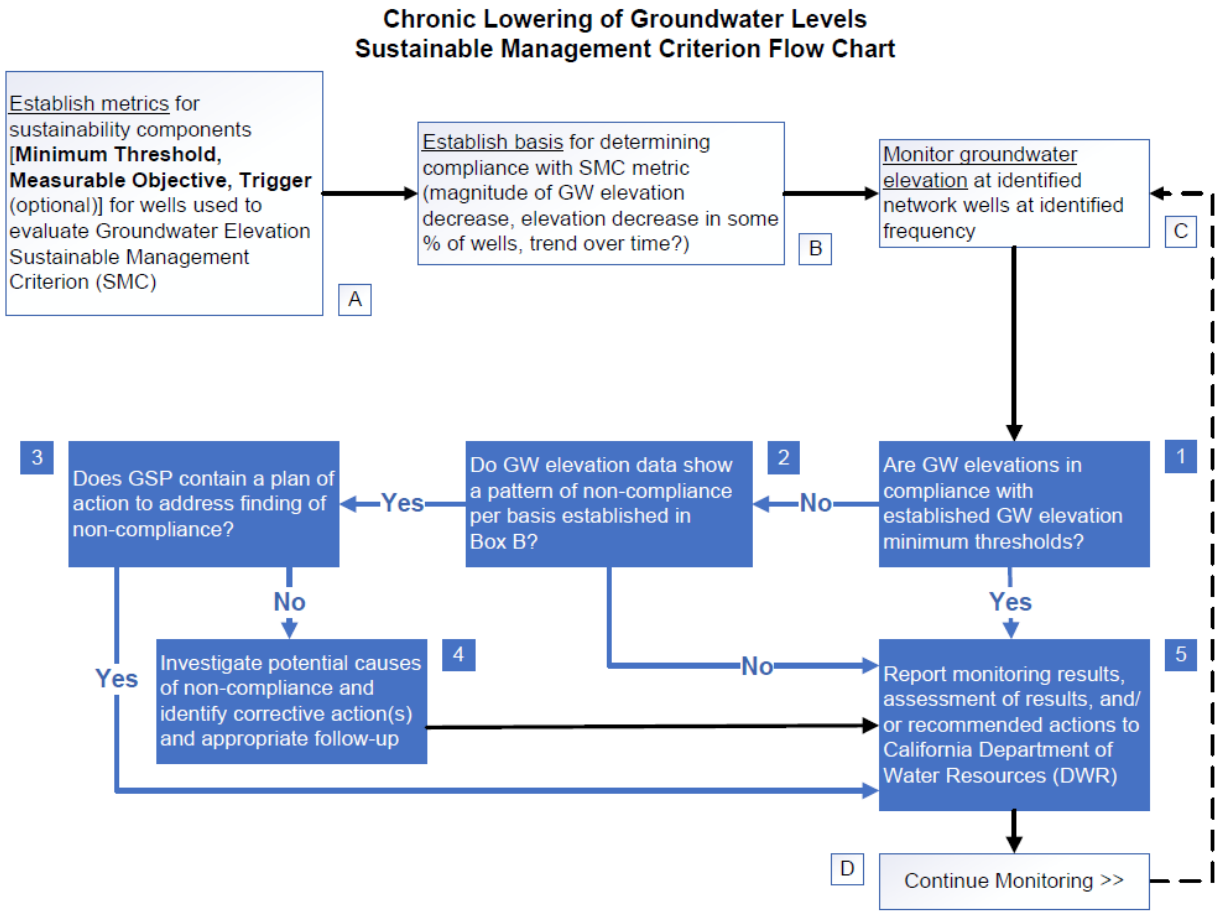
3.3.1.6 Path to Achieve Measurable Objectives

The GSAs will support achievement of the MOs by monitoring groundwater levels and coordinating with agencies and stakeholders within the Subbasin to implement projects and management actions. The GSAs will review and analyze groundwater level data to evaluate any changes in groundwater levels resulting from groundwater pumping or recharge projects in the Subbasin. Using monitoring data collected as part of GSP implementation, the GSAs will develop information (e.g., hydrograph plots, see Figure 3.3.1-1 above) to demonstrate that projects and management actions are operating to maintain or improve groundwater level conditions and to avoid unreasonable groundwater levels. Should groundwater levels drop to a trigger or MT, the GSAs may implement measures to address this occurrence. This process is illustrated in Figure 3.3.1-7 based on a combination of monitoring, reporting, investigation, and when necessary, corrective actions.

Projects and management actions are presented in further detail in Chapter 4. Implementation timelines and approximate costs are discussed in Chapter 5. Examples of possible GSAs actions include stakeholder education and outreach, support for impacted stakeholders, and incentivizing conservation practices.

To support decision-making around management actions in the event of groundwater level decline, the GSAs may choose to conduct additional or more frequent monitoring or initiate additional modeling. The need for additional studies on groundwater levels will be assessed throughout GSP implementation. The GSAs may identify information needs, seek funding, and help to implement additional studies.

Figure 3.3.1-7: Groundwater Level Sustainable Management Criteria Flow Chart



3.3.1.6.1 Interim Milestones

Interim milestones (IMs) were defined as regular 5 year-long intervals between the MT and MO in 2027, 2032, and 2037. The MO can be understood as the fourth and final IM. When the operational flexibility for an RMP is less than 3 feet, due to nearest-integer-rounding, one or more IMs will be equal to the MO.

3.3.2 Groundwater Storage

Chronic lowering of groundwater levels is directly correlated with reduction of groundwater storage. Groundwater storage is the three-dimensional equivalent of groundwater level (one-dimensional) over an area. Reduction in groundwater storage generally indicates groundwater level decline and vice versa. Thus, groundwater levels may be used as a proxy for groundwater storage, and the potential causes and identification of Undesirable Results related to reduction in groundwater storage are identical to those related to chronic lowering of groundwater levels (Section 3.3.1.1).

GSAs will track and project groundwater storage with the Sierra Valley integrated hydrologic model and calibrate groundwater storage estimates based on data collected throughout the Subbasin. As before, potential effects of Undesirable Results on beneficial uses and users of groundwater due to reduced groundwater storage are identical to those outlined due to chronic lowering of groundwater levels (Section 3.3.1.2), as are SMC (Sections 3.3.1.4 - 3.3.1.6).

3.3.3 Depletion of Interconnected Surface Waters

3.3.3.1 Undesirable Results – Depletion of Interconnected Surface Water

Depletion of ISW is related to chronic lowering of groundwater levels via changes in the hydraulic gradient. Darcy's Law is a fundamental tenet of groundwater hydrogeology that explains this.[1] It states that the amount of water that flows through an aquifer (e.g., ISW depletion) is proportional to the hydraulic gradient (in this case, the difference between the water surface elevation in the stream ('stage') and adjacent groundwater elevation). Hence, declines in groundwater level which increase the hydraulic gradient between the ISW, and the aquifer also increase ISW depletion.

Significant and unreasonable depletion of interconnected surface water (ISW) due to groundwater extraction will be identified if ISW depletion exceeds the maximum depletion rates indicated in the monitoring record from January 2000 to January 2021. At the time of writing, these rates have not been calculated and depend on results from the Sierra Valley integrated hydrologic model. However, in the absence of conclusive modeling, this GSP conservatively assumes that ISW depletion is occurring based on groundwater level declines near ISWs, but this depletion does not appear to be significant and unreasonable. The conservative approach of not worsening ISW gradients is taken to ensure that previously unexperienced effects do not occur in the Subbasin. These management objectives to maintain ISWs are quantitatively achieved by maintaining groundwater levels near ISW at historical levels, which thereby maintains hydraulic gradients and ISW depletion.

3.3.3.1.1 Potential Causes of Undesirable Results

Depletion of ISW could be caused by increased pumping and/or reduced recharge (e.g., due to drought, climate change, or changes in irrigation rates or practices). Most of the pumped groundwater in the basin is used for agriculture; therefore, increased demand per irrigated acre or an increase in irrigated acreage could result in depletions to surface water. Natural and managed variability in the timing and magnitude of inter- and intra-basin diversions could also affect recharge and available surface water and lead to ISW depletion. Additionally, efforts to move from flood irrigation (commonly practiced on the south and west sides of the valley) to spray irrigation could increase irrigation efficiency but also potentially reduce recharge, leading to lower groundwater level and hence, ISW depletion. The inter-basin diversion from the Little Truckee River supplies substantial surface water (6,693 acre-feet on average from 1959 to 2020) to Sierra Valley during the irrigation season. In a warming climate, reduced snowpack and spring and summer runoff could affect the availability of water from the Little Truckee Diversion. Other factors related to climate change such as decreased precipitation and increased evapotranspiration could also lead to ISW depletion.

3.3.3.2 Effects on Beneficial Uses and Users

Undesirable Results would affect agricultural and environmental uses and users, as well as the economy and tourism. Many agricultural users rely heavily on surface water to irrigate pasture. Ongoing or increased groundwater pumping could alter the horizontal and vertical gradients that affect the rates and direction of groundwater flow. Streams and GDEs could switch from gaining to losing if groundwater levels decline past critical thresholds, which would result in less

[1] Darcy's Law, $Q = K \cdot A \cdot i$ states that the volumetric rate of flow Q is proportional to the hydraulic conductivity (K, or resistance to flow), the cross-sectional area (A, in this case, of the streambed), and the hydraulic gradient i (in this case, the difference between water surface elevation in the stream ('stage') and adjacent groundwater level). Thus, as the difference between stream stage and groundwater level increases, the hydraulic gradient (i) increases, which makes streamflow depletion (Q) increase.

available surface water for irrigation, and stream losses into shallow aquifers. In addition to affecting the quantity of water available, it is possible that water quality may also be impacted.

ISW provides habitat for priority species and other beneficial users, thus ISW depletion may impact these beneficial users. Late summer and early fall are particularly important, as some ISW streams may depend on late-season groundwater discharge to support baseflow when snowmelt and surface runoff are at a minimum. ISW depletion could not only decrease the availability, but also the quality of habitat for aquatic species. In late summer and fall conditions, upwelling of relatively cool groundwater near springs and flowing wells helps maintain surface water temperature from warming excessively and negatively impacting ISW beneficial users. In Sierra Valley, the location and degree to which ISW depletion may impact sensitive species is poorly understood. Monitoring of species diversity, populations, and available habitat occurs, but is insufficient to fully understand the impacts of ISW depletion on such environmental systems. Widespread monitoring and documentation needs are discussed further in Section 3.4.1.4.

3.3.3.3 Relationship to Other Sustainability Indicators

Minimum thresholds (MTs) established for the depletion of interconnected surface water are the most conservative of the sustainability indicators, in that they do not allow for future conditions that exceed historically observed ISW depletion.

Increased ISW depletion results from chronic lowering of groundwater levels that increase the stream-aquifer hydraulic gradient, and hence, increase depletion. Therefore, by effectively managing groundwater levels to avoid decline, ISW depletion can also be managed. Moreover, monitoring and forecasting basin-wide storage also provides a big picture view of how ISW depletion may be impacted, although spatially distributed changes in groundwater level are much more useful in isolating local-scale ISW impacts.

Groundwater level SMC at some RMPs allow minimum thresholds lower than historically observed groundwater levels, but that still avoid impacts to beneficial users (Figure 3.3.1-1) In contrast, in ISW zones, groundwater level MTs are adjusted consistent with ISW MTs, such that no additional groundwater level depletion occurs in excess of historical impacts (i.e., observed between January 2000 and January 2021).

3.3.3.4 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

3.3.3.4.1 Groundwater Elevations as a Proxy for Depletion of Interconnected Surface Water Minimum Thresholds

Depletion of Interconnected Surface Water as a volume or rate is difficult to quantify in Sierra Valley due to data gaps. Groundwater monitoring data is lacking near ISW, and there are no continuous streamflow or stage gages within the basin. Data collected by the DWR Watermaster for Sierra Valley is only done in preparation for and during the irrigation season with periodic measurements on up to 12 different tributaries. Due to the discontinuous nature of these measurements, simple mass-balance approaches to ISW depletion estimation are infeasible.

Estimation of ISW depletion is in development and will be achieved through the use of the Sierra Valley integrated surface water-groundwater model. Two different scenarios will be evaluated: with and without pumping. All other model inputs will remain the same between the two scenarios. Streamflow results will be compared, and the difference, measured as a volume or rate, is the amount of surface water depletion due to groundwater pumping. In lieu of results from this integrated surface and groundwater model, we conservatively set ISW SMC to maintain hydraulic gradients near ISW.

As noted above, groundwater elevations directly control the stream-aquifer hydraulic gradient, and thus, the magnitude of ISW depletion. In the absence of high-confidence estimates of streamflow depletion, but reasonable groundwater level data, groundwater levels are used as a proxy for ISW depletion (similar to other sustainability indicators). Therefore, conservative MTs are set near ISW and GDEs that would maintain groundwater elevations above historically observed lows and thus reduce the risk that hydraulic gradients between surface and groundwater do not reverse or steepen. In other words, these conservative groundwater level MTs protect ISW from experiencing depletion in excess of historically observed values by controlling stream-aquifer hydraulic gradients.

To protect priority species and aquatic and riparian communities that rely on ISW (henceforth, ISW beneficial users), MTs are set for existing monitoring wells that are located nearest to GDEs and ISW. RMPs associated with ISW or GDEs that support ISW beneficial users are assigned a groundwater level MT equal to the lowest reading since January 2000 (Figure 3.3.3-1, Figure 3.3.3-2, and Table 3.3.3-1). All ISW RMPs are contained in the groundwater level RMP network except 37 and 364 because their locations overlap with other RMPs.

Table 3.3.3-1: MTs and MOs for Select RMPs Associated with GDEs and ISW

RMP ID	Well Name	Site Code	Water Surface (ft AMSL)	Ground Surface (ft AMSL)	MO (ft AMSL)	MT (ft AMSL)
12	20N14E14R001M	395808N1203851W001	5,016.1	5,038.6	5,029	5,009
38	DMW 1s	396976N1202492W001	4,898.2	4,916.6	4,898	4,895
31	21N14E25P003M	396391N1203667W001	4,917.2	4,938.6	4,921	4,913
73	21N16E18G002M	396744N1202282W001	4,979.6	4,998.7	4,979	4,972
161	23N14E35L001M	398020N1203815W001	4,869.96	4,880.96	4,872	4,864
176	23N15E34D001M	398094N1202932W001	4,870.33	4,891.83	4,872	4,863
209	23N16E36N002M	397951N1201418W001	5,004.1	5,013.6	5,003	4,994
291	DMW 2s	395951N1203910W001	4,944.29	4,953.3	4,946	4,943
294	DMW 3s	396444N1204137W001	4,912.25	4,915.2	4,912	4,871
297	DMW 4s	396722N1204095W001	4,889.41	4,919.4	4,897	4,889
300	DMW 5s	397956N1201417W003	5,001.95	5,010.6	5,001	4,996
302	DMW 6s	398170N1203478W002	4,860.68	4,890.48	4,865	4,835
364	DMW 7s	N/A	4,886.7	4,895.9	4,887	4,887

Figure 3.3.3-1: Proposed Representative Monitoring Points for ISW and GDEs[1]

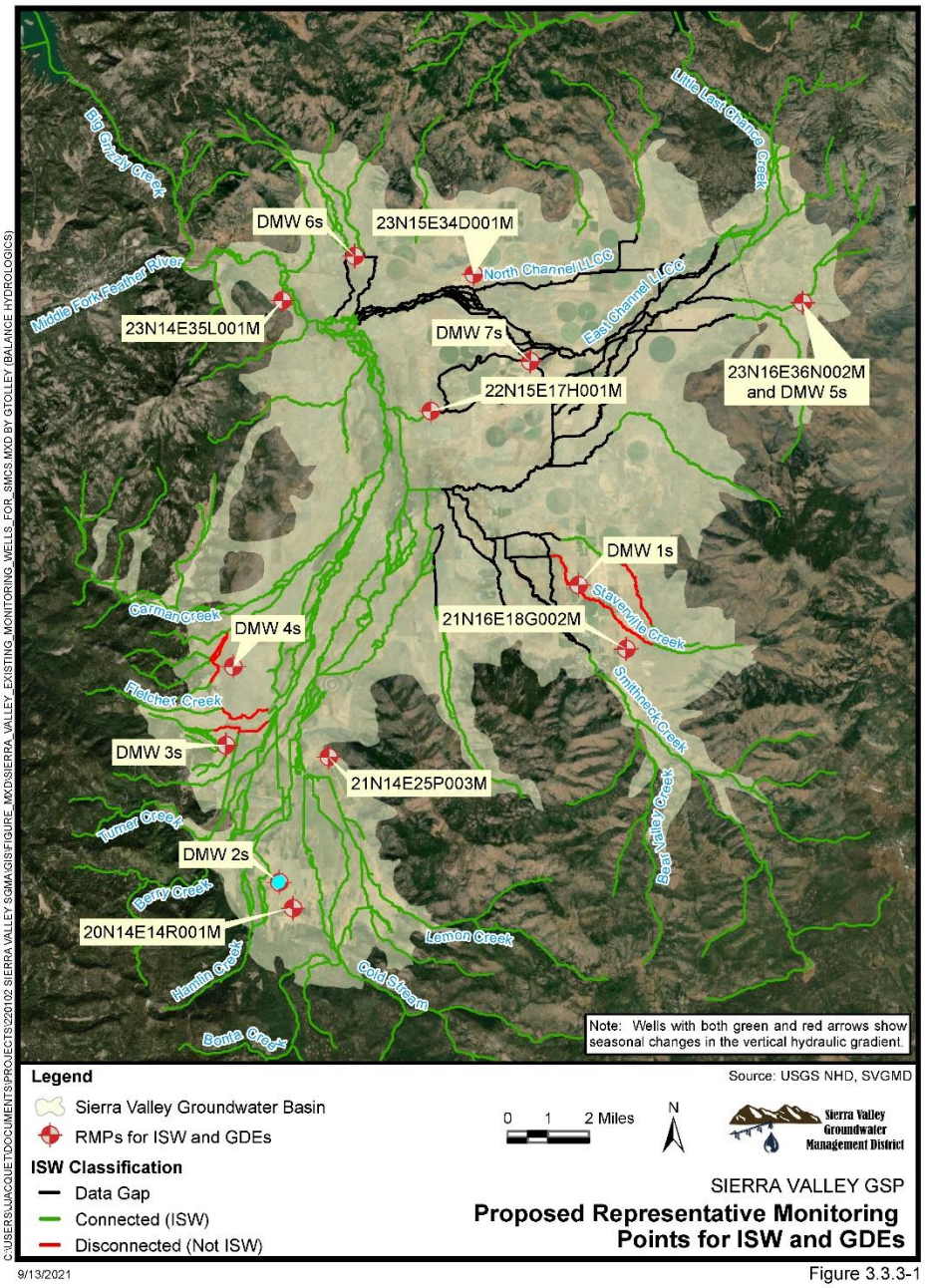
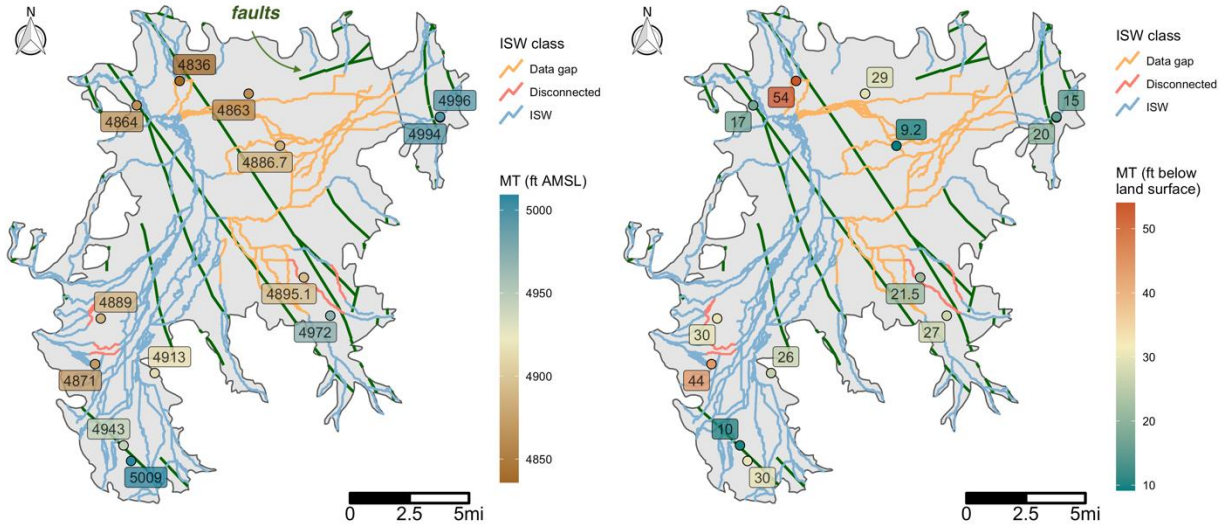


Figure 3.3.3-1

[1] Streams that were found to have water at any point and the depth to groundwater was found to be within 5 feet of the surface during 2017-2020 were classified as ISW. This indicates that some streams classified as ISW may be dry part of the year but connected at other times depending on the season.

Figure 3.3.3-2: MTs at ISW RMPs

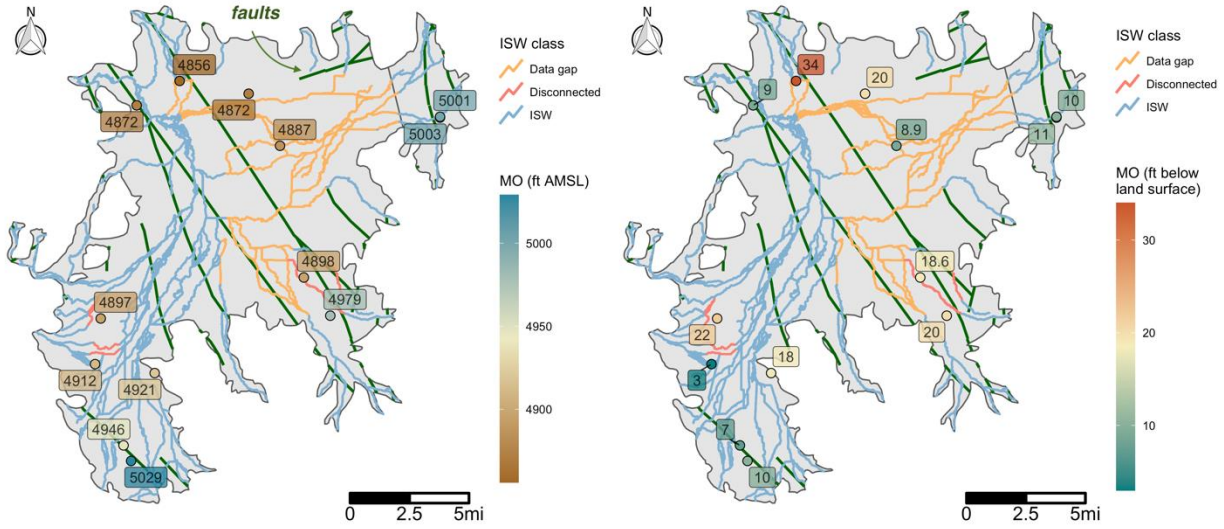


(1) In terms of elevation above mean sea level (left) and depth below land surface (right). Faults are shown as dark green lines. ISW classification (Chapter 2) is shown for data gaps (orange), disconnected reaches (red), and ISW (blue).

3.3.3.5 Measurable Objectives

Measurable Objectives for the depletion of ISW are consistent with those for Groundwater Elevation. Thus, ISW MOs are based on the mean of the current (2015 to 2021) groundwater conditions in the basin at each RMPs (Figure 3.3.1-3 and Table 3.3.3-1).

Figure 3.3.3-3: MOs at ISW RMPs



Notes:
- MOs at ISW RMPs in terms of elevation above mean sea level (left) and depth below land surface (right). Faults are shown as dark green lines. ISW classification (Chapter 2) is shown for data gaps (orange), disconnected reaches (red), and ISW (blue).

3.3.3.6 Path to Achieve Measurable Objectives

The GSA will support achievement of the measurable objectives by monitoring groundwater levels and surface water elevations at RMPs and coordinating with agencies and stakeholders within the Basin to implement projects and management actions (PMAs). The GSA will review and analyze groundwater level data to evaluate any changes in groundwater levels resulting from groundwater pumping or recharge projects in the Basin. Using monitoring data collected as part of GSP implementation (as discussed further with respect to process and timing in Chapters 4 and 5), the GSA will develop information (e.g., hydrographs) to demonstrate that projects and management actions are operating to maintain or improve groundwater level conditions in the Basin and to avoid unreasonable groundwater levels. Should groundwater levels drop to a trigger or minimum threshold, the GSAs may implement measures to address this occurrence.

3.3.3.7 Interim Milestones

Interim milestones are consistent with those set for groundwater level SMC (Section 3.3.1.6.1).

3.3.4 Degraded Groundwater Quality

Groundwater quality in the SV Subbasin is generally good and well-suited for the municipal, domestic, agricultural, and other existing and potential beneficial uses designated for groundwater in the Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin (Basin Plan). Existing groundwater quality concerns within the SV Subbasin are identified in Section 2.2.2.4, and a detailed water quality assessment is included in Appendix 2-6 of Chapter 2. Based on the water quality assessment, constituents of concern

in the SV Subbasin were deemed to include nitrate, total dissolved solids (TDS), arsenic, boron, pH, iron, manganese, and MTBE. SMCs are defined for two constituents: nitrate and TDS.

Arsenic, boron, pH, iron, and manganese are impacted significantly by natural processes and local geological conditions that are not controllable by the GSAs through groundwater management processes. Therefore, SMCs are not defined for these constituents. Additionally, as detailed in Section 2.2.2.4, MTBE has diminished substantially over the last 10 years. During the period 2016 to 2020 no exceedances of the 5 µg/L SMCL occurred, and the highest concentration measured was 0.7 µg/L. Therefore, no SMC is defined for this constituent; moreover, it is associated with contaminated sites that have dedicated monitoring and cleanup and is not likely a risk for future contamination.

In addition to conducting monitoring for the constituents with SMCs (nitrate and TDS), the GSA will monitor arsenic, boron, and pH to track any potential mobilization of elevated concentrations or exceedances of the Maximum Contaminant Levels (MCLs, provided in Section 2.2.2.4, Table 2.2.2-1). As the regional groundwater flow model becomes available, additional attention will be paid to how groundwater pumping may mobilize or influence contaminant plumes.

Water quality degradation is typically associated with increasing constituent concentration; thus, the GSAs have decided not to use the term “minimum threshold” in the context of water quality, but rather, “maximum threshold”.

3.3.4.1 Undesirable Results

An undesirable result under SGMA is defined as an impact that is determined to be significant and unreasonable, as previously defined in Section 3.1. Significant and unreasonable degradation of groundwater quality is the degradation of water quality that would impair beneficial uses of groundwater within the SV Subbasin or result in the failure to comply with groundwater regulatory thresholds including state and federal drinking water standards and Basin Plan water quality objectives. While others may be identified, undesirable results to groundwater quality that are currently of primary concern include:

- adverse groundwater quality impacts to safe drinking water,
- adverse groundwater quality impacts to irrigation water use,
- the spread of degraded water quality through old or abandoned wells; and,
- the spread of degraded groundwater quality.

Based on the State’s 1968 antidegradation policy[2], water quality degradation inconsistent with the provisions of this policy is degradation determined to be significant and unreasonable. Furthermore, the violation of water quality objectives is significant and unreasonable under the State’s antidegradation policy. The Central Valley Regional Water Quality Control Board (Regional Board) and the State Water Board are the two entities that determine if degradation is inconsistent with Resolution No. 68-16.

Federal and state water quality standards, water quality objectives defined in the Basin Plan, and the management of known and suspected contaminated sites within the Subbasin will continue to be the jurisdictional responsibility of the relevant regulatory agencies (e.g., Regional Board, State Water Board). The role of the GSAs is to provide additional local oversight of groundwater quality, collaborate with appropriate parties to implement water quality projects and

[2] State Water Resources Control Board. “Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality of Waters in California”, California, October 28, 1968.

actions, and to evaluate and monitor, as needed, water quality effects of projects and actions implemented to meet the requirements of other SMCs.

Sustainable management of groundwater quality includes maintenance of water quality within regulatory and programmatic limits while executing GSP projects and actions. To achieve this goal, the GSAs will coordinate with the regulatory agencies that are currently authorized to maintain and improve groundwater quality within the Subbasin. This includes informing the Regional Board of any issues that arise and working with the Regional Board to address potential problems. All future projects and management actions implemented by the GSAs will be evaluated and designed to avoid causing undesirable groundwater quality outcomes. Monitoring should be included as part of the applicable project or management action to allow evaluation of any impacts. Historic and current groundwater quality monitoring data and reporting efforts have been used to document baseline groundwater quality conditions in the basin. These conditions provide a baseline to compare with future groundwater quality conditions and identify any changes observed due to GSP implementation.

In addition to supporting agricultural and domestic water supply beneficial uses, groundwater also supports GDEs and instream environmental resources. These beneficial uses, among others, are protected in part by the Regional Board through the water quality objectives adopted in the Basin Plan. The constituents of concern in the Subbasin, and their associated regulatory thresholds, are listed in Section 2.2.2.4.

3.3.4.1.1 Potential Causes of Undesirable Results

Future monitored activities or conditions with potential to affect water quality may include significant changes in location and magnitude of groundwater pumping or changes to planned and incidental groundwater recharge mechanisms sufficient to change the flow and transport of subsurface contaminants. Altering the location or rate of groundwater pumping could change the direction of groundwater flow which may redirect existing contaminant plumes, or plumes that may develop in the future, thus potentially compromising ongoing remediation efforts. Similarly, recharge activities could alter hydraulic gradients which could result in the downward movement of contaminants into groundwater or move existing groundwater contaminant plumes towards supply wells.

Sources and activities that may lead to undesirable groundwater quality include industrial contamination, pesticides, sewage, animal waste, other wastewaters, and natural causes. Fertilizers and other agricultural activities can elevate concentrations of constituents such as nitrate and TDS. Wastewater, such as sewage from septic tanks and animal waste, can also elevate nitrate and TDS concentrations. Natural causes, such as local volcanic geology and soils, can elevate concentrations of arsenic, boron, iron, manganese, pH, and TDS. The GSAs cannot control and are not responsible for natural causes of groundwater contamination but are responsible for how project and management actions may impact groundwater quality (e.g., through mobilization of naturally occurring contaminants).

Groundwater quality degradation associated with known sources will be primarily managed by the Regional Board which is the entity currently overseeing such sites. In the SV Subbasin, existing contaminant sites are currently being managed, and though additional degradation is not anticipated from known sources, new sites may cause undesirable results due to constituents that, depending on the contents, may include petroleum hydrocarbons, solvents, or other contaminants.

Agricultural activities in the SV Subbasin primarily include pasture, grain and hay, and alfalfa. Alfalfa and pasture production have low risk for fertilizer-associated nitrate leaching into the groundwater (Harter et al., 2017). Grain production is rotated with alfalfa production, usually for

one year, after which alfalfa is replanted. Grain production also does not pose a significant nitrate-leaching risk. Animal farming, a common source of nitrate pollution, is present but not at stocking densities of major concern. Changes or additions to land uses may require a re-examination of groundwater contamination risk. The Subbasin is not currently categorized as a priority subbasin under the CV-SALTS program managed by the Regional Board.

3.3.4.2 Effects on Beneficial Uses and Users

Potential adverse water quality impacts to the beneficial uses of groundwater in the Subbasin are identified by elevated or increasing concentrations of constituents of concern, and the potential local or regional effects that degraded water quality can have on such beneficial uses. Potential adverse water quality impacts to the beneficial uses of groundwater in the Subbasin are identified by elevated or increasing concentrations of constituents of concern, and the potential local or regional effects that degraded water quality can have on such beneficial uses.

The potential impact of poor groundwater quality on major classes of beneficial users is now discussed:

- **Municipal Drinking Water Users:** Under California law, agencies that provide drinking water are required to routinely sample groundwater wells and compare the results to state and federal drinking water standards for individual constituents. Groundwater quality that does not meet state drinking water standards may render the water unusable or may require additional treatment, carried out by the agency. Impacted municipal supply wells may potentially be taken offline until a solution is found, depending on the constituents detected and the configuration of the municipal system in question. This reduces the reliability of the overall water supply system during the rehabilitation period.
- **Rural and/or Agricultural Residential Drinking Water Users:** Residential structures not located within the service areas of a local municipal water agency or private water supplier will typically obtain water supply from private domestic groundwater wells. Unless the number of connections supplied by the well is sufficiently large, the well will not have a regulatory groundwater quality testing requirement. Thus, groundwater quality at such wells may be unknown unless the landowner has initiated testing and shared the data with other entities. Degraded water quality in such wells can lead to rural residential groundwater use that poses health consequences, does not meet potable water standards, and results in the need for installation of new or modified domestic wells, and/or well-head treatment that provides acceptable quality groundwater.
- **Agricultural Users:** Irrigation water quality bears importantly on crop production and has a variable impact on agriculture due to different crop sensitivities. Impacts from poor water quality (e.g., elevated TDS) may include declines in crop yields, crop damage, and alterations to the crops that can be grown in the area (e.g., depending on salt tolerance).
- **Environmental Uses:** In gaining streams, poor quality groundwater may result in contaminant migration which may impact groundwater-dependent ecosystems or instream environments, and the species therein.

3.3.4.3 Relationship to Other Sustainability Indicators

Groundwater quality does not typically influence other sustainability indicators, which are more influenced by groundwater *quantity*. However, in some circumstances, groundwater quality can be affected by changes in groundwater levels and reductions in groundwater storage because activities that alter groundwater flow patterns can also mobilize subsurface contaminants.

- **Groundwater Levels:** In some instances, declining groundwater levels can potentially lead to increased concentrations of constituents of concern in groundwater and may alter the existing hydraulic gradient, which can result in the movement of contaminated groundwater plumes. Changes in groundwater levels may also mobilize some contaminants that may be present in unsaturated soils. In such cases, the MTs established for groundwater quality may influence groundwater level minimum thresholds by limiting the location or number of projects (e.g., groundwater recharge), to avoid degradation of groundwater quality.
- **Groundwater Storage:** Groundwater quality is not a primary driver of groundwater use in the basin and is therefore not directly related to groundwater storage. The groundwater quality MTs will not cause groundwater pumping to exceed the basin sustainability yield[3] and therefore will not cause exceedances of the groundwater storage minimum thresholds.
- **Depletion of Interconnected Surface Waters:** The groundwater quality MT does not promote additional pumping or lower groundwater levels near interconnected surface waters. The groundwater quality MT does not negatively affect interconnected surface waters.
- **Seawater Intrusion:** This sustainability indicator is not applicable in the SV Subbasin.
- **Subsidence:** The groundwater quality MT does not promote additional pumping or lower groundwater levels and therefore does not interfere with subsidence MTs. In some cases, and depending on the basin's subsurface composition, extreme land subsidence (e.g., similar to rates in California's Central Valley) can lead to elevated arsenic concentrations (Smith et al., 2018), although this effect is not expected in the SV Subbasin because the basin pumping is moderate and subsurface arsenic-rich clays are not abundant.

3.3.4.4 Information and Methodology Used to Establish Maximum Thresholds and Measurable Objectives

The two constituents of concern (nitrate and TDS) for which SMCs were considered were specifically selected due to stakeholder input and prevalence as a groundwater contaminant in California. Constituents of concern were identified using current and historical groundwater quality data and may be reevaluated during future GSP updates. In establishing MTs for groundwater quality, the following information was considered:

- Feedback about water quality concerns from stakeholders.
- An assessment of available historical and current groundwater quality data from wells in the Subbasin.
- An assessment of historical compliance with federal and state drinking water quality standards and water quality objectives.
- An assessment of trends in groundwater quality at selected wells with adequate data to perform the assessment.
- Information regarding sources, control options and regulatory jurisdiction pertaining to constituents of concern.

[3] This will be confirmed by the integrated hydrologic model and updated as needed.

- Input from stakeholders resulting from the consideration of the above information in the form of recommendations regarding MTs and associated management actions.

The historical and current groundwater quality data used to establish groundwater quality MTs are discussed in Section 2.2.2.4. Based on a review of the data, applicable water quality regulations, Subbasin water quality needs, and information from stakeholders, the GSAs determined that state drinking water standards (MCLs and Water Quality Objectives) are appropriate to define MTs for groundwater quality (Table 3.3.4-1). Hence, MTs for groundwater quality are set to the Title 22 primary MCL for nitrate (10 mg/L), and the Title 22 secondary MCL for TDS (500 mg/L). These MTs protect and maintain groundwater quality for existing and potential beneficial uses and users.

New constituents of concern may be added with changing conditions and as new information becomes available.

3.3.4.5 Maximum Thresholds

As previously stated, based on a comprehensive water quality evaluation of historic and current data and reports, SMCs were developed for two constituents of concern in the Subbasin: nitrate and TDS. Arsenic, boron, iron, manganese, and pH are considered constituents of concern in the Subbasin but were not assigned SMCs because they are naturally occurring; these constituents will be monitored as part of the GSP and Basin Plan to track any potential mobilization of elevated concentrations. MTBE is identified as a potential constituent of concern; however, no SMC is defined as it is associated with contaminated sites with dedicated monitoring and cleanup.

The selected MTs for the concentration of TDS and nitrate, and their associated regulatory thresholds, are listed in Table 3.3.4-1. Water quality MTs will be evaluated at wells, or RMPs, that are selected for inclusion in the water quality monitoring network. As shown, there is a MT for the measured concentration of nitrate and TDS at each RMP (a concentration MT), and a MT for the number of RMPs in the network allowed to exceed the concentration MT (a network MT). Importantly, ***Undesirable Results for groundwater quality occur when any water quality RMP exceeds concentration MTs for nitrate or TDS at a number of RMPs greater than the number of RMPs that show exceedances at the time of writing (2021-09-01)***. Exceedances already exist at some RMPs, and these exceedances will likely continue into the future. The MT for the number of allowed exceedance RMPs is therefore equal to the current number of RMPs with exceedances (none for nitrate, and three for TDS). The identification of Undesirable Results is therefore based on the *number* of RMPs to have exceedances for each nitrate and TDS, not necessarily the *same* RMPs. As denoted in Table 3.3.4-1 and Table 3.3.4-2 there are no RMPs with exceedances of the nitrate MT, and three RMPs with exceedances of the TDS MT. For example, MTs for nitrate and TDS are zero and three RMPs respectively, and an Undesirable Result would occur if one RMP showed a nitrate exceedance, or if four RMPs showed a TDS exceedance.

An average of water quality concentrations will be used for RMPs that are measured more than once a year. As MTs are currently based on only existing wells, the water quality monitoring network will be reassessed every five years to identify any new wells that should be added as RMPs. There will also be a review of wells and removal of those that are no longer in operation, not meeting objectives or have been replaced with an alternative location that is more representative. If future water quality data collected from the network results in exceedances of MCLs and SMCLs of additional constituents, MTs and MOs will be developed for these additional constituents.

As described in Section 3.4.1.3, RMPs for inclusion in the groundwater quality monitoring network are not currently finalized for this GSP due to data gaps in well construction information, and inadequate spatial coverage. However, an initial analysis of water quality data for the proposed network was conducted to establish the interim MTs and MOs that will be updated once the data gaps are filled and a more complete assessment of this monitoring network can be established.

3.3.4.5.1 Triggers

The GSAs will use concentrations of the identified constituents of concern (nitrate and TDS) below the MT as triggers for action to proactively avoid the occurrence of undesirable results. Triggers are warning concentrations defined to indicate that groundwater quality degradation may be occurring, and that additional attention or action may be needed to avoid an increase to the MT. If the triggers are exceeded, the GSAs will conduct an investigation and may use management actions. As listed in Table 3.3.4-1 the trigger value for TDS is 55% of the Title 22 Secondary MCL (275 mg/L), while the trigger values for nitrate are half and 90% of the Title 22 MCL (5 mg/L and 9 mg/L, respectively).

3.3.4.5.2 Method for Quantitative Measurement of Maximum Thresholds

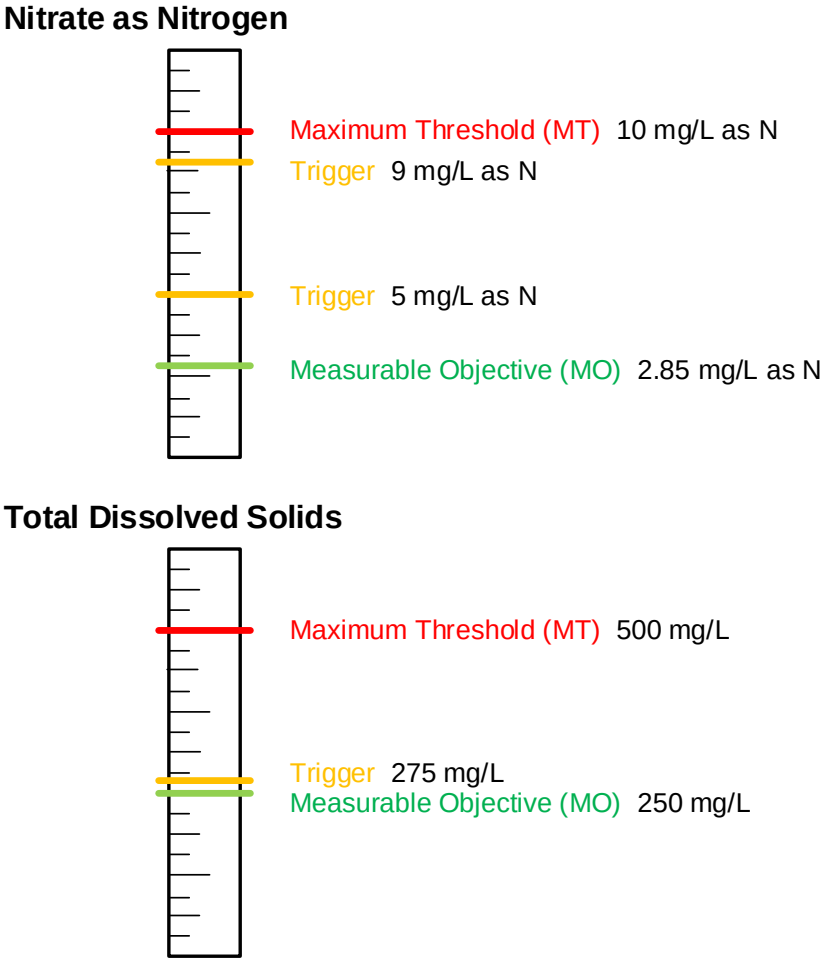
Groundwater quality will be measured at RMPs as discussed in Section 3.4.1.3. Statistical evaluation of groundwater quality data obtained from the monitoring network will be performed. The MTs for constituents of concern are shown in Table 3.3.4-1 and Figure 3.3.4-1.

, which show “rulers” for each of the two identified constituents of concern, with the associated MTs, MOs, and triggers. MOs are detailed in the following subsection.

Table 3.3.4-1: Constituents of Concern and the Associated Maximum Thresholds and Triggers

Constituent	Regulatory Threshold	Maximum Threshold (MT), Concentration	Maximum Threshold, Number of RMPs Exceeding MT Concentration
Nitrate as Nitrogen	10 mg/L (Primary MCL – Title 22)	*5 mg/L, trigger only*	0
		9 mg/L, trigger only	
		10 mg/L, MT	
Total Dissolved Solids (TDS)	500 mg/L (Secondary MCL – Title 22)	*275 mg/L, trigger only*	3
		500 mg/L, MT	

Figure 3.3.4-1: Degraded Water Quality Rulers for the Constituents of Concern in the Sierra Valley Subbasin



(1) Measurable objectives are provided as an example and are specific to each well in the monitoring network.

3.3.4.6 Measurable Objectives

MOs are defined under SGMA as described previously in Section 3.1 and represent the desired condition to be achieved to satisfy each Sustainability Indicator. Within the Subbasin, the MOs for water quality are established to provide an indication of desired water quality at levels that are sufficiently protective of beneficial uses and users. MOs differ from triggers in that they define concentrations that will allow the Subbasin to achieve its sustainability goal within 20 years of Plan implementation. For nitrate and TDS, MOs are defined on a well-specific basis, with consideration for historical water quality data.

3.3.4.6.1 Description of Measurable Objectives

The MO for RMPs where concentrations have historically been below the MTs for water quality is the highest measured concentration during the period 1990 to July 2020. For RMPs where the concentration has historically exceeded or equaled 90% of the MT, the MO is instead 90% of the MT concentration. For newly installed or newly monitored RMPs, the MO will be preliminarily set to the first measured concentration until more data is available to set a more informed SMC. As with RMPs that have historically been monitored, if this concentration

exceeds or equals 90% of the MT, the MO will instead be 90% of the MT. In instances where the highest measured concentration of nitrate is a non-detect value, the MO is defined as 0.05 mg/L.

Specifically, for nitrate and TDS, the MO for the groundwater monitoring network is for individual RMPs not to exceed the MO for two consecutive years. The MOs for nitrate and TDS at proposed RMPs within the SV Subbasin are listed in Table 3.3.4-2.

3.3.4.7 Path to Achieve Measurable Objectives

The GSAs will support the protection of groundwater quality by monitoring groundwater quality conditions and coordinating with the relevant regulatory agencies that work to maintain groundwater quality in the Subbasin. All future projects and management actions will be implemented by the GSAs with the intent to comply with state and federal water quality standards and Basin Plan water quality objectives and will be designed to maintain groundwater quality for all uses and users and avoid causing unreasonable groundwater quality degradation. The GSAs will review and analyze groundwater monitoring data as part of GSP implementation to evaluate any changes in groundwater quality resulting from groundwater pumping or recharge projects (anthropogenic recharge) in the Subbasin. The need for additional studies on groundwater quality will be assessed throughout GSP implementation. The GSAs may identify data gaps, seek funding, and help to implement additional studies.

Using monitoring data collected as part of project implementation, the GSAs will develop information (e.g., time-series plots of water quality constituents) to demonstrate that projects and management actions are operating to maintain or improve groundwater quality conditions in the Subbasin and to avoid unreasonable groundwater quality degradation. Should the concentration of a constituent of concern increase above its MO or trigger value as the result of GSAs project implementation, the GSAs will implement measures to address this occurrence. This process is illustrated in Figure 3.3.4-2, and depicts the high-level decision making that goes into developing SMCs, monitoring to determine if criteria are met, and actions to be taken based on monitoring results

If a degraded water quality trigger is exceeded, the GSAs will investigate the cause and source and implement management actions as appropriate. Where the cause is known, projects and management actions along with stakeholder education and outreach will be implemented. Examples of possible GSAs actions include notification and outreach to impacted stakeholders, alternative placement of groundwater recharge projects, and coordination with the appropriate water quality regulation agency. Projects and management actions are presented in further detail in Chapter 4.

Exceedances of nitrate, and TDS will be referred to the Regional Board. Where the cause of an exceedance is unknown, the GSAs may choose to conduct additional or more frequent monitoring.

