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

John Woodling
GEI Consultants
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RE: Approved Determination of the 2022 Groundwater Sustainability Plan Submitted for the Sacramento Valley – South American Subbasin

Dear John Woodling,

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

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their GSPs at least every five years and whenever the Plan is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved GSPs and issue an assessment at least every five years. The Department will initiate the first periodic review of the South American Subbasin GSP no later than January 27, 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 Sacramento Valley – South American Subbasin Groundwater Sustainability Plan

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE SACRAMENTO VALLEY – SOUTH AMERICAN SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP or Plan) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA or Act), is likely to achieve the sustainability goal for the basin covered by the Plan, and whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the Plan within two years of its submission. (Water Code § 10733.4.) This Statement of Findings explains the Department's decision regarding the Plan submitted by the Sacramento Central Groundwater Authority (SCGA) Groundwater Sustainability Agency (GSA), Omochumne-Hartnell Water District (OHWD) GSA, Reclamation District (RD) 551 GSA, Sloughhouse Resource Conservation District (SRCD) GSA, the County of Sacramento GSA, and the Northern Delta GSA (NDGSA) group (collectively referenced to as the GSAs or Agencies) for the South American Subbasin (Basin No. 5-021.65).

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

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

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

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

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

B. The general standards the Department applied in its evaluation and assessment of the Plan are: (1) "conformance" with the specified statutory requirements, (2) "substantial compliance" with the GSP Regulations, (3) whether the Plan is likely to achieve the sustainability goal for the Subbasin within 20 years of the implementation of the Plan, and (4) whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) Application of these standards requires exercise of the Department's expertise, judgment, and discretion when making its determination of whether a Plan should be deemed "approved," "incomplete," or "inadequate."

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

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

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

1. The sustainable management criteria and goal to maintain water levels within 15.3 feet of the post-2015 low groundwater elevation are sufficiently justified and explained. The GSP provides analyses on beneficial uses and users such as wells, groundwater dependent ecosystems, and interconnected surface water to support their sustainable management criteria. The Plan relies on credible information and science to quantify the groundwater conditions that the Plan seeks to avoid and provides an objective way to determine whether the Subbasin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)

2. The Plan demonstrates an understanding of where data gaps exist and provides a description of measures to fill these data gaps. The GSP describes specific data gaps related to uncertainties in interconnected surface water locations and well information in its groundwater levels and quality monitoring networks. The Plan provides a management action to address these data gaps and commits to developing a plan, schedule, and budget for actions to address the data gaps by the first year of GSP implementation. (23 CCR § 355.4(b)(2).)

3. The projects and management actions proposed are designed to provide benefits to the Subbasin through in-lieu recharge, direct recharge, and increased surface water supply through conjunctive use, recharge projects, and recycled water projects. The projects and management actions are reasonable and commensurate with the level of understanding of the Subbasin setting. The projects and management actions described in the Plan provide a feasible approach to achieving the Subbasin's sustainability goal and should provide the GSAs with greater versatility to adapt and respond to changing conditions and future challenges during GSP implementation. (23 CCR § 355.4(b)(3).)

4. The Plan provides a detailed explanation of how the varied interests of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests, including public, domestic, and agriculture wells; groundwater dependent ecoystems; and interconnected surface water would be impacted by the chosen minimum thresholds. Although a recommended corrective action has been identified seeking clarification on potential impacts from decreased streamflow, the Plan generally provides sufficiently detailed information that does not preclude Plan approval at this time. (23 CCR § 355.4(b)(4).)

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

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

7. At this time, it does not appear that the Plan will adversely affect the ability of an adjacent basin to implement its GSP or impede achievement of sustainability goals in an adjacent basin. The Plan states states that groundwater level minimum thresholds were developed in coordination with the neighboring Cosumnes Subbasin and North American Subbasin. Additionally, the GSP discusses plans of future collaboration with adjacent basins in attaining joint sustainability goals. (23 CCR § 355.4(b)(7).)

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

9. The six GSAs and the Northern Delta GSA's associated member agencies history of groundwater management provide a reasonable level of confidence that the GSAs have the legal authority and financial resources necessary to implement the Plan. (23 CCR § 355.4(b)(9).)

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

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

1. The Plan demonstrates that its groundwater level sustainable management criteria take into consideration impacts to existing well users through a well impacts analysis. The well impacts analysis evaluated how many domestic, agricultural, or public wells would go dry assuming either a 31-year retirement age or 40-year retirement age under different modeling scenarios. Under the projected scenario with projects and

management actions and climate change, the scenario on which the majority of minimum thresholds are based, the results show that the groundwater levels are protective of between 97 to 99 percent of wells. The Plan's compliance with the requirements of SGMA and substantial compliance with the GSP Regulations supports the state policy regarding the human right to water (Water Code § 106.3). The Department developed its GSP Regulations consistent with and intending to further the policy through implementation of SGMA and the Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water in its evaluation of the Plan. (23 CCR § 350.4(g).

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

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

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

Accordingly, the GSP submitted by the Agencies for the South American Subbasin is hereby **APPROVED.** The recommended corrective actions identified in the Staff Report will assist the Department's future review of the Plan's implementation for consistency with SGMA and the Department therefore recommends the Agencies address them by the time of the Department's periodic review, which is set to begin on January 27, 2027, as required by Water Code § 10733.8. Failure to address the Department's Recommended Corrective Actions before future, subsequent plan evaluations, may lead to a Plan being determined incomplete or inadequate.

Signed:

Karla Nemeth

Karla Nemeth, Director
Date: July 27, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Sacramento Valley – South American Subbasin

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

Groundwater Basin Name:	Sacramento Valley – South American Subbasin (No. 5-021.65)
Submitting Agency:	Sacramento Central Groundwater Authority GSA, Omochumne-Hartnell Water District GSA, Reclamation District 551 GSA, Sloughhouse Resources Conservation District GSA, County of Sacramento GSA, and Northern Delta GSA group
Submittal Type:	Initial GSP Submission
Submittal Date:	January 27, 2022
Recommendation:	Approved
Date:	July 27, 2023

The Sacramento Central Groundwater Authority (SCGA) Groundwater Sustainability Agency (GSA), Omochumne-Hartnell Water District (OHWD) GSA, Reclamation District (RD) 551 GSA, Sloughhouse Resource Conservation District (SRCD) GSA, the County of Sacramento GSA, and the Northern Delta GSA (NDGSA) group (collectively referenced to as the GSAs or Agencies) submitted the South American Subbasin Groundwater Sustainability Plan (GSP or Plan) for the South American Subbasin (Subbasin) to the Department of Water Resources (DWR or Department) for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)[1] and GSP Regulations.[2] The GSP covers the entire Subbasin for the implementation of SGMA.

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

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

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.
- **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 South American Subbasin GSP. The GSAs have identified areas for improvement of their Plan (e.g., filling data gaps related to the hydrogeologic conceptual model, groundwater conditions, and interconnected surface water locations). Department staff concur that those items are important and recommend the GSAs address them as soon as possible. Department staff have also identified additional recommended corrective actions within this assessment that the GSAs should consider addressing by the first periodic evaluation of the Plan. The recommended corrective actions generally focus on the following:

(1) Amending or providing more supporting information about the definition of undesirable results for degraded water quality.

(2) Revising the definition of undesirable results for land subsidence such that groundwater extraction and other factors, whether due to action or inaction of the GSAs with respect to Subbasin management, are considered and not excluded in the undesirable result definition.

(3) Continuing to fill data gaps, collecting additional monitoring data, coordinating with resource 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.

(4) Providing updates to the monitoring network.

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

2 EVALUATION CRITERIA

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

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

When evaluating whether the Plan is likely to achieve the sustainability goal for the Subbasin, Department staff reviewed the information provided and relied upon in the GSP for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.[13] The Department's review considers whether there is a reasonable relationship between the information provided and the assumptions and conclusions made by the GSA, including whether the interests of the beneficial uses and users of

[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).

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]

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

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

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

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

[14] 23 CCR §§ 355.4(b)(1), (3), (4), and (5).
[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*.

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

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

3 REQUIRED CONDITIONS

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

3.1 SUBMISSION DEADLINE

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

The GSAs submitted their Plan on January 27, 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]

[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).

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

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

4 Plan Evaluation

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

4.1 Administrative Information

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

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[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/111.
[33] Water Code § 10727(b); 23 CCR § 355.4(a)(3).
[34] South American GSP, Section 1.1, p. 66.
[35] 23 CCR § 354.6 *et seq*.
[36] 23 CCR § 354.8 *et seq*.
[37] 23 CCR § 354.6(e).

The Plan describes the organizational and management structure of the GSAs and explains the GSAs' authority to manage groundwater. The GSP identifies the GSAs in the Subbasin as Sacramento Central Groundwater Authority (SCGA), Omochumne-Hartnell Water District (OHWD), Sloughhouse Resource Conservation District (SRCD), Reclamation District (RD) 551, the County of Sacramento, and the Northern Delta GSA (NDGSA).[38] The NDGSA was formed through a joint powers agreement by numerous local agencies that had completed SGMA's GSA formation process and includes Franklin Drainage District and RDs 1002, 813, 744, 2110, and 369.[39] Per the GSP, RD 755 is listed as a member agency of the NDGSA; however, RD 755 withdrew its GSA formation notification in July 2022.[40] The NDGSA and the other GSAs in the Subbasin should confirm that there is sufficient management coverage throughout the Subbasin to effectively implement the GSP.

The GSP describes that five of the six GSA entities entered into a Memorandum of Agreement to develop the GSP Working Group for the Subbasin; RD 551 GSA entered into an agreement with the NDGSA to be represented for GSP development.[41] A map showing the GSA jurisdictions is included in the GSP as Figure 2.1-3.[42] The local entities represented by the GSAs in the Subbasin include the City of Sacramento, Sacramento County Water Agency, City of Elk Grove, City of Rancho Cordova, City of Folsom, Rancho Murieta, Sacramento Regional County Sanitation District, Elk Grove Water District, OHWD, SRCD, and the various Reclamation Districts.[43]

The Department designates the South American Subbasin as a high priority basin.[44] The Subbasin is approximately 388 square miles and is contained entirely within Sacramento County. The Subbasin is located in the southeastern portion of the Sacramento Valley Groundwater Basin, bound by the American River to the north, the Sierra Nevada foothills to the east, the Sacramento River to the west, and the Cosumnes and Mokelumne Rivers to the south.[45] The Subbasin is adjacent to five other subbasins: North American Subbasin (No. 5-021.64) to the north, Yolo Subbasin (No. 5-021.67) to the west, Solano Subbasin (No. 5-021.66) to the southwest, Eastern San Joaquin Subbasin (No. 5-022.01) to the south, and Cosumnes Subbasin (No. 5-022.16) to the southeast. A map showing the Subbasin boundaries and adjacent subbasins is shown in Figure 1 below.

[38] South American GSP, Section Abstract, p. 32, Figure ES-1, p. 36.
[39] South American GSP, Table 1-2, p. 72.
[40] https://sgma.water.ca.gov/portal/gsa/withdrawals
[41] South American GSP, Section 1.4.3, pp. 76-77.
[42] South American GSP, Figure 2.1-3, p. 88.
[43] South American GSP, Abstract, p. 32.
[44] South American GSP, Section ES-1, p. 34.
[45] South American GSP, Sections ES-2 and 2.1.1, pp. 37 and 84, Figure 2.1-1, p. 85.

