CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE
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July 27, 2023

Einen Grandi
Sierra Valley Groundwater Management District GSA
P.O. Box 88
Chilcoot, CA 96105
sierravalleygmd@sbcglobal.net

RE: Sierra Valley – Sierra Valley Subbasin - 2022 Groundwater Sustainability Plan

Dear Einen Grandi,

The Department of Water Resources (Department) has evaluated the groundwater sustainability plan (GSP) submitted for the Sierra Valley – Sierra Valley Subbasin and has determined the GSP is approved. The approval is based on recommendations from the Staff Report, included as an exhibit to the attached Statement of Findings, which describes that the Sierra Valley Subbasin GSP satisfies the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially complies with the GSP Regulations. The Staff Report also proposes recommended corrective actions that the Department believes will enhance the GSP and facilitate future evaluation by the Department. The Department strongly encourages the recommended corrective actions be given due consideration and suggests incorporating all resulting changes to the GSP in future updates.

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their GSPs at least every five years and whenever the Plan is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved GSPs and issue an assessment at least every five years. The Department will initiate the first periodic review of the Sierra Valley Subbasin GSP no later than January 28, 2027.

Please contact Sustainable Groundwater Management staff by emailing sgmps@water.ca.gov if you have any questions related to the Department's assessment or implementation of your GSP.

Thank You,

Paul Gosselin

Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Approval of the Sierra Valley – Sierra Valley Subbasin Groundwater Sustainability Plan

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE SIERRA VALLEY – SIERRA VALLEY SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP or Plan) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA or Act), is likely to achieve the sustainability goal for the basin covered by the Plan, and whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the Plan within two years of its submission. (Water Code § 10733.4.) This Statement of Findings explains the Department's decision regarding the Plan submitted by the Sierra Valley Groundwater Management District GSA and Plumas County GSA (GSA(s) or Agency/Agencies) for the Sierra Valley – Sierra Valley Subbasin (Basin No. 5-012.01).

Department management has discussed the Plan with staff and has reviewed the Department Staff Report, entitled Sustainable Groundwater Management Program Groundwater Sustainability Plan Assessment Staff Report, attached as Exhibit A, recommending approval of the GSP. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Plan and concurs with staff's recommendation and all the recommended corrective actions. The Department therefore **APPROVES** the Plan and makes the following findings:

A. The Plan satisfies the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.):

    1. The Plan was submitted within the statutory deadline of January 31, 2022. (Water Code § 10720.7(a); 23 CCR § 355.4(a)(1).)

    2. The Plan was complete, meaning it generally appeared to include the information required by the Act and the GSP Regulations sufficient to warrant a thorough evaluation and issuance of an assessment by the Department. (23 CCR § 355.4(a)(2).)

    3. The Plan, either on its own or in coordination with other Plans, covers the entire Subbasin. (23 CCR § 355.4(a)(3).)

B. The general standards the Department applied in its evaluation and assessment of the Plan are: (1) "conformance" with the specified statutory requirements, (2) "substantial compliance" with the GSP Regulations, (3) whether the Plan is likely

to achieve the sustainability goal for the Subbasin within 20 years of the implementation of the Plan, and (4) whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) Application of these standards requires exercise of the Department's expertise, judgment, and discretion when making its determination of whether a Plan should be deemed "approved," "incomplete," or "inadequate."

The statutes and GSP Regulations require Plans to include and address a multitude and wide range of informational and technical components. The Department has observed a diverse array of approaches to addressing these technical and informational components being used by GSAs in different basins throughout the state. The Department does not apply a set formula or criterion that would require a particular outcome based on how a Plan addresses any one of SGMA's numerous informational and technical components. The Department finds that affording flexibility and discretion to local GSAs is consistent with the standards identified above; the state policy that sustainable groundwater management is best achieved locally through the development, implementation, and updating of local plans and programs (Water Code § 113); and the Legislature's express intent under SGMA that groundwater basins be managed through the actions of local governmental agencies to the greatest extent feasible, while minimizing state intervention to only when necessary to ensure that local agencies manage groundwater in a sustainable manner. (Water Code § 10720.1(h)) The Department's final determination of a Plan is made based on the entirety of the Plan's contents on a case-by-case basis, considering and weighing factors relevant to the particular Plan and Subbasin under review.

C. In making these findings and Plan determination, the Department also recognized that: (1) The Department maintains continuing oversight and jurisdiction to ensure the Plan is adequately implemented; (2) the Legislature intended SGMA to be implemented over many years; (3) SGMA provides Plans 20 years of implementation to achieve the sustainability goal in the Subbasin (with the possibility that the Department may grant GSAs an additional five years upon request if the GSA has made satisfactory progress toward sustainability); and, (4) local agencies acting as GSAs are authorized, but not required, to address undesirable results that occurred prior to enactment of SGMA. (Water Code §§ 10721(r); 10727.2(b); 10733(a); 10733.8.)

D. The Plan conforms with Water Code §§ 10727.2 and 10727.4, substantially complies with 23 CCR § 355.4, and appears likely to achieve the sustainability goal for the Subbasin. It does not appear at this time that the Plan will adversely affect the ability of adjacent basins to implement their GSPs or impede achievement of sustainability goals.

1. The sustainable management criteria, which are set with the goal of managing groundwater resources for the long-term health of the people, environment, and economy of Sierra Valley by considering historical groundwater trends and performing various impact analyses to beneficial users, are sufficiently justified and explained. While acknowledging data gaps exist, the Plan relies on best available information and science when considering impacts to beneficial users, identification of groundwater-dependent ecosystems and interconnected surface water, and quantification of the groundwater conditions that the Plan seeks to avoid. The Plan provides an objective way to determine whether the Subbasin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)

2. The Plan demonstrates a reasonable understanding of where data gaps exist and actions needed to overcome those data gaps. For example, the GSP details specific data gaps identified for the hydrogeologic model, water budget, and for each sustainability indicator monitoring network and then presents the plan to overcome each data gap. The GSP indicates that the anticipated benefits of addressing these data gaps include a better understanding of groundwater seasonal patterns and gradients, well inventory and monitoring network improvements, and refinement to the hydrogeologic model, water budget, and groundwater and surface water interaction. Filling these known data gaps, and others described in the Plan, should also lead to refinement of the GSA's sustainable management criteria and help inform and guide future adaptive management strategies and projects and management actions. (23 CCR § 355.4(b)(2).)

3. The projects and management actions proposed are designed to achieve the major objectives of stopping groundwater decline, maintaining groundwater-dependent ecosystems to support existing wetlands and wildlife, and prevent significant and unreasonable land subsidence in the Subbasin. The projects and management actions are reasonable and commensurate with the level of understanding of the Subbasin setting. The projects and management actions described in the Plan provide a feasible approach to achieving the Subbasin's sustainability goal and should provide the GSAs with greater versatility to adapt and respond to changing conditions and future challenges during GSP implementation. (23 CCR § 355.4(b)(3).)

4. The Plan provides a detailed explanation of how the varied interests of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests, including domestic wells, groundwater-dependent ecosystems, and

interconnected surface water, would be impacted by the chosen minimum thresholds. (23 CCR § 355.4(b)(4).)

5. The Plan's projects and management actions appear feasible at this time and appear capable of preventing undesirable results and ensuring that the Subbasin is managed within its sustainable yield within 20 years. The Department will continue to monitor Plan implementation and reserves the right to change its determination if projects and management actions are not implemented or appear unlikely to prevent undesirable results or achieve sustainability within SGMA timeframes. (23 CCR § 355.4(b)(5).)

6. The Plan includes a reasonable assessment of overdraft conditions and includes reasonable means to mitigate overdraft, if present. (23 CCR § 355.4(b)(6).)

7. At this time, it does not appear that the Plan will adversely affect the ability of an adjacent basin to implement its GSP or impede achievement of sustainability goals in an adjacent basin. The Sierra Valley Subbasin adjoins one very-low priority Subbasin, the Chilcoot Subbasin, that at this time is not required to develop a GSP or manage groundwater for long-term sustainability, and to date no such plan has been submitted. (23 CCR § 355.4(b)(7).)

8. Because a single plan was submitted for the Subbasin, a coordination agreement was not required. (23 CCR § 355.4(b)(8).)

9. The GSAs' member agencies, Sierra Valley Groundwater Management District and Plumas County, have required metering of high capacity wells since 1989 and historically implemented several supply augmentation and demand management actions. The GSAs' member agencies and their history of groundwater management provide a reasonable level of confidence, at this time, that the GSAs have the legal authority and financial resources necessary to implement the Plan. (23 CCR § 355.4(b)(9).)

10. Through review of the Plan and consideration of public comments, the Department determines that the GSAs adequately responded to comments that raised credible technical or policy issues with the Plan, sufficient to warrant approval of the Plan at this time. The Department also notes that the recommended corrective actions included in the Staff Report are important to addressing certain technical or policy issues that were raised and, if not addressed before future, subsequent plan evaluations, may preclude approval of the Plan in those future evaluations. (23 CCR § 355.4(b)(10).)

E. In addition to the grounds listed above, DWR also finds that:

1. The Plan sets forth minimum thresholds for chronic lowering of groundwater levels that take into consideration shallow water supply wells using the best available information (Sierra Valley GSP, p. 194). The GSP includes a well impact analysis that indicates that groundwater levels at minimum thresholds will not lead to significant and unreasonable impacts on shallow wells and is protective of 98 percent of wells in the Subbasin. The Plan's compliance with the requirements of SGMA and substantial compliance with the GSP Regulations supports the state policy regarding the human right to water (Water Code § 106.3). The Department developed its GSP Regulations consistent with and intending to further the policy through implementation of SGMA and the Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water in its evaluation of the Plan. (23 CCR § 350.4(g).)

2. The Plan acknowledges and identifies interconnected surface waters within the Subbasin. The GSAs proposes initial sustainable management criteria to manage this sustainability indicator and measures to improve understanding and management of interconnected surface water. The GSAs acknowledge, and the Department agrees, many data gaps related to interconnected surface water exist. The GSAs should continue filling data gaps, collecting additional monitoring data, and coordinating with resources agencies and interested parties to understand beneficial uses and users that may be impacted by depletions of interconnected surface water caused by groundwater pumping. Future updates to the Plan should aim to improve the initial sustainable management criteria as more information and improved methodology becomes available.

3. Projections of future basin extractions are likely to stay within current and historic ranges, at least until the next periodic evaluation by the GSA and the Department. Basin groundwater levels and other SGMA sustainability indicators are unlikely to substantially deteriorate while the GSA implements the Department's recommended corrective actions. State intervention is not necessary at this time to ensure that local agencies manage groundwater in a sustainable manner. (Wat. Code § 10720.1(h).)

4. The California Environmental Quality Act (Public Resources Code § 21000 *et seq*.) does not apply to the Department's evaluation and assessment of the Plan.

Accordingly, the GSP submitted by the Agencies for the Sierra Valley – Sierra Valley Subbasin is hereby **APPROVED.** The recommended corrective actions identified in the Staff Report will assist the Department's future review of the Plan's implementation for consistency with SGMA and the Department therefore recommends the Agencies address them by the time of the Department's periodic review, which is set to begin on January 28, 2027, as required by Water Code § 10733.8. Failure to address the Department's Recommended Corrective Actions before future, subsequent plan evaluations, may lead to a Plan being determined incomplete or inadequate.

Signed:

Karla Nemeth

Karla Nemeth, Director
Date: July 27, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Sierra Valley – Sierra Valley Subbasin

State of California
Department of Water Resources
Sustainable Groundwater Management Program
Groundwater Sustainability Plan Assessment
Staff Report

Groundwater Basin Name:	Sierra Valley – Sierra Valley Subbasin (Basin No. 5-012.01)
Submitting Agency:	Sierra Valley Groundwater Management District GSA and Plumas County GSA
Submittal Type:	Initial GSP Submission
Submittal Date:	January 28, 2022
Recommendation:	Approved
Date:	July 27, 2023

The Sierra Valley Groundwater Management District and Plumas County (collectively referenced to as the GSAs or Agencies) submitted the Sierra Valley Subbasin Groundwater Sustainability Plan (GSP or Plan) for the Sierra Valley Subbasin (Subbasin) to the Department of Water Resources (Department) for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA) [1] and GSP Regulations.[2] The GSP covers the entire Subbasin for the implementation of SGMA.

After evaluation and assessment, Department staff conclude that the Plan includes the required components of a GSP, demonstrates a thorough understanding of the Subbasin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent undesirable results as defined in the Plan, and proposes a set of projects and management actions that will likely achieve the sustainability goal defined for the Subbasin. [3] Department staff will continue to monitor and evaluate the Subbasin's progress toward achieving the sustainability goal through annual reporting and future periodic evaluations of the GSP and its implementation.

- ***Based on the current evaluation of the Plan, Department staff recommend the GSP be APPROVED with the recommended corrective actions described herein.***

This assessment includes five sections:

[1] Water Code § 10720 *et seq*.
[2] 23 CCR § 350 *et seq*.
[3] 23 CCR § 350 *et seq*.

- **Section 1 – Summary:** Overview of Department staff's assessment and recommendations.
- **Section 2 – Evaluation Criteria:** Describes the legislative requirements and the Department's evaluation criteria.
- **Section 3 – Required Conditions:** Describes the submission requirements, Plan completeness, and basin coverage required for a GSP to be evaluated by the Department.
- **Section 4 – Plan Evaluation:** Provides an assessment of the contents included in the GSP organized by each Subarticle outlined in the GSP Regulations.
- **Section 5 – Staff Recommendation:** Includes the staff recommendation for the Plan and any recommended or required corrective actions, as applicable.

