CALIFORNIA DEPARTMENT OF WATER RESOURCES

SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

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April 27, 2023

Matt Parker
Siskiyou County Natural Resources Department
Siskiyou County Department of Flood Control and Conservation District
1312 Fairlane Road
Yreka, CA, 96097
mparker@co.siskiyou.ca.us

RE: Approved Determination of the 2022 Groundwater Sustainability Plan Submitted for the Shasta Valley

Dear Matt Parker,

The Department of Water Resources (Department) has evaluated the groundwater sustainability plan (GSP) submitted for the Shasta Valley Basin 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 Shasta Valley 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 five-year review of the Shasta Valley 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 Shasta Valley Groundwater Sustainability Plan

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE SHASTA VALLEY BASIN 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 Siskiyou County Flood Control and Water Conservation District Groundwater Sustainability Agency (GSA or Agency) for the Shasta Valley Basin (No. 1-004).

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 Basin (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 Basin 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's status 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 Basin under review.

C. In making these findings and Plan determination, the Department also recognized that: (1) it 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 a Basin (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 Basin. 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 and goal, which are to maintain groundwater levels within 10 feet of historical conditions and reduce depletions of surface water from historical averages, are reasonable and sufficiently explained. The plan relies on the best available information and science to quantify groundwater conditions and have identified plans to fill key data gaps. The GSP limits future extractions to the average of historical extractions, and has plans to improve the GSA's understanding of interconnected surface water (23 CCR § 355.4(b)(1).)

2. The Plan demonstrates an understanding of where data gaps exist and commits to fill those data gaps by the next GSP update. In particular, Department staff note that the Basin was expanded in 2018 to triple its size, and that the new areas added to the Basin in the expansion are not well understood. The GSP identifies that better understanding the hydrogeologic properties of the Basin's aquifers and the flow of water between the Basin's aquifers is needed so that the GSA may better understand the relationship between regional groundwater pumping and interconnected surface water depletions. The GSP plans to expand the groundwater level monitoring network and expanding stream gage locations. The GSP plans to incorporate new information into numerical models to improve water budget and change in groundwater storage calculations and will be important in reducing uncertainty regarding the GSA's ability to evaluate potential significant and unreasonable effects related to interconnected surface water in the Subbasin. Filling these data gaps and others described in the Plan, should lead to the refinement of the GSA's monitoring networks and sustainable management criteria and help inform and guide adaptive management strategies. (23 CCR § 355.4(b)(2).)

3. The projects and management actions proposed are designed to limit pumping to historical averages and maintain groundwater conditions within 10 feet of historical lows levels. The projects and management actions are reasonable and commensurate with the level of understanding of the Basin setting. The projects and management actions described in the Plan provide a feasible approach to achieving the Basin's sustainability goal and should provide the GSA 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 Basin were considered in developing the sustainable management criteria and how those interests, including a comprehensive analysis of potential impacts to wells in the basin, to

evaluate wells that 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 likely to prevent undesirable results and ensure that the Basin is operated 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 Basin is not neighboring other groundwater basins. (23 CCR § 355.4(b)(7).)

8. If required, a satisfactory coordination agreement has been adopted by all relevant parties. (23 CCR § 355.4(b)(8).)

9. The GSA member agency the Siskiyou County Flood Control and Water Conservation District is governed by the Siskiyou County Board of Supervisors, and has had an active role in groundwater management in the Basin prior to becoming the GSA. Siskiyou County is currently issuing well drilling permits, limiting groundwater use for cannabis cultivation, requires a permit for use of groundwater outside of the parcel it was pumped on, and is studying Shasta side channel connectivity. The Siskiyou County Flood Control and Water Conservation District history of groundwater management provide a reasonable level of confidence that the GSA has 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 GSA 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 may have been 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 (Shasta Valley GSP p. 247). The GSA sets minimum thresholds to maintain conditions within 10 feet of historical low levels to account for future drought conditions. The GSA has also identified a path forward to fill data gaps and improve understanding of interconnected surface water. Department staff have requested through a recommended corrective action that the GSA evaluate the effects on interconnected surface water if groundwater levels were to reach minimum thresholds. 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 Basin. The GSA proposes initial sustainable management criteria to manage this sustainability indicator and measures to improve understanding and management of depletions of interconnected surface water. The GSA acknowledge, and the Department agrees, that many data gaps related to interconnected surface water exist. The GSA 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. Department Staff have requested through a recommended corrective action that the GSA select quantitative values for minimum thresholds for depletions of interconnected surface water, as part of the next update. Future updates to the Plan should aim to improve the initial sustainable management criteria as more information and improved methodologies become available.

3. 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 Agency for the Shasta Valley Basin 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 Agency address them by the time of the Department's five-year 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: April 27, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Shasta Valley Basin

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

Groundwater Basin Name:	Shasta Valley Basin (No. 1-004)
Submitting Agency:	Siskiyou County Flood Control and Water Conservation District Groundwater Sustainability Agency
Submittal Type:	Initial GSP Submission
Submittal Date:	January 31, 2022
Recommendation:	Approved
Date:	April 27, 2023

The Siskiyou County Flood Control and Water Conservation District Groundwater Sustainability Agency (Agency or GSA) submitted the Shasta Valley Basin Groundwater Sustainability Plan (GSP or Plan) for the Shasta Valley Basin (Basin) 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 Basin 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 Basin 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 Basin.[3] Department staff will continue to monitor and evaluate the Basin'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:

- **Section 1 – Summary:** Overview of Department staff's assessment and recommendations.

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

- **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 Shasta Valley Basin GSP. The GSA has identified areas for improvement of its Plan (e.g. quantification of sustainable management criteria for interconnected surface water). Department staff concur that those items are important and recommend the GSA address them as soon as possible. Department staff have also identified additional recommended corrective actions within this assessment that the GSA should consider addressing by the first periodic evaluation of the Plan. The recommended corrective actions generally focus on the following:

(1) Provide clarification on what areas within the Basin the GSA has the legal authority to manage.
(2) Investigate and filling data gaps related to the hydrogeologic conceptual model and groundwater conditions.
(3) Provide a current water budget.
(4) Describe the relationship between established minimum thresholds for the chronic lowering of groundwater levels and other sustainability indicators.
(5) Refine the degraded water quality sustainable management criteria.
(6) Continue to fill data gaps, collect additional monitoring data, coordinate 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 refine sustainable management criteria.

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 GSA 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 Shasta Valley Basin.[5] To achieve the sustainability goal for the Basin, 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 Basin, 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 five-year 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 GSA submitted the Shasta Valley GSP 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 GSA submitted an adopted GSP for the entire Basin. 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 14, 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.

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 Basin is provided below.

4.1 Administrative Information

The GSP Regulations require each Plan to include administrative information identifying the submitting agency, demonstrating the legal authority, and describing the plan area, existing monitoring, and management programs, describing the ability of the GSA to develop and implement a plan for that area, and providing outreach.[34]

The medium-priority Shasta Valley Basin is approximately 340.6 square miles (217,980 acres) and is not bordered by any other groundwater basins. The Department approved a large basin boundary modification in 2018 which expanded the size of the Basin substantially.[35] A vicinity map showing the Basin's location and nearby basins is shown below as Figure 1.

[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/90.
[33] Water Code § 10727(b); 23 CCR § 355.4(a)(3).
[34] 23 CCR §§ 354.2 *et seq*.
[35] https://sgma.water.ca.gov/basinmod/modrequest/preview/185.