Table 3.3.4-2: Potential Groundwater Quality Representative Monitoring Points and Associated Measurable Objectives

Well Description	Well ID	Measurable Objectives (mg/L)		Notes
		Nitrate as Nitrogen	TDS	
Potential (GAMA)	21N14E15J001M	0.05[a]	269	
Potential (GAMA)	21N14E32G001M	0.07	172	
Potential (GAMA)	21N15E05D001M	0.05[a]	450[b]	
Potential (GAMA)	22N15E21K001M	0.05[a]	450[b]	
Potential (GAMA)	22N15E35H001M	0.05[a]	175	
Potential (GAMA)	3200020-001	0.13	N/A	No historical monitoring of TDS, measurable objectives to be defined after monitoring begins
Potential (GAMA)	3200138-001	1.4	252	
Potential (GAMA)	3200193-001	0.4	450[b]	
Potential (GAMA)	3200618-002	2.85	190	
Potential (GAMA)	4600003-001	0.5	N/A	No historical monitoring of TDS, measurable objectives to be defined after monitoring begins
Potential (GAMA)	3200171-001	0.5	N/A	No historical monitoring of TDS, measurable objectives to be defined after monitoring begins
Potential (GAMA)	4600009-002	1.0	197	
Potential (GAMA)	4600037-001	0.5	N/A	No historical monitoring of TDS, measurable objectives to be defined after monitoring begins
Potential (GAMA)	4600083-001	0.75	N/A	No historical monitoring of TDS, measurable objectives to be defined after monitoring begins
Potential (GAMA)	4600092-001	0.5	169	
Potential (GAMA)	4610001-002	0.5	200	
Potential (GAMA)	4610001-004	0.5	234	
Community Volunteer Wells (8 potential wells)	N/A	N/A	N/A	Measurable objectives to be defined after monitoring begins
DWR New Installation	N/A	N/A	N/A	Measurable objectives to be defined after monitoring begins
5x additional GSP Monitoring Wells to Cover Spatial Gaps	N/A	N/A	N/A	Measurable objectives to be defined after monitoring begins; wells selected from existing community volunteer wells

[a] N measurable objective set to 0.05 mg/L due to no detected concentrations in historical results

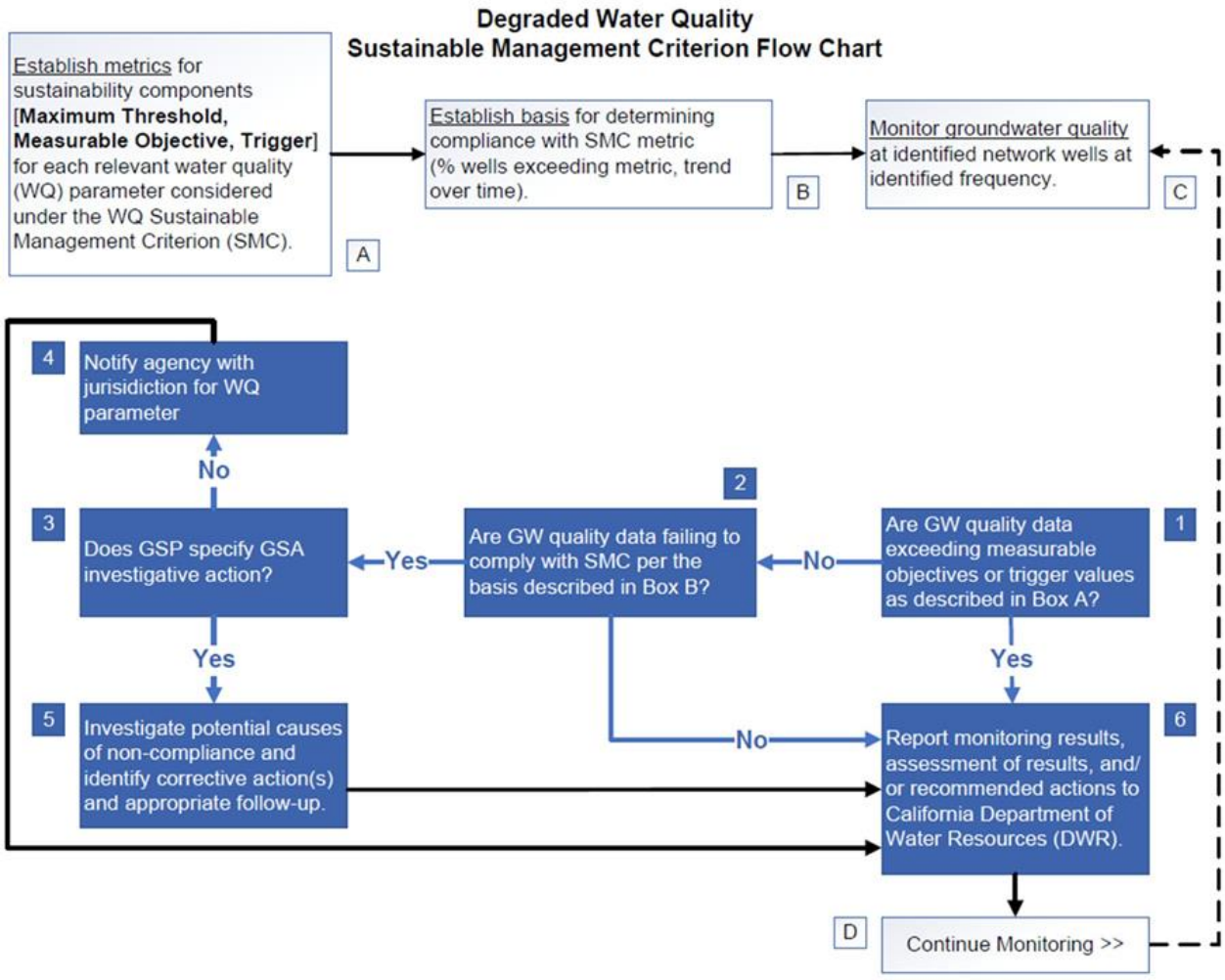
[b] TDS measurable objective set to 90% of maximum threshold due to historical exceedance of this value

N/A = the well has not been monitored, and therefore historical monitoring data is not yet available

3.3.4.7.1 Interim Milestones

As existing groundwater quality data indicate that groundwater in the Subbasin generally meets applicable state and federal water quality standards for nitrate and TDS, the objective is to maintain existing groundwater quality. Interim milestones are therefore set to maintain groundwater quality equivalent to the MOs established for nitrate and TDS, with the goal of maintaining water quality within the historical range of observed values.

Figure 3.3.4-2: Degraded Water Quality Sustainable Management Criteria Flow Chart



The flow chart in Figure 3.3.4-2 depicts the high-level decision-making that goes into developing SMCs, monitoring to determine if criteria are met, and actions to be taken based on monitoring results.

3.3.5 Land Subsidence

Sierra Valley has experienced land subsidence in the past and some land subsidence continues into the present day. Subsidence has occurred in varying areas in Sierra Valley over time and has overlapped with areas of significant groundwater pumping. The Sierra Valley subsurface geology is typical of Californian mountain valleys, and predominantly composed of eroded, alluvial, sedimentary deposits (e.g., clay, silt, sand, and gravel). The clay deposits are

particularly susceptible to inelastic compression resulting in land subsidence when significant levels of drawdown have occurred.

Average annual subsidence in the Subbasin has been estimated by various studies (Table 3.3.5-1). The first recorded account of subsidence in Sierra Valley was by the California Department of Water Resources (DWR, 1983). DWR (1983) and Plumas County Road Department surveys reported localized groundwater level decline and corresponding inelastic subsidence of about 1 to 2 feet between 1960 and 1983 (i.e., an effective annual subsidence rate of about 0.05 to 0.1+ feet/year). Subsidence from 1983 to 2012 is unknown as records during this time are not available. During the severe 2012 to 2016 drought, the California Department of Transportation (CalTrans, 2016) surveyed areas of heavy groundwater pumping and water level drawdown, and estimated subsidence of 0.3 to 1.9 feet (i.e., approximately 0.08 to 0.48 feet/year). These results agree with another estimate made between 2015 and 2016: satellite-based Interferometric Synthetic Aperture Radar (InSAR) data from NASA JPL suggested subsidence in the northeastern Sierra Valley of up to 0.5 feet/year.[4] From March of 2015 to November 2019, the same NASA JPL InSAR data suggests up to 1.2 feet of subsidence (i.e., about 0.3 feet/year). InSAR reported accuracy is 18mm (or 0.06 feet) at 95% confidence. During the same period, DWR/TRE by Altamira (2021), estimated 0.15 ± 0.1 feet/year of subsidence – about half the land subsidence estimated by NASA JPL. In April of 2021, CalTrans staff observed cracks with 1 inch of vertical subsidence, and extension of 1.5 inches in the northern region of the Subbasin on State Route 70 (CalTrans, 2021). Although these cracks were observed to appear about five years ago, there is no associated subsidence rate as CalTrans maintenance has applied patches to the roadway surface multiple times during this period.

Table 3.3.5-1: Estimated Average Annual Subsidence in the Subbasin as Measured by Various Studies

Study or Entity Reporting Subsidence	Date Range	Average Annual Subsidence (estimate)
DWR (1983) and Plumas County Road Department	1960 – 1983	0.05 to >0.1 feet/year
CalTrans	2012 – 2016	0.08 to 0.48 feet/year
NASA JPL, InSAR	2015 - 2016	Up to 0.5 feet/year
NASA JPL, InSAR	March 2015 to November 2019	0.3 feet/year
DWR/TRE by Altamira (2020)	March 2015 to November 2019	0.15 to >0.1 feet/year

3.3.5.1 Undesirable Results (Reg. § 354.26)

An undesirable result occurs when subsidence substantially interferes with beneficial uses of groundwater and surface land uses. Subsidence occurs when excessive groundwater pumping dewaters typically fine-grained sediments (e.g., clays and silts) causing them to compact, either temporarily (elastic subsidence) or permanently (inelastic subsidence). Clay and silt sediments are only moderately present in the eastern side of the Subbasin. Areas of differential subsidence, where subsidence transitions from little to moderate over a short lateral distance,

[4] Information available from the SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub (last accessed on December 15, 2021).

are of particular concern because they can impact infrastructure along this transition zone. Differential subsidence prone areas include zones along faults where drawdown effects are localized to one side of the fault, and zones of rapid transition from fine to coarse-grained sediments, such as near alluvial fan transitions to valley floor sediments. Specific examples of undesirable results include substantial interference with land use, and significant damage to critical infrastructure, such as building foundations, roadways, railroads, canals, pipes, and water conveyance.

3.3.5.2 Effects on Beneficial Uses and Users

Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results related to subsidence could be:

- Financial impacts to all groundwater users and well owners for mitigation costs and supplemental supplies (including de minimis groundwater users and members of disadvantaged communities).
- Impacts to shallow wells (<100 ft deep) due to potentially degraded water quality, requiring well treatment or abandonment.
- Land subsidence causing detrimental impacts to infrastructure (sinking roads, inefficient surface water delivery), private structures, and/or land uses.
- Irreversible losses to aquifer storage permeability and storage capacity.
- Damage to wells (subsidence can cause wellhead damage or casing failure).

3.3.5.3 Relationship to Other Sustainability Indicators

Land subsidence does not typically influence other sustainability indicators but is rather influenced directly by chronic lowering of groundwater levels and chronic reduction in groundwater storage. However, recent scientific research suggests that land subsidence in low-permeability silts and clays may mobilize arsenic (Smith et al, 2018).

- **Groundwater Levels:** In the Sierra Valley, groundwater levels are primarily controlled by pumping and recharge. Groundwater level decline can remove groundwater from saturated pore spaces – this depressurizes sediments causing them to collapse, which in turn causes the land surface to subside. Heterogeneous geology and different patterns of groundwater pumping across space drive differential groundwater level decline across and throughout the Sierra Valley aquifer-aquitard system. Land subsidence is influenced by differential groundwater decline and is therefore also heterogeneous across the landscape. Depending on the sediments present and magnitude of subsidence, some subsidence is reversible (elastic) following an increase in groundwater level, whereas at other times subsidence is irreversible (inelastic) and results in a permanent loss of groundwater storage capacity. It is common for both inelastic and elastic subsidence to be simultaneously present, but difficult in practice to estimate the relative contribution of each because doing so requires extensive knowledge of hard-to-measure subsurface geology.
- **Groundwater Storage:** Groundwater storage decline drives groundwater level decline, which can cause land subsidence if the storage is extracted from sediments prone to subsidence (i.e., typically fine-grained clays and silts).
- **Depletion of Interconnected Surface Waters:** A direct connection to land subsidence is less clear for ISW depletion. ISW losing streams that substantially recharge

subsurface aquifers may buffer against land subsidence due to nearby extraction, although this contribution to the groundwater budget is localized to ISW areas and likely less than other combined sources of recharge to the basin-like irrigation return flow and subsurface inflow.

- **Seawater Intrusion:** This sustainability indicator is not applicable in the SV Subbasin.
- **Groundwater Quality:** Smith et al (2018) demonstrated a relationship between land subsidence and arsenic-leeching from clays and silts in the Central Valley. The sedimentary, clastic, alluvial geology of Smith's study site are similar to geologic conditions in the Sierra Valley, thus is it reasonable to monitor Arsenic concentrations near anticipated zones of land subsidence.

By managing groundwater pumping and avoiding chronic lowering of groundwater levels (Section 3.3.1), land subsidence, and possible water quality impacts resulting from such subsidence will also be mitigated.

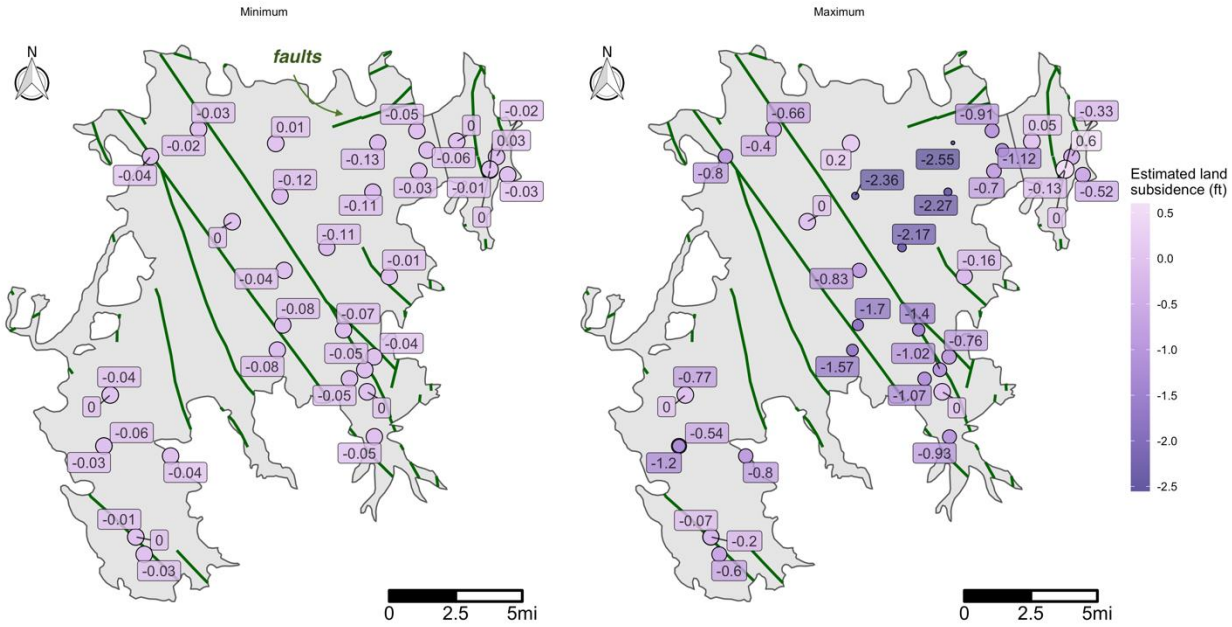
3.3.5.4 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives (Reg. § 354.30)

Although InSAR satellite-based measures of land subsidence are available for the SV Subbasin, these data are relatively recent, do not show long-term trends, and indicate total subsidence which represent a combination of elastic (reversible) subsidence and inelastic (irreversible) subsidence. Furthermore, ground-based data do not conclusively determine the extent of long-term, inelastic subsidence. As such, adequate, Subbasin-specific information correlating the detailed, long-term connection between land subsidence and groundwater levels is lacking.

Poland and Davis (1969) estimated the land subsidence to groundwater level decline ratio in the Sierra Valley as approximately 0.01 to 0.2 feet of subsidence per foot of groundwater level decline. Assuming a worst-case scenario in which 100% of RMPs simultaneously reach MTs, maximum potential groundwater level declines past historic lows were calculated. Next, the potential range of land subsidence for this worst-case scenario was calculated using the ratio provided by Poland and Davis (1969), and ranges from 0 to 2.55 feet depending on the location in the basin (Figure 3.3.5-1). Larger distance between recent historic lows (around fall 2015) and groundwater level MTs leads to increased estimated land subsidence. At this time, significant and unreasonable impacts to beneficial uses and users are not anticipated under these land subsidence estimates and hence, the avoidance of land subsidence is achieved via management of groundwater levels above MTs (Figure 3.3.5-1). Importantly, due to the relatively long-time scales on which land subsidence occurs, land subsidence should be monitored, used to validate the work of Poland and Davis (1969), and adaptively managed.

The GSAs will monitor subsidence annually using InSAR data. Four subsidence monument sites will be installed in areas prone to subsidence (i.e., northeast portion of Sierra Valley) and surveyed every 5 years. Additional surveys will be conducted if InSAR subsidence increases by 50% of the average annual subsidence from baseline period (2015-2019). The GSAs may at their discretion elect to survey monuments more frequently, pending available funds. Impacts to arsenic in groundwater, and damage to physical infrastructure is of particular concern in the basin and will also be monitored.

Figure 3.3.5-1: Minimum and Maximum Range of Land Subsidence Implied by the Change in Groundwater Level between Recent Historic Lows Groundwater Level MTs



Notes:
- Historic Lows are from Fall 2015.

Currently, groundwater levels and the correlations established by Poland and Davis (1969) offer the best available information to estimate potential land subsidence for the Subbasin. For the first five years, the GSP will use groundwater elevation proxy for land subsidence. Within the first five years of plan implementation, effort will be made to demonstrate more robust correlations with different subsidence data types, and an adaptive methodology for assessing land subsidence will be developed to supplement the groundwater level proxy. This will incorporate groundwater levels, ground-based elevation surveys, and satellite-based InSAR data.

3.3.5.5 Minimum Thresholds (Reg. § 354.28)

The Sierra Valley basin lacks detailed information regarding aquifer lithology, aquitard units, and long-term land-subsidence trends. Satellite-based InSAR data are useful for assessing total land subsidence, these data have only been processed for 2015-2019. It is assumed that InSAR data will continue to be collected from agencies operating satellites during the implementation period by DWR. These measurements will be coupled with groundwater elevation and ground-based survey data to inform adaptive management and the development of more refined MTs in the next 5-year Plan update.

23 CCR § 354.28(d) states: “An Agency may establish a representative MT for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual MTs as supported by adequate evidence.”

This GSP adopts groundwater level as a proxy for changes in land subsidence, using evidence of a linear and physical relationship between land subsidence and groundwater level change

documented by Poland and Davis (1969) and detailed in Section 3.3.5.4. Groundwater levels are a useful "lever" to control land subsidence and estimated worst-case land subsidence (Figure 3.3.5-1) is not determined to be significant and unreasonable. Hence, managing groundwater levels above MTs also protects against significant and unreasonable land subsidence. Thus, the MT for land subsidence for this GSP is the same as the MT for groundwater levels as detailed in Section 3.3.1.4. There are currently no other state, federal, or local standards that relate to this sustainability indicator in the Subbasin.

3.3.5.6 Measurable Objectives

Using groundwater level as a proxy, the MOs, and IMs for land subsidence for this GSP are identical to groundwater level MOs and IMs, as detailed in Section 3.3.1.4. Protecting against chronic lowering of groundwater levels will directly protect against land subsidence.

3.3.5.7 Path to Achieve Measurable Objectives

GSAs will continue to monitor groundwater elevation and combine these data with InSAR and ground-based elevation surveys to measure progress towards MOs and to improve understanding of land subsidence in the basin. GSAs will coordinate with the relevant stakeholders to determine impacts to beneficial users and uses that may be impacted by land subsidence and take necessary actions to adaptively manage groundwater pumping and avoid significant and unreasonable impacts. Projects and management actions will be implemented and prioritized as described in Chapter 4. Beyond these actions, the GSAs will approach groundwater level management as described in Section 3.3.1.6.

3.4 Monitoring Networks (Reg. § 354.26)

Monitoring is fundamental to measure progress towards Plan management goals. The monitoring networks described in this subsection support data collection to monitor the SV Subbasin's sustainability indicators which include the lowering of groundwater levels, reduction of groundwater storage, depletion of interconnected surface water, degradation of water quality, and land subsidence. Monitoring data will be used to track spatial and temporal changes in groundwater conditions that may result from projects and actions that are part of GSP implementation.

Per 23 CCR § 354.34, monitoring networks should be designed to:

- Demonstrate progress towards achieving MOs described in the Plan,
- Monitor impacts to the beneficial uses or users of groundwater,
- Monitor changes in groundwater conditions relative to MOs and minimum or maximum thresholds; and,
- Quantify annual changes in water budget components.

The monitoring network will have sufficient spatial density and temporal resolution to evaluate the effects and effectiveness of plan implementation and represent seasonal, short-term, and long-term trends in groundwater conditions and related surface conditions. For the purposes of this Plan, short-term is considered a time span of 1 to 5 years, and long-term is considered to be 5 to 20 years. The spatial densities and frequency of data measurement are specific to the monitoring objectives, parameter measured, degree of groundwater use, and SV Subbasin conditions.

Although "shallow" and "deep" aquifer terms have been historically used by DWR (the zone between "shallow" and "deep" roughly corresponding to around 300 feet), analysis of data from

drilling records, water level response, groundwater chemistry and groundwater temperature studies do not necessarily indicate two distinctive aquifers throughout the groundwater Subbasin (see Section 2.2.1.6). Regardless, monitoring wells with adequate vertical distribution are selected as RMPs to capture “shallow” and “deep” zones of the production aquifer.

This section describes the monitoring networks (existing and potential expansion) that will be used to track progress and characterize the subbasin under the GSP. The process and costs associated with network maintenance and expansion are described in Chapter 4, Projects and Management Actions in section 4.2.2.

Network Enrollment and Expansion

Except for streamflow, land subsidence, and ISW depletion due to groundwater pumping, monitoring is performed using networks of groundwater monitoring wells and surface water monitoring stations. In the case of land subsidence and ISW depletion, although other monitoring and assessment approaches exist (i.e., InSAR and elevation surveys; modeled ISW depletion rates and volumes), groundwater level will also be used as a proxy. Thus, groundwater monitoring wells are critical.

Some groundwater wells will be monitored for water level, some for water quality, and some will be monitored for both. Each monitoring well in the network will be modified throughout GSP implementation as necessary to address monitoring objectives and support projects and management actions. Expansion of networks will involve identifying existing wells in the Subbasin that can potentially be added to the network, applying selection criteria, and ultimately approving the well for inclusion.

Evaluation of the monitoring networks will be conducted at least every 5 years to determine whether additional wells are required to achieve sufficient spatial density, whether wells are representative of Subbasin conditions, and whether wells cover key areas identified by stakeholders. Prior to enrolling wells into the GSA’s monitoring network, wells are evaluated using the following selection criteria: well location, monitoring history, well information, and well access. These criteria are discussed below.

Well Location

Objectives for network design include sufficient coverage, density, and distribution of wells to monitor groundwater storage, flow directions, and hydraulic gradients. Where monitoring wells are not present, statistical methods are used to aid in extrapolating data from existing monitoring sites to the entire Subbasin. Beyond capturing general hydrologic trends in the Subbasin, it is important to monitor planned GSP projects and management actions, and locations where existing or legacy operations may threaten groundwater quality for beneficial uses and users.

Monitoring History

Wells with a long monitoring record provide valuable historical groundwater level and water quality data and enable the assessment of long-term trends. Such wells are preferentially selected over wells with limited monitoring data.

Well Information

Well construction information, including well depth and screened interval, are essential to interpret monitoring results and ensure adequate vertical monitoring coverage of the aquifer. At a minimum, selected wells should have well depth information. Although the perforated interval is not available for all wells, it is essential to include these wells as potential wells to provide adequate lateral coverage. For these wells, the GSAs will work to collect well information with

site surveys during the first year of GSP implementation as outlined in Chapter 5 (GSP Implementation).

Well Access/Agency Support

Ability to gain access to a well to collect samples at the required frequency is critical. When necessary, the GSAs will coordinate with existing programs to develop an agreement for data collection responsibilities, monitoring protocols, and data reporting and sharing. For existing monitoring programs implemented by agencies, monitoring will be conducted by agency program staff or their contractors. For groundwater elevation monitoring, a subset of wells included in the California Statewide Groundwater Elevation Monitoring (CASGEM) Program for Plumas County and Sierra County was selected and incorporated into the GSP monitoring network administered by the GSA. For water quality monitoring, samples will be analyzed at contracted analytical laboratories.

3.4.1 Monitoring Networks in the Subbasin

Based on the SV Subbasin's historical and present-day conditions (Section 2.2.2), the sustainability indicators that will be monitored include groundwater level and storage, interconnected surface water, groundwater quality, and land subsidence. Seawater intrusion is not found in the Subbasin and is therefore not monitored (23 CCR § 354.34(j)). Existing and planned spatial density, and data collection frequency is now described for each monitoring network. Descriptions, assessments, and plans for future improvement of the well monitoring networks, along with protocols for data collection and monitoring are addressed for each sustainability indicator in its corresponding subsection.

As listed in Table 3.4.1-1 there are four monitoring networks: a water level monitoring network, a streamflow depletion monitoring network, a land subsidence monitoring system, and water quality monitoring network (groundwater storage is monitored using the same wells included in the groundwater elevation monitoring network). The water level and water quality networks are independent but utilize some of the same wells. The land subsidence monitoring system utilizes satellite remote sensing along with land-based survey monuments, and the streamflow depletion monitoring network utilizes wells, streamflow gauges, and integrated hydrological model estimates adapted throughout the implementation period based on available data and tools.

Table 3.4.1-1: Summary of Monitoring Networks, Metrics, and Number of Sites for Sustainability Indicators

Sustainability Indicator [1]	Metric	Number of RMPs in Current Network
Chronic Lowering of Groundwater Levels [2]	Groundwater level	36
Reduction of Groundwater Storage	Groundwater level as proxy; volume of water per year, computed by the forthcoming regional groundwater flow model	Uses chronic lowering of groundwater levels network
Stream Depletion due to Groundwater Pumping	Groundwater level as proxy; and ISW depletion rate and volume computed by the forthcoming regional groundwater flow model. Additionally, vertical hydraulic gradients will be measured at multi-completion wells and streamflow will be measured at stream gages.	13
Groundwater Quality	Concentration of selected water quality parameters	17 confirmed; 14 pending (Table 3.3.4-2)
Land Subsidence	Groundwater level as proxy; DWR's vertical displacement estimates derived from Interferometric Synthetic Aperture Radar (InSAR) data[3]	Spatially continuous

[1] This table only includes monitoring networks used to measure sustainability indicators. It does not include additional monitoring necessary to monitoring the various water budget components of the Subbasin, described in Chapter 2, or to monitoring the implementation of projects and management actions, which are described in Chapter 4.

[2] The groundwater level monitoring network is also used for non-riparian groundwater-dependent ecosystems.

[3] Land surface elevation changes are monitored through satellite remote sensing will be sourced from DWR or evaluated independently in the absence of these data being readily available.

3.4.1.1 Groundwater Elevation Monitoring Network

The groundwater elevation monitoring network is designed to monitor groundwater occurrence, level, flow directions, and hydraulic gradients between the aquifers and surface water bodies.

The initial list of groundwater level monitoring wells included 130 wells. These wells were narrowed down based on the following criteria:

- Either depth or perforated interval are known, preferably both;
- Measured water level data are available through at least 2019 (this criterion was relaxed in locations where spatial coverage is lacking);
- A preference was given to wells with data prior to 2005; and,
- The well has at least five historical measurements.

Annual pumping in the subbasin is between 1,000 and 10,000 acre-feet/year per 100 square miles, resulting in a suggested density of 2 monitoring wells per 100 square miles to collect representative groundwater elevation measurements (Hopkins and Anderson, 1984; DWR, 2016). Based on this density consideration, and the Subbasin's surface area of 195.1 square

miles (combined area of the SV Subbasin and Chilcoot Subbasin), 4 monitoring wells are adequate to monitor representative groundwater elevations within the Subbasin.

Alternatively, Sophocleous (1983) estimates 6.3 monitoring wells are needed per 100 square miles, resulting in 12.3 monitoring wells needed in the Subbasin (Sophocleous, 1983; DWR, 2016). Based on this estimate, 13 wells will sufficiently monitor the Subbasin's surface area of 195.1 square miles; equivalent to a lateral coverage of 15.0 square miles per well, or radius of 2.2-miles per well. The proposed groundwater elevation network (Figure 3.4.1-1 and Table 3.3.1-1) uses 36 monitoring wells and covers 82% of the Subbasin (160.4 of 195.1 square miles) according to spatial coverage estimates by Sophocleous (1983).

As stated, although "shallow" and "deep" aquifer terms have been historically used by DWR, analysis does not necessarily indicate the presence of two distinct aquifers throughout the Subbasin (Section 2.2.1.6); however, wells are selected to provide adequate vertical coverage throughout the aquifer to reflect trends in the depths that are pumped. Importantly, the proposed monitoring well density is appropriate to extrapolate seasonal groundwater elevation maps to support analysis of impacts to shallow domestic wells, GDE impact analysis, and to monitor seasonal changes in hydraulic gradients that may indicate changes in ISW depletion. Implementation actions are proposed to cover data gaps in the network and make improvements to existing RMPs

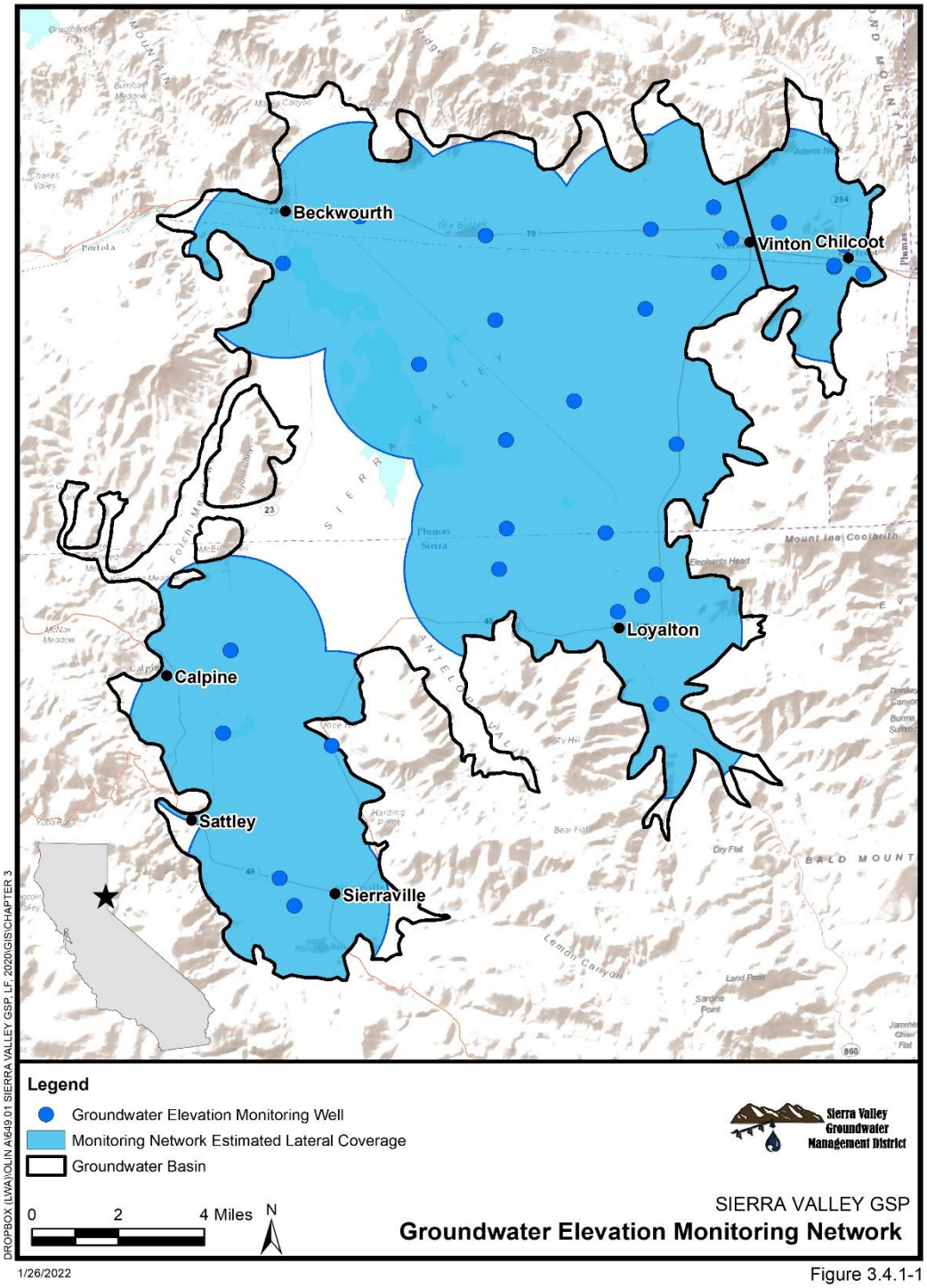
Monitoring frequency is important to characterize groundwater and surface water dynamics. Wells will be measured at least biannually, in spring (mid-March) and fall (mid-October), in line with DWR Best Management Practices (DWR, 2016). Monitoring standards and conventions are consistent with 23 CCR § 352.4, which outlines data and reporting standards for groundwater level measurements. To the extent that improved information is required on surface and groundwater interactions in the basin, continuous monitoring will be considered.

3.4.1.1.1 Protocols for Data Collection and Monitoring (23 CCR § 352.2)

This subsection briefly summarizes monitoring protocols. Groundwater level data collection may be conducted remotely via telemetry equipment, or with an in-person field crew. This subsection provides a brief summary of monitoring protocols. Establishment of protocols will ensure that data collected for groundwater elevation are accurate, representative, reproducible, and contain all required information. All groundwater data collection in support of this GSP is required to follow the established protocols for consistency throughout the basin and over time. These monitoring protocols will be updated as necessary and will be re-evaluated every five years. All groundwater elevation measurements are references to a consistent datum, known as the Reference Point (RP). For monitoring wells, the RP consists of a mark on the top of the well casing. For most production wells, the RP is the top of the well's concrete pedestal. The elevation of the RP of each well is surveyed to the National Geodetic Vertical Datum of 1929 (NDVD 29). The elevation of the RP is accurate to at least 0.5 feet.

Groundwater level measurements are taken to the nearest 0.01 foot relative to the RP using procedures appropriate for the measuring device. Equipment is operated and maintained in accordance with manufacturer's instructions, and all measurements are consistent units of feet, tenths of feet, and hundredths of feet.

Figure 3.4.1-1: RMPs for the Groundwater Level Monitoring Network



Notes:

- Network coverage is depicted with blue, circular 15.0 square mile buffers around each monitoring point that show the 82% lateral coverage of the network

Groundwater elevation is calculated using the following equation:

$$GWE = RPE - DTW$$

Where GWE is the groundwater elevation, RPE is the reference point elevation, and DTW is the depth to water. When available, barometric pressure is also accounted for in the depth to water calculation.

In cases where the official RPE is a concrete pedestal, but the hand soundings are referenced off the top of a sounding tube, the measured DTW is adjusted by subtracting the sounding tube offset from the top of the pedestal.

All groundwater level measurements must include a record of the date, well identifier, time (in 24-hour military format), RPE, DTW, GWE, and comments regarding factors which may influence the recorded measurement such as nearby production wells pumping, weather, flooding, or well condition.

Manual Groundwater Level Measurement

Groundwater level data collected by an in-person field crew will follow the following general protocols:

- Prior to sample collection, all sampling equipment and the sampling port must be cleaned.
- Manual groundwater level measurements are made with electronic sounders or steel tape. Electronic sounders consist of a long, graduated wire equipped with a weighted electric sensor. When the sensor is lowered into water, a circuit is completed and an audible beep is produced, at which point the sampler will record the depth to water. Some production wells may have lubricating oil floating on the top of the water column, in which case electric sounders will be ineffective. In this circumstance, steel tape may be used. Steel tape instruments consist of simple graduated lines where the end of the line is chalked to indicate depth to water without interference from floating oil.
- All equipment is used following manufacturer specifications for procedure and maintenance.
- Measurements must be taken in wells that have not been subject to recent pumping. At least 2 hours of recovery must be allowed before a hand sounding is taken.
- For each well, multiple measurements are collected to ensure the well has reached equilibrium such that no significant changes in groundwater level are observed.
- Equipment is sanitized between well locations to prevent contamination and maintain the accuracy of concurrent groundwater quality sampling.

Data Logger Groundwater Level Measurement

Telemetry equipment and data loggers can be installed at individual wells to record continuous water level data, which is then remotely collected via satellite to a central database and accessed on the Sierra Valley Database Portal in a web browser. Installation and use of data loggers must abide by the following protocols:

- Prior to installation the sampler uses an electronic sounder or steel tape to measure and calculate the current groundwater level to properly install and calibrate the transducer. This is done following the protocols listed above.

- All data logger installations follow manufacturer specifications for installation, calibration, data logging intervals, battery life, and anticipated life expectancy.
- Data loggers are set to record only measured groundwater level to conserve data capacity; groundwater elevation is calculated later after downloading.
- In any log or recorded datasheet, site photographs, the well ID, transducer ID, transducer range, transducer accuracy, and cable serial number are all recorded.
- The field staff notes whether the pressure transducer uses a vented or non-vented cable for barometric compensation. If non-vented units are used, data are properly corrected for natural barometric pressure changes.
- All data logger cables are secured to the well head with a well dock or another reliable method. This cable is marked at the elevation of the reference point to allow estimates of future cable slippage.
- Data logger data is periodically checked against hand measured groundwater levels to monitor electronic drift, highlight cable movement, and ensure the data logger is operating correctly. This check occurs at least annually, typically during routine site visits.
- For wells not connected to a supervisory control and data acquisition (SCADA) system, transducer data is downloaded as necessary to ensure no data is overwritten or lost. Data is entered into the data management system as soon as possible. When the transducer data is successfully downloaded and stored, the data is deleted or overwritten to ensure adequate data logger memory.

3.4.1.2 Groundwater Storage Monitoring Network

Groundwater level is used as a proxy for groundwater storage (Section 3.3.1.6.1) and therefore the groundwater storage monitoring network is identical to the network for groundwater level. Observations obtained at the groundwater level monitoring network will directly inform integrated surface and groundwater modeling in the subbasin as model calibration targets.

3.4.1.3 Groundwater Quality Monitoring Network

The objective of the groundwater quality monitoring network design is to capture sufficient spatial and temporal detail to understand groundwater quality in the Subbasin. The purpose is also to adequately monitor groundwater conditions for all beneficial uses. The data from the network will provide an ongoing water quality record for future assessments of groundwater quality. The spatial and temporal coverage of the network is designed to allow the GSAs to take an effective and efficient adaptive management approach in protecting groundwater quality, to minimize the risk for exceeding maximum water quality thresholds, to support the GSAs in implementing timely projects and actions, and ultimately, to contribute to compliance with water quality objectives throughout the Subbasin.

Existing wells used to monitor groundwater quality in the Subbasin are primarily located within and near the semi-urban areas of the Subbasin. Additionally, members of the community volunteered eight wells to potentially be included in the network; these volunteered wells do not have a historical record of water quality data. There are data gaps in the Subbasin regarding the spatial and temporal distribution of groundwater quality data. For this reason, up to five of the monitoring wells volunteered by community members will be included as part of the network. If necessary, these additional wells will be incorporated into the network to improve spatial coverage of the Subbasin; one additional well installed by DWR will also be incorporated into the network.

The monitoring network will use existing programs in the Subbasin that already monitor for specific constituents of concern for which SMCs are set (nitrate and TDS), and from other programs where these constituents could be added as part of routine monitoring efforts in support of the GSP. Coordination will be conducted between existing monitoring programs and the GSAs to develop an agreement for data collection responsibilities, monitoring protocols, and data reporting. Samples for nitrate, TDS, arsenic, boron, and pH will be collected at least once every three years from each well in the existing water quality network. To prevent bias associated with the date of sample collection, all samples should be collected on approximately the same date (i.e., +/- 30 days of each other) each year. Groundwater quality samples will be collected and analyzed in accordance with the monitoring protocols outlined below.

Using the geographic location of wells with historic groundwater quality records (June 1990 – July 2020), an initial list of wells with groundwater quality measurements was created for inclusion in the monitoring network. Water quality monitoring well locations were then reviewed to assess the spatial coverage obtained from the network. Information on the screened interval and well depth was scarce. This data gap will be addressed through further investigation of well completion reports and use of well video logs. Spatial data gaps, and potentially inadequate vertical coverage, will be addressed through the addition of wells volunteered by community members. Additionally, future project and management actions outlined in Chapter 4 will be implemented to refine the water quality network as needed.

The initial list of groundwater quality monitoring wells was created using data downloaded from the California Groundwater Ambient Monitoring and Assessment (GAMA) Program Database, which for the Sierra Valley Subbasin includes water quality information collected by the following agencies:

- Department of Water Resources (DWR)
- State Water Board, Division of Drinking Water public supply well water quality (DDW)
- State and Regional Water Board Regulatory Programs (Electronic Deliverable Format (EDF) and Irrigated Agricultural Land Waiver (AGLAND))
- U.S. Geological Survey (USGS)

Evaluating these data, the initial list of groundwater quality monitoring wells includes 53 wells with historical data for both nitrate and TDS. To further narrow down the number of wells, the following criteria were considered (it is noted criteria were relaxed in some instances so as to provide better spatial coverage):

- Both nitrate and TDS measured at the same well;
- Measured water quality data are available at least through 2019; and,
- The well has at least two historical measurements.

Wells that met this criterion were then narrowed down to avoid inclusion of redundant monitoring wells that were within proximity to each other. As shown in Figure 3.4.1-2 the final network includes 17 GAMA wells for potential inclusion in the network. While there is no definitive rule for the appropriate density of groundwater quality monitoring points needed in a basin, Sophocleous (1983) estimates 6.3 monitoring wells are needed per 100 square miles to adequately monitor groundwater levels in a basin, resulting in an estimated 12.3 monitoring wells needed in the SV subbasin (Sophocleous, 1983; DWR, 2016). Based on Sophocleous (1983), 13 wells are needed to monitor the subbasin's surface area of 195.1 square miles; equivalent to a lateral coverage of 15.0 square miles per well, or radius of 2.2 miles per well.

Table 3.4.1-2: Potential GAMA Wells to be added as Representative Monitoring Points to the Groundwater Quality Monitoring Network

Well ID	Well Type (Owner)	Nitrate Measurements			TDS Measurements			Logic For Selection
		From	To	# of Records	From	To	# of Records	
21N14E15J001M	Unknown	10/30/07	10/30/07	1	12/7/99	10/30/07	2	Spatial
21N14E32G001M	Ag	10/30/07	10/30/07	1	12/7/99	10/30/07	2	Spatial
21N15E05D001M	Unknown	10/30/07	10/30/07	1	12/8/99	10/30/07	2	Spatial
22N15E21K001M	Unknown	10/31/07	10/31/07	1	10/31/07	10/31/07	1	Spatial
22N15E35H001M	Unknown	10/31/07	10/31/07	1	10/31/07	10/31/07	1	Spatial
3200020-001	Municipal (Caltrans Reststop)	4/16/96	5/19/20	20	-	-	-	Monitoring Record
3200138-001	Municipal (Meadow Edge Park)	12/1/92	6/9/20	20	12/1/92	8/20/19	6	Monitoring Record
3200171-001	Municipal (Sierra Valley RV Park)	11/28/95	8/20/19	15	-	-	-	Spatial
3200193-001	Municipal (Plumas National Forest; Nervino)	6/23/11	6/18/19	8	6/23/11	6/23/11	1	Spatial
3200618-002	Municipal	12/18/01	5/5/20	11	6/11/12	6/11/12	1	Spatial
4600003-001	Municipal (Treasure Mountain Camp)	6/6/95	7/17/19	21	-	-	-	Monitoring Record
4600009-002	Municipal (Sierra CSA #5, Sierra Brooks)	9/1/90	7/6/20	19	9/1/90	4/23/14	6	Monitoring Record
4600037-001	Municipal (New Age Church of Being, Sierraville)	6/27/95	6/8/20	19	-	-	-	Monitoring Record
4600083-001	Municipal	12/5/95	4/3/07	11	12/15/94	7/6/00	3	Spatial
4600092-001	Municipal	7/6/00	4/3/07	4	-	-	-	Spatial
4610001-002	Municipal (City of Loyalton)	5/5/92	12/18/17	13	5/5/92	12/18/17	4	Monitoring Record
4610001-004	Municipal (Loyalton High School)	5/5/92	1/15/19	18	5/5/92	12/18/17	5	Monitoring Record

Figure 3.4.1-2: Potential Wells for Inclusion in the Groundwater Quality Monitoring Network

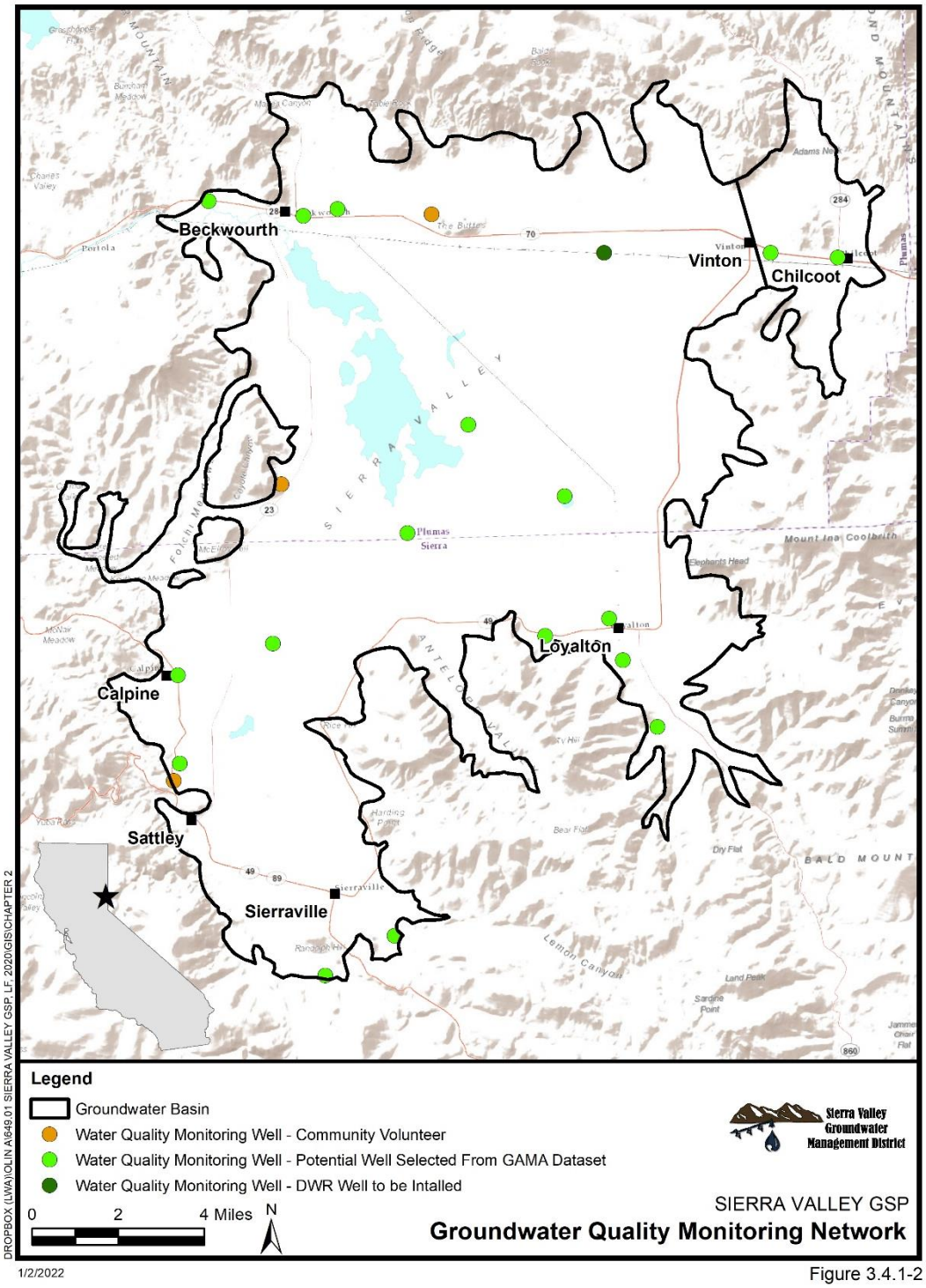


Figure 3.4.1-2

Notes:
-Includes 17 GAMA wells shown in Table 3.4.1-2 and 3 community volunteered wells and new DWR well

3.4.1.3.1 Monitoring Protocols for Data Collection and Monitoring (Reg. § 352.2)

Sample collection will follow the USGS National Field Manual for the Collection of Water Quality Data (USGS, 2015) and Standard Methods for the Examination of Water and Wastewater (Rice et al., 2012), as applicable, in addition to the general sampling protocols listed below.