1 SUMMARY

Department staff recommend approval of the Sierra Valley Subbasin GSP. The GSAs have identified areas for improvement of their Plan (e.g. filling data gaps related to interconnected surface water and the monitoring network). Department staff concur that those items are important and recommend the GSAs address them as soon as possible. Department staff have also identified additional recommended corrective actions within this assessment that the GSAs should consider addressing by the first periodic evaluation of the Plan. The recommended corrective actions generally focus on the following:

(1) Investigating the basin fill and bedrock units and identifying the appropriate principal aquifer(s);
(2) Providing more information about how data from the adjacent Chilcoot Subbasin will be utilized by the GSA during plan implementation;
(3) Amending the definition of undesirable results for the chronic lowering of groundwater levels;
(4) Amending the definition of undesirable results for land subsidence and establishing sustainable management criteria based on groundwater surface elevation changes;
(5) Providing a rationale for why water quality conditions in 2021 were selected;
(6) Continuing to fill data gaps, collecting additional monitoring data, coordinating with resources agencies and interested parties to understand beneficial uses and users that may be impacted by depletions of interconnected surface water caused by groundwater pumping, and potentially refining sustainable management criteria; and
(7) Providing updates to the monitoring network.

Addressing the recommended corrective actions identified in Section 5 of this assessment will be important to demonstrate, on an ongoing basis, that implementation of the Plan is likely to achieve the sustainability goal.

2 EVALUATION CRITERIA

The GSAs submitted a single GSP to the Department to evaluate whether the Plan conforms to specified SGMA requirements[4] and is likely to achieve the sustainability goal for the Sierra Valley Subbasin.[5] To achieve the sustainability goal for the Subbasin, the GSP must demonstrate that implementation of the Plan will lead to sustainable groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.[6] Undesirable results must be defined quantitatively by the GSAs.[7] The Department is also required to evaluate whether the GSP will adversely affect the ability of an adjacent basin to implement its GSP or achieve its sustainability goal.[8]

For the GSP to be evaluated by the Department, it must first be determined that the Plan was submitted by the statutory deadline,[9] and that it is complete and covers the entire basin.[10] If these conditions are satisfied, the Department evaluates the Plan to determine whether it complies with specific SGMA requirements and substantially complies with the GSP Regulations.[11] Substantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plan, and the Department determines that any discrepancy would not materially affect the ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plan to attain that goal.[12]

When evaluating whether the Plan is likely to achieve the sustainability goal for the Subbasin, Department staff reviewed the information provided and relied upon in the GSP for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.[13] The Department's review considers whether there is a reasonable relationship between the information provided and the assumptions and conclusions made by the GSA, including whether the interests of the beneficial uses and users of groundwater in the basin have been considered; whether sustainable management criteria and projects and management actions described in the Plan are commensurate with the level of understanding of the basin setting; and whether those projects and management actions are feasible and likely to prevent undesirable results.[14]

[4] Water Code §§ 10727.2, 10727.4.
[5] Water Code § 10733(a).
[6] Water Code § 10721(v).
[7] 23 CCR § 354.26 *et seq.*
[8] Water Code § 10733(c).
[9] 23 CCR § 355.4(a)(1).
[10] 23 CCR §§ 355.4(a)(2), 355.4(a)(3).
[11] 23 CCR § 350 *et seq.*
[12] 23 CCR § 355.4(b).
[13] 23 CCR § 351(h).
[14] 23 CCR §§ 355.4(b)(1), (3), (4), and (5).

The Department also considers whether the GSA has the legal authority and financial resources necessary to implement the Plan.[15]

To the extent overdraft is present in a basin, the Department evaluates whether the Plan provides a reasonable assessment of the overdraft and includes reasonable means to mitigate the overdraft.[16] The Department also considers whether the Plan provides reasonable measures and schedules to eliminate identified data gaps.[17] Lastly, the Department's review considers the comments submitted on the Plan and evaluates whether the GSA adequately responded to the comments that raise credible technical or policy issues with the Plan.[18]

The Department is required to evaluate the Plan within two years of its submittal date and issue a written assessment of the Plan.[19] The assessment is required to include a determination of the Plan's status.[20] The GSP Regulations define the three options for determining the status of a Plan: Approved,[21] Incomplete,[22] or Inadequate.[23]

Even when review indicates that the GSP satisfies the requirements of SGMA and is in substantial compliance with the GSP Regulations, the Department may recommend corrective actions.[24] Recommended corrective actions are intended to facilitate progress in achieving the sustainability goal within the basin and the Department's future evaluations, and to allow the Department to better evaluate whether the Plan adversely affects adjacent basins. While the issues addressed by the recommended corrective actions do not, at this time, preclude approval of the Plan, the Department recommends that the issues be addressed to ensure the Plan's implementation continues to be consistent with SGMA and the Department is able to assess progress in achieving the sustainability goal within the basin.[25] Unless otherwise noted, the Department proposes that recommended corrective actions be addressed by the submission date for the first periodic assessment.[26]

The staff assessment of the GSP involves the review of information presented by the GSA, including models and assumptions, and an evaluation of that information based on scientific reasonableness, including standard or accepted professional and scientific methods and practices. The assessment does not require Department staff to recalculate or reevaluate technical information provided in the Plan or to perform its own geologic or

[15] 23 CCR § 355.4(b)(9).
[16] 23 CCR § 355.4(b)(6).
[17] 23 CCR § 355.4(b)(2).
[18] 23 CCR § 355.4(b)(10).
[19] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[20] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[21] 23 CCR § 355.2(e)(1).
[22] 23 CCR § 355.2(e)(2).
[23] 23 CCR § 355.2(e)(3).
[24] Water Code § 10733.4(d).
[25] Water Code § 10733.8.
[26] 23 CCR § 356.4 *et seq*.

engineering analysis of that information. The staff recommendation to approve a Plan does not signify that Department staff, were they to exercise the professional judgment required to develop a GSP for the basin, would make the same assumptions and interpretations as those contained in the Plan, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSA are supported by adequate, credible evidence, and are scientifically reasonable.

Lastly, the Department's review and approval of the Plan is a continual process. Both SGMA and the GSP Regulations provide the Department with the ongoing authority and duty to review the implementation of the Plan.[27] Also, GSAs have an ongoing duty to provide reports to the Department, periodically reassess their plans, and, when necessary, update or amend their plans.[28] The passage of time or new information may make what is reasonable and feasible at the time of this review to not be so in the future. The emphasis of the Department's periodic reviews will be to assess the progress toward achieving the sustainability goal for the basin and whether Plan implementation adversely affects the ability of adjacent basins to achieve their sustainability goals.

3 REQUIRED CONDITIONS

A GSP, to be evaluated by the Department, must be submitted within the applicable statutory deadline. The GSP must also be complete and must, either on its own or in coordination with other GSPs, cover the entire basin.

3.1 SUBMISSION DEADLINE

SGMA required basins categorized as high- or medium-priority and not subject to critical conditions of overdraft to submit a GSP no later than January 31, 2022.[29]

The GSAs submitted their Plan on January 28, 2022.

3.2 COMPLETENESS

GSP Regulations specify that the Department shall evaluate a GSP if that GSP is complete and includes the information required by SGMA and the GSP Regulations.[30]

The GSAs submitted an adopted GSP for the entire Subbasin. After an initial, preliminary review, Department staff found the GSP to be complete and appearing to include the

[27] Water Code § 10733.8; 23 CCR § 355.6.
[28] Water Code §§ 10728 *et seq.*, 10728.2.
[29] Water Code § 10720.7(a)(2).
[30] 23 CCR § 355.4(a)(2).

required information, sufficient to warrant a thorough evaluation by the Department.[31] The Department posted the GSP to its website on February 7, 2022.[32]

3.3 Basin Coverage

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.[33] A GSP that is intended to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting GSAs.

The GSP intends to manage the entire Sierra Valley Subbasin and the jurisdictional boundary of the submitting GSAs fully contains the Subbasin.[34]

4 Plan Evaluation

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department's assessment is based on a number of related factors including whether the elements of a GSP were developed in the manner required by the GSP Regulations, whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable, and whether the GSP, through the implementation of clearly defined and technically feasible projects and management actions, is likely to achieve a tenable sustainability goal for the basin. The Department staff's evaluation of the likelihood of the Plan to attain the sustainability goal for the Subbasin is provided below.

4.1 Administrative Information

The GSP Regulations require each Plan to include administrative information identifying the submitting Agency, its decision-making process, and its legal authority;[35] a description of the Plan area and identification of beneficial uses and users in the Plan area;[36] and a description of the ability of the submitting Agency to develop and implement a Plan for that area.[37]

The Sierra Valley Groundwater Management District (District) was authorized under SB 1391 in 1980 to protect and oversee the management of the groundwater within the Sierra Valley Subbasin. SB 1391 defined the legal boundaries and regulatory authority of the

[31] The Department undertakes a preliminary completeness review of a submitted Plan under section 355.4(a) of the GSP Regulations to determine whether the elements of a Plan required by SGMA and the Regulations have been provided, which is different from a determination, upon review, that a Plan is "incomplete" for purposes of section 355.2(e)(2) of the Regulations.
[32] https://sgma.water.ca.gov/portal/gsp/preview/125.
[33] Water Code § 10727(b); 23 CCR § 355.4(a)(3).
[34] Sierra Valley GSP, Section 1.3.2, pp. 35-36.
[35] 23 CCR § 354.6 *et seq*.
[36] 23 CCR § 354.8 *et seq*.
[37] 23 CCR § 354.6(e).

District and authorized its creation by a joint exercise of powers agreements between Plumas and Sierra Counties. Upon submitting notification to the Department, Sierra Valley Groundwater Management District and Plumas County became the GSAs for their respective portions of the Sierra Valley Subbasin.[38] The Plumas County GSA oversees a relatively small area in the northwest corner of the Sierra Valley Subbasin, approximately 115 acres or less than 0.1 percent of the Subbasin, which falls outside of the Sierra Valley Groundwater Management District jurisdiction. The remaining portion of the Subbasin is covered by the Sierra Valley GSA, which is the lead GSA for the Subbasin. A memorandum of understanding was established between Sierra Valley GSA and Plumas County GSA regarding management of the Subbasin.[39]

The GSP states that decision-making authority and responsibility rests with the GSAs but also describes a "collaborative planning approach." This approach includes the following elements: (1) a technical advisory committee consisting of an array of stakeholders; (2) periodic public workshops; (3) presentations and updates at monthly Sierra Valley Groundwater Management District Board meetings; and (4) regular email communication and updates to interested parties.[40] The GSP provides a list of organizations and interests that comprised the technical advisory committee.[41] Discussion of how the collaborative planning elements mentioned above, particularly the technical advisory committee, fit into the decision-making process is not provided, and a lack of interaction and dialogue between the Sierra Valley Groundwater Management District Board and the technical advisory committee is highlighted in multiple public comments submitted by technical advisory members.

The GSP defines the Sierra Valley Subbasin as an irregularly shaped, complexly faulted valley with seismic influences located in the southeastern Plumas County and northeastern Sierra County in northeastern California.[42] It is stated to be the home to largest wetland in the Serra Nevada Mountains and considered one of the most biodiverse landscapes in the United States.[43] Figure 1 is a map showing the Sierra Valley Subbasin, GSA boundary, and neighboring basins.

[38] Sierra Valley GSA, Section 1.3.2, pp. 35-36.
[39] Sierra Valley GSA, Appendix 1-2, pp. 326-328.
[40] Sierra Valley GSP, Section 2.1.5.3, p. 70.
[41] Sierra Valley GSP, Section 2.1.5.3, pp. 70-71.
[42] Sierra Valley GSP, Section 2.1, p.39.
[43] Sierra Valley GSP, Section 2.1, p.39.

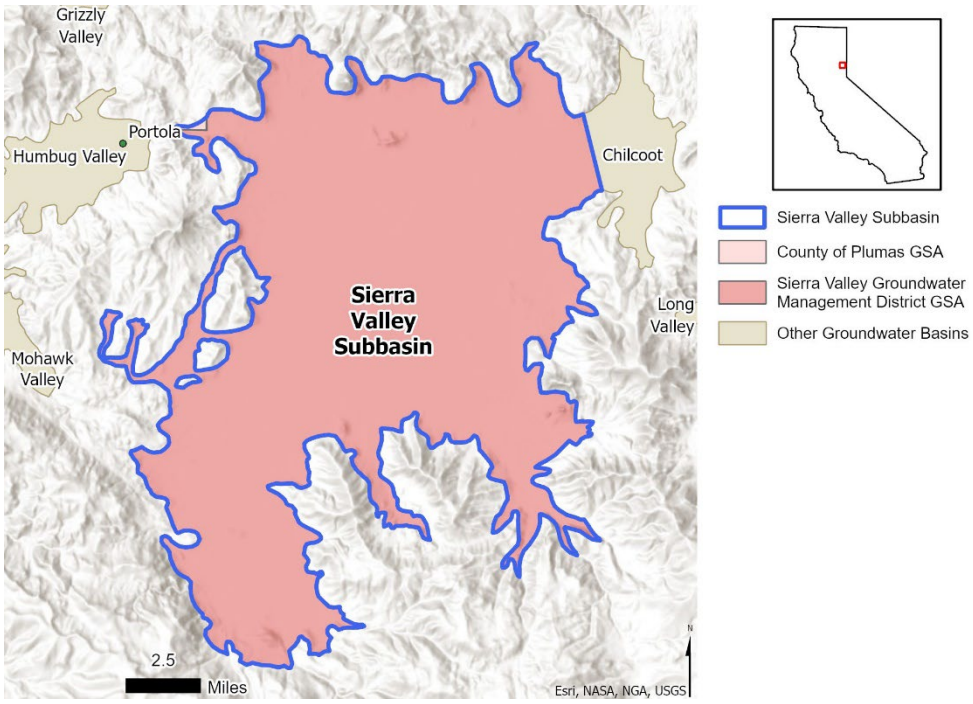

Figure 1: Sierra Valley Subbasin Location Map.