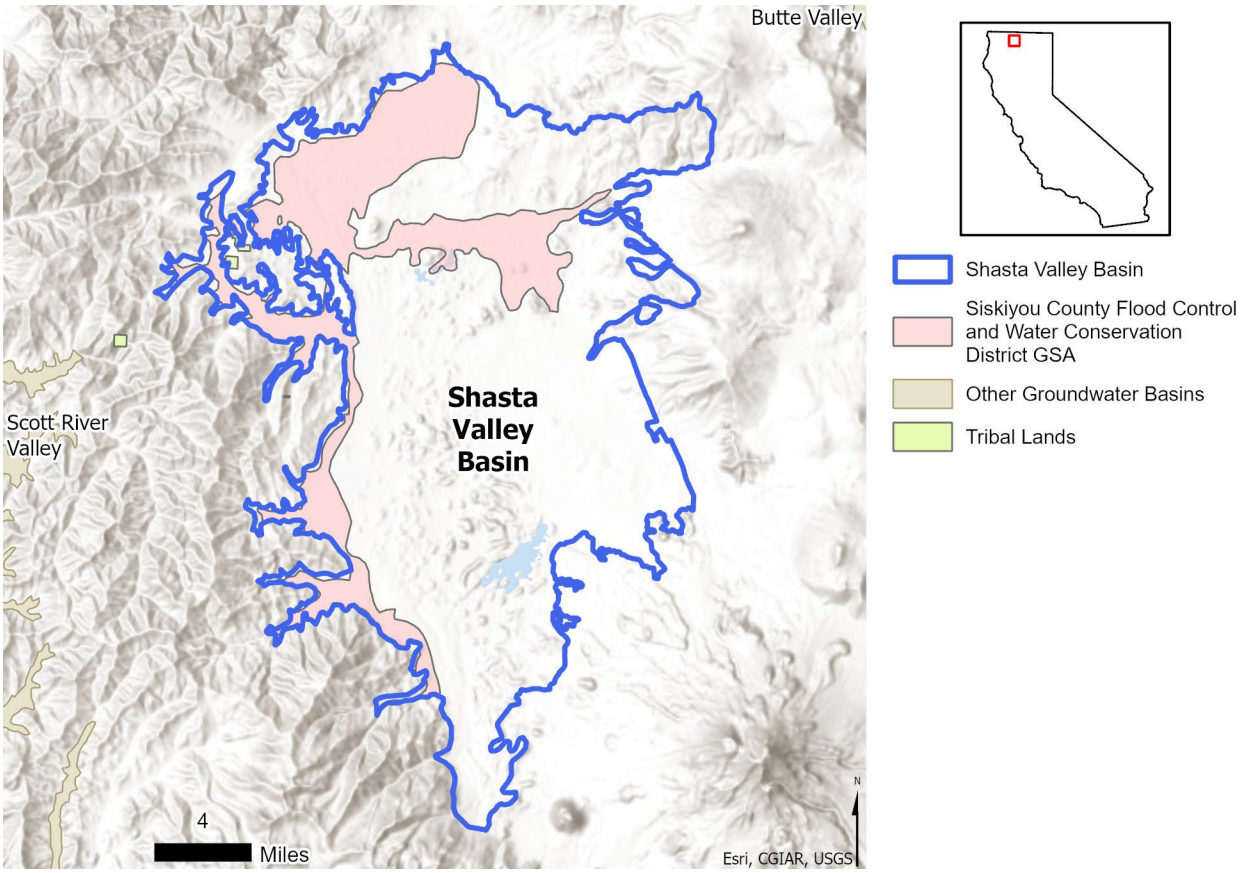

Figure 1: Vicinity Map of the Shasta Valley Basin

The GSP explains that in 2018, the Basin was expanded from 52,589 acres to 217,980 acres.[36] The modification was conducted to account for more groundwater pumping in the Basin and allow for more comprehensive management. This modification substantially increased the extent of the Basin to include various complex geological and hydrological areas of the Watershed requiring filling numerous data gaps.[37] The GSP notes that portions of the Basin lack a sufficient density of monitoring sites, with some regions completely lacking monitoring wells, and that the absence of a comprehensive monitoring network is a critical data gap in understanding groundwater level trends.[38]

The Siskiyou County Flood Control and Water Conservation District GSA is the sole GSA for the Basin. The GSP explains that the Siskiyou County Flood Control and Water Conservation District was created by the State Legislature in 1959 and is governed by a Board of Directors that is composed of the County Board of Supervisors. Siskiyou County Resolution FLD17-01, approved by the District Board on April 4th, 2017, authorized the Siskiyou County Flood Control and Water Conservation District to act as the GSA.[39]

[36] Shasta Valley GSP, Section 2.1.1, p. 52.
[37] Shasta Valley GSP, Section 2.1.1, p. 52.
[38] Shasta Valley GSP, Section 2.1.1, p. 52.
[39] Shasta Valley GSP, Section 1.3.2, p. 43.

Decisions of the District are completed pursuant to a majority vote. Actions of the Board are informed with input from the Scott Valley Advisory Committee,[40] which has members appointed by Board members. The GSP describes in sufficient detail the GSA's authority to manage groundwater within the Basin and includes the organizational structure of the GSA.

The GSP identifies that the Basin was expanded in 2018, from 52,589 acres to 217,980 acres. The modification was conducted to include more groundwater pumping in the Basin, to allow for more comprehensive management. This modification substantially increased the extent of the Basin to include various complex geological and hydrological areas of the Watershed requiring filling numerous data gaps.[41] The GSP notes that portions of the Basin lack sufficient well monitoring sites within the network and some regions completely lack monitoring wells, and that the absence of a comprehensive well monitoring network is a critical data gap in the analysis of groundwater level trends.[42]

While Department staff concur with the GSA's claim it is the sole GSA for the Basin, it is unclear to Department staff what area within the Basin the GSA has legal jurisdiction to manage. Based on the information that has been submitted to the Department via the SGMA Portal, the area of the Siskiyou County Flood Control and Water Conservation District GSA only covers the portion of the Basin that existed before the 2018 basin boundary modification (shown in Figure 1 as a pink polygon). Nevertheless, the GSP states that the GSA intends to manage the entire Basin under the Plan. Department staff understand the GSA's intent is to manage the entire Basin and infer that the failure to upload a matching GSA boundary modification to the SGMA Portal is an oversight. Department staff recommend the GSA coordinate with the Department through the appropriate channels to clearly show what portions of the Basin the GSA has jurisdiction over and intends to manage under the Plan (see Recommended Corrective Action 1). Areas of the Basin that are not within the management area of a GSA may be subject to extraction reporting and fees under Water Code section 5202.

According to the GSP, anthropogenic land within the Basin is primarily used for agriculture including pasture, alfalfa, and grain. Land use for pasture occurs in 8.2% of the Basin, and alfalfa and grain/hay farming occurs in 1.6% and 2.1% of the Basin, respectively.[43] The Basin contains the incorporated communities of Yreka and Weed, as well as the unincorporated communities of Montague, Grenada, Gazelle, Edgewood, and Carrick, all of which are identified in the GSP as severely disadvantaged communities or disadvantaged communities.[44] The population of the Basin was estimated at 13,000. The identified beneficial uses and users include: agriculture, drinking water, environmental and endangered species, recreation, surface water, tribal government, and

[40] Shasta Valley GSP, Section 1.4.2, p. 44.
[41] Shasta Valley GSP, Section 2.1.1, p. 51.
[42] Shasta Valley GSP, Section 2.1.1, p. 52.
[43] Shasta Valley GSP, Table 2.1, p. 56.
[44] Shasta Valley GSP, Figure 2.2, p. 54.

disadvantaged community uses.[45] The Basin's well infrastructure includes 3,264 domestic wells, 388 agricultural production wells, and 35 public or municipal wells.[46] Department staff conclude the GSP contains sufficient detail regarding the beneficial uses and users of groundwater, types and distribution of land use, and water use types.

Multiple water resources monitoring and management programs are described in the GSP, as is the GSA's current understanding of how those programs will be incorporated into GSP implementation and how they may limit operational flexibility during GSP implementation.[47] The programs include: (1) DWR CASGEM program; (2) California Department Fish and Wildlife's Big Springs Ranch and Shasta Valley Wildlife Areas; (3) California Department of Pesticide Regulation; (4) California State Water Resources Control Board; (5) Endangered Species Conservation Laws; (6) Public Trust Doctrine; (7) University NAVSTAR Consortium; (8) United States Bureau of Reclamation; (9) United States Geological Survey; (10) North Coast Regional Water Control Board; (11) United States Forest Service; (12) Karuk Tribe Department of Natural Resources; (13) Irrigation Districts and Associations; (14) Shasta Valley Resource Conservation District; (15) County of Siskiyou Flood Control and Water Conservation District; (16) The Nature Conservancy; and (17) Scott Valley and Shasta Valley Watermaster District. Programs identified in the GSP with the potential to limit operational flexibility during GSP implementation include the California Endangered Species Act,[48] and the North Coast Regional Water Control Board Basin Plan.[49]

Six key implementation elements are described in the GSP, which include: (1) GSA management, administration, and legal day-to-day operations; (2) Implementation of GSP monitoring activities; (3) Technical support; (4) Reporting (annuals and 5-years); (5) Project and management actions; (6) Outreach to stakeholders.[50] The cost of GSP implementation over a 20-year horizon is projected at $168,000 to $287,000 per year.[51] The GSP indicates that the GSA will pursue funding from state and federal sources, may further evaluate funding mechanisms and fee criteria, and may perform a cost-benefit analysis of fee collection.[52] The information presented in the GSP related to the GSA's authority and financial plan to implement the Plan provides a reasonable level of confidence that the Agency can manage groundwater to progress towards the sustainability goal in the Basin.

The GSA developed and implemented a communication and engagement plan. Communication included maintaining an interested parties list, holding GSA Board meetings, public workshops, working groups, coordination with local agencies and Tribes,

[45] Shasta Valley GSP, Section 1.4.3.1, p. 46.
[46] Shasta Valley GSP, Section 2.1.1, p. 58.
[47] Shasta Valley GSP, Section 2.1.2, pp. 60-72.
[48] Shasta Valley GSP, Section 2.1.2.5, p. 63.
[49] Shasta Valley GSP, Section 2.1.2.10, p. 65.
[50] Shasta Valley GSP, Section ES-5, p. 40.
[51] Shasta Valley GSP, Section ES-5, p. 40.
[52] Shasta Valley GSP, Section ES-5, p. 40.

and coordination with state and federal agencies.[53] The GSA provided public notifications announcing GSA Board Meetings and Stakeholder Workshops, and accepted public comments and provided a table indicating how public comments were addressed.[54]

The GSP states the GSA considered the public trust in development of their Plan, especially with regard to interconnected surface waters, and that consideration of the public trust doctrine will be considered during implementation of the Plan.[55] The Department received multiple public comments regarding the Plan that refer to the public trust doctrine.[56] Although Department staff recognizes that the evaluation of impacts to certain interconnected surface water may touch on traditional elements of the public trust, it is beyond the scope of this assessment to evaluate the adequacy or necessity of any consideration of the public trust undertaken by the GSA.

Aside from the recommended corrective action related to clarifying the GSA coverage area, the administrative information section included in the GSP is substantially compliant with the requirements outlined in the GSP Regulations. Department staff consider the information presented in the Plan to satisfy the general requirements of the GSP Regulations for administrative information.[57]

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]

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

[53] Shasta Valley GSP, Section 1.4.3, pp. 45-48.
[54] Shasta Valley GSP, Appendix 1-C, pp. 360-567.
[55] Shasta Valley GSP, Section 2.1.2.6, p. 63.
[56] https://sgma.water.ca.gov/portal/gsp/comments/90.
[57] 23 CCR §§ 354.2 *et seq*.
[58] 23 CCR § 354.12.
[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).

boundaries and the bottom of the basin,[61] principal aquifers and aquitards,[62] and identifies data gaps[63].