The following section provides a summary of monitoring protocols for sample collection and analytical testing for evaluation of groundwater quality. Establishment of and adherence to these protocols will ensure that data collected for groundwater quality are accurate, representative, reproducible, and contain all required information. All sample collection and testing for water quality in support of this GSP are required to follow the established protocols for consistency throughout the Subbasin and over time. All testing of groundwater quality samples will be conducted by laboratories with certification under the California Environmental Laboratory Accreditation Program (ELAP). These monitoring protocols will be updated as necessary and will be re-evaluated every 5 years.

Wells used for sampling are required to have a distinct identifier, which must be located on the well housing or casing. This identifier will also be included on the sample container label to ensure traceability.

Event Preparation:

- Before the sampling event, coordination with any laboratory used for sample analysis is required. Pre-sampling event coordination must include the scheduling of the laboratory for sample testing and a review of the applicable sample holding times and preservation requirements that must be observed.
- Sample labels must include the sample ID, well ID, sample date and time, personnel responsible for sample collection, any preservative in the sample container, the analyte to be analyzed, and the analytical method to be used. Sample containers may be labelled prior to or during the sampling event.

Sample Collection and Analysis:

- Sample collection must occur at, or close to, the wellhead for wells with dedicated pumps and may not be collected after any treatment, from tanks, or after the water has travelled through long pipes. Prior to sample collection, the sample collector should clean all sampling equipment and the sampling port. The sampling equipment must also be cleaned prior to use at each new sample location or well.
- Sample collection in wells with low-flow or passive sampling equipment must follow protocols outlined in the EPA's Low-flow (minimal drawdown) ground-water sampling procedures (Puls and Barcelona, 1996) and USGS Fact Sheet 088-00 (USGS, 2000), respectively. Prior to sample collection in wells without low-flow or passive sampling equipment, at least three well casing volumes should be purged prior to sample collection to make sure ambient water is being tested. The sample collector should use best professional judgement to ensure that the sample is representative of ambient groundwater. If a well goes dry, this should be noted, and the well should be allowed to return to at least 90% of the original level before a sample is collected.
- Sample collection should be completed under laminar flow conditions.
- Samples must be collected in accordance with appropriate guidance and standards and should meet specifications for the specific constituent analyzed and associated data quality objectives.

- In addition to sample collection for the target analyte (e.g., nitrate), field parameters, including temperature, pH, and specific conductivity, must be collected at every site during well purging. Field parameters should stabilize before being recorded and before samples are collected. Field instruments must be calibrated daily and checked for drift throughout the day.
- Samples should be chilled and maintained at a temperature of 4^{o} C and maintained at this temperature through delivery to the laboratory responsible for analysis.
- Chain of custody forms are required for all sample collection and must be delivered to the laboratory responsible for analysis of the samples to ensure that samples are tested within applicable holding limits.
- Laboratories must use reporting limits that are equivalent, or less than, applicable data quality objectives.

3.4.1.4 Depletions of Interconnected Surface Water Monitoring Network

The ISW depletion monitoring network, shown in Figure 3.4.1-3, is developed to document streamflow and hydraulic gradients within Sierra Valley and incorporates groundwater level RMPs, and monitoring sites for streamflow, and stream stage. The leveraging and combination of existing monitoring networks will allow for a better understanding of the surface-groundwater interactions, enable calculation of streamflow depletion and its spatial and temporal distribution, and will provide important context for understanding the potential effects of pumping on surface water that is critical for beneficial users. To evaluate the potential impacts of groundwater pumping on surface water depletion, groundwater level, stream stage, and streamflow conditions will be documented over time at representative monitoring points.

ISW depletion monitoring in the Sierra Valley will involve two approaches: 1) measuring relatively shallow groundwater and its relationship to surface water elevation (‘stage’) for calculation of hydraulic gradients between streams and groundwater, and 2) monitoring streamflow. As described in Section 3.3.3.4.1, stage data are not currently being collected, so groundwater levels are proposed as a proxy for hydraulic gradients, and by extension, for ISW depletion, until surface water monitoring stations can be established. The shallow groundwater monitoring network will initially consist of existing wells which are screened at shallow depths (Table 3.3.3-1), some of which are also included in the groundwater level monitoring network. The absence of near-continuous streamflow gaging stations prevents direct measurement of streamflow changes due to pumping under current conditions: however, as part of the PMA and based on specific needs and funding availability, continuous streamflow monitoring stations are proposed as upgrades to the existing DWR streamflow monitoring stations (i.e., where major tributaries enter the Basin), and at select locations where flow concentrates and streamflow measurement is anticipated to be feasible. This approach leverages existing monitoring programs, measures much of the flow entering the basin and can be used to calibrate modeled estimates of total surface inflows, resulting in refinement of the basin-wide water budget, as well as depletion estimates as these streams cross the valley floor.

Strategically located new wells and stream stage and/or streamflow monitoring stations are also proposed as discussed further in Chapter 4 (Projects and Management Actions) and Chapter 5 (GSP Implementation), so that each ISW RMP in Figure 3.3.3-1 consists of a coupled surface water and shallow groundwater monitoring station for eventual calculation and tracking of hydraulic gradients in the vicinity of representative ISWs. The proposed new wells are intended to address shallow groundwater level data gaps and provide coverage where groundwater level declines due to pumping have been documented. This information, used in conjunction with the basin groundwater model, will allow for a spatial and temporal quantification of ISW depletion.

Final locations of proposed wells, stage monitoring stations, and streamflow monitoring stations will be established during a site suitability investigation, in which physical characteristics of the stream and site accessibility will be evaluated. This is the ideal design and its need will be reassessed by the GSA during implementation and included as needed into the request for grant funding.

Table 3.4.1-3: Proposed Stream Stage Gages and Coupled Wells to Monitor ISW Depletion

Stream Stage Gage	General Location	Coupled Well
Middle Fork Feather River	At Marble Hot Springs Road	RMP ID 106 (22N15E17H001M) if active or a proposed new well in a similar location
Middle Fork Feather River (Flow also measured here)	Downstream of Little Last Chance Creek confluence	RMP ID 161 (23N14E35L001M) and RMP ID 301 (DMW 6s)
Smithneck Creek	Between Highway 49 and Poole Lane	RMP ID 73 (21N16E18G002M) and RMP ID 37 (DMW 1s)
Central Wetland Complex	West of Harriet Lane south of Dyson Lane	Proposed new shallow well 1
Sierra Valley Channels	West of Highway 49 near Rice Hill	RMP ID 31 (21N14E25P003M) and RMP ID 294 (DMW 3s)
Carman Creek	Near Westside Road	RMP ID 297 (DMW 4s)
Hamlin Creek (Flow also measured here)	South of Willow Street on Forest Service Road 54020	RMP ID 291 (DMW 2s)
Cold Stream (Flow also measured here)	Downstream of Bonta Creek and upstream of diversions	RMP ID 12 (20N14E14R001M)
East Channel LLC Creek	At Sierra Valley Mc Nella Lane	Proposed new shallow well 1
East Channel LLC Creek	East of Roberti Ranch Road	RMP ID 364 (DMW 7s)
North Channel LLC Creek	South of Highway 70 near The Buttes	RMP 176 (23N15E34D001M)
Little Last Chance Creek East and West Branches (Flow also measured here)	At Highway 70	Proposed new shallow well 2, RMP ID 209 (23N16E36N002M), and RMP 300 (DMW 5s)

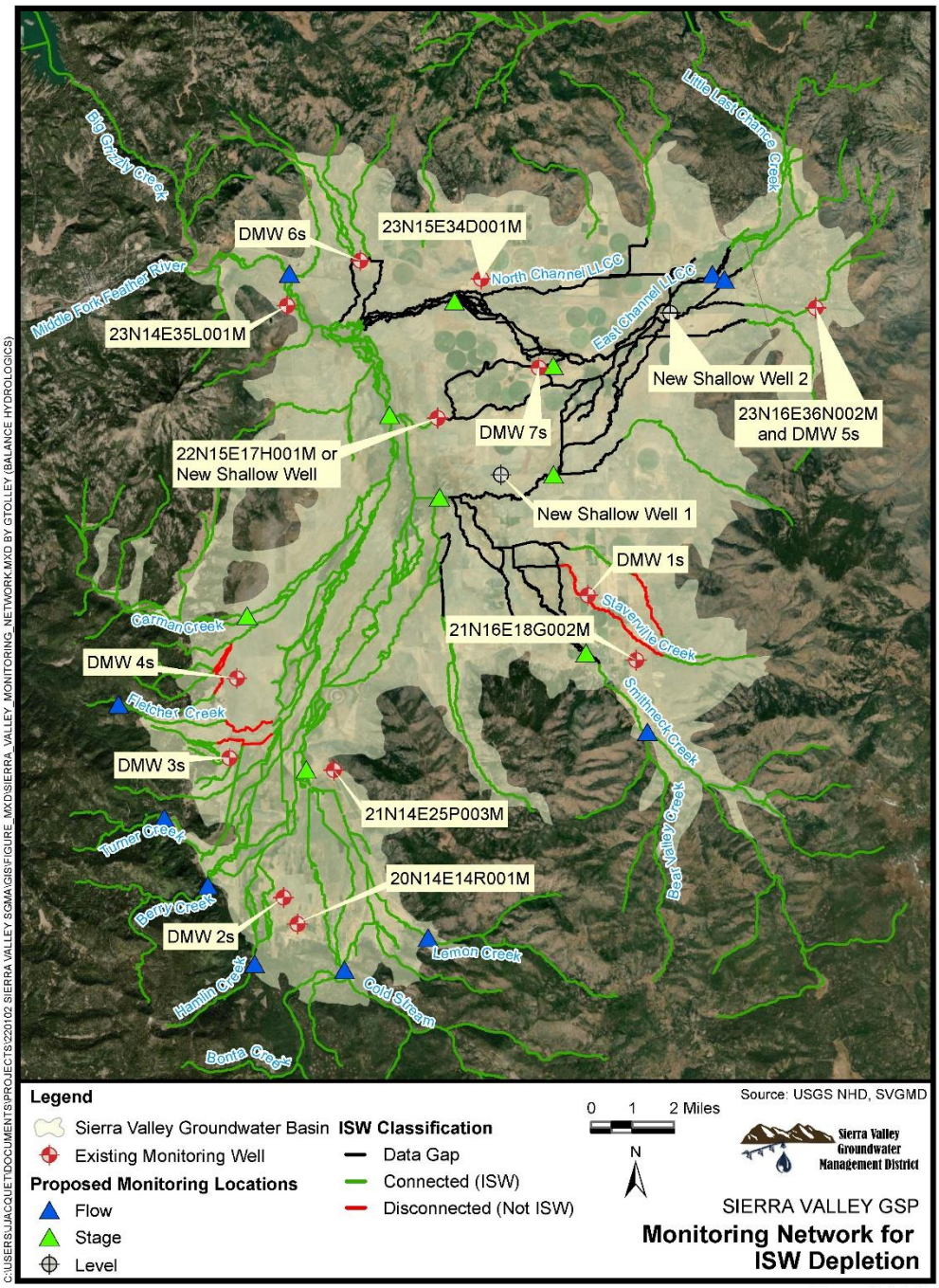
In addition to shallow groundwater and surface water stage monitoring, near-continuous recording streamflow gages are an integral part of the ISW depletion monitoring program. Streams and numerous diversion ditches are vast, and in-situ monitoring of every ISW and GDE extent is impractical. Therefore continuous streamflow monitoring gages are proposed as upgrades to the existing DWR streamflow monitoring stations (i.e., where major tributaries enter the Basin), and at select locations where flow concentrates. This approach captures much of the flow entering the basin and can be used to calibrate modeled estimates of total surface inflows, as well as depletion estimates as these streams cross the valley floor. As discussed in Chapter 4, the implementation of these monitoring points is subject to funding availability and included in a potential PMA that the SVGMD will reevaluate as needed during the implementation period.

Table 3.4.1-4: Proposed Streamflow Gages to Monitor ISW Depletion

Streamflow Gage	General Location	Notes
Little Last Chance Creek East and West Branches	At Highway 70	Two existing but inactive DWR gaging stations exist here and would be reoccupied and upgraded
Smithneck Creek	Upstream of Loyalton	
Fletcher Creek	West of Calpine	
Turner Creek	Northwest of Sattley	
Berry (Miller) Creek	West of Highway 49 in Wild Bill Canyon	
Hamlin Creek	South of Willow Street on Forest Service Road 54020	
Cold Stream	Downstream of Bonta Creek and upstream of diversions	This would combine the Bonta (Webber) Creek stations to one station below the confluence of the two creeks, provided that this would not interfere with Little Truckee Diversion operations.
Lemon Creek	At Lemon Canyon Road (650)	
Middle Fork Feather River	Downstream of Little Last Chance Creek confluence	

Data collected from the monitoring network will allow for evaluation of minimum thresholds and undesirable results and whether adjustments will be needed at the five year GSP review. After this initial five years of GSP implementation, the use of groundwater levels and hydraulic gradients as a proxy for surface water depletion will also be reevaluated to determine if the approach is a beneficial addition to direct streamflow measurements and still an appropriate metric for the sustainability indicator. Minimum thresholds and measurable objectives will be reviewed, and adjustments will be made as needed.

Figure 3.4.1-3: Monitoring Network for ISW Depletion



Notes:
- Existing and Proposed ISW Monitoring Locations for Flow, Stage, and Groundwater Level Alongside ISW characterization at prominent surface water bodies

3.4.1.4.1 Protocols for Data Collection and Monitoring (23 CCR § 352.2)

Groundwater Level Measurement

See Section 3.4.1.1.1 for protocols for monitoring of groundwater levels.

Measurement of Continuous Stage and Streamflow

- Stream-gaging practices will follow the procedures used by the USGS, as outlined by Carter and Davidian (1968).
- Installation of streamflow gages will be based on reach specific characteristics and ideally located upstream of a natural or constructed grade control to maintain the relationship between stage and streamflow.
- Installation and instrumentation will include a 'Style C' staff plate that displays stage in decimal feet and is secured to a wood or metal post driven into the bed of the stream. A near-continuous water level logger will accompany the staff plate and will measure water depths in 15-minute intervals. If an unvented logger is used, a barometer will need to be installed at one of the stream gaging locations to compensate data for changing barometric pressure
- Flow will be measured a minimum of 5 times annually over a range of different water depths ('stages').
- Based on these periodic site visits where staff plate readings and streamflow measurements are made, an empirical stage-to-discharge relationship will be developed and adjusted over time for each station, also referred to as a stage-discharge "rating curve." The rating curve will be used to convert the continuous-logging record of stage to flow.
- The data will be analyzed, and if necessary, stage shifts will be applied to account for local scour and fill during the monitoring period, and the effects of leaf and debris dams during low flows, or effects of snow and ice in the winter.

3.4.1.5 Subsidence Monitoring Network

As per 23 CCR § 354.36(b), this GSP adopts groundwater elevations as a proxy for monitoring changes in groundwater in land subsidence, and consistent with the observation that groundwater levels maintained above MTs also prevent significant and unreasonable land subsidence. Groundwater levels are the only long-term measure of land subsidence for the Subbasin at the time of writing. Poland and Davis (1969) report the land subsidence to groundwater level decline ratio as approximately 0.01 to 0.2 foot of subsidence per foot of groundwater level decline. These land subsidence SMC will be augmented by InSAR based land elevation change, and ground-based surveys. Throughout the GSP implementation period, the relationship between the change in groundwater levels and the change in the amount land subsidence (factoring in that total land subsidence is a composite of elastic and inelastic land subsidence) will be developed.

Management areas are not planned for this GSP at this time. The monitoring network applies to the entire Subbasin area.

3.4.1.5.1 Monitoring Protocols for Data Collection and Monitoring for Land Subsidence Sustainability Indicator (Reg. § 352.2)

As groundwater elevation measurements are to be used as a proxy for inelastic land subsidence in this GSP, the monitoring network for the land subsidence sustainability indicator

is the same as the groundwater level monitoring network. The protocols used for the groundwater level monitoring network described in Section 3.4.1.1 are the same for the land subsidence monitoring network.

Four (4) monument-based land surface elevation stations will be installed within the primary geographic area where subsidence is documented by DWR from InSAR data processing for 2015-2019. The subsidence monument placements will also be developed in consideration of geologic discontinuities, such as the Grizzly Valley Fault Zone. At these geologic discontinuities, there is the greatest potential for differential subsidence, which is normally the most damaging to structures and improvements such as roads or underground utilities.

A licensed Professional Surveyor in the state of California will install the monuments. The monuments will be a deep rod construction type applicable to soils and land surface conditions at installation locations. Monument installation will follow industry guidelines for vertical control monument installation as documented in the US Army Corps of Engineers Guidance Document EM 1110-1-1002, (USACE, March 2012). Monument vertical elevations will be surveyed every 5 years. Additional surveys will be conducted if InSAR subsidence increases by 50% of the average annual subsidence from the baseline period (2015-2019). The GSAs may at their discretion elect to survey monuments more frequently, pending available funds. Survey-grade GPS technology, with vertical resolution of 0.05 ft, with elevations reported as feet above sea level using a standardized datum, will be used. Initial elevation measurements will be made at least 28 days after installation.

The monument elevations will be used to gauge the accuracy of future InSAR data processing and surveying of the monuments is expected only if InSAR data show some anomalies. Monuments will also be used to calibrate the InSAR data processing if needed. The data monument-based measurements may enable differentiation of inelastic and elastic components of land subsidence, if monuments are located near to monitoring well locations where depth to groundwater levels are being measured and some variance in depths to groundwater up and down is recorded (rebound in groundwater levels can be associated with rebound, or lack thereof, in land surface).

3.4.1.5.2 Representative Monitoring for Land Subsidence Sustainability Indicator (Reg. § 354.36)

As groundwater elevation measurements are to be used as a proxy for inelastic land subsidence in this GSP, the monitoring network for the land subsidence sustainability indicator is the same as the groundwater level monitoring network. Therefore, the representative monitoring sites within the groundwater elevation monitoring network, discussed in detail in Section 3.4.1.1, are identical to the monitoring network for the land subsidence sustainability indicator.

3.4.1.5.3 Assessment and Improvement of Monitoring Network for Land Subsidence Sustainability Indicator (Reg. § 354.38)

As groundwater elevation measurements are to be used as a proxy for inelastic land subsidence in this GSP, the monitoring network for the land subsidence sustainability indicator is the same as the groundwater level monitoring network discussed in detail in Section 3.4.1.1.

InSAR and ground-based elevation surveys will augment groundwater level measurements and contribute towards improved understanding of land subsidence in the basin. Pending results from these analyses, the monitoring network may be improved in the five-year plan update.

3.4.2 Assessment and Improvement of the Monitoring Network (23 CCR § 354.38)

The GSP and each five-year assessment report will include an evaluation of the monitoring networks, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the Subbasin. Evaluation of data gaps must consider whether the spatial and temporal coverage of data is sufficient and whether monitoring sites provide reliable and representative data. The description of identified data gaps will include the location and basis for determining data gaps in the monitoring network as well as local issues and circumstances that limit or prevent monitoring. These data gaps will be addressed by describing steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.

3.4.3 Reporting Monitoring Data to the Department (23 CCR § 354.40, § 352.4)

Monitoring data will be stored in the data management system and a copy of the monitoring data will be included in each Annual Report submitted electronically to DWR. All reporting standards and information shall follow the guidelines outlined in 23 CCR § 352.4.

3.4.4 Monitoring Networks Summary

The SMC monitoring networks were developed leveraging current and ongoing monitoring to assess minimum thresholds. A summary of the existing and potential expansion of the monitoring networks is presented in Table 3.4.4-1 and locations of the monitoring wells along with who monitors them and monitoring frequency are show in Figure 3.3.4-1.

3.4.4.1 Groundwater level and storage

The groundwater levels monitoring network combined with the current DWR CASGEM network serves as basis for assessing all SMCs with the exception of water quality. All 36 wells that have been selected for the immediate levels monitoring network, which cover discreet locations as well as shallow, medium and deep levels of the aquifer, are either existing SVGMD monitoring wells that are currently monitored by SVGMD or wells included in the CASGEM network and monitored by DWR twice per year. The current minimum monitoring frequency of twice each year (spring and fall) is retained for the well included in the CASGEM network. For the district wells, a minimum of twice per year is suggested for all the wells, with a subset of wells monitored more frequently during the irrigation season (already ongoing with the current monitoring effort). Two recently installed multi-completion DWR wells (DMW7 and DMW8) include pressure transducers for continuous monitoring. Criteria for these new wells have not yet been established, but they will be included among the RMPs in the 5-years update. If funding is secured, level sensors and telemetry could be added to a subset of the wells to enhance the frequency of monitoring and remove the need for monitoring site visits. Groundwater storage uses the levels monitoring network as a proxy and has no additional requirements.

3.4.4.2 Groundwater quality

The 17 existing wells selected for the water quality monitoring network are part of the GAMA system. They are regularly monitored as municipal wells, but the frequency varies. The program seeks to augment the GAMA wells with six additional wells (five existing domestic wells and at least one of the two new monitoring wells installed by DWR, DMW7 and DMW8), for additional coverage in areas where septic tanks may affect groundwater quality and where boron and arsenic may create future problems. For the 6 new wells, TDS, Nitrate, Boron and Arsenic will be monitored every two years for the first 5 years. If no problems are shown, the frequency will drop to once every three years. The results will be complemented with the ongoing monitoring undertaken by public health for the municipal wells mentioned above and included in the GAMA

program. The monitoring plan will be augmented as needed if constituents will exceed the criteria or if specific increasing trends in the constituents' concentration are observed.

3.4.4.3 Interconnected surface water and GDEs

The interconnected surface water monitoring network is initially a subset of the existing shallow groundwater levels monitoring network and will assess impacts strictly through water levels. The near-term addition to this initial network is to instrument at least 4 shallow existing wells located near ISW and GDE with continuous pressure transducers. Cost for transducers and installation is covered through the existing planning and implementation grant. An initial PMA is then suggested to evaluate possible locations and design of up to ten streamflow gauges and up to eight stream stage gauges to be paired with the continuous groundwater measurements. As projects are developed within the basin that may benefit from and provide funding for the gauges, they will be added to the monitoring network.

Changes to summer NDVI will be used in coordination with groundwater elevation and interconnected surface discharge to monitor the health of GDEs in the SV subbasin, assuming that declines in vegetation greenness will correspond to changes in water availability for special status species. Because the NDVI dataset dates from 1985, it allows NDVI changes to be compared with past NDVI values. Changes to average NDVI values around RMPs and the spatial pattern changes of NDVI throughout the basin will be evaluated in updates to the GSP.

3.4.4.4 Subsidence

In general, the groundwater level monitoring network serves as a proxy for the subsidence SMC across the SV Subbasin. As part of the existing GSP development grant, allocations have been made for installation of four monuments in the area with observed subsidence. DWR will periodically provide InSAR data that will be analyzed and assessed with the groundwater levels and surveying of the monuments will be performed and funded by the district only in case of significant anomalies reported by the InSAR data.

Figure 3.4.4-1: SMC Wells and Monitoring Frequency

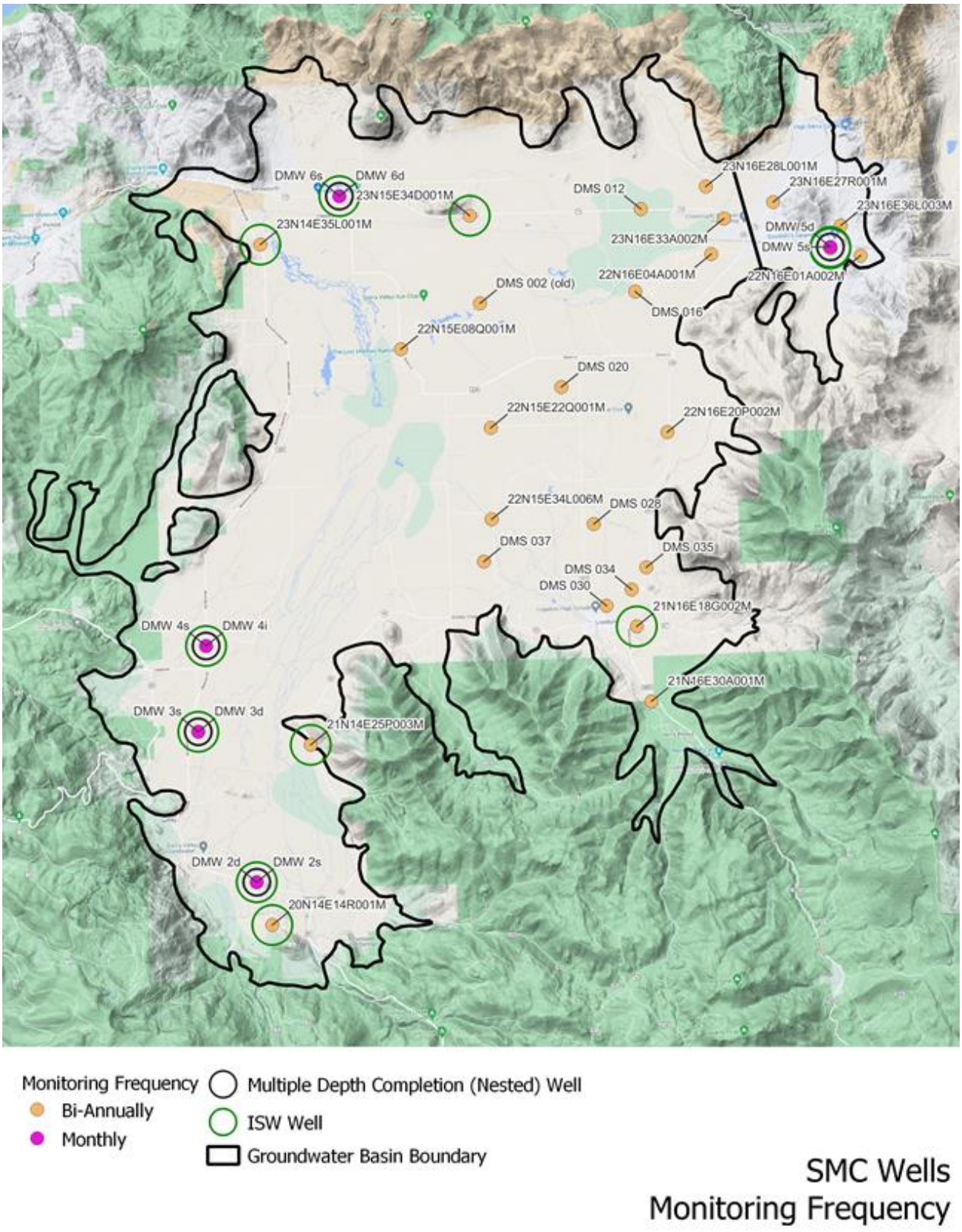


Table 3.4.4-1: Summary of Existing and Potential Future Monitoring for Assessment of SMCs

SMC	Wells		Measurement		Potential future measurement, based on funding availability
	Existing	New	Existing	New	
Groundwater Levels	19 district wells 17 CASGEM wells	0	Measured at least 2x/year, additional measurements during the irrigation season Measured at least 2x/year, but with continuous measurements in the latest multi-completion wells	(a)	N/A
Storage	Groundwater Levels as Proxy				N/A
Water Quality	17	Up to 6 (b)	1x/3 years (c)	(b)	N/A
ISW	13 mostly shallow	4 (d)	13 at least quarterly and 4 continuously	(a)	Up to Ten stream flow gauges (e) and Eight stage gauges (e)
Subsidence	Groundwater Levels as Proxy for the first 5 years		InSAR Data (g)	4 monuments (f)	

(a) Telemetry may be employed to increase data collection frequency and minimize field visits.

(b) Five community members have volunteered their wells for inclusion in the water quality monitoring network. DWR is installing one new observation well that can be used for both groundwater level and groundwater quality monitoring. If incorporated in the network, the new DWR wells would be monitored on the same frequency as the other volunteered wells

(c) Coordinate with existing GAMA water quality monitoring to obtain data

(d) 4 existing shallow wells will be considered for installation of continuous pressure transducers in the area near Groundwater Dependent Ecosystem. Funding for the instrumentation is already available through the implementation grant and there are opportunities for more external funding (e.g., from USGS/DWR project). Cost of maintaining these stations will be minimal and data are expected to be downloaded twice per year.

(e) More continuous data in existing shallow wells may be considered in the future as implementation funding become available and as the model provides more certainty about locations where these data are critical. Shallow wells will be paired with flow and/or stage gauges, pending funding availability over the first 5 years of the implementation period. Feasibility study required to assess potential locations. Gauges may benefit by using telemetry to provide continuous data.

(f) Funding currently allocated to install monuments. Monuments will be surveyed as needed if InSAR data show undesirable results

(g) InSAR data analyzed as it becomes available from DWR, but no more frequently than once every two years.

4 Projects and Management Actions

To achieve this Plan's sustainability goal by 2042 and avoid undesirable results as required by SGMA regulations, multiple projects, and management actions (PMAs) have been identified for potential implementation by the GSA. This section provides a description of PMAs that may be implemented to achieve and maintain the sustainability goal and to respond to changing conditions in the SV Subbasin. PMAs are described in accordance with §354.42 and §354.44 of the SGMA regulations. The PMAs may be combined to the degree stakeholders find appropriate and provide the maintenance of sustainability goals. As PMAs are implemented, additional actions not included here may become evident and desirable. As such, the implementation of PMAs will be commensurate with measured conditions, progress toward sustainability goals, and effectiveness. Projects generally refer to infrastructure features and other capital investments, their planning, and their implementation, whereas management actions are typically programs or policies that do not require capital investments but are geared toward engagement, education, outreach, changing groundwater use behavior, adoption of land-use practices, etc. PMAs discussed in this section will help achieve and maintain the sustainability goals and measurable objectives, and avoid the undesirable results identified for the SV Subbasin in Chapter 3. These efforts will be periodically assessed during the implementation period, at minimum every five years. The suite of PMAs stakeholders choose to implement will follow the progress toward reaching sustainability goals. The assessments performed each five-year period will allow adaptive management of emphasizing particular PMAs to provide the portfolio of actions to prevent undesirable effects.

4.1 Introduction

In developing PMAs, key considerations include effectiveness toward maintaining the sustainability of the SV Subbasin, minimization of impacts to the SV Subbasin's economy, cost-effective solutions for external funding, and selection of voluntary and incentive-based programs over mandatory programs. These planned or proposed PMAs are at varying stages of development. As they advance, additional information will be obtained on construction and permitting requirements, operations, and overall costs. Chapter 5, GSP Implementation, contains details about PMA prioritization and implementation.

In Sierra Valley, the PMAs are designed to achieve the major objectives related to the SMCs presented in Chapter 3:

- Stopping groundwater level decline.
- Maintaining groundwater-dependent ecosystems to enhance the presence of wildlife and support wetlands for migratory and local birds.
- Preventing significant and unreasonable land subsidence in the SV Subbasin. Infrastructure and agriculture production in Sierra Valley remain safe from permanent subsidence of land surface elevations.

The identified PMAs reflect a range of options to achieve the goals of the GSP. Many of the PMAs can only be completed through an integrative and collaborative approach with other agencies, organizations, landowners, beneficial users, and stakeholders. The success of implementing some PMAs will depend on establishing an agreed-upon approach for proceeding. The extent to which any given PMA is advanced will depend on the ability and need

to provide progress toward a Measurable Objective, and the agreement and ability of stakeholders to continue implementation. For some PMAs, the GSAs may not be able to fully quantify the overall benefits and, for this reason, PMAs are envisioned to be implemented at progressive stages, starting with pilot projects that will provide a preliminary understanding of the chances of success in supporting the achievement of the previously mentioned goals.

Few PMAs will be implemented by the GSAs alone. The GSAs are one of multiple parties collaborating on achieving overlapping, complementary, multi-benefit goals across the integrated water and land use management nexus in the SV Subbasin. Multi-benefit PMAs will be most successful if implemented to meet multiple objectives with cooperating or collaborating partners: for example, the Regional Board could be a partner for water quality PMAs, while the Audubon society could work collaboratively to maintain good wildlife conditions. For many of the PMAs, the GSAs will therefore enter informal or formal partnerships with other agencies, non-governmental organizations (NGOs), or individuals. These partnerships may be in various formats, from GSAs participation in informal technical or information exchange meetings to collaborating on third-party proposals, projects, and management actions, to leading proposals and subsequently implementing PMAs.

PMAs are classified under three main categories: (1) demand management for groundwater; (2) supply augmentation; (3) others. This last category includes mostly management actions, such as enhancement of data collection. Project types within these three categories are shown in Table 4.2-1 and Table 4.3-1. Furthermore, PMAs are organized into two tiers reflective of the timeline for implementation:

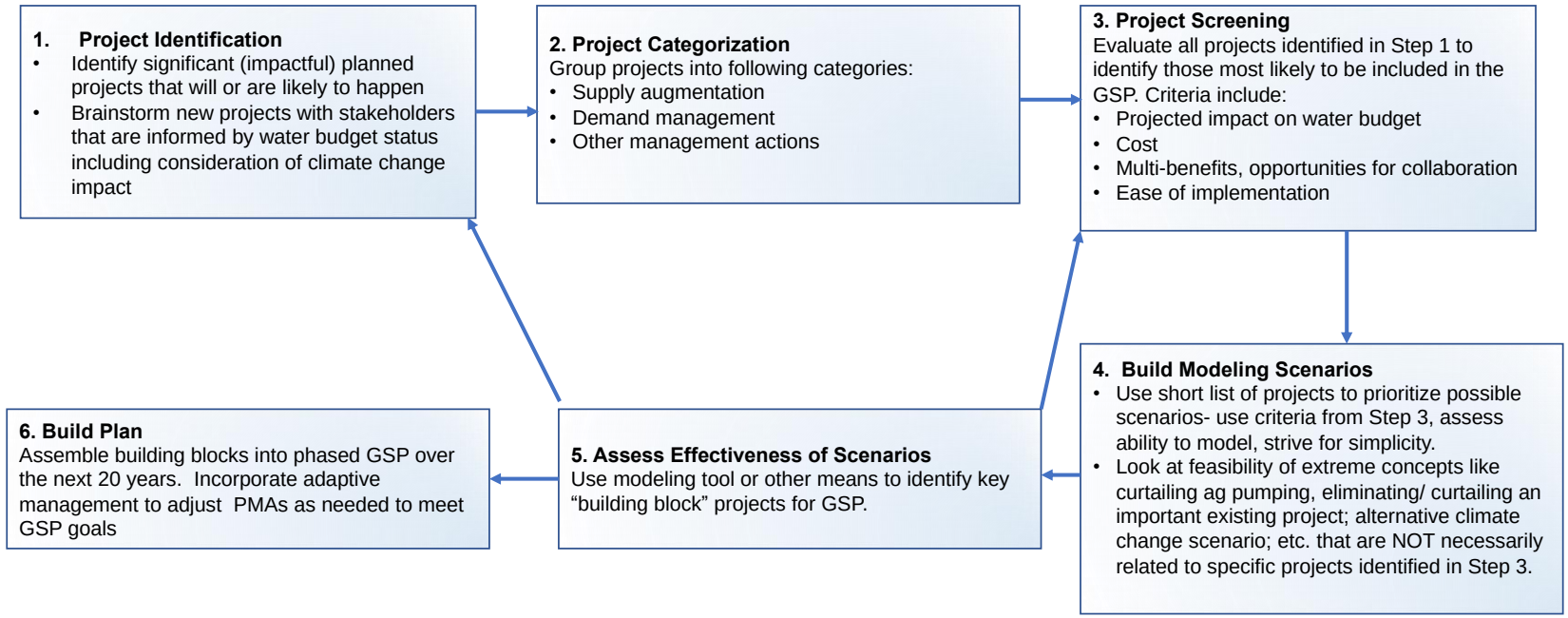
1. **TIER I:** Existing PMAs that are currently being implemented and are anticipated to continue to be implemented, potentially with enhancements.
2. **TIER II**: PMAs identified for consideration within the first five-years of the GSP. The initiation and implementation by the GSAs will occur based on an evaluation of feasibility and funding availability. Within this tier, we understand that some PMAs may require a longer timeframe for development, and those are expected to initiate the conceptual development in the first five years but would not be fully operational until sometime after 2027. It is also possible that upon further evaluation, certain PMAs would not be implemented if the expected benefit is not likely to contribute to achieving sustainability.

A general description of existing and ongoing (Tier I) PMAs are provided in Table 4.2-1; descriptions of Tier II PMAs are provided in Table 4.3-1.

The process of identifying, screening, and finalizing PMAs is illustrated in Figure 4.1-1 and spans a different timeframe depending on the specific PMAs. As a first step, existing and potential projects were identified based on input from the TAC, the GSAs' staff and board members, irrigators, and other stakeholders and review of proposed projects in other similar basins. These projects were then categorized into the two tiers introduced above. All projects are included in the GSP with more details developed for those that were considered most likely to be implemented in the near term. Using the Sierra Valley Watershed Hydrogeological Model (SVWHM), the effectiveness of each project or a combination of projects will be assessed to finalize those projects that, if implemented, will most likely support the achievement of sustainability in the SV Subbasin. Monitoring will be a critical component for evaluating PMA benefits and measuring potential impacts. A road map for prioritizing PMAs based on feasibility and potential for success of each project (or a combination of projects) is discussed further in Chapter 5.

The ability to secure funding is an important component in the viability of implementing a particular PMA. Funding sources may include grants or other fee structures (Appendix 5-1). Under the Sustainable Groundwater Management Implementation Grant Program Proposition 68, grants can be awarded for planning and projects with a capital improvement component. Funding will also be sought from other local, state, federal, and private (NGO) sources.

Figure 4.1-1: Process for Identifying Projects and Management Actions



4.2 Tier I: Existing or Ongoing Projects and Management Actions

As shown in Table 4.2-1, there are existing and ongoing PMAs in the SV Subbasin (Tier I). The SV Subbasin has a range of existing PMAs in place to provide demand management, supply augmentation, and other management actions (e.g., data management, monitoring and education, and outreach). Potential enhancements are included in the description of several of these existing PMAs. These enhancements would be evaluated and only implemented if considered technically and economically feasible. The PMAs in Table 4.2-1 are discussed in detail in the remainder of Section 4.2.

Table 4.2-1: Existing or Ongoing Projects and Management Actions for Sierra Valley

Category	Title	Description	Near-Term Actions
Other Management Actions	High Capacity Wells Metering	**Current MA**: SVGMD maintains a list of large-capacity wells in the SV Subbasin, including active metered wells and inactive wells. All active large-capacity agricultural wells are fitted with flow meters owned and read by SVGMD. **Potential MA Enhancement**: SVGMD is continuing and enhancing metering efforts for high-capacity wells to support groundwater management.	• Continue existing metering and data collection program • Refine well inventory & registry program, including GPS coordinates for each high capacity well • Install, reinstall, repair, calibrate, and replace flowmeters as needed
Other Management Actions	Monitoring and Reporting	**Current MA**: SVGMD reads flowmeters on large-capacity agricultural wells monthly during the growing season and sounds monitoring wells for groundwater levels periodically. DWR measures groundwater levels in the SV Subbasin twice per year and posts results in CASGEM. The Sierra Valley Watermaster collects stream flow data in the SV Subbasin, which is not published publicly. **Potential MA Enhancement**: Optimize/implement monitoring networks and data gathering, sharing, and analysis for: groundwater levels and quality, surface water flows, subsidence, and GDEs/ISW.	• Optimize water level monitoring network, as proposed in this plan (Section 4.2.1) • Investigate external funding or implementation by state/federal agencies to help mitigate costs of stream/ surface water monitoring • Perform groundwater-dependent ecosystem (GDE) monitoring • Implement subsidence monitoring • Develop comprehensive, streamlined, easy-to-use reporting systems to comply with SGMA and to support management decisions • Include groundwater quality monitoring plan and optimize groundwater quality monitoring as needed

Category	Title	Description	Near-Term Actions
Other Management Actions	Data Management and Modeling	**Current MAs**: SVGMD collects water usage data from large-capacity agricultural wells as well as usage data from municipal well operators in the SV Subbasin. SVGMD and DWR collect water-level data in monitoring wells around the SV Subbasin, with DWR data posted in CASGEM and SVGMD data reported in public board meetings. Water quality data has been sporadically collected by DWR and more regularly collected by County Environmental Health Departments for public supply wells **Potential MA Enhancement**: Optimize data collection to inform management decisions in the SV Subbasin and support updates of the hydrogeologic conceptual model.	• Continue data collection from existing water level and water use monitoring • Determine frequency of updates and recalibration of model • Initiate data collection from newly identified wells in monitoring network • Implement use of Data Management System
Other Management Actions	Education and Outreach	**Current MA**: SVGMD and UCCE have conducted periodic workshops to update stakeholders on topics related to water management. **Potential MA Enhancement**: Continue current education and outreach programs to cover additional topics related to sustainable groundwater management, GSP implementation, and on-farm best management practices (BMPs) for landowners. Educational workshops for domestic well owners could also be initiated.	• Host periodic educational workshops to continue outreach on GSP and groundwater conditions to all parties • Determine frequency of workshops that are feasible or determine appropriate alternative approaches (e.g., annual workshops and supplement with additional educational materials and information sharing
Demand Management	Well Permit Ordinances	**Current MA**: SVGMD has enacted ordinances that: • Require meters on all high-capacity wells (Ordinance 82-03) • Require review of water availability for new development applications (83-01) • Restrict installation of new high-capacity agricultural wells in specific areas of the SV Subbasin (18-01 §3a) **Potential MA Enhancement**: Continue existing protections and adjust as-needed to include process for reactivating inactive wells and permitting wells outside the restricted zone	• Develop a decision-making process for review of requests to reactivate registered inactive large-capacity wells • Develop decision-making/review process for permitting large-capacity wells outside the restricted zone and developing monitoring strategies to launch if other areas of the SV Subbasin become active with high-capacity groundwater pumping.

Category	Title	Description	Near-Term Actions
Supply Augmentation	Reuse	**Current MA:** Reuse of treated wastewater from Loyalton WWTP and former Loyalton Mill/Co-gen plant for crop irrigation **Potential MA Enhancement**: Explore feasibility of repairing leaks in Loyalton sewer pipes and/or other infrastructure improvements	• Evaluate if additional opportunities for reuse exist
Supply Augmentation	Sierra Brooks—Smithneck Wildland Urban Interface Fuels Reduction Project	**Current MA:** Grant-funded project to reduce heavy fuel loads through mastication, manual forest thinning, and brush abatement to improve water retention and water quality. Builds on other projects in the area to increase forest resilience and resistance to destructive wildfire, disease, and insect infestation, and protect the community of, and water supply for, Sierra Brooks.	• Coordinate with Sierra Valley RCD to identify opportunities to support this project and other watershed health projects • Explore opportunities with other agencies (e.g., NRCS, CalFire)

4.2.1 Inventory and Metering

4.2.1.1 Project Description

This management action (MA) of maintaining a comprehensive inventory of high-capacity wells will help assess impacts associated with the SMCs set in the GSP. Implementation of the MA can be focused on critical locations, to protect wells where minimum thresholds are in jeopardy of being reached, or measurable objectives are not being attained.

This existing/ongoing MA involves gathering exact coordination and information on wells, replacing old flowmeters, calibrating existing flowmeters, and completing analysis for telemetry options, including initial and ongoing costs for the replacement and adjustments to flowmeter installations on high-capacity wells to achieve installations consistent with meter specifications.

A detailed well inventory and assessment of impacts improves the understanding of SV Subbasin conditions and will be valuable for calibrating model results and management decisions. Currently, SVGMD maintains an inventory of large capacity wells. To account for large-scale pumping of the SV Subbasin, metering is required by the GSAs for all active and inactive large-capacity wells that are 100 gpm or larger, or that have larger than 6-inch casings[1]. Large-capacity agricultural well owners purchase the first meter for their well, with the meter becoming the property of the Sierra Valley Groundwater Management District, and maintenance provided by the District's meter technician. This has been required since ordinance 82-03 was passed by SVGMD in 1982, with refinements, such as diameter requirements, passed in subsequent years [2]. Municipal wells in Sierra Brooks, Loyalton, and Calpine are also metered with management by the local water utility districts. Application depths can be estimated by combining groundwater pumping volume and acreage served to support model calibration. Information collected is confidential and reported in aggregate to maintain confidentiality. Further information regarding how monitoring groundwater use may be used is further explained in Section 4.3.7.