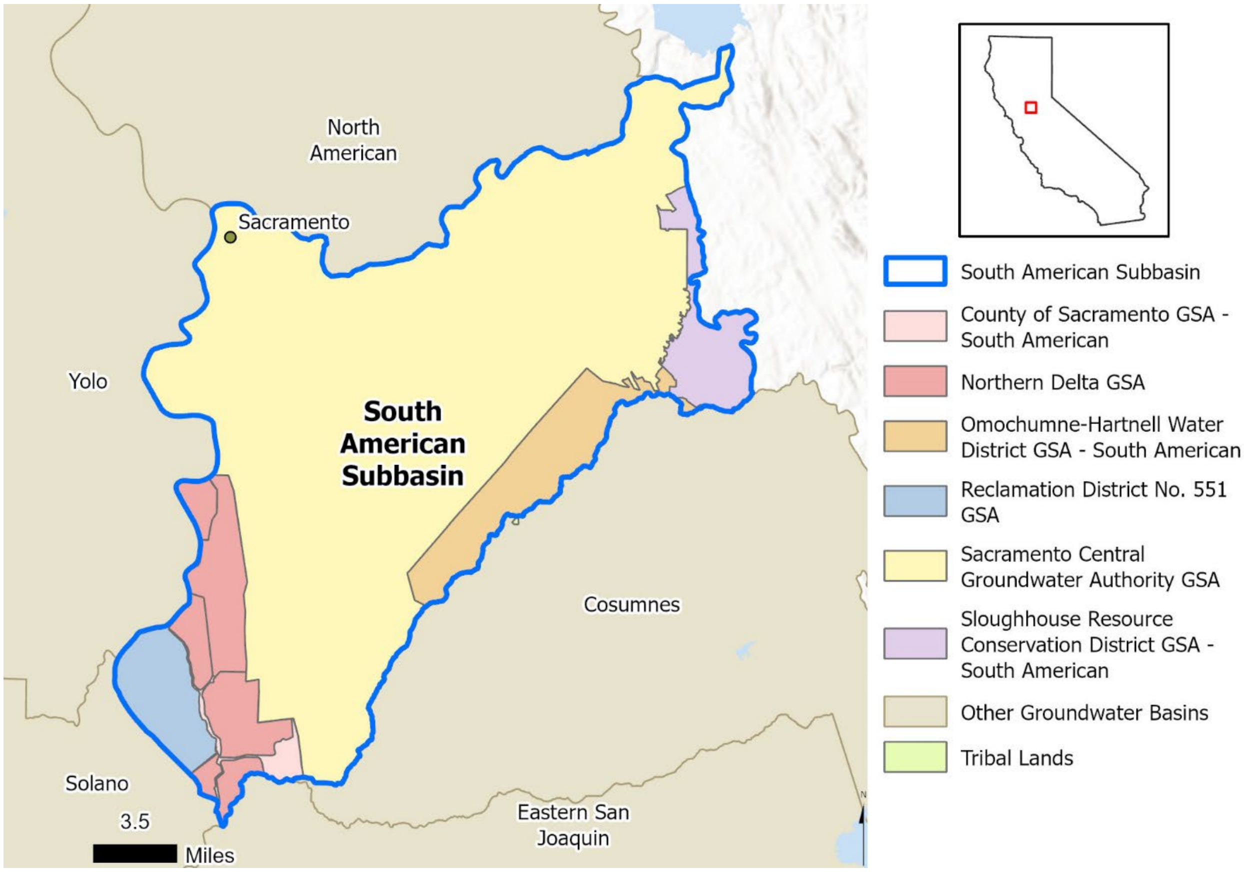

Figure 1: South American Subbasin Location Map.

The GSP describes the major surface water bodies in the Subbasin as follows: the Sacramento, American, Cosumnes, and Mokelumne rivers;[46] natural creeks include the Buffalo, Alder, Laguna, Elder, Morrison, Beacon, and Deer creeks;[47] and anthropogenic water bodies are the Freeport Regional Water Authority Pipeline, the northern portion of the Folsom South Canal, and Lake Natoma.[48]

The GSP lists the following land use categories in the Subbasin: agricultural, commercial, industrial, recreational, residential, wildlife preserves, and easements. The crop types present in the Subbasin are provided in a table and on a map in the GSP.[49] The GSP states that agricultural irrigation water is provided by surface water, groundwater, and a mix of surface and groundwater; a map is provided which shows the irrigation water sources.[50] Additionally, the GSP provides figures[51] representing the densities of domestic, production, and public groundwater wells.[52] The well infrastructure in the

[46] South American GSP, Section 1.1, p. 64.
[47] South American GSP, Section 2.1.1, p. 84.
[48] South American GSP, Section 2.1.1, p. 84.
[49] South American GSP, Section 2.1.2.6, p. 93, Table 2.1-4, p. 93, Figure 2.1-7, p. 95.
[50] South American GSP, Section 2.1.2.6, p. 93. Figure 2.1-8, p. 96.
[51] South American GSP, Figures 2.1-9 through 2.1-11, pp. 98-100.
[52] South American GSP, Section 2.1.2.7, p. 97.

Subbasin includes private domestic wells, irrigation wells, and municipal supply wells.[53] The GSP states that the Subbasin has no adjudicated areas.[54]

The GSP provides the following list of beneficial uses/users that it has identified in the Subbasin: agricultural users (farmers, ranchers, dairy); rural, agricultural-residential and domestic well owners; municipal well operators; public water systems; local land use planning agencies; environmental uses and users of groundwater, including but not limited to habitat that supports fish, birds, animals and insects; endangered species protection; protection of beneficial habitat for recreation and other societal benefits; surface water users; the federal government (not limited to the military and managers of federal lands); tribal governments; disadvantaged communities; entities monitoring or reporting groundwater elevations in the Subbasin; holders of overlying groundwater rights; adjacent subbasins including Yolo, North American, Cosumnes, East San Joaquin and Solano; industrial users; commercial users; remediation pumpers; natural ecosystems; and the general public.[55]

The GSP states that surface water is used "extensively" within the Subbasin "to augment the region's water supply and increase its reliability."[56] The GSP states that surface water is diverted from the American River and Sacramento River for use by the diverting entities. The GSP states that agricultural use of surface water occurs primarily at diversions in the Delta and along the Cosumnes River.[57] Surface water diversions and volumes for the municipal, agricultural, rural residential, and remediation water sectors are provided on Table 2.1-5 for the 2018 water year.[58] Department staff note that additional water use sectors and water source types were identified in the annual reports[59] and encourage the GSP to provide this information in future updates.

The GSP describes conjunctive water use in the Subbasin. The Zone 40 Water Supply Master Plan's primary objective is to meet future water demand through conjunctive water use, utilizing surface water, groundwater, and recycled water.[60] The GSP states that as a result, the planning and construction of the regional water distribution system allow the use of surface water during wet periods and groundwater pumping during dry periods.[61] The GSP provides sufficient information for the following topics:[62] a description of how the implementation of existing general plans may change water demands within the

[53] South American GSP, ES-2, p. 44.
[54] South American GSP, Sections ES-1 and 2.1.2.1, pp. 34 and 86, Figures ES-1 thru ES-2 and 2.1-2 thru 2.1-3, pp. 36, 38 and 87-88.
[55] South American GSP, Abstract, p. 32, Section 1.5.3.1, p. 78.
[56] South American GSP, Section 2.1.4, p. 101.
[57] South American GSP, Section 2.1.4, p. 101.
[58] South American GSP, Section 2.1.4, p. 101, Table 2.1-5, p. 101.
[59] South American Subbasin GSP WY 2022 Annual Report, https://sgma.water.ca.gov/portal/gspar/preview/224; South American GSP WY 2021 Annual Report, https://sgma.water.ca.gov/portal/gspar/preview/136
[60] South American GSP, Section 2.1.9.9, p. 141.
[61] South American GSP, Section 2.3, pp. 187-188.
[62] 23 CCR §§ 354.8(a)(4), 354.8(c), 354.8(f)(2-3).

Subbasin or affect the ability of the Agencies to achieve sustainable groundwater management; and a description of how the implementation of the Plan may affect the water supply assumptions of relevant general plans.

The GSP describes its management structure as divided into roles between the SCGA, the other five GSA Boards, and the GSP Working Group. The GSP explains that the SCGA is the designated Plan Manager of the GSP and oversees and coordinates consultants, ensures grant obligations are met and reimbursements are received, and delivers the GSP priorities within the GSP schedule.[63] The GSA Boards were responsible for executing public outreach per the Communication and Engagement Plan, informing GSP Working Group members regarding GSP development, accepting approvals according to the GSP schedule, and adopting the final GSP for submittal to DWR.[64] The GSP Working Group consists of board members and senior staff of each GSA and is responsible for coordinating planning activities and public outreach. The GSP outlines specific GSP Working Group responsibilities, framework, and guiding principles in Appendix 1C. [65] The Plan states that its decision-making process utilized the GSP Working Group to make decisions by consensus.[66]

The GSP states that the Communication and Engagement Plan[67] was developed to assist the GSAs with stakeholder outreach.[68] The GSP provides each GSA's website, meeting frequency, and location.[69] The websites of the GSAs facilitate communication of GSA board meetings, documents, maps, status updates, and contact information.[70] The GSP states that informing and educating the public about GSP implementation and the status of projects and management actions will continue as described in the Communication and Engagement Plan; future engagement activities include updates to the Subbasin's website, community meetings, social media, workshops, newsletters, brochures, and informational surveys.[71]

The annual cost estimates for implementing the GSP over the next 20 years is $860,000.[72] The GSP explains that some portion of funding will be met by cost sharing among the GSAs; however, this does not provide for new groundwater wells and equipment, or costs associated with administration and management for each GSA.[73] Propositions 1 and 68 provided funding for GSP development, and funding for

[63] South American GSP, Section 1.4.2.1, p. 74.
[64] South American GSP, Section 1.4.2.3, p. 76.
[65] South American GSP, Section 1.4.2.2, pp. 74-76, Appendix 1-B, pp. 635-645, Appendix 1-C, pp. 646-660.
[66] South American GSP, Section 1.4.3, pp. 76-77.
[67] South American GSP, Appendix 1-D, pp. 661-745.
[68] South American GSP, Sections 1.5.3 and 1.5.3.2, pp. 78 and 79.
[69] South American GSP, Table 1-3, p. 79.
[70] South American GSP, Section 1.5.3.2, p. 79.
[71] South American GSP, Section 5.1.7, p. 415, Appendix 1-D, pp. 661-745.
[72] South American GSP, Sections ES-5 and 5.2, pp. 62 and 416, Table 5-2, p. 417.
[73] South American GSP, Sections ES-5 and 5.2, pp. 62-63 and 416, Table 5-2, p. 417.

implementation is expected to come from future federal and state grants, fees, increased water rates, and low-interest loans.[74]

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

4.2 Basin Setting

GSP Regulations require information about the physical setting and characteristics of the basin and current conditions of the basin, including a hydrogeologic conceptual model; a description of historical and current groundwater conditions; and a water budget accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.[75]

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.[76] The GSP Regulations require a descriptive hydrogeologic conceptual model that includes a written description of geologic conditions, supported by cross sections and maps,[77] and includes a description of basin boundaries and the bottom of the basin,[78] principal aquifers and aquitards,[79] and data gaps.[80]

To describe the hydrogeological conceptual model, the GSP utilizes prior technical studies, maps, cross sections, and expands on these prior works using additional available data. [81] Some components of the hydrogeologic conceptual model utilized the Subbasin's numerical groundwater model, the Cosumnes-South American-North American (CoSANA) model. The model is described below in more detail in Section 4.2.3.

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[74] South American GSP, Sections Abstract, ES-5, and 5.2, pp. 32, 63, and 416.
[75] 23 CCR § 354.12.
[76] 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.
[77] 23 CCR §§ 354.14 (a), 354.14 (c).
[78] 23 CCR §§ 354.14 (b)(2-3).
[79] 23 CCR § 354.14 (b)(4) *et seq.*
[80] 23 CCR § 354.14 (b)(5).
[81] South American GSP, Section 2.2, pp. 153-184.

The GSP explains that the subsurface of the Sacramento Valley is composed of marine and continental sedimentary deposits ranging in age from the Cretaceous to Quaternary. The Plan describes the Sacramento Valley as a broad, northwest-trending asymmetrical syncline, with a more gently dipping eastern limb.[82] The synclinal trough is bounded to the east by the eastern Sierra Nevada forming a depositional basin that has accumulated a thick sequence of sedimentary deposits; the upper portions of those sedimentary deposits provide the framework for the aquifer system.[83] Stratigraphy of the Subbasin consists primarily of a sequence of unconsolidated to partly consolidated continental deposits of Eocene to Quaternary age overlying older marine sedimentary rocks of late Cretaceous to Eocene age.[84] The basin sediments primarily formed through a complex combination of orogenic events, sea-level transgressions and regressions, volcanic activity and glaciation.[85] The GSP includes a map and figure depicting the geologic units and a generalized stratigraphic column of geologic formations.[86] The GSP includes six cross-sections.[87]

The GSP describes the Subbasin's physical and administrative lateral boundaries. The Plan notes that the Subbasin's boundaries consist of seven boundary segments,[88] including five segments that are groundwater divides, one segment that is a boundary with impermeable bedrock, and one segment identified by the political boundary between Yolo and Sacramento counties — which is coincident with the Sacramento River.[89] The northern boundary is the American River beginning at the confluence of the Sacramento River and extending northeasterly where the boundary becomes the geologic contact between sediments and fractured bedrock. The eastern boundary is the contact between sediments and fractured bedrock. The southern boundary extends southwesterly along the Cosumnes River to the confluence with the Mokelumne River. The western boundary follows the Sacramento River north to its confluence with the American River, with a portion of the boundary with the Yolo Subbasin being defined as a political boundary between Yolo and Sacramento counties.[90] The GSP states that groundwater divides between the Subbasin and adjacent basins may provide only a limited barrier to groundwater movement; this barrier may be more pronounced for near-surface groundwater influenced by rivers and streams, but may not limit deeper interbasin flow.[91]