The GSP describes a brief geologic history of the Basin and provides the geologic units in and around the Basin.[64] Groundwater-bearing units of the Shasta Valley Basin are primarily alluvium in the Basin's western side, and the Pluto's Cave Basalt on its eastern side. Both geologic units are separated by a volcanic debris avalanche.[65] The GSP provides scaled cross-sections[66] and maps providing geology, soils, topography, and hydrology, which appear to be geologically reasonable and based on best available objective sources of information.[67]

The GSP identifies impermeable bedrock, and the top of bedrock as the bottom of the Basin.[68] However, the GSP also acknowledges that geophysical studies indicate that the topography, depth, and/or elevation of the Basin bottom interface remains largely unknown at this time.[69] Department staff recognize that uncertainty surrounding aspects of the hydrogeologic conceptual model, specifically the location of the bottom of the Basin, is understandable considering the large expansion of the Basin in 2018. The GSA received public comments during the GSP development process concerning the defined bottom of Basin and responded by stating that "a definable base is not presented in the HCM because a clear spatial definition of the contact between alluvium, volcanics, and bedrock is not available, especially where volcanic rocks are very thick."[70] Department staff understand there appears to be uncertainty surrounding where the bottom of the Basin is within the Shasta Valley Basin; however, Department staff also note the GSP did not provide details describing the methodology that was used nor a discussion of whether additional data or alternative methods could be employed to further refine the bottom of the Basin. Department staff believe additional evaluation is necessary to further the understanding of the bottom of the Basin particularly considering that the GSP acknowledges that there has been limited hydrogeologic investigation of the Basin (see Recommended Corrective Action 2a).

GSP Regulations require the description of principal aquifers, including the formation names in each principal aquifer, physical properties of the aquifers, and the structural properties of the basin that restrict groundwater flow in principal aquifers.[71] The GSP did not identify principal aquifers;[72] however, the GSP does identify water-bearing formations

[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] Shasta Valley GSP, Section '2.2.1.3.1, pp. 89-115.
[65] Shasta Valley GSP, Figure 2.17, p. 105.
[66] Shasta Valley GSP, Figures 2.19 through 2.27, pp. 105-115.
[67] Shasta Valley GSP, Figure 10. P. 85, Figure 14, p. 91, Figure 18, p. 103, Figure 19, p. 108.
[68] Shasta Valley GSP, Section 2.2.1.3.1., pp. 89-90 and p. 97.
[69] Shasta Valley GSP, Section 2.2.1.3.1, pp. 108-115 and Section 2.2.1.6, pp. 129-130.
[70] Shasta Valley GSP, Attachment C, p. 563
[71] 23 CCR § 354.14 (b)(4)(A-E).
[72] Shasta Valley GSP, Section 2.2.1, pp. 78-130

that include alluvial, volcanic debris, and lava flow geologic formations.[73] The hydrogeologic properties for these formations were limited to a range of well capacities for each formation.[74] The GSP reports that previous studies have not estimated groundwater storage due to the complexity of this effort when studying volcanic water-bearing formations.[75] The GSP identifies significant differences in the characteristics of the three formations. The three water bearing formations are described in the GSP as follows:

- The alluvial deposits include stream and terrace deposits originating mainly from fluvial processes.[76] Most wells only produce 20 to 220 gallons per minute which generally support domestic and stock well uses; although, some wells can produce up to 1,500 gallons per minute.[77]
- The Pluto's Cave Basalt contains clinkery surfaces, lava tubes, and fracture structures that act as conduits for groundwater and can transmit large volumes of groundwater through these interconnected voids. Well yields within lava flows are between 10 and 100 gallons per minute; although, several wells reportedly yield over 4,000 gallons per minute.[78]
- The volcanic debris flows are made up of mud flows embedded with occasional volcanic rocks, boulders, and blocks scattered throughout the region. Well yields from within the debris avalanche deposits are highly variable. The GSP identifies that these less permeable avalanche deposits act as a significant barrier to groundwater flow through the more permeable Pluto's Cave Basalt, resulting in multiple high volume groundwater springs along the contact between the two formations.[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, Department staff also note that understanding the three water-bearing formations and identifying the appropriate principal aquifer(s) for the Basin is critical to successfully managing the Basin. 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 Basin. Given the information provided in the GSP, the alluvial deposits, lava flow, and volcanic debris water-bearing formations each have significantly different hydrogeologic characteristics that likely require different approaches for management. Department staff recommend the GSA investigate the three water-bearing formations and identify the appropriate principal aquifer(s) for the Basin (see Recommended Corrective Action 2b).

[73] Shasta Valley GSP, Section 2.2.1.1, p. 78.
[74] Shasta Valley GSP, Section 2.2.1.3.1, p. 96.
[75] Shasta Valley GSP, Section 2.2.2.2, p. 136.
[76] Shasta Valley GSP, Section 2.2.1.3.1, p. 93.
[77] Shasta Valley GSP, Section 2.2.1.3.1, p. 101.
[78] Shasta Valley GSP, Section 2.2.1.3.1, p. 100.
[79] Shasta Valley GSP, Section 2.2.1.3.1, pp. 100-101.

GSP Regulations require identification of data gaps and uncertainty within the hydrogeologic conceptual model.[80] The GSP does not discuss data gaps in the hydrogeologic conceptual model section of the GSP but does generally discuss data gaps for geology in Appendix 3-A,[81] which describes using DWR's airborne electromagnetic surveys and completing a planned geophysical study. However, neither discussion describes how these approaches will help the GSA sufficiently understand the complex geology of the Basin. Staff note that the Project and Management Actions Section of the GSP shows that there is a proposal for an aquifer characterization analysis, as a tier 2 management project, but no schedule has been set and this is not considered a high priority.[82]

Department staff conclude the GSP insufficiently identifies principal aquifers and does not provide a complete analysis of aquifer characteristics. Department staff have included recommended corrective actions to address this issue; however, these recommended corrective actions do not preclude GSP approval at this time.

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 (GDEs) that include the following: groundwater elevation contour maps and hydrographs,[83] a graph depicting change in groundwater storage,[84] maps and cross-sections of the seawater intrusion front,[85] maps of groundwater contamination sites and plumes,[86] maps depicting total subsidence,[87] identification of interconnected surface water systems and an estimate of the quantity and timing of depletions of those systems,[88] and identification of GDEs.[89]

The GSP provides a description of current and historical groundwater elevations throughout the Basin.[90] Seasonal groundwater elevations fluctuate between highs in winter and lows in summer.[91] Groundwater hydrographs indicate that groundwater elevations have generally been stable over a monitored period from 2005 to 2020.[92] Groundwater elevation surface maps are provided for spring and fall of 2010 and 2015.[93] The GSP also provided a graph showing groundwater elevations at five monitoring

[80] 23 CCR § 354.14 (b)(5).
[81] Shasta Valley GSP, Appendix 3-A, p. 1316.
[82] Shasta Valley GSP, Section 4.3, p. 277 and p. 288.
[83] 23 CCR § 354.16 (a)(1-2).
[84] 23 CCR § 354.16 (b).
[85] 23 CCR § 354.16 (c).
[86] 23 CCR § 354.16 (d).
[87] 23 CCR § 354.16 (e).
[88] 23 CCR § 354.16 (f).
[89] 23 CCR § 354.16 (g).
[90] Shasta Valley GSP, Section 2.2.2.1, pp. 131-136.
[91] Shasta Valley GSP, Figure 2.40, p. 136.
[92] Shasta Valley GSP, Figure 2.40, p. 136.
[93] Shasta Valley GSP, Figures 2.36-2.39, pp. 135-139.

sites.[94] The GSP provided additional figures and analysis of groundwater levels and trends in an appendix.[95] Department staff's review of the provided materials indicate that: groundwater elevations increase towards the edges of the Basin, groundwater generally flows towards the Shasta River, and the GSA's assessment that groundwater elevations have largely been stable appears to be correct.

The GSP does not provide an estimate of groundwater storage nor a description of groundwater storage conditions. The GSP states groundwater storage estimates were attempted by Seymour Mack in 1960, but those estimates were not completed due to the geologic complexity of the Basin.[96] Department staff note the GSP does include information about the annual and cumulative change in groundwater storage in the historical water budget section developed using the Shasta Watershed Groundwater Model (SWGM).[97] It is unclear to Department staff why the GSA did not provide content describing groundwater storage conditions in the GSP given this information appears to be available. Staff infer based on the information presented in the historical water budget section that cumulative change in storage over time has fluctuated based on climate conditions, but overall has remained near zero.[98] Department staff recommend the GSA clearly describe groundwater storage conditions in the Basin including a chart depicting estimates of the change in groundwater in storage, demonstrating the annual and cumulative change in the volume of groundwater in storage, including the annual groundwater use and water year type (see Recommended Corrective Action 3a).