Through feedback provided on other GSPs, DWR has made clear that a detailed inventory and definition of active wells are to be included in annual reports. DWR suggests including a discussion of anticipated impacts to these wells due to instances such as continuing water level decline, as some shallow wells may be impacted if minimum thresholds (MTs) for groundwater levels are reached, as described in Chapter 3.

4.2.1.2 Measurable Objective

Replacement of, calibration of, and installation of new flowmeters for wells to be identified and development of a comprehensive inventory of active domestic, industrial, and stock wells. By optimizing the number and location of wells used for the WQ monitoring well network, a more accurate characterization of current groundwater quality conditions can also be developed.

4.2.1.3 Public Noticing

Public noticing for this project will be conducted by the GSAs prior to project implementation if required. Public notification is planned to be executed with significant project changes or additional project elements.

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[1] https://www.sierravalleygmd.org/files/ea2824af1/18-01+Ordinance+%28Requirements+for+New+Water+Well+Permits+%2B+Amended+map%29+%28signed%29.pdf

[2] The ordinance that defines the 6-inch diameter distinction (18-01) says "constructed with casings larger than seven (7) inch outside diameter (OD)." See: https://www.sierravalleygmd.org/files/42f03652e/82-03+Ordinance+%28Req+Metering+Extraction+Facilities%29.pdf

4.2.1.4 Permitting and Regulatory Process

Permitting is not applicable to this MA.

4.2.1.5 Schedule for Implementation

This MA is existing and ongoing. Future actions will include developing a more comprehensive well inventory and evaluating the feasibility and need for additional metering within three years of GSP implementation.

4.2.1.6 Implementation

Implementation of the well inventory and metering program is ongoing. Future implementation efforts would include:

- Finalize the internal database/well inventory for the high-capacity wells.
- Identify wells in need of flowmeter replacement or repair.
- Calibrate, install, repair, and replace flowmeters as necessary.
- Investigate different options for telemetry for meters and associated costs.

4.2.1.7 Expected Benefits

A comprehensive database would provide improved understanding of the high-capacity active wells including locations and depths. More precise metering could result in better understanding of groundwater use geographically and could support water use efficiency programs.

4.2.1.8 Legal Authority

Article 6, Section 601 of SB 1391 authorizes SVGMD to require metering of any new, deepened, or previously-abandoned-then-reactivated well. As such, the GSAs are legally authorized to collect data and require metering to facilitate the data collection.

4.2.1.9 Estimated Costs and Funding Plan

Currently, the SVGMD budget includes $6,100/yr for meter installation, maintenance, and monitoring. In addition, the budget includes $2,000/yr for data logger analysis associated with this program and $11,500 for new flow meters and repair and replacement of meters

4.2.2 Monitoring and Reporting

4.2.2.1 Project Description

The SV Subbasin has identified monitoring networks for water levels, streamflow depletion, land subsidence, and water quality which are presented and described in Chapter 3. The monitoring networks are comprised of data collected by local, state, and federal agencies. This MA of continuing and optimizing monitoring and reporting would enhance and optimize existing monitoring networks for sustainability indicators to further improve the current calibration of the Sierra Valley model. This would include identifying additional wells to be monitored, measuring water quality at existing wells, adding stream gages and subsidence monuments as needed. Once better calibration has been achieved, the model will be used to simulate the basin response to different PMAs under current and future conditions. Specific data will be used to monitor the effectiveness of specific PMAs and therefore will be included in the model and used in future model simulations. Monitoring includes data gathering, frequent reporting, and analysis. For example, to better monitor streamflow depletion, near-term actions could include the installation of streamflow gages. GDE monitoring could be utilized to analyze changes in ecosystem health using vegetation indices (e.g., NDVI) derived from satellite imagery, rainfall

records, and groundwater data from existing wells. Proposed optimization of monitoring networks is described in Chapter 3 and further justified in the data gaps section (Appendix 2-5).

4.2.2.2 Measurable Objective

Collect and report accurate data sufficient to provide accurate groundwater levels, water quality, subsidence, and GDEs conditions and demonstrate whether the sustainable management criteria outlined in Chapter 3 for all indicators are being met through the projects and management actions in place in the basin. As discussed in Chapter 3, the proposed groundwater elevation network uses 36 monitoring wells and covers 82% of the Subbasin according to spatial coverage estimates by Sophocleous (1983). The proposed monitoring well density should allow for extrapolating seasonal groundwater elevation maps to support analysis of impacts to shallow domestic wells, GDE impact analysis, and to monitor seasonal changes in hydraulic gradients that may indicate changes in ISW depletion. Additional monitoring wells will be incorporated to adequately cover the remaining 18% of the Subbasin. Up to five existing monitoring wells may be added as part of the water quality network. Wells will be measured at least biannually, in spring (mid-March) and fall (mid-October), in line with DWR Best Management Practices (DWR, 2016).

Subsidence will be monitored annually using InSAR data provided by DWR. Four subsidence monuments will be installed in high-risk areas of the Subbasin and surveyed every five years. Additional surveys will be conducted if the InSAR subsidence increases by 50% of the average annual subsidence from the baseline period (2015-2021). The GSAs may at their discretion elect to survey monuments more frequently, pending available funds. If subsidence is detected additional evaluation may be warranted to assess how declining groundwater levels contributed to observed subsidence.

4.2.2.3 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.2.2.4 Permitting and Regulatory Process

Permitting may be necessary for the installation of new monitoring wells or streamflow gages. Land subsidence and water quality can be monitored without acquiring additional permits. All applicable permits will be obtained as necessary.

4.2.2.5 Schedule for Implementation

This PMA is existing, partially funded through the current grant, and will be enhanced immediately after GSP submission. Future actions will include evaluating the feasibility for expansion of the program within three years of GSP implementation, but this will be based on funding availability. GSP annual reports and five-year updates will include an evaluation of the monitoring network and provide a description of the remaining monitoring network data gaps.

4.2.2.6 Implementation

Considering the monitoring needs highlighted in chapter 3, the GSAs will work toward getting permits and access permissions, as needed, purchasing, and installing monitoring equipment, collecting, and synthesizing data, and reporting on trends. Additionally, the GSA will work with technical staff, state, and federal agencies to collect and incorporate additional datasets into the GSP development process. For example, DWR is currently conducting airborne electromagnetic (AEM) surveys in California's high- and medium-priority groundwater basins. Once the data is available, the GSA will work on incorporating the additional geophysical data into their HCM and to better identify locations for project implementation, as funding allows.

4.2.2.7 Expected Benefits

The data collected for the monitoring networks will provide the information needed to comply with SGMA requirements and to evaluate the effectiveness of the implemented (or planned) PMAs in achieving the criteria for all the sustainability indicators as defined in Chapter 3. Annual reports will be submitted by the GSAs to DWR as required by SGMA.

4.2.2.8 Legal Authority

The GSAs are legally authorized to develop and maintain the representative monitoring network points (RMPs) discussed in chapter 3. Adding more RMPs can be beneficial, but their installation and collection can be dependent on funding availability.

4.2.2.9 Estimated Costs and Funding Plan

Based on estimated operations and maintenance costs for other basins, annual reporting and monitoring costs range from $43,000- $65,000 (SCI, 2021, Appendix 5-1). This is currently included as part of the GSAs' operating budget. It will cost the GSAs approximately $3,000 annually to survey the subsidence monuments. The GSAs may elect to survey the monuments annually, pending funding, or as described in Section 4.2.2.2.

4.2.3 Data Management and Modeling Updates

4.2.3.1 Project Description

This MA of maintaining and periodically updating the hydrogeologic model would analyze SV Subbasin conditions (e.g., groundwater levels and quality) to support maintenance of the criteria described in chapter 3 for all the sustainability indicators. Frequency of model updates will be considered based on current projects and funding availability.

The newly collected data described in Section 4.2.2 would provide information to implement the Sustainable Management Criteria in Section 3 and provide accurate records for use in the hydrogeological model. The database management system (DMS) developed for the GSP will be used to store the new data collected from the optimized monitoring network as discussed in Section 4.2.2 and Chapter 3. The DMS will be designed and developed to require minimal user interaction reducing ongoing implementation costs. Scripts will be developed to populate the DMS, and output figures and tables used to populate GSP annual reports and 5-year GSP updates.

4.2.3.2 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.2.3.3 Permitting and Regulatory Process

Permitting is not applicable to this MA.

4.2.3.4 Schedule for Implementation

This MA is existing and ongoing. The data management system will be updated on an annual basis to add new data and to review for quality control. The integrated hydrological model will use the new data to be recalibrated on an annual or biannual basis (precise frequency can be determined based on which projects are being implemented and funding availability) to better determine SV Subbasin conditions.

4.2.3.5 Implementation

This MA has been implemented with the development of the SVHM model. Future actions will include updating the model periodically with new information.

4.2.3.6 Expected Benefits

A modeling analysis of SV Subbasin conditions supports the sustainable management of the SV Subbasin through its use to evaluate impacts of changing conditions and implementation of PMAs. A comprehensive DMS is a critical tool for characterizing groundwater conditions in the Subbasin.

4.2.3.7 Legal Authority

The GSAs are legally authorized to implement this MA.

4.2.3.8 Estimated Costs and Funding Plan

Costs and funding for development of the model have been funded through a SGMA related grant from DWR. The GSAs have estimated that the annual cost to update the data management system by incorporating newly collected data would be approximately $3000. Updates of the model to reflect changing conditions (e.g., impacts of wildfires) and extend the simulation period to include a more current timeframe (i.e., extending from 2020 to 2025) are estimated to cost approximately $21,000 for each update. A more comprehensive update could cost up to $85,000 and would involve reviewing and recalibrating the model using recently collected data (e.g., USGS study currently in progress, anticipated DWR airborne electromagnetic (AEM) survey) to better simulate hydrologic conditions in Sierra Valley. This level of maintenance will not be required on an annual basis allowing the $21,000-$85,000 to be spread over a period of 3-5 years and be allocated based on funding availability through grants and other capital projects. These costs are consistent with estimates for updates and model maintenance for similar basins of $28,000-$65,000 per year (SCI,2021, App 5-1). Potential funding sources for ongoing model updates will be explored during the first year of GSP implementation.

4.2.4 Education and Outreach

4.2.4.1 Project Description

An education and outreach program currently exists through development of the GSP and includes public workshops along with presentation of information at Board meetings that are open to the public as described in Section 2.1.5, Notice and Communication, and in Appendix 2-3, Communication and Engagement Plan. In addition, GSP materials are all posted on the SVGMD website. A more robust education and outreach program is proposed as a MA for the SV Subbasin. The program will provide irrigators, landowners, and other groundwater users with educational resources to implement actions for sustainable use of water resources. Educational programs will add value to other groundwater sustainability efforts throughout GSP implementation. Over time, programs will be tailored to reflect current technologies and best practices in on-farm water management, especially as groundwater conditions change in the SV Subbasin and as proposed pilot projects yield results. Additionally, well owners and other stakeholders are encouraged to report information, such as when and where domestic wells are going dry and groundwater quality concerns, to the GSA to help educate governing agencies and their consultant team. DWR has set up an online portal to submit problems with wells going dry. The website can be accessed at: https://mydrywell.water.ca.gov/report/. Similar web portals can be developed and/or provided, if already existing, to encourage stakeholder data sharing.

The GSAs would consider partnering with local organizations, or professionals, or groups with experience providing education and outreach to growers and landowners. Potential agencies and groups that the GSAs may consider partnering with are:

- University of California, Davis (UC Davis)

- Natural Resources Conservation Service (NRCS)
- Resource Conservation District (RCD)
- UC Cooperative Extension (UCCE)
- University of Nevada, Reno (UNR)
- Desert Research Institute (DRI)
- The Nature Conservancy (TNC)

Often periodic outreach events are not sufficient to help individual landowners identify Best Management Practices (BMPs). Individual ranch assessments may be needed to identify BMPs to implement on a case-by-case basis. For larger ranches, a water resources inventory and operations assessment can be conducted to identify BMPs that will contribute to achieving the sustainability goals outlined in the GSP. BMPs may include utilizing in-lieu recharge, constructing new and/or increase storage of existing off-stream reservoirs, improving on-farm irrigation efficiencies, and methods to maintain farm production and profitability. Water resources and operation assessments can be completed through performing farm water budgets, seepage tests on open ditches, conducting bathymetric surveys determining reservoir capacity, land grading assessments, etc. Opportunities to collaborate with other potential agencies and groups will be explored. Related details are also found in Section 4.3.6 discussing PMA on water conservation.

4.2.4.2 Measurable Objective

Education and outreach programs could provide resources for landowners and result in reductions in groundwater pumping or surface water depletion through workshops and activities. To this end, workshops will be conducted annually to provide resources and training regarding practices to better manage water resources. Outreach materials will also be distributed to provide information. Individual ranch water resources and operations assessments will be conducted as funding allows.

4.2.4.3 Public Noticing

It is anticipated that the public and other agencies will be notified of planned education activities through outreach and communication channels identified in the GSP.

4.2.4.4 Permitting and Regulatory Process

Permitting is not applicable to this MA. However, permits may be required for stakeholders to implement specific BMPs.

4.2.4.5 Schedule for Implementation

Planning and partnership development would be expected to begin with the first two years of GSP implementation. Educational programs would be expected to occur throughout the implementation of the GSP, with a fully developed program within three years.

4.2.4.6 Implementation

The education and outreach program would consist of workshops that would cover topics surrounding best management practices for sustainable groundwater management. A committee would develop a schedule and list of topics that would be beneficial for attendees, such as managing soils, reducing ET, and other on-farm practices. The GSAs could partner with other agencies to develop workshop content. The workshops would provide resources for growers to implement these practices in their water management and agricultural practices.

4.2.4.7 Expected Benefits

Implementation of an outreach and education program is expected to benefit groundwater levels, groundwater storage, and water quality by providing education resources for irrigators and other water users to implement BMPs that may reduce non-beneficial ET and provide in-lieu recharge benefits to the groundwater in the SV Subbasin, for example.

4.2.4.8 Legal Authority

The GSAs are legally authorized to provide education and outreach.

4.2.4.9 Estimated Costs and Funding Plan

Depending on size, scale, and participation, typical education and outreach programs based on similar basins range from $7,000 to $18,000 per year (SCI, 2021, App 5-2). If individual ranch inventories and assessments are conducted, the cost may exceed $50,000 per year spanning the project duration depending on the level of effort. Additional funding sources can be identified to support these activities.

4.2.5 Well Permit Ordinances

As an ongoing MA, the GSAs manage and enact well-permitting ordinances. SVGMD has enacted ordinances that:

- Require meters on all high-capacity wells (82-03);
- Require review of water availability for new development applications (83-01), and
- Restrict installation of new high-capacity agricultural wells in specific areas of the SV Subbasin (18-01 §3a).

Permit approval is required for newly constructed wells to ensure that new wells are used for accepted purposes and do not adversely impact groundwater within the SV Subbasin. Active ordinances prohibit the installation of high-capacity wells in certain hydrogeologic areas or wells of a certain size to avoid declining groundwater levels. The ordinance also specifies that high-capacity wells shall not be located within a one-quarter mile from other high-capacity wells.

Future activities under this MA could include additional spacing requirements for construction of new wells to limit negative impacts to the SV Subbasin, developing a process for reviewing requests to reactivate currently inactive wells, and a permitting process for wells outside the restricted zone, and specifying minimum well design requirements. For example, wells can be designed and installed so large capacity wells extract water from deeper in the aquifer sealing the upper aquifer minimizing the risk to shallow domestic wells and GDEs. Shallow domestic wells should be sufficiently deep considering groundwater and ground surface elevations and sufficient submergence to allow groundwater fluctuations during periods of drought.

4.2.5.1 Measurable Objective

The objective of the well permit ordinance is currently to avoid high-capacity wells in areas with declining groundwater levels potentially impacting domestic wells and GDEs. The GSA will monitor groundwater well installations to prevent wells from being installed in high-risk areas. A review of ordinances/policies on an annual basis is recommended to ensure that they are an effective tool to support sustainable management of groundwater resources. Modifying existing or adding new ordinances and policies can be considered to offer protection against harming GDEs and domestic well owners, as necessary while ensuring agricultural production and profitability, which is vital to the local economy.

4.2.5.2 Public Noticing

Public noticing for this project will be conducted by the GSAs prior to project implementation as required for all new and adjusted ordinances

4.2.5.3 Permitting and Regulatory Process

External permitting from regulatory agencies is not anticipated for this management action.

4.2.5.4 Schedule for Implementation

This MA is ongoing. Ordinances will be updated on an annual basis.

4.2.5.5 Implementation

The GSAs would research and propose ordinances based on SV Subbasin conditions and water use.

4.2.5.6 Expected Benefits

Implementation of well permit ordinances is expected to benefit groundwater levels, groundwater storage, water quality, GDEs, and domestic well owners by limiting high-capacity wells in specific subdivisions as appropriate in the SV Subbasin.

4.2.5.7 Legal Authority

The GSAs have the legal authority to issue new construction well permits, uphold restrictions for use, size, and spacing and prohibit installation of new wells.

4.2.5.8 Estimated Costs and Funding Plan

Costs for implementing existing ordinances and for updating and implementing revised or new ordinances are standard functions of the GSA and are included in the current annual budget. Cost may vary depending on if new ordinances or if modifying existing ordinances extends beyond their standard procedures and require additional technical and legal input. A cost to make changes to ordinances is not provided at this time since no specific changes have been identified that extend beyond the GSA routine review of ordinances. The GSA will consider incorporating additional ordinance(s), which will be discussed in the annual reports and the 5-year update as groundwater conditions dictate.

4.2.6 Water Reuse

Reuse of treated municipal wastewater for irrigation presents an alternative to groundwater. This then provides the opportunity for groundwater supplies that could be reserved for other uses where higher quality may be needed (i.e., meet drinking water standards). Currently, treated wastewater from the City of Loyalton's wastewater treatment plant is used to irrigate crops. Similarly, when in operation, discharges from the former Loyalton Mill/Co-gen plant are used for crop irrigation. Other opportunities to reuse treated wastewater in compliance with the State Water Board Recycled Water Policy (Resolution No. 2018-0057) will be explored through evaluation of activities at commercial and municipal facilities to determine if water is discharged that could be reused.

As an example of an opportunity to expand reuse, increased volumes of recycled water may be achieved by repairing leaking pipes or making other infrastructure improvements if needed in the City's collection system and increasing the volume of wastewater to be treated and reused. Other reuse opportunities could include reusing process or wash water at commercial or industrial facilities for dust control or landscape irrigation.

4.2.6.1 Measurable Objective

The amount of groundwater supply that is conserved as a result of increasing the use of recycled water for approved applications such as irrigation or dust control. Specifically, quantities of recycled water used for irrigation and other approved uses would be tracked.

4.2.6.2 Public Noticing

Public noticing may be required for new uses of recycled water and signage may be required indicating where recycled water is being used for irrigation

4.2.6.3 Permitting and Regulatory Process.

Recycled water use is regulated by the State Water Resources Control Board and Central Valley Regional Board under the Statewide Water Reclamation Requirements for Recycled Water Use (Order WQ 2016-0068-DWQ)

4.2.6.4 Schedule for Implementation

This MA is ongoing.

4.2.6.5 Implementation

The GSAs may coordinate with the City of Loyalton and other recycled water users to estimate the amount of water reuse occurring and how it impacts local groundwater supplies.

4.2.6.6 Expected Benefits

Water reuse is expected to benefit groundwater levels and groundwater storage by reducing the use of groundwater for certain applications.

4.2.6.7 Legal Authority

Legal authority is delegated to the Water Boards.

4.2.6.8 Estimated Costs and Funding Plan

Costs to the GSAs are primarily associated with tracking the benefits of recycled water use and coordinating with the City of Loyalton as needed. The potential for the GSAs to share costs associated with infrastructure repair (i.e., leaking sewer lines) could also be explored.

4.2.7 Sierra Brooks – Smithneck Wildland Urban Interface Fuels Reduction Project[3]

This MA is for the GSAs to coordinate actions with an existing fuels reduction project in an effort to take advantage of actions to reduce vegetation thus improving water retention and water quality. As detailed in PMA 4.3.11 Assessment of Post-Fire Hydrology, reducing vegetation in overstocked forests may increase the amount of water that infiltrates into the aquifer, both from interconnected surface waters and from precipitation.

The Sierra Valley Resource Conservation District (SVRCD) will reduce heavy fuel loads on 723 acres of U.S. Forest Service and California Department of Fish and Wildlife lands adjacent to the Sierra Brooks Subdivision and one mile southeast of the community of Loyalton in Sierra County. Implementation of proposed treatments will benefit wildlife, including critical winter range for the Truckee-Loyalton deer herd, increase forest resilience and resistance to destructive wildfire, disease, and insect infestation, and protect the community of, and water supply for, Sierra Brooks.

[3] https://sierranevada.ca.gov/what-we-do/2021-early-action-projects/#project1314

The long-term goal of the project is to return the landscape to a condition within the range of natural variability of forest density, allowing for prescribed underburns that will maintain healthy forest conditions. Treatments were identified as high priorities for fuels reduction in the Sierra County Community Wildfire Protection Plan, by the Sierraville Ranger District and the Sierra Brooks Firewise Community.

The project furthers the Integrated Regional Water Management Plan for the Upper Feather River Watershed and meets the goals of improving local water retention and improving water quality. The project will complement existing adjacent forest health and fuels reduction projects which have recently been completed by private landowners. Several minor projects have been executed within the last five years and include manual fuel treatments along the Forest Service 04 Road, mastication and manual thinning in the Loyalton Pines Subdivision, and thinning/brush abatement within the Sierra Brooks Subdivision. The SVRCD has been conducting ecosystem restoration and providing forest health assistance to landowners in Sierra County for over 25 years.

The GSAs will coordinate with the RCD to identify opportunities for this project to further benefit management of groundwater resources in the SV Subbasin.

4.2.7.1 Measurable Objective

Vegetation management and fuels reduction projects have the potential to increase recharge of groundwater aquifers and increase groundwater levels.

4.2.7.2 Public Noticing

Public noticing for this project will be conducted by the SVRCD as appropriate and will be reported to the GSAs.

4.2.7.3 Permitting and Regulatory Process.

Any permitting or regulatory process required by the project would be conducted by the SVRCD. The GSAs would support these processes as necessary.

4.2.7.4 Schedule for Implementation

The scope of the project has been developed, and the project is ready for bid. As of December 2021, the project has not gone out to bid. The project is expected to take two years and there will be an additional six months of post-project monitoring.

4.2.7.5 Implementation

This project will be implemented by SVRCD. The GSAs may explore approaches to coordinating with SVRCD on this project.

4.2.7.6 Expected Benefits

The expected benefit is to return the landscape to a natural state, which will improve forest health, including water retention in the soils, and reduce the risk of wildfires.

4.2.7.7 Legal Authority

SVRCD has the legal authority to install monitoring equipment and work with other organizations / public agencies.

4.2.7.8 Estimated Costs and Funding Plan

Funding for this project is coordinated through SVRCD. The project is funded by the Sierra Nevada Conservancy. The total cost of this project is estimated at $1,100,000. Tahoe National

Forest's Sierraville Ranger District and CDFW are helping to fund this project. Costs for the GSAs to coordinate with this project would need to be determined.

4.3 Tier II: Potential Projects and Management Actions

Tier II PMAs are potential projects for the GSAs to implement based on an evaluation of which are most likely to be effective and technically and financially feasible. The GSAs will work to evaluate and prioritize these PMAs during the first year of GSP implementation. Based on these evaluations, the highest priority PMAs will be scheduled for near-term initiation and implementation (2022-2027) by individual agencies, while others will be designated as needing feasibility studies or pilot projects that will be implemented over the first five years of GSP implementation. It is also possible that a PMA will be determined to be infeasible or not beneficial. Where found feasible and effective, these PMAs will be advanced to further design. Where funding exists these PMAs will be scheduled as part of the GSP implementation. As noted, the prioritization and more specific plan for PMA implementation and grant applications will be one of the initial tasks taken on in February 2022 under GSP implementation.

The Tier II Potential PMAs are identified in Table 4.3-1. Project descriptions are provided for each of the identified Tier II PMAs. The level of detail depends on the status of the PMA. Where possible, PMA descriptions include information under §354.42 and §354.44 of the SGMA regulations

Table 4.3-1: Potential Projects and Management Actions for Sierra Valley

Category	Title	Description	Potential Actions

Demand Management	Agricultural efficiency improvements	Various equipment and operational improvements designed to reduce overall water demand	• Develop individualized conservation plans with ranchers/other irrigators to
			  ○ Install soil moisture sensors
			  ○ Fix leaking irrigation pipes
			  ○ Convert to low-profile (near ground-level) sprinkler applicators, as appropriate
			  ○ Manage irrigation time of day to reduce evaporative and wind drift losses
			  ○ Reduce use of end guns on center pivots
			  ○ Convert flood irrigation to sprinkler
			  ○ Convert wheel lines to center pivot systems
			• Evaluate cost implications for landowners and approaches to addressing costs including supporting potential for grant funding for improving irrigation efficiencies

Other Management Actions	Well Inventory Expansion	Enhance inventory and metering efforts to support groundwater management. Expand the inventory to all types of wells, including domestic wells used for drinking water.	• Consider adding inventory for domestic, commercial, industrial, and stock well inventory and use estimation
Supply augmentation	Reoperation of, or adjustments to, surface water supplies	More efficient use of surface water resources to reduce long-term groundwater pumping	• Investigate process and evaluate feasibility of modifying surface water rights delivery from Frenchman Lake and Little Last Chance Creek for more efficient use of surface water • Divert some Lake Davis water into Sierra Valley • Gain benefit from winter spills from Frenchman Lake and winter runoff from other streams by winter diversions to pasture (icing) • Evaluate feasibility of increasing capacity of Frenchman Lake (long-term project)
Supply augmentation	Off-stream storage	Develop off-stream surface water storage projects	• Increase on-farm storage of surface water (Smithneck and Little Last Chance) • Store flood water for later use through catchments, tanks

Category	Title	Description	Potential Actions
Other Management Actions	Drought mitigation & planning	Drought mitigation planning and identification of drought triggers tied to precipitation, runoff, and other factors	• Develop Drought Mitigation Plan to address this critical element of water management in the valley including determination of drought status and what tiers of drought would trigger actions and adjustments
Demand Management	Water Conservation	Develop a water conservation program to reduce water demand to offset ground and surface water pumping	• Develop voluntary water conservation agreements (e.g., only going to irrigate to crop ET, foregoing a fourth cutting, cutting back pumping by x %, moving irrigation start date from March 1 to March 15) • Develop pilot program for implementation of water use conservation agreement
Demand Management	Groundwater Trading and Allocations System	Develop an approach for establishing groundwater pumping allocations if other management actions do not result in needed reductions	• Develop an approach for limiting groundwater extractions, – that would be available if and as needed – to incrementally reduce the permitted pumping amount, allowing for transfers and flexibility. • Develop approach for trading or transferring allocations
Supply Augmentation	Watershed and Upland Management and Restoration	Implement multi-benefit projects that enhance precipitation retention and infiltration (i.e., reducing runoff), reduce fuel loads, and support ecosystem services such as reducing peak flood flows and enhancing summer baseflows; Improvement of recharge in the higher elevations and provide multi-benefits, including potential benefit for fire prevention.	• Watershed management • Upland management (forest/meadow restoration, road improvements or removal, soil decompaction) • Enhance wetlands and meadows to better retain water in GDEs • Planning study with pilot program • Forest treatment to promote recharge

Category	Title	Description	Potential Actions
Demand Management	Voluntary Managed Land Repurposing	This includes a wide range of voluntary activities that make dedicated, managed changes to land use (including crop type) on specific parcels in an effort to reduce consumptive water use in the SV Subbasin	• Support alternative crop conversion There are limits to what can be grown. Early freezes affect what is planted in the fall. Some crops will survive the early freezes. • Develop terms contracts through a Conservation Reserve Program (need more details) this would involve marginal lands – might be a benefit to wildlife. This is for dryland cultivated land. Would not generally be applicable, raising more concerns than benefits. • Develop crop rotation program • Develop irrigated margin reduction
Supply Augmentation	Groundwater Recharge / Managed aquifer recharge (MAR)	Develop aquifer recharge projects to store and augment water supply.	• Planning study/GIS study to determine the feasibility of MAR in SV Subbasin • Spreading SV Subbasins • Flooding agricultural fields • Injection wells • Streams and canals: e.g., diversion from Badenaugh Creek • Indirect recharge • Distributed stormwater collection and MAR
Supply Augmentation	Assessment of post-fire hydrology – water supply augmentation	The Plumas County Fire Safe Council has received funding and is in the process of developing the Eastern Plumas Wildfire Protection Project to reduce fuel conditions that can contribute to catastrophic wildfires.	• SVGMD will coordinate with Plumas County Fire Safe Council to identify opportunities for monitoring changes in streamflow and groundwater levels that result from the project actions. • Other specific actions to be identified as the project is developed
Other Management Actions	Climate Change Impact Assessment	Incorporate additional climate change scenarios into the hydrologic model to assess potential impacts and to evaluate and prioritize PMAs.	• Identify funding source(s) to evaluate additional climate change scenarios. • Assess how climate change may impact reaching sustainability. • Use refined model results based on climate change scenarios to prioritize PMAs for implementation.

4.3.1 Agricultural Efficiency Improvements

4.3.1.1 Project Description

Achieving increases in irrigation efficiency through equipment improvements is anticipated to reduce overall water demand. This management action would include development of work plans tailored to individual ranches based on identifying viable alternatives for existing practices and initially conducting pilot projects to evaluate their effectiveness.

Existing agriculture in Sierra Valley primarily produces forage crops for cattle and dairy industries. This includes flood irrigated pasture, and cultivated alfalfa, grass hay, and grains as rotation crops. Irrigation efficiency refers to the quantity of water required to meet crops' water demand versus the volume of water applied. Irrigation efficiency can be improved by accomplishing more uniform distribution of water to soils, minimizing losses to wind (wind drift), minimizing evaporation, and preventing overapplication of water, with a goal of applying just the right amount of water to meet the crop evapotranspiration (ET) requirement, while minimizing deep percolation past the root zone, or runoff from the irrigated area. Depending on climate and soil salinity, some over application of water above the required ET amount is necessary for leaching of salts, and prevention of salt buildup in the root zone. In reality, due to non-uniformity of applied water and soils variability, achieving perfect efficiency is not possible, and when approached, will result in some percentage of the irrigated area experiencing crop distress and crop loss.

In Sierra Valley, most groundwater is pumped to center-pivot irrigation systems. Mid-Elevation Spray Application (MESA) sprinkler heads are used throughout the valley, with few exceptions. Some end-guns are in use to expand the irrigated area. A smaller amount of irrigation is accomplished using wheel line irrigation systems, and smaller yet, some groundwater is pumped to pastures for flood irrigation. Center pivot irrigation technology is generally considered the most efficient of these means for irrigation. However, lower elevation Spray Application (LESA) and Low Energy Precision Application (LEPA) are not currently used in the valley. Sprinkler modifications to existing pivots, and possibly wheel lines, presents opportunities to increase irrigation efficiency and reduce pumping water demand to produce an equal quality and quantity of forage crop. A study by Bachand and Associates in 2018 and 2019 (Bachand and Associates, 2020) assessed use of LESA sprinkler systems in Sierra Valley and estimated a 7% water reduction was achieved. Studies conducted by Washington State University and University of Idaho found water savings of 5% to 15% in pilot demonstration projects (Bonneville Power Administration, n.d.). Further studies indicated a 15% decrease by use of water using LESA versus MESA systems. Other studies in the Northwest (Oregon and Washington) have found similar 15% reductions in water use.

As a proposed project for Sierra Valley, a pilot test of LESA and LEPA systems is proposed. The pilot study varies from the Bachand (2018) evaluation, in that a control MESA pivot would be compared with reduced water LESA or LEPA retrofitted pivots, with an objective to reduce applied water by 15% as contrasted with the control MESA pivot.

All ranches in Sierra Valley could improve upon existing irrigation efficiencies. This could be accomplished through other approaches specific to applicability at each Sierra Valley ranch:

- Use of Variable Frequency Drive (VFD) pump controls systems to modulate pumping rates from wells to meet crop water demand more effectively, minimizing over-application of water.
- Use of soil moisture sensors to aid in adjustment of applied water amounts and minimize deep percolation (percolation beyond the root zone).

- Use weather stations or weather monitoring to avoid, if possible, irrigation during excessively windy conditions.
- Irrigation system automation for improved water delivery to match crop water requirements.
- Reduce use of end-guns (especially high-capacity end guns), which are not as efficient in irrigating peripheries of the fields, and if not used would result in mildly smaller irrigated areas.
- Convert wheel line irrigation to center-pivot irrigation, where possible.
- Minimize use of groundwater for use in low-efficiency flood irrigation of pastures.
- Consider use of soil amendments to increase water holding capacity.

As a related groundwater efficiency improvement on the farm level, improvements to minimize water conveyance losses will reduce groundwater pumping. Specific items to consider at the ranch/farm level are:

- Reduce leakage from pipelines.
- Evaluation of the efficacy of reducing conveyance of pumped groundwater through unlined open ditches. Included in this evaluation would be if there are any benefits associated with seepage for near-surface groundwater and marshy areas and if there are adverse impacts to wildlife if ditches were lined and infiltration reduced.

Also, for consideration for reducing groundwater consumption on the ranches are crop types being grown. Conversion to economical alternative crops that have lower required water amounts could reduce pumping in the valley while maintaining a viable agricultural community. However, the climate in Sierra Valley, including freezing spring temperatures, limits potential alternative crops. Also, many of the ranches engage in farming of forage crops to in part, or whole, support cattle that are also raised by the ranching operations.

As opportunities are identified for alternative crops, willing ranches can conduct tests to further gage the variability of alternative crop types. Hemp has been tested on the Roberti Ranch and working with agricultural extension groups of universities in the region (California and Nevada) should be pursued.

Future benefits of actual implementation will be evaluated and assessed with the Sierra Valley Integrated Hydrogeologic Model (SVIHM) using the methodology described in Chapter 3.3 and using data collected through the GSPs monitoring program along with tracking information specific to this process.

Monitoring data that will be collected by this project include, but are not limited to:

- Total acreage with improved irrigation efficiency equipment
- Location of fields under improved irrigation efficiency equipment
- Assessment of the increase in irrigation efficiency, with particular emphasis on assessing the reduction or changes in consumptive water use (evaporation, evapotranspiration) based on equipment specification, scientific literature, or field experiments
- Cropping systems in fields with improved irrigation efficiency equipment

4.3.1.2 Measurable Objective

Reductions in pumping volumes will be used to measure reductions in groundwater use for individual properties and overall.

4.3.1.3 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.3.1.4 Permitting and Regulatory Process

External permitting from regulatory agencies is not anticipated for this management action.

4.3.1.5 Schedule for Implementation

A plan to implement irrigation efficiencies will be developed in the first two years of GSP implementation.

4.3.1.6 Implementation

As needed and in coordination with other outreach efforts (see Section 4.24, Education and Outreach)., the GSAs will attempt to engage with landowners to identify appropriate practices for each property and develop and implement plans based on landowner input.

Short-Term Goals (first 2-3 years of GSP implementation):

- Implement the pilot LESA – LEPA evaluation
- Support efforts by ranches to identify areas for irrigation efficiency improvements, such as implementation of soil moisture sensors, conversion to LEPA and LESA systems, and automation to improve water application to match crop requirements.
- Identify possible funding sources (e.g., NRCS) for on-farm irrigation efficiency improvements.
- Encourage ranches to identify and improve groundwater conveyance to minimize losses.

Long-Term Goals (within first 5 years of GSP implementation:

- Engage university Ag Extension groups for input and ideas on potential alternative crops.

In addition, reporting of volumes of groundwater pumping will continue over the implementation phase of the GSP in the same format as what the SVGMD is already collecting. Including a system for continuing reporting using telemetry is under consideration.

Data will be used to better quantify groundwater extraction spatially and temporally throughout the SV Subbasin.

4.3.1.7 Expected Benefits

Implementation of irrigation efficiencies will result in reduced groundwater usage to help maintain groundwater levels and other SMCs.

4.3.1.8 Legal Authority

This MA is primarily implemented through voluntary actions not requiring legal authority on the part of the GSA.

4.3.1.9 Estimated Costs and Funding Plan

Currently, this project is in the planning phase and funding options will be explored during the first five years of GSP implementation. The costs for the installation of flowmeters or other

equipment to manage irrigation efficiency practices that may be needed for implementation can be obtained through Prop 68 Implementation funds.

4.3.2 Well Inventory Expansion

4.3.2.1 Project Description

This management action (MA) would build on the Tier 1 MA for tracking large-capacity agricultural wells (Section 4.2.1). As noted in Section 4.2.1, a comprehensive well inventory that includes all types of wells in the valley will help assess impacts associated with the SMCs set in the GSP. Outreach will be conducted to domestic well owners to create awareness about the importance of checking groundwater levels and periodically testing groundwater quality.

A detailed well inventory and assessment of impacts improves the understanding of SV Subbasin conditions and will be valuable for calibrating model results and management decisions.

This MA will potentially add a comprehensive inventory of all wells in the valley including active domestic wells based on density analysis that identified locations in the Plan Area where the number of wells is currently unknown as shown in Figure 2.1.1-7. Currently available information on both large capacity wells and smaller domestic wells is included in Appendix 3-1 (Well Impact Analysis), and includes precise locations (GPS coordinates), along with the number and general locations of domestic and stock wells, and discussion of current and potential impacts to domestic wells due to approaching the criteria set in chapter 3 (e.g., decline in groundwater levels or quality).

An enhancement of the current MA is suggested to provide a more complete inventory of small domestic wells, including their current water levels (and therefore their chances of being impacted by a decline in groundwater levels in the SV Subbasin) and adding more water quality sampling. This should improve the understanding of SV Subbasin conditions and will be valuable for future management decisions and modeling results. The University of California Cooperative Extension (UCCE) conducted a cross-sectional analysis to assess Nitrate+Nitrite as N, arsenic, boron, and total dissolved solids in agricultural and domestic wells across Sierra Valley Groundwater Management District.[4] The study determined the presence of high-quality water within the District with localized exceptions. The study filled a data gap of water quality in the GAMA program and data collection should continue to provide further guidance with focused attention on potential areas of concern.

4.3.2.2 Measurable Objective

Development of a comprehensive inventory of active domestic, industrial, and stock wells. By optimizing the number and location of wells used for the WQ monitoring well network, a more accurate characterization of current groundwater quality conditions can also be developed.

4.3.2.3 Public Noticing

Public noticing for this project will be conducted by the GSAs prior to project implementation if required. Public notification is planned to be executed with significant project changes or additional project elements.

4.3.2.4 Permitting and Regulatory Process

Permitting is not applicable to this MA.

[4] Study accessible here: https://ucanr.edu/sites/Rangelands/files/358503.pdf

4.3.2.5 Schedule for Implementation

The implementation of this MA is depending on availability of funding as a considerable outreach effort can be foreseen. Future actions will include evaluating the feasibility and need for additional metering within three years of GSP implementation.

4.3.2.6 Implementation

Future implementation efforts would include:

- Identification of wells in key locations with unknown well density. Areas of focus would include all communities and corridors of decentralized homes.
- Outreach to domestic well users regarding importance of level and water quality monitoring.
- Finalize the internal database/well inventory.
- Investigate different options for telemetry for meters and associated costs.

4.3.2.7 Expected Benefits

More information and outreach on domestic wells will ensure protection of domestic wells used for drinking water and help preserve water quality.

4.3.2.8 Legal Authority

Article 6, Section 601 of SB 1391 authorizes SVGMD to require metering of any new, deepened, or previously-abandoned-then-reactivated well. As such, the GSAs are legally authorized to collect data and require metering to facilitate the data collection.

4.3.2.9 Estimated Costs and Funding Plan

Additional funding would be needed for expanding the well inventory with the budget to be determined once funding is available.

4.3.3 Reoperation of Surface Water Supplies

Opportunities to use surface water resources more efficiently may be an important strategy to reduce long-term groundwater pumping in Sierra Valley. Opportunities may exist for Frenchman Lake / Little Last Chance Creek, Lake Davis / Grizzly Creek (Plumas County water right allotment), Smithneck Creek, and smaller tributaries to the northern and eastern sides of the basin.

Frenchman Lake/Reservoir north of the Chilcoot-Vinton impounds waters of the Little Last Chance Creek. Current and historical reservoir operations will be reviewed to identify opportunities to provide more reliable surface water delivery (i.e., delivery of water that is more efficient in meeting crop water demands and modification of the timing of water delivery), which in turn could help reduce groundwater pumping on ranches that have access to surface water and surface water rights in the SV Subbasin. Implementing a new reservoir management scheme can be reviewed to increase storage capacity, maintain higher minimum pools for more assured drought supply, and/or to reduce flood spills and conserve water, which in Sierra Valley might involve managed winter releases to recharge the aquifer, or impound additional water on farms through augmented on-farm storage, or winter icing of flood irrigated pastures.

The Pumping Management Actions via Improved Surface Water Management may include the following activities:

- Identification of Irrigation Areas with Combined Surface Water and Groundwater Use.

- Review of Reliability of Surface Water Resources and Dependency on Supplemental Groundwater over a range of year types (Wet Year, Normal Year, Dry Year).
- Review of DWR Water Master Surface Water Management and Decree Rights, along with potential legal issues.
- Review of Historical Frenchman Lake/Reservoir Storage and Managed Releases for Irrigation.
- Review and Quantification of Historical Frenchman Lake/Reservoir Spill Releases.
- Concept Review for Modifications to Frenchman Lake/Reservoir Operations.
    - Increased minimum pool in fall to carryover for potential drought supply
    - Modifications to reduce spill (Winter Release concept)
    - Institutional/Legal arrangements necessary to implement operational changes
- Review for Development of Additional On-Ranch Surface Water Storage.
- Review of Lake Davis Possible Water Availability and Potential Use (physical limitation to routes to divert, place of use limitations, possible use for aquifer recharge along northern edge of valley)
- Preliminary Concept Review of Reservoir Improvements, such as Increasing Storage Capacity (Frenchman Lake/Reservoir).

This MA will be evaluated in the context of a Pumping Management Actions document which will include:

- Preliminary feasibility analysis of timing and magnitude of Frenchman Lake/Reservoir releases for agriculture, and preliminary identification of potential reservoir management improvement to reduce long-term pumping on ranches that supplement Little Last Chance water with groundwater.
- Conceptual review of options and alternatives for reservoir operations, which may require further analyses. This may include releases prior to irrigation season (winter releases), releases specifically for aquifer recharge, releases for on-farm storage, modification of release timing for improved efficiency (conveyance losses and match to crop water demands).
- Documentation from engagement of the Sierra Valley Watermaster and DWR in discussions on possible opportunities.
- Preliminary analysis of potential use of Lake Davis water in Sierra Valley (topographic routing along the northern periphery of the valley for aquifer recharge, or direct use to offset uses of groundwater in the northern part of the basin).
- Potential for enhanced recharge of intermittent and ephemeral drainages tributary to the eastern and northern portion of Sierra Valley.

4.3.3.1 Measurable Objective

This MA provides critical information to be included in the model and will enable the model to provide refined information of this MA on the entire water budget of the SV Subbasin. The refined water budget will benefit the measurable objectives for all the critical Sustainability Indicators.

4.3.3.2 Public Noticing

Public noticing for this project will be conducted by GSAs during regular meetings prior to project implementation if required.

4.3.3.3 Permitting and Regulatory Process

External permitting from regulatory agencies is not anticipated for this management action during the planning phases. If water rights changes are required, significant permitting may be required during implementation.

4.3.3.4 Schedule for Implementation

A preliminary feasibility review related to surface water management to reduce groundwater pumping will be included in the Pumping Management Actions Review to be completed by September 2022. A schedule for future actions will be developed based on the findings of the Pumping Management Actions review.

4.3.3.5 Implementation

The following actions will be taken to implement this MA:

Short-Term Goals (first 2 years of GSP implementation)

- Conduct more detailed evaluations, as needed, to advance potentially feasible alternatives, as identified in the Pumping Management Actions analyses.
- Secure DWR grant funding to conduct more detailed evaluations.
- Implement a pilot program of alternative Frenchman Lake/Reservoir operation, if determined to be potentially viable. This may include winter releases, modified timing of irrigation season releases, reservoir level management modifications, etc.

Long-Term Goals (to be implemented within 10 years of GSP implementation if determined to be feasible and beneficial)

- Implement projects to improve use of surface water to meet farming and crop water demands and lessen reliance upon groundwater. This may include construction of additional on-farm storage facilities.
- Implement a new operational scheme for Frenchman Lake/Reservoir and Little Last Chance Creek water deliveries to ranches with combined surface water and groundwater use.
- Implement projects to use Lake Davis water to offset existing groundwater uses, and potentially benefit other GSP goals for GDEs, etc.
- Implement projects to increase the effective recharge to the deep aquifer (not shallow aquifer) – Little Last Chance, Lake Davis, and other ephemeral/intermittent drainages on the northern and eastern side of the basin.

4.3.3.6 Expected Benefits

Implementation of reoperation of surface water supplies will provide refined information on water use that will be incorporated in the integrated model: this will improve estimates for the current water budget and will support the simulation of future water use scenarios. Such scenarios could include increased storage capacity for droughts or winter releases to recharge the aquifer.

4.3.3.7 Legal Authority

Planning for this MA will include evaluating the water rights, who holds rights, times, and quantities of diversions to verify the reoperation is within the water rights.

4.3.3.8 Estimated Costs and Funding Plan

At the time of GSP preparation, the costs and funding plan for this project have not been estimated or developed.

4.3.4 Off-Stream Storage

Increased off-stream surface water storage projects are a potential strategy to augment water supply by diverting and storing surface water that would otherwise exit the SV Subbasin as runoff. This water, captured during the wet season and periods of increased surface runoff, would be stored, and then used during dry periods to supplement groundwater pumping or surface water diversion that may cause seasonal depletions. Storage of this water can be achieved through the construction of small-scale reservoirs (e.g., agricultural ponds or site-specific ponds), or utilization of storage tanks or catchments. The stored water can be used to supplement supply to agricultural operations, as well as domestic or municipal uses. A consideration for off-stream storage is to beware of potential off-stream ponding consequences, such as invasive species, and possible stranding of important species. In addition, impacts to critical habitats of diverting water to storage should also be considered. Through the water rights permitting process, the amount diverted is ensured to not impact downstream human and ecological uses.

Off-stream storage in the Sierra Valley SV Subbasin would be comprised of multiple dispersed storage projects located throughout the SV Subbasin, as opposed to a small number of large-scale projects. Therefore, a key initial step to understanding the viability of this project is to conduct site-specific surveys that quantify the diversion potential of surface water, as well as the storage potential located near the point of diversion. These storage projects are likely to supply water on a site-specific basis, and therefore the stored water will need to be located in close proximity to the ultimate use of the water. Two streams that have been identified for potential on-farm storage of surface water include Smithneck Creek and Little Last Chance Creek.