The GSP states that the bottom of the Subbasin "is the shallower of either the base of fresh water or the bottom of the Valley Springs Formation."[92] The GSP considers the base

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[82] South American GSP, Section 2.2, p. 153.
[83] South American GSP, Section 2.2, p. 153.
[84] South American GSP, Section 2.2.3, p. 156.
[85] South American GSP, Section 2.2.2, p. 155.
[86] South American GSP, Figure 2.2-30A, p. 157 and Figure 2.2-31, p. 159.
[87] South American GSP, Figures 2.2-34 to 2.2-39, pp. 162-167.
[88] South American GSP, Section 2.2.5, pp. 172-173.
[89] South American GSP, Section 2.2.5.1, p. 172; B118 Basin Boundary DWR, 2020.
[90] South American GSP, Section 2.2.5.1, p. 172.
[91] South American GSP, Section 2.2.5.1, p. 173.
[92] South American GSP, Section 2.2.5.3, p. 173.

of fresh water to be the depth at which the specific conductivity of groundwater is 3,000 micromhos per centimeter — which the Plan notes corresponds to a total dissolved solids (TDS) concentration of approximately 2,000 milligrams per liter (mg/L) — and is approximately 1,400 feet below ground surface (bgs) in the central part of the Subbasin.[93]

The GSP states that the Subbasin consists of a single principal aquifer primarily composed of post-Eocene sedimentary deposits and typically divided into an upper zone and a lower zone.[94] Department staff note that the GSP does not clearly describe or delineate the estimated depth that would distinguish between the upper and lower zones. According to the GSP, the upper zone is partially separated by a discontinuous clay layer in the lower portion of the Laguna Formation that can act as a semi-confining layer for the lower zone of the aquifer.[95] The upper zone is comprised of unconfined Pleistocene to Quaternary-age sediments including the Modesto, Riverbank, and Laguna formations and the South Fork Gravels and Arroyo Seco Gravels. The zone extends approximately 200 to 300 feet bgs and is typically of high quality and is often used for private domestic and/or irrigation wells.[96] The lower zone primarily consists of Miocene to Pliocene-age volcanic deposits that include the Mehrten Formation and portions of the underlying Valley Springs and Ione formations, depending on the depth to the base of fresh water which averages 1,400 feet bgs in the Subbasin. The Plan states that in areas where interference with domestic wells could occur, larger municipal supply wells often target the deeper black sand of the Mehrten Formation where high production rates can be achieved with minimal impacts to domestic wells screened in the upper zone of the aquifer.[97]

The Plan indicates that there are no structural features, such as faults or folds, within the that could affect groundwater flow in the Subbasin.[98] The Plan provides estimates of various aquifer properties, such as hydraulic conductivity, transmissivity, specific yield, and specific storage for the different geologic units.[99]

The GSP states that there are no data gaps that would prevent the Subbasin from achieving sustainability by 2042; however, the GSP does identify data gaps that could improve the Subbasin's hydrogeologic conceptual model and understanding of the groundwater system, including: further refinement of aquifer characteristics within and near Subbasin boundary areas; depth- or zone-specific water levels to assess vertical interconnection; shallow groundwater data near surface waters and natural communities commonly associated with groundwater; groundwater level data near major creeks and rivers to improve quantification and understanding of subsurface flows between

[93] South American GSP, Section 2.2.5.3, p. 173.
[94] South American GSP, Section 2.2.6, p. 173.
[95] South American GSP, Section 2.2.6.1, p. 173.
[96] South American GSP, Section 2.2.6.1, p. 173.
[97] South American GSP, Section 2.2.6.2, p. 174.
[98] South American GSP, Section 2.2.4, p. 172.
[99] South American GSP, Section 2.2.6, pp. 174-176.

groundwater subbasins and surface water-groundwater interaction; additional water quality monitoring at various depths to help inform the understanding of water quality; additional depth-specific water quality data to inform sustainable management criteria for degraded water quality; and improved characterization of near-surface soil conditions as they relate to recharge.[100]

The information provided in the GSP that comprises the hydrogeologic conceptual model substantially complies with the requirements outlined in the GSP Regulations. In general, the Plan's descriptions of the regional geologic setting, the Plan area's physical characteristics, the identification of the principal aquifer, and hydrogeologic conceptual model appear to utilize the best available science. Department staff are aware of no significant inconsistencies or contrary technical information to that presented in the Plan.

4.2.2 Groundwater Conditions

The GSP Regulations require a written description of historical and current groundwater conditions for each of the applicable sustainability indicators and groundwater dependent ecosystems that includes the following: groundwater elevation contour maps and hydrographs,[101] a graph depicting change in groundwater storage,[102] maps and cross-sections of the seawater intrusion front,[103] maps of groundwater contamination sites and plumes,[104] maps depicting total subsidence,[105] identification of interconnected surface water systems and an estimate of the quantity and timing of depletions of those systems,[106] and identification of groundwater dependent ecosystems.[107]

The GSP presents 8 hydrographs that depict long-term groundwater elevation trends, which were selected "because they broadly represent Subbasin conditions in their areas."[108] Short and long-term hydrographs for all wells (showing data from 1970 to 2020) are presented in Appendix 2-C.[109] Long-term hydrographs show an overall increase in groundwater levels of up to 25 feet in the western portion of the Subbasin from 1970 to 2020.[110] The GSP attributes groundwater level increases in the western portion of the Subbasin to the increased use of surface water, implementation of demand management measures, and fallowing of previously irrigated agricultural lands that transitioned into urban development areas.[111] Conversely, hydrographs show an overall decrease in groundwater levels of up to 60 feet in the eastern portion of the Subbasin from 1970 to

[100] South American GSP, Section 2.2.9, pp. 184 and 187.
[101] 23 CCR §§ 354.16 (a)(1-2).
[102] 23 CCR § 354.16 (b).
[103] 23 CCR § 354.16 (c).
[104] 23 CCR § 354.16 (d).
[105] 23 CCR § 354.16 (e).
[106] 23 CCR § 354.16 (f).
[107] 23 CCR § 354.16 (g).
[108] South American GSP, Section 2.3.1, pp. 198-201.
[109] South American GSP, Appendix 2-C, pp. 1319-1715.
[110] South American GSP, Figures 2.3-7, 2.3-8, and 2.3-9, pp. 198-199.
[111] South American GSP, Section 2.3.1, p. 202.

present.[112] According to the GSP, declines in the eastern portion of the Subbasin are not well understood but may be due to remediation activities at Mather Field, the Aerojet Superfund Site, and the Inactive Rancho Cordova Test Site.[113] Wells in the western portion of the Subbasin show a depth to groundwater of 10 to 30 feet bgs, with historic lows from the mid-1970s to the mid-1980s, and a historic high around 2017. Wells in the eastern portion of the Subbasin show depths ranging from 50 to 180 feet bgs, with historic highs in the mid-1980s and historic lows in 2017.[114]

The GSP includes a description of the change in groundwater storage and graphs depicting the change in storage demonstrating the annual and cumulative change in volume of groundwater storage.[115] The GSP states that between 1990 and 2018, the estimated cumulative storage in the Subbasin has increased by 188,000 acre-feet. The most recent 10-year period (2009 to 2018) shows an estimated cumulative storage increase of 77,000 acre-feet.[116] The GSP includes a graph depicting the cumulative change in Subbasin storage from 1990 to 2018, along with the annual storage change for each given year. Water year types are provided; however, the GSP does not specify whether seasonal high conditions were used for these estimates.

The GSP explains that seawater intrusion is not a relevant sustainability indicator within the Subbasin "due to the distance between the Subbasin and the Pacific Ocean, which at its closest is approximately 30 miles west at San Francisco Bay." [117] The GSP acknowledges that the western margin of the Subbasin overlies the Sacramento-San Joaquin Delta; however, the GSP details the natural and manmade conditions which regulate the salinity in this area.[118]

The GSP includes a description (and maps) of current and historical groundwater quality issues in the Subbasin and identifies nitrate, TDS, arsenic, hexavalent chromium, and per- and polyfluoroalkyl (PFAS) as the water quality constituents of interest based on previous studies and stakeholder concerns discussed during public meetings. [119] The GSP states that groundwater quality is "generally of good quality and meets local needs for municipal, domestic, and agricultural uses" and constituent exceedances "may be caused by localized conditions and generally are not reflective of regionally poor groundwater quality." [120] The GSP used exceedances of the Primary Maximum Contaminant Level (MCL) and Secondary MCL (SMCL) to determine which constituents

[112] South American GSP, Figures 2.3-10 to 2.3-14, pp. 199-201.
[113] South American GSP, Section 2.3.1, pp. 202-203.
[114] South American GSP, Section ES-2, pp. 45-46, Figures 2.3-7 to 2.3-14, pp. 198-201, Section 2.3.1, pp. 202-203.
[115] South American GSP, Figures 2.3-27, p. 218.
[116] South American GSP, Section 2.3.2, p. 218.
[117] South American GSP, Section 2.3.3, pp. 218-219.
[118] South American GSP, Section 2.3.3, pp. 218-219.
[119] South American GSP, Section 2.3.4, p. 220, Figures 2.3-30 to 2.3-33, pp. 224-227 and Figures 2.3-34 to 2.3-38, pp. 229-233.
[120] South American GSP, Section 2.3.4, p. 219.

may be of concern.[121] The GSP notes that there are arsenic and nitrate concentrations in the shallow aquifer zone that exceed the MCL of 10 micrograms per liter and 10 mg/L, respectively, but asserts that where these exceedances occur in the Subbasin, domestic water supply is delivered by municipal community water systems and domestic well density is low.[122] Maps showing the locations of MCL exceedances are provided in Figures 2.3-34 and 2.3-35 for arsenic[123] and Figures 2.3-30 and 2.3-31 for nitrate.[124] The GSP states that arsenic concentrations could be elevated due to naturally occurring aquifer sediments or due to land subsidence caused by groundwater pumping; however, the GSP states that it is unclear whether these are the cause for elevated arsenic concentrations in the Subbasin. The GSAs do not anticipate land subsidence to occur in the Subbasin and, therefore, do not expect arsenic concentrations to be increased in the shallow aquifer zone.[125]

The GSP states that TDS concentrations below the recommended SMCL of 500 mg/L "are desirable for a higher degree of consumer acceptance"; however, up to 1,000 mg/L, the upper SMCL, can be considered acceptable.[126] The GSP states that while TDS concentrations have consistently been below the SMCL value in the deep zone, TDS concentrations in the shallow aquifer have exhibited "higher" concentrations from 2005 to 2020.[127] Figure 2.3-32, which depicts TDS concentrations in the shallow zone, shows some areas of between 500 to 1,000 mg/L and exceedances of greater than 1,000 mg/L in the western part of the Subbasin.[128]

The GSP notes that groundwater remediation efforts being overseen by federal, state, and local regulatory agencies are taking place at the following remediation sites within the Subbasin: Boeing Inactive Rancho Cordova Test Site, Aerojet Superfund Site, Mather Airforce Base, Kiefer Landfill, Sacramento Army Depot, Union Pacific Downtown, and Union Pacific Curtis Park.[129] A map of contamination sites and plumes in the Subbasin is included in Section 2.1.8 of the GSP.[130]

The GSP includes a description of current and historical land subsidence conditions, along with maps, in the Subbasin.[131] The maps of current land subsidence cover the extent, cumulative total, and annual rate of subsidence in the Subbasin. Current subsidence data includes DWR-published Interferometric Synthetic Aperture Radar (InSAR) data ranging from June 2015 to October 2020, and continuous global positioning

[121] South American GSP, Section 2.3.4, p. 219.
[122] South American GSP, Section 2.3.4, pp. 221 and 228.
[123] South American GSP, Figures 2.3-34 and 2.3-35, pp. 229-230.
[124] South American GSP, Figures 2.3-30 and 2.3-31, pp. 224-225.
[125] South American GSP, Section 2.3.4, p. 228.
[126] South American GSP, Section 2.3.4, p. 221.
[127] South American GSP, Section 2.3.4, p. 221, Figure 2.3-32 and 2.3-33, p. 226-227.
[128] South American GSP, Figure 2.3-32, p. 226.
[129] South American GSP, Section 2.1.8, pp. 118-136.
[130] South American GSP, Figure 2.1-18, p. 119.
[131] South American GSP, Section 2.3.5, p. 234 and Figures 2.3-39 and 2.3-40, pp. 235-236.