The Plan states that "[d]ue to the distance between the Basin and the Pacific Ocean, seawater intrusion is not evident nor of concern and therefore, is not a sustainability indicator applicable to the Basin."[99] Department staff agree with the assertion that this sustainability indicator is not applicable due to the Basin not being adjacent to the Pacific Ocean, bays, deltas, or inlets.[100]

The GSP includes a thorough and detailed discussion on existing groundwater quality conditions in the Basin stating the natural composition of groundwater in the Basin is characterized as magnesium bicarbonate water.[101] Ongoing monitoring programs show that some constituents and water quality parameters, including arsenic, boron, iron, manganese, benzene, pH, and specific conductivity, exceed water quality standards in

[94] Shasta Valley GSP, Figure 2.40, p. 136.
[95] Shasta Valley GSP, Appendix 2-C, pp. 762-839.
[96] Shasta Valley GSP, Section 2.2.2.2, p. 136.
[97] Shasta Valley GSP, Appendix 3-A, p. 1320.
[98] Shasta Valley GSP, Figure 2.62, p. 188.
[99] Shasta Valley GSP, Section 2.2.2.5, p. 150.
[100] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-6-Sustainable-Management-Criteria-DRAFT_ay_19.pdf
[101] Shasta Valley GSP, Section 2.2.2.3, p. 137.

parts of the Basin.[102] The GSP provided a detailed water quality analysis in Appendix 2-B.[103]

The Plan utilizes the TRE Altamira Interferometric Synthetic Aperture Radar (InSAR) data to determine total coverage of vertical displacement within the Basin.[104] Land subsidence in Shasta Valley has cumulative vertical displacements in a range of less than 0.1 feet between January 2015 and June 2018.[105] The GSP states that the alluvial aquifers of the Basin do not include extensive clay layers that can lead to subsidence and that the Basin is unlikely to experience inelastic subsidence.[106]

The GSP identifies major interconnected surface water bodies in the Basin, and states that all surface water is considered potentially interconnected.[107] The Basin is within the watershed of the Shasta River, which is fed by its tributaries and local springs originating from Cascade volcanic mountains.[108] Springs fed by the Pluto's Cave Basalt include the Big Springs Complex, which is a key spring that provides contributions to the Shasta River, with estimated flows of 60 cubic feet per second (and was over 100 cubic feet per second prior to diversions).[109] The GSP presents the results of two studies, called transactional studies, that indicate that overall groundwater levels in the piezometers near the river were higher in elevation than nearby surface water.[110] The GSP describes the direction of groundwater flow is toward the surface water bodies and provides a net discharge into the rivers.[111]

An estimate of the location and volume of depletions of surface water due to groundwater extraction was not included in the GSP. The GSA developed a preliminary numeric model to estimate water budgets but was unable to complete model development in time to use it to estimate the change in groundwater storage or depletions of interconnected surface water by reach, as required by GSP Regulations.[112] Understanding depletions of surface water due to groundwater pumping will be a key to managing groundwater sustainably in the Basin. Department staff recommend the GSA provide an estimate of the location, volume, and timing of depletions of surface water due to groundwater extraction in future updates to the GSP (see Recommended Corrective Action 3b).

The GSA used the Natural Communities Commonly Associated Groundwater dataset (NC Dataset),[113] to create a preliminary list of potential GDEs in the Basin. The GSA then

[102] Shasta Valley GSP, Section 2.2.2.3, p. 137.
[103] Shasta Valley GSP, Appendix 2-B, pp. 701-761.
[104] Shasta Valley GSP, Section 2.2.2.4, p. 147.
[105] Shasta Valley GSP, Section 2.2.2.4, p. 147.
[106] Shasta Valley GSP, Section 2.2.2.4, p. 147.
[107] Shasta Valley GSP, Section 2.2.2.4, p. 147.
[108] Shasta Valley GSP, Section 2.2.2.6, p. 150.
[109] Shasta Valley GSP, Section 2.2.2.6, p. 150.
[110] Shasta Valley GSP, Section 2.2.2.6, p. 159.
[111] Shasta Valley GSP, Section 2.2.2.6 p. 164.
[112] 23 CCR § 354.16(b), § 354.16(f).
[113] Shasta Valley GSP, Section 2.2.2.7, pp. 168-186.

modified the list to remove items based on depth to groundwater and local land use[114] to produce the final list of GDEs in the Basin. The NC Dataset is a starting point which GSAs can use and may include items that are not GDEs and may not include all areas where GDEs possibly exist. Department staff notes the GSA only removed items that were identified in the NC Dataset and did not discuss any attempt to identify other areas where GDEs may exist in the Basin.

The GSP provides supporting figures and tables in Appendix 2-G.[115] A summary of findings for GDEs that were selected or removed from the dataset was provided.[116] Department staff are unable to evaluate the GDE analysis provided by the GSA and note that the scales for the figures provided for GDEs in the GSP, and in the appendix,[117] are not clear. Department staff recommend making figures that are legible and suitable for evaluation as required by GSP Regulations.[118]

Department staff conclude the GSP insufficiently describes groundwater storage and does not provide an estimate of the timing of surface water depletions due to groundwater pumping. Despite the identification of a recommended corrective action to address these issues, Department staff conclude that this does not preclude GSP approval at this time.

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,[119] and the sustainable yield.[120]

The GSP uses a preliminary numeric model, the SWGM, to estimate inflows and outflows to the Basin and subsurface flows into the Basin.[121] The GSP identifies that the SWGM is not a complete model because it is limited by data availability and uncertainty.[122] The GSA only uses it to estimate historical and future water budgets and did not use it for other GSP components.[123] This is largely due to the Basin size expanding during the approved basin boundary modification in 2018.[124] As such the GSP identifies data gaps for the SWGM and plans to fill them prior to the next 5-year update.[125] There are several high priority Projects and Managements Actions related to the filling of data gaps (i.e.,

[114] Shasta Valley GSP, Section 2.2.1.7, pp. 172-181.
[115] Shasta Valley GSP, Appendix 2-G, pp. 1232-1255.
[116] Shasta Valley GSP, Figures 3, 2.56-2.61, Appendix 2-G Figures 1-16, p. 35, 173-185, 1240-1255
[117] Shasta Valley GSP, Figure 3, p. 35.
[118] 23 CCR § 352.4 (d) *et seq.*
[119] 23 CCR §§ 354.18 (a), 354.18 (c) *et seq*.
[120] 23 CCR § 354.18 (b)(7).
[121] Shasta Valley GSP, Appendix 2-E, p. 1111.
[122] Shasta Valley GSP, Section 3.3.4.1, p. 236.
[123] Shasta Valley GSP, Appendix 2-E, p. 1110.
[124] Shasta Valley GSP, Section 2.1.1, p. 52.
[125] Shasta Valley GSP, Appendix 3-A. pp.

"Interconnected Surface Water Data Gaps" and other "General Data Gaps") that will help with the SWGM update.[126]

The GSP provides a section on groundwater dynamics in the Basin's aquifer system.[127] The GSP explains that due to the complexity and juxtaposition of different aquifer units, many springs are present in the Basin which discharge groundwater to the surface. Additionally, the Plan states that during most of the year groundwater discharges into the Shasta River and its tributaries. The GSP notes that during the summer months some locations along the main stem of the Shasta River become a losing stream, thus reducing the baseflow, with groundwater pumping being a contributing factor. The GSP identifies that depletion (stream losing to groundwater) may affect streams on a time scale that ranges from days to months.[128] Department staff infer that this discussion is included in the water budget section, because the complex dynamics of the groundwater system have made, and will continue to make, modeling efforts in the Basin challenging.

The GSP provides a historical water budget for the period 1991 through 2018.[129] The GSP provides estimates of inflows to groundwater from land and surface water sources.[130] The GSP provided quantitative data about components of the historical water budget.[131] The historical water budgets provided in the GSP show that the water budget fluctuates considerably from year to year. Basin inflows range from 138,000 acre-feet to 368,000 acre-feet. Outflow from streams averages 81,000 acre-feet per year and agricultural pumping averages 39,000 acre-feet per year.[132]

A current water budget was not provided in the GSP, as required by the GSP Regulations.[133] While this is a missing component of the Plan, because water levels and pumping have historically remained consistent within the Basin and the GSP's historical water budget includes recent water years, Department staff note that the lack of an identified current water budget does not appear to limit the understanding of the Basin. Department staff recommend the GSA provide a current water budget with future updates to the GSP (see Recommended Corrective Action 4).

The GSP provides a projected water budget for the period 2022-2070.[134] The GSP shows projected change in storage, indicating no long-term reduction in storage is projected.[135] The future water budget was developed using the 1991-2011 period conditions multiple times to build a 50-year 'base case' climate record.[136] The GSP considered four climate

[126] Shasta Valley GSP, Section 4.3, p. 285.
[127] Shasta Valley GSP, Section 2.2.3.4, p. 193.
[128] Shasta Valley GSP, Section 2.2.3.4, pp. 193-194.
[129] Shasta Valley GSP, Section 2.2.3, p. 187, Figure 2.62-2.63, p. 188.
[130] Shasta Valley GSP, Tables 2.14 and 2.15, p. 192.
[131] Shasta Valley GSP, Tables 2.14 and 2.15, p. 192.
[132] Shasta Valley GSP, Tables 2.14 and 2.15, p. 192.
[133] 23 CCR § 354.18(c).
[134] Shasta Valley GSP, Section 2.2.4, p. 195.
[135] Shasta Valley GSP, Figure unnumbered, p. 171.
[136] Shasta Valley GSP, Section 2.2.4, pp. 194-208.

scenarios ("Near," "Far," "Wet," and "Dry") for the projected water budgets.[137] The GSP's analysis found that interannual variability was a greater driver of change in storage than which climate scenario was selected.[138] None of the climate scenarios were predicted to cause a reduction of water in storage over time. The GSP indicates that the GSA will work to update and revise water budget analysis in the future.[139]

GSP Regulations require that the Water Budget component of a GSP include an estimate of the sustainable yield for the Basin.[140] SGMA defines "sustainable yield" as the maximum quantity of water that can be withdrawn annually from a groundwater supply without causing an undesirable result.[141] The GSP defines the sustainable yield as "the long-term average annual groundwater pumping rate … that does not cause an undesirable result." The GSP suggests that the sustainable yield for the Basin is 42,000 to 45,000 acre-feet per year, which represents a 28-year average of groundwater extraction.[142]

While Department staff have identified recommended corrective actions for the GSA to address prior to the periodic update, these recommendations do not preclude approval at this time as it does not appear to limit the understanding of the Basin or prevent the GSA from implementing the Plan. Department staff conclude the information provided in the GSP that comprises the water budget substantially complies with the requirements outlined in the GSP Regulations.