4.3.4.1 Measurable Objective

Off-stream storage projects are designed to preserve groundwater storage during periods of dry weather by supplementing groundwater demand with stored surface water. Off-stream storage has the potential to increase groundwater storage if adequate amounts of stored surface water are reliably available during times of high groundwater demand. Additionally, the stored surface water has the potential to not only offset pumping but also reduce surface water diversions during dry weather that may cause seasonal depletions.

4.3.4.2 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.3.4.3 Permitting and Regulatory Process

Permitting from the Regional Water Quality Control Board may be required to divert surface water. Additional external permitting may be required and could include permits from the Department of Fish and Wildlife and the Army Corps of Engineers.

4.3.4.4 Schedule for Implementation

This project is in the conceptual stage and has not yet been planned. Interest in the project will be confirmed within the first 5 years of GSP implementation. If interest is confirmed within this period, an implementation schedule will be determined.

4.3.4.5 Implementation

Once interest for off-stream storage has been confirmed, the project will be implemented by first conducting site-specific surveys that quantify the potential for diversion of surface water, as well as the storage potential that is located near the point of diversion. The site-specific surveys will be planned within one year of confirming project interest.

4.3.4.6 Expected Benefits

Implementation of off-site storage is expected to benefit groundwater levels, groundwater storage, and surface water depletion by utilizing stored surface water during dry periods to supplement groundwater pumping or surface water diversions that may cause seasonal depletions.

4.3.4.7 Legal Authority

The GSAs have the legal authority to issue new construction permits for surface water storage (e.g., ponds or storage tanks). As previously noted, the diversion of surface water may need to be approved by the Regional Water Quality Control Board and other agencies.

4.3.4.8 Estimated Costs and Funding Plan

At the time of GSP writing, the costs and funding plan for this project have not been estimated or developed. It is estimated that private landowners will partially finance the projects as they will receive direct benefit from the additional stored water, and that grant funding opportunities related to increased water storage will be sought in the future to share in project costs.

4.3.5 Drought Mitigation Planning

Drought mitigation planning is an important tool that will be used to identify and quantify the impacts to the Valley's water supplies caused by extended periods of dry weather. Once these impacts have been characterized, triggers tied to variables such as precipitation, runoff, and other factors such as the quantity of water in storage, will be developed to minimize stress to water resources, and plan for the appropriate level of use during the dry period. A Drought Mitigation Plan will be developed to address this aspect of water management in the Valley including determination of drought status and what tiers of drought would trigger specific actions and adjustments. With the unprecedented changes in climate that have recently been observed, the Drought Mitigation Plan will be a critical document that may inform other PMAs. Throughout its development, it is important to emphasize how drought status is determined, and how tiers of drought will trigger adjustments to different PMAs.

4.3.5.1 Measurable Objective

Implementation of the Drought Mitigation Plan is intended to safeguard the SV Subbasin's groundwater resources from experiencing significant and unreasonable effects related to lowering of groundwater levels, reduction in storage, degraded groundwater quality, and surface water depletion. The amount of water conserved during a specified drought period is a measurable component of this PMA.

4.3.5.2 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.3.5.3 Permitting and Regulatory Process

External permitting from regulatory agencies is not anticipated for this management action.

4.3.5.4 Schedule for Implementation

This project is in the conceptual stage and has not yet been planned. The schedule for implementation will be based on the release of relevant state funding for drought relief planning.

4.3.5.5 Implementation

Drought mitigation plans or similar contingency plans related to drought planning have been developed for districts, tribes, and municipalities throughout California. This PMA involves obtaining such documents and evaluating them to find common conservation and supply reliability actions that involve coordination within the SV Subbasin or watershed to serve a larger beneficial user group. During the development of the Drought Mitigation Plan, the GSAs' Board of Directors would direct staff to research and propose ordinances based on SV Subbasin conditions and water use. If deemed necessary, the GSAs will coordinate with other partners to develop and implement the Plan.

4.3.5.6 Expected Benefits

The Drought Mitigation Plan will be used as a planning document to conserve water resources and ensure economic and environmental prosperity are preserved during drought periods. The Plan will: determine appropriate mitigation and response actions to reduce risk and vulnerability to drought, identify measurable triggers to start or stop mitigation actions during the onset and termination of drought, and identify the appropriate agencies or organizations that will develop and implement the mitigation actions.

4.3.5.7 Legal Authority

The GSAs have the legal authority to develop and implement a Drought Mitigation Plan.

4.3.5.8 Estimated Costs and Funding Plan

At the time of GSP writing, the costs and funding plan for this project have not been estimated or developed. It is estimated that state grant funding opportunities will share in the project cost.

4.3.6 Water Conservation

A prescribed or voluntary GSP water conservation program could be implemented to promote use of water conservation methods, equipment, or techniques to reduce water demand to offset groundwater pumping. For example, a conservation program could establish a voluntary conservation agreement, in which users would agree to reduce water use during summer months or practice the utilization of stored water only during critical dry months of the year.

Additionally, the PMA may provide incentives and rebates for water-efficient appliances, utility improvements, leak detection, and improved metering. The agricultural sector may be involved through the development of voluntary water conservation agreements (e.g., only irrigating crop ET, foregoing a fourth cutting, or modifying irrigation start and stop dates). Real-time monitoring of an array of parameters related to water demand such as soil moisture, ET potential, and environmental and delivered flows are important to measure to accurately match supply to demand. Outreach and coordination with irrigators and other stakeholders may also be critical to ensure practices are adopted for enough of the affected areas to achieve needed reductions.

4.3.6.1 Measurable Objective

This MA would implement water conservation measures designed to maintain groundwater levels and groundwater storage, as well as prevent surface water depletion below levels

corresponding to the most recent twenty-year period. The seasonal reduction in demand for water resources is a measurable component of this PMA.

4.3.6.2 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.3.6.3 Permitting and Regulatory Process

Permitting is not anticipated for this MA.

4.3.6.4 Schedule for Implementation

Depending on funding availability, planning and development of a robust program would be expected to begin with the first two years of GSP implementation and implemented within three years of GSP implementation.

4.3.6.5 Implementation

Implementation of a water conservation program could include partnerships with local and state agencies to establish a pilot program to implement water use efficiency practices, such as the installation of soil moisture sensors throughout the SV Subbasin.

4.3.6.6 Expected Benefits

Implementation of a water conservation program is expected to benefit groundwater levels, and groundwater storage by reducing groundwater extraction. Prevention of streamflow depletion will also be gained through this PMA. Water use is expected to be optimized through implementation of this PMA, as real-time water demands versus actual requirements will be better understood.

4.3.6.7 Legal Authority

GSAs have the legal authority to plan and partner with other agencies to implement water conservation activities. Permitting would likely not be necessary.

4.3.6.8 Estimated Costs and Funding Plan

Costs and funding for this project have not yet been explored. Potential funding sources will be explored during the first two years of GSP implementation. The GSAs could pursue partnerships and grant funding opportunities to offset the cost to ratepayers. Additional funding may become available in the future as the state releases grant funding opportunities to grapple with the recent increase in drought and extended dry periods.

4.3.7 Groundwater Trading and Allocations System

Groundwater trading and an allocations system is a mechanism to reduce long-term groundwater pumping. This manner of demand management action would support sustainable groundwater management in the Subbasin through the implementation of policies, programs, and agreements that require, promote, and/or incentivize water conservation and efficient water use. Demand management refers to water management actions that would require a reduction in the use of groundwater and may include defining water allocations (shares) to each high-volume user of groundwater. Normally, allocations would not be required for typical residential water uses below a threshold, such as 2 acre-feet (~650,000 gallons) per year. Allocations can be initially assigned to users based on historical water uses and irrigated acres, along with considerations for supplemental surface water or treated effluent water sources. Shares are managed on an annual use audit, and duties may be fixed or variable depending on the water year and anticipated irrigation water requirements for the growing season. To effectively result

in long-term groundwater use reductions, allocations may also be ramped down in duty so as to gradually result in reduced pumping, and duties can be fine-tuned in an adaptive management approach based on aquifer water level responses and projected ability to meet the 20-year sustainability goals of the GSA. The allocations could also be traded or transferred to alternative locations throughout the basin or within prescribed areas. These groundwater trading programs are being proposed or explored by GSAs for a mechanism to assure that sustainability goals can be achieved, and an equitable format for pumping reduction is established.

The structure for an allocation system has not been extensively explored at the time of this GSP, as allocations and associated requirements to reduce pumping within allocations is not a desired management action if other less economically impactful tools and management actions can be implemented to reach sustainability goals. An allocation program can limit groundwater pumping in certain areas and/or from certain aquifer layers. The GSAs would like to better understand the relationship between pumping from the lower and upper aquifer layers, which can be further simulated in the hydrologic model. Limiting pumping in the upper aquifer layer so GDEs and domestic well users are not impacted from deep agricultural wells is a potential option to allocate groundwater pumping while minimizing economic impact. This potential management action can be reassessed while developing annual reports and at the 5-year GSP audit point to determine need, in consideration of the effectiveness and refined understanding of the feasibility of other management actions to meet sustainability goals.

4.3.7.1 Measurable Objective

This MA would implement demand management measures designed to maintain groundwater levels and groundwater storage, as well as prevent surface water depletion below levels corresponding to the most recent twenty-year period. The seasonal reduction in demand for water resources is a measurable component of this PMA.

4.3.7.2 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation if required.

4.3.7.3 Permitting and Regulatory Process

Permitting or regulatory requirements would be evaluated and developed during the planning process.

4.3.7.4 Schedule for Implementation

Because of the economic implications associated with the MA, it will be assessed for feasibility at the 5-year point of the GSP to determine if other MAs have been effective and if this MA is still needed. It would be implemented during the second 5 years of GSP implementation if needed.

4.3.7.5 Implementation

Implementation of a groundwater allocation system would include outreach to residential and agricultural users and development of program requirements for both groups.

4.3.7.6 Expected Benefits

Implementation of groundwater allocation or demand management actions is expected to benefit groundwater levels, and groundwater storage by reducing groundwater extraction. Prevention of streamflow depletion will also be gained through this PMA. Water use is expected to be optimized through implementation of this PMA, as real-time water demands versus actual requirements will be better understood.

4.3.7.7 Legal Authority

GSAs have the legal authority to plan and partner with other agencies to implement groundwater trading or transfer and to set allocations for their users.

4.3.7.8 Estimated Costs and Funding Plan

Costs and funding for this project have not yet been explored. Potential funding sources will be explored during the first two years of GSP implementation. The GSAs could pursue partnerships and grant funding opportunities to offset the cost to ratepayers. Additional funding may become available in the future as the state releases grant funding opportunities to grapple with the recent increase in drought and extended dry periods.

4.3.8 Watershed Management and Upland Restoration

Watershed management and restoration would seek to implement multi-benefit projects that enhance precipitation retention and infiltration (i.e., reducing runoff), reduce fuel loads, and support ecosystem services such as reducing peak flood flows and enhancing summer baseflows. Projects could be identified on a watershed-wide scale or to focus on specific areas. A focus on specific areas may allow for more feasible projects that are easier to evaluate with respect to effectiveness. As an example of a focus on a specific area of the watershed, upland management, as described further below, could include forest/meadow restoration, thinning of vegetation, road improvements or removal, and soil decompaction (i.e., goal of increasing water retention in the soils).

In addition, projects to enhance wetlands and meadows could better retain water to support GDEs. For example, the US Forest Service implemented meadow restoration projects at Perazzo Meadow and Knutson Meadow.

In the Sierra Nevada, snowmelt from higher elevations serves as the main source of water that recharges groundwater aquifers in the valleys of the range, particularly for valleys that receive lower annual precipitation such as Sierra Valley. Snow accumulates in high-elevation forests during the winter and the snowmelt is typically released gradually. Percolation of precipitation and snowmelt to aquifers often takes several or many years depending upon the permeability of soil layers, the hydraulic gradient, and the distance between the aquifer and source precipitation. Bedrock fissures and faults can provide a much faster path for delivery of snowmelt to aquifers, resulting in measurable increases in aquifer water tables within one year of a high precipitation season.

In the upper watershed, hydrologic connectivity is often disrupted by disturbances from historic and ongoing management practices, including, for example, logging, fire suppression, railroad building, road building, and the construction of other linear features (powerlines, pipelines, etc.) that can re-route stream and surface flows, compact soils, and have altered the natural forest condition. According to a watershed study prepared by Vestra (2005), the Sierra Valley watershed is 297,000 acres and “is defined. . . where slopes are generally less than five percent. It includes approximately 115,000 acres or about 40 percent of the watershed.” This suggests that over half of the contributing area to the groundwater basin is in upland areas. When rainfall and snowmelt contact the ground surface in those upland areas, that water either infiltrates or runs off. In areas of compacted ground, water runs off at a much greater rate than that from uncompacted ground. Water that leaves that site and enters a watercourse is no longer available for infiltration and potential groundwater recharge. As the precipitation regime changes due to climate change, it is expected that more precipitation will fall as rain rather than snow within and around Sierra Valley which could result in an increase in erosion and runoff,

making restoration efforts geared at increasing infiltration and protecting against erosion increasingly important.

Forests in the higher elevations of Sierra Valley are managed by the US Forest Service (USFS) as well as private forest landowners, with USFS lands north of CA Highway 70 managed by Plumas National Forest and Tahoe National Forest managing the Sierra Valley watersheds south of CA Highway 70. On US Forest Service lands in the upper watershed, restoration activities are focused on restoring hydrologic connectivity are often planned and implemented as components of forest restoration and timber projects. Increases in water infiltration to the groundwater due to forest restoration and timber projects have been documented across the Sierra Nevada (Tague et al. 2018) while road improvements, soil decompaction, and mulching can result in restored upstream to downstream surface and groundwater hydrologic connectivity (Drake et al. 2013) and are part of the implementation actions associated with forest restoration projects. Additionally, meadow restoration projects recharge groundwater and support summer baseflows (Hunt et al 2018).

Groundwater recharge is affected by forest management, largely due to greater uptake of soil water by trees and to increased water-holding capacity of forest soils, arising from higher organic content (Allen 2001; Tague et al. 2018). Increased tree density in forests typically results in a reduction of runoff and groundwater recharge, mainly due to interception of rainfall by forest canopies and increased moisture in the forest root zone resulting in higher forest evapotranspiration rates. Forest thinning has the opposite impact. Beginning in the mid-1980s, in the western United States, the frequency of large forest fires and the length of the wildfire season increased suddenly and markedly (Glazer 2012). This trend has accelerated since the 2010s. In the last two years, two large fires have impacted the upper watershed, with 13,425 acres burning in the Loyalton Fire in 2020 and 73,773 acres burning in the Beckwourth Fire in 2021. These fires create the potential for increased erosion and hydrologic disruption while the burned area recovers.

Over this same period, forests worldwide have been subjected to ‘‘stress complexes,’’ combinations of biotic and abiotic stresses, that have led to an increasing number of large-scale forest dieback events (Glazer 2012). These stress complexes typically involve some combination of drought, insects and/or fungi, and fire. A growing body of evidence indicates that climate change has contributed to these dieback events (USDA Region 5 Ecology Program 2021). Trees in coniferous forests are deep-rooted and require large amounts of water. When exposed to protracted water stress by a combination of drought and warmer temperatures, these trees maintain themselves as long as possible by upward hydraulic redistribution of groundwater through their deep roots, resulting in less groundwater available to recharge aquifers.

Forest restoration projects can improve groundwater recharge but must also address issues related to soil compaction and disturbance related to ground-based operations. Disturbed or compacted soil areas that are rehabilitated infiltration rates can increase, in some cases, by an order of magnitude or more following soil decompaction/loosening or incorporation of woodchips/organic material. For instance, in a simulated 1” per hour rainstorm, 90-95% of that rainfall can be infiltrated on a treated site, as compared to an untreated site (Grismer, Hogan, 2004).

Meadow and wetland restoration can include the reconnection of the stream channel to the floodplain or the reconnection of disconnected surface and groundwater hydrology due to roads and trails. Degradation of a meadow’s surface and groundwater connectivity and function can be directly correlated with a decline in key ecosystem services including water filtration

(Woltemade 2000), flood attenuation (Loheide et al. 2009; Lowry et al. 2011), headwater storage capacity (Lord et al. 2011), greenhouse gas emissions (Blankinship and Hart 2014; Reed et al. 2020), conifer encroachment (Lubetkin et al. 2017), loss of bird and other wildlife populations (McKelvey et al. 1996; Campos et al. 2020), and resilience against invasive plant species (Hammersmark et al. 2009).

Upper watershed restoration efforts can have a positive impact on downstream groundwater and surface water resources and should be taken into consideration when considering the long-term sustainability of groundwater resources in Sierra Valley. Specific soil treatments designed to maximize soil infiltration can be combined with forest health projects, road and trail construction, range management, and otherwise to address areas of low infiltration throughout the watershed and thus contribute to an increase in groundwater storage. Collaborative projects that work across ownership boundaries promote shared stewardship and can create more grant funding opportunities and have a positive influence on the local economy.

4.3.8.1 Measurable Objectives

The objective of this upland management project is to improve recharge in higher slopes. This project will have multiple benefits, including potential for fire prevention.

4.3.8.2 Public Noticing

Public noticing for the upland management project will be conducted by the GSAs prior to project implementation and include a CEQA and NEPA Negative Declaration if required. Public notification is planned to be executed with significant project changes or additional project elements.

4.3.8.3 Permitting and Regulatory Process

Permits will be obtained as necessary.

4.3.8.4 Schedule for Implementation

This project is in the conceptualization stage. An exploration of funding sources, project location, and project feasibility is planned within the first ten years of GSP implementation.

4.3.8.5 Implementation

This PMA would require further studies to evaluate the feasibility of implementing such projects. An evapotranspiration study to assess the impact of wildfires and forest management can provide insights into the amount of water available for groundwater recharge. The reduction in forest ET is equivalent to the increased amount of water available for groundwater recharge and surface runoff. Methods to estimate evapotranspiration include:

1. Use available commercial evapotranspiration products, such as OpenET. OpenET provides a historical archive on remote sensed ET estimates going back to 2016.[5]
2. Complete a Mapping EvapoTranspiration at High Resolution and Internalized Calibration (METRIC) analysis to estimate actual evapotranspiration before and after an event like a forest fire or thinning. A METRIC analysis can be further calibrated based on additional ground-truthed sources of forest ET, such as from Ameriflux.[6]

Evapotranspiration estimates would serve as an input into the hydrologic model to assess what portion of the precipitation infiltrates into the groundwater system or contributes to surface runoff under historical, present, and projected forest conditions.

[5] OpenET website: https://openetdata.org/

[6] Ameriflux website: https://ameriflux.lbl.gov/about/about-ameriflux/

4.3.8.6 Expected Benefits

Expansion of preexisting seasonal recharge to groundwater levels for domestic and agricultural supplies. Data from Grismer and Hogan (2004) can be considered to help determine benefits vs costs, and implications of precipitation capture, retention, and infiltration

4.3.8.7 Legal Authority

With the appropriate permitting, and without infringement on existing water rights, the GSAs are authorized to implement projects to enhance infiltration.

4.3.8.8 Estimated Costs and Funding Plan

Multi-benefit projects such as those discussed in this section may be able to leverage multiple funding sources and grant programs. In addition, there are likely to be implementation/funding partners such as the USFS and NRCS which will also reduce the costs to the GSAs.

4.3.9 Voluntary Managed Land Repurposing

4.3.9.1 Project Description

Voluntary managed land repurposing programs include a wide range of voluntary activities that make dedicated, managed changes to land use (including crop type) on specific parcels in an effort to reduce consumptive water use in the SV Subbasin to improve and increase groundwater levels. By repurposing previously irrigated land into new uses that use less or no water, voluntary land management practices can result in multiple benefits, such as sustainable water supplies and healthier air and soil. This MA would include a preliminary evaluation of land repurposing activities to determine if further actions are viable for the SV Subbasin and groundwater users. Similar activities may be described in Sections 4.3.7 and 4.3.2. These activities may include any of the following:

Term Contracts: In some circumstances, programs like the Conservation Reserve Program (CRP) could provide a means of limiting irrigation on a given area for a term of years. Because of low rates, the CRP has not been utilized much in California, but this could change in the future. In addition, other term agreements may be developed at the state or local level with the implementation of SGMA. Further research is needed to evaluate the effectiveness of term contracts, or the level of participation anticipated for groundwater users.

Alternative Crops/Return to Native Vegetation Alternatively, landowners could be encouraged to retire high water-use crops and switch to alternative, low-water-use crops such as grain. Such a conversion could reduce irrigation of land and groundwater pumping. Landowners could also convert agricultural land to non-irrigated native vegetation or grassland.

Other Uses: In some circumstances, portions of a farm that are currently irrigated may be well suited for other uses that do not consume water. For example, a corner of a field may be well suited for wildlife habitat or solar panels, subject to appropriate zoning requirements to avoid undesirable outcomes.

4.3.9.2 Measurable Objective

Determine available acreage that irrigation could be reduced and estimate the corresponding reduction in water usage.

4.3.9.3 Public Noticing

Public noticing for this project, if required, will be conducted by GSAs during regular meetings prior to project implementation.

4.3.9.4 Permitting and Regulatory Process

External permitting from regulatory agencies is not anticipated for this management action.

4.3.9.5 Schedule for Implementation

The initial inventory and potentially feasible projects would be identified within the first two years of GSP implementation. For identified projects, funding would be pursued to allow implementation within the first five years of GSP implementation

4.3.9.6 Implementation

Implementation of this project type includes the following elements to be conducted.

- Determine role of the GSAs versus other agencies, local organizations, and NGOs.
- Development of education and outreach programs in collaboration with local organizations.
- Exploration of program structure.
- Contracting options.
- Exploration and securing of funding source(s).
- Identification of areas and options for easements or other contractual instruments.

Monitoring data collected in this voluntary managed land repurposing program include, but are not limited to:

- Total acreage and timing of land repurposing.
- Location of parcels with land repurposing.
- Assessment of the effective decrease in evapotranspiration (consumptive water use) and applied water use.
- Description of the alternative management on repurposed land with:
    - Quantification and timeline of surface water dedications to instream flow specified in the easement.
    - Quantification and timeline of groundwater pumping, including water year type or similar rule to be applied and specified in the easement.
- Annual Water Master certification of easement implementation, as appropriate.

4.3.9.7 Expected Benefits

Future benefits of implemented land purposing projects to stabilizing groundwater levels will be evaluated and assessed with the hydrogeologic model using the methodology described in Chapter 3 and using the above monitoring data that describe the implementation of voluntary managed land repurposing programs.

4.3.9.8 Legal Authority

The implementing organizations such as Land Trusts, have the legal authority to implement term contracts with individual property owners.

4.3.9.9 Estimated Costs and Funding Plan

At the time of GSP writing, the costs and funding plan for this project have not been estimated or developed. It is estimated that state grant funding opportunities will share in the project cost.

Changes to agricultural activities by individual landowners may result in impacts to the rural economy that should be considered for the MA.

4.3.10 Groundwater Recharge/Managed Aquifer Recharge

4.3.10.1 Project Description

Managed Aquifer Recharge (MAR) is the process of intentionally adding water to aquifers. Both active and passive conjunctive uses can be considered in the SV Subbasin to provide water supplies for MAR projects. Active conjunctive use, or direct recharge, includes any practice that delivers water to the aquifer and increases groundwater storage. Passive conjunctive use, or indirect recharge, includes conjunctive use practices (i.e., coordinated uses of surface water and groundwater) that reduce the amount of groundwater withdrawals which leads to increased aquifer storage.

SVGMD is currently working with the State Water Board to develop a project to divert water in the winter from Badenaugh Creek to irrigation fields and wildlife areas for groundwater recharge.

Key to MAR projects is the identification of water to drive the project, which generally is limited to excess stormwater runoff or increased water deliveries. Direct recharge can be accomplished via the following:

- Spreading Basins: Spreading Basins facilitate the movement of water from the ground surface to the underlying hydraulically connected unconfined aquifer. A large volume of infiltrating water is concentrated on the ground surface which provides opportunities for recharge over larger areas and for longer periods than what would otherwise occur.
- Flooding agricultural fields (Flood-MAR): This practice involves use of floodwater or stormwater for managed aquifer recharge on agricultural lands and engineered landscapes. Flood-MAR projects can provide multiple benefits to the water supply system, ecosystem, and wildlife habitat by increasing water supply reliability, flood risk mitigation, drought preparedness, aquifer replenishment, ecosystem enhancement, subsidence mitigation, water quality improvement, working landscape preservation and stewardship, climate change adaptation, recreation, and aesthetics.
- Injection wells and/or dry wells: Using injection or dry wells involves the installation and operation of equipment to inject water into specific aquifers. Aquifer storage and recovery (ASR) wells are the most common injection method used in California. Groundwater injection projects are typically most effective when utilizing a consistent, designated water supply (such as recycled water). ASR wells do not have seasonal constraints and do not depend on surficial soil characteristics but require controlled operation and regular maintenance to sustain adequate recharge rates. Injection wells are necessary for MAR into a confined aquifer, due to the higher pressure of the groundwater under the confined layer. Modifications to existing wells could be used for injection in wintertime. However, one of the main disadvantages of injection into confined aquifers is the low injection rate per well and the resulting need for additional wells. Additionally, clogging of the aquifer can become an issue for injection wells into confined aquifers, therefore, the feasibility of utilizing an injection well in a confined aquifer needs to be established.
- Streams and canals: These features can be used to infiltrate water and increase groundwater recharge. For example, diverting water during non-irrigation seasons into

unlined canals can supplement groundwater recharge if canal seepage reaches the underlying aquifers.

Additionally, recharge sites can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide habitat for wildlife and aquatic species. Further information can be found in the "Multi-Benefit Recharge Project Methodology Guidance Document" provided by The Nature Conservancy.[7]

4.3.10.2 Measurable Objective

Use of MAR has been explored in different Subbasins in California as an option to increase groundwater recharge. It could be implemented in Sierra Valley to help maintain or increase groundwater levels and storage to meet the GSP's Measurable Objective.

4.3.10.3 Public Noticing

Public noticing for this project will be conducted by GSAs prior to project implementation and include a CEQA Negative Declaration if required. Public notification is planned to be executed with significant project changes or additional project elements.

4.3.10.4 Permitting and Regulatory Process

Permitting will be required to implement MAR and will depend on the project. For example, if the project involves diversion of surface water, a temporary Water Rights permit (i.e., SWRCB Application for Temporary Permit filed pursuant to Water Code 1425 to Divert to Underground Storage During High Flow Events) would be needed to allow diversion of water. These permits can be issued for up to 180 days. Tributaries that are not adjudicated over the winter season will be prioritized to minimize the permitting and regulatory process.

4.3.10.5 Schedule for Implementation

This project is in the planning and conceptualization stage. An exploration of funding sources, project location, and project feasibility is planned within the first ten years of GSP implementation.

4.3.10.6 Implementation

A Managed Aquifer Recharge Project would initially be developed as a pilot project on one property to evaluate its feasibility for the Subbasin and expanded to other properties and areas of the SV Subbasin if applicable.

This project utilizes excess winter and spring flows for recharge. The project includes:

- Finding landowners willing to participate
- Securing project funding
- Obtaining water rights, protecting existing natural and human uses of water, and meeting other permit requirements as necessary
- Constructing infrastructure and installing monitoring equipment as necessary to identify potential project impacts and quantify project benefits.

4.3.10.7 Expected Benefits

Expansion of preexisting seasonal recharge to groundwater levels for domestic and agricultural supplies.

[7] Multi-Benefit Recharge Project Methodology Guidance Document. The Nature Conservancy. June 2021. Website: https://groundwaterresourcehub.org/sgma-tools/multi-benefit-recharge-project-methodology-guidance

4.3.10.8 Legal Authority

With the appropriate permitting, and without infringement on existing water rights, the GSAs are authorized to divert surface water for use with MAR and injection wells.

4.3.10.9 Estimated Costs and Funding Plan

Costs and funding for this project have not yet been explored. Potential funding sources will be explored during the first ten years of GSP implementation.

4.3.11 Assessment of Post-Fire Hydrology and Potential Water Supply Augmentation

Forest management projects are being implemented in and around Sierra Valley that are multi-benefit projects intended to manage for impacts of climate change and to protect wildlife and other resources through forest management, thinning/brush abatement, and other fuels reduction efforts. These projects, which reduce vegetation, have the benefits of reducing the severity of wildfires and potentially augmenting groundwater supplies. Reducing vegetation in overstocked forests may increase the amount of water that infiltrates into the aquifer, both from interconnected surface waters and from precipitation.

The Plumas County Fire Safe Council has received funding and is in the process of developing the Eastern Plumas Wildfire Protection Project to reduce fuel conditions that can contribute to catastrophic wildfires. As shown in Figure 4.3-1. the project area overlaps with the Sierra Valley Watershed. To the extent that on-the-ground fuels reduction projects occur in locations that recharge impacted areas of the Sierra Valley Subbasin, an opportunity may present itself for the Sierra Valley Groundwater Sustainability Agencies (GSAs) to coordinate with this project to measure and monitor beneficial impacts to the aquifer. The goal of the GSAs would be to support fuels reduction and watershed management efforts in Sierra Valley that have the potential to increase groundwater recharge, while also addressing wildfire severity. As the Eastern Plumas Wildfire Protection Project is developed, the GSAs are proposing to work with the Plumas County Fire Safe Council to develop approaches to monitoring changes in streamflow and groundwater levels that result from the project actions.

4.3.11.1 Measurable Objective

Vegetation management and fuels reduction projects have the potential to increase recharge of groundwater aquifers and increase groundwater levels.

4.3.11.2 Public Noticing

Public noticing for this project will be conducted by GSAs in coordination with the Plumas County Fire Safe Council prior to project implementation if required.

4.3.11.3 Permitting and Regulatory Process

Any permitting or regulatory process required by the project would be conducted by the Plumas County Fire Safe Council. The GSAs would support these processes as necessary.

4.3.11.4 Schedule for Implementation

The scope of the project is currently being developed with the goal of initial implementation being in the Fall of 2022. The GSAs would coordinate with the Plumas County Fire Safe Council to develop a monitoring program to be ready to begin collecting data when the project implementation is initiated.

4.3.11.5 Implementation

The project will be implemented in coordination with the Plumas County Fire Safe Council's program.

4.3.11.6 Expected Benefits

Implementation of off-site storage is expected to benefit groundwater levels, groundwater storage, and surface water depletion by utilizing stored surface water during dry periods to supplement groundwater pumping or surface water diversions that may cause seasonal depletions.

4.3.11.7 Legal Authority

The GSAs have the legal authority to install monitoring equipment and work with other organizations/ public agencies.

4.3.11.8 Estimated Costs and Funding Plan

The overall project is currently funded through a grant awarded to the Plumas County Fire Safe Council. Costs associated with the GSAs portion of the project will be developed during the first 6 months of 2022 and additional funding will be sought if needed.

Figure 4.3-1: Easter Plumas Wildfire Prevention PMA Project Area

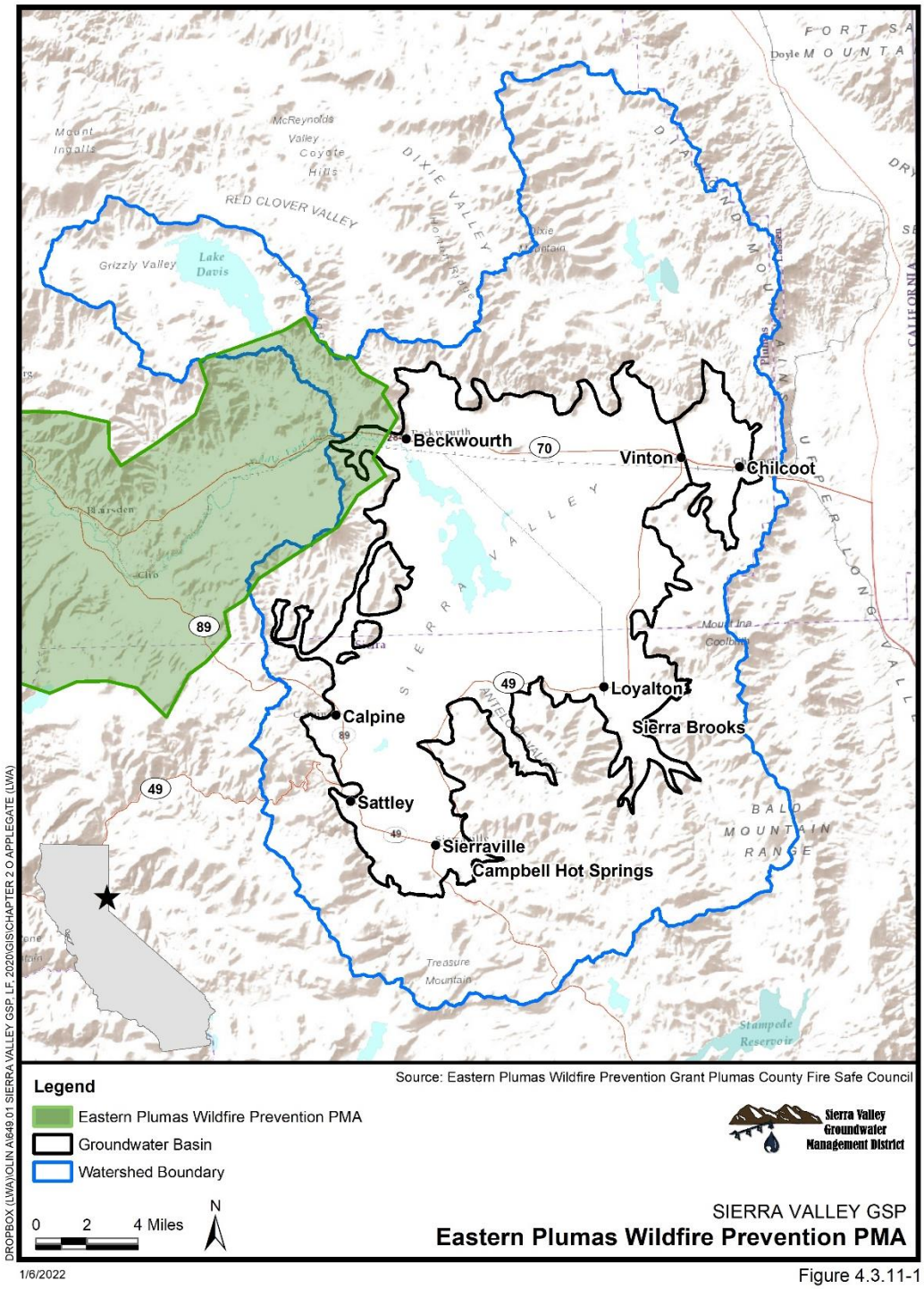


Figure 4.3.11-1

4.3.12 Climate Change Impact Assessment

The GSA acknowledges the importance of assessing the impacts of climate change in all aspects of the GSP and providing adaptability to mitigate such effects efficiently and effectively. The significance of these changes has been made ever so clearer during the recent drought in Sierra Valley.

The GSA has simulated a 2030 central tendency, a 2070 central tendency, and two 2070 extreme scenarios (i.e., one drier with extreme warming and one wetter with moderate warming) suggested by the DWR to assess climate change impacts on Basin's sustainability. This approach is consistent with several submitted critical basin GSPs. These simulations are discussed in Section 2.2.3 of the GSP as wells as Appendix 2-7. These scenarios and their impacts on groundwater levels and water budget were extensively discussed at GSA Board and its technical committee meetings and were considered in setting sustainable management criteria and planning the future of the Basin. However, the GSA is aware that these scenarios may not represent the full spectrum of impacts and uncertainty that climate change may impose on the Basin. Due to DWR methodology, it is difficult to assess the impacts of climate change on precipitation patterns, including changes to timing and intensity of precipitation events. It is also important to consider the increasing lengths and severity of droughts and dry years, which this methodology may not represent due to repeating the historical hydrology.

The GSA also acknowledges data gaps and existing uncertainty in its Sierra Valley integrated hydrological model (SVIHM), as outlined in Appendix 2-7. While the model was developed based on the best available science and data and provided a sufficient understanding of Basin conditions, further improvements are needed to conduct climate change studies and simulate future scenarios. GSA has sought to coordinate with local and regional stakeholders in generating and conducting climate change scenarios to include the largest spectrum of expected changes possible. Surface water availability can have significant impacts on the Basin and need to be incorporated into future scenarios.

Conducting such extensive studies needed major enhancements to the SVIHM and significant cooperation from the GSAs and stakeholders that could not fit within the scope of the GSP development. Therefore, a PMA is added to outline the path forward for conducting climate change studies and future scenarios evaluating PMA impacts.

4.3.12.1 Measurable Objective

The climate change impact assessment will improve the understanding of the Basin’s conditions and will enhance integrated hydrological model and projected conditions prioritizing PMAs.

4.3.12.2 Public Noticing

The GSAs would inform the public of project status at the GSAs’ scheduled meetings.

4.3.12.3 Permitting and Regulatory Process

Any permitting or regulatory process required by the project would be conducted by the GSAs. The GSAs would support these processes as necessary.

4.3.12.4 Schedule for Implementation

A plan to evaluate climate change impacts will be developed in the first five years of GSP implementation.

4.3.12.5 Implementation

The project will be implemented in coordination with the GSAs, stakeholders, and state and federal agencies. Climate change impacts will be documented in annual reports and the 5-year GSP update.

4.3.12.6 Expected Benefits

Implementation of climate change impact assessment will ensure the GSAs are identifying and implementing PMAs that address a changing climate.

4.3.12.7 Legal Authority

This MA is primarily implemented through voluntary actions not requiring legal authority on the part of the GSAs.

4.3.12.8 Estimated Costs and Funding Plan

Currently, this project is in the planning phase and funding options will be explored during the first two years of GSP implementation.

4.4 Other Management Actions

Management actions described in Sections 4.2 to 4.4 focus on demand management and maintaining groundwater levels in the SV Subbasin. Other management actions may include projects that indirectly help the GSAs meet the sustainability goals of the SV Subbasin and help the SV Subbasin adapt to future climate conditions.

4.4.1 Future Actions

Future basin actions could include:

1. **Developing a study of the economic impacts of the PMAs included in the GSP**. This would include an evaluation of how implementation of the PMA could affect the economic health of the region and on local agricultural industry. It would also consider the projected changes to the region's land uses and population and whether implementation of these PMAs would support projected and planned growth.
2. **Develop actions to reduce energy use for groundwater pumping.** This would include land repurposing and using solar panels to offset costs of energy used for pumping. To maintain the character of the region, solar installations likely would be limited in scale to power individual wells. It would also include the installation of variable frequency drive pumps in appropriate wells.

5 Plan Implementation

This section describes in general how the GSAs will implement the Sierra Valley Subbasin Groundwater Sustainability Plan (GSP). The SVGMD will be coordinating with other agencies, organizations, and landowners in the region to effectively manage the groundwater basin. As described in prior sections, a variety of projects and management actions (PMAs) that support groundwater levels, groundwater storage, and interconnected surface waters (ISWs) are currently being, have previously been, or are proposed to be implemented. Existing and planned PMAs will contribute to the attainment of the subbasin's groundwater sustainability goal over the planning horizon of this GSP. These PMAs, as described in Chapter 4, enable the continued use of groundwater, and protect all groundwater uses and users into the future.

In this section, the GSP implementation plan for the SV Subbasin is defined. Elements of this plan include:

1. Management and Administration
    a. GSA management, administration, legal, and day-to-day operations.
    b. Reporting, including preparation of annual reports and five-year evaluations and updates.
2. Implementation
    a. Implementation of the GSP monitoring program activities described in Chapter 3.
    b. Technical support, including model updates, data collection, and other technical analysis.
    c. Projects and Management Actions (PMAs) as described in Chapter 4.
3. Outreach and Education
    a. Coordination activities with stakeholders and entities in the subbasin.
    b. Ongoing education and outreach activities to stakeholders.

Cost estimates and funding methods for GSP implementation are also presented in this section.

5.1 Description of GSP Implementation Elements

The following tasks and functions will be required for implementation of this GSP:

5.1.1 Management and Administration

5.1.1.1 GSAs management, administration, legal and day-to-day operations

GSA functions associated with the management and administration of the GSP implementation activities are covered under this category, which includes the administrative, technical, and finance staff support and related expenses, office supplies and materials, insurance, and grant writing to support funding for specific projects and/or management actions. GSA staff, supplemented by contractors, as-needed, will provide work products, administrative support, staff leadership, and management for the GSAs to provide work products, administrative support, staff leadership, and management for the subbasin`.

As GSP implementation begins in February 2022, staffing support and ongoing administrative and management needs will be further evaluated so that the budget can be refined as

necessary. Staffing needs will be reevaluated annually during the early years of GSP implementation to gain a better understanding of the support required and associated costs.

GSA administration activities include meeting coordination with other organizations on projects or studies, email, and website updates to inform stakeholders about ongoing activities within the Basin, administration of projects implemented by the GSAs, and general oversight and coordination. Other oversight and administrative activities will occur on an as-needed basis. The GSAs are responsible for and authorized to take, appropriate action to achieve sustainable management of groundwater within the basin based on the authority granted under Section 6 of the California Water Code. On an as-needed basis, the GSAs may seek legal services to assist in the interpretation of legal requirements and provide legal advice during GSP implementation.

GSP implementation costs include GSAs administration, management actions, monitoring protocols, data management, sustaining a sufficient fiscal reserve, and other potential costs for the twenty-year implementation horizon. The estimated annual cost of ongoing activities, as well as the estimated cost of activities anticipated to be conducted within the next five years, are classified as major categories. For each category, an estimated five-year total cost and an associated annualized cost is provided below and in Appendix 5-1.

5.1.1.2 Reporting, including preparation of annual reports and five-year evaluations and updates

As part of GSP implementation starting in 2022, the GSAs must prepare and submit annual reports and five-year assessments for the GSP to the Department of Water Resources (DWR). Annual reports will be submitted to DWR by April 1st of each year and an initial five-year GSP assessment and update will be due to DWR by April 2027. Requirements for each of these reports are explained below.

5.1.1.3 Annual Reporting

Per Water Code Sections 10727.2, 10728, and 10733.2, SGMA regulations require the GSAs to submit an annual report on the implementation of the GSP to the DWR. Annual reports will cover the preceding water year, October 1 through September 30. The report will be submitted to DWR no later than April 1st of the year following the covered water year. A template for annual reporting is provided as Appendix 5-2. Annual reports will be completed in a format consistent with Section 356.2 of the SGMA regulations and will include three key sections:

5.1.1.3.1 General Information

General information will include a map of the SV Subbasin and an executive summary that includes a summary of the sustainability goal, ongoing PMAs in the subbasin, newly implemented PMAs, and their progress, as well as a current/updated implementation schedule.

5.1.1.3.2 Basin Conditions

This section will describe the current groundwater conditions and monitoring results, used to evaluate how groundwater conditions have changed in the SV Subbasin during the previous year. SGMA regulations require the following key components to be included in this section:

- Groundwater elevation data from monitoring wells, including (1) groundwater elevation contour maps for the principal aquifers in the subbasin depicting seasonal high and low groundwater conditions, and (2) hydrographs of historical-to-current-reporting-year data showing groundwater elevations and water year type.
- Groundwater extractions during the preceding water year summarized by water use sector (i.e., agricultural, domestic, municipal, etc.), including a map showing the general

location and volume of groundwater extractions, as well as the method of measurement (direct or estimate) and accuracy of measurements.

- Surface water supply for managed groundwater recharge, off-stream storage, or in-lieu use, including the annual volume and sources for the preceding water year.
- Total water uses by water use sector and water source type (i.e., groundwater, surface water), including the method of measurement (direct or estimate) and accuracy of measurements.
- Maps of changes in groundwater storage for the principal aquifer and a graph depicting historical-to-current-reporting-year water year type, groundwater use, annual change in groundwater in storage, and the cumulative change in groundwater storage for the subbasin.

This information may change over time to incorporate potentially revised GSA priorities and to reflect new basin conditions and applicable SGMA requirements.

5.1.1.3.3 Plan Implementation Progress

The progress made toward achieving interim milestones and implementation of PMAs will be explained in more detail in this section, along with a summary of plan implementation progress and sustainability progress.

5.1.1.4 Periodic Evaluations every Five Years

Per Water Code Sections 10727.2, 10728, 10728.2, 10733.2, and 10733.8, SGMA regulations require the GSAs to provide a written assessment of GSP implementation and progress toward meeting the sustainability goal at least every five years. A similar evaluation must also be submitted whenever the GSP is amended. The five-year assessment reports will be completed in a format consistent with Section 356.4 of the SGMA regulations and include the following elements:

5.1.1.4.1 Sustainability Evaluation

The overall basin sustainability and current groundwater conditions for each applicable sustainability indicator will be described, including progress toward achieving interim milestones and measurable objectives, and an evaluation of groundwater elevations at each of the representative monitoring points (RMPs) in relation to minimum thresholds.

5.1.1.4.2 Plan Implementation Progress

This section will describe the current implementation status of PMAs, along with the effect on groundwater conditions resulting from their implementation, if applicable.

5.1.1.4.3 Reconsideration of GSP Elements

Elements of the GSP may require revision due to one or more of the following: collection of additional monitoring data during GSP implementation; implementation of PMAs; significant changes in groundwater uses or supplies and/or land uses. Such new information may require revision to the following GSP elements: basin setting, water budgets, monitoring network, sustainable management criteria (SMC), or PMAs.

5.1.1.4.4 Monitoring Network Description

This section will provide an assessment of the monitoring network's function, an analysis of data collected to date, a discussion of data gaps and the need to address them, and identification of areas within the subbasin that are not monitored in a manner commensurate with the requirements of Sections 352.4 and 354.34(c) of the SGMA regulations.

5.1.1.4.5 Consideration of New Information for Basin Setting and SMC

New information made available after GSP adoption will be described and evaluated. If new information would warrant a change to the GSP, including a re-evaluation of the basin setting and SMC, then corresponding revised descriptions will be included in the five-year GSP update.

5.1.1.4.6 Regulations or Ordinances

If DWR adopts new regulations that impact GSP implementation, the update will also identify and address those requirements that may necessitate updates to the GSP.

5.1.1.4.7 Legal or Enforcement Actions

Any enforcement or legal actions taken by the GSAs to contribute to attainment of the sustainability goal for the subbasin will be summarized.

5.1.1.4.8 Plan Amendments

Each five-year assessment report will include a description of amendments to the GSP, including adopted amendments, amendments that are underway during development of the report, and recommended amendments for future adoption.

5.1.1.4.9 Coordination

A summary of coordination that has occurred between the subbasin, different agencies in the subbasin, or agencies with jurisdiction over land use and well construction will be incorporated in the five-year assessment report. The five-year assessment will also include any other information deemed appropriate by the GSAs to support DWR in its periodic review of GSP implementation, as required by Water Code Section 10733.