system (CGPS) station data from October 2005 to October 2020.[132] The GSP includes the extent, cumulative total, and annual rate of subsidence within the Subbasin in Figure 2.3-39 and Figure 2.3-40.[133] The GSP states that, based on InSAR data collected from June 2015 to September 2019, the maximum total displacement was 0.15 feet (1.8 inches) in three locations on the western side of the Subbasin located in the Elk Grove area and Sacramento-San Joaquin Delta area.[134] The GSP also uses a CGPS station in the southwestern corner of the Subbasin to track historical subsidence. Historical trends from this CGPS station indicate that from October 2005 to October 2020, this area experienced a vertical displacement change of 0 to -0.14 feet, or less than -0.01 feet per year.[135] The GSP concludes that the analysis of subsidence data shows only minimal amounts of subsidence has occurred in the Subbasin.[136]

The GSP presents an analysis of interconnected surface water in the Subbasin.[137] The analysis focuses on three major surface water features in the Subbasin (the Sacramento, American, and Cosumnes Rivers) and included a review of groundwater level data from multiple sources as well as modeling.[138] The GSP identifies interconnected surface water as occurring when interpolated groundwater levels intersect with the stream clogging layer. If the groundwater levels are below the clogging layer, the stream is considered disconnected.[139] The GSP uses the CoSANA integrated water resources model to look at the timing and location of gaining, losing, and disconnected stream reaches and shows the probable interconnected and disconnected stream reaches within the Subbasin.[140] The GSP ultimately identifies multiple reaches in the American River, Sacramento River, Cosumnes River, Mokelumne River, Alder Creek, and Morrison Creek as interconnected surface water within the Subbasin.[141] The interconnected surface water reaches are provided in Figure 2.3-45.[142]

The GSP presents what it calls seasonally-averaged interconnected surface water depletion estimates.[143] However, the accompanying description indicates this is seepage, where a negative seepage indicates a losing stream and a positive seepage indicates a gaining stream. The GSP further indicates timing of depletion in terms of a percentage of seasons connected using 2005 to 2018 results from the CoSANA model.[144]

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[132] South American GSP, Section 2.3.5, p. 234.
[133] South American GSP, Figures 2.3-39 and 2.3-40, pp. 235-236.
[134] South American GSP, Section 2.3.5, p. 234, Section 3.4.5, pp. 333-334.
[135] South American GSP, Section 2.3.5, p. 234, Figure 2.3-40, p. 236.
[136] South American GSP, Section 2.3.5, p. 234.
[137] South American GSP, Appendix 3-A, pp. 1832-1900.
[138] South American GSP, Appendix 3-A, p. 1860.
[139] South American GSP, Appendix 3-A, p. 1864.
[140] South American GSP, Appendix 3-A, Figure 25, p. 1877.
[141] South American GSP, Section 2.3.6, p. 238.
[142] South American GSP, Figure 2.3-45, p. 240.
[143] South American GSP, Figure 2.3-45, p. 240.
[144] South American GSP, Figure 2.3-44, p. 239.

The GSP identifies data gaps, related to the identification of interconnected surface water, along a portion of the Cosumnes River. In addition, the GSP cites the scientific study/article Brunner et al. (2009), indicating that interconnection may continue to exist after groundwater levels drop below the streambed clogging layer due to capillary action. The GSP states they expressly neglect capillary action in their analysis, but that this may represent a path for future scientific study.[145]

The discussion of depletion of interconnected surface water does not appear to estimate the quantity and timing of depletions of interconnected surface water due to groundwater pumping in the South American Subbasin. Instead, the depletions mentioned appear to be the equivalent of surface water-groundwater interactions, i.e., stream gains and losses to groundwater.

The GSP includes a description of groundwater dependent ecosystems in the Subbasin, along with a map of potential groundwater dependent ecosystems. Datasets used to identify potential wetland and non-wetland groundwater dependent ecosystems included the Natural Communities Commonly Associated with Groundwater Vegetation, South Sacramento Habitat Conservation Plan landcover, California Department of Fish and Wildlife vegetation, National Wetlands Inventory, and California Aquatic Resource Inventory.[146] A maximum rooting depth of 30 feet was assigned to each potential groundwater dependent ecosystem polygon, based on the maximum rooting depth of Valley Oaks found in the region. Seasonal groundwater levels from 2005-2018 were cross-referenced with the 30-foot rooting depth to further classify potential groundwater dependent ecosystems as "GDE" (connected 100% of seasons), "Potential GDE – likely" (connected between ≥50% and <100% of seasons), "Potential GDE – unlikely" (connected between >0% and <50% of seasons), and "Not GDE" (connected 0% of seasons). While the GSAs conducted and aerial imagery evaluation to support their analysis (as described Appendix 3-D),[147] the GSP does not state that additional observations or field-based data will be collected to confirm potential groundwater dependent ecosystems.

Although, as discussed above, more information is required to fully understand depletions of interconnected surface water, at this time, the Plan sufficiently describes the historical and current groundwater conditions related to chronic lowering of groundwater level, change in storage, groundwater quality, and land subsidence throughout the Plan area and the information included in the Plan substantially complies with the requirements outlined in the GSP Regulations.

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

[145] South American GSP, Appendix 3-A, p. 1864
[146] South American GSP, Section 2.3.7, p. 241.
[147] South American GSP, Appendix 3-D, p. 1949.

leaving the basin, including historical; current; and projected water budget conditions,[148] and the sustainable yield.[149]

The GSP uses the CoSANA integrated hydrologic model for the water budget. The model covers the South American, North American, and Cosumnes Subbasins.[150] The GSP describes the model as "a quasi-three-dimensional finite element model that was developed using the Integrated Water Flow Model (IWFM) 2015 software package to simulate the relevant hydrologic processes prevailing in the region."[151] The model uses data and information from hydrogeologic conditions, agricultural and urban water demands, agricultural and urban water supplies, and an evaluation of regional water quality conditions.[152] The model has been calibrated for the hydrologic period spanning October 1994 to September 2018.

The GSP includes a historical water budget for water year 1995 through water year 2018 and uses 2009 through 2018 to represent recent historical conditions in the GSP. The GSP uses a groundwater flow model for the historical water budget. The historical water budget information is provided in tabular[153, 154] and graphical[155] form and includes estimates for the total groundwater entering and leaving the Subbasin. The major inflows to groundwater include subsurface inflow, groundwater injection, stream losses to groundwater, and deep percolation. The groundwater outflows represented in the water budget include subsurface outflow, groundwater production, and stream gain from groundwater.[156] Groundwater production is the dominant outflow with 207,400 acre-feet per year (AFY) between 2009 and 2018.[157] During this period the historical water budget also indicates an average increase in storage of 7,700 AFY.[158] The GSP presents a table of the average annual historical water budget.[159]

Department staff note that the time period covered by the historical water budget is not consistent within the GSP's discussions of historical water budget conditions. The historical water budget section indicates water years 1990 to 2018 are analyzed to provide a period of representative hydrology and capture recent Subbasin operations.[160] The GSP also indicates the 10-year period from water years 2009 to 2018 is selected as

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148 23 CCR §§ 354.18 (a), 354.18 (c) *et seq*.
149 23 CCR § 354.18 (b)(7).
150 South American GSP, Section 2.4.1.2, p. 248.
151 South American GSP, Section 2.4.1.2, p. 248.
152 South American GSP, Section 2.4.1.2, p. 248, Appendix 2-B, pp. 827-1318.
153 South American GSP, Table 2.4-7, p. 258.
154 South American GSP, Appendix 2-B, p. 1050.
155 South American GSP, Appendix 2-B, Figure 4-17, p. 932.
156 South American GSP, Table 2.4-7, pp. 258-259.
157 South American GSP, Table 2.4-7, pp. 258-259. Note: 207,400 AFY is the sum of Urban and Industrial, Ag Residential, Agricultural, and Remediation groundwater production for the Historical Condition Water Budget (WY 2009-2018) in Table 2.4-7.
158 South American GSP, Section 2.4.2, p. 252, Table 2.4-7, pp. 258-259.
159 South American GSP, Table 2.4-7, pp. 258-259.
160 South American GSP, Section 2.4.1.3.1, p. 249.

the best representation of recent historical conditions.[161] However, the summary of water budget assumptions shows the historical water budget includes water years 1995 to 2018 for the hydrologic years.[162] While it appears that many of the tables and figures reference the water year 2009 to 2018 period, it is unclear why the water year 1995 to 2018 period is used. Department staff suggest that the GSP use a consistent historical period to represent the historical water budget or explain when and why different historical periods are used.

The historical water budget in the GSP includes groundwater pumping for remediation in the Subbasin occurring at multiple sites that were previously used for aerospace, industrial, manufacturing, and defense industries. Some of this treated groundwater is discharged to surface water bodies. Local water districts including Sacramento County Water Agency and Golden State Water Company have been diverting some of this treated water out of the American and Sacramento Rivers for use in their service areas.[163]

The GSP includes a current condition water budget for water years 1970 to 2019.[164] The current water budget information is provided in tabular[165] and graphical[166,167] form and includes estimates for the total groundwater entering and leaving the Subbasin. The components of the major inflows and outflows are the same as the historical water budget.[168] The current conditions groundwater budget has an average annual surplus in groundwater storage of 2,200 acre-feet.[169]

The GSP includes a projected water budget using 50 years of historical hydrology as the baseline period and incorporates climate change.[170] The projected water budget information is provided in tabular[171] and graphical[172] form.

The projected water budget represents a 50-year hydrologic period of water years 2020 to 2069 and is analyzed with and without climate change. The projected water budget conditions correspond to the historical hydrologic period from water years 1970 to 2019; uses current land and water use conditions; and uses projected future land and water use conditions.[173] The projected urban and agriculture water demands considered information from Urban Water Management Plans and local general plans and reflect projections of 2035 to 2045 water demands depending on the purveyor.[174] The climate

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[161] South American GSP, Section 2.4.1.3.1, p. 249.
[162] South American GSP, Table 2.4-1, p. 251.
[163] South American GSP, Section 2.1.8.2.1, p. 130.
[164] South American GSP, Section 2.4.1.3.2, pp. 249-250.
[165] South American GSP, Table 2.4-7, pp. 258-259.
[166] South American GSP, Figure 2.4-8, p. 266.
[167] South American GSP, Appendix 2-B, Figure 5-16, p. 992.
[168] South American GSP, Table 2.4-7, pp. 258-259.
[169] South American GSP, Section 2.4.2.2, p. 265, Table 2.4-7, pp. 258-259.
[170] South American GSP, Section 2.4.1.3.3, p. 250.
[171] South American GSP, Table 2.4-7, pp. 258-259.
[172] South American GSP, Appendix 2-B, Figure 5-42, p. 1025.
[173] South American GSP, Section 2.4.1.3.3, p. 250, Table 2.4-1, p. 251.
[174] South American GSP, Appendix 2-B, pp. 1004-1005.

change data incorporates modifications to precipitation, stream inflow, and evapotranspiration time series data from the American River Basin Study (ARBS). The GSP provides information about the various climate change scenarios that were developed and explains that it ultimately chose the 2070 Central-Tendency Conditions scenario as the representative climate change scenario for groundwater sustainability planning.[175] The projected conditions groundwater budget has an average annual loss of in groundwater storage of -1,100 acre-feet.[176] The projected conditions groundwater budget with climate change has an average annual loss of groundwater in storage of -6,200 acre-feet.[177]

Department staff note that the CoSANA model extends beyond the boundary of the South American Subbasin, and it appears the Folsom South Canal destinations are accounted for in the model. However, it is unclear if the surface water diversions shown in the surface water budget also include the water that leaves the Subbasin boundary through the Folsom South Canal and is delivered within the Cosumnes Subbasin. Department staff suggest that the GSP explain how water diverted through the Folsom South Canal is accounted for in the surface water budget.

The GSP explains that a historical sustainable yield of 273,000 AFY, for an area very similar to the Subbasin's current boundaries, was established as part of the Sacramento Water Forum basin yield analysis in 1997.[178] However, since that sustainable yield predates SGMA, the definition is slightly different. The GSP explains that the development of the new sustainable yield, for the purpose of SGMA, incorporates reduction of groundwater storage, chronic lowering of groundwater levels, and depletion of interconnected surface water.[179] Based on modeling analysis using the CoSANA model and consideration of the undesirable results defined in the GSP, the sustainable yield estimate is updated to 235,000 AFY.[180] In the discussion of this estimate, the GSP acknowledges that water quality and land subsidence are not included, but it states that defining sustainable yield using groundwater levels, storage, and interconnected surface water would also meet the criteria for water quality and land subsidence as a byproduct.[181]

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

[175] South American GSP, Section 2.4.2.4, p. 270.
[176] South American GSP, Table 2.4-7, pp. 258-259.
[177] South American GSP, Table 2.4-7, pp. 258-259.
[178] South American GSP, Section 2.5.1, p. 274.
[179] South American GSP, Section 2.5.2, pp. 274-276.
[180] South American GSP, Section 2.5.2, p. 276.
[181] South American GSP, Section 2.5.2, p. 276.

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.[182]

This GSP has not defined management areas for the Subbasin.