The GSP states there are no adjudicated groundwater areas or areas covered by an Alternative,[44] as well as no Tribal Trust Land Tracts[45] or identified management areas within the Subbasin.[46] The GSP indicates that the only incorporated city in the Plan area is the City of Loyalton and the city limits generally correspond to the City of Loyalton Water District's boundary. All communities within the Subbasin are stated to be disadvantaged communities[47] and groundwater-dependent to some extent.[48] Water sources for the basin are both surface water and groundwater, with groundwater making up 36 percent of total water supply for the Subbasin.[49] The primary existing land use stated in the GSP s agriculture/cropland and grazing, with the majority of crops being pasture or production of hay.[50]

The GSP describes multiple water resource monitoring programs, such as groundwater conditions studies, groundwater level monitoring, agricultural groundwater extraction monitoring, stream and channel surface water flow monitoring, and water quality monitoring.[51] Proposed improvements and incorporation of these programs into the Plan

[44] Sierra Valley GSP, Section 2.1.1.2, p. 54.
[45] Sierra Valley GSP, Section 2.1.1, p. 40.
[46] Sierra Valley GSP, Section 2.2.4, p. 188.
[47] Sierra Valley GSP, Section 2.1.5, p. 67.
[48] Sierra Valley GSP, Section 2.1.1, p. 40.
[49] Sierra Valley GSP, Section 2.1.1.4, p. 56.
[50] Sierra Valley GSP, Section 2.1.1.4, p. 56.
[51] Sierra Valley GSP, Section 2.1.2.1, p. 57.

are also discussed.[52] The GSP states that agricultural groundwater extraction rates have been metered since 1989.[53]

The GSP describes several water resource management programs including surface water rights allocation management/tracking by the area Water Master, waterway preservation/restoration efforts by the Sierra Valley Resource Conservation District, and groundwater management by Sierra Valley Groundwater Management District. [54] Conjunctive use is stated to play a role in the Subbasin by "optimizing management/use of water resources to maximize surface water use for irrigation, as water rights allow, and switch to supplement with groundwater irrigation only as needed".[55] Existing conjunctive use programs also include reuse of treated wastewater from the Loyalton wastewater treatment system for irrigation and construction of ponds for recharge. The GSP states that over GSP implementation the GSAs will strive to optimize conjunctive use programs to maximize groundwater recharge and minimize agricultural demand on groundwater.[56]

Beneficial uses listed include water supplies such as domestic, municipal, agricultural, industrial service and process, environmental, interconnected surface water, and "other". Beneficial users are identified as domestic well owners, municipal well operators, public water systems, agricultural users, industrial operations, environmental users, groundwater dependent ecosystems, interconnected surface water users, California Native American Tribes, land use and water managers, and watershed systems.[57]

The GSP's discussion and presentation of administrative information covers the specific items listed in the GSP Regulations in an understandable format using appropriate detail. Department staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the quality, data, and discussion of this subject in the GSP. The administrative information included in the Plan substantially complies with the requirements outlined in the GSP Regulations.

4.2 Basin Setting

GSP Regulations require information about the physical setting and characteristics of the basin and current conditions of the basin, including a hydrogeologic conceptual model; a description of historical and current groundwater conditions; and a water budget accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.[58]

[52] Sierra Valley GSP, Section 3.4, p. 224-245.
[53] Sierra Valley GSP, Section 2.1.2.1.3, p. 58.
[54] Sierra Valley GSP, Section 2.1.2.2, p. 59.
[55] Sierra Valley GSP, Section 2.1.2.3, p. 60.
[56] Sierra Valley GSP, Section 2.1.2.3, p. 60.
[57] Sierra Valley GSP, Table 2.1.5-1, pp. 68-69.
[58] 23 CCR § 354.12.

4.2.1 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model is a non-numerical model of the physical setting, characteristics, and processes that govern groundwater occurrence within a basin, and represents a local agency's understanding of the geology and hydrology of the basin that support the geologic assumptions used in developing mathematical models, such as those that allow for quantification of the water budget.[59] The GSP Regulations require a descriptive hydrogeologic conceptual model that includes a written description of geologic conditions, supported by cross sections and maps,[60] and includes a description of basin boundaries and the bottom of the basin,[61] principal aquifers and aquitards,[62] and data gaps.[63]

As described in the Plan, the Sierra Valley Subbasin is part of a dropped down fault block surrounded by uplifted mountains with a complex history of volcanism, rifting, faulting and deposition.[64] The GSP describes lateral basin boundaries as the contact between the basin fill and adjacent bedrock created by deposition or faulting.[65] Several fault zones dissect the basin, acting as a barrier to groundwater flow in most areas, but also as a conduit in some.[66]

The GSP indicates that geophysical surveys were used to define the depth to granitic and metamorphic bedrock and identify locations of major faults. The results of the survey produced an insight to the variable depths to the contact between the bedrock and overlying basin sediment. It was found that the thickness of sediment ranges from 800 feet to 2,000 feet below ground surface with the deepest location of the sediments found in the central portion Subbasin and decreasing to a few hundred feet in depth toward the periphery of the basin.[67] The underlying bedrock unit is considered impermeable relative to the basin fill sediments and the contact between the basin fill unit and bedrock unit is considered to represent the valley floor.[68]

Although the GSP does not provide geologic formation names, it identifies two hydrostratigraphic units referred to as the "basin fill unit" and "bedrock unit." The basin fill unit contains the primary water-bearing formations in Sierra Valley Subbasin and includes Holocene sedimentary deposits, Pleistocene Lake deposits, and Pleistocene lava flows. Fine-grained sediments generally dominate the central portion of the groundwater basin,

[59] DWR Best Management Practices for the Sustainable Management of Groundwater: Hydrogeologic Conceptual Model, December 2016: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-3-Hydrogeologic-Conceptual-Model_ay_19.pdf.
[60] 23 CCR §§ 354.14 (a), 354.14 (c).
[61] 23 CCR §§ 354.14 (b)(2-3).
[62] 23 CCR § 354.14 (b)(4) *et seq.*
[63] 23 CCR § 354.14 (b)(5).
[64] Sierra Valley GSP, Section 2.2.1.5, p. 89.
[65] Sierra Valley GSP, Section 2.2.1.6, p. 97.
[66] Sierra Valley GSP, Section 2.2.1.5, pp. 89-94.
[67] Sierra Valley GSP, Section 2.2.1.6, p. 94-97.
[68] Sierra Valley GSP, Section 2.2.1.6, p. 97-98.

whereas coarse-grained sediments are found along the margins of the valley and represent the former lake shoreline.[69] The bedrock unit underlying the basin fill unit is characterized by secondary (fracture) permeability and porosity. Pumping data from supply wells completed in the bedrock unit generally show hydraulic conductivity to be about three orders of magnitude smaller than in the overlying basin fill unit.[70]

Hydrologically, the GSP indicates that the basin fill unit acts as a single aquifer based on comparisons of groundwater elevation data, temperature, and water chemistry data.[71] Parts of a deep aquifer zone may be pressurized by low permeability confining layers, although the lateral and vertical extent and isolation between shallow and deep aquifer zones likely vary throughout the Sierra Valley Subbasin.[72] The Sierra Valley Hydrogeologic System Model (SVHSM) presents the single-aquifer basin using twelve hydrogeologically connected stratigraphic layers with the bedrock unit contact serving as the bottom of the basin.[73]

Department staff note that the GSP contains some conflicting information about whether the basin fill unit and the bedrock unit should be categorized as a single aquifer unit. Specifically, information contained in the water budget separate the basin fill unit into an eastside and westside area because faults hydrogeologically separate these areas of the basin.[74] Additionally, pumping data from supply wells completed in the bedrock unit generally show hydraulic conductivity to be about three orders of magnitude smaller than the basin fill unit. Department staff believe understanding the basin fill unit and bedrock unit is critical to successfully managing the Subbasin. Further, inappropriately combining separate and distinct aquifer systems into one uniform system for management will likely reduce the GSA's ability to effectively manage the Subbasin. Given the information provided in the GSP, the east and westsides of the basin fill unit, as well as bedrock unit, may have significantly different hydrogeologic characteristics that could require different approaches for management. Department staff recommend the GSA investigate the basin fill unit and bedrock unit and identify the appropriate principal aquifer(s) for the Subbasin (see Recommended Corrective Action 1).

The GSP states that the basin fill unit characterization is based on five pumping tests that provide a hydraulic conductivity range of 36 to 69 gallons per day per square feet (gpd/ft^2) and an outlier of 375 gpd/ft^2. Only two estimates of storativity were provided due to a lack of monitoring wells in proximity of pumping wells.[75] Bedrock hydrologic conductivity was calculated for fourteen wells and the results range from 0.1 to 30.7 gpd/ft^2.[76] Department staff note that the GSP does not reference the locations of the wells used to estimate

[69] Sierra Valley GSP, Section 2.2.1.6, p. 97.
[70] Sierra Valley GSP, Section 2.2.1.6, p. 98.
[71] Sierra Valley GSP, Section 2.2.1.6, p. 95.
[72] Sierra Valley GSP, Section 2.2.1.6, p. 97.
[73] Sierra Valley GSP, Appendix 2-7, pp. 601-622.
[74] Sierra Valley GSP, Section 2.2.3.3, p. 164.
[75] Sierra Valley GSP, Section 2.2.1.6, p. 97 and Table 2.2.1-3, p. 98.
[76] Sierra Valley GSP, Section 2.2.1.6, Table 2.2.1-4, p. 99.

aquifer properties, making it difficult to determine if the data are sufficient to characterize the basin fill unit's aquifer characteristics. Given the spatial variability of faults, fine-grained deposits potentially acting as local confining units, and thermal zones potentially lithifying sediments in local areas, physical parameters such as hydraulic conductivity and storativity may be highly variable across the basin.

The GSP identifies several structural elements restricting groundwater flow in the Sierra Valley Subbasin: the northwest-trending Grizzly Valley Fault Zone acts as a groundwater barrier as evidenced by numerous springs along fault traces and changes in water level elevations. In the southwestern part of the basin, the Mohawk Fault Zone also acts as a barrier between the Sierra Valley Subbasin and Mohawk Valley Basin (5-011) showing a 500-foot difference in groundwater levels.[77]

The GSP states that potential data gaps exist for aquifer characterization, structure, hydrogeologic and transport properties and for better delineation of fine-grained deposits that act as localized confining zones in the aquifer.[78] The GSP states that the GSA intends to perform studies that would provide robust aquifer characterization analysis by coordinating parties that have large-capacity wells and collecting static water levels of the pumping well(s), nearby wells, spring discharge measurements of nearby springs, and upstream and downstream flow measurements of nearby streams before, during and after pumping. Based on the GSP's proposed plan to overcome this data gap, the timing of these studies is contingent upon installation of future monitoring wells to prioritize areas with limited subsurface characterization.[79] Department staff note the fact there is uncertainty surrounding aspects of the hydrogeologic conceptual model, specifically the definition of principal aquifers, is understandable considering the large expansion of the Basin in 2018; however, given the importance of refining the hydrogeologic conceptual model to understand primary aquifer extent and physical characteristics, Department staff encourage the GSA to prioritize filling this data gap with the required monitoring well installation and pump test data collection.

Although a recommended corrective action was identified, the Plan's descriptions of the regional geologic setting, the Plan area's physical characteristics, the identification of the principal aquifer, and hydrogeologic conceptual model appear to utilize the best available science. Department staff are aware of no significant inconsistencies or contrary technical information to that presented in the Plan. The corrective action to better understand the aquifer units in the Subbasin does not preclude plan approval as uncertainty within the hydrogeologic conceptual model is common during plan implementation. The GSA should work to address this and other data gaps that have been identified during future plan evaluations.

[77] Sierra Valley GSP, Section 2.2.1.6, pp. 95-98.
[78] Sierra Valley GSP, Appendix 2-5, pp. 520-521.
[79] Sierra Valley GSP, Appendix 2-5, Table 2, p. 520.

4.2.2 Groundwater Conditions

The GSP Regulations require a written description of historical and current groundwater conditions for each of the applicable sustainability indicators and groundwater dependent ecosystems that includes the following: groundwater elevation contour maps and hydrographs,[80] a graph depicting change in groundwater storage,[81] maps and cross-sections of the seawater intrusion front,[82] maps of groundwater contamination sites and plumes,[83] maps depicting total subsidence,[84] identification of interconnected surface water systems and an estimate of the quantity and timing of depletions of those systems,[85] and identification of groundwater dependent ecosystems.[86]

The groundwater conditions described in the GSP are reflective of the entirety of the Sierra Valley Basin, which includes the Sierra Valley Subbasin and the Chilcoot Subbasin. The Chilcoot Subbasin is designated as a very low priority basin and does not have a groundwater sustainability agency established. Department staff note that groundwater level trends shown in the GSP show little to no change in groundwater levels in the Chilcoot Subbasin while some wells within the Sierra Valley Subbasin show decline.[87] While Department staff appreciate the GSA's inclusion of data from the adjacent Chilcoot Subbasin into the GSP, it is unclear how this data will be used by the GSA during plan implementation. Further, Department staff question whether including data from the Chilcoot Subbasin when analyzing Sierra Valley Subbasin may result in an inaccurate representation of groundwater conditions. Department staff recommend the GSA provide more information about how data from the adjacent Chilcoot Subbasin will be utilized during GSP implementation and analyze whether the inclusion of this data into an analysis of groundwater conditions is appropriate (see Recommended Corrective Action 2).

The GSP describes groundwater elevations as relatively stable along the periphery of the subbasin with wells in the central basin showing declining groundwater levels. A majority of the wells are described as either slightly increasing or slightly decreasing, with the wells in the central portion of the subbasin showing the greatest decline. Figure 2.2.2-1 shows groundwater level decline of up to 44 feet at Well 136, located in the northeastern portion of the basin.[88] The GSP states that wells in the eastern, and especially the north-eastern, portion of the basin experience the greatest depression over the irrigated season, while the western portion of the basin remains relatively stable.[89] The GSP provides a contour

[80] 23 CCR §§ 354.16 (a)(1-2).
[81] 23 CCR § 354.16 (b).
[82] 23 CCR § 354.16 (c).
[83] 23 CCR § 354.16 (d).
[84] 23 CCR § 354.16 (e).
[85] 23 CCR § 354.16 (f).
[86] 23 CCR § 354.16 (g).
[87] Sierra Valley GSP, Figure 2.2.2-2, p. 106.
[88] Sierra Valley GSP, Figure 2.2.2-1, p. 106.
[89] Sierra Valley GSP, Section 2.2.2.1.2, p. 106.

map for average spring conditions from 2000 to 2003.[90] The GSP provides two contour maps to show the historic groundwater level averaged over three years from 2013 to 2016.[91] The GSP also provides a dot map that depicts the annual rate of change in groundwater elevations[92], but does not provide information about what years were considered in the analysis. Department staff recommend the GSA provide more information about what years were considered when creating the annual rate of change maps in the GSP in the next periodic evaluation of the Plan.