5.1.2 Implementation

5.1.2.1 Implementation of the monitoring program activities described in Chapter 3

This section covers the functions associated with monitoring activities, including logistics and coordination with third-party entities performing monitoring in the GSP Monitoring Network and any related monitoring data management. The GSP Monitoring Networks for groundwater level, interconnected surface waters, and groundwater quality, including the agencies performing that monitoring, are detailed in Chapter 3.

To address data gaps that are identified during GSP implementation, improvements to or expansion of the GSP Monitoring Network may be necessary. In that event, additional monitoring wells, monitoring well instrumentation; sampling and in-situ measurements; sample analysis; and associated data management and analysis may be required in the future. Costs for those facilities and activities are not addressed in this section.

Monitoring and data-related activities include:

- Groundwater Elevation Monitoring
- Groundwater Quality Monitoring
- Streamflow Monitoring
- Subsidence Monitoring, based on data provided by DWR and via monuments
- Monitoring data management (including data management system (DMS) maintenance), data validation (QA/QC), data entry and security, and data sharing
- As needed groundwater-dependent ecosystems (GDEs) monitoring

5.1.2.2 Technical support, including Sierra Valley Subbasin Integrated Hydrological Model (SVIHM) model updates, SMC tracking, other data analysis and technical support

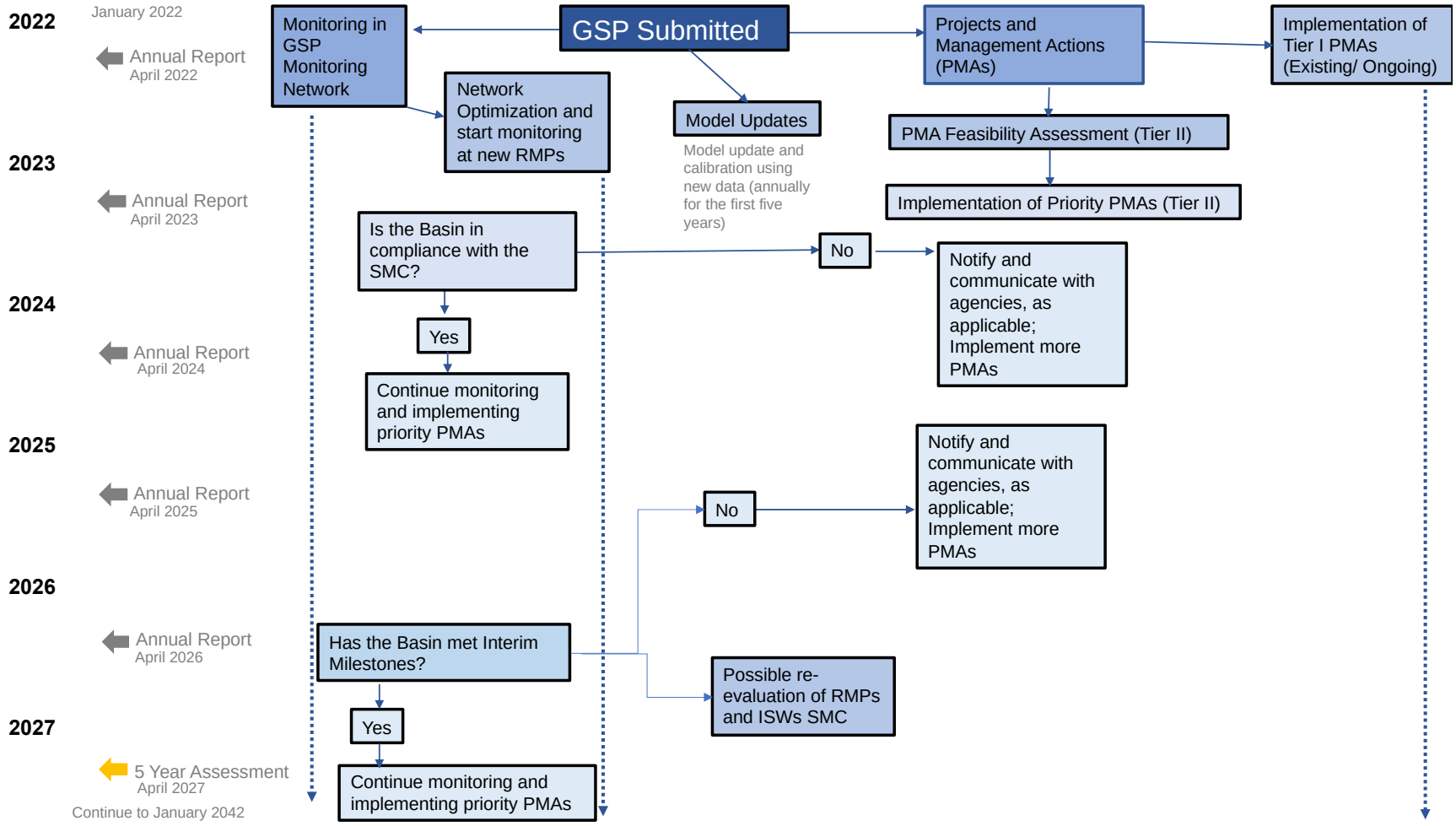
SVIHM updates – Management activities and ongoing performance evaluation of the SMC are informed by SVIHM model output, which will require periodic updates and refinements as more data become available. Model updates and refinements help maintain, and potentially improve, the model functionality and its capabilities in providing more representative simulation results. These activities include incorporation of new model tools, features, and new data and calibration and model parameter updates as additional data from the monitoring network and stream gauges is obtained, use of SVIHM to update water budgets, assess water usage, and assess the status of basin-wide storage volumes, and related work to support ongoing simulations of PMAs and reporting requirements.

SMC tracking – Synthesis of data to analyze and track the status of compliance with SMC at the RMP wells and other monitoring locations included in the Monitoring Network. This information will comprise an essential element of the annual reports and five-year updates. A template for SMC tracking based on the annual report requirements from DWR is available in Appendix 5-2.

Data analysis – Additional data analysis and associated technical support, outside of the GSAs' resource capabilities, will be needed for annual reporting and five-year GSP update and outreach activities. The GSAs may also have an ongoing need for technical and administrative support for the subbasin management, such as vulnerability assessments for climate change, hydrologic technical support, assessment of managed aquifer recharge opportunities, economic and funding mechanisms assessments, and studies to address data gaps.

Results of the monitoring program activities will inform GSAs management actions and next steps. The flowchart shown in Figure 5.1.2-1 illustrates the process and decision points for the first five years of GSP implementation. This process will be refined, as necessary, throughout the first five years of GSP implementation and will be updated in parallel with the five-year evaluations. The initial GSP is a starting point toward achievement of the sustainability goal for the subbasin. Although available information and monitoring data have been evaluated throughout the GSP planning process to set SMC and define projects and management actions, there are gaps in knowledge and additional monitoring requirements. Information gained in the first five years of plan implementation, and through the planned monitoring network expansions, will be used to further refine the strategy outlined in this version of the GSP. The GSAs will work towards implementation of the GSP to meet all provisions of SGMA and will utilize available local resources, and likely resources from State and Federal agencies to achieve this. It is anticipated that coordination with other agencies that conduct monitoring and/or management activities will occur throughout GSP implementation to fund and conduct this important work. As described in Appendix 5-1, additional funding required may be achieved through fees, or other means, to support progress towards compliance with SGMA. The GSAs will use this preliminary flowchart to develop a more defined roadmap at the beginning of the implementation period in February 2022. Further detail on the prioritization and implementation timeline of PMAs can be found in the discussion of PMAs below.

Figure 5.1.2-1: GSP Implementation Process for the First Five Years of Implementation



Notes:
- The road map is expected to be similar for the following five-year cycles.

5.1.2.3 Re-evaluation of depletion of ISWs sustainable management criteria

As discussed in Chapter 3, SMC set for ISWs are based on groundwater levels due to existing data gaps. However, installation of streamflow gages is an element of the ISW monitoring network, and a framework is proposed to re-assess available data, upon collection of additional data and information during GSP implementation to update depletion of ISWs sustainable management criteria and set them based on the rate and/or volume of streamflow depletion due to groundwater pumping, as required by SGMA. This action is planned to be preferably conducted during the first five -year evaluation of the Plan, or if available data is not sufficient, at the second five-year evaluation of the GSP. The cost of this re-evaluation which includes subtasks including but not limited to data analysis, SVIHM updates, and calibration, and additional monitoring, will be included in the respective round of periodic evaluation of GSP.

5.1.2.4 Re-evaluation of RMPs for different sustainability indicators

Similar to the re-evaluation of depletion of ISWs SMC, Chapter 3 discusses the possible re-evaluation of RMPs for chronic lowering of groundwater elevations, subsidence, and degradation of groundwater quality monitoring networks and SMC. The GSP is primarily utilizing the existing wells with established records of monitoring for its RMPs for chronic lowering of groundwater levels and for the decrease in storage. However, efforts are ongoing to supplement the monitoring networks with wells at suitable locations, establishing monitoring records. Upon collection of a sufficiently long record of measurements at such wells, it may be beneficial to the management of the subbasin if those dedicated monitoring wells are considered as RMPs. Needed analysis to assess if those wells satisfy the requirements of an RMP will be done before updating the plan. The cost of this re-evaluation will be included in the respective round of periodic evaluation of GSP and will be covered by new grant funding if possible.

5.1.2.5 Projects and Management Actions described in Chapter 4.

Chapter 4 of this GSP identifies two different tiers of projects and management actions (PMAs) in the Basin, as follows:

1. Tier I: Existing PMAs that are currently being implemented and are anticipated to continue to be implemented and enhanced as proposed in Chapter 4.
2. Tier II: PMAs planned for near-term initiation and implementation (2022–2027) by individual member agencies or PMAs that may be implemented in the future, as necessary (initiation and/or implementation 2027–2042).

The PMAs listed in Chapter 4 reflect a collection of potential options that may be employed to support the sustainability goals outlined ed in this plan. Tier I PMAs are anticipated to continue to be implemented throughout the GSP implementation period. For the Tier II Potential PMAs and proposed enhancements to Tier 1 PMAs, a preliminary strategy for prioritization and associated criteria has been developed. As a first step in Plan implementation, Tier II PMAs and Tier II enhancements will be ranked using criteria including the projected effectiveness, complexity, cost, and level of support for the project or management action. This preliminary prioritization step will be initiated immediately after submission of the GSP to provide the GSAs with enough time to evaluate projects' feasibility and include the selected projects into future funding requests. The GSAs are expected to continue to refine this prioritization as more information on the feasibility, costs and anticipated benefits becomes available for these PMAs.

5.1.3 Outreach

5.1.2.6 Coordination activities with other entities

The GSAs may need to budget for ongoing coordination during GSP implementation. Coordination will be required with the following entities on the following topical areas:

- With agencies in the subbasin with land use jurisdiction to identify and communicate regarding activities that may impact basin sustainability.
- With local utility districts and irrigators, to obtain updated information regarding water use efficiency programs, encourage such programs, and obtain information regarding the impacts of those programs on water demands.
- With Sierra and Plumas County Environmental Health Divisions to implement as needed updates environmental regulations, ordinances, and existing procedures for new and existing groundwater wells such as well permitting.
- With entities sponsoring projects, such as recharge, forest management or efficiency improvements in the subbasin that will provide benefits to attainment of sustainability goals and objectives, including support for grant funding.
- With any other entities working in the subbasin to support the sustainability goal and aspirational watershed goal, as applicable.

To achieve this coordination, the GSAs may need to develop additional governance and communication processes to support these activities efficiently and effectively.

5.1.2.7 Outreach to stakeholders

Activities under this element of the GSP implementation plan include continuation of education, outreach, and engagement with stakeholders, building off the framework and activities established in the Communication and Engagement Plan, as described in Appendix 2-3. Such activities performed during GSP implementation include maintaining the SVGMD website and the online/social media presence, community meetings, workshops, and public events. These activities may also include electronic newsletters, informational surveys, coordination with entities conducting outreach to diverse communities in the Basin, and development of brochures and print materials. Decisions regarding the nature and extent of these outreach activities will be made by the GSA.

5.2 Estimate of GSP Implementation Costs

The implementation costs for the Sierra Valley GSP will include funding for functions associated with the GSP implementation elements described above, including GSAs management and administration, monitoring, technical support, data management, coordination, reporting, management actions, and outreach. GSP implementation costs will also cover the building of sufficient fiscal reserves to address other potential costs for the twenty-year implementation horizon.

5.2.1 Projected Implementation Costs

Implementation of the GSP over the 20-year planning horizon is projected to cost $68,500 - $142,000 annually for operation and maintenance along with capital projects, which are expected to be funded through future available grants. A breakdown of these costs by implementation element is summarized in Table 5.2.1-1. These costs are based on the best

available estimates at the time of Plan development and may vary throughout the period of Plan implementation. Costs include 3% annual Consumer Price Index increases and the cost of each task may vary in different years. For example, the five -year assessment cost may need to be primarily funded every 4 to 5 years. Overall, GSP implementation cost, not including capital projects, is estimated to fall within the total range provided. If the GSAs develop additional projects or management actions during the GSP implementation period, the cost estimates will be refined and reported to DWR through the annual reports or five-year periodic assessments. Similarly, grant awards may offset some of the costs estimated and shown in Table 5.2.1-1.

Development of this GSP was funded largely through a Proposition 1 Groundwater Grant Program and Proposition 68 Grant. The GSAs will pursue additional grant funding for GSP implementation as it is available. In the following analysis, it is assumed that the GSAs will identify other sources of funding to cover GSP implementation costs. Sources of funding are being considered and are presented in Appendix 5-1. The exact funding mechanisms will be decided by the GSAs and will depend on their legal authority.

Table 5.2.1-1 Summary of Preliminary GSP Implementation Costs

GSP Implementation Tasks	Recurring Annual Cost
GSAs Management, Administration, Legal and Day-to-Day Operations	$7,000-$22,000
Administrative Staff Support /Accounting	TBD
GSAs management and staff support	TBD
Legal support	TBD
Data management	TBD
GSP Reporting	
Annual Reports	$11,000-$20,000
5-Year GSP Assessments	TBD
Tier I: Existing or Ongoing Projects and Management Actions	
High-capacity wells Inventory and Metering	Included in Monitoring
Monitoring	$32,000-$45,000
Modeling Updates	$11,500 - $37,000
Education & Outreach	$7,000-$18,000
Well Permit Ordinance	**TBD**
Water Reuse	**TBD**
Sierra Brooks-Smithneck Wildland Urban Interface Fuels Reduction Project	**TBD**
Tier II: Planned Projects and Management Actions	
Agricultural Efficiency Improvements	TBD/Prop 68 Funding
Agricultural Water Use Management	TBD
All wells Inventory	TBD
Reoperation of Surface Water Supplies	TBD
Off-Stream Storage	TBD
Drought Mitigation Planning	TBD
Water Conservation and Demand Management	TBD
Watershed and Upland Management and Restoration	TBD/Leverage multiple funding sources
Voluntary Managed Land Repurposing	TBD
Groundwater Recharge/Managed Aquifer Recharge	TBD
Assessment of Post-Fire Hydrology and Potential Water Supply Augmentation	TBD
Total	$68,500-$142,000

5.2.2 Financial Reserves and Contingencies

To mitigate financial risks associated with expense overruns due to unanticipated expenditures and actual expenses exceeding estimated costs, the GSAs may carry a general reserve with no restrictions on the types of expenses for which it can be used. Adoption of a financial reserves policy is authorized by SGMA Sections 10730(a) and 10730.2(a)(1).

5.2.3 Total Implementation Costs Through 2042

The implementation of this GSP is estimated to have a total annual cost of $68,500 – $142,000 excluding capital projects based on the best available information at the time of Plan preparation and submittal. Actual cost of the GSP implementation for each year will depend on the specific tasks that need to be conducted during that year. The breakdown of this total estimated annual cost is presented by major budget category in Table 5.2.1-1.

5.3 Schedule for Implementation

The final GSP will be presented to the GSA Boards for adoption in January 2022 and will be submitted to DWR no later than January 31, 2022.

5.3.1 Preliminary Schedule

The preliminary schedule for agency administration, management, and coordination activities, GSP reporting, and community outreach and education are provided in Table 5.3.1-1. While most activities are continuous during GSP implementation, annual reports will be submitted to DWR by April 1st of each year and periodic five-year assessment reports will be submitted to DWR by April 1st every five years after the initiation of Plan implementation in 2022 (i.e., assessment report submittal in 2027, 2032, 2037, and 2042).

To provide a sense of how the planned GSP implementation actions will need to be coordinated, a more detailed potential schedule for implementing the existing and potential management actions is shown in Table 5.3.1-2Table 5.3.1-2. The table provides a detailed list of actions for each quarter of 2022, details for the following years will be developed at the beginning of the implementation phase and based on preliminary results of the PMAs that are being implemented. As shown in Table 5.3.1-2, monitoring of groundwater levels is an existing and ongoing management action. As described in Chapters 3 and 4, additional monitoring will be implemented for subsidence, water quality and ISWs/GDEs. The summary of existing and planned monitoring activities from Chapter 3 is repeated in Table 5.3.1-3 to provide a more complete picture of monitoring that will be included in GSP implementation.

Table 5.3.1-1: Preliminary GSP Implementation Schedule

	Start	2022-2042																				
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Data Management and Reporting																						
Milestones																						
GSP Submitted to DWR	January 2022	●																				
Groundwater Sustainability Goal Attained	January 2042																					●
Reporting																						
Annual Reporting	April 2022	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5-Year Evaluations	April 2027						●					●					●					
Possible re-evaluation of GSP RMPs	April 2027						●					●										
Possible re-evaluation of depletion of ISWs SMC	April 2027						●					●										
Monitoring																						
Monitoring: Groundwater (all)	Quarterly or Continuous																					
Monitoring: Streamflow	Continuous																					
Monitoring: Stream transects	Continuous																					
Groundwater Quality Monitoring Network Expansion	January 2022																					
Data Management	Continuous																					
Outreach and Education																						
Stakeholder Outreach and Education	Continuous																					
Projects and Management Actions																						
Teir I PMAs: Ongoing	January 2022																					
Teir II PMAs: Feasibility study and prioritization upon funding availability	January 2022	●																				
Teir II PMAs: Implementation of highly prioritized PMAs depending of funding availability	January 2023		●																			

Table 5.3.1-2: **Preliminary Schedule and Status for Projects and Management Actions**

			GSP Implementation Year[1]							
			1 (2022)				2	3	3	5
Task and Project and Management Action (Chapter 4)	**Status**	**Funding**	**Q1**	**Q2**	**Q3**	**Q4**	**2023**	**2024**	**2025**	**2026**
Existing (on-going) and Required										
Inventory and Metering for high-capacity Wells (see Chapter 4.2.1)										
Flow Meter Readings during Irrigation Season	On-going, Monthly	SVGMD Existing O&M		x	x	x	x	x	x	x
Flow Meter Replacements (**nineteen** planned)	On-going (completion by April 15, 2022)	DWR Grant - Existing	x	x						
GSA activities after GSP submission: Monitoring and Reporting (Chapter 4.2.2)										
Water Level Measurements at existing SVGMD MW1-MW7 and W1-W6 (includes winter monthly monitoring for post-pumping recovery); Subsidence, water quality; continuous monitoring to assess GDE and ISW	On-going, Monthly except in winter months or continuous	SVGMD Existing O&M		x	x	x	x	x	x	x
Annual Report (water levels, pumped volumes, differences in water levels, ongoing and planned actions)	Required, April 1st Submittal to DWR	NOT CURRENTLY FUNDED, but propose using existing DWR grant to develop first report and template	x				x	x	x	
5-Year Basin Status Report, including modelling updates	Required	NOT CURRENTLY FUNDED								x

[1] **x = occurs, blue = funded by existing DWR grant to SVGMD, orange = funded by existing SVGMD revenue, yellow = funded directly by DWR)**

			GSP Implementation Year[1]							
			1 (2022)				2	3	3	5
Task and Project and Management Action (Chapter 4)	**Status**	**Funding**	**Q1**	**Q2**	**Q3**	**Q4**	**2023**	**2024**	**2025**	**2026**
Additional Existing PMAs (4.2)										
Well Permit Ordinance (4.2.5)	Ongoing	SVGMD Existing O&M		x	x	x	x	x	x	x
Water Reuse (4.2.6)	SVGMD to coordinated with existing efforts	TBD		x	x					
Sierra Brooks- Smithneck Wildland Urban Interface Fuels Reduction Project (4.2.7)	SVGMD to explore coordination with existing project	TBD		x	x					
Proposed Advancement of Potential Projects & Management Actions (4.3): prioritization to be considered in February 2022										
Agricultural Efficiency Improvements (4.3.1)	Initiated Q4 2021 and Q1 2022	Identify opportunities and implement pilot studies covered by existing DWR grant; future large scale IMPLEMENTATION NOT FUNDED	x	x	x	x	x	x	x	
Reoperation of Surface Water Supplies (4.3.4) Preliminary Feasibility Review for Frenchman Reservoir and Little Last Chance Creek Resource; Lake Davis water source utilization	Q1 - Q3 2022	Feasibility study funded through existing DWR Grant		x	x	x				
Additional Off-stream storage (4.3.5)	Q1 - Q3 2022	Feasibility study funded through existing DWR Grant		x	x	x				

			GSP Implementation Year[1]							
			1 (2022)				2	3	3	5
Task and Project and Management Action (Chapter 4)	**Status**	**Funding**	**Q1**	**Q2**	**Q3**	**Q4**	**2023**	**2024**	**2025**	**2026**
Preliminary Feasibility for Groundwater Recharge/Managed Aquifer Recharge (4.3.10)	Q1 - Q3 2022	Feasibility study funded through existing DWR Grant		x	x	x				
Prepare Additional Grant Funding Applications based on Feasibility Reviews and on prioritization discussed in February 2022	Q3-Q4 2022 (as available)	NOT CURRENTLY FUNDED				x	x	x	x	x
Education and Outreach (4.2.4)	Quarterly to Annual (TBD)	NOT CURRENTLY FUNDED after GSP completion	x		x		x	x	x	x
Additional Possible Projects & Management Actions in 5-year Horizon (4.3)										
Drought Mitigation Planning (4.3.6)	Scheduling Pending release of State Funding, TBD	NOT CURRENTLY FUNDED - SEEK STATE FUNDING	x	x	x	x	x	x	x	x
Watershed and Upland Management and Restoration (4.3.8)	Feasible projects identified and prioritized within two years Implementation within five years contingent on funding	NOT CURRENTLY FUNDED - SEEK FUNDING OPPORTUNITIES AND PARTNERS	x	x	x	x	x	x	x	x
Voluntary Managed Land Repurposing (4.3.9)	Feasible projects identified and prioritized within two years Implementation within	NOT CURRENTLY FUNDED - SEEK FUNDING OPPORTUNITIES AND PARTNERS	x	x	x	x	x	x	x	x

Task and Project and Management Action (Chapter 4)	Status	Funding	GSP Implementation Year[1]							
			1 (2022)				2	3	3	5
			Q1	Q2	Q3	Q4	2023	2024	2025	2026
	five years contingent on funding									
Assessment of Post-Fire Hydrology and Potential Water Supply Augmentation (4.3.11)	SVGMD to support the project and coordinate as needed with Plumas Fire Safe Council to collect data	NOT CURRENTLY FUNDED – SEEK FUNDING OPPORTUNITIES AS NEEDED	x	x	x	x	x	x	x	x
Water Conservation and Demand Management (4.3.7)	Approach to this project would be based on effectiveness of other PMAs and the implementation approach would be developed as needed within the first 5 years of GSP implementation	TBD					x	x		
Climate Change Impact Assessment (4.3.12)	Approach to this effort will be developed within the first 5 years of GSP implementation and are based on availability of new climate change scenarios	NOT CURRENTLY FUNDED – SEEK FUNDING OPPORTUNITIES AS NEEDED			x	x	x	x		

Table 5.3.1-3: Summary of Existing and Proposed New Monitoring for Assessment of SMCs

SMC	Wells		Measurement		Potential other measurement, based on funding availability
	Existing	New	Existing	New	
Groundwater Levels	19 district wells 17 CASGEM wells	0	Measured at least 2x/year, additional measurements during the irrigation season Measured at least 2x/year, but with continuous measurements in the latest multi-completion wells	(a)	N/A
Storage	Groundwater Levels as Proxy				N/A
Water Quality	17	Up to 6 (b)	1x/3 years (c)	1x/3 years (b)	N/A
ISW	13 mostly shallow	4 (d)	13 at least quarterly and 4 continuously	(a)	Up to Ten stream flow gauges (e) and Eight stage gauges (e)
Subsidence	Groundwater Levels as Proxy at least for the first 2 years		InSAR Data (g)	4 monuments (f)	

(a) Telemetry may be employed to increase data collection frequency and minimize field visits.

(b) Five community members have volunteered their wells for inclusion in the water quality monitoring network. DWR is installing one new observation well that can be used for both groundwater level and groundwater quality monitoring. If incorporated in the network, the new DWR wells would be monitored on the same frequency as the other volunteered wells

(c) Coordinate with existing GAMA water quality monitoring to obtain data

(d) 4 existing shallow wells will be considered for installation of continuous pressure transducers in the area near Groundwater Dependent Ecosystem. Funding for the instrumentation is already available through the implementation grant and there are opportunities for more external funding (e.g., from USGS/DWR project). Cost of maintaining these stations will be minimal and data are expected to be downloaded twice per year.

(e) More continuous data in existing shallow wells may be considered in the future as implementation funding become available and as the model provides more certainty about locations where these data are critical. Shallow wells will be paired with flow and/or stage gauges, pending funding availability over the first 5 years of the implementation period. Feasibility study required to assess potential locations. Gauges may benefit by using telemetry to provide continuous data.

(f) Funding currently allocated to install monuments. Monuments will be surveyed as needed if InSAR data show undesirable results and at least every five years for the GSP updates.

5.4 Funding Sources and Mechanisms

SGMA authorizes GSAs to charge fees, such as pumping and permitting fees, to fund the costs of groundwater management and sustainability programs. Consistent with this approach, SVGMD has been funded by contributions from Sierra and Plumas Counties, management charges on parcels and on wells, and grants as described in more detail in Appendix 5-1.

5.4.1 Funding Opportunities

The GSAs will pursue various funding opportunities from state and federal sources for GSP implementation. As the GSP implementation proceeds, the GSAs will further evaluate funding mechanisms and may perform a cost-benefit analysis of fee collection to support consideration of potential refinements. Appendix 5-1 presents examples of potential financing options. At the start of the GSP implementation, the GSAs will be funded according to the current fee structure as described in Appendix 5-1.

The need for additional revenue beyond the GSAs' existing revenue structure will be determined in the coming months. Several factors will be evaluated in choosing the optimal funding mechanism should additional revenue be necessary. As described in Appendix 5-1, Several potential funding mechanisms are being considered. Should the GSAs determine a pressing need for additional funding, a regulatory fee could be implemented with an expedited timeline. Several aspects of regulatory fees highlight their advantages and disadvantages and will inform the GSAs' decision-making process.

Use of Funds – Regulatory fees, in accordance with California Proposition 26 and Article XIII C of the California Constitution, may be imposed to recover the costs of a regulatory program. In accordance with Water Code Section 10730, regulatory fees may be used to fund the costs of a groundwater sustainability program, including, but not limited to: preparation, adoption, and amendment of a groundwater sustainability plan; investigations, inspections, compliance assistance, enforcement, and program administration; a prudent reserve. Revenue from regulatory fees may not contribute to the funding of capital projects. (If revenue is needed to support capital projects, a property-related fee is recommended).

It is anticipated that the GSAs will utilize grant funding for the implementation of capital projects. For this reason, a regulatory fee program may be best suited to the Sierra Valley Basin. Should the GSAs determine that additional funding for operations and maintenance will be necessary, the clearest path forward would be a regulatory fee on wells.

Methodology – Such a fee program could employ a methodology of either groundwater extraction, which would require metering of all non-de minimis wells, or estimated groundwater extraction, which would place a flat estimated use fee on each non-de minimis well. A regulatory fee on all affected parcels in the basin could also be explored, though there is some legal vulnerability and concerns over this methodology.

Revenue Generation Potential – As modeled in Appendix 5-1, a fee-based on groundwater extraction could generate $83,000 per year with a rate of $6.50 per acre-foot extracted. A fee-based on estimated groundwater extraction could generate $83,000 per year with a rate of $1,350 per large-capacity well, and $50 to $60 per medium-capacity non-de minimis well. The revenue generated by a new regulatory fee program, in addition to the revenue generated by the GSAs' current revenue structure, must collectively not exceed the reasonable costs of the governmental activity they will fund.

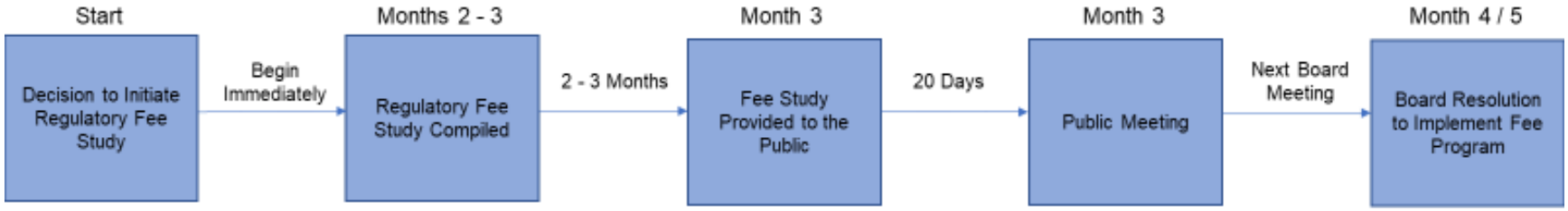
Required Documents – A fee study is highly recommended, as it establishes the legal, methodological, and policy basis for the fee program. When provided to the public, the fee study would satisfy Water Code Section 10730(b)(2), which requires that the GSAs provide to the public the data upon which the fee is based.

Timeline – Regulatory fee implementation is advantageous due to its relatively streamlined process. The fee study would take approximately 2-3 months to complete. This time would be used to establish compliance with Proposition 26, including that: the levy, charge, or other exaction is not a tax; the amount is not more than necessary to cover the reasonable cost of the governmental activity; and that the way those costs are allocated to a payor bears a fair or reasonable relationship to the payor's burden on, or benefits received from, the governmental activity. This process would also include data refinement and determination of specific methodology.

Once complete, the fee study would be provided to the public at least 20 days before a public meeting is held to provide opportunity for public comment and discussion. The Board could then approve the fee program by resolution at the next Board meeting.

A detailed timeline is provided below in Figure 5.4.1-1.

Figure 5.4.1-1: Timeline of Regulatory Fee Implementation



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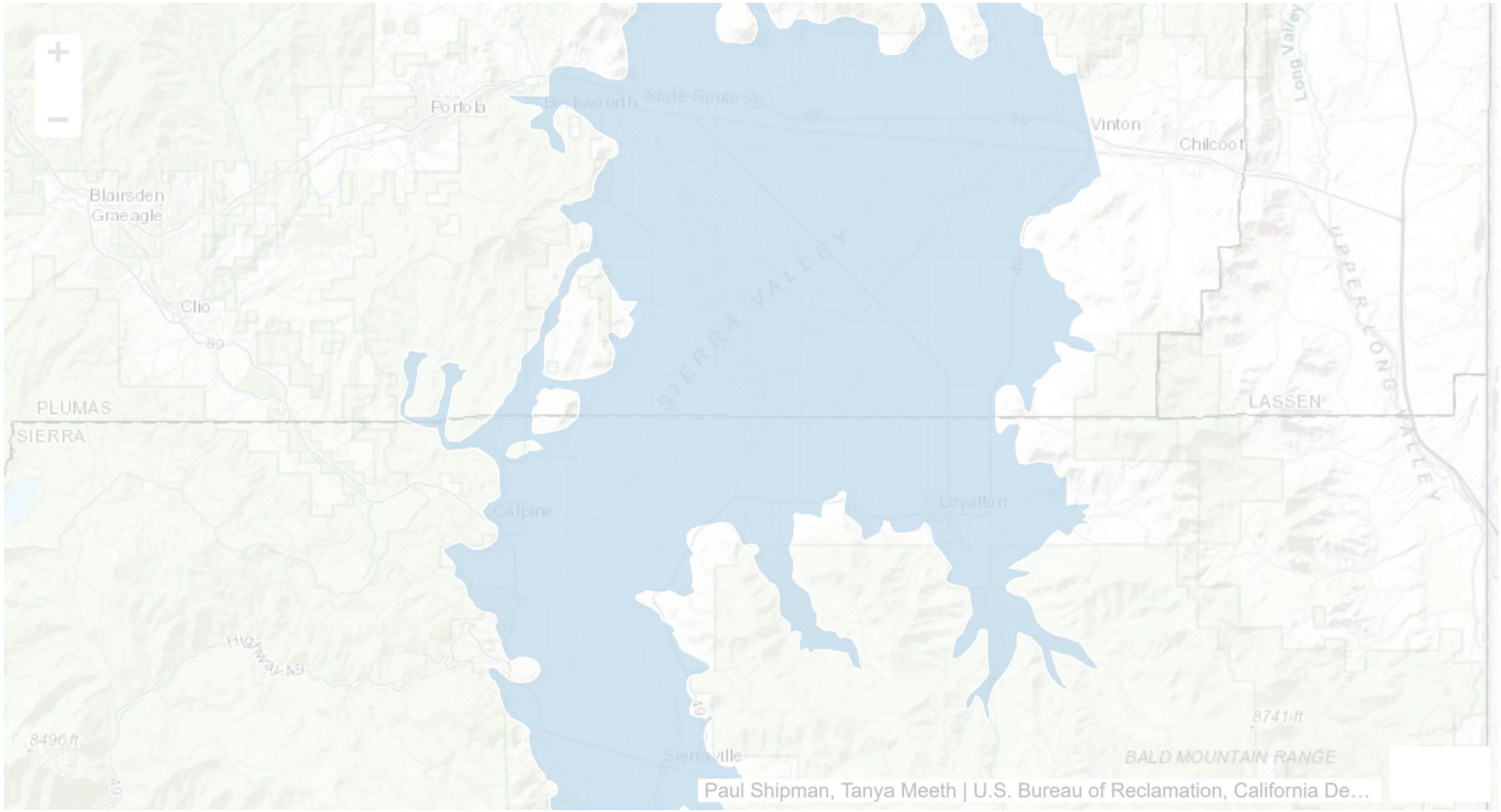
Appendix 1-1: GSA Submittal to DWR

Sierra Valley Groundwater Management District

(5-012.01 SIERRA VALLEY SIERRA VALLEY)



Point of Contact Information

Einen Grandi, Chairman
Sierra Valley Groundwater Management District
P.O. Box 88 | Chilcoot, CA 96105
530-428-5002 | sierravalleygmd@sbcglobal.net
http://sierravalleygmd.org/

A GSA Eligibility Determination

1. Provide a description of your local agency's water supply, water management, or land use responsibilities within the groundwater basin / basins you intend to manage.

   The Sierra Valley Groundwater Management District (SVGMD) was created through California special act legislation (SB 1391 in 1980) for the specific purpose of implementing sustainable management and regulation of groundwater aquifers, underlying its jurisdiction within Sierra Valley (including Department of Water Resources Bulletin 118 subbasin 5-12.01). The SVGMD was formed under a joint powers agreement between Plumas County and Sierra County.

2. Are you an "exclusive local agency" listed in Water Code §10723(c)?

   Yes

   Select exclusive local agency name.

   Sierra Valley Groundwater Management District

   Upload your statutory area boundary shape file if you are an exclusive local agency.

   SVGMD District Boundary.zip (4.8kB) Uploaded on 03/31/2017 at 04:53PM

B Decision to Become a GSA

1. Please enter the date your local agency, or agencies, decided to become or form a GSA.

   03/13/2017

2. Upload a copy of the Government Code §6066 notice.

3. Upload a copy of resolution forming the new agency.

   SVGMD GSA notification.pdf (2.1MB) Uploaded on 03/31/2017 at 04:44PM

4. If desired, please upload or provide additional information related to your local agency's decision to become or form a GSA.

C Type of GSA Formation and Contact Information

GSA Name

Sierra Valley Groundwater Management District

1. Select a Point of Contact (POC) for your GSA.

> Einen Grandi

2. If you anticipate submitting multiple GSA notices on behalf of your local agency/GSA, please consider adding a "Local ID" for reference purposes to distinctly identify separate areas you intend to manage.

3. Is this a Single-Agency or Multiple-Agency GSA?

> SINGLE

D Map & Service Area Boundaries

1. Select Basin(s)/Subbasin(s) to be managed by the GSA.

> 5-012.01 SIERRA VALLEY SIERRA VALLEY

2. Upload a PDF map that clearly defines: (1) the service area boundaries of each local agency that is part of your GSA; and (2) the boundaries of the basin(s) or portion of the basin(s) your GSA intends to manage.

> District AND Subbasin boundaries.pdf (163.6kB) Uploaded on 03/31/2017 at 01:35PM

3. Upload service area boundary GIS shape file.

> SVGMD District Boundary.zip (4.8kB) Uploaded on 03/31/2017 at 04:50PM

4. Upload GSA area boundary GIS shape file.

> GSA Boundary.zip (30.4kB) Uploaded on 03/31/2017 at 04:51PM

5. If desired, please provide information that clarifies your service area boundary and GSA boundary, if those boundaries are different.

> District AND Subbasin boundaries.pdf (163.6kB) Uploaded on 03/31/2017 at 04:59PM

E Required Documents

1. Provide a list of interested parties developed pursuant to Water Code Section 10723.2 and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of the GSP.

> The SVGMD has identified the following interested parties as defined in Water Code Section 10723.2. The SVGMD will consider all beneficial uses and users of groundwater within the Sierra Valley Groundwater Subbasin. The SVGMD will engage with and encourage feedback from interested parties during GSP development. While this list may be altered during GSP development, current interested parties include: All property owners in SVGMD and Sierra Valley Basin outside District; all Agricultural Producers; City of Loyalton; City of Loyalton Planning Commission; Sierraville Public Utilities District; Calpine Water District; Sierra County Water System; Plumas County Planning Department;

> Plumas County Planning Commission; Plumas County Flood Control District and Water Conservation District; Sierra County Planning Department; Sierra County Planning Commission; Sierra County Flood Control and Water Conservation District; US Forest Service; BLM; Grizzly Ranch CSD; California Dept. of Fish & Wildlife; Plumas Audubon Society; The Nature Conservancy; Plumas-Sierra Community Food Council; Plumas-Sierra Cattlemen?s Association; Farm Bureau (local); Tribal contact lists (Mountain Maidu, Washoe); and the Sierra Valley Watermaster.

2. Provide a list of the other agencies managing or proposing to manage groundwater within the basin, or upload a document or map that provides the same information.

> Plumas County has passed a resolution to become the GSA for the small section of the Sierra Valley sub-basin that extends outside Sierra Valley Groundwater District boundaries.
> Plumas County GSA map.pdf (1.7MB) Uploaded on 03/31/2017 at 01:45PM

3. Provide a description or upload a copy of any new by laws, ordinances, or new authorities adopted by the local agency.

> No new bylaws, ordinances, or other authorities were adopted in conjunction with the District's decision to become the GSA.

Appendix 1-2: GSA Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING BETWEEN PARTIES IN THE SIERRA VALLEY GROUNDWATER BASIN AS RELATED TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT.

THIS MEMORANDUM OF UNDERSTANDING (MOU) is made and entered into on January 8, 2019 by and between the County of Plumas ("County" herein) and the Sierra Valley Groundwater Management District ("District" herein), each a "Party" and collectively the "Parties").

WHEREAS, on September 16, 2014, Governor Jerry Brown signed into law Senate Bills 1168 and 1139 and Assembly Bill 1739 known collectively as the Sustainable Groundwater Management Act ("SGMA"); and

WHEREAS, the purpose of SGMA is to create a comprehensive management system in California by creating a structure to manage groundwater at the local level, while providing authority to the State to oversee and regulate, if necessary, the local groundwater management system; and

WHEREAS, SGMA empowers and requires local agencies to develop and adopt Groundwater Sustainability Plans ("GSP") that are tailored to the resources and needs of their communities, provide a buffer against drought and contribute to reliable water supply for the future; and

WHEREAS, Water Code Section 10723.6 authorizes a combination of local agencies overlying a groundwater basin to elect to become a Groundwater Sustainability Agency ("GSA") by using a memorandum of agreement or other agreement; and

WHEREAS, the Department of Water Resources (DWR) granted the Sierra Valley Groundwater Management District GSA authority over the portion of Sierra Valley Groundwater Basin within the District's boundaries on 4-1-2017; and

WHEREAS, the Department of Water Resources (DWR) granted Plumas County GSA authority over portions of the Sierra Valley Groundwater Basin outside of the District boundary and within Plumas County on 4-14-2017; and

NOW THERFORE, incorporating the above recitals herein it is mutually understood and agreed as follows:

1. PURPOSE. This MOU is entered into by and between the Parties to facilitate a cooperative and ongoing working relationship to develop a single Sierra Valley GSP that will allow compliance with SGMA and State law, both as amended from time to time. The primary goal of the MOU is to eliminate overlap between the GSAs and to establish a working partnership to move toward a multi-GSA agreement to cover all portions of the Sierra Valley Goundwater Basin designated in DWR Bulletin 118 and to prepare and adopt a SGMA compliant GSP prior to the January 31, 2022 deadline set under SGMA.

All Parties agree that all actions taken and/or contemplated under the GSP will be based on sound groundwater science and local expertise that will drive the development of the sustainability goals of the basin as outlined under SGMA.

2. TERM. This MOU shall remain in effect unless terminated by the mutual consent of the Parties and as allowed by State law.

3. AMENDING THE MOU. This MOU hereto may only be amended by subsequent writing, approved and signed by all Parties.

4. HOLD HARMLESS. No Party, not any officer or employees of a Party, shall be responsible for any damage or liability occurring by reason of anything done or omitted to be done by another Party in connection with this MOU.

SIERRA VALLEY GROUNDWATER MANAGEMENT DISTRICT

By: _____

DATE: 2/11/19

COUNTY OF PLUMAS

By: _____

DATE: 1/8/19

Approved as to form:

_____

R. Craig Settlemire
Plumas County Counsel

AGREEMENT NO. _____

Appendix 1-3: SVGMD Policy Manual

SIERRA VALLEY GROUNDWATER MANAGEMENT DISTRICT

ESTABLISHED BY THE SIERRA VALLEY GROUNDWATER BASIN ACT OF 1980 (WATER CODE, APP. 119)

SIERRA VALLEY GROUNDWATER MANAGEMENT DISTRICT

P.O. Box 102 Sierraville, CA 96126-0102 (530) 994 3706 (530) 994 3282 (fax)
emailsierrravalleygmd@sbcglobal.net

POLICIES & PROCEDURES MANUAL

This Policy & Procedures Manual was approved by a motion at the Board of Directors Meeting on October 8, 2012 – Chairman Genasci, Vice-Chairman Wallace, Directors Swofford, Goicoechea, , Harrison, and Potter

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Chapter 1 General Rules

Section 1 Applicability

These rules shall apply to all meetings of the Sierra Valley Groundwater Management District, Board of Directors. It shall be the responsibility of each member of the Board of Directors to become knowledgeable with these rules.

Section 2 Membership

The Board of Directors shall be composed of seven (7) members appointed by the respective Boards of Supervisors of Sierra and Plumas Counties in accordance with any joint exercise of powers agreement.

Section 3 Voting

Four (4) members of the Board of Directors shall constitute a quorum for the transaction of business of the District. Any Ex-officio or Advisory members shall not have a vote on any matter of business before the Board of Directors.

Section 4 Meeting Attendance

If any member of the Board of Directors is unable to attend a regular or special meeting, the members shall notify the Chairman or the Secretary prior to the meeting advising the reasons thereof. Failure

of a member to attend meetings of the Board of Directors may be reported to the respective Board of Supervisors of Sierra and Plumas Counties by resolution of the full Board of Directors.

Chapter 2 Board Officers

Section 5 Election of Officers

The Board of Directors shall, at the first regular meeting in January of each year, elect a Chairman and Vice Chairman. The Chairman and Vice Chairman shall be elected by a majority of the total appointed members of the Board of Directors. If there is more than one (1) candidate for each office, the election shall be taken by secret ballot and administered by the Secretary of the Board.

Section 6 Chairman

The Chairman of the Board of Directors, when present, shall preside at all meetings; shall take the chair at the hour appointed for every Board of Directors meeting and immediately call the meeting to order; and shall proceed to administer the business of the Board of Directors in a manner consistent with the rules of the Board. The Chairman of the Board of Directors shall preserve order, the decorum, and shall decide upon all questions of order subject to the transaction of business by the Board of Directors.

Section 7 Vice Chairman

The Vice Chairman shall, in the inability or absence of the Chairman to act, take the Chair and have all powers and duties of the Chairman.

Section 8 Secretary

The Secretary of the Board shall be responsible for giving notice of all Board of Directors meetings; preparing all Board of Directors agendas; maintenance and recording of all meetings and actions of the Board of Directors; signing all documents and resolutions; conducting correspondence; and supervising the maintenance of official files, records, exhibits, and documents. The Secretary may appoint an alternate to fulfill duties of the Secretary in the case of absence.

Section 9 Legal Counsel

The County Counsel of Sierra or Plumas Counties may provide legal counsel to the Board of Directors during the transaction of business during any regular or special meeting. Whenever possible, legal advice should be in written form. The Board of Directors may contract for counsel services at any time.

Section 10 Advisory Members

Advisory members to the Board of Directors shall be the Sierra Valley Watermaster, the Plumas and Sierra County Directors of Public Works, Plumas and Sierra County Health Officers and Plumas and Sierra County Planning Directors. The advisory members should participate in Board of Directors meetings as requested and directed by the Chairman.

Upon request, all public officials shall furnish to the Board of Directors within a reasonable period of time and as provided by law,

such available information as may be required for the work of the Board of Directors

Section 11 Committees

The Chairman shall be responsible for the appointment of individual members of the Board of Directors to any committees as created by the Board of Directors.

Chapter 3 Board Meetings

Section 12 Rules of Conduct

The Chairman shall conduct all meetings of the Board of Directors in accordance with Roberts Rules of Order.

Section 13 Order of Business

The order of business of each regular meeting of the Board of Directors shall be transacted in the following order:

a) Call to order by the Chairman
b) Roll call by the Secretary
c) Introductions by the Chairman
d) Public comment
e) Approval of minutes of previous Board of Directors meetings
f) Approval of meeting agenda
g) Public hearings on Ordinances
h) Public hearings on permits
i) Old business

j) Petitions, Resolutions, Board Orders
k) Correspondence
l) Report on cash balance and bills to be paid
m) Set agenda items for next meeting
n) Staff Reports
o) Adjournment

The order of business may be altered or suspended at the direction of the Chairman.