4.3 SUSTAINABLE MANAGEMENT CRITERIA

GSP Regulations require each Plan to include a sustainability goal for the basin and to characterize and establish undesirable results, minimum thresholds, and measurable objectives for each applicable sustainability indicator, as appropriate. The GSP Regulations require each Plan to define conditions that constitute sustainable groundwater management for the basin including the process by which the GSA characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.[183]

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.[184]

The sustainability goal for the South American Subbasin is "to protect and ensure the long-term viability of groundwater resources for urban, domestic, agricultural, industrial, and environmental beneficial users of groundwater."[185] The Subbasin plans to achieve its sustainability goal "by rigorous assessment of potential impacts to these beneficial users, and scientifically-informed management that avoids significant and unreasonable impacts to beneficial uses and users of groundwater."[186]

The GSP states that the Subbasin will be sustainable through the implementation period "as long as planned recycled water, recharge, and other projects are implemented."[187] In its discussion of the sustainability goal, the GSP acknowledges challenges to sustainable groundwater management as climate change, unplanned growth, and complex inter-basin coordination. The Plan proposes that it will address these challenges through improving monitoring and scientific studies to address data gaps and refine models; testing its sustainable management criteria through modeling historical and projected

[182] 23 CCR § 354.20.
[183] 23 CCR § 354.22 *et seq*.
[184] 23 CCR § 354.24.
[185] South American GSP, Section 3.1, p. 281.
[186] South American GSP, Section 3.1, p. 281.
[187] South American GSP, Abstract, p. 33.

groundwater use scenarios to ensure that groundwater users do not experience significant and unreasonable results; the use of a shared regional integrated surface and groundwater model shared between the South American, North American, and Cosumnes subbasins; and inter-agency and inter-basin coordination on projects and management actions.[188]

Based on the information provided in the Plan for the sustainability goal, Department staff conclude that the Plan substantially complies with the GSP Regulations.

4.3.2 Sustainability Indicators

Sustainability indicators are defined as any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results.[189] 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[190] – but refer to groundwater conditions that are not, in and of themselves, significant and unreasonable. Rather, sustainability indicators refer to the effects caused by changing groundwater conditions that are monitored, and for which criteria in the form of minimum thresholds are established by the agency to define when the effect becomes significant and unreasonable, producing an undesirable result.

GSP Regulations require that GSAs provide descriptions of undesirable results including defining what are significant and unreasonable potential effects to beneficial uses and users for each sustainability indicator.[191] 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.[192]

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.[193] GSAs are required to describe how conditions at minimum thresholds may affect beneficial uses and users,[194] and the relationship between the

[188] South American GSP, Section 3.1, p. 282.
[189] 23 CCR § 351(ah).
[190] Water Code § 10721(x).
[191] 23 CCR §§ 354.26 (a), 354.26 (b)(c).
[192] 23 CCR § 354.26 (b)(2).
[193] 23 CCR § 354.28 (b)(1).
[194] 23 CCR § 354.28 (b)(4).

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.[195]

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.[196] 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.[197]

The following subsections thus consolidate three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information, as presented in the Plan, pertaining to the processes and criteria relied upon to define undesirable results applicable to the Subbasin, as quantified through the establishment of minimum thresholds, are addressed for each applicable sustainability 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.[198]

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.[199]

The GSP defines the level at which beneficial users would experience significant and unreasonable effects by impacts to vulnerable wells, groundwater dependent ecosystems, and interconnected surface water, which are defined at the following three criteria:

1. Percentage of impacted domestic, agricultural, or public wells exceeds 5 percent for any well type.
2. Percentage decrease in potential groundwater dependent ecosystem area exceeds 5 percent.
3. Percentage decrease in interconnected surface water reach length exceeds 5 percent; percentage decrease in the 50th percentile of interconnected surface

[195] 23 CCR § 354.28 (b)(2).
[196] 23 CCR § 354.30 (a).
[197] 23 CCR § 354.30 (b).
[198] 23 CCR § 354.26 (d).
[199] 23 CCR § 354.28(c)(1) *et seq*.

water streamflow exceedance during October-December spawning months exceeds 10 percent of historical conditions.[200]

These criteria are not used as the quantified undesirable result and the GSP does not intend to directly monitor for these criteria. Instead, the GSP provides analyses to demonstrate that these criteria would not occur if groundwater levels reached the minimum thresholds.[201] The rationale and details for these impact analyses are explained in further detail below in the discussion of minimum thresholds.

The GSP defines the undesirable result as a quantified combination of exceedances of the minimum thresholds as follows: "Significant and unreasonable chronic lowering of groundwater levels resulting from groundwater extraction occurs when more than 25% (12/45 wells) of representative monitoring wells for groundwater levels and storage in the Basin fall below their [minimum thresholds] for 3 consecutive years."[202] The GSP explains that this criteria is "designed to reflect the anticipated return of a 4 year drought similar in intensity to the 2012-2016 drought, plus an additional 3 years of drought to account for hydrologic uncertainty."[203]

The GSP defines its minimum thresholds for the chronic lowering of groundwater levels "at the post-2015 low or the lowest groundwater level in the projected scenario with PMA and climate change, whichever is lower."[204] The "post-2015 low" refers to the lowest groundwater level observed at the respective monitoring well after January 1, 2015. The "projected scenario with PMA and climate change" (*Projected PMA CC*) refers to the groundwater levels modeled within a CoSANA modeling scenario that considered projected groundwater use, climate change, and anticipated benefits from projects.[205]

The GSP defines minimum thresholds at 45 representative monitoring wells throughout the Subbasin, provided in Table 3-4.[206] Twenty wells use the post-2015 low groundwater level as its minimum threshold, and 25 of the representative monitoring wells have minimum thresholds below the post-2015 low level because they use the groundwater level in the projected (*Projected PMA CC*) scenario.[207] For this latter group, the GSP states that the post-2015 lows were exceeded by the projected lows by a mean of 2.8 feet, a median of 0.5 feet, and a range of 0 feet to 15.3 feet.[208]

The GSP provides analyses on well protection, impacts to groundwater dependent ecosystems, and interconnected surface water which correspond to the three criteria which define the level at which beneficial users would experience significant and

[200] South American GSP, Section 3.2.1.2, pp. 284-285.
[201] South American GSP, Section 3.2.1.2, p. 284.
[202] South American GSP, Section 3.2.1.2, p. 285.
[203] South American GSP, Section 3.2.1.1, p. 285.
[204] South American GSP, Section 3.3.1.1, p. 296.
[205] South American GSP, Section 3.3.1.2, p. 303.
[206] South American GSP, Table 3-4, p. 317.
[207] South American GSP, Section 3.3.1.1, Footnote 9, p. 296.
[208] South American GSP, Section 3.3.1.1, Footnote 9, p. 296.

unreasonable effects.[209] The GSP provides these analyses to demonstrate that these criteria would not occur if groundwater levels reached the minimum thresholds.[210] All of the analyses utilized the CoSANA model to simulate a baseline scenario and four projected scenarios to evaluate potential impacts to beneficial uses and users. The five scenarios were as follows: *Baseline*, representing fall 2015 conditions; *Projected*, which includes projected groundwater use; *Projected CC*, which includes projected groundwater use and a median climate change scenario; *Projected PMA*, which includes projected groundwater use and in-progress projects; and *Projected PMA CC*, which includes projected groundwater use, in-progress projects, and a median climate change scenario.[211] The GSP's conclusions to the analyses are mainly based on the results of the *Projected PMA CC* scenario because the minimum thresholds that are defined at levels lower than the post-2015 lows are based on groundwater levels simulated in the *Projected PMA CC* scenario.[212]

The GSP's analysis of "well protection" evaluated if groundwater levels defined by the minimum thresholds would cause a "percentage of impacted domestic, agricultural, or public wells exceed[ing] 5% for any well type."[213] The analysis evaluated how many domestic, agricultural, or public wells would go dry assuming either a 31-year retirement age or 40-year retirement age under each of the five modeling scenarios.[214] The GSP provides Figure 3-6 to summarize the percentage of the agriculture, domestic, and public wells that will go dry in each scenario.[215] The results for the baseline (fall 2015) and *Projected PMA CC* modeling scenarios did not exceed 5 percent for any well type or retirement age.[216] The GSP concludes that the minimum thresholds would not cause well impacts outside of the 5 percent impact threshold.[217]

The GSP's analysis of "groundwater dependent ecosystem protection" evaluated whether minimum thresholds would cause a "percentage decrease in potential [groundwater dependent ecosystem] area exceed[ing] 5%."[218] The impacts analysis evaluated how the area of groundwater dependent ecosystems would change under each of the projected modeling scenarios with respect to the baseline scenario.[219] The groundwater dependent ecosystem area in the four projected modeling scenarios was simulated by using a 30-foot groundwater depth threshold and results were reported as a percent change with

[209] South American GSP, Section 3.2.1.2, pp. 284-285.
[210] South American GSP, Section 3.2.1.2, pp. 284-285.
[211] South American GSP, Section 3.3.1.2, p. 303, Figure 3-16, p. 321. Note: projects considered in the modeling scenarios include the Harvest Water project, OHWD recharge project, and Regional Conjunctive Use project.
[212] South American GSP, Section 3.3.1.1, p. 296, Figure 3-6, p. 305.
[213] South American GSP, Section 3.2.1.2, pp. 284-285.
[214] South American GSP, Section 3.3.1.2, pp. 303-305, Appendix 3C, pp. 1901-1932.
[215] South American GSP, Section 3.3.1.2, p. 304, Figure 3-6, p. 305.
[216] South American GSP, Figure 3-6, p. 305.
[217] South American GSP, Appendix 3C, p. 1929.
[218] South American GSP, Section 3.2.1.2, p. 284.
[219] South American GSP, Section 3.3.1.2, pp. 306-307, Appendix 3D, pp. 1933-1956.

respect to the fall 2015 baseline scenario.[220] For the scenarios that include projects and management actions, including the *Projected PMA CC* scenario on which the minimum thresholds are based, the reduction in groundwater dependent ecosystem area was under 5 percent.[221] The GSP concludes that "considering climate uncertainties, results suggest that projected groundwater use with PMA is likely to maintain [groundwater dependent ecosystem] area consistent with historical levels and thus avoid undesirable results."[222]

The "avoidance of interconnected surface water depletion" analysis evaluated whether minimum thresholds would cause a "percentage decrease in [interconnected surface water] reach length exceed[ing] 5%" or a "percentage decrease in the 50th percentile of [interconnected surface water] streamflow exceedance during October-December spawning months exceed[ing] 10% of historical conditions."[223] The GSP's analysis for avoidance of interconnected surface water depletion consisted of an analyses on stream seepage, streamflow length of interconnected reaches, and streamflow exceedance for fish passage.[224] See Department staff's discussion of Depletions of Interconnected Surface Water, Section 4.3.2.6, for a discussion of this analysis.

The GSP ultimately concludes that the analyses demonstrate that the conditions at the minimum thresholds would not cause significant and unreasonable dewatering of vulnerable wells, depletions of interconnected surface water, impacts to groundwater dependent ecosystems, and impacts to adjacent basins."[225] Additionally, the GSP states that "the impacts actually experienced if criteria to identify [u]ndesirable [r]esults are observed are likely to be less severe than analyses suggest."[226] The GSP explains that that the analyses are a representation of conditions if 100 percent of the groundwater wells were to reach their minimum thresholds in the Subbasin. However, the GSP defines a more conservative undesirable result as occurring when 25 percent of the wells in the Subbasin reach their minimum thresholds.[227]

The GSP set the measurable objectives for the chronic lowering of groundwater levels by using the average post-2015 low groundwater level and adjusting it based on the groundwater levels simulated in the *Projected PMA CC scenario*.[228] In representative monitoring wells that use the post-2015 low as the minimum threshold, the measurable objectives are defined as the average post-2015 groundwater level at each respective well. In representative monitoring wells where the minimum threshold was reduced lower than the post-2015 low based on the *Projected PMA CC* scenario, the post-2015 average

[220] South American GSP, Figure 3-7, p. 307.
[221] South American GSP, Figure 3-7, p. 307.
[222] South American GSP, Section 3.3.1.2, p. 307.
[223] South American GSP, Section 3.2.1.2, pp. 284-285.
[224] South American GSP, Section 3.3.1.2, pp. 308-315.
[225] South American GSP, Section 3.3.1.3, p. 316.
[226] South American GSP, Section 3.3.1.3, p. 316.
[227] South American GSP, Section 3.2.1.2, p. 285.
[228] South American GSP, Figure 3-1, p. 298.

was reduced by the head difference between the 2015-low and the level in the scenario.[229] The GSP states that it interprets the measurable objectives as “the average spring and fall groundwater level over a roughly present-day period (2015-2019), which contains 1 critical year, 2 below normal years, and 2 wet years.”[230] Additionally, in eight representative monitoring sites that are located within or near the Harvest Water project, the measurable objectives were increased because modeling showed that groundwater levels will increase as a result of the project.[231] The GSP provides a map with the measurable objectives on Figure 3-17.[232]

The GSP defines the interim milestones as linear progress between the minimum threshold and measurable objective over 5-year intervals. The GSP projects that 5 years following Plan submission, the Subbasin will make 25 percent progress towards the measurable objective; in 10 years, the Subbasin will make 50 percent progress; in 15 years, the Subbasin will make 75 percent progress; and in 20 years, the Subbasin will meet its measurable objectives and attain its long-term sustainability goal.[233]

The GSP provides a general discussion of the relationship of groundwater levels and other sustainability indicators.[234] The relationship between groundwater level minimum thresholds and interconnected surface water are explained in the GSP’s impacts analyses for groundwater dependent ecosystems and interconnected surface water.[235] GSP states that groundwater depletion estimates are not sufficient to lead to “significant” land subsidence.[236] The GSP anticipates that recharge projects will have a “positive impact” on groundwater quality.[237]

Department staff conclude that the GSP’s discussion of sustainable management criteria for groundwater levels is commensurate with the level of understanding of the Subbasin and includes adequate information to understand the GSAs’ process and rationale. Staff also find that the GSP’s discussion and presentation of information substantially covers the specific items listed in the GSP Regulations. Based on the impact analyses for well protection, groundwater dependent ecosystems, and interconnected surface water, the groundwater levels defined by the minimum thresholds appear likely to help avoid a new significant and unreasonable depletion of supply in the Subbasin.