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.[143]

The GSP did not use management areas.

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

[137] Shasta Valley GSP, Section 2.2.4, p.194.
[138] Shasta Valley GSP, Figures, pp. 201-206.
[139] Shasta Valley GSP, Section 2.2.5, p. 209.
[140] 23 CCR § 354.18(b)(7).
[141] CWC § 10721(w).
[142] Shasta Valley GSP, Section 2.2.5, p. 209.
[143] 23 CCR § 354.20.

characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.[144]

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.[145]

The Plan defines the sustainability goal for the Basin as being "to maintain groundwater resources in ways that best support the continued and long-term health of the people, the environment, and the economy in Shasta Valley, for generations to come."[146] The Plan further states the GSP intends to manage groundwater conditions for each sustainability indicator so that: groundwater elevations do not significantly decline below their historically measured range, groundwater quality is suitable for beneficial uses, land subsidence is prevented, and groundwater will continue to provide river baseflow with no significant reduction in volume.[147] Staff consider the GSP's sustainability goal to reflect the interests of a wide range of beneficial uses and users of groundwater in the Basin.

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.[148] 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 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[149] – 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

[144] 23 CCR § 354.22 *et seq*.
[145] 23 CCR § 354.24.
[146] Shasta Valley GSP Section 3.2, p. 214.
[147] Shasta Valley GSP Section 3.2, p. 214.
[148] 23 CCR § 351(ah).
[149] Water Code § 10721(x).

users for each sustainability indicator.[150] 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.[151]

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.[152] GSAs are required to describe how conditions at minimum thresholds may affect beneficial uses and users,[153] 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.[154]

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.[155] 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.[156]

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 Basin, as quantified through the establishment of minimum thresholds, are addressed for each applicable sustainability 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.[157]

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.[158]

[150] 23 CCR §§ 354.26 (a), 354.26 (b)(c).
[151] 23 CCR § 354.26 (b)(2).
[152] 23 CCR § 354.28 (b)(1).
[153] 23 CCR § 354.28 (b)(4).
[154] 23 CCR § 354.28 (b)(2).
[155] 23 CCR § 354.30 (a).
[156] 23 CCR § 354.30 (b).
[157] 23 CCR § 354.26 (d).
[158] 23 CCR § 354.28(c)(1) *et seq*.

SGMA defines the undesirable result for chronic lowering of groundwater levels to be a significant and unreasonable depletion of supply if continued over the planning and implementation horizon and that overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.[159]

The GSP describes significant and unreasonable groundwater level conditions as those that occur when a significant number of private, agricultural, industrial, or municipal production wells can no longer pump enough groundwater to supply beneficial uses, or when lower groundwater levels adversely affect environmental uses and users of interconnected surface water and groundwater-dependent ecosystems.[160] Department staff note that the GSP's definition of significant and unreasonable conditions uses the word 'significant', which is recursive and not descriptive of conditions, and staff suggest that the GSA fully describe significant and unreasonable conditions as part of the next GSP update.

The GSP defines an undesirable result for the chronic lowering of groundwater as being detected when the low water level observation in the fall (i.e., the minimum elevation in any given water year) in any of the representative monitoring sites in the Basin drop below their respective minimum thresholds in two consecutive years.[161]

The GSP defines the minimum threshold as the historic low measured at each representative monitoring point minus a buffer, which is either 10% of the historic maximum depth to water measured, or 10 feet, whichever is smaller.[162] The GSP indicates that it used a buffer to allow for operational flexibility under extreme climate conditions and to accommodate additional "action triggers" that the GSA will use to trigger an investigation of conditions and to consider implementing projects and management actions.[163]

The GSP indicated that during the development of minimum thresholds, the GSA considered potential effects on beneficial uses and users, and the GSP provided a robust analysis of the potential effects reaching minimum thresholds would have on existing well infrastructure.[164] The analysis considered wells used in the Basin, and which geologic formation was estimated to be at the bottom of the well. This risk analysis concluded that the average minimum threshold is 5 feet below the historical low at each monitoring site, and that reaching 5 feet below the historical low would affect 25-45 wells.[165] The GSP

[159] CWC § 10721(x)(1).
[160] Shasta Valley GSP, Section 3.4.1.1, p.243.
[161] Shasta Valley GSP, Section 3.4.1.1, p.243.
[162] Shasta Valley GSP, Section 3.4.1.2, p. 244.
[163] Shasta Valley GSP, Section 3.4.1.2, p. 244.
[164] Shasta Valley GSP, Appendix 3-C, pp. 1342-1366.
[165] Shasta Valley GSP, Appendix 3-C, p. 1366.

acknowledges several factors that limited the accuracy of the analysis for estimating impacts at the proposed minimum thresholds. Department staff encourage the GSA to update the impact analysis as the factors that limited the accuracy of the analysis are resolved and more information becomes available.

The GSP Regulations require that the GSP include the relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the GSA has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.[166] The GSP does not include this information, instead stating the GSA plans to evaluate this interaction in a future GSP update.[167] Department staff note that, aside from being a required component of a GSP, due to the Basin's high interconnectivity with surface water and potential for increased depletion of surface water from lowering groundwater levels, this analysis is vital to the sustainable management of the Basin. Department staff recommend the GSA provide a description of the relationship between established minimum thresholds for the chronic lowering of groundwater levels and how they avoid undesirable results for each of the other sustainability indicators as required by the GSP Regulations[168] (see Recommended Corrective Action 5).

The GSP establishes the measurable objective as the 75th percentile of the fall measurement range at each individual representative monitoring point, using the same metrics and monitoring sites as minimum thresholds.[169]

Overall, Department staff consider the sustainable management criteria for groundwater levels to be substantially compliant and are supported by the GSP's historical water budgets,[170] long-term groundwater elevation trends,[171] and consideration of periods of drought, commensurate with the level of understanding of the Basin.

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 sustainable yield of the basin, calculated based on historical trends, water year type, and

[166] 23 CCR § 354.28 (b).
[167] Shasta Valley GSP, Section 3.4.1.2, p. 244.
[168] 23 CCR § 354.28(c)(1)(B).
[169] Shasta Valley GSP, Section 3.4.1.2, p. 244.
[170] Shasta Valley GSP, Section 2.2.3, pp. 187-209.
[171] Shasta Valley GSP, Section 2.2.2.1, pp. 131-136.

projected water use in the basin.[172] GSAs may also manage storage by using levels as a proxy, where a GSA provides evidence that the managing through proxy is appropriate.[173]

The GSP selects groundwater levels as the proxy for groundwater storage. The GSP justifies using groundwater levels as a proxy by referencing a study conducted by the United States Geologic Survey (USGS) that indicates that direct measurements of groundwater levels can be used to estimate changes in groundwater storage.[174] Department staff note the hydrogeologic conceptual model included in the GSP identifies the aquifer's characteristics as a data gap to be filled and states the properties of key aquifers are unknown.[175] While the use of groundwater levels as a proxy for groundwater storage is a common practice, Department staff question whether the GSA knows enough information about the aquifer characteristics to use the method outlined in the study by the United States Geologic Survey to correlate groundwater levels and groundwater storage. Department staff encourage the GSA to reevaluate whether this is an appropriate proxy once these data gaps are filled, and more information is available.

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.[176]

As explained in the Plan's Basin Setting Section, the Basin is an inland basin located at an elevation of over 2,600 feet above mean sea level and is more than 100 miles from, and not hydraulically connected to, a sea or ocean. Based on this, Department staff conclude that seawater intrusion is not a factor in the Basin and the Plan does not describe undesirable results due to seawater intrusion or consider seawater intrusion as a sustainability indicator requiring sustainable management criteria.[177] Given the physical setting of the Basin, Department staff regard the GSA's decision to omit sustainable management criteria for seawater intrusion as reasonable.

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

[172] 23 CCR § 354.28(c)(2).
[173] 23 CCR § 354.28(d).
[174] Shasta Valley GSP, Section 3.4.2, p. 248.
[175] [175] Shasta Valley GSP, Section 2.2.1.3.1, pp. 108-115.
[176] 23 CCR § 354.28(c)(3).
[177] Shasta Valley GSP, Section 2.2.2.5, p. 150.

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.[178]

The GSP has established sustainable management criteria for nitrate (as N) and specific conductivity.[179] The GSP provides rationale for not establishing sustainable management criteria for arsenic, benzene, boron, iron, and manganese.[180] Department staff conclude the rationale provided by the GSA to not set sustainable management criteria for these constituents is reasonable at this time

The GSP describes significant and unreasonable degraded water quality conditions as "those that occur when the degradation of water quality that would impair beneficial uses of groundwater within the basin or result in failure to comply with groundwater regulatory thresholds."[181]

The GSP defines the undesirable result for degraded water quality as when "concentrations of [constituents of concern] exceed defined maximum thresholds or if a significant trend of groundwater quality degradation is observed for the identified [constituents of concern]."[182] The GSP plans to calculate when a trend in degradation is observed by tracking trends and comparing trends using weighted averages.[183] The GSP provides an equation to calculate the likelihood of conditions exceeding an anti-degradation policy, based on a combination of 10-year averages and 2-year averages.[184]

Department staff recognize the GSA has attempted to use an alternative method to define an undesirable result for degraded water quality, and the GSP Regulations require that the minimum threshold for degraded water quality be based on the number of supply wells, a volume of water, or the location of an isocontour.[185] Additionally, the GSP Regulations require that an undesirable result be based on a quantitative description of the combination of minimum threshold exceedances.[186] Department staff recommend the GSA redefine their undesirable results for degraded water quality to be consistent with the GSP Regulations to be based on criteria used to define when and where the effects of the groundwater conditions cause undesirable results, based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the Basin (see Recommended Corrective Action 6a).