Section 14 Regular Meetings

Regular meetings of the Board of Directors shall be held on the second (2nd) Monday of each month of the year at 6:00 p.m. at the Loyalton Social Hall, Loyalton, California. If any regular meeting falls on a holiday, the regular meeting of the Board of Directors shall be held on the next succeeding Monday commencing at the same hour, in which all hearings, applications, and petitions and other matters before the Board of Directors shall be deemed to be and are hereby automatically continued to said day and hour.

Section 15 Special Meetings

Special meetings of the Board of Directors may be called in the manner provided by law and the order calling the special meeting shall specify the time and place of the meeting and the specific business to be transacted by the Board of Directors at such meeting. No other business shall be considered at a special meeting outside of that business which appears within the order calling the special meeting. The Chairman or a quorum of the Board of Directors may call and order a special meeting of the Board of Directors.

Section 16 Adjourned Meetings

An adjourned meeting of a regular meeting or an adjourned regular meeting is part of the regular meeting. An adjourned meeting may be adjourned to a specific place, date and time by a majority of the members present.

Section 17 Lack of Quorum

In the absence of a quorum, the members of the Board of Directors present shall adjourn a regular, special or adjourned meeting until:

a) In the case of a regular meeting, until the next succeeding Monday commencing at the same hour, in which all hearings, applications, and petitions and other matters before the Board of Directors shall be deemed to be and are hereby automatically continued to said day and hour; and
b) In the case of a special or adjourned meeting, until a date, time and location specified by the members of the Board of Directors present in which all hearings, applications and petitions and other matters before the Board of Directors shall be deemed to be and are hereby automatically continued to said specified day, hour and location.

If all members of the Board of Directors are absent, the Secretary of the Board of Directors may adjourn the meeting at a stated time and place as provided by law.

Section 18 Compensation

Compensation at a rate provided by resolution and/or ordinance of the Board of Directors shall be provided to individual Directors for all regular, special or adjourned meetings of the Board of Directors as

well as for participation by individual Board of Directors members serving on committees of the Board of Directors

Chapter 4 Board Records

Section 19 Agendas (See Exhibit 1)

Agendas of the Board of Directors meeting shall be prepared by the Secretary. The ability to include items upon the Board of Directors agenda shall close at 5:00 p.m. five (5)days prior to the date of the meeting for which the agenda is being prepared.

Section 20 Public Notices (See Exhibit 2)

Public notices containing detailed information as required by law for all public hearings shall be prepared by the Secretary of the Board of Directors. The information required for a public notice can be provided on a separate document or contained upon the meeting agenda but in either case must contain the same information.

Section 21 Agenda and Public Notice Publishing, Posting, Distribution

Agendas of the Board of Directors meetings need not be published. Public notices for public hearings before the Board of Directors shall be published as required by law and at least 72 hours prior to a meeting of the Board of Directors. Agendas and public notices shall be posted at the following locations at least 72 hours prior to a meeting of the Board of Directors:

a) Door of the meeting room of the Board of Directors
b) Courthouse bulletin board, Downieville and Sierra
c) Post Office buildings throughout Sierra and Plumas Counties
d) Loyalton City Hall and Portola City Hall

Agendas and public notices shall be distributed through the U.S. Mail (and by electronic mail, by request) at least 72 hours prior to a meeting of the Board of Directions to the following:

a) Board members
b) County Clerk, Sierra and Plumas Counties
c) City Clerk, Loyalton and Portola
d) State/Federal agencies as requested
e) Any owner of record of property subject to the transaction of business
f) Any applicant or representative of property subject to the transaction
of business
g) Contiguous property owners as required by law and as determined by the Board of Directors

Agendas can be distributed to other parties upon written request and pre-payment at actual cost for reproduction and thirty (30) self-addressed, stamped envelopes to the Secretary.

Section 22 Meeting Minutes (See Exhibit 3)

Minutes of all Board of Directors meetings shall be prepared under the direction of the Board of Directors Secretary. The Secretary of the Board of Directors shall be responsible for the content and accuracy of the minutes. Written minutes need not be and shall not be relied upon as a verbatim transcript of a meeting. The minutes shall contain a summary of all actions and sufficient documentation with applicable references as may be necessary to make any action of

the Board of Directors understandable. Minutes of meetings shall be approved by the Board of Directors and shall subsequently be signed by the Secretary attesting to approval of said minutes. Minutes, upon approval by the Board of Directors and signature by the Secretary shall be distributed to the following:

a) Board members
b) Newspaper of General Circulation within Sierra and Plumas counties
(for information only)

Minutes can be distributed to other parties upon written request and pre-payment at actual cost of reproduction and the provision of thirty (30) self-addressed, stamped envelopes to the Secretary.

Section 23 Staff Reports

Staff reports and recommendations on any matter to be considered by the Board of Directors shall be prepared and mailed to members of the Board of Directors in sufficient time for Directors to receive them on the Wednesday prior to the regular Monday meeting of the Board of Directors. Copies of the reports and/or recommendations shall be made available for public inspection at the office of the Secretary prior to the commencement of any meeting of the Board of Directors and the Board of Directors may allow in its discretion, the filing of supplemental reports which shall be made public at the commencement of any hearing or meeting of the Board of Directors. Staff reports shall be provided to an owner of record/applicant for any property being considered as a matter of business before the Board of Directors as provided by law.

Section 24 Resolutions (See Exhibit 4)

Resolutions of the Board of Directors shall be provided for any actions of the Board of Directors as follows:

a) Recommendations to a Board of Supervisors on development projects
b) Reports to the Board of Supervisors on failure of a Board of Director
to regularly attend Board of Directors meetings.
c) Initiation of policies and ordinances
d) Setting the time, place and location of public hearings on any matter
before the Board of Directors
e) Adoption of and amendments to policies of the Board of Directors

Resolutions of the Board of Directors shall be prepared by the Secretary and shall be approved by the affirmative vote of a majority of members present.
Voting shall be by roll call conducted by the Secretary.

Section 25 Exhibits

All exhibits including but not limited to reports, analyses, maps, graphs, drawings, photographs, letters, petitions, and other documentary or physical evidence received by the Board of Directors at a hearing or regular meeting shall be retained as part of the official hearing record of the Board of Directors. All exhibits shall be marked by the Secretary for reference and identification as follows:

and shall be filed in a safe and orderly fashion in the office of the Secretary. All exhibits under the jurisdiction of the Board of Directors shall be accessible to the members of the Board of Directors and to the public under such rules, not inconsistent with the law, as the Board of Directors may establish.

BOARD HEARINGS

PROCEDURAL RULES

The following procedural rules shall govern the conduct of all land use hearings before the Board of Directors.

Section Twenty-Six (Hearings, Continuances and Priority)

1) Hearings: All hearings shall be set for a specific date, time and location. No person having a propriety interest in a parcel of land on which such person contemplates an application shall appear before a hearing body on such matter until an application has been duly filed with and processed by Staff.

2) Continuances: When more than one item has been set for hearing at a particular time, the Chairman, at the time set for such hearings, shall inquire of Staff and the audience as to whether continuances are being requested on any of such items, and may order the hearing on any item to be continued to a specified date and time; provided, however, that upon request of any member of

the Board, continuance decisions shall be made by roll call vote of all members present.

3)Priority: It shall be the policy in hearings to take up those items first, which are of interest to persons who have come from the greatest distance and second, which are of interest to the greatest number of persons present. When more than one item has been set for hearing at a particular time, the Chairman, at the time set for such hearings, shall ascertain the number of persons present on each item, and may direct that such items be heard in an order different from that specified on the agenda, provided, however that upon request of any member of the Board, decisions as to the priority of items shall be made by roll call vote of all members present.

Section Twenty-Seven (Presentation of Evidence)

1) Recording: All hearings shall be recorded by electronic device. Any person desiring to have a hearing recorded by a stenographic reporter at his own expense may do so, provided that he consults the
   Secretary to arrange facilities for such reporting prior to commencement of the hearing and advises the Secretary of the full name and business address and telephone number of the reporter being used.

2) Statement of Legal Principles: The Chairman may, in his discretion, request that Counsel make a brief statement of applicable legal principles and requirements for the information of members of the audience or hearing body prior to the opening of the hearing. The statement may include a summary of

the statutory and judicial requirements applicable to the decision on the specific type of matter (e.g., ordinance, permit, variance, etc.) to be heard.

3) Order of Procedure: Unless the Chairman, in his discretion , shall direct otherwise, the order for presentation of evidence on particular items shall be as follows:

    a) Presentation of staff report

    b) Presentation of applicant or appellant

    c) Presentations of persons in favor of requested action, including related correspondence on file

    d) Rebuttals

    e) Closing comments by staff

4) Swearing of Witnesses: Witnesses at hearings on adjudicatory matters may be sworn before giving testimony. Witnesses may be sworn as a group prior to the presentation of the staff report. Witnesses at hearings on legislative matters will not ordinarily be sworn.

5) Rules of Evidence: The hearing need not be conducted according to technical judicial rules of evidence, but statutory and judicial rules regarding inferences and presumptions in civil litigations shall be applicable. Any relevant evidence may be considered if it is the sort of evidence on which responsible persons are accustomed to reply in the conduct of serious affairs. The Chairman may exclude irrelevant or redundant testimony and may make such other rulings as may be necessary for the orderly conduct of the proceedings while ensuring

basic fairness and a full airing of the issues involved. Evidentiary objections shall be waived unless timely made to the Board.

6) Burden of Proof: The party requesting the relief or action sought shall have the burden of proof as to all facts required by law to be shown as prerequisites to the granting of such relief or action.

7) Exhibits and Staff Reports:

    a) Subject to the conditions stated below, all exhibits, including documentary materials such as photographs, slides, drawings, maps, charts, letters, petitions and other physical evidence presented at a hearing shall be retained by the Secretary and duly filed as part of the record of the hearing.

    b) All exhibits presented to the Board will be marked for purposes of identification. Exhibits presented by District staff will be marked in order numerically. Exhibits presented by persons other than District staff personnel will be marked in order alphabetically. Each exhibit shall be marked so as to indicate the number of the case, the date upon which it is presented, and the name of the person by whom it is presented.

    c) Any written staff report presented to the Board shall be marked as "Exhibit 1" and shall be made available to the public prior to, or at the beginning of, the hearing.

    d) Any staff exhibit (e.g., a general plan or area map) which has been or will be used in other land use hearings need not be retained in a

particular case file, but shall be preserved by the Secretary for future reference and a notation indicating its location shall be made in the case file in any matter which it has been used.

e) Scale models and other physical exhibited which cannot be conveniently retained in case files may be photographed at the expense of, and then released to , the person submitting them. The photograph shall be entered in the file in place of the original exhibit, and a notation shall be made on the photograph as to where the original exhibit may be located.

f) Any person referring to an exhibit during testimony shall indicate the number or letter designation assigned to such exhibit.

g) Upon timely objection in adjudicatory hearings, petitions, and letters signed by person not present at the hearing for questioning as to their contents shall be received by the hearing body only for the limited purpose of showing the names of the persons protesting or supporting the action under consideration.

8) Oral Evidence: Any person desiring to speak must first be recognized by the Chairman. All comments must be made clearly and distinctly into a microphone, and all speakers must first state their full names and addresses and the names of any persons in whose behalf they are appearing.

9) Time Limits and Number of Witnesses: In order to expedite the conduct of hearing, the Chairman may limit the amount of time which a person may use in addressing the hearing body. The Chairman may also

limit the number of speakers or amount of testimony upon a particular issue in order to avoid repetitious and cumulative evidence. Except when necessary for immediate clarification of a particular point, no person shall be allowed to speak a second time until all others wishing to speak have had an opportunity to do so.

10) Questioning of Speakers: Any person other than members of the Board desiring to direct a questions to a speaker or staff member shall submit the question to the Chairman, who shall determine whether the question is relevant to the subject of the hearing and whether or not it need be answered by the speaker or staff member. Direct questioning of speakers or staff members may be allowed at the discretion of the Chairman.

11) Field Investigations: The Board may take field trips to view property or for other purposes relevant to the hearing. All field trips of the Board shall be taken as part of a regular, adjourned or special meeting of the hearing body, and all interested persons shall be afforded the opportunity to be present to view the property and hear any reports or comments.
A record of the field trip shall be entered into the minutes so the hearing record will indicate that the field trip was taken into consideration as evidence.

12) Study Sessions: The Board may hold a study session as part of a regular, adjourned or special meeting. When a matter is set for a study session, public testimony may be barred or limited to particular persons at the discretion of the Chairman. Persons speaking at study sessions may be questioned pursuant to Rule 8 (10), above. Public notice for study sessions on specific matters for which public

hearings are anticipated in the future shall be given in the same manner as that required for public hearings and a record of such study sessions shall be entered into the minutes of any such future public hearings so that the hearing records will indicate whether any information received at the study sessions was taken into consideration as evidence at the subsequent public hearings.

Section Twenty-Eight (Findings)

On any matter which requires the preparation of written findings, the staff report submitted on the matter shall contain findings proposed for adoption by the Board. Any mention directly or impliedly rejecting such proposed findings must include a statement of alternative or modified findings or a direction that the matter under consideration be continued for a reasonable amount of time in order for staff to prepare a new set of proposed findings consistent with the evidence which has been presented and the decision which is anticipated. Findings which should be considered by the Board of Directors include:

1) Environmental Impact

    a) A negative declaration has been filed; no EIR is required; or

    b) This project is categorically exempt by reason of the following facts:

    c) An EIR has been filed in this proceeding and is complete. The mitigating measures recommended in said EIR are sufficient to avoid any significant impacts on the

environment, and are included in the conditions of approval herein; or

d) An EIR has been filed in this proceeding and is complete. It is feasible to mitigate the effects on the project except as set forth in said report, however, the public benefit is to be derived from said project outweighs any such negative environmental impacts; or (if the project is to be disapproved); or

e) An EIR has been filed in this proceeding and is complete. The probably adverse impacts on the environment are significant and the mitigating measures as proposed are not adequate. The probable adverse impacts on the environment outweigh other considerations, including any public benefit which might be derived by said project.

2) Development Projects – Review and Approval

a) The proposed development project, together with the provisions for its design and improvement is consistent with the Groundwater Management Plan, if applicable; and any specific plan adopted for the area.

b) The site is physically suitable for the type and density of development.

c) The design of the development project and proposed improvements are not likely to cause substantial environmental damage or substantially and avoidably injure fish or wildlife or their habitat.

d) The design of the development project and improvements is not likely to cause serious public health problems.

e) The design of the development projects and improvements will not conflict with easements of record acquired by the public at large for access through or use of property within the proposed boundary of the development project

OR

f) Adequate water is available for use within the development project.

g) The proposed development project would not results in material damage or prejudice to other property in the vicinity.

h) The proposed development project will not cause well interference.

Section Twenty-Nine (Decision)

1) Voting:

   a) Approval of any request or appeal brought before the Board shall require the affirmative vote of no less than four (4) of its members.

   b) Voting upon a motion may, at the discretion of the Chairman, and shall, upon request of any member, be by roll call. When voting is not by roll call, the Chairman may, in the absence of

objection by any member of the Board, declare an item to be unanimously approved.

c) A motion to adopt or approve staff recommendations or simply approve the action under consideration shall, unless otherwise particularly specified, be deemed to include adoption of all proposed findings and execution of all actions recommended in the staff report on file in the matter.

d) A member who is absent from any portion of a hearing conducted by the Board may vote on the matter at the time it is acted upon by the Board provided that he has familiarized himself with the portion of the hearing conducted in his absence.

Section Thirty (Construction and Effect)

1. These procedural rules shall be construed and applied so as to ensure a full and fair hearing of relevant evidence which is offered on a matter and to facilitate an orderly analysis of evidence and issues by the Board in such matters.

2. Adoption and implementation of these rules shall in no way be construed to constitute a waiver of the law.

Appendix 1-4: SVGMD Purchasing Policy

SIERRA VALLEY GROUNDWATER MANAGEMENT DISTRICT
PURCHASING POLICY

ADOPTED – MAY 18, 2020
AMENDED – OCTOBER 29, 2021

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SECTION 1 – INTRODUCTION AND GENERAL INFORMATION

1.1 Purpose

The purpose of this Purchasing Policy is to provide direction regarding the policies and procedures relating to procurement of goods, professional services, and construction contracts for the Sierra Valley Groundwater Management District (District) to ensure continuity, uniformity, and fairness in the application of such policies and procedures.

1.2 Adoption

The Purchasing Policy was adopted by the District Board of Directors (Board) Resolution 20-03 and may be amended by Board action.

1.3 Purchasing Agent

The Board Clerk is designated as the District's Purchasing Agent. All purchases of goods and acquisition of professional services and construction contracts require prior approval of the Board unless otherwise exempt pursuant to this Purchasing Policy. The Purchasing Agent has authority to execute goods and professional services and construction contracts under the Board's direction.

1.4 Oral Purchase Commitments

No oral purchase commitments shall be allowed.

1.5 Record Retention

Pursuant to California Government Code Section 255501.5 all requisitions and related procurement documents shall be retained for a period of not less than three (3) years unless otherwise prescribed by State law. Such requisitions and related procurement documents need not be photographed, reproduced, or microfilmed prior to destruction and no copy thereof need be retained.

SECTION 2 – UNAUTHORIZED PURCHASES AND CONFLICT OF INTEREST

2.1 Board Not Obligated for Unauthorized Purchases

Only the Purchasing Agent, his/her designee, and the Board may commit Board funds for the purchase of goods, professional services, and construction contracts. Unauthorized purchases in violation of this Purchasing Policy are not considered an obligation of the District and the individual making such purchases shall be held personally liable for the cost of the purchase. An unauthorized purchase may include any of the following: a) any purchase that does not meet the policies and procedures outlined in the Purchasing Policy, and b) any purchase for personal use.

2.2 Conflict of Interest Code

When making procurement decisions for goods, professional services, and construction contracts the Board shall follow the District adopted Conflict of Interest Code. District Counsel may be consulted for guidance whenever there is any question of a conflict of interest.

SECTION 3 – INVOICES FOR GOODS

3.1 Invoice Requirements

The payment for all goods are subject to submission and approval of an invoice in a form and content approved by the Board. The District shall not pay for goods without submission of an invoice to the Board Clerk unless specifically exempted. All invoices must be approved by the Board in advance of the requested purchase.

SECTION 4 – CONTRACTING FOR GOODS

4.1 Procurement of Goods

The Board Clerk may purchase "goods" including supplies and equipment in amounts of $250.00 or less without Board approval. Purchase of goods in excess of $250.00 shall be approved by the Board in advance and follow the requirements in Section 3 and Section 5.1 of this Purchasing Policy unless specifically exempted.

4.2 Goods Exempt from Informal Competitive Bid Procedures

Procurement of goods in the amount of $5,000.00 or less shall not be subject to Section 5.1 of this Purchasing Policy.

4.3 Emergency Purchases

Emergency purchases shall only be made by the Purchasing Agent, his/her designee, and the Board when the goods so purchased are necessary for the immediate preservation of health, life, and safety. Such emergency purchases, where they exceed the amount generally requiring the bidding procedure, shall be submitted to the Board for ratification at the next meeting of the Board after the purchases.

SECTION 5 – BID POLICIES AND PROCEDURES

5.1 Informal Competitive Bid Procedures

The informal competitive bid procedure applies to goods and consists of:

1. Obtaining not less than three (3) written quotations from three (3) independent vendors.
2. If the subject purchase is made, the lowest cost quotation shall be selected unless the Board approves a higher quotation upon specific findings.
3. All quotations may be rejected.

To qualify as a valid quotation, the vendor submitting the quotation must be ready, willing, and able to supply the object of the quotation (i.e., goods) according to the terms and conditions of the quotation and in a commercially reasonable manner. A purchase authorized following the required informal competitive bid may not be consummated unless it is made on the price, terms, and conditions set forth in the quotation and so approved by the Board.

5.2 Formal Competitive Bid Procedures

The formal competitive bid procedures apply to professional services and construction contracts unless specifically exempted and requires the preparation and advance approval of bid documents or Request for Proposal (RFP) solicitations by the Board.

A notice inviting bids shall be published in a newspaper of general circulation not less than ten (10) business days before the bid deadline, shall be posted on the District's website, and may be electronically emailed to a list of known interested contractors. The bid notice shall describe the project, state where bid documents are to be obtained and filed, and the bid deadline.

In its discretion, the Board shall follow any of the following alternatives after the receiving the bids for professional services and construction contracts:

1. The Board shall accept the lowest responsive and responsible bidder unless the Board approves a higher quotation upon specific findings.
2. The Board shall reject any or all bids.

The Board may cancel or amend RFP solicitations at any time and may submit similar solicitations in the future.

A pre-bid conference may be held.

The opening of formal competitive bids for professional services is not subject to attendance by the general public.

The opening of formal competitive bids for construction contracts shall be publically opened and read aloud. An abstract of the amounts of the base bids and major alternatives, if any, shall be made available to the bidders after the opening of the bids.

The Board may reject any submittal that does not meet all of the mandatory requirements of the RFP solicitation.

The Board may request clarification of any submitted information, may request additional information on any or all responses provided for any reason whatsoever, and may waive irregularities or informalities in any bid or in the bidding and minor inconsistencies deemed to be irrelevant.

The modification or withdrawal of any bid documents or RFP submittal by a contractor for construction contracts or professional services prior to the required submission date and time for formal competitive bid openings must be made in writing and must be signed by the contractor. No construction contracts bidder shall withdraw his or her bid for a period of sixty (60) calendar days following the date of the bid opening.

Any and all questions and communication regarding an RFP shall be submitted in writing by email and directed to the Board Clerk. The District will provide answers and clarifications in writing by posting an addendum or addenda to the bid documents or RFP on the District's website. The District reserves the right to issue an addendum or addenda to clarify, correct, or change the bid documents or RFP solicitations as deemed necessary.

An evaluation panel will be assembled and approved by the Board for professional services. The evaluation panel will review and rank proposals using developed proposal evaluation criteria. The contractors with the highest three (3) scores will be invited to an interview. During interviews at a minimum contractors shall make a presentation and respond to a standard set of questions.

The contractor for professional services with the overall highest rating from the proposal review and interview will be selected to negotiate a professional service agreement with the District.

The District may discuss professional services proposals and negotiate modifications as a part of the selection process.

5.3 Informal and Formal Competitive Bid Procedure Exemptions

Goods purchase orders, professional services agreements, and construction contracts may be awarded without competitive solicitation when there is only one vendor or contractor available or capable of providing the required goods, professional services, or construction work and where there are limitations in the availability of potential contractors, or when the professional services or construction work required are of such as specialized nature that precludes competitive solicitations.

5.4 Disclosure of Professional Services Bid Information

All information and materials submitted to the District in response to professional services bids may be reproduced by the District for the purpose of providing copies to authorized personnel involved in the evaluation of the proposals, but shall be exempt from public inspection under the California Public Records Act until such time as an agreement is executed. Once an agreement is executed, professional services proposals submitted in response to bids are subject to public disclosure as required by law. Contractor's submission of a professional services proposal is considered their consent to the District's disclosure of the proposal. The District shall not be liable for disclosure of any information or records related to procurements.

5.5 Board Members and Employees Prohibited from Bidding

No Board member or employee shall be permitted to submit a bid on goods or professional services.

SECTION 6 – CONTRACTING FOR PROFESSIONAL SERVICES

6.1 Professional Services Procurement

"Professional Services" means and includes the performance of a task involving utilization of personnel who are retained in writing by a contract or the District's Professional Service Agreement (Agreement).

Services in which the Board cannot provide, either because of workload capacity or lack of specialized expertise, may be provided through an Agreement under the following conditions:

1. The contractor is a legal entity or the contractor is one who meets the basic requirement to enter into an independent contractor relationship, including a majority of the following criteria:
    a. Possesses licensure;
    b. Possesses advanced academic and/or professional degrees;
    c. Operates an independent business including clients other than the Board;
    d. Routinely provides services on an independent contractor fee for services basis;
    e. Provides own equipment, supplies, and personnel;

f. Works primarily without supervision as to time, manner, and methods utilized to perform services;

g. Maintains own liability insurance including commercial general, professional, and automobile;

h. Maintains own workers' compensation insurance policy or has no employees;

i. Maintains own books and records;

j. Files own payroll, and state and federal income tax returns applicable to service income and expenses;

k. Routinely bills for services; and

l. Agreeable to the terms and conditions of the District's Professional Service Agreement.

6.2 Competitive Bidding and Negotiations

The formal competitive bid procedures in Section 5.2 of this Purchasing Policy shall be required for all contractors retained for professional services unless specifically exempted under Section 6.3 and shall comply with all applicable laws and regulations regarding the securing of competitive bids and undertaking competitive negotiations. Formal competitive bidding may be waived by the Board for any contractual arrangement that is specifically made exempt by statutes, this Purchasing Policy, or Board ordinances.

6.3 Professional Services Exempt from Formal Competitive Bid Procedures

Contracting for professional services in the amount of $15,000.00 or less shall not be subject to Section 5.2 of this Purchasing Policy.

SECTION 7 – CONSTRUCTION CONTRACTS FOR WORK

7.1 Construction Contract Procurement

"Construction Contracts" means and includes the performance of work as specified or indicated in the contract bid documents and the District's Agreement Between Owner and Contractor for Construction Contract (Agreement).

Work in which the Board cannot provide, either because of capacity or lack of specialized expertise, may be provided through an Agreement under the following conditions:

1. The contractor, and any subcontractor, is a legal entity or the contractor, and any subcontractor, is one who meets the basic requirement to enter into an independent contract relationship, including a majority of the following criteria:

    m. Possesses valid licenses of a class corresponding to the work to be done as required by the State of California's Contractors' License Law in addition to any applicable business licenses in the local jurisdiction of the work;

    n. Possesses required permits;

    o. Operates as an independent contractor doing business including clients other than the Board;

    p. Routinely provides services on an independent contractor fee for services basis;

q. Provides own equipment, supplies, and personnel;

r. Preforms work primarily without supervision as to time, manner, and methods utilized;

s. Maintains own liability insurance including commercial general, professional, and automobile;

t. Agrees to be bound by all the provisions of the Labor Code, as required, regarding prevailing wage and maintains own workers' compensation insurance policy or has no employees;

u. Shall furnish bonds including faithful performance and labor and materials, as required, in favor of the District;

v. Maintains own books and records;

w. Files own payroll, and state and federal income tax returns applicable to service income and expenses;

x. Routinely bills for services; and

y. Agreeable to the terms and conditions of the District's Agreement Between Owner and Contractor for Construction Contract.

7.2 Competitive Bidding and Negotiations

The formal competitive bid procedures in Section 5.2 of this Purchasing Policy shall be required for all contractors retained for construction work unless specifically exempted under Section 7.3 and shall comply with all applicable laws and regulations regarding the securing of competitive bids. Formal competitive bidding may be waived by the Board for any contractual arrangement that is specifically made exempt by statutes, this Purchasing Policy, or Board ordinances.

7.3 Construction Contracts Exempt from Formal Competitive Bid Procedures

Contracting for construction work in the amount of $10,000.00 or less shall not be subject to Section 5.2 of this Purchasing Policy.

Appendix 1-5: GSP Preparation Checklist

Article 5.			Plan Contents for Sierra Valley Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.			**Introduction to Plan Contents**					
			This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
SubArticle 1.			**Administrative Information**					
§ 354.2.			**Introduction to Administrative Information**					
			This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.4.			**General Information**					
			Each Plan shall include the following general information:					
(a)			An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.	8:19	Executive Summary		ES-1:ES-2	
(b)			A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.	312:320	6			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
§ 354.6.			**Agency Information**					
			When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:					
(a)			The name and mailing address of the Agency.	33	1.3			
(b)			The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.	34:35	1.3.1			
(c)			The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.	33	1.3			
(d)			The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.	35:36	1.3.2			
(e)			An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.	804:840				Appendix 5-1
			Note: Authority cited: Section 10733.2, Water Code.					

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Reference: Sections 10723.8, 10727.2, and 10733.2, Water Code.					
§ 354.8.			**Description of Plan Area**					
			Each Plan shall include a description of the geographic areas covered, including the following information:					
(a)			One or more maps of the basin that depict the following, as applicable:					
	(1)		The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.	39:44	2.1:2.1.1.2	2.1.1-1:2.1.1-2		
	(2)		Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.	54	2.1.1.2	2.1.1-3		
	(3)		Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.	39:49	2.1.1	2.1.1-4:2.1.1-5	2.1.1-1	
	(4)		Existing land use designations and the identification of water use sector and water source type.	49	2.1.1	2.1.1-6		
	(5)		The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.	50:53	2.1.1	2.1.1-7:2.1.1-9	2.1.1-2	
(b)			A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.	39:74	2.1	2.1.1-4:2.1.1-5		
(c)			Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.	57:62	2.1.2			
(d)			A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.	61	2.1.2.5			
(e)			A description of conjunctive use programs in the basin.	65	2.1.4.6			
(f)			A plain language description of the land use elements or topic categories of applicable general plans that includes the following:					
	(1)		A summary of general plans and other land use plans governing the basin.	61:63	2.1.3.1			Appendix 2-2 provides background on historical land use
	(2)		A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects	63	2.1.3.2			

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.	63	2.1.3.3			
	(4)		A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.	63	2.1.3.4			
	(5)		To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.	64	2.1.3.5			
(g)			A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.	64:67	2.1.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10720.3, 10727.2, 10727.4, 10733, and 10733.2, Water Code.					
§ 354.10.			**Notice and Communication**					
			Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:					
(a)			A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.	67:69	2.1.5.1		2.1.5-1	
(b)			A list of public meetings at which the Plan was discussed or considered by the Agency.	71:73	2.1.5.3		2.1.5-2:2.1.5-3	
(c)			Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.	459:511	App 2-4			Appendix 2-4 Comment Response Summary
(d)			A communication section of the Plan that includes the following:					
	(1)		An explanation of the Agency's decision-making process.	69:70	2.1.5.2			
	(2)		Identification of opportunities for public engagement and a discussion of how public input and response will be used.	70:74	2.1.5.3		2.1.5-2:2.1.5-3	
	(3)		A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.	73:74	2.1.5.4			
	(4)		The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.	74:75	2.1.5.5			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.8, 10728.4, and 10733.2, Water Code					
SubArticle 2.			**Basin Setting**					
§ 354.12.			**Introduction to Basin Setting**					

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.14.			**Hydrogeologic Conceptual Model**					
(a)			Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.	75:104	2.2.1			
(b)			The hydrogeologic conceptual model shall be summarized in a written description that includes the following:					
	(1)		The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.	76:104	2.2.1.1:2.2.1.6	2.2.1-1:2.2.1-15	2.2.1-1:2.2.1-5	
	(2)		Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.	90,382:402	2.2.1.5	2.2.1-10		Appendix 2-1
	(3)		The definable bottom of the basin.	91:93	2.2.1.5	2.2.1-11:2.2.1-13		
	(4)		Principal aquifers and aquitards, including the following information:					
		(A)	Formation names, if defined.	90:95	2.2.1.5	2.2.1-11		
		(B)	Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.	77,79:80,89:95	2.2.1.1,2.2.1.4,2.2.1.5	2.2.1-1:2.2.1-2,2.2.1-10:2.2.1-13		
		(C)	Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.	89,91	2.2.1.5	2.2.1-11		
		(D)	General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.	109:119	2.2.2.4		2.2.2-2	
		(E)	Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.	110	2.2.2.4			
	(5)		Identification of data gaps and uncertainty within the hydrogeologic conceptual model	153,512:521	2.2.2.7.7,App 2-5			Appendix 2-5 (Monitoring and Data Gaps Analysis)

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(c)			The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.	92	2.2.1.5	2.2.1-12		
(d)			Physical characteristics of the basin shall be represented on one or more maps that depict the following:					
	(1)		Topographic information derived from the U.S. Geological Survey or another reliable source.	77	2.1.1	2.2.1-1		
	(2)		Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.	89:90,92:93	2.2.1.5	2.2.1-10,2.2.1-12:2.2.1-13		
	(3)		Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.	79:88	2.2.1.4	2.2.1-6:2.2.1-9	2.2.1-1	
	(4)		Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.	96:97,578	2.2.1.6,App 2-7	App 2-7 Fig 4-10		Appendix 2-7 Figure 4-10
	(5)		Surface water bodies that are significant to the management of the basin.	80	2.2.1.4	2.2.1-2		
	(6)		The source and point of delivery for imported water supplies.	96,158	2.2.1.6,2.2.3.2.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10733, and 10733.2, Water Code.					
§ 354.16.			**Groundwater Conditions**					
			Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:					
(a)			Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:					
	(1)		Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.	107:108	2.2.2.1.2	2.2.2-3:2.2.2-4		
	(2)		Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.	106	2.2.2.1.2	2.2.2-1:2.2.2-2		
(b)			A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.	184:188	2.2.3.5.4:2.2.3.6	2.2.3-17:2.2.3-21		
(c)			Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.	109	2.2.2.3			Not applicable to this basin.

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(d)			Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.	109:118	2.2.2.4	2.2.2-5	2.2.2-2	
(e)			The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	119:124	2.2.2.5	2.2.2-6:2.2.2-9		
(f)			Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	125:130	2.2.2.6	2.2.2-10:2.2.2-12		
(g)			Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	131:153	2.2.2.7	2.2.2-13:2.2.2-16	2.2.2-3:2.2.2-4	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, and 10733.2, Water Code.					
§ 354.18.			**Water Budget**					
(a)			Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.	153:189	2.2.3	2.2.3-1:2.2.2.3-21	2.2.3-1:2.2.2.3-10	
(b)			The water budget shall quantify the following, either through direct measurements or estimates based on data:					
	(1)		Total surface water entering and leaving a basin by water source type.	155:156,158:	2.2.3.1.1,2.2.3.3		2.2.3-1	See also Appendix 2-7
	(2)		Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.	159,168	2.2.3.3,2.2.3.4		2.2.3-1,2.2.3-4	
	(3)		Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.	159,168	2.2.3.3,2.2.3.4		2.2.3.3,2.2.3.4	
	(4)		The change in the annual volume of groundwater in storage between seasonal high conditions.	163,169	2.2.3.3,2.2.3.4		2.2.3-3,2.2.3-6	
	(5)		If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.	186:188	2.2.3.6	2.2.3-20:2.2.3-21		
	(6)		The water year type associated with the annual supply, demand, and change in groundwater stored.	163,169	2.2.3.3,2.2.3.4		2.2.3-3,2.2.3-6	
	(7)		An estimate of sustainable yield for the basin.	188	2.2.3.7			

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(c)			Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:					
	(1)		Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.	168:170	2.2.3.4		2.2.3-4:2.2.3-6	
	(2)		Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:					
		(A)	A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.	159	2.2.3.3		2.2.3-1	
		(B)	A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.	158:167	2.2.3.3	2.2.3-3:2.2.3-8	2.2.3-1:2.2.3-3	
		(C)	A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.	158:167	2.2.3.3			
	(3)		Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:					
		(A)	Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.	170:172	2.2.3.5.1	2.2.3-9:2.2.3-10		
		(B)	Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.	173:174	2.2.3.5.2	2.2.3-11:2.2.3-12		

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(C)	Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.	174:175	2.2.3.5.3	2.2.3-13		
(d)			The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:					
	(1)		Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.	172	2.2.3.5.1	2.2.3-10		
	(2)		Current water budget information for temperature, water year type, evapotranspiration, and land use.	168:170	2.2.3.4			
	(3)		Projected water budget information for population, population growth, climate change, and sea level rise.	169:174	2.2.3.5			
(e)			Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.	154:188	2.2.3			
(f)			The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.	547:706	App 2-7			Appendix 2-7 SVHSM Model & Water Budget Report
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10727.6, 10729, and 10733.2, Water Code.					
§ 354.20.			**Management Areas**					
(a)			Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.	188	2.2.4			The Subbasin is not divided into separate management areas.
(b)			A basin that includes one or more management areas shall describe the following in the Plan:					

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		The reason for the creation of each management area.	N/A				The Subbasin is not divided into separate management areas.
	(2)		The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.	N/A				The Subbasin is not divided into separate management areas.
	(3)		The level of monitoring and analysis appropriate for each management area.	N/A				The Subbasin is not divided into separate management areas.
	(4)		An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.	N/A				The Subbasin is not divided into separate management areas.
(c)			If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.	N/A				The Subbasin is not divided into separate management areas.
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
SubArticle 3.			**Sustainable Management Criteria**					
§ 354.22.			**Introduction to Sustainable Management Criteria**					
			This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.24.			**Sustainability Goal**					
			Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.	190:191	3.2			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10727, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.26.			**Undesirable Results**					
(a)			Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.	191:192,204,210:219,219:223	3.3.1.1.1:3.3.1.2,3.3.3.1,3.3.4,3.3.3.5		3.3.5-1	

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(b)			The description of undesirable results shall include the following:					
	(1)		The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.	192,204,211:212,221:222	3.3.1.1.2,3.3.1.1,3.3.4.1.1,3.3.5.1			
	(2)		The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.	196:201,213:214,222	3.3.1.4.1,3.3.1.4.2,3.3.4.4,3.3.5.4	3.3.1-1:3.3.1-5	3.3.1-1	
	(3)		Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.	192:193,204,212,221	3.3.1.2,3.3.3.2,3.3.4.2,3.3.5.2			
(c)			The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.	193:196,205:208,222:224	3.3.1.4,3.3.3.4,3.3.5.4:3.5.5.5	3.3.3-1:3.3.3-2,3.3.5-1	3.3.3-1	
(d)			An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.	193,205,212:213,221:222	3.3.1.3,3.3.3,3.3.3.4.3,3.3.5.3			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.28.			**Minimum Thresholds**					
(a)			Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.	193:201,205:208,213:214	3.3.1.4,3.3.3.4,3.3.4.4			
(b)			The description of minimum thresholds shall include the following:					
	(1)		The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.	193:201,205:208,213:214	3.3.1.4,3.3.3.4,3.3.4.4	3.3.3-1:3.3.3-2	3.3.3-1	
	(2)		The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.	193,205,212:213	3.3.1.3,3.3.3,3.3.4.3			

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.	193:201,205:208,213:214	3.3.1.4,3.3.3.4,3.3.4.4			
	(4)		How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.	192:193,204:205,212	3.3.1.2,3.3.3.2,3.3.4.2			
	(5)		How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.	192,204,210:211	3.3.1.1.1,3.3.3.1,3.3.4,			
	(6)		How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.	193:201,205:208,213:214	3.3.1.4,3.3.3.4,3.3.4.4			
(c)			Minimum thresholds for each sustainability indicator shall be defined as follows:					
	(1)		Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:					
		(A)	The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.	196	3.3.1.4.1	3.3.1-1		
		(B)	Potential effects on other sustainability indicators.	193	3.3.1.3			
	(2)		Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.	203	3.3.2			
	(3)		Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:					
		(A)	Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.	N/A				The SV Subbasin is not a coastal basin, therefore this SI does not apply.
		(B)	A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.	N/A				The SV Subbasin is not a coastal basin, therefore this SI does not apply.

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.	209:219	3.3.4			
	(5)		Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:					
		(A)	Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.	220:224	3.3.5			
		(B)	Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.	220	3.3.5	3.3.5-1	3.3.5-1	
	(6)		Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:					
		(A)	The location, quantity, and timing of depletions of interconnected surface water.	206:207	3.3.3	3.3.3-1	3.3.3-1	
		(B)	A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.	204:	3.3.3			
(d)			An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.	204	3.3.3.1			
(e)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.	N/A				This does not apply to the subbasin.
			Note: Authority cited: Section 10733.2, Water Code.					

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Reference: Sections 10723.2, 10727.2, 10733, 10733.2, and 10733.8, Water Code.					
§ 354.30.			**Measurable Objectives**					
(a)			Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.	202:203,208:209,216:217,224	3.3.1.5,3.3.5,3.3.4.6,3.3.5.6	3.3.1-6,3.3.3-3		
(b)			Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.	202:203,208:209,216:217,224	3.3.1.5,3.3.5,3.3.4.6,3.3.5.6	3.3.1-6,3.3.3-3		
(c)			Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.	202:203,208:209,216:217,224	3.3.1.5,3.3.5,3.3.4.6,3.3.5.6	3.3.1-6,3.3.3-3		
(d)			An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.	202:203	3.3.1.5	3.3.1-6		The measurable objective for groundwater elevation serves as a representative MO for multiple sustainability indicators.
(e)			Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.	202:203,209,216:218,224	3.3.1.6,3.3.6,3.3.3.4.6,3.3.5.6	3.3.1-7,3.3.4-2		
(f)			Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.	203,209,219	3.3.1.7,3.3.7,3.3.4.7.1	3.3.4-2		
(g)			An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.	202:203,208:209,216:217,224	3.3.1.5,3.3.5,3.3.4.6,3.3.5.6	3.3.1-6,3.3.3-3		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					
SubArticle 4.			**Monitoring Networks**					
§ 354.32.			**Introduction to Monitoring Networks**					
			This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.					

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.34.			**Monitoring Network**					
(a)			Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.	224:245,512:706	3.4,App 2-5		3.4.1-1	
(b)			Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:					
	(1)		Demonstrate progress toward achieving measurable objectives described in the Plan.	224	3.4			
	(2)		Monitor impacts to the beneficial uses or users of groundwater.	224	3.4			
	(3)		Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.	224	3.4			
	(4)		Quantify annual changes in water budget components.	224	3.4			
(c)			Each monitoring network shall be designed to accomplish the following for each sustainability indicator:					
	(1)		Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:					
		(A)	A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.	227:228	3.4.1.1			
		(B)	Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.	228:230,520	3.4.1.1,App 2-7		App 2-7, Table 2	
	(2)		Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.	204	3.3.2			
	(3)		Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.	N/A				This does not apply to the SV Subbasin.
	(4)		Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.	209:220	3.3.4	3.3.4-1:3.3.4-2	3.3.4-1:3.3.4-2	

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(5)		Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.	243	3.4.4.4			
	(6)		Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:					
		(A)	Flow conditions including surface water discharge, surface water head, and baseflow contribution.	236	3.4.1.4	3.4.1-3		
		(B)	Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.	236:238	3.4.1.4		3.4.1-3,3.4.1-4	
		(C)	Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.	236	3.4.1.4			
		(D)	Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.	236	3.4.1.4			
(d)			The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.	245	3.4.4.4		3.4.4-1	
(e)			A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.	231:234	3.4.1.3	3.4.1-2	3.4.1-2	
(f)			The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:					
	(1)		Amount of current and projected groundwater use.	228,244	3.4.1.1	3.4.4-1		
	(2)		Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.	228	3.4.1.1			
	(3)		Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.	228	3.4.1.1			
	(4)		Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.	228	3.4.1.1			
(g)			Each Plan shall describe the following information about the monitoring network:					
	(1)		Scientific rationale for the monitoring site selection process.	242	3.4.4			

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(2)		Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.	228	3.4.1.1			
	(3)		For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.	240	3.4.1.5			
(h)			The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.	229	3.4.1.1.1	3.4.1-1		
(i)			The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.	228:231,235:236	3.4.1.1.1,3.4.1.3.1	3.4.1-1		
(j)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.	N/A				A monitoring network is required for this subbasin.
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, 10728, 10733, 10733.2, and 10733.8, Water Code					
§ 354.36.			**Representative Monitoring**					
			Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:					
(a)			Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.	229	3.4.1.1.1	3.4.1-1		
(b)			(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:					
	(1)		Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.	204	3.3.2			
	(2)		Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.	57	2.1.2			

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(c)			The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.	194	3.3.1.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2 and 10733.2, Water Code					
§ 354.38.			**Assessment and Improvement of Monitoring Network**					
(a)			Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.	242	3.4.2			
(b)			Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.	242,512:706	3.4.2, App 2-5			Appendix 2-5
(c)			If the monitoring network contains data gaps, the Plan shall include a description of the following:					
	(1)		The location and reason for data gaps in the monitoring network.	514:519	App 2-5		App 2-5, Table 1	Appendix 2-5, Table 1
	(2)		Local issues and circumstances that limit or prevent monitoring.	242	3.4.2			
(d)			Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.	514:519	App 2-5		App 2-5, Table 1	
(e)			Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:					
	(1)		Minimum threshold exceedances.	242,514:519	3.4.4,app 2-5		App 2-5, Table 1	
	(2)		Highly variable spatial or temporal conditions.	242,514:519	3.4.4,app 2-5		App 2-5, Table 1	
	(3)		Adverse impacts to beneficial uses and users of groundwater.	242,514:519	3.4.4,app 2-5		App 2-5, Table 1	
	(4)		The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.	242,514:519	3.4.4,app 2-5		App 2-5, Table 1	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10728.2, 10733, 10733.2, and 10733.8, Water Code					
§ 354.40.			**Reporting Monitoring Data to the Department**					

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.					
SubArticle 5.			**Projects and Management Actions**					
§ 354.42.			**Introduction to Projects and Management Actions**					
			This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.44.			**Projects and Management Actions**					
(a)			Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.	246:291	4	4.1-1	4.2-1,4.3-1	
(b)			Each Plan shall include a description of the projects and management actions that include the following:					
	(1)		A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:					
		(A)	A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.	254,255:256,257,258,260,261,262:263	4.2.1.1,4.2.2.1,4.2.3.1,4.2.4.1,4.2.5,4.2.6,4.2.7			
		(B)	The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.	254,256,257,259,261,262,263	4.2.1.3,4.2.2.3,4.2.3.2,4.2.4.3,4.2.5.2,4.2.6.2,4.2.7.2			
	(2)		If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.	252	4.2		4.2-1	

				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		A summary of the permitting and regulatory process required for each project and management action.	255,256,257,259,261,262,263	4.2.1.4,4.2.2.4,4.2.3.3,4.2.4.4,4.2.5.3,4.2.6.3,4.2.7.3			
	(4)		The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.	255,256,257,259,261,262,263	4.2.1.5,4.2.2.5,4.2.3.4,4.2.4.5,4.2.5.4,4.2.6.4,4.2.7.4			
	(5)		An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.	255,257,258,260,261,262,263	4.2.1.7,4.2.2.7,4.2.3.6,4.2.4.7,4.2.5.7,4.2.6.6,4.2.7.6			
	(6)		An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.	255,256,257:258,259,261,262,263	4.2.1.6,4.2.2.6,4.2.3.5,4.2.4.6,4.2.5.6,4.2.6.5,4.2.7.5			
	(7)		A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.	255,257,258,260,261,262,263	4.2.1.8,4.2.2.8,4.2.3.7,4.2.4.8,4.2.5.7,4.2.6.7,4.2.7.7			
	(8)		A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.	255,257,258,260,261,262,263	4.2.1.9,4.2.2.9,4.2.3.8,4.2.4.9,4.2.5.8,4.2.6.8,4.2.7.8			
	(9)		A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.	285:286	4.3.10			
(c)			Projects and management actions shall be supported by best available information and best available science.	290	4.3.12			
(d)			An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.	290	4.3.12			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

Appendix 2-1: DMS Technical Memorandum

Certification

This document was prepared in accordance with generally accepted professional hydrogeologic principles and practices. This document makes no other warranties, either expressed or implied as to the professional advice or data included in it. This document has not been prepared for use by parties or projects other than those named or described herein. It may not contain sufficient information for other parties or purposes.

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Appendix A. DMS Tables and Affiliations.