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

[229] South American GSP, Section 3.4.1, p. 326, Section 3.3.1.1, pp. 296-297, Figure 3-1, p. 298.
[230] South American GSP, Section 3.4.1, p. 326.
[231] South American GSP, Section 3.4.1, p. 326, Figure 3-1, p. 298.
[232] South American GSP, Figure 3-17, p. 327.
[233] South American GSP, Section 3.4.1, pp. 326-327, Figure 3-1, p. 298.
[234] South American GSP, Section 3.2.1.4, p. 286.
[235] South American GSP, Section 3.3.1.2, pp. 308-315.
[236] South American GSP, Section 3.2.5.1, p. 293.
[237] South American GSP, Section 3.2.3.4, p. 290.

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 projected water use in the basin.[238]

The GSP identifies groundwater levels as a proxy for groundwater storage and states that the sustainable management criteria for both indicators are identical, including undesirable results, minimum thresholds, and measurable objectives.[239] Potential effects of reduced groundwater storage are stated to be identical to those outlined for chronic lowering of groundwater levels.[240]

To demonstrate that using groundwater levels as a proxy would protect the Subbasin from experiencing undesirable results related to groundwater storage, the GSP provides an analysis which used the CoSANA model to evaluate the future projected groundwater storage in the Subbasin.[241] From the results of the analysis, the GSP concludes that the sustainable management criteria for groundwater levels would protect against “significant and unreasonable reduction in groundwater storage.”[242] The GSP commits to tracking projected groundwater storage and calibrating groundwater storage estimates from its collected data with the CoSANA model.[243] Because the information in the GSP sufficiently correlated groundwater elevations with groundwater storage, Department staff concur, at this time, with the GSAs’ rationale for using groundwater levels as a proxy for groundwater storage.

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.[244]

The GSP states that the Subbasin is not located in a coastal area; therefore, seawater intrusion conditions are not applicable to this GSP.[245] Given the physical setting of the Subbasin, Department staff concur with the rationale for not setting sustainable management criteria for seawater intrusion for the Subbasin.

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

[238] 23 CCR § 354.28(c)(2).
[239] South American GSP, Section 3.2.2.1, p. 287, Section 3.3.2, p. 320, Section 3.4.2, p. 331.
[240] South American GSP, Section 3.2.2.4, p. 287.
[241] South American GSP, Section 3.3.2, pp. 320-321.
[242] South American GSP, Section 3.3.2, pp. 320-321.
[243] South American GSP, Section 3.2.2.2, p. 287.
[244] 23 CCR § 354.28(c)(3).
[245] South American GSP, Section 2.3.3, p. 218.

to be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.[246]

The GSP develops sustainable management criteria for two constituents of concern: nitrate and specific conductivity. The GSP states that sustainable management criteria were developed for these constituents because of exceedances in water quality standards during the last 30 years and stakeholder input.[247] However, Department staff note that arsenic also appears to meet this criteria and appears to have exceedances of the MCL at similar or higher frequencies than nitrate and TDS, according to the maps provided,[248] but it is not included as one of the GSP's sustainable management criteria constituents. Department staff recommend the GSAs establish sustainable management criteria for arsenic or provide further clarification about why sustainable management criteria was not developed for this constituent (see Recommended Corrective Action 1a).

The GSP states that water quality degradation is typically associated with increasing, rather than decreasing, concentration of constituents; therefore, the GSAs has decided to not use the term "minimum threshold" in the context of water quality, but instead use the term "maximum threshold."[249] While Department staff understand the reasoning behind using the term "maximum threshold" for groundwater quality sustainable management criteria, it is recommended to use the terminology that is identified and defined in the GSP Regulations.[250] For this review, the term minimum threshold will refer to the GSAs' description of maximum threshold.

The GSP defines "[s]ignificant and unreasonable degradation" of groundwater quality as "the degradation of water quality that would impair beneficial uses of groundwater within the [Subbasin] or result in failure to comply with groundwater regulatory thresholds including state and federal drinking water standards and Basin Plan water quality objective."[251]

The GSP quantitively defines an undesirable result for degraded groundwater quality as occurring when "[m]ore than 10% of groundwater quality wells exceed [minimum] thresholds in each aquifer zone (1/10 wells and 1/11 wells in the upper and lower zones,

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[246] 23 CCR § 354.28(c)(4).
[247] South American GSP, Section 3.3.3, p. 322.
[248] South American GSP, Figures 2.3-30 and 2.3-31, pp. 224-225, Figure 2.3-32 and 2.3-33, p. 226-227, Figures 2.3-34 and 2.3-35, pp. 229-230.
[249] South American GSP, Section 3.3.3, p. 321.
[250] 23 CCR § 351(t).
[251] South American GSP, Section 3.2.3, p. 287.

respectively)."[252] The GSP's rationale for this criteria is that "maintaining high water quality is important to GSAs, and these conservative criteria reflect that value."[253]

The minimum thresholds are set at the respective state drinking water standards for each of the constituents.[254] Nitrate is set at the Title 22 Primary MCL of 10 mg/L (for nitrate as N). Specific conductivity is set at the upper threshold of the Title 22 Secondary MCL at 1,600 micromhos/cm.[255] The GSP explains that the minimum thresholds considered available historical and current groundwater quality data, groundwater quality trends in wells with adequate data, historical compliance with state and federal drinking water standards, and feedback from stakeholders.[256] Department staff note that the GSP provided an analysis for historical concentrations and exceedances of TDS (mg/L) rather than specific conductivity (micromhos/cm) in its discussion of groundwater quality conditions, as described in Section 4.2.2. While Department staff understand that TDS and specific conductivity are related, the GSP should provide the information regarding the Subbasin's groundwater quality conditions using specific conductivity or provide a better explanation of the relationship between TDS and specific conductivity (See Recommended Corrective Action 1b).

The GSP asserts that the minimum thresholds will "protect and maintain groundwater quality for existing or potential beneficial uses and users." The GSP provides descriptions of general potential impacts of poor groundwater quality on its beneficial uses and users; however, the impacts are not specific to particular constituents and are not necessarily referring to nitrate or specific conductivity.[257] The GSP lacks a description for how the conditions at the undesirable result, which allows for 10 percent of wells in the upper and lower zones to exceed the minimum thresholds for nitrate and specific conductivity, may affect beneficial uses and users.

Additionally, Department staff find that the GSP does not explain the technical justification for the undesirable results quantitative metrics. It is unclear to Department staff whether the undesirable result criteria will only apply if the exceedances are occurring in both the upper *and* lower zones simultaneously. If exceedances are required in both the upper and lower zones simultaneously, it is possible for a substantial number of exceedances to occur in one zone and not be considered an undesirable result if the exceedances are not occurring in the other zone. Because the definition seems to imply that exceedances are required in both zones, it is unclear to Department staff whether the undesirable result definition is adequate for avoiding significant and unreasonable effects to groundwater quality. Department staff recommend the GSAs amend the quantitative definition of undesirable results to account for localized threshold exceedances in a single aquifer

[252] South American GSP, Section 3.2.3.1, p. 288.
[253] South American GSP, Section 3.2.3.1, p. 288.
[254] South American GSP, Section 3.3.3, p. 323.
[255] South American GSP, Table 3-5, p. 322, Figure 3-30, p. 350.
[256] South American GSP, Section 3.3.3, p. 322.
[257] South American GSP, Section 3.2.3.3, p. 289.

zone or provide additional information to the GSP to support why undesirable results will not occur unless simultaneous exceedances occur in both aquifer zones (see Recommended Corrective Action 1c).

In addition to minimum thresholds, the GSP develops a trigger value for its constituents of concern. The GSP describes trigger values as "triggers for action in order to proactively avoid the occurrence of undesirable results";[258] these values are set below the concentration of the minimum threshold for each of the constituents. The trigger value for nitrate is described in the GSP as 90 percent of the Title 22 MCL (i.e., 9 mg/L nitrate as N). However, the GSP also includes a second trigger of 5 mg/L on Table 3-5.[259] Department staff encourage the GSAs to rectify the inconsistency between the narrative text in the Plan and the information provided in Table 3-5 related to the trigger values for nitrate in the next periodic evaluation of the GSP. The trigger value for specific conductivity is "the 90% upper limit or 90th percentile value for a calendar year" or 900 micromhos/cm.[260] The GSP plans to report if a constituent is approaching or has exceeded the trigger thresholds to the Regional Water Board to solicit their recommendations.[261]

The GSP defines measurable objectives at representative monitoring wells. In wells where the concentrations have historically been below the respective minimum thresholds "in recent years," the measurable objective is defined as maintaining the concentrations at or below the current concentration range. In wells where concentrations "have [ever] historically exceeded or been equal to" the respective minimum threshold, the measurable objective is defined as 90 percent of the minimum threshold.[262] Interim milestones are defined as "maintain[ing] groundwater quality equivalent to the measurable objectives established for nitrate and specific conductivity, with the goal of maintaining water quality within the historical range of values."[263]

Other than the recommended corrective actions identified above, the GSP's discussion of constituents of concern in the Plan area and the degraded water quality sustainability indicator is comprehensive and includes adequate support, justification, and information to understand the GSAs' process, analysis, and rationale. Based on the review of the minimum thresholds and measurable objectives for degraded water quality and materials referenced in the GSP, Department staff find that the GSP's discussion and presentation of information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data and assumptions. Staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and,

[258] South American GSP, Section 3.3.3, p. 322.
[259] South American GSP, Table 3-5, p. 322.
[260] South American GSP, Table 3-5, p. 322, Section 3.3.3, p. 322.
[261] South American GSP, Section 3.3.3, p. 322.
[262] South American GSP, Section 3.4.3, p. 331.
[263] South American GSP, Section 3.4.3, p. 333.

therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.5 Land Subsidence

In addition to components identified in 23 CCR §§ 354.28 (a-b), the GSP Regulations require the minimum threshold for land subsidence to be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.[264] 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.[265]

The GSP defines an undesirable result for land subsidence as "when subsidence substantially interferes with beneficial uses of groundwater and surface land uses."[266] The GSP states that potential effects of undesirable results include significant damage to critical infrastructure such as pipes, canals, and other water conveyance facilities; roadways; building foundations; and other urban infrastructure elements.[267]

The GSP states that "any moderate land subsidence caused by the chronic lowering of groundwater levels at a greater magnitude than historically observed occurring in the Basin would be considered significant and unreasonable."[268] To define its quantified undesirable result, the GSP states that "[p]umping-induced inelastic subsidence of greater than 0.1 foot [0.03 m] in any single year and a cumulative 0.5 foot [0.15 m] in any five-year period (across the region of greatest land subsidence in the basin) could significantly interfere with surface land use if left unmonitored."[269] The GSP states that this is set equivalent to InSAR's magnitude of estimated error, +/- 0.1 feet.