Department staff note that the GSP excludes undesirable results for degradation of groundwater quality for "groundwater quality changes that occur independent of SGMA

[178] 23 CCR § 354.28(c)(4).
[179] Shasta Valley GSP, Table 3.9, p. 263.
[180] Shasta Valley GSP, Section 2.2.2.3.2, pp. 141-
[181] Shasta Valley GSP, Section 3.4.4.1, p. 260.
[182] Shasta Valley GSP, Section 3.4.4.1, p. 260.
[183] Shasta Valley GSP, Section 3.4.4.1, pp. 260-261.
[184] Shasta Valley GSP, Section 3.4.3.1, pp. 260-261.
[185] 23 CCR §354.28(c)(4).
[186] 23 CCR §354.26(b)(2).

activities."[187] The GSP's definition of undesirable results for degraded water quality, which solely focuses on water quality impacts caused directly by the GSA implementing an action, is incorrect. SGMA includes in its definition of undesirable results the "significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies."[188] SGMA specifies that the significant and unreasonable effects are those "caused by groundwater conditions occurring throughout the basin," but does not limit them to impacts caused by basin management under the GSP. As currently defined, if for instance, a minimum threshold exceedance occurs because of mobilization of naturally occurring constituents or migration of a contaminant plume to supply wells caused by groundwater pumping, but the GSA has not implemented any pumping regulations, the GSA would not identify this as an undesirable result. Staff consider this to be inconsistent with the intent of SGMA, which requires GSAs to ensure management of groundwater conditions in the basin, including any action taken by the GSA, will not significantly and unreasonably degrade water quality. Therefore, degraded water quality caused by groundwater pumping, whether the GSA has implemented pumping regulations or not, should be considered in the assessment of undesirable results in the Basin. Department staff recommend the GSA revise the definition of undesirable results such that groundwater pumping, whether due to action or inaction of the GSA with respect to Basin management, is considered in the undesirable result definition (see Recommended Corrective Action 6b).

The GSP defined the minimum thresholds using: existing groundwater quality data; consideration of groundwater beneficial uses designated in the Basin; existing regulations, including the Water Quality Control Plan for the North Coast Region (as adopted by the North Coast Regional Water Quality Control Board) and Title 22; and consultation with the GSA advisory committee and stakeholders.[189] The GSA establishes the minimum threshold for Nitrate as N as 10 milligrams per liter, and for specific conductivity as 900 micromhos.[190] The GSP further defines additional "action triggers" that the GSA will use to investigate conditions and consider implementing projects and management actions.[191] The GSP indicates that minimum thresholds also includes a provision that allows a 15 percent average increase per year over ten years in no more than 25 percent of the wells.[192]

Department staff note that GSP Regulations require minimum thresholds for degraded water quality to 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.[193]. The proposed management of allowing an increasing

[187] Shasta Valley GSP, Section 3.4.4.1, p. 260.
[188] 23 CCR § 354.28(c)(4).
[189] Shasta Valley GSP, Section 3.4.4.1, p. 262.
[190] Shasta Valley GSP, Table 3.9, p. 263.
[191] Shasta Valley GSP, Section 3.4.4.1, p. 263.
[192] Shasta Valley GSP, Table 3.9, p. 263.
[193] 23 CCR § 354.28 (c)(4).

average value does not appear to be allowable within the GSP Regulations. While the proposed minimum threshold value for degraded water quality is incorrect, the overall water quality in the Basin is generally not at risk of short-term degradation based on the information included in the GSP so this fault does not preclude plan approval. Department staff recommend the GSA refine its minimum thresholds for degraded water quality to 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 (see Recommended Corrective Action 6c).

The GSP defined measurable objectives for degraded water quality using the same metrics as minimum thresholds, milligrams per liter for nitrate as N, and as micromhos for specific conductivity. The GSP established measurable objectives as a range of water quality within 90% of measurements measured over the 1990-2020 period.[194] The GSP identified that the highest concentration for nitrate that is within the measurable objective is 7.5 milligrams per liter, and the highest specific conductivity is 675 micromhos.[195] Staff regard the measurable objectives for the chronic lowering of groundwater levels in the Scott River Valley GSP as providing a reasonable margin of operational flexibility under adverse conditions, and sufficient to support sustainable management of the Basin.

Department staff conclude that the Plan's approach of using nitrate as N and specific conductivity for its water quality sustainable management criteria is generally reasonable and consistent with the GSP Regulations. Department staff recognize that GSAs are not responsible for improving existing degraded water quality conditions. GSAs are required; however, to manage future groundwater extraction to ensure that groundwater use subject to its jurisdiction does not significantly and unreasonably exacerbate existing degraded water quality conditions. Where natural and other human factors are contributing to water quality degradation, the GSA may have to confront complex technical and scientific issues regarding the causal role of groundwater extraction and other groundwater management activities, as opposed to other factors, in any continued degradation; but the analysis should be on whether groundwater extraction is causing the degradation in contrast to only looking at whether a specific project or management activity results in water quality degradation. Department staff recommend that the GSA coordinate with the appropriate water quality regulatory programs and agencies in the Basin to understand and develop a process for determining when groundwater management and extraction is resulting in degraded water quality in the Basin (see Recommended Corrective Action 6d).

Overall, Department staff consider the sustainable management criteria for degraded water quality to be commensurate with the level of understanding of the Basin based on water quality information presented in the Plan's Basin settings. Staff note that groundwater quality in the Basin is generally not at risk of short-term degradation, and the

[194] Shasta Valley GSP, Section 3.4.4.3, p. 265.
[195] Shasta Valley GSP, Figure 3.11, p. 264.

GSA should revise undesirable results and minimum thresholds according to GSP Regulations (as indicated in the recommended corrective actions) by the next 5-year GSP update.

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.[196] 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.[197]

The GSP describes significant and unreasonable land subsidence as occurring "when subsidence substantially interferes with beneficial uses of groundwater and land uses."[198] The GSP defines an undesirable result for land subsidence as being detected as an exceedance of the minimum threshold due to pumping in any one year, anywhere in the Basin.[199]

The Plan sets the minimum threshold for land subsidence as 0.1 foot of subsidence in any one year, resulting in no long-term permanent subsidence. The GSP relies on the Department's annual InSAR dataset to monitor subsidence and has selected the minimum threshold to be the estimated measurement error in InSAR data.[200] Department staff note that the GSA is protecting land uses and property interests in the Basin by limiting subsidence by setting the minimum threshold at the smallest amount of subsidence measurable by InSAR.

The GSP establishes a measurable objective of maintaining zero long term subsidence throughout the GSP implementation period using the same metrics and monitoring sites as minimum thresholds.[201] The GSP states that the guiding principle of the measurable objective is the maintenance of current ground surface elevations.[202]

Based on review of the GSP's justification of its selection of sustainable management criteria for land subsidence, staff consider the GSP's discussion and presentation of

[196] 23 CCR § 354.28(c)(5).
[197] 23 CCR §§ 354.28(c)(5)(A-B).
[198] Shasta Valley GSP, Section 3.4.5.1, p. 268.
[199] Shasta Valley GSP, Section 3.4.5.1, p. 268.
[200] Shasta Valley GSP, Section 3.4.5.2, p. 268.
[201] Shasta Valley GSP, Section 3.4.5.3, p. 269.
[202] Shasta Valley GSP, Section 3.4.5.3, p. 269.

information on land subsidence to cover the specific items listed in the GSP regulations in an understandable format using appropriate data.

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.[203] 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.[204] 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.[205]

The GSP identifies major interconnected surface water bodies in the Basin as the Little Shasta and Shasta Rivers, and states that all surface water is considered potentially interconnected.[206]

The GSP does not quantify the rate or volume of depletions due to groundwater pumping as the sustainable management criteria for depletions of interconnected surface water as required by the GSP Regulations. The GSP states stream depletion volumes due to groundwater extraction were not computed because the Basin's numerical model was not ready for use for this purpose at the time of GSP development. Instead, the GSP establishes a minimum threshold for depletions of interconnected surface water as the groundwater contribution to Shasta River flows, measured at the Shasta River Montague gage.[207] The sustainable management criteria developed by the GSP focus on using in stream flows as a temporary metric for sustainability of interconnected surface water to be used during development of the numerical model.[208] The GSP states this is a temporary approach based on direct measurements of groundwater conditions based on a surface water balance.[209] The lack of data does not amount to a technical justification for the use of groundwater contributions to instream flows instead of depletions of interconnected surface water due to pumping as required by GSP Regulations. Department staff note the GSP does not demonstrate, with adequate evidence, that the use of this alternate method based on a surface water balance is sufficient to quantify the location, quantity, and timing of depletions.

[203] Water Code § 10721(x)(6).
[204] 23 CCR § 354.16 (f).
[205] 23 CCR § 354.28 (c)(6).
[206] Shasta Valley GSP, Figure 2.52, p. 165.
[207] Shasta Valley GSP, Section 3.4.3.2, p. 251.
[208] Shasta Valley GSP, Section 3.4.3.2, p. 251.
[209] Shasta Valley GSP, Section 3.4.3.2, p. 251.

The GSP describes significant and unreasonable interconnected surface water conditions as: "stream depletion that can be attributed to groundwater pumping to the degree it leads to significant and unreasonable impacts on beneficial uses of surface water,"[210] and elsewhere clarifies "[b]ecause the surface flow of the Shasta River, which is sustained by [interconnected surface water], is currently inadequate in many years to meet the needs of both the environment and agriculture, a sustained reduction in interconnected surface water would constitute an undesirable result." The GSP does not describe when and where the effects of groundwater extraction on the depletion of interconnected surface water would lead to undesirable results.