The GSP states that the current estimated groundwater storage within the Subbasin is 22,162 thousand-acre feet (TAF), with the accessible groundwater storage estimated to be 3,100 TAF (estimated from the groundwater flow model using the simulated specific yield).[93] The GSA does not provide any information to correlate how groundwater storage may change in relation to groundwater levels changes within the Subbasin.

The GSP states that the Basin is located far from coastal areas and seawater intrusion is not a relevant sustainability indicator for the Subbasin.[94] Department staff consider the GSP's conclusion to be reasonable as the nearest coastline is more than 100 miles away from the Subbasin.

The GSP describes groundwater in the Subbasin as "generally of good quality and meets local needs for municipal, domestic, and agricultural uses."[95] The GSP states that the poorest quality groundwater is found in the central west side of the valley where thermal waters associated with faults and hot springs yield water with high concentrations of boron, fluoride, iron, and sodium. Several wells in this area also have high concentrations of arsenic and manganese.[96] Groundwater quality is stated to not be regularly monitored for water quality but that data has been collected through the California Groundwater Ambient Monitoring and Assessment (GAMA) Program since 1955. Within the Subbasin, a total of 200 wells were identified and used to characterize existing water quality based on a data screening and evaluation process that identified constituents of interest important to sustainable groundwater management.[97] Groundwater quality data were compared to the strictest value among the state and federal drinking water standards as well as state water quality objectives specified in the Water Quality Control Plan for the Central Valley Region (Basin Plan). Additional analyses such as categorization by magnitude of detection and examining changes in groundwater over time were used to

[90] Sierra Valley Subbasin GSP, Well Impact Analysis Appendix, p. 718-719.
[91] Sierra Valley GSP, Figures 2.2.2-1 and 2.2.2-2, p. 106.
[92] Sierra Valley GSP, Figure 2.2.2-1, p. 106.
[93] Sierra Valley GSP, Section 2.2.2.2, p. 108 and Table 2.2.2-1, p. 109.
[94] Sierra Valley GSP, Section 2.2.2.3, p. 109.
[95] Sierra Valley GSP, Section 2.2.2.4.1, p. 110.
[96] Sierra Valley GSP, Section 2.2.2.4.1, p. 110.
[97] Sierra Valley GSP, Section 2.2.2.4.3, p. 111.

identify the constituents of interest for Sierra Valley Subbasin, which include arsenic, boron, iron, manganese, MTBE, nitrate, pH, and total dissolved solids.[98]

The GSP states that current and historical subsidence monitoring data collected in the Subbasin show historical and likely present inelastic subsidence is occurring in the basin in areas known to have significant groundwater pumping.[99] The GSP states that the total subsidence in the basin is 0.6 +/- 0.1 over a widespread area and potentially higher in smaller areas, during the period between June 2015 to September 2019. The annual subsidence rate is estimated at up to 0.15 +/- 0.1 feet/year. [100] Figures 2.2.2-6 through 2.2.2-9 show that the subsidence has occurred in the central and northeastern portion of the subbasin.[101]

The GSP defines interconnected surface water where overlying surface water exists and groundwater was estimated to be less than 5-feet below the land surface.[102] To identify interconnected surface water, the GSP describes the methodology of first identifying the surface water features within the valley, then analyzed multiple years of data for monitoring wells and springs to generate a composite potentiometric surface of groundwater elevations. Ground surface elevation was used to get depth to groundwater and then compared to overlying surface water features.[103] Vertical gradients at seven nested monitoring wells located throughout the subbasin were used to confirm potential upwelling of deep groundwater to shallow groundwater.[104] Interconnected surface water was identified at multiple streams, shown on Figure 2.2.2-12, primarily in the western portion of the subbasin and along the basin boundaries.[105] Non-interconnected surface water was also identified as well as streams that do not have enough information, and are classified as a data gap. In general, streams in the central and eastern portions of the Sierra Valley are classified as data gaps due to the lack of shallow groundwater elevation data.[106] The Plan does not provide an estimate of the quantity and timing of depletions of interconnected surface water occurring in the subbasin due to groundwater pumping.

The Plan states that potential GDEs were identified by first assessing the USDA- Forest Service's CalVeg Landsat data, USFWS's National Wetlands Inventory, Statewide Crop Mapping, interconnected surface water and springs detailed in Section 2.2.2.6, and average depth to groundwater level measurements from 2017-2020 at less than 30 feet.[107] The Plan identified 17,581 acres, or 14 percent of the total basin area, as a potential GDE. The Plan also states that uncertainty in groundwater level measurements

[98] Sierra Valley GSP, Section 2.2.2.4.5, p. 113.
[99] Sierra Valley Subbasin GSP, Section 2.2.2.5, p. 119.
[100] Sierra Valley GSP, Section 2.2.2.5.2, p. 119-120.
[101] Sierra Valley GSP, Figures 2.2.2-6-2.2.2-9, pp. 121-124.
[102] Sierra Valley GSP, Section 2.2.2.6, p. 125.
[103] Sierra Valley GSP, Section 2.2.2.6, p. 125.
[104] Sierra Valley GSP, Section 2.2.2.6.4, pp. 126-127.
[105] Sierra Valley GSP, Figure 2.2.2-12, p. 130.
[106] Sierra Valley GSP, Section 2.2.2.6.5, p. 129.
[107] Sierra Valley GSP, Section 2.2.2.7.1.1, p. 131-132.

is high and up to 9,500 acres could be reclassified as likely GDEs if groundwater elevation uncertainty decreased. The Plan also notes that shallow groundwater monitoring well data are needed to reduce depth to water assessments. [108] The GSP states that the lack of sufficient detail in vegetation mapping to determine rooting depth and the lack of shallow groundwater elevation near GDEs are data gaps.[109]

Although a recommended corrective action is identified, the Plan sufficiently describes the historical and current groundwater conditions related to chronic lowering of groundwater level, change in storage, seawater intrusion, and land subsidence throughout the Plan area and the information included in the Plan substantially complies with the requirements outlined in the GSP Regulations. However, more information is required to fully understand groundwater conditions related to degraded water quality, depletions of interconnected surface water, and GDEs in the Plan area as discussed above.

4.2.3 Water Budget

GSP Regulations require 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,[110] and the sustainable yield.[111]

The GSP uses the Sierra Valley Hydrogeologic System Model (SVHSM) for the historical, current, and project water budgets. The SVHSM includes three sub models: (1) the PRMS model for the upper watershed rainfall-runoff modeling; (2) the SWBM for valley floor soil water balance; and (3) MODFLOW for valley floor groundwater and surface water flows. The model coupling among sub models is that PRMS provides simulated stream inflows and mountain front recharge to MODFLOW, and SWBM provides deep percolation of rainfall and applied water to MODFLOW. The GSP states that SWBM cannot simulate groundwater uptake by root zone.[112] The Subbasin water budgets are described as three component subsystems: surface water, land surface (unsaturated zone), and aquifer (groundwater/saturated zone). The GSP includes a detailed discussion and estimates of inflows and outflows to each of the subsystems, provides a historical water budget for a 15-year historical period from Water Years (WY) 2001 through 2015,[113] and provides a water year type associated with the annual supply, demand, and change in groundwater stored. The water year type classification follows Sacramento Valley water year index provided by the Department.[114]

[108] Sierra Valley GSP, Section 2.2.2.7.2, p. 134-135.
[109] Sierra Valley GSP, Appendix 2-5, p. 516.
[110] 23 CCR §§ 354.18 (a), 354.18 (c) *et seq*.
[111] 23 CCR § 354.18 (b)(7).
[112] Sierra Valley GSP, Appendix 2-7, p. 623.
[113] Sierra Valley GSP, Section 2.2.3.2, p.157.
[114] https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST

The historical surface water budget states inflows are stream flow and valley floor runoff. Outflows are stated as surface water diversions and a single stream outflow location as the Middle Fork Feather River gage near Portola (CDEC: MFP). Groundwater exchange is presented as either inflow or outflow, with inflow represented by positive values in the surface water budget and outflows represented by negative values. Department staff note there is a -3,000 acre-feet per year (AFY) of discrepancy in the historical surface water budget.[115] Department staff recommend this be verified with monthly time series data reported in the modeling appendix and corrected as more data becomes available.[116] Local imported surface water supply from the Little Truckee River is mentioned but not separately presented in the surface water budget. Surface water flows are described to vary greatly, depending on the water year type, but on average show greater inflows than outflows.[117]

The historical water budget shows greater outflow than inflow, with an average change in storage of -3,300 AFY. The GSP presents storage separately for the eastside of the subbasin and the westside of the subbasin, which are stated to be hydrogeological separated by the Loyalton and Grizzly Valley Faults. The GSP identifies overdraft conditions in the east portion of the Basin, while the westside is stated to be in dynamic equilibrium, with the eastside overdraft due to "significantly greater groundwater pumping volume that occurs on the eastside of the basin compared to the westside."[118] The GSP concludes that long term groundwater level declining in the past two decades shows a range of 1,300 to 3,000 AFY overdraft.[119]

The GSP uses the same groundwater flow model, SVHSM, to simulate current water budget conditions as the historical water budget. As a result, the current water budget inflows and outflows are the same for each subsystem as for the historical water budgets. The current water budget represents the five most recent water years, 2016 through 2020, which include two below normal, one dry, and two wet water years. The average hydrologic condition for current water budget is wetter than historical water budget period (WY2001 through WY2015), however the GSP states that the above normal or wet years have not been enough to offset historical deficit.[120] The current groundwater budget shows a change of storage of -1,300 AFY, indicating overdraft conditions.[121]

The GSP provides a projected water budget using 50-year (WY 2021-2070) simulations of historical hydrology and incorporates climate change. The groundwater flow model, SVHSM, was used for the projected water budget. The four climate scenarios are derived from the Department's climate change scenarios: 2030 and 2070 central tendency;

[115] Sierra Valley GSP, Table 2.2.3-1, p.159.
[116] Sierra Valley GSP, Appendix C, p. 698.
[117] Sierra Valley GSP, Table 2.2.3-1, p. 159.
[118] Sierra Valley GSP, Section 2.2.3.3, p. 164.
[119] Sierra Valley GSP, Section 2.2.3.6, p.186.
[120] Sierra Valley GSP, Section 2.2.3.4, p. 169.
[121] Sierra Valley GSP, Table 2.2.3-6, p. 169.

2070DEW and 2070WMW and change factors were applied to historical precipitation, reference evapotranspiration, stream flow, and air temperature. The GSP states that, in general, future climate is projected to produce greater precipitation, but with less runoff due to increased evapotranspiration. A limited discussion in the GSP of projected water demand and use indicates that the only change to future water demand is expected to be greater crop demand due to increases in evapotranspiration, resulting in projected increases of agricultural groundwater pumping, ranging from 200 AFY to 2,500 AFY in addition to the observed historical average of 8,500 AFY. Future land use patterns are expected to remain the same as those observed historically.[122] Projected surface water use is held at the historical level value (~30,000 AFY), though stream flow inflows are shown to decrease in all scenarios except 2070WMW.[123] Projected increases in recharge due to increased precipitation are stated to generally offset increased pumping demand. Long-term changes in groundwater storage are projected to be improved, ranging from -500 AFY to +100 AFY, from the -1,300 AFY by SVHSM for WY 2001-2020.[124] Department staff note the projections included on the GSP that current overdraft will be eliminated by natural changes to future conditions should be continually evaluated during plan implementation to ensure these initial assumptions are correct.

An estimate of the sustainable yield for the basin is provided in the GSP as “about 6,000-7,000 AFY”.[125] The sustainable yield estimate is based on a sensitivity analysis of the historical water budget by reducing agricultural pumping to making zero cumulative groundwater storage change. Department staff note this approach is more in line with the concept of safe yield and encourage the GSA to continuously refine the definition of sustainable yield during plan implementation.

Department staff conclude that the historical, current, and projected water budgets included in the Plan substantially comply with the requirements outlined in the GSP Regulations. The GSP provides the required historical, current, and future accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the Plan area and includes an estimate of the sustainable yield of the Plan area and projected future water demands.

4.2.4 Management Areas

The GSP Regulations provide the option for one or more management areas to be defined within a basin if the GSA has determined that the creation of the management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives, provided that undesirable results are defined consistently throughout the basin.[126]

[122] Sierra Valley GSP, Section 2.2.3.5.2, p. 173.
[123] Sierra Valley GSP, Table 2.2.3-8, p. 178.
[124] Sierra Valley GSP, Section 2.2.3.5.4, p.175.
[125] Sierra Valley GSP, Section 2.2.3.3.1, p.167.
[126] 23 CCR § 354.20.

This GSP has not defined management areas for the Subbasin.