While the GSP provides the aforementioned criteria, Department staff note that the GSP contains inconsistencies regarding whether it considers this criterion to be the quantified undesirable result for subsidence. In the GSP's summary table of definitions of quantified undesirable results, the GSP states that land subsidence is "not significant to the [Subbasin]" in place of providing an undesirable result definition.[270] Additionally, the land subsidence undesirable result is also omitted from Table 3-1 which provides a summary of the undesirable results criteria for the sustainability indicators in the Subbasin.[271]

[264] 23 CCR § 354.28(c)(5).
[265] 23 CCR §§ 354.28(c)(5)(A-B).
[266] South American GSP, Section 3.2.5, p. 293.
[267] South American GSP, Section 3.2.5.3, p. 294.
[268] South American GSP, Section 3.2.5.2, p. 293.
[269] South American GSP, Section 3.2.5.2, p. 293.
[270] South American GSP, Table ES-4, p. 54.
[271] South American GSP, Table 3-1, p. 294.

Department staff assume that the criteria provided above is the GSP's quantification of an undesirable result. The GSAs should clarify if this is not the case and, in any event, provide a consistent definition for undesirable results for subsidence and update its discussion and tables accordingly.

The minimum threshold for subsidence is defined as "no more than 0.1 foot [0.03 m] in any single year and a cumulative 0.5 foot [0.15 m] in any five-year period, resulting in no long-term permanent subsidence." The GSP states that "if the minimum thresholds are exceeded or if there are areas of concern for inelastic subsidence that are identified, ground-truthing studies could determine whether the signal is related to groundwater extraction, or potentially related to changes in land use and agricultural practices. If it is determined to be resulting from groundwater extraction and is significant and unreasonable, then ground-based elevation surveys might be needed to monitor the situation more closely."[272]

The GSP's definition of undesirable results for land subsidence, which implies that action will only be taken if an exceedance of the minimum thresholds is determined to be caused by groundwater extraction and determined to be "significant and unreasonable," is inconsistent with SGMA. SGMA specifies that the significant and unreasonable effects are those "caused by groundwater conditions occurring throughout the basin," which does not limit them to only impacts directly caused by what the GSAs determine to be groundwater extraction.[273] As currently defined, if, for instance, a minimum threshold exceedance occurs but the GSAs are unable to determine that the subsidence was caused by groundwater extraction, the GSAs would not identify this exceedance as an undesirable result. Additionally, the GSP does not explain the process in which it would determine the cause of the subsidence. Due to the uncertainties with the undesirable result definition, it is also unclear if the GSP intends for "monitor[ing] the situation more closely" to mean that an undesirable result has been identified, or if this is an additional step involved prior to identifying an undesirable result. Department staff recommend the GSAs revise the definition of land subsidence undesirable results such that groundwater extraction and other factors, whether due to action or inaction of the GSAs with respect to Subbasin management, are considered and not excluded in the undesirable result definition (see Recommended Corrective Action 2).

The GSP states that the minimum thresholds are intended to be used as a "preventative measure to ensure the maintenance of current ground surface elevations and as an added safety measure for potential future impacts not currently present in the Basin and nearby basins"; and by complying with minimum thresholds, the Subbasin will avoid significant and unreasonable rates of land subsidence.[274] The GSP states that because significant and unreasonable subsidence is not anticipated within the Subbasin, it does

[272] South American GSP, Section 3.3.5, p. 325.
[273] 23 CCR § 354.26 (a)
[274] South American GSP, Section 3.3.5, p. 324.

not expect that the interests of beneficial uses and users of groundwater, property interests, or land uses will be affected by the minimum threshold.[275] The GSP states that groundwater depletion estimates are not sufficient to lead to significant land subsidence;[276] however, it does not provide further analysis or details on how the Plan came to this conclusion.

The GSP defines its measurable objective as maintaining current ground surface elevations over the entire Subbasin area. The GSP considers the measurable objective to be a "reasonable margin of safety" because it is "based on the past and current aquifer conditions and is more reasonable to the alternative action of simply setting the subsidence indicator as 'not applicable' in the Basin due to current and documented historical evidence." [277] Because the measurable objective has already been met, the GSP intends to use interim milestones as "check-in opportunities" in which it will review yearly subsidence rates from the previous five-year period. The check-ins are intended to assess any long-term subsidence trends in addition to the observations in annual reviews. [278]

While a recommended corrective action is identified to clarify the definition of a subsidence undesirable result, the GSP's discussion of land subsidence includes adequate support, justification, and information to understand the GSAs' process, analysis, and rationale. Based on review of the sustainable management criteria established for land subsidence and materials referenced in the GSP, Department staff find that the GSP's discussion and presentation of information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data and assumptions. Department staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.6 Depletions of Interconnected Surface Water

SGMA defines undesirable results for the depletion of interconnected surface water as those that have significant and unreasonable adverse impacts on beneficial uses of surface water and are caused by groundwater conditions occurring throughout the basin.[279] 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.[280] 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

[275] South American GSP, Section 3.3.5, p. 324.
[276] South American GSP, Section 3.2.5.1, p. 293.
[277] South American GSP, Section 3.4.5, p. 334.
[278] South American GSP, Section 3.4.5, p. 334.
[279] Water Code § 10721(x)(6).
[280] 23 CCR § 354.16 (f).

adversely impact beneficial uses of the surface water and may lead to undesirable results.[281]

The Plan acknowledges the presence of interconnected surface waters in the Subbasin and identifies their location by performing an analysis in the CoSANA model.[282] The GSP ultimately identifies multiple reaches of the American River, Sacramento River, Cosumnes River, Mokelumne River, Alder Creek, and Morrison Creek as interconnected surface water within the Subbasin.[283] The interconnected surface water reaches are provided in Figure 2.3-45.[284] The GSP identifies data gaps associated with interconnected surface water in reaches of the Cosumnes River which "show sub-seasonal connection but are disconnected on a seasonal level,"[285] and the GSP plans to improve its understanding of the interconnected reaches in the future.[286] Department staff are satisfied that the GSAs have adopted a reasonable approach to identify the location of interconnected surface waters in the Subbasin.

The GSP does not quantify the rate or volume of surface water depletions due to groundwater pumping as required by the GSP Regulations.[287] Instead, the GSP proposes use of the sustainable management criteria set for groundwater levels as a proxy for depletions of interconnected surface water. The GSP states that its approach to setting sustainable management criteria is based on avoiding disconnecting interconnected surface water, rather than maintaining interconnected surface water seepage.[288] The GSP's justification for this method is based on output from the CoSANA model, which shows increased streamflow associated with wet periods due to climatic variability may cause increased stream seepage to occur. The GSP states that because stream seepage due to wet conditions can be confused with interconnected surface water depletion from unsustainable groundwater management, it plans to monitor its interconnected surface water depletion through the monitoring of groundwater levels near streams which are representative of the impacts of pumping.[289]

The GSP states that "[s]ignificant and unreasonable depletion of [interconnected surface water] occurs when the percentage decrease in ISW reach length exceeds 5%, or when percentage decrease in the 50th percentile of ISW streamflow exceedance during October-December spawning months exceeds 10% of historical conditions."[290] This criterion matches the criteria which defined significant and unreasonable impacts to beneficial uses and users as described in the discussion of chronic lowering of

[281] 23 CCR § 354.28 (c)(6).
[282] South American GSP, pp. 238-239, Figure 2.3-44, p. 239.
[283] South American GSP, Section 2.3.6, p. 238.
[284] South American GSP, Figure 2.3-45, p. 240.
[285] South American GSP, Section 2.3.8, p. 245, Figure 2.3-44, p. 239.
[286] South American GSP, Section 2.3.8, p. 245.
[287] 23 CCR § 354.28 (c)(6).
[288] South American GSP, Section 3.2.4.2, p. 292, Section 3.3.4, p. 323.
[289] South American GSP, Section 3.2.4.1, pp. 291 and 292.
[290] South American GSP, Section 3.2.4.2, p. 292.

groundwater levels in Section 4.3.2.1. The GSP states that the rationale for this criterion is that "anything less than a maintenance of roughly current conditions plus reasonable hydrologic variability constitutes an undesirable result."[291] As stated previously, this criterion is not used as the quantified undesirable result and the GSP does not intend to directly monitor this sustainability indicator. Instead, the GSP provides a reasonable analysis to demonstrate that these criteria would not occur if groundwater levels reached the minimum thresholds.[292]

The GSP quantifies its undesirable result by using groundwater levels as a proxy. The GSP states that "significant and unreasonable depletion of interconnected surface water resulting from groundwater extraction occurs when more than 25% (3/10 wells) of representative monitoring wells for [interconnected surface water] fall below their [minimum thresholds] for 3 consecutive years."[293] The GSP uses a subset of 10 of its groundwater level representative monitoring wells to monitor for depletions of interconnected surface water.[294] The GSP states that each of the representative wells are associated with a respective stream reach and are also paired with stream gages.[295] The GSP states that these wells were selected because "they represent changes in groundwater level caused by groundwater pumping, and not near-stream influences, like stream seepage."[296]

The GSP provides an analysis which evaluated whether minimum thresholds would cause a "percentage decrease in [interconnected surface water] reach length exceed[ing] 5%" or a "percentage decrease in the 50th percentile of [interconnected surface water] streamflow exceedance during October-December spawning months exceed[ing] 10% of historical conditions."[297] The GSP's analysis consisted of evaluations of stream seepage, streamflow length of interconnected reaches, and streamflow exceedance probability for fish passage.[298]

For the stream seepage analysis, the GSP provides seasonally averaged interconnected surface water depletion for multiple interconnected surface water reaches in the Subbasin.[299] The GSP used the CoSANA model to estimate the timing and quantity of surface water depletions and provides the monthly seepage (acre-feet/month) during the spring and fall seasons from 1990 to 2020.[300] The modeling results are provided for the Historical, Projected, Projected CC, Projected PMA, and Projected PMA CC scenarios.[301]

[291] South American GSP, Section 3.2.4.2, p. 292.
[292] South American GSP, Section 3.2.1.2, p. 284.
[293] South American GSP, Section 3.2.4.2, p. 292.
[294] South American GSP, Table 3-4, p. 317, Figure 3-14, p. 318.
[295] South American GSP, Section 3.2.4.2, p. 292.
[296] South American GSP, Section 3.2.4.2, p. 292.
[297] South American GSP, Section 3.2.1.2, pp. 284-285.
[298] South American GSP, Section 3.3.1.2, pp. 308-315.
[299] South American GSP, Figure 2.3-45, p. 240, Figure 3-12, p. 313, Section 3.3.4, pp. 323-324.
[300] South American GSP, Section 2.3.6, p. 239.
[301] South American GSP, Figure 2.3-45, p. 240.

From this analysis, the GSP concludes that if minimum thresholds are reached, the depletion rates do "not appreciably differ from present day conditions."[302]

For the interconnected streamflow length analysis, the GSP used seasonal groundwater mapping to classify groundwater into "connected" and "disconnected" classifications, and then performed an impacts analysis to find how surface water connections changed with the four projected modeling scenarios. [303] The impacts analysis calculated the percent change of the interconnected surface water reach length of the four projected scenarios with respect to the Baseline (fall 2015) scenario.[304] The GSP notes that the *Projected PMA CC* scenario results in a -2.62 percent change in interconnected surface water reach length, which is within the quantitative criteria of a five percent reduction that was determined to be "significant and unreasonable."[305]

For the streamflow exceedance probability analysis, the GSP evaluated streamflow exceedance during the Chinook salmon fall-run (October-December) spawning migration for baseline conditions (fall conditions from 1969 to 2018) and compared it to the streamflow exceedance in the four projected scenarios.[306] The results are expressed as a percent difference in 50th percentile cubic feet per second (cfs) exceedance probability compared to the baseline scenario in Table 3-3.[307] In the *Projected PMA CC* scenario, the results for the percent difference in the 50th percentile exceedance compared to baseline are -65 percent, -7 percent, and -18 percent for the American, Cosumnes, and Sacramento Rivers, respectively.[308] The results for the American and Sacramento Rivers exceed the criteria which state that beneficial uses and users would experience undesirable results if "percentage decrease in the 50th percentile of [interconnected surface water] streamflow exceedance during October-December spawning months exceeds 10% of historical conditions."[309] The GSP concludes that in the Cosumnes River, modeling suggests that projected management would "[avoid] significant and unreasonable impacts to beneficial users of groundwater"; however, a similar statement is not made for the American and Sacramento Rivers. To these results, the GSP states that "[m]ore work is needed to assess climate change impacts to [interconnected surface water]…and will be completed before the 5 year plan update (2027)," which may include monitoring expansion or sustainable management criteria revision.[310] The GSP states that the results suggest that there may still be sufficient flows for supporting spawning migration in all scenarios evaluated; however, this is based on the 32 cfs target which is on the lowest end of the range of estimated flow conditions required for spawning

302 South American GSP, Section 3.3.4, p. 323.
303 South American GSP, Section 3.3.1.2, p. 308, Figure 3-8, p. 310.
304 South American GSP, Section 3.3.1.2, p. 308.
305 South American GSP, Section 3.3.1.2, p. 308, Section 3.2.1.2, p. 284, Figure 3-9, p. 310.
306 South American GSP, Section 3.3.1.2, p. 308, Figure 3-10, p. 311.
307 South American GSP, Table 3-3, p. 309.
308 South American GSP, Table 3-3, p. 309.
309 South American GSP, Section 3.2.1.2, pp. 284-285.
310 South American GSP, Section 3.3.1.2, p. 309, Section 3.5.5, pp. 361-362.

migration.[311] Department staff interpret this result to indicate that beneficial uses and users related to the American and Sacramento Rivers could experience "significant and unreasonable depletions" of interconnected surface water, by the GSP's definition,[312] if groundwater conditions were to reach those in the *Projected PMA CC* scenario.