Department staff note that the GSP appears to imply that a pre-existing undesirable result was present in 2015,[211] but does not expressly state that this is the case. The GSP does not define the measured conditions that would result in an undesirable result, as required by GSP Regulations. Staff note that GSAs are required to describe the cause of groundwater conditions occurring throughout the basin that has led to undesirable results[212] if they are present, and the criteria used to define when and where the effects of groundwater conditions cause undesirable results based on a combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.[213] Staff recommend the GSA clarify where and when undesirable results may have been occurring for interconnected surface water, and define measured conditions that would result in an undesirable result (see Recommended Corrective Action 7a).

The GSP described potential impacts to beneficial uses and users that would be considered significant and unreasonable include: inadequate flows to support riparian health and ecosystems, and diminished agricultural surface water diversions, beyond typical reductions for any given water year type.[214] The GSP notes that the stream network is ecologically stressed due in part to insufficient baseflow conditions during the summer and fall, and adverse conditions impact, among others, two species of native anadromous fish: Coho and Chinook salmon.[215]

The GSP establishes a minimum threshold for depletions of interconnected surface water as the groundwater contribution to Shasta River flows, measured at the Shasta River Montague gage.[216] The GSP calculates this value by subtracting instream flows from other sources, and adding diversions and estimated diversions.[217] The GSP provided a table of flows, instream releases, diversions, and groundwater contributions by date with values from 2016-2020.[218] The GSP indicates that during preparation, the GSA reviewed

[210] Shasta Valley GSP, Section 3.4.3.1, p. 249.
[211] Shasta Valley GSP, Section 3.4.3.1, p. 250.
[212] 23 CCR § 354.26(b)(1).
[213] 23 CCR § 354.26(b)(2).
[214] Shasta Valley GSP, Section 3.4.3.1, p. 250.
[215] Shasta Valley GSP, Section 3.4.3.1, p. 249.
[216] Shasta Valley GSP, Section 3.4.3.2, p. 251.
[217] Shasta Valley GSP, Section 3.4.3.2, pp. 251-252.
[218] Shasta Valley GSP, Table 3.7, pp. 252-253.

measured conditions from 2018-2020; however, the GSA was unable to find data that included a drought year. The GSP establishes a preliminary minimum threshold of 100 cubic feet per second of baseflow by considering typical baseflow under recent conditions that lacks a drought year representation.[219] The GSP states that this approach will only be valid while surface water uses do not change.[220] Department staff note that this is a lower contribution than the average estimated groundwater contribution of 127 cubic feet per second.[221]

Department staff note that the GSA was unable to complete the Basin's numerical model in time to prepare all required components of the GSP, and that the GSA has indicated it plans to fill data gaps, complete the model, and use the updated model to prepare sufficiently compliant sustainable management criteria for interconnected surface water, as part of GSP implementation, by the first 5 years of implementation.[222]

GSP Regulations require measurable objectives for interconnected surface waters to be established based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.[223] The GSP provided a measurable objective of 145 cubic feet per second of baseflow, but did not provide a description of how that criteria was selected.[224] Department staff request that the GSA, as part of updating sustainable management criteria, include explanations for the criteria used to select measurable objectives.

Public comments submitted to the Department indicate there may be concern with the proposed management of depletions of interconnected surface water as proposed in the GSP. Department staff recognize that there can be disagreement regarding which scientific studies, reports, information, and biological, physical, or ecological factors are best suited to use when developing sustainable management criteria in the Basin for depletions of interconnected surface water under SGMA. Additionally, there appear to be other state and federal agencies that are or may act under other laws and authorities to address biological or ecological concerns regarding low instream flows within the Basin, which appear to be caused by numerous factors of which depletions of interconnected surface waters from groundwater extractions in the Basin is only one. Department staff conclude that at this time the GSA has considered this issue and explained and supported its choices adequately. It may be that alternative choices or methodology could also be supported by other studies or data, but it does not appear that there is a clear or convincing case that the GSA's choices or explanation are inappropriate.

Department staff understand that quantifying depletions of surface water from groundwater extractions is a complex task that likely requires developing new, specialized

[219] Shasta Valley GSP, Section 3.4.3.2, p. 251.
[220] Shasta Valley GSP, Section 3.4.3.2, p. 252.
[221] Shasta Valley GSP, Table 3.7, p. 253.
[222] Shasta Valley GSP, Section 3.3.4.1, p. 238.
[223] 23 CCR § 354.30(b).
[224] Shasta Valley GSP, Section 3.4.3.4, p.255, Table 3.8, p. 256.

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 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 7b). 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 7c). 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 7d).

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.[225]

Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[226] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[227] capture seasonal low and high conditions,[228] include

[225] 23 CCR § 354.32.
[226] 23 CCR § 354.34(b)(2).
[227] 23 CCR § 354.34(b)(3).
[228] 23 CCR § 354.34(c)(1)(B).

required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[229] Department staff encourage GSAs to collect monitoring data as specified in the GSP, follow SGMA data and reporting standards,[230] fill data gaps identified in the GSP prior to the first periodic update,[231] update monitoring network information as needed, follow monitoring best management practices,[232] 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.

The Basin's monitoring network is comprised of four separate networks which monitor their respective sustainability indicators: (1) a groundwater level monitoring network for the lowering of groundwater levels, reduction of storage, and GDEs; (2) a degraded water quality monitoring network for the observation of constituents; (3) a land subsidence monitoring network utilizing remote sensing for the observation of vertical land displacement; and (4) an interconnected surface water network used to update a numeric model for the estimation of stream depletion due to groundwater pumping.[233] The GSP provided descriptions of its monitoring networks, included maps of the levels and quality networks, and a table of well information for the levels network.[234] The GSP Regulations require that GSPs provide monitoring network details that comply with data and reporting standards.[235] The information provided about monitoring networks did not include the level of detail and information required by GSP Regulations. Department staff encourage the GSA to provide these details by the next 5-year update.

The GSP provides information about the monitoring network for the chronic lowering of groundwater.[236] The GSP has identified 13 monitoring wells to include in their groundwater level monitoring network.[237] One principal aquifer has been indicated for the Basin; however, there are three hydrogeologic water-bearing formations or aquifers described though out the GSP: fractured basalt, alluvial, and volcanic debris flow.[238] The GSP uses the groundwater levels network to monitor for changes in groundwater storage by proxy. The proposed frequency for collecting groundwater level measurements is semi-annually with additional monitoring if needed. Department staff note that monitoring networks may need to be updated as part of the 5-year update to adjust monitoring networks to support any principal aquifer adjustments made by the GSA. Department staff also note the Department's Monitoring Network Module displays a total of 14

[229] 23 CCR §§ 354.34(g-h).
[230] 23 CCR § 352.4 *et seq*.
[231] 23 CCR § 354.38(d).
[232] Department of Water Resources, 2016, Best Management Practices and Guidance Documents.
[233] Shasta Valley GSP, Section 3.3, p. 215-242.
[234] Shasta Valley GSP, Section 3.3, pp. 215-242.
[235] 23 CCR § 352.2 *et seq*, § 352.4 *et seq.*
[236] Scott River Valley GSP, Section 3.3.1, pp. 227-.
[237] Shasta Valley GSP, Section 3.3.1, p. 227.
[238] Shasta Valley GSP, Section 3.3.1, p. 227.

representative monitoring wells within the groundwater level monitoring network and suggest the GSA ensure the Monitoring Network Module remains current and the 5-year update includes any changes to the monitoring network.

The GSP provides information about the monitoring network for degraded water quality.[239] The GSP states that the groundwater quality monitoring network is designed to collect sufficient spatial and temporal data to define groundwater quality conditions relative to measurable objectives and groundwater quality trends.[240] The groundwater quality network consists of 16 municipal and public water supply wells, located near municipalities in the Basin, that will be used to monitor nitrate and specific conductivity.[241] A map is provided for the location of the water quality monitoring sites.[242]

A planned water quality monitoring network assessment and expansion, identified as a data gap, will take place within the first five years of plan implementation to provide improved spatial coverage of the Basin.[243] The monitoring frequency for constituents of concern varies by representative monitoring site. Nitrate will be sampled either annually or quarterly, depending on location, and specific conductivity will be monitored either every 3 or 9 years at a subset of locations.[244] Department staff note that one monitoring event every 9 years is insufficient to provide information at a density that is useful for sustainable management and encourage the GSA to improve the frequency of monitoring for specific conductivity.

The GSP documents a preliminary numeric model, the SWGM, which is used to support evaluation of Basin conditions. The GSP also states that the monitoring network will use surface water gaging stations, measured surface water diversions, and groundwater elevations to assess sustainability.[245] The GSP has identified one shallow stream-adjacent monitoring well to include in the monitoring network.[246] The shallow stream-adjacent monitoring well contains a pressure transducer to collect temperature and groundwater level data at hourly intervals. The shallow monitoring well is adjacent to Shasta River. The monitoring network also includes one USGS stream gage, one stream gage Instream Flow Releases from Dwinnell Reservoir/Shasta River Dam, and surface water diversions manually measured by the Scott and Shasta Watermaster District. Both stream gages collect continuous data. The USGS stream gage is adjacent to the shallow monitoring well. [247]

[239] Shasta Valley GSP, Section 3.3.2, pp. 230-235.
[240] Shasta Valley GSP, Section 3.3.3.1, pp. 231-232.
[241] Shasta Valley GSP, Section 3.3.3.1, p. 231.
[242] Shasta Valley GSP, Figure 3.5, p. 234.
[243] Shasta Valley GSP, Section 3.3.3.2, p. 235.
[244] Shasta Valley GSP, Table 3.3, p. 233.
[245] Shasta Valley GSP, Section 3.3.4.1, p. 236.
[246] Shasta Valley GSP, Section 3.3.4.1, p. 238.
[247] Shasta Valley GSP, Table 3.5, p. 239, Figure 3.7, p. 240.