4.3 Sustainable Management Criteria

GSP Regulations require each Plan to include a sustainability goal for the basin and to characterize and establish undesirable results, minimum thresholds, and measurable objectives for each applicable sustainability indicator, as appropriate. The GSP Regulations require each Plan to define conditions that constitute sustainable groundwater management for the basin including the process by which the GSA characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.[127]

4.3.1 Sustainability Goal

GSP Regulations require that GSAs establish a sustainability goal for the basin. The sustainability goal should be based on information provided in the GSP's basin setting and should include an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation.[128]

The GSP gives the overarching sustainability goal for groundwater management in Sierra Valley Subbasin (Subbasin) as: "To manage groundwater resources in a manner that best supports the long-term health of the people, the environment, and the economy of Sierra Valley into the future by avoiding significant and unreasonable impacts to environmental, domestic, agricultural, and industrial beneficial uses and users of groundwater."[129]

The sustainability goal is stated to be "achieved by quantifying and minimizing potential impacts to domestic, residential, agricultural, industrial, and environmental beneficial users" and by implementing projects and management actions, monitoring, and iteratively refining the GSP so that the sustainability goal is "achieved during implementation and maintained afterward."[130]

Based on review of the GSP, Department staff conclude that the GSP's discussion and presentation of information related to the Subbasin's sustainability goal covers the specific items listed in the GSP Regulations.

4.3.2 Sustainability Indicators

Sustainability indicators are defined as any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results.[131] Sustainability indicators thus correspond with the six undesirable results – chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon, significant and unreasonable reduction of groundwater storage, significant and unreasonable

[127] 23 CCR § 354.22 *et seq*.
[128] 23 CCR § 354.24.
[129] Sierra Valley GSP, Section 3.2, p. 190.
[130] Sierra Valley GSP, Section 3.2, pp. 190-191.
[131] 23 CCR § 351(ah).

seawater intrusion, significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies, land subsidence that substantially interferes with surface land uses, and depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water[132] – but refer to groundwater conditions that are not, in and of themselves, significant and unreasonable. Rather, sustainability indicators refer to the effects caused by changing groundwater conditions that are monitored, and for which criteria in the form of minimum thresholds are established by the agency to define when the effect becomes significant and unreasonable, producing an undesirable result.

GSP Regulations require that GSAs provide descriptions of undesirable results including defining what are significant and unreasonable potential effects to beneficial uses and users for each sustainability indicator.[133] GSP Regulations also require GSPs provide 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.[134]

GSP Regulations require that the description of minimum thresholds include the information and criteria relied upon to establish and justify the minimum threshold for each sustainability indicator.[135] GSAs are required to describe how conditions at minimum thresholds may affect beneficial uses and users,[136] and the relationship between the minimum thresholds for each sustainability indicator, including an explanation for how the GSA has determined conditions at each minimum threshold will avoid causing undesirable results for other sustainability indicators.[137]

GSP Regulations require that GSPs include a description of the criteria used to select measurable objectives, including interim milestones, to achieve the sustainability goal within 20 years.[138] GSP Regulations also require that the measurable objectives be established based on the same metrics and monitoring sites as those used to define minimum thresholds.[139]

The following subsections thus consolidate three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information, as presented in the Plan, pertaining to the processes and criteria relied upon to define undesirable results applicable to the Subbasin, as quantified through the establishment of minimum thresholds, are addressed for each applicable sustainability

[132] Water Code § 10721(x).
[133] 23 CCR §§ 354.26 (a), 354.26 (b)(c).
[134] 23 CCR § 354.26 (b)(2).
[135] 23 CCR § 354.28 (b)(1).
[136] 23 CCR § 354.28 (b)(4).
[137] 23 CCR § 354.28 (b)(2).
[138] 23 CCR § 354.30 (a).
[139] 23 CCR § 354.30 (b).

indicator. A submitting agency is not required to establish criteria for undesirable results that the agency can demonstrate are not present and are not likely to occur in a basin.[140]

4.3.2.1 Chronic Lowering of Groundwater Levels

In addition to components identified in 23 CCR §§ 354.28 (a-b), for the chronic lowering of groundwater, the GSP Regulations require the minimum threshold for chronic lowering of groundwater levels to be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results that is supported by information about groundwater elevation conditions and potential effects on other sustainability indicators.[141]

The GSP considers the chronic lowering of groundwater levels to be significant and unreasonable when "a significant number of private, agricultural, industrial, or municipal production wells cannot pump enough groundwater to supply beneficial uses." [142] Potential undesirable results identified by the GSAs include:

- Domestic, public, or agricultural wells going dry.
- Reduction in the pumping capacity of existing wells.
- Increase in pumping costs due to greater lift.
- Need for deeper well installations or lowering of pumps.
- Financial burden to local agricultural interests.
- Land subsidence.
- Adverse impacts to environmental uses and users, including reduced interconnected surface water (ISW) or decline of groundwater-dependent ecosystems (GDEs).

The GSP also states that undesirable results occurring as the result of groundwater level declines have been minor and manageable with the Subbasin.[143] The GSP identifies the above impacts as "potential" undesirable results and based on the definition above it is not clear to Department Staff what constitutes an undesirable result and how the GSA will determine if unreasonable impacts are being/have been experienced. Department staff note the GSA does identify an undesirable result for shallow wells while performing a well impact analysis in the GSP. For this analysis, the GSP assumes that significant and undesirable results would occur when 5 percent or more of wells of any type (domestic, agricultural, public, and industrial) are impacted.[144] Department staff note the GSA identifies 5 percent of wells being impacted as significant and recommend the GSA update the definition of undesirable results in the GSP to identify what the GSA constitutes

[140] 23 CCR § 354.26 (d).
[141] 23 CCR § 354.28(c)(1) *et seq*.
[142] Sierra Valley GSP, Section 3.3.1.1, p. 191.
[143] Sierra Valley GSP, Section 3.3.1.1, pp. 191-192.
[144] Sierra Valley GSP, Appendix 3-1, Section 1, p. 711.

as a significant number of private, agricultural, industrial, or municipal production wells (see Recommended Corrective Action 3).

The GSP defines quantitative criteria based on a number of representative monitoring sites exceeding thresholds for the identification of undesirable results occurring in the Subbasin: "Operationally, an undesirable result for the groundwater level sustainable management criteria would occur when more than 10% (4 or more of the 36 wells) of representative monitoring points for groundwater levels in the Subbasin fall below their minimum threshold for two consecutive years."[145]

According to the GSP, the following information and criteria were considered when establishing minimum thresholds for groundwater elevation: (1) feedback and input from stakeholders; (2) assessment of available historical and current groundwater level data; (3) assessment of groundwater level trends; and (4) potential impact to interconnected surface water, groundwater dependent ecosystems, and other unidentified areas.[146]

The GSP describes setting sustainable management criteria for groundwater levels by performing an iterative process involving historical analysis of groundwater level monitoring data, setting a preliminary minimum threshold, and evaluating impact on beneficial users. This process was then repeated until the projected sustainable management criteria would avoid significant and unreasonable impacts.[147] The GSP described a three-step process that was followed at each representative monitoring point: (1) linearly projecting the "January 2020 to current" trend of groundwater levels to January 2032.[148] (2) the projected water level at 2032 was then compared to lowest groundwater elevation observed after January 2015; (3) The lowest elevation of this comparison was then reduced by a buffer, which is equal to 10 percent of the January 2000 to current range of groundwater levels observed at that representative monitoring point, rounded down to the nearest integer. For wells that show an increasing groundwater level projected trend, the historical minimum level was used as the minimum threshold. The 10 percent buffer is stated to allow for operational flexibility to account for potential extreme climate conditions and accommodate practicable triggers.[149] Department staff note that Figure 3.3.1-1[150], showing an example hydrograph and graphical representation of this projection, shows a linear trend identified and projected for data ranging between 2000 and 2020. This is inconsistent with the descriptive text, which states "January 2020 to current".[151] Department staff interpret this as an error in the descriptive text that should be updated.

[145] Sierra Valley GSP, Section 3.3.1.1.1, p. 192.
[146] Sierra Valley GSP, Section 3.3.1.4, pp. 193-194.
[147] Sierra Valley GSP, Section 3.3.1.4, p. 195.
[148] Sierra Valley GSP, Section 3.3.1.4, p. 194.
[149] Sierra Valley GSP, Section 3.3.1.4, p. 194.
[150] Sierra Valley GSP, Figure 3.3.1-1, p. 196.
[151] Sierra Valley GSP, Section 3.3.1.4, p. 194.

After a preliminary minimum threshold was obtained using the process summarized above, it was assessed in terms of potential impact to beneficial users including shallow wells (e.g., domestic, public, agricultural, and industrial), groundwater dependent ecosystems, and interconnected surface water.[152] The GSA analyzed the impact to shallow wells at the proposed minimum thresholds through a well impact analysis.[153] The well impact analysis states there is a lack of well census for domestic wells but approximates the number of active wells in the Subbasin (accounting for ageing and well retirement) using the best available data (well counts provided in the online well completion report database) as: domestic – 325 to 450, agricultural – 57 to 61, public – 14 to 21, and industrial – one. The analysis states that during the 2012-2016 drought, which includes a "[modern] historic low" in the Sierra Valley Subbasin, no wells were reported dry; therefore, a return to 2015 fall low groundwater levels would not cause widespread and catastrophic well failure in the Sierra Valley Subbasin.[154] Groundwater level data from spring 2000 to fall 2020 were analyzed at biannual seasonal intervals. Data were then grouped into seasonal 4-year running seasonal means, for example, the 2000 to 2003 spring level is defined as the average of spring groundwater elevations in 2000, 2001, 2002, and 2003. Thirty-six seasonally averaged groundwater elevations conditions were generated for the period between spring 2000 to fall 2020. Ordinary kriging, a technique to create an interpolated surface from various points, was then applied to generate an interpolated groundwater level surface across the subbasin.[155]

To evaluate if a well will fail, a "critical datum" was assigned to each well, equal to 30 feet above the total completed depth. This is stated to be "roughly 3 times the height of water column required to prevent decreased well function and cavitation as calculated by Pauloo et al 2020 using standard assumptions of pumping rate, net positive suction head, barometric pressure head, vapor pressure, and frictional losses." If groundwater level scenarios imply a groundwater elevation below this critical datum, it is considered "impacted."[156] For the purposes of the study, it was assumed that significant and undesirable results would occur when 5 percent or more of wells of any type (domestic, agricultural, public, and industrial) are impacted.[157]

The average 2020 groundwater levels were considered the initial conditions, and two boundary conditions were evaluated: the Fall 2015 low and the projected minimum threshold. The difference between the initial conditions and the Fall 2015 low is described as very similar to the difference between the initial conditions and the minimum threshold. The well impact analysis found that an estimated 6 to 10 domestic wells (depending on which well retirement age was assumed – 31 years or 40 years, respectively), which is roughly 2 percent of domestic wells in the subbasin, would be impacted in the worst-case

[152] Sierra Valley GSP, Section 3.3.1.4, p. 194.
[153] Sierra Valley GSP, Appendix 3-1: Well Impact Analysis (Larry Walker Associates, 2021)
[154] Sierra Valley GSP, Appendix 3-1, Section 2, p. 712.
[155] Sierra Valley GSP, Appendix 3-1, Section 3.1, pp. 714-715.
[156] Sierra Valley GSP, Appendix 3-1, Section 3.3, pp. 715-716.
[157] Sierra Valley GSP, Appendix 3-1, Section 1, p. 711.

scenario of all representative monitoring points reaching the minimum threshold. No other well type was affected. These results are stated to be consistent with the Fall 2015 low levels, during which no wells were reported dry in Sierra Valley Subbasin.[158]

Impacts to groundwater dependent ecosystems (GDEs) were evaluated if mapped GDE polygons were identified within a 1-mile radius of the monitoring point, including polygons only partially within that radius. The Normalized Difference Vegetation Index (NDVI), which is stated to be a commonly used proxy for vegetation health in analysis of temporal trends, was also tracked and linkages between summer NDVI values and summer groundwater depth (stated to be when GDEs are most likely to use groundwater) were assessed. Because NDVI lacks species information, potential effects of minimum thresholds and measurable objectives could not be assessed using rooting depth. Impact of measurable objectives and minimum thresholds were assessed at a monitoring well if a statistically significant relationship exists between the depth to groundwater and NDVI. Groundwater level data for all available shallow wells (less than 300 feet deep) were used. Recovery of NDVI following water elevations near the minimum thresholds was investigated to ensure avoidance of negative impact. If impact was observed, the minimum thresholds were adjusted to the historic low where the impact GDEs was known. For riverine GDEs, the minimum threshold was adjusted to within 10 feet of the ground to promote interconnected surface water where reasonable.[159] Using this method, measurable objectives and minimum thresholds were adjusted at four monitoring points.

To avoid impacts to interconnected surface water (ISW), minimum thresholds near identified interconnected surface water are set to “no lower than historically observed low groundwater levels to maintain hydraulic gradients and prevent ISWs depletion that exceeds previously experienced depletion”.[160] This distance from RMPs to ISW is not specified and it is unclear to Department staff what criteria was used to determine RMP proximity to ISW. The minimum thresholds at three RMPs were adjusted using this method.[161] Minimum threshold values for each RMP are provided in Table 3.3.1-1[162] and shown on Figure 3.3.1-5.[163] The difference between fall 2015 groundwater levels and minimum thresholds is stated to vary by location and ranges from 0 to 13 feet.[164]

Although not required by the regulations, the GSP also defines “triggers” for an initial investigation that may result in management actions. The triggers are identified as when: (1) two wells fall below the minimum threshold for two consecutive years; or (2) if four wells fall below the minimum threshold in a single year. A trigger for domestic well outage reports is stated to be not defined at this time because a more robust inventory and

[158] Sierra Valley GSP, Appendix 3-1, Section 5, p. 726.
[159] Sierra Valley GSP, Section 3.3.1.4, pp. 194-195.
[160] Sierra Valley GSP, Section 3.3.1.4, pp. 195-196.
[161] Sierra Valley GSP, Section 3.3.1.4, p. 195.
[162] Sierra Valley GSP, Table 3.3.1-1, p. 200.
[163] Sierra Valley GSP, Figure 3.3.1-5, p. 201.
[164] Sierra Valley GSP, Section 3.3.1.4, p. 196.

assessment of domestic wells is needed to further assess potential impact and defining an undesirable result based on well outage reports.