List of Acronyms

API - Application Programming Interface

ASP - Active Server Pages

SSL - Secure Sockets Layer

DBS&A - Daniel B. Stephens & Associates, Inc.

DMS - Database Management System

GIS - Geographic Information System

GSA - Groundwater Sustainability Agency

GSP - Groundwater Sustainability Plan

HTTPS - Hypertext Transfer Protocol Secure

IIS - Internet Information Services

LWA - Larry Walker Associates

SGMA - Sustainable Groundwater Management Act

SQL - Structured Query Language

SVGMD - Sierra Valley Groundwater Management District

URL - Uniform Resource Locator

1.0 Introduction and Purpose

Daniel B. Stephens & Associates, Inc. (DBS&A) was contracted by Larry Walker Associates (LWA) under LWA Project No. 649.01 to develop an integrated hydrologic model of the Sierra Valley and database management system (DMS) to assist with Groundwater Sustainability Plan (GSP) development and implementation. This report provides a description of the DMS with examples of how to navigate the web interface for stakeholders. It also provides information on how to upload and modify data for users with administrative level access.

The DMS (https://sierra-valley.gladata.com/) is a user-friendly, comprehensive, web-accessible database with a geographic information system (GIS) interface that provides visual and graphic outputs in addition to traditional tables. It enables stakeholders and technical staff to readily access and interact with basin data, and provides a platform where data can be safely and easily stored, visualized, updated, and exported for more detailed analyses.

2.0 Database Management System Framework

The DMS is a GLA Data (https://bit.ly/3FjGPZF) web application that utilizes an ASP.NET solution written in C# with two SQL Server back-end databases. It can be viewed using any common web browser, although it has been optimized for Google Chrome. The web site is transmitted through the HTTPS protocol using SSL. The web application also includes client-side code written in JavaScript that utilizing numerous APIs such as jQuery, ArcGIS and HighCharts. The web application runs on a Microsoft Windows Server through IIS.

The two SQL Server databases contain discreet data, with one focused on data utilized and shared across all GLA Data web applications and the other containing basin-specific data. The shared database stores tables that limit acceptable entries for other data fields. For example, wells can only be assigned to a type contained within the *lst_well_types* table. This standardizes entries for these data fields which assists with overall database organization.

The second database contains basin-specific data such as monitoring point locations, water level data, water quality data, etc. Monitoring points (typically wells) are grouped together into sites which is used for mapping, graphing, filtering, and reporting purposes. Similarly, analytical (water quality) readings are grouped together into sample sets. Each set is related to a single monitoring point thus providing the overall data hierarchy: sites, wells, samples, readings. A summary of the database tables and affiliations is included in Appendix A of this document.

Publically available data can be viewed and downloaded the via web application (https://sierra-valley.gladata.com/) without the need to create an account. Nearly all data used to develop the Sierra Valley GSP is publically available. The only exceptions includes data with privacy concerns (e.g., well-specific groundwater pumping). Public users cannot modify data.

Administrative users can be provided login credentials that allow them access different capabilities such as the ability to add/update/delete data or advanced graphing and reporting

features. Access to these features is restricted by user type, which allows SVGMD to control which users can modify the database. Batch upload of new data are supported for analytical, depth to water, production, and flow data. Through the web application, templates and instructions are provided for each import type. Imported data is validated against various rules and violations are reported back to the user.

3.0 Web Application Interface

The web application interface of the DMS can be accessed via https://sierra-valley.gladata.com/.

3.1 Navigation

The main page of the DMS web application is an interactive map that defaults to displaying all of the monitoring points for the basin (Figure 3-1). Green circles indicate clusters on monitoring points, with the number within the circle indicating the number of monitoring points that have been clustered. Clustering is done automatically and will change depending on the current zoom level. Hovering over menu and toolbar items in the web interface will usually bring up a short description.

The map interface can be zoomed in/out using the scroll wheel on the mouse or the “Zoom In” (+) and “Zoom Out” (−) buttons on the toolbar located at the top right corner. Double clicking on a location will also zoom into that area by one level. Clicking and dragging within the map area allows the user to pan the current map extent. Users can change the basemap displayed by selecting the “Switch Basemap” ( ) button, which will bring up several different options

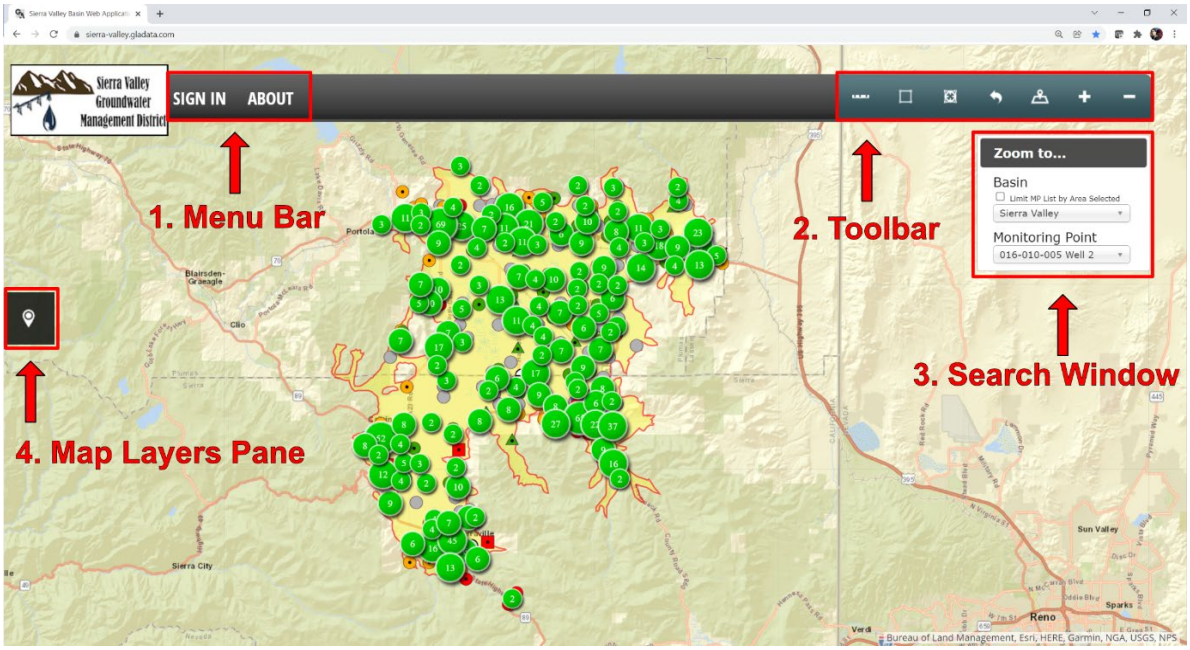

Figure 3-1. Overview of DMS interface.

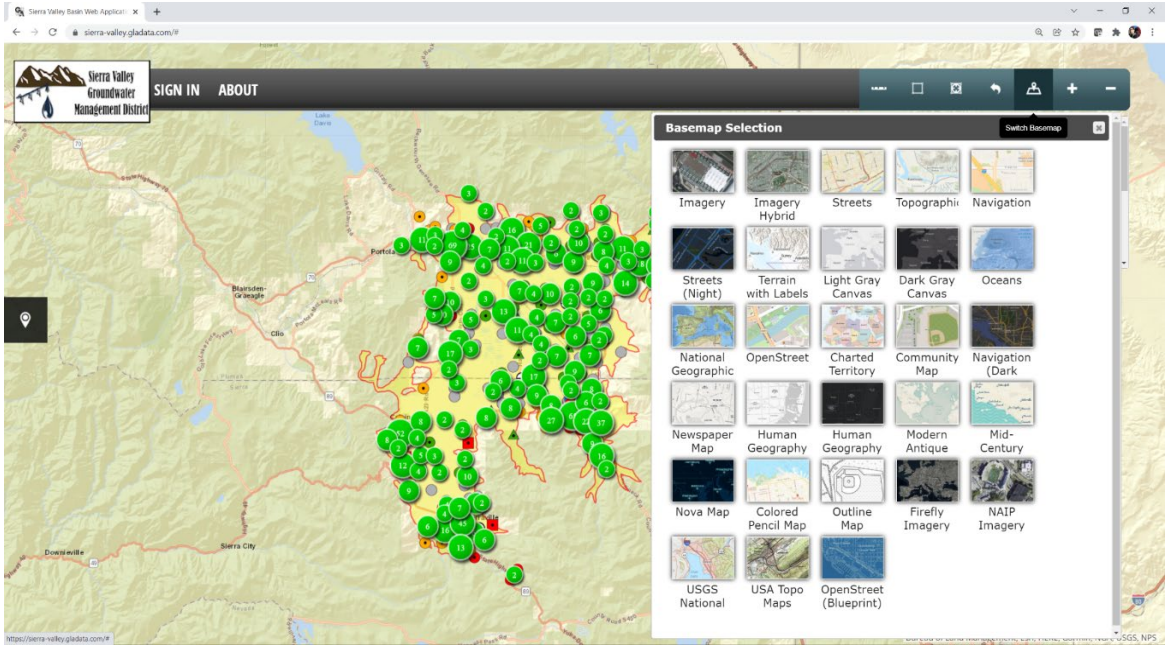

Figure 3-2. Available basemaps in the DMS web interface.

including satellite imagery and topographic maps (Figure 3-2). Users can return to the basin extent using the "Return to Initial Extent" ( ) button, or by selecting "Sierra Valley" from the Basin list in the search window (see Figure 3-1).

3.2 Searching for Monitoring Points

Monitoring points can be navigated to in the map interface either by zooming to the location or by searching for the monitoring point name in the search window. To zoom to a specific monitoring point, select the dropdown menu under "Monitoring Point" in the search window and begin typing the name of the well (Figure 3-3). The list will automatically filter all well names that contain what the user has typed in anywhere in the well name. Selecting the well in the list will automatically zoom the map to the monitoring point location. Note that the size of the search window may need to be expanded depending on user's browser settings.

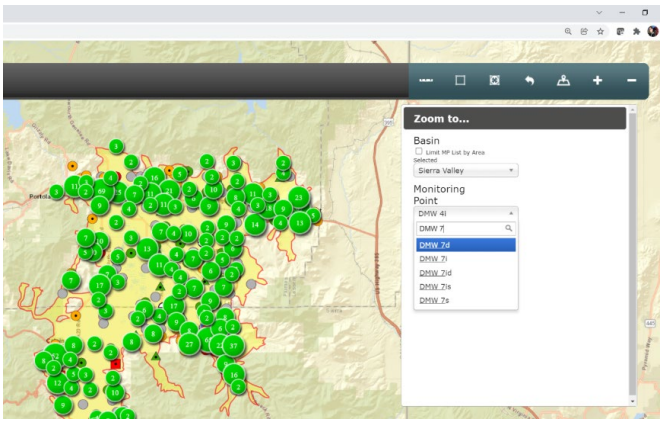

Figure 3-3. Zoom to specific well location by searching

Monitoring points can also be searched for spatially using the "Query Region" ( ) tool that allows the user to draw a rectangle and return all of the visible monitoring points within it, or the "Query Radius" ( ) tool that returns all of the visible wells within a certain distance of a location on the map selected by the user. The

results of these queries will be displayed in the “Item Details” pane that appears on the left side of the web interface. Well name labels will automatically appear when zoomed in far enough, but can manually be enabled by selecting the box to the left of “Labels” under the “Monitoring Points” header in the “Map Layers” pane.

3.3 Filtering

The DMS web interface provides several different methods for filtering monitoring points by attributes or associated data. Clicking on the “Map Layers” icon ( ) on the left side of the map window will open a pane with two main dropdown menus: 1) “Map Layers” and 2) “Additional Layers”. Under the “Map Layers” section, the user has the option of filtering wells by status, type, associated data, if the well is part of the representative monitoring network, associated entity, aquifer zone the well is screened within, or screen depth interval if known (Figure 3-4). This allows users to quickly find wells or data they are looking for.

Filters and data layers can be turned on and off by selecting the box to the left of the text. Note that all filters stack, meaning that only wells that meet all applied criteria will be displayed. For example, if the “Contains Water Quality Data” and “Contains Water Level Data” filters are both turned on, only wells that have both water quality and water level data associated with them will be displayed.

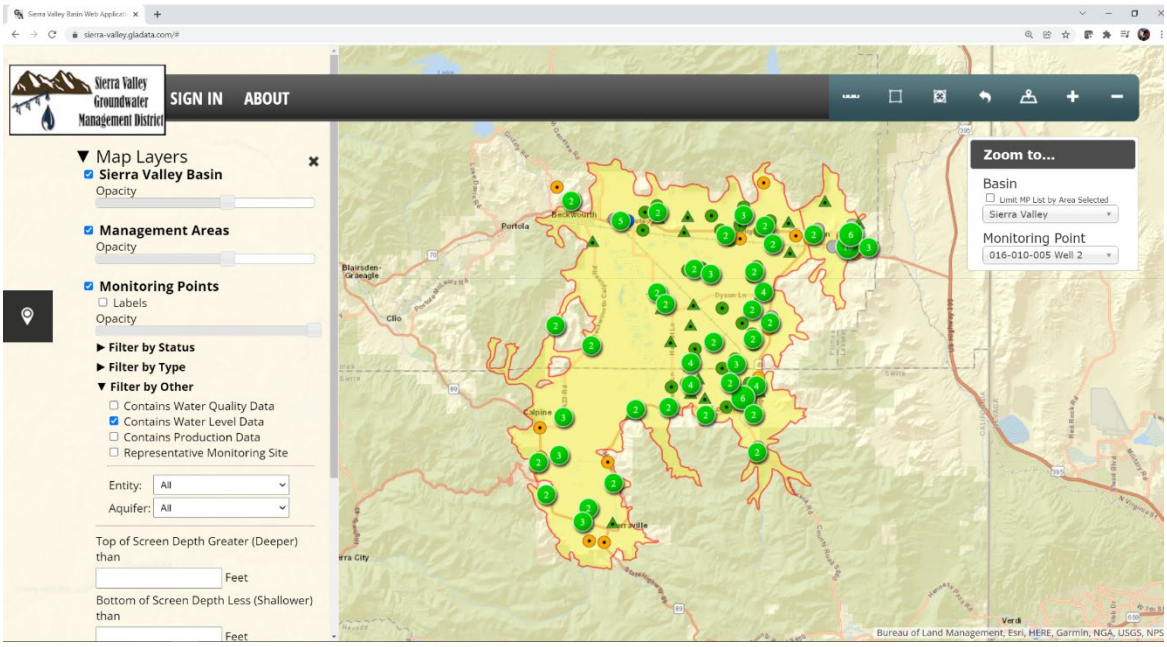

Figure 3-4. DMS browser window with “Map Layers” pane visible and only wells with water level data being displayed.

3.4 Monitoring Point Attributes and Data

Users can view pertinent information about a well contained in the DMS by clicking on the symbol in the map window, which brings up the up the “Item Details” pane. Selecting a cluster of

wells brings up a window that allows the user to cycle though each well to make a selection. This typically occurs when the map is not zoomed in very far or multiple wells have identical coordinates, such as nested monitoring wells. Selecting the “View Extended Details” link in the “Item Details” pane will open a new window with different tabs depending on the data associated with the monitoring point. The “General Info” tab contains the same information that was displayed on the “Item Details” pane that appears when the well is selected on the map viewer.

If groundwater levels have been measured in the well, the “Levels” tab will be visible (Figure 3-5). This will display a data table and interactive plot within the window. The data table can expanded using the dropdown menu located above, or exported to one of several available file formats. Text typed into the search bar is applied to all fields, so specific dates, water levels, or conditions can easily be identified. Columns can be sorted by clicking on the header. Water level data can be viewed visually either as elevation or as depth from surface by selecting the appropriate tab above the plot. All plots are interactive, with labels that appear when the user hovers over a data point on the graph. Axis limits can also be dynamically changed by clicking and dragging within the plot window.

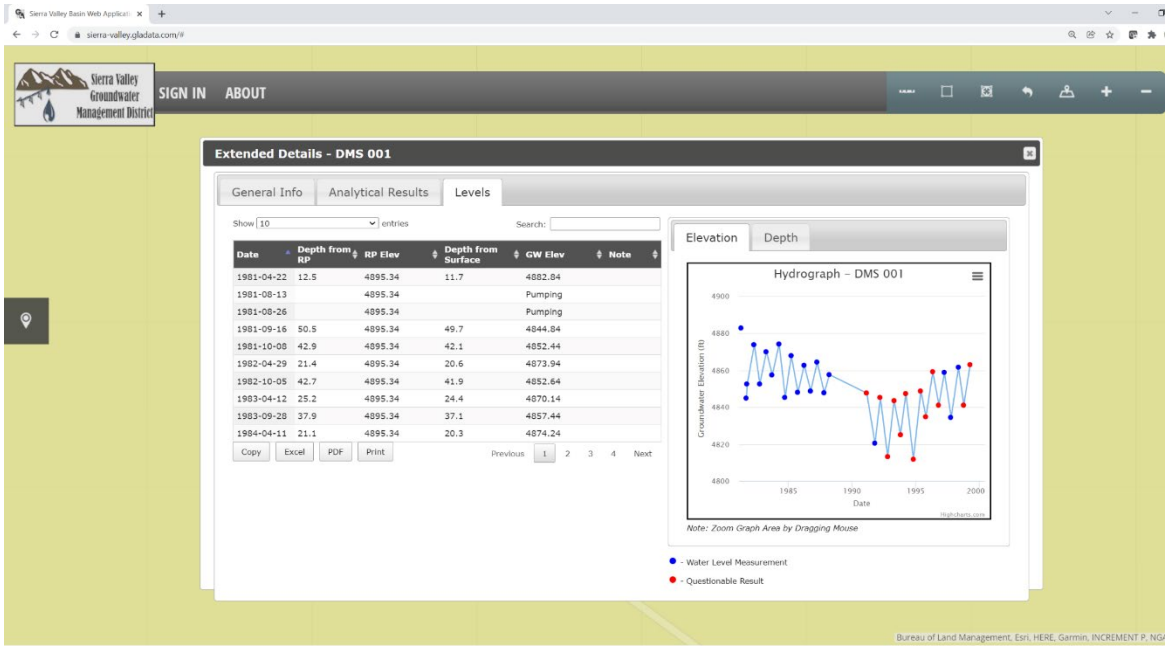

Figure 3-5. “Extended Details” window with “Levels” tab selected for well DMS 001. Data can be exported to various formats. Plot is interactive or can be exported to several different image formats.

If a well has water quality data associated with it then the “Analytical Results” tab will be visible. This tab operates nearly identically to the “Levels” tab, with water quality data tabulated on the left and plotted on the right (Figure 3-6). The user can select the chemical constituent to be plotted using the dropdown menu above the plot, with those having no detections removed from the list by enabling the filter above the plot. Just like the water level data, water quality data can be exported to several different tabular or image formats.

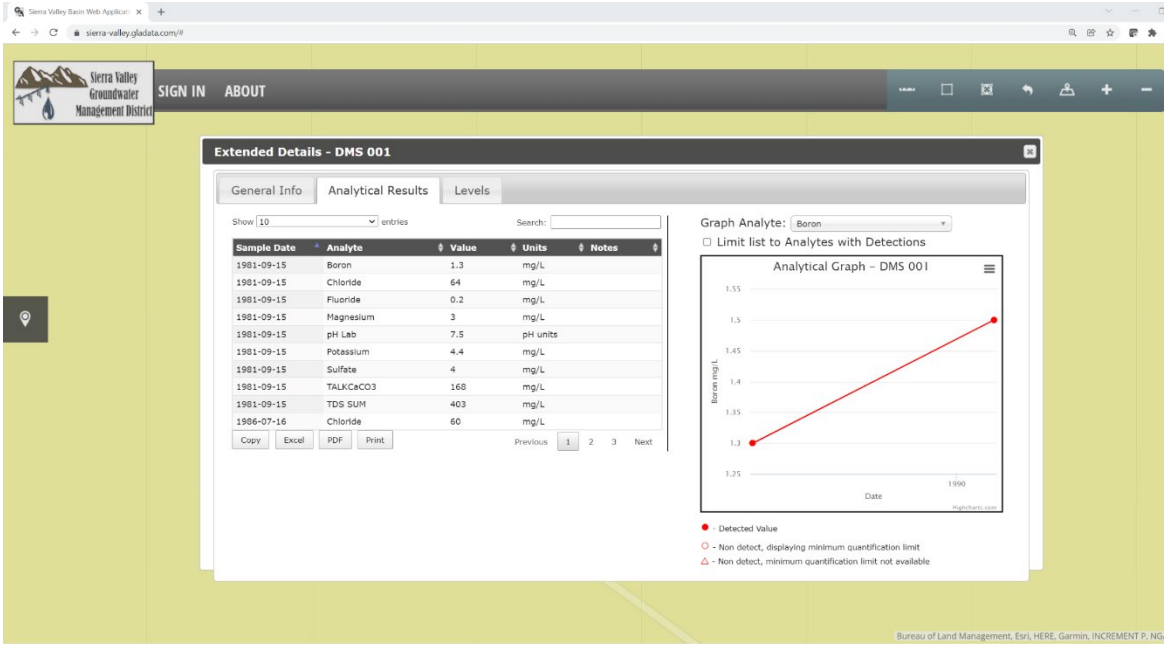

Figure 3-6. "Extended Details" window with "Analytical Results" tab selected for well DMS 001. Chemical constituent can be selected using dropdown menu above plot. Non-detects can be removed be selecting the filter above the plot. Data can be exported to various formats. Plot is interactive or can be exported to several different image formats.

3.5 Spatial Features and Coverages (GIS Data)

The DMS web interface has the capability of displaying GIS features and coverages such as shapefile layers and raster images. This allows users to view spatial data for the basin without the need for a high level understanding of GIS, as layer symbology has already been defined. Users simply toggle the layers on or off, and can adjust layer transparency if multiple overlapping shapefiles or coverages are being displayed simultaneously. The ability to display multiple types, or rapidly toggle back and forth between different layers, allows users to explore the spatial data available for the basin and gain a greater understanding of spatial relationships within the basin.

Spatial features and coverages can be accessed by selecting the "Map Layers" icon ( ) on the left side of the map window. All shapefiles and coverages (excluding the basin boundary, management areas, and monitoring points) are found under the "Additional Layers" dropdown menu on the "Map Layers" pane (Figure 3-7). Layers can be toggled on and off by selecting the box to the left of the layer name. The user can access a descripton of the shapefile by selecting the "Information" icon ( ). The slider bar beneath each layer controls the layer transparancy, and legends for all active layers can be found by expanding the "Lengend" dropdown menu under "Additional Layers." Selecting an item within a spatial layer (e.g., selecting one of the

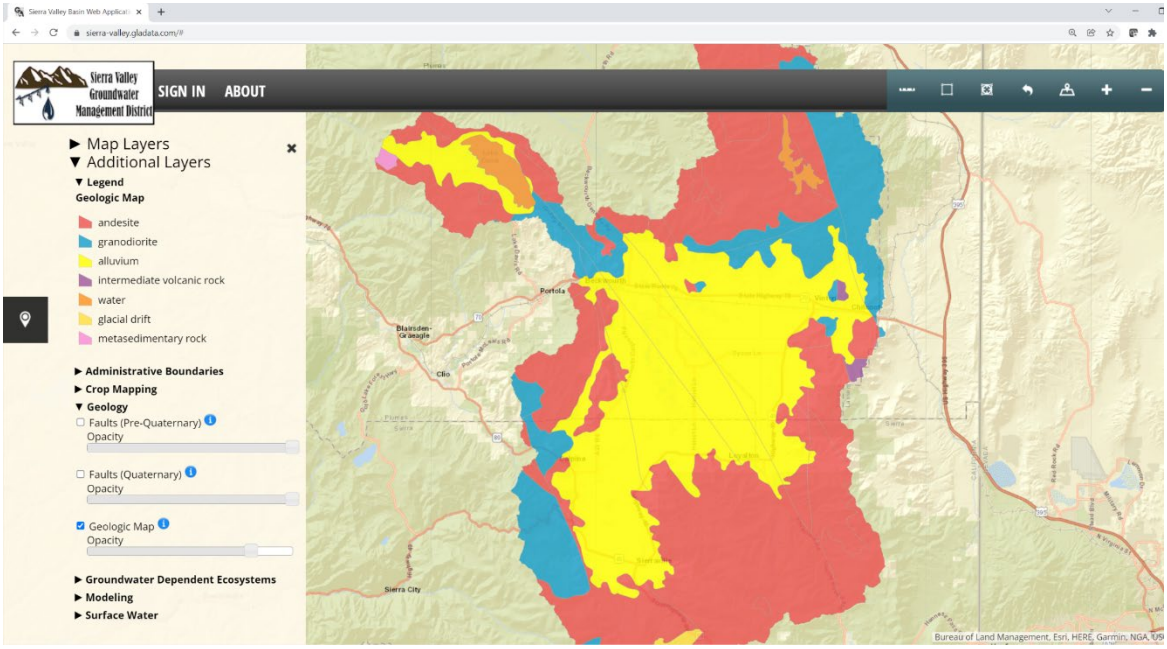

Figure 3-7. Spatial data can be displayed by toggling layers on and off under the "Additional Layers" dropdown menu.

colored polygons in Figure 3-7) will bring up the "Item Details" pane that displays of the data for that item contained with the attribute table.

4.0 Advanced Features

Users with login credentials can access additional functionality not available to the public. The majority of this functionality is related to database maintenance, and includes the ability to upload, modify, or delete data or spatial coverages directly through the web interface; knowledge of SQL or relational databases is not required. Access to these features is restricted by user type, which allows SVGMD to control which users can modify the database. Users can provide their credentials by selecting the "Sign In" button on the menu bar at top of the map window. After logging in, the option in the menu bar with change to those shown in Figure 4-1. The "Map" menu item returns the user to the map window. The other dropdown menu items are described below.

4.1 Documents Menu

The DMS includes a document and photo library for reference and organization. Both can be associated with a monitoring point, such as well logs or site photos, or pertain to the basin in general, such as previous reports. To add new items, select the "Add Document" or "Add Photo Library Item" at the top of the respective page after selection from the dropdown menu. Several different attributes can be assigned to each document, such as name, date, type/category, and

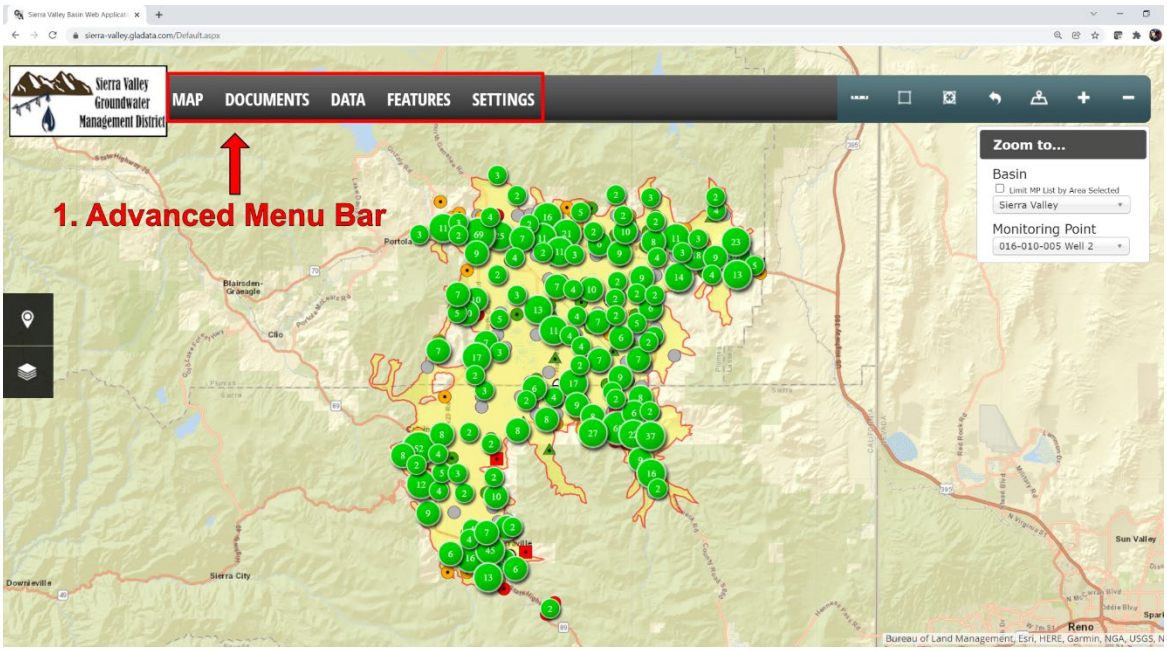

Figure 4-1. Advanced menu bar for users with appropriate login credentials.

any specific notes. Documents and photos can be viewed in the web browser or downloaded by the user.

4.2 Data Menu

The “Data” dropdown menu allows users with appropriate level access to view, query, modify, and delete data contained within the database. The dropdown menu item are basin, monitoring points, samples, and results, which corresponds with the overall data hierarchy in the DMS. New entries can be added to the database by selecting the link located at the top of each respective page when selected from the dropdown menu. For example, a new monitoring point can be added by selecting the “Add Monitoring Point” link at the top of the page that appears after “Monitoring Points” is selected from the “Data” dropdown menu (Figure 4-2). A data entry window will appear that allows the user to populate attribute fields. For bulk data upload, see Section 4.3.

4.3 Features Menu

The “Features” dropdown menu provides two general advanced tools that provide the user with the ability to 1) automatically plot hydrographs or water quality results for multiple wells on the same graph and 2) bulk upload data. Selecting the “Graph” item of the dropdown menu takes the user to the graphing page where they can select one of four different graph types from the dropdown menu at the top (Figure 4-3).

Bulk data uploads are accomplished by selecting the appropriate dropdown menu item and are available for the follow data types: (1) analytical (water quality) data, (2) water level data, (3) well flow rates, and (4) well production volumes. Each of the data import pages contains

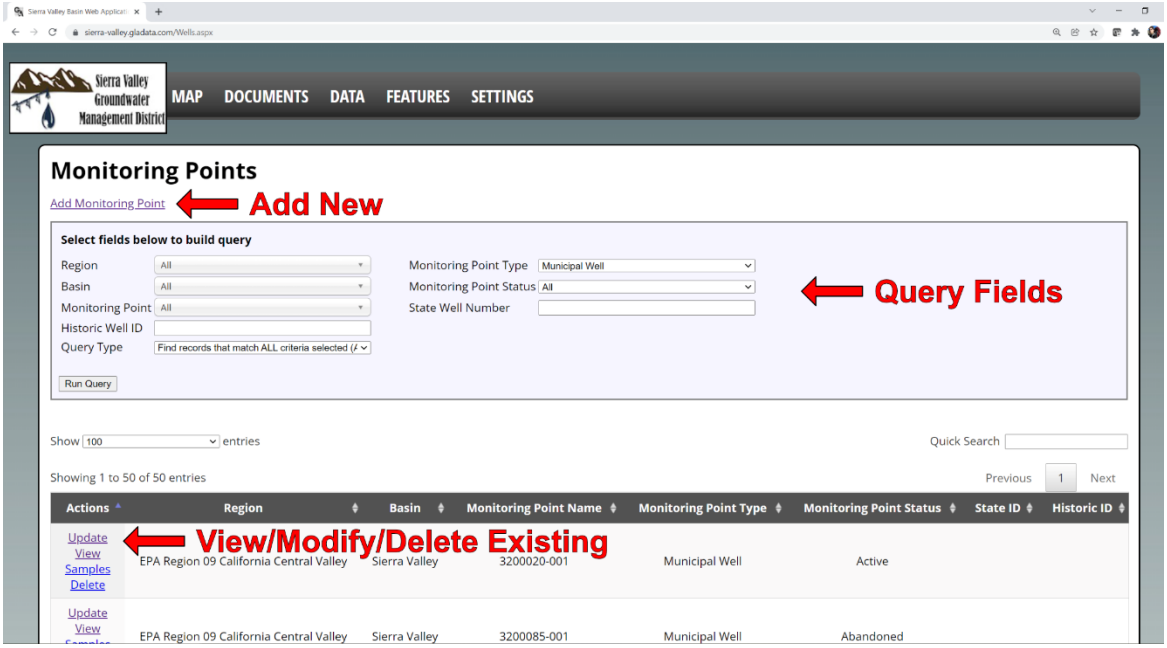

Figure 4-2. Annotated example of "Monitoring Points" menu item. All pages under the "Data" menu have similar structure.

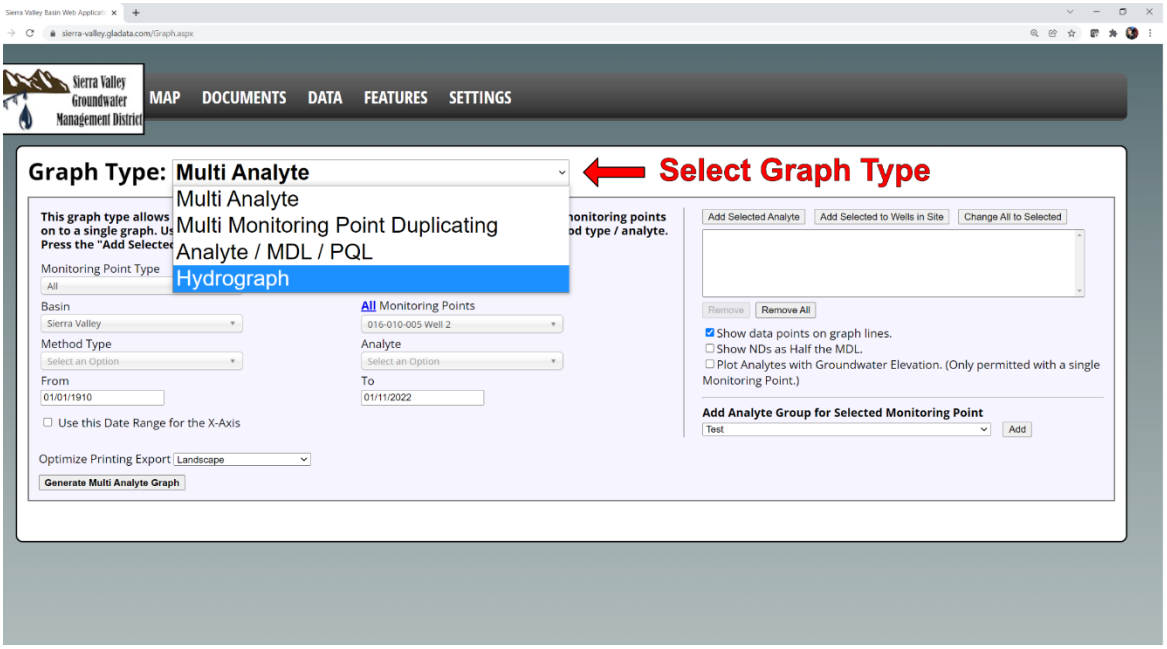

Figure 4-3. Different types of graphs available for plotting data from multiple wells.

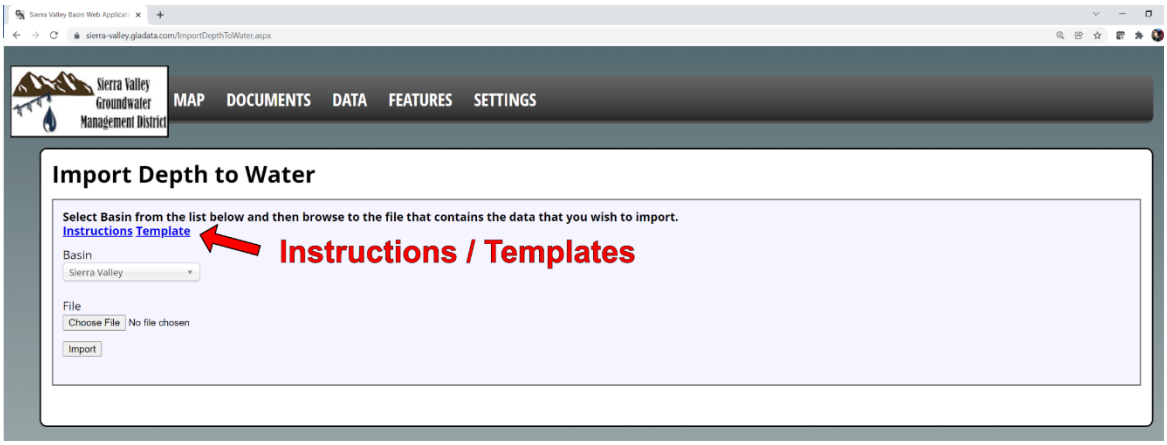

Figure 4-4. Example data import page with location of downloadable instructions and template files indicated.

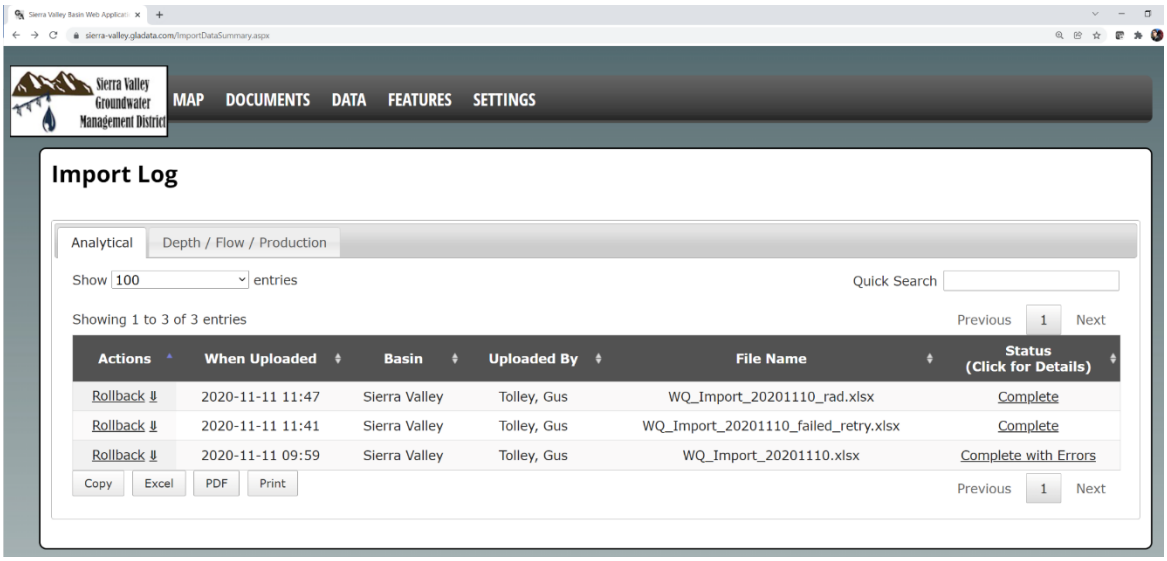

Figure 4-5. Example data import page with location of downloadable instructions and template files indicated.

downloadable instructions and template files for uploading data (Figure 4-4). The DMS automatically performs a validity check on the uploaded data and rejects the entire upload if an error is found.

Users with sufficient priviledges can also access the “Import Log” page located in the “Features” dropdown menu. This page shows a summary of data imports including the upload date, user, filename, and upload status (Figure 4-5). If an error is later discovered in the upload, then all data associated with the upload can be easily removed from the database using the “Rollback”

feature. It is recommended that only high-level users are granted access to this functionality in order to preserve database integrity.

4.4 Managing Spatial Features and Coverages

The “Manage Additional Layers” page (Figure 4-6) can be found under the “Settings” dropdown menu and allows the user to add, modify, or delete shapefile and coverages that can be displayed in the DMS web browser. Existing items are shown of the left side of the window, and can be selected using the “Layer Name” dropdown menu located near the top.

Changing attributes of a spatial item simply requires selecting the layer, modifying the information in the fields, and selecting the “Save” button near the bottom. Similarly, deleting an existing spatial item requires the user to select the layer from the dropdown list and then select the “Delete” button near the bottom. New layers can be added using the right side of the “Manage Additional Layers” page. The “Layer Address” is the URL to the ArcGIS REST interface with the token removed. These addresses will typically contain the text “FeatureServer/0”.

It should be noted that the DMS does not store the spatial data, it only displays it. The data and display options are stored on a separate GIS server which is not part of the DMS. Appropriate access to the GIS server the spatial data is stored in is necessary to modify any display preferences other than transparency. If a shapefile does not display when selected, it is likely the spatial data or address have been modified, and the entry in the DMS must be updated accordingly.

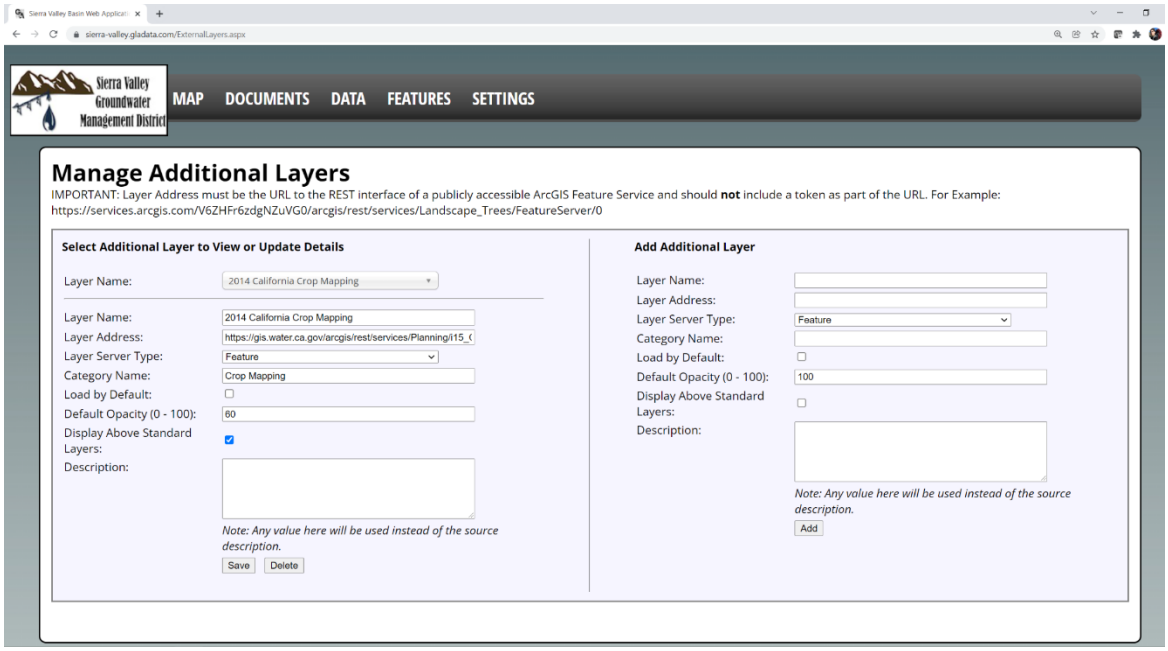

Figure 4-6. Manage additional layers page.

Appendix A
DMS Tables and Affiliations

Database	Table	Description	Primary Key	Affiliated Tables
Shared	AnalyteGroupForReportItems	Analytes can be grouped to ease their selection as a collection in reports. This table stores analytes that are in a user-defined group.	analyte_group_item_id	AnalyteGroupForReports, analytes
	AnalyteGroupForReports	Analytes can be grouped to ease their selection as a collection in reports. This table stores top-level group data.	analyte_group_id	
	AnalyteGroupItems	Analytes can be grouped to ease their selection as a collection on graphs. This table stores analytes that are in a user-defined group.	analyte_group_item_id	AnalyteGroupss, analytes, methods
	AnalyteGroups	Analytes can be grouped to ease their selection as a collection in graphs. This table stores analytes that are in a user-defined group.	analyte_group_id	
	analytes	Stores analytical data that is used for redings, graphing, reporting and validation when importing data.	analyte_id	
	analytes_to_methods	Links analytes and methods together in many-to-many relationship.	anayte_id, method_id	
	basins	Contains region lookup item for application sites.	basin_id	
	flags	Dereferences flat abbreviations for reported analytical data.	flag	
	lst_doc_type	Look up values for types for documents added to the database.	doc_type	
	lst_elevation_survey_methods	Look up values for elevation survey methods associated with a well.	elevation_survey_method	
	lst_method_types	Method types that a method can be associated with and used for report grouping.	method_type_id	
	lst_monitoring_status	Look up values for monitoring status for a well.	monitoring_status	
	lst_photo_library_categories	Look up values for categories that photos can belong to that are associated with a well.	photoLibraryCategoryID	

Database	Table	Description	Primary Key	Affiliated Tables
Shared	lst_well_icons	When wells are displayed on the map, they appear as an icon that is defined through the meta data in this table as associated with the well status.	well_type, well_status	
	lst_well_status	Look up values for the status of a well.	well_status	
	lst_well_types	Look up values for the type of well.	well_type	
	lst_xy_survey_methods	Look up values for the survey methods that are used in association with a well.	xy_survey_method	
	mcls	State-specific MCL reports can be generated as part of the historic report. This table contains those MCL values.	stateMclId	analytes
	methods	Stores top-level method information as it relates to analytical results associated with a monitoring point.	method_id	
	synonyms	When analytical data is imported, associated with wells, if the analyte for the record being imported is not found in the analytes table, a check is made to see if the value being imported is found in the synonym table. If so, the analyte associated with the synonym is substituted.	synonymID	analytes
	xImportAllSURFACEwq	Not used in web application.		
Sierra Valley	aquifers	Not used in web application.		
	change_log	Stores information related to actions performed by users against certain tables.	change_log_id	samples, readings, sites, wells, photo_library_items, documents, methods, analytes
	conversions	Not used in web application.		
	documents	Stores metainformation about documents that relate to sites and/or wells.	doc_id	sites, wells

Database	Table	Description	Primary Key	Affiliated Tables
Sierra Valley	edd_staging	Utility table used to store analytical data as it is being imported.	edd_staging_id	edd_summary
	edd_summary	Stores top-level analytical data import information.	edd_summary_id	
	ErrorLog	Not used in web application.		
	ExcelAnGrpItems	Not used in web application.		
	ExcelImportTable	Not used in web application.		
	externalLayers	Stores metainformation about optional layers displayed on map that come from external sources.	externalLayerId	
	FileDownloadLog	Not used in web application.		
	ImportFlowData	Stores individual flow data items during import process. Related to ImportLogs through groupGUID field.	ImportFlowDataId	ImportLogs
	ImportLogs	Top-level import information related to non-analytical data imports.	importLogId	
	ImportProductionData	Stores production data items during import process. Related to ImportLogs through groupGUID field.	ImportProductionDataId	ImportLogs
	ImportWaterLevels	Stores water level data items during import process. Related to ImportLogs through groupGUID field.	ImportWaterLevelID	ImportLogs
	ImportWQPSs	Not used in web application.		
	lab_references	Not used in web application.		
	lithology	Lithology observations related to wells, typically obtained from well logs.	lithology_id	wells
	lst_aquifers	List of aquifers that a well can be associated with.	aquifer	wells
	lst_entities	List of entities that a well can be associated with.	entity_name	wells