Department staff regard the use of integrated hydrologic models, such as the SWGM, to quantify the depletion of interconnected surface waters due to groundwater extraction to be consistent with best scientific and management practices, and as such represent an approximate means of addressing this sustainability indicator. However, the GSP does not yet provide detailed information about the timing, location, and quantity of depletion of surface waters consistent with the regulatory requirements. The GSP identifies data gaps and describes means to fill those gaps, but the Plan only proposes to use surface water and biological monitoring. Department staff do not understand how data from such monitoring would provide the sort of information needed to characterize the spatial and temporal exchanges between surface water and groundwater as required by the Regulations, and the GSA does not explain how this information would be used to achieve that end[248] (see Recommended Corrective Action 8).

The description of the monitoring network included in the Plan sufficiently complies with the requirements outlined in the GSP Regulations. Overall, the Plan describes a monitoring network that promotes the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Basin and evaluate changing conditions that occur through Plan implementation. The Plan also describes existing data gaps and the steps that will be taken to fill data gaps and improve the monitoring network prior to the next five-year assessment. Department staff note that the GSP states its ability to fill data gaps may be based on funding availability.[249] Staff remind the GSA that data gaps are required to be identified and filled by the GSP Regulations.[250] Staff note that if the GSP's identified data gaps are not filled promptly, the GSA's understanding of Basin conditions may not reflect the best available science, as is required by the GSP Regulations.[251]

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 Regulations require a description of the projects and management actions the submitting agency has determined will achieve the sustainability goal for the basin,

[248] Shasta Valley GSP, Section 3.3.5.1, pp. 235-240
[249] Shasta Valley GSP, Section 3.3.4.2, p. 238.
[250] 23 CCR § 354.38 (c) *et seq.*
[251] 23 CCR § 354.18 (e).
[252] 23 CCR § 354.44 (a).
[253] 23 CCR § 354.44 (b) *et seq.*

including projects and management actions to respond to changing conditions in the basin.[254] The GSP's projects and management actions must show that the GSA will be able to implement the projects and/or management actions that will maintain groundwater conditions that will not become undesirable.

The GSP's sustainable management criteria indicate that the GSA's management strategy is to maintain current conditions for groundwater levels, storage, groundwater quality, and subsidence. Due to acknowledged data gaps, it is unclear how the projects and management actions will reach sustainability in the Basin.

The GSP proposes 30 projects and management actions, designed to maintain current conditions and improve Basin understanding:

- *Avoiding Significant Increase of Total Net Groundwater Use from the Basin* – This management action was established to ensure that the sustainable yield of the Basin is not exceeded, and sets a framework to develop a process to limit total Basin groundwater extraction to levels that have occurred over the most recent twenty year period. This management action will use evapotranspiration estimates in conjunction with the SVIHM to assess the effectiveness of this management action to avoid the expansion of total net groundwater use.[255]
- *Update the Shasta Groundwater Model* – This project will update the model to fill gaps, including interconnected surface water, and expansion with new data and inclusion of more recent years.[256]
- *Filling Data Gaps* – The GSP identifies filling data gaps as high priority and describes that the PMA aims to fill all data gaps described in the GSP's Appendix 3-A.[257] The GSP identifies management actions to fill monitoring network data gaps, GDE data gaps, interconnected surface water data gaps, and to perform a drought year analysis.[258]
- *Aquifer Characterization Analysis* – This project will perform testing to improve understanding of aquifer characteristics in the Basin by monitoring a pumping site and nearby wells to calculate aquifer characteristics.[259]
- *Shasta Recharge Pilot Project* – This project will divert water from the Shasta River onto land near Gazelle and Grenada for winter groundwater recharge. The goal of this project is to explore future recharge opportunities in the Basin, and this project is in the conceptual stage of development.[260] Managed aquifer recharge or in-lieu recharge projects would be refined by the GSA based on results of this project.[261]

[254] 23 CCR § 354.44 et seq.
[255] Shasta Valley GSP, Section 4.3, pp. 288-298.
[256] Shasta Valley GSP, Section 4.3, p. 285.
[257] Shasta Valley GSP, Appendix 3-A, pp. 1308-1332.
[258] Shasta Valley GSP, Section 4.3, p. 286-287.
[259] Shasta Valley GSP, Section 4.3, p. 288.
[260] Shasta Valley GSP, Section 4.3, pp. 302-303.
[261] Shasta Valley GSP, Section 4.3, pp. 305-306.

- *Strategic Groundwater Pumping Restriction* – This project would consider establishing groundwater pumping restrictions (if necessary) should other projects and management actions not achieve sustainability.[262]

Department staff note that the success of the groundwater recharge projects relies on future groundwater and climatic conditions aligning with the modeled predictions. Because climatic conditions are unpredictable and a potential increase in surface water demand may reduce recharge project water availability in the future, alternative projects and/or management actions may need to be considered (in the future) if the proposed groundwater recharge projects are unable to produce the expected benefits.

While Department staff note the Plan's projects and management actions appear generally feasible and likely to prevent undesirable results in the Basin, Department staff note that the lack of complete descriptions of many projects and management actions limit staff's ability to review the effectiveness of the projects and management actions. The GSP does not provide a clear strategy on how the Agency may prioritize the initiation and implementation of the 30 identified projects and management actions provided in the GSP. Staff use the detailed descriptions of projects and management actions to understand the GSP's planned implementation to help the department's evaluation of projects and management actions the GSA plans to take to achieve sustainability and encourage the GSA to provide additional details in future updates to the GSP.

The projects and management actions in the GSP, if implemented, will allow the GSA to manage groundwater sustainably, achieve the sustainability goal, avoid causing new undesirable results, and avoid exacerbating existing undesirable results. Staff conclude the GSP proposes projects and management actions in a manner that substantially complies with the GSP Regulations.[263]

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."[264] 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.[265]

The Basin is not adjacent to other basins or subbasins.

[262] Shasta Valley GSP, Section 4.3, p. 306.
[263] 23 CCR §§ 354.44 (a-d).
[264] Water Code § 10733(c).
[265] 23 CCR § 354.28(b)(3).

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.[266]

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 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[267] to evaluate how their Plan's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

[266] 23 CCR § 354.18.
[267] Water Code § 10609.50.

5 STAFF RECOMMENDATION

Department staff recommend approval of the GSP with the recommended corrective actions listed below. The Shasta Valley 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 Shasta Valley Basin. The GSA has identified several areas for improvement of its 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 staff believes should be addressed by the GSA before or during the first periodic assessment of its 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

Coordinate with the Department through the appropriate channels to clearly show what portions of the Basin the GSA has jurisdiction over and intends to manage under the Plan. This should include updating the GSA information on the SGMA Portal and associated geospatial files.

RECOMMENDED CORRECTIVE ACTION 2

Investigate and work to fill data gaps related to the hydrogeologic conceptual model as follows:

a) The GSA should investigate and improve its understanding of the locations and extent of the bottom of the Basin.
b) The GSA should investigate the three water-bearing formations and identify the appropriate principal aquifer(s) for the Basin.

RECOMMENDED CORRECTIVE ACTION 3

Investigate and work to fill data gaps related to understanding groundwater conditions as follows:

a) Describe groundwater storage conditions in the Basin including a chart depicting estimates of the change in groundwater in storage, demonstrating the annual and cumulative change in the volume of groundwater in storage, including the annual groundwater use and water year type.
b) Provide an estimate of the location, volume, and timing of depletions of surface water due to groundwater extraction.

RECOMMENDED CORRECTIVE ACTION 4

Provide a current water budget as required by the GSP Regulations.[268]

RECOMMENDED CORRECTIVE ACTION 5

Provide a description of the relationship between established minimum thresholds for the chronic lowering of groundwater levels and how they avoid undesirable results for each of the other sustainability indicators.

RECOMMENDED CORRECTIVE ACTION 6

The GSA should update its plan to include sustainable management criteria for degraded water quality as follows:

a) The GSA should redefine the undesirable results for degraded water quality, to be consistent with the GSP Regulations, and should be based on criteria used to define when and where the effects of the groundwater conditions cause undesirable results, based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the Basin.[269]

b) Revise the definition of undesirable results for degraded groundwater quality so that exceedances of minimum thresholds caused by groundwater extraction, whether the GSA has implemented pumping regulations or not, are considered in the assessment of undesirable results in the Basin.

c) The GSA should refine its minimum thresholds for degraded water quality to 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.[270]

d) The GSA should coordinate with the appropriate groundwater users, including drinking water, environmental, and irrigation users as identified in the Plan, and water quality regulatory agencies and programs in the Basin to understand and develop a process for monitoring and determining if groundwater management and extraction is resulting in migration of constituents of concern or degraded water quality in the Basin.[271]

RECOMMENDED CORRECTIVE ACTION 7

Department staff understand that estimating the location, quantity, and timing of stream depletion due to ongoing, basin-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

[268] 23 CCR § 354.18(c)(1).
[269] 23 CCR § 354.26(b)(2).
[270] 23 CCR § 354.28 (c)(4).
[271] 23 CCR § 354.28(c)(4).

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 describing the conditions that are significantly and unreasonably undesirable for interconnected surface water in the Basin. Describe how the GSA will know an undesirable result has occurred using a quantitative combination of minimum threshold exceedances.

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

c. 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.

d. 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 8

The GSA should provide identification of the physical monitoring that will be used to support the SVIHM's estimates of depletions of surface water for the interconnected surface water monitoring network.[272]

[272] 23 CCR § 354.34(c)(6) *et seq*.