General discussion of the relationship of groundwater level minimum thresholds and other sustainability indicators is provided. Groundwater level minimum thresholds are stated to be sufficiently close to historic groundwater levels, and although land subsidence has been observed in the subbasin, it is not significant or unreasonable. Thus, significant subsidence resulting from groundwater levels at the minimum threshold is not anticipated.[165]

Measurable objectives were defined as the average groundwater elevation observed between January 1, 2015 to October 2020. Interim milestones were set as five-year long intervals between the minimum threshold and measurable objective, with groundwater levels at each interim milestone moving from the minimum threshold value toward the measurable objective, with the measurable objective as the 4th and final interim milestone.[166] The path to achieve measurable objectives is identified as monitoring of groundwater levels and coordinating with agencies and stakeholders within the subbasin to implement projects and management actions. Groundwater level data will be reviewed and analyzed and information such as hydrographs will be developed to demonstrate PMAs are operating to maintain or improve groundwater level conditions and to avoid unreasonable groundwater levels.[167]

Despite the recommended corrective action, the GSP's discussion of minimum thresholds and measurable objectives for the chronic lowering of groundwater levels seems to be comprehensive and includes adequate support, justification, and information to understand the GSA's process, analysis, and rationale. Department staff find that the GSP's discussion and presentation of information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data and assumptions. Staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.2 Reduction of Groundwater Storage

In addition to components identified in 23 CCR §§ 354.28 (a-b), for the reduction of groundwater storage, the GSP Regulations require the minimum threshold for the reduction of groundwater storage to 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

[165] Sierra Valley GSP, Section 3.3.1.3, p. 193.
[166] Sierra Valley GSP, Section 3.3.1.4, p. 196.
[167] Sierra Valley GSP, Section 3.3.1.6, p. 202.

sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.[168]

The GSP identifies groundwater levels as a proxy for groundwater storage and states that therefore the sustainable management criteria are identical, including undesirable results, minimum thresholds, and measurable objectives. The GSP states that the GSAs will track and project groundwater storage with the Sierra Valley integrated hydrologic model and calibrate groundwater storage estimates based on collected data. Potential effects of reduced groundwater storage are stated to be identical to those outlined in chronic lowering of groundwater levels.[169] Department staff concur with the rationale for using groundwater levels as a proxy for groundwater storage at this time.

4.3.2.3 Seawater Intrusion

In addition to components identified in 23 CCR §§ 354.28 (a-b), for seawater intrusion, the GSP Regulations require the minimum threshold for seawater intrusion to be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.[170]

The GSP states that the subbasin is not located in a coastal area; therefore, seawater intrusion conditions are not applicable to this GSP.[171]

Given the physical setting of the Subbasin, Department staff concur with the rationale for not setting sustainable management criteria for seawater intrusion for the Basin.

4.3.2.4 Degraded Water Quality

In addition to components identified in 23 CCR §§ 354.28 (a-b), for degraded water quality, the GSP Regulations require the minimum threshold for degraded water quality to 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.[172]

Significant and unreasonable degradation of groundwater quality is defined in the GSP as the “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

[168] 23 CCR § 354.28(c)(2).
[169] Sierra Valley GSP, Section 3.3.2, p. 203.
[170] 23 CCR § 354.28(c)(3).
[171] Sierra Valley GSP, Section 2.2.2.3, p. 109.
[172] 23 CCR § 354.28(c)(4).

quality objectives."[173] Undesirable results from degraded groundwater quality of primary concern are identified as:

- 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

The GSP also states that, based on the State's 1968 antidegradation policy, water quality degradation inconsistent with the provisions of this policy is degradation determined to be significant and unreasonable.[174]

The GSP identifies eight constituents of concern in the Sierra Valley Subbasin which include nitrate, total dissolved solids (TDS), arsenic, boron, pH, iron, manganese, and methyl tert-Butyl Ether (MTBE). Sustainable management criteria are set for two constituents: nitrate and TDS. Arsenic, boron, pH, iron, and manganese were stated to be significantly impacted by natural processes and local geologic conditions that are not controllable by the GSAs through groundwater management processes.[175] MTBE has substantially diminished over the last 10 years, has no exceedances of the maximum contaminant level (MCL) between 2016 to 2020, and is associated with contaminated sites that have dedicated monitoring and cleanup; therefore, no sustainable management criteria were established.[176] The GSP states "the GSAs will monitor arsenic, boron, and pH to track any potential mobilization of elevated concentrations or exceedances of the Maximum Contaminant Levels."[177]

Operationally, undesirable results for groundwater quality are defined as "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)."[178]

The GSP states that water quality degradation is typically associated with increasing, rather than decreasing, concentration of constituents; therefore the GSA has decided to not use the term "minimum threshold" in the context of water quality, but instead use the term "maximum threshold (MT)".[179] While Department staff understand the reasoning behind using the term "maximum threshold" for groundwater quality sustainable management criteria, it is recommended to use the terminology that is identified and defined in the GSP regulations in future periodic evaluations of the Plan.[180]

[173] Sierra Valley GSP, Section 3.3.4.1, p. 210.
[174] Sierra Valley GSP, Section 3.3.4.1, p. 210.
[175] Sierra Valley GSP, Section 3.3.4, p. 210.
[176] Sierra Valley GSP, Section 3.3.4, pp. 209-210.
[177] Sierra Valley GSP, Section 3.3.4, p. 210.
[178] Sierra Valley GSP, Section 3.3.4.5, p. 214.
[179] Sierra Valley GSP, Section 3.3.4, p. 210.
[180] 23 CCR § 351(t)

The GSP describes the information and criteria considered when establishing minimum thresholds and 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). Additionally, a "network MT" was also identified, which is equal to the number of RMPs with exceedances at the time the GSP was written, identified as September 1, 2021, which is zero exceedances for nitrate and three for TDS; therefore, undesirable results for groundwater quality would occur if one RMP shows an exceedance for nitrate, or four RMPs show exceedances of TDS. The GSP also states that exceedances do not need to occur at the same RMPs. The GSP did not explain why the date of September 1, 2021 was selected and how this date compares to historical exceedances in the Subbasin.

While GSAs are not required to address undesirable results that occurred and were not corrected prior to January 1, 2015, GSAs are required to address undesirable results that occur after January 1, 2015. The GSAs use 2021 concentration data instead of 2015 concentration data as the baseline for establishing the minimum thresholds for degraded water quality, but do not explain whether the number of representative monitoring wells with constituents of concern exceeding the regulatory standard in 2021 was the same as in 2015. Department staff recommend the GSAs provide the rationale for establishing the minimum thresholds for degraded water quality based on 2021 data instead of 2015 data and describe how the 2021 conditions compare to the 2015 conditions (see Recommended Corrective Action 4).

For RMPs measured more than once per year, average concentrations will be used. The monitoring network will be assessed every 5 years for potential inclusion of new wells. The GSP states "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."[181] The GSP also states that RMPs identified for inclusion in the groundwater quality monitoring network is not finalized due to data gaps in well construction information and inadequate spatial coverage; MOs and MTs are considered interim until data gaps are filled.[182]

The GSP also identifies "triggers for action" at concentrations approaching the MT to proactively avoid the occurrence of undesirable results. If a trigger is exceeded, the GSAs will conduct an investigation and may use management actions. Minimum thresholds and triggers are provided in Table 3.3.4-1,[183] and 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).[184]

[181] Sierra Valley GSP, Section 3.3.4.5, p. 214.
[182] Sierra Valley GSP, Section 3.3.4.5, p. 215.
[183] Sierra Valley GSP, Table 3.3.4-1, p. 215.
[184] Sierra Valley GSP, Section 3.3.4.5.1, p. 215.

Under the GSP, measurable objectives are defined as "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." MO values are defined on a well-specific basis, based on historical water data.[185] MOs are based on historical data at each well:

- For wells with no historical MT exceedances: MO is the highest measured concentration during the period 1990 to July 2020.
- For wells with exceedances or concentrations greater than 90% of the MT: the MO is 90% of the MT concentration.
- For newly monitored or installed wells: the MO will be preliminarily set to the first measured concentration until more data is available to set a more informed SMC. If this concentration is greater than or equals 90% of the MT, the MO will be 90% of the MT.
- For wells that have only non-detect values for nitrate: the MO is defined as 0.05 mg/L.[186]

Measurable objectives values for each "potential" RMP are shown in Table 3.3.4-2.[187] The path to achieve groundwater quality measurable objectives is described as monitoring groundwater quality conditions and coordinating with the relevant regulatory agencies that work to maintain groundwater quality in the Subbasin. The GSP states that "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." Information such as time-series plots will be developed to demonstrate that PMAs are avoiding undesirable results for groundwater quality. The GSP states that "the GSAs may identify data gaps, seek funding, and help to implement additional studies." If a trigger or MT is exceeded, the GSAs will investigate the cause and source and may implement PMAs as appropriate. Additionally, exceedances will be referred to the Regional Board.[188]

The GSP states the goal is maintain existing groundwater quality, therefore interim milestones are 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.[189]

Although a recommended corrective action is identified, the GSP's discussion of constituents of concern in the Plan area and the degraded water quality sustainability indicator is comprehensive and includes adequate support, justification, and information

[185] Sierra Valley GSP, Section 3.3.4.6, p. 216.
[186] Sierra Valley GSP, Section 3.3.4.6.1, pp. 217-218.
[187] Sierra Valley GSP, Table 3.3.4-2, p. 218.
[188] Sierra Valley GSP, Section 3.3.4.7, p. 217.
[189] Sierra Valley GSP, Section 3.3.4.7.1, p. 219.

to understand the GSA's process, analysis, and rationale. Based on the review of the minimum thresholds and measurable objectives for degraded water quality and materials referenced in the GSP, Department staff find that the GSP's discussion and presentation of information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data and assumptions. Staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.5 Land Subsidence

In addition to components identified in 23 CCR §§ 354.28 (a-b), the GSP Regulations require the minimum threshold for land subsidence to be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.[190] Minimum thresholds for land subsidence shall be supported by 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 and maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum thresholds and measurable objectives.[191]

The GSP states that Sierra Valley has experienced land subsidence in the past and some land subsidence continues to present day. Areas of subsidence is stated to vary over time and overlap with areas of significant groundwater pumping.[192] Average annual subsidence has been estimated over the years by several sources, presented in Table 3.3.5-1, such as DWR, Plumas County, CalTrans, and NASA InSAR, and ranges from 0.05 feet per year to 0.48 feet per year.[193] Department Staff note that the average annual subsidence estimate for DWR/TRE by Altamira (2020) for the date range of March 2015 to November 2019 is stated in Table 3.3.5-1 to be "0.15 to >0.1 feet/year"; however, Department staff interpret this to be an error, meant to be "0.15 +/- 0.1 feet/year", and encourage the GSA to resolve this inconsistency in the GSP.

The GSP states that "an undesirable result occurs when subsidence substantially interferes with beneficial uses of groundwater and surface land uses."[194] Specific examples of undesirable results for subsidence are stated as substantial interference with land use, and significant damage to critical infrastructure, such as building foundations, roadways, railroads, canals, pipes, and water conveyance.[195] Department staff note the GSP lacks a clear, quantitative definition of when undesirable results for land subsidence

[190] 23 CCR § 354.28(c)(5).
[191] 23 CCR §§ 354.28(c)(5)(A-B).
[192] Sierra Valley GSP, Section 3.3.5, p. 219.
[193] Sierra Valley GSP, Table 3.3.5-1, p. 220.
[194] Sierra Valley GSP, Section 3.3.5.1, p. 220.
[195] Sierra Valley GSP, Section 3.3.5.1, pp. 220-221.

may occur or have occurred in the basin, as required by the GSP regulations[196] (see Recommended Corrective Action 5a).

The GSP states for the first five years of GSP implementation, groundwater elevations minimum thresholds will be a proxy for land subsidence minimum thresholds.[197] The GSP references a study from Poland and Davis (1969)[198] as supporting documentation of this approach. The GSP states that Poland and Davis (1969) documented the estimated 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 the worst-case scenario in which all RMPs simultaneously reach MTs, the potential range of subsidence using the ratio provided by Poland and Davis (1969) is 0 to 2.55 feet, depending on location in the Subbasin. Department staff note the study cited by the GSA was conducted nearly 50 years ago and includes a wide range of uncertainty given the ratio ranges from approximately 0.01 to 0.2 feet of subsidence per foot of groundwater level decline the use of this proxy is inappropriate. Given the GSA's proposed management strategy to lower groundwater levels below historic lows and the history of land subsidence in the subbasin, Department staff recommend the GSA establish sustainable management criteria for the Subbasin utilizing a monitoring network that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations (see Recommended Corrective Action 5b).

The GSP states that subsidence will be monitored by the GSAs annually using InSAR data and four subsidence monument sites will be installed in areas prone to subsidence and surveyed every 5 years. And that additional surveys will be conducted if InSAR subsidence increases by 50% of the average annual subsidence from baseline period (2015-2019).[199] However, the GSP also states that "although InSAR satellite-based measures of land subsidence are available for the Sierra Valley Subbasin, these dates are relatively recent, do not show long-term trends, and indicate total subsidence which represent a combination of elastic and inelastic subsidence." Adequate, subbasin-specific information is described as lacking.[200] The GSP then states "within the first five years, 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."[201] Based on this seemingly conflicting information, it is unclear to Department staff if the annual monitoring of TRE Altamira InSAR data will be conducted during the first 5 years of implementation, in addition to using groundwater levels as a proxy. Department staff consider the publicly

[196] 23 CCR § 354.26 (b)(2)
[197] Sierra Valley GSP, Section 3.3.5.4, p. 223.
[198] Sierra Valley GSP, References, p. 317.
[199] Sierra Valley GSP, Section 3.3.5.4, p. 222.
[200] Sierra Valley GSP, Section 3.3.5.4, p. 222.
[201] Sierra Valley GSP, Section 3.3.5.4, p. 223.

available TRE Altamira InSAR Dataset[202], which is updated quarterly, to be the best available data for land subsidence currently in the Sierra Valley Subbasin and encourage the GSAs to utilize this resource for monitoring of land subsidence in the first 5 years of implementation and beyond.