The GSP ultimately concludes that the interconnected surface water analyses "indicate[d] that significant and undesirable impacts to [interconnected surface water] are avoided at groundwater level [minimum thresholds] set at the lower of the post-2015 low….or the low under projected management with PMA and climate change."[313] However, this conclusion seems to contradict with the results of the streamflow exceedance probability analysis for the American and Sacramento Rivers.[314] If the Subbasin were to reach the groundwater levels minimum thresholds, which are largely based on the *Projected PMA CC* scenario, the Subbasin's definition of "significant and unreasonable depletion" of interconnected surface water may not be avoided. The GSP does not explain why it considers using groundwater level minimum thresholds as a proxy for interconnected surface water to be reasonable when the *Projected PMA CC* scenario is shown in the impacts analysis to exceed the criteria defined as "significant and unreasonable depletions" to interconnected surface water. Department staff recommend the GSAs provide further clarification regarding the potential impacts to beneficial uses and users that may be affected by future depletions of interconnected surface water related to the projected decreased streamflow exceedance probabilities for the American and Sacramento Rivers due to climate change (see Recommended Corrective Action 3a).

Similar to undesirable results and minimum thresholds, the GSP uses the groundwater levels measurable objectives and interim milestones as a proxy for interconnected surface water.[315] The measurable objectives and interim milestones are provided on Table 3-4.[316] The GSP states that these criteria will provide the Subbasin with reasonable operational flexibility.

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

[311] South American GSP, Section 3.3.1.2, p. 309.
[312] South American GSP, Section 3.2.1.2, pp. 284-285.
[313] South American GSP, Section 3.3.1.2, p. 308.
[314] South American GSP, Section 3.2.1.2, pp. 284-285.
[315] South American GSP, Section 3.4.4, p. 333.
[316] South American GSP, Table 3-4, p. 317. Note: Representative monitoring wells for interconnected surface water are designated in the "ISW RMP" column.

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 GSP periodic evaluations (See Recommended Corrective Action 3b). 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 3c). 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 3d).

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.[317] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[318] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[319] capture seasonal low and high conditions,[320] include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[321] Department staff encourage GSAs to collect monitoring data as specified in the GSP, follow SGMA data and reporting standards,[322] fill data gaps identified in the GSP prior to the first periodic evaluation,[323] update monitoring network information as needed, follow monitoring best

[317] 23 CCR § 354.32.
[318] 23 CCR § 354.34(b)(2).
[319] 23 CCR § 354.34(b)(3).
[320] 23 CCR § 354.34(c)(1)(B).
[321] 23 CCR §§ 354.34(g-h).
[322] 23 CCR § 352.4 *et seq*.
[323] 23 CCR § 354.38(d).

management practices,[324] and submit all monitoring data to the Department's Monitoring Network Module immediately after collection including any additional groundwater monitoring data that is collected within the Plan area that is used for groundwater management decisions. Department staff note that if GSAs do not fill their identified data gaps, the GSA's basin understanding may not represent the best available science for use to monitor basin conditions.

The GSP has identified 45 monitoring wells within the principal aquifer of Subbasin to include in the groundwater level monitoring network.[325] The entire groundwater level monitoring network will be used as representative monitoring points in the Subbasin. However, there are a total of 43 wells uploaded to DWR's SGMA Portal Monitoring Network Module (MNM). The MNM is consistent with the GSP regarding all wells in the monitoring network being used as representative monitoring points. The Department's review of the groundwater level monitoring network is also based on information provided in the MNM rather than just information provided in the GSP.

The GSP proposes to use the groundwater level monitoring network as a proxy for the groundwater storage monitoring network because changes in groundwater storage are directly dependent on changes in groundwater levels.[326]

The GSP states that 21 wells from existing water quality monitoring activities in the Subbasin will be used to monitor the two constituents of concern in the Subbasin, which are nitrate and TDS.[327] Data collection and management of the monitoring data will be the responsibility of the GSAs in coordination with the existing monitoring programs in the Subbasin.[328]

The GSP states that subsidence is not a significant concern for the Subbasin, however InSAR data will be used to monitor for subsidence since the data provides sufficient spatial and temporal monitoring of the Subbasin.[329]

The GSP has identified 10 upper zone monitoring wells from the chronic lowering of groundwater levels network to include in the monitoring network for depletions of interconnected surface water.[330] The monitoring network also includes seven stream gauges that will be paired up with adjacent monitoring wells along the American, Sacramento, and Cosumnes rivers, which will be collecting up to 15-minute interval data. The GSP states that data collected from the monitoring network will directly inform integrated surface and groundwater modeling in the Subbasin.[331]

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[324] Department of Water Resources, 2016, Best Management Practices and Guidance Documents.
[325] South American GSP, Section 3.5.2, p. 339, Table 3-4, p. 317.
[326] South American GSP, Section 3.2.2.1, p. 287.
[327] South American GSP, Section 3.5.2, pp. 343-345.
[328] South American GSP, Section 3.5.2, p. 343.
[329] South American GSP, Section 3.5.2, p. 353.
[330] South American GSP, Section 3.5.2, p. 338.
[331] South American GSP, Section 3.5.2, p. 338.

While the GSP does provide a map identifying the location of the representative monitoring sites for degradation of water quality, and representative monitoring sites have been identified in the Department's Monitoring Network Module, Department staff have determined additional information should be provided in the GSP regarding the monitoring network for degraded water quality. The GSP did not report, in tabular format, the monitoring site type or measurement frequency for the degraded water quality monitoring network as required by the GSP Regulations.[332] Including this information will provide the Department with additional clarity on how other water quality programs are being leveraged in the Subbasin to comply with the requirements of the GSP Regulations and SGMA (see Recommended Corrective Action 4a).

The GSP Regulations require GSPs to provide specific information about each monitoring site per the data and reporting standards.[333] As an example, well construction information is required for monitoring sites, but is not provided for wells in the degraded water quality monitoring network. It is imperative the GSAs work to ensure the information defining the Subbasin's monitoring network is consistent within the GSP, consistent with the Department's Monitoring Network Module, and follow the data and reporting standards. Department staff recommend there be a reconciliation between the details of the monitoring network provided in the GSP with the requirements of the data and reporting standards in the GSP Regulations (See Recommended Corrective Action 4b).

While recommended corrective actions were identified to clarify some aspects of the Subbasin's monitoring network, Department staff conclude that the description of the monitoring network included in the Plan substantially complies with the requirements outlined in the GSP Regulations. Overall, the Plan describes in sufficient detail a monitoring network that promotes the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin and evaluate changing conditions that occur through Plan implementation.

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.[334] 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.[335]

[332] 23 CCR § 354.34 (h).
[333] 23 CCR §§ 352.4, 354.34(g)(2).
[334] 23 CCR § 354.44 (a).
[335] 23 CCR § 354.44 (b) *et seq.*

The GSP states that the "[Sub]basin will be sustainable over the next twenty years as long as planned recycled water, recharge and other projects are implemented."[336] The GSP provides a suite of projects and management actions that the GSAs plan to implement or are currently implementing within the Subbasin.[337] The management actions will fill data gaps, facilitate coordination between various entities, and create a program to protect shallow or vulnerable wells. The projects will generally provide benefits to the Subbasin through in-lieu recharge, direct recharge, and increased surface water supply.

The GSP categorizes its projects into three groups based on the estimated time of implementation:[338]

- Group 1: Existing Projects includes three projects that were completed prior to GSP development and are currently being implemented. These existing projects were included in the CoSANA baseline modeling scenario. As these projects have already been completed, Department staff's evaluation of the projects and management actions is mainly focused on planned projects and management actions. However, Department staff concur with the continued implementation of these Group 1 projects to support attaining the sustainability goal in the Subbasin.
- Group 2: Near-term Planned Projects includes three projects that are in the planning or design phase – the GSAs plan to implement these projects within five years.[339] The GSP includes Group 2 projects and management actions in its assessment of future basin conditions using the CoSANA model. The projects are as follows:
    - Harvest Water Project
    - OHWD Groundwater Recharge Project and Groundwater Monitoring (OHWD Recharge Project)
    - Regional Conjunctive Use Program
- Group 3: Supplemental Projects consists of a single project, the Sacramento Area Flood Control Agency Flood-Managed Aquifer Recharge project. The GSP states that this project is in conceptual stages and is "not expected to be operational within the next 10-15 years"; however, it could assist the Subbasin in adapting to future conditions.[340]

The GSP intends for the projects, particularly in Group 2, to mitigate the projected future deficit projected in the water budget,[341] and describes the estimated quantified benefits

[336] South American GSP, Abstract, p. 32.
[337] South American GSP, Sections 4.2 through 4.5, pp. 367-384.
[338] South American GSP, Section 4.2, p. 367.
[339] South American GSP, Section 4.4, p. 369.
[340] South American GSP, Section 4.5, p. 381, Section 4.2, p. 367.
[341] South American GSP, Table 2.4-7, pp. 258-259.

that these projects could provide to the Subbasin. The Harvest Water project could provide up to 50,000 AFY of tertiary-treated recycled water from the Sacramento Regional Wastewater Treatment Plant to irrigate more than 16,000 acres of permanent agriculture and habitat conservation lands.[342] The OHWD Recharge Project could ultimately allow 6,000 AFY of surface water diversion during wet years to be recharged, which could then be extracted during the following growing season to offset pumping demands.[343] The Regional Conjunctive Use Program could offset annual groundwater pumping by an average of 7,200 AFY, and an average of 20,400 AF of surface water being made available during wet years.[344]

To demonstrate and evaluate the effects of implementing projects and management actions in meeting the Subbasin's sustainability goal, the GSP provides an analysis using the CoSANA model.[345] The analysis evaluated the average annual groundwater storage conditions under modeling scenarios with climate change and without climate change with different combinations of benefits from the Harvest Water Project, OHWD Recharge Project, Regional Conjunctive Use Program, and demand reduction.[346] Ten scenarios were performed under differing conditions, outlined in Table 4-2.[347] The GSP states that the projected condition baseline scenario with climate change (PCBL CC) will result in an average groundwater storage change of -6,200 AFY;[348] this scenario represents the projected conditions if the Subbasin did not implement any projects.[349] In Scenario 5, which represents the projected storage conditions if the Harvest Water, OHWD Recharge, and Regional Conjunctive Use projects were implemented, the average annual groundwater storage change is -100 AFY.[350] The GSP states that additional demand management would be able to offset the -100 AFY storage deficit.[351] From these results, the GSP concludes that that planned demand management, in addition to the implementation of the three projects, would allow the Subbasin to achieve sustainability.[352]

Although Department staff understand that many of the project and management details will be developed during the next several years, Department staff conclude that the GSP describes proposed projects and management actions in a manner that is generally consistent and substantially complies with the GSP Regulations. The projects and management actions are directly related to the sustainable management criteria and present a generally feasible approach to achieving the sustainability goal of the Subbasin.

[342] South American GSP, Section 4.4.1.1, p. 369.
[343] South American GSP, Section 4.4.2.3, p. 375.
[344] South American GSP, Section 4.4.3.1, pp. 377-379, Table 4-1, p. 379, Section 4.4.3.5, p. 380.
[345] South American GSP, Section 4.6, p. 384.
[346] South American GSP, Table 4-3, p. 400, Table 4-4, p. 400.
[347] South American GSP, Table 4-2, p. 384.
[348] South American GSP, Table 4-4, p. 400.
[349] South American GSP, Section 4.6, p. 384.
[350] South American GSP, Table 4-4, p. 400.
[351] South American GSP, Section 4.6.4, p. 397.
[352] South American GSP, Table 4-4, p. 400, Section 4.6.5, p. 400.

Since meeting the sustainability goal is largely dependent upon the implementation of these projects and management actions, failure to implement these projects or management actions, or making material modifications, may affect the Department's conclusions regarding the adequacy of the GSP or its implementation in future evaluations.

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."[353] 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.[354]

The adjacent subbasins to the South American Subbasin include the North American, Yolo, Solano, Eastern San Joaquin, and Cosumnes