The GSP identifies potential effects of land subsidence undesirable results on beneficial uses and users of groundwater as:

- "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)."[203]

The GSP describes the relationship of subsidence undesirable results to other sustainability indicators. However, the GSP lacks discussion of the connection between inelastic land subsidence occurrence and the potential permanent loss in groundwater storage that can result.[204]

The GSP identifies groundwater level measurable objectives and interim milestones as proxies for the land subsidence measurable objectives and interim milestones. The path to achieve measurable objectives is described as continued monitoring of groundwater elevation combined with InSAR and ground-based elevation surveys to measure progress. As noted previously, Department staff are unclear as to when InSAR and ground-based elevation surveys will be utilized in implementation. The GSP states that the GSAs will coordinate with relevant stakeholders to determine impacts to beneficial users and uses and adaptively management groundwater pumping to avoid significant and unreasonable impacts.[205]

Although recommended corrective actions are identified, the GSP's discussion of land subsidence includes adequate support, justification, and information to understand the GSA's process, analysis, and rationale. Based on review of the sustainable management criteria established for land subsidence and materials referenced in the GSP, Department staff find that the GSP's discussion and presentation of information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data

[202] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub
[203] Sierra Valley GSP, Section 3.3.5.2, p. 221.
[204] Sierra Valley GSP, Section 3.3.5.3, p. 221.
[205] Sierra Valley GSP, Section 3.3.5.7, p. 224.

and assumptions. Department staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.6 Depletions of Interconnected Surface Water

SGMA defines undesirable results for the depletion of interconnected surface water as those that have significant and unreasonable adverse impacts on beneficial uses of surface water and are caused by groundwater conditions occurring throughout the basin.[206] The GSP Regulations require that a Plan identify the presence of interconnected surface water systems in the basin and estimate the quantity and timing of depletions of those systems.[207] The GSP Regulations further require that minimum thresholds be set based on the rate or volume of surface water depletions caused by groundwater use, supported by information including the location, quantity, and timing of depletions, that adversely impact beneficial uses of the surface water and may lead to undesirable results.[208]

The Plan acknowledges the presence of interconnected surface waters in the Subbasin and identifies their location where overlying surface water exists and groundwater was estimated to be less than 5-feet below the land surface.[209] Department staff are satisfied that the GSAs have adopted a reasonable approach to identify the location of interconnected surface waters in the Subbasin.

The GSP does not quantify the rate or volume of surface water depletions due to groundwater pumping as the sustainable management criteria as required by the GSP Regulations.[210] The GSP states that depletion of ISW as a volume or rate is difficult in the Sierra Valley Subbasin due to: (1) lacking groundwater monitoring data; (2) no continuous streamflow or stage gages; and (3) the data that is collected by the Watermaster is discontinuous and only done in preparation for the irrigation season. The Sierra Valley integrated surface water-groundwater model is stated to be in development and will provide estimation of ISW depletion. In the absence of the model, the GSP instead proposes the use of groundwater elevations as a proxy for ISW depletion. Minimum thresholds for groundwater elevations are set near ISWs and GDEs to maintain groundwater levels no lower than historically observed lows, which is the lowest value recorded since January 2000.[211] The adjustment of groundwater elevation minimum thresholds is further described in Section 3.3.1.4.[212] RMPs associated with GDEs and ISW are identified in Table 3.3.3-1[213] and shown on Figure 3.3.3-1.[214] Additional details

[206] Water Code § 10721(x)(6).
[207] 23 CCR § 354.16 (f).
[208] 23 CCR § 354.28 (c)(6).
[209] Sierra Valley GSP, Section 2.2.2.6, p. 125.
[210] 23 CCR § 354.28 (c)(6).
[211] Sierra Valley GSP, Section 3.3.3.4.1, pp. 205-206.
[212] Sierra Valley GSP, Section 3.3.1.4, pp. 193-196.
[213] Sierra Valley GSP, Table 3.3.3-1, p. 206.
[214] Sierra Valley GSP, Figure 3.3.3-1, p. 207.

for determining which RMPs are considered "near" ISWs, such as a distance, depth, or other qualifying criteria, were not provided and should be added to the GSP. As a result, the GSA has not demonstrated by adequate evidence that groundwater elevation can serve as a sustainability indicator for the depletion of interconnected surface water.

The GSP states that depletion of interconnected surface water (ISW) is related to the chronic lowering of groundwater levels via changes in the hydraulic gradient. "Significant and unreasonable depletion of interconnected surface water 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." The GSP states that in the absence of conclusive modeling, it conservatively assumes that ISW depletion is occurring based on groundwater level declines near ISWs, but that this depletion does not appear to be significant or unreasonable. The management objective is to maintain groundwater levels near ISWs at historic levels to maintain hydraulic gradients and protect against unexperienced effects of ISW depletion in the Subbasin.[215]

The GSP states that measurable objectives for ISW depletion are consistent with groundwater elevation measurable objectives; thus, are based on the mean of current (2015 to 2021) groundwater conditions in the Subbasin at each RMP.[216] The path to measurable objectives is stated to be achieved 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).[217] Interim milestones are stated to be consistent with groundwater level interim milestones.[218]

Department staff understand that quantifying depletions of surface water from groundwater extractions is a complex task that likely requires developing new, specialized tools, models, and methods to understand local hydrogeologic conditions, interactions, and responses. During the initial review of GSPs, Department staff have observed that most GSAs have struggled with this new requirement of SGMA. However, staff believe that most GSAs will more fully comply with regulatory requirements after several years of Plan implementation that includes projects and management actions to address the data gaps and other issues necessary to understand, quantify, and manage depletions of interconnected surface waters. Accordingly, Department staff believes that affording GSAs adequate time to refine their Plans to address interconnected surface waters is appropriate and remains consistent with SGMA's timelines and local control preferences.

The Department will continue to support GSAs in this regard by providing, as appropriate, financial and technical assistance to GSAs, including the development of guidance

[215] Sierra Valley GSP, Section 3.3.3.1, p. 204.
[216] Sierra Valley GSP, Section 3.3.35, p. 208.
[217] Sierra Valley GSP, Section 3.3.3.6, p. 209.
[218] Sierra Valley GSP, Section 3.3.3.7, p. 209.

describing appropriate methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water caused by groundwater extractions. Once the Department's guidance related to depletions of interconnected surface water is publicly available, the GSA, where applicable, should consider incorporating appropriate guidance approaches into their future periodic updates to the GSP (see Recommended Corrective Action 6a). GSAs should consider availing themselves of the Department's financial or technical assistance, but in any event must continue to fill data gaps, collect additional monitoring data, and implement strategies to better understand and manage depletions of interconnected surface water caused by groundwater extractions and define segments of interconnectivity and timing within their jurisdictional area (see Recommended Corrective Action 6b). Furthermore, GSAs should coordinate with local, state, and federal resources agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion (see Recommended Corrective Action 6c).

4.4 Monitoring Network

The GSP Regulations describe the monitoring network that must be developed for each sustainability indicator including monitoring objectives, monitoring protocols, and data reporting requirements. Collecting monitoring data of a sufficient quality and quantity is necessary for the successful implementation of a groundwater sustainability plan. The GSP Regulations require a monitoring network 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.[219] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[220] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[221] capture seasonal low and high conditions,[222] include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[223] Department staff encourage GSAs to collect monitoring data as specified in the GSP, follow SGMA data and reporting standards,[224] fill data gaps identified in the GSP prior to the first periodic update,[225] update monitoring network information as needed, follow monitoring best management practices,[226] and submit all monitoring data to the Department's Monitoring Network Module immediately after collection including any additional groundwater monitoring data that is collected within the Plan area that is used for groundwater management decisions. Department staff note that if GSAs do not fill their identified data

[219] 23 CCR § 354.32.
[220] 23 CCR § 354.34(b)(2).
[221] 23 CCR § 354.34(b)(3).
[222] 23 CCR § 354.34(c)(1)(B).
[223] 23 CCR §§ 354.34(g-h).
[224] 23 CCR § 352.4 *et seq*.
[225] 23 CCR § 354.38(d).
[226] Department of Water Resources, 2016, Best Management Practices and Guidance Documents.

gaps, the GSA's basin understanding may not represent the best available science for use to monitor basin conditions.

The GSP describes monitoring networks for the five sustainability indicators relevant to the Subbasin: chronic lowering of groundwater levels, reduction in groundwater storage, degraded water quality, land subsidence, and depletions of interconnected surface water. As previously stated in the discussion of the Hydrogeologic Conceptual Model (Section 4.2.1), it is unclear to Department staff whether it is appropriate to manage and monitor the basin fill and bedrock units within the subbasin as a single aquifer given the hydrogeologic properties of the subbasin. Department staff encourage the GSA to reevaluate whether the proposed monitoring network is appropriate as the data gaps related to the hydrogeologic conceptual model as filled.

The GSP notes that 36 Representative Monitoring Point (RMP) wells are identified for inclusion in the SGMA Monitoring Network the chronic lowering of groundwater levels sustainability indicator.[227] Department staff note inconsistency in the GSP with respect to the number of RMPs, with 37 wells listed in Table 3.3.1-1[228] and only 27 wells are shown in Figure 3.4.1-1.[229] The GSP shows that at least four of the 36 monitoring wells are located within Chilcoot Subbasin and not within the Sierra Valley Subbasin.[230] Including groundwater level monitoring wells located in the Chilcoot Subbasin as a part of the Sierra Valley Subbasin monitoring network may result in trends that do not accurately represent conditions in the Sierra Valley Subbasin. Additionally, no construction information is provided for any of the wells, and it is unclear what depths of the aquifer the wells are monitoring. Given the previously described data gaps in basin fill hydrogeology and varying hydrogeology throughout the subbasin, well construction information for all wells that are used for monitoring is necessary to confirm sufficient density in depth-discrete intervals to collect representative measurements to characterize the groundwater table in this Subbasin, as required by the GSP regulations[231] (see Recommended Corrective Action 7a).

The proposed frequency for collecting groundwater level measurements is at least biannually, in spring (mid-March) and fall (mid-October).[232] The GSP calculates the density of monitoring wells in the stated single principal aquifer as 36 wells per 195.1 square miles in the Basin.[233] This equates to a density of approximately 18 wells per 100 square miles, which is a greater density than the range (0.2 – 10 wells per 100 square miles) recommended by the Department's Best Management Practices.[234]

[227] Sierra Valley Subbasin GSP, Section 3.4.1.1., pp. 227-228, and Table 3.4.1-1, p. 227.
[228] Sierra Valley Subbasin GSP, Table 3.3.1-1, pp. 200-201.
[229] Sierra Valley Subbasin GSP, Figure 3.4.1-1, p. 229.
[230] Sierra Valley Subbasin GSP, Figure 3.4.1-1, p. 229.
[231] 23 CCR § 354.34(c)(1)(A).
[232] Sierra Valley Subbasin GSP, Section 3.4.1.1., pp. 227-228, and Table 3.4.1-1, p. 227.
[233] Sierra Valley Subbasin GSP, Section 3.4.1.1., pp. 227-228, and Table 3.4.1-1, p. 227.
[234] Department of Water Resources, 2016, Monitoring Networks and Identification of Data Gaps BMP.

The GSP proposes to use the 36 RMP wells defined for the groundwater level monitoring network as a proxy for the groundwater storage monitoring network because changes in groundwater storage are directly dependent on changes in groundwater levels.[235] Department staff determine the utilization of the groundwater level monitoring network as a proxy for the groundwater storage network is reasonable; however, as stated previously for this Subbasin, the inclusion of monitoring wells located within the Chilcoot Subbasin in the Sierra Valley Subbasin monitoring network, may not provide an accurate representation of the conditions within the Sierra Valley Subbasin.

The GSP proposes to establish a monitoring network for degraded water quality by reviewing water quality data from wells within the State Water Resource Control Board's California Groundwater Ambient Monitoring and Assessment (GAMA) Program Database, community volunteer wells, and a well that the GSA expects will be drilled by DWR in the future.[236] The GSP states that sustainable management criteria have been defined for nitrate and total dissolved solids (TDS)[237] and that samples for nitrate, TDS, arsenic, boron, and pH will be collected at least once every three years.[238] The total number of wells to be monitored is unclear. The GSP states there are 17 "potential" GAMA well sites[239] and 8 "potential" community volunteer well sites.[240] Department staff interpret the use of the term "potential" to mean that the sites are not yet defined, and the number of sites monitored may be different than what is described in the GSP. Department staff note the frequency of monitoring for the groundwater quality monitoring network may not be sufficient to demonstrate short-term and seasonal trends in groundwater conditions or monitor impacts to beneficial uses and users of groundwater and the GSP does not report, in tabular format, the monitoring site type or measurement frequency for the degraded water quality monitoring network as required by the GSP Regulations.[241] Providing this information will provide the Department additional clarity on how other water quality programs are being leveraged by the Basin to comply with the requirements of the GSP Regulations and SGMA (see Recommended Corrective Action 7b).

The GSP proposes to use the groundwater level monitoring network as a proxy for the land subsidence monitoring network. [242] The GSP notes that "throughout the GSP implementation period, the relationship between the change in groundwater levels and the change in the amount of land subsidence (factoring in that total land subsidence is a composite of elastic and inelastic land subsidence) will be developed."[243] The GSP notes that InSAR and ground-based elevation surveys will augment groundwater elevation

[235] Sierra Valley Subbasin GSP, Section 3.3.2, p. 203 and Section3.4.1.2, p. 231.
[236] Sierra Valley Subbasin GSP, Section 3.4.1.3, pp. 231-232.
[237] Sierra Valley Subbasin GSP, Section 3.3.4, pp. 209-210.
[238] Sierra Valley Subbasin GSP, Section 3.4.1.3, pp. 231-232.
[239] Sierra Valley Subbasin GSP, Section 3.4.1.3, pp. 231-232, Table 3.3.4-2, p. 218, and Table 3.4.1-2, p. 233.
[240] Sierra Valley Subbasin GSP, Table 3.3.4-2, p. 218 and Figure 3.4.1-2, p. 234.
[241] 23 CCR § 354.34 (h).
[242] Sierra Valley Subbasin GSP, Section 3.4.1.5.3, p. 241.
[243] Sierra Valley Subbasin GSP, Section 3.4.1.5, p. 240.

measurements and contribute towards an improved understanding of land subsidence in the basin. [244] The GSP states that InSAR data provided by DWR will be monitored annually to characterize current land subsidence conditions in the Subbasin[245]. The GSP notes that four monument-based land surface elevation stations will be installed within the area of known subsidence, as defined by DWR's InSAR data. Monument elevations will be used to gauge the accuracy of future InSAR data processing and to calibrate the InSAR data, if needed, but it is stated that the monuments will only be surveyed if the InSAR data show anomalies. [246]

Department staff have determined that the utilization of the groundwater level monitoring network as a proxy for the land subsidence monitoring network is not appropriate given the history of land subsidence in the subbasin and the GSA's proposed management to lower groundwater levels below historic low levels as discussed in Section 4.3.2.5. Department staff recommend the GSA establish monitoring for land subsidence utilizing a method that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations (see Recommended Corrective Action 7c).

The GSP proposes to use the groundwater level monitoring network as a proxy for the depletions of interconnected surface water monitoring network because stage data are not currently being collected and changes in the depletions of interconnected surface water are directly dependent on changes in groundwater levels. The GSP has identified 13 shallow monitoring wells in the vicinity of streams or creeks to include in the depletions of interconnected surface water monitoring network. [247] All but two of the shallow groundwater wells are also included in the depletion of groundwater levels monitoring network. [248] The GSP notes that the absence of near-continuous streamflow gaging stations to represent direct measurement of streamflow changes due to pumping. The GSP states that additional stream stage and flow gages will be installed based on specific needs and funding availability and describes the location of 12 proposed stream stage gages and coupled groundwater wells[249] and nine proposed streamflow gages. [250] This GSP also notes a proposed upgrade to continuous streamflow monitoring to existing DWR streamflow monitoring. [251]

While one or more recommended corrective actions are identified, the description of the monitoring network included in the Plan substantially complies with the requirements outlined in the GSP Regulations. Overall, the Plan describes in sufficient detail a monitoring network that promotes the collection of data of sufficient quality, frequency,

[244] Sierra Valley Subbasin GSP, Section 3.4.1.5.3, p. 241.
[245] Sierra Valley GSP, Section 3.3.5.4, p. 222.
[246] Sierra Valley Subbasin GSP, Section 3.4.1.5.1, p. 240-241.
[247] Sierra Valley Subbasin GSP, Section 3.4.1.4, p. 236 and Figure 3.4.1-3, p. 239.
[248] Sierra Valley Subbasin GSP, Section 3.3.3.4.1, p. 206.
[249] Sierra Valley Subbasin GSP, Table 3.4.1-3, p. 237.
[250] Sierra Valley Subbasin GSP, Table 3.4.1-4, p. 238.
[251] Sierra Valley Subbasin GSP, Section 3.4.1.4, p. 236.

and distribution to characterize groundwater and related surface water conditions in the Plan area and evaluate changing conditions that occur through Plan implementation. The GSP provides a good explanation for the conclusion that the monitoring network is supported by the best available information and data and is designed to ensure adequate coverage of sustainability indicators. The Plan also describes existing data gaps and the steps that will be taken to fill data gaps and improve the monitoring network. Department staff consider the information presented in the Plan to satisfy the general requirements of the GSP Regulations regarding monitoring network.

4.5 PROJECTS AND MANAGEMENT ACTIONS

The GSP Regulations require a description of the projects and management actions the submitting Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.[252] Each Plan's description of projects and management actions must include details such as: how projects and management actions in the GSP will achieve sustainability, the implementation process and expected benefits, and prioritization and criteria used to initiate projects and management actions. [253]

The GSP describes 22 projects and management actions (PMAs) that the GSAs propose to implement in the Sierra Valley Subbasin.[254] The GSP states that the goals of the PMAs are to achieve the GSP's sustainability goal by 2042 and avoid undesirable results, per SGMA regulations.[255] The PMAs are categorized into three categories.[256] The categories are described as follows:

- Tier I: Existing PMAs that are currently being implemented and are anticipated to continue to be implemented, potentially with enhancements
- Tier II: PMAs identified for consideration within the first five-years of the GSP, with initiation and implementation by the GSAs dependent upon an evaluation of feasibility and funding availability
- Future Actions: Other PMAs may include projects that indirectly help the GSAs meet the sustainability goals of the Subbasin and help the adapt to future climate conditions

The GSP includes a PMA summary table for each tier, and identifies 7 as Tier I[257], 13 as Tier II[258], and 2 as Future Actions[259]. The tables include the title, a category, PMA title, a

[252] 23 CCR § 354.44 (a).
[253] 23 CCR § 354.44 (b) *et seq.*
[254] Sierra Valley Subbasin GSP, Section 4, pp. 246-291.
[255] Sierra Valley Subbasin GSP, ES, Chapter 4, p. 17.
[256] Sierra Valley Subbasin GSP, Section 4.1, p. 247.
[257] Sierra Valley Subbasin GSP, Table 4.2-1, pp. 251-253.
[258] Sierra Valley Subbasin GSP, Table 4.3-1, pp. 265-267.
[259] Sierra Valley Subbasin GSP, Section 4.4.1, p. 291.

one to two sentence description, and bullet points of near-term actions and potential actions for Tier I PMAs and Tier II PMAs, respectively.

The GSP states that the Tier I PMAs provide benefits to groundwater levels, groundwater storage, water quality, groundwater dependent ecosystems (GDEs), beneficial users, water use efficiency programs, provide information to support planned or implemented PMAs, and provide in-lieu recharge benefits to groundwater in the Subbasin.[260] The GSP includes an implementation schedule that shows Tier I PMAs as ongoing, but does not identify when some of the existing PMAs began.[261]

The GSP states that the Tier II PMAs focus on demand management and maintaining groundwater levels in the Subbasin by providing benefits to groundwater levels, groundwater storage, water quality, and groundwater dependent ecosystems (GDEs). The GSP includes an implementation schedule that shows Tier II PMAs to be implemented based on an evaluation of which are most likely to be effective and technically and financially feasible. The GSP states "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."[262] The GSP notes that some PMAs in Tier II may require more time than five years for development but does not provide a time-table for expected initiation and completion as required by GSP regulations.[263]

The GSP states that Future Actions and other management actions focus on demand management and maintaining groundwater levels in the Subbasin. These PMAs may include projects that indirectly help the GSAs meet the sustainability goals of the Subbasin and help adapt to future climate conditions.[264]

The Plan adequately describes proposed projects and management actions in a manner that is generally consistent and substantially complies with the GSP Regulations.[265] The projects and management actions, which focus largely on refining the GSA's understanding of basin conditions and avoiding undesirable results, are directly related to the sustainable management criteria and present a generally feasible approach to achieving the sustainability goal of the Plan area.

As projects and management actions are implemented, the Department expects that progress be included in annual reports and any addition or removal of project and management actions be documented in periodic updates.

[260] Sierra Valley Subbasin GSP, Section 4.2, pp. 250-263.
[261] Sierra Valley Subbasin GSP, Section 4.2, pp. 250-263.
[262] Sierra Valley Subbasin GSP, Section 4.3, p. 264.
[263] 23 CCR § 354.44 (b) (4).
[264] Sierra Valley Subbasin GSP, Section 4.4, p. 291.
[265] 23 CCR §§ 354.44 *et seq*.

4.6 Consideration of Adjacent Basins/Subbasins

SGMA requires the Department to "…evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin."[266] Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP be designed to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.[267]

The Chilcoot Subbasin (5-012.02) is directly adjacent to Sierra Valley Subbasin, with a shared straight-line border along the northeastern edge of the Sierra Valley Subbasin. Collectively the two subbasins comprise the Sierra Valley Basin (5-012). The GSP states that "Although the Chilcoot Subbasin is currently designated as very low priority by DWR and therefore not required to have a GSP, it has been included in this Plan." The Chilcoot Subbasin is currently not represented by GSA. As stated previously, Chilcoot Subbasin information has been incorporated throughout the Sierra Valley GSP, including in groundwater conditions, sustainable management criteria, and monitoring networks.

The GSP lacks discussion of how the minimum thresholds have been selected to avoid causing undesirable results in adjacent basins, as required by the GSP Regulations, for groundwater levels and groundwater quality; however, the inclusion of the Chilcoot Subbasin data in the selection of minimum thresholds and inclusion of monitoring wells within the Chilcoot Subbasin within the SMC monitoring networks, may provide adequate information to monitor and evaluate impacts. Department staff recommend the GSA consider and evaluate the specific potential impacts of GSP implementation on the Chilcoot Subbasin.

Based on information available at this time, Department staff have no reason to believe that groundwater management in the Plan area will adversely affect groundwater conditions in the adjacent basin at this time. Department staff will continue to review periodic updates to the Plan to assess whether implementation of the Sierra Valley GSP is potentially impacting the Chilcoot Subbasin.

4.7 Consideration of Climate Change and Future Conditions

The GSP Regulations require a GSA to consider future conditions and project how future water use may change due to multiple factors including climate change.[268]

Since the GSP was adopted and submitted, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, drier conditions will result in a loss of 10% of California's water supply. As California adapts to a hotter, drier climate, GSAs should be preparing for these changing conditions as they work to sustainably

[266] Water Code § 10733(c).
[267] 23 CCR § 354.28(b)(3).
[268] 23 CCR § 354.18.

manage groundwater within their jurisdictional areas. Specifically, the Department encourages GSAs to:

1. Explore how their proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the basin based on current and future drought conditions;
2. Explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought;
3. Take into consideration changes to surface water reliability and that impact on groundwater conditions;
4. Evaluate updated watershed studies that may modify assumed frequency and magnitude of recharge projects, if applicable, and
5. Continually coordinate with the appropriate groundwater users, including but not limited to domestic well owners and state small water systems, and the appropriate overlying county jurisdictions developing drought plans and establishing local drought task forces[269] to evaluate how their Plan's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

5 STAFF RECOMMENDATION

Department staff recommend approval of the GSP with the recommended corrective actions listed below. The Sierra Valley Subbasin GSP conforms with Water Code Sections 10727.2 and 10727.4 of SGMA and substantially complies with the GSP Regulations. Implementation of the GSP will likely achieve the sustainability goal for the Sierra Valley Subbasin. The GSA) have identified several areas for improvement of their Plan and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified additional recommended corrective actions that should be considered by the GSAs for the first periodic assessment of the GSP. Addressing these recommended corrective actions will be important to demonstrate that implementation of the Plan is likely to achieve the sustainability goal.

The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

Investigate the basin fill and bedrock units and identify the appropriate principal aquifer(s) for the Subbasin.

[269] Water Code § 10609.50.

RECOMMENDED CORRECTIVE ACTION 2

Provide more information about how data from the adjacent Chilcoot Subbasin will be utilized during GSP implementation and explanation as to whether the inclusion of this data into the groundwater conditions analysis for the Sierra Valley Subbasin may impact the results.

RECOMMENDED CORRECTIVE ACTION 3

Provide additional information on the chronic lowering of groundwater levels sustainable management criteria, including the specific level(s) where effects that the GSA considers significant and unreasonable would constitute specific undesirable results that the GSA seeks to avoid by managing groundwater levels to avoid these minimum thresholds. For example, the GSAs could incorporate the undesirable result definition presented in the well impact analysis which states, "significant and undesirable results would occur when 5 percent or more of wells of any type (domestic, agricultural, public, and industrial) are impacted" into the Plan's definition for an undesirable result.[270] Currently, the 5% metric is for the "purpose of the study" and not stated in the sustainable management criteria section of the Plan.

RECOMMENDED CORRECTIVE ACTION 4

Provide the rationale for using 2021 concentration data instead of 2015 concentration data as the baseline for setting minimum thresholds for degraded water quality.

RECOMMENDED CORRECTIVE ACTION 5

Provide additional information on the land subsidence sustainable management criteria, including:

a. Provide a clear, quantitative definition of when undesirable results for land subsidence may occur or has occurred in the basin, as required by the GSP regulations, to support the selection of land subsidence minimum thresholds that demonstrate avoidance of undesirable results.
b. Establish sustainable management criteria for land subsidence for the Subbasin utilizing a monitoring network that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations.

RECOMMENDED CORRECTIVE ACTION 6

Department staff understand that estimating the location, quantity, and timing of stream depletion due to ongoing, Subbasin-wide pumping is a complex task and that developing suitable tools may take additional time; however, it is critical for the Department's ongoing and future evaluations of whether GSP implementation is on track to achieve sustainable

[270] Sierra Valley GSP, Appendix 3-1, Section 1, p. 711.

groundwater management. The Department plans to provide guidance on methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water and support for establishing specific sustainable management criteria in the near future. This guidance is intended to assist GSAs to sustainably manage depletions of interconnected surface water.

In addition, the GSA should work to address the following items by the first periodic update:

a. Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department to establish quantifiable minimum thresholds, measurable objectives, and management actions.

b. Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing.

c. Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion within the GSA's jurisdictional area.

RECOMMENDED CORRECTIVE ACTION 7

Provide additional information on the monitoring networks for sustainability indicators in the Plan area, including:

a. Clearly identify the number and location of all monitoring wells to be included in the monitoring networks and provide well construction, total well depth, and screened interval information for all wells that are monitored.

b. Define the monitoring site type and data collection frequency in tabular format for the degraded water quality monitoring network in the GSP. Evaluate whether the frequency should be increased to better define groundwater quality conditions throughout the year especially during the timing of peak groundwater use to monitor and identify potential impacts to beneficial uses and users of groundwater.

c. Establish a monitoring network for land subsidence that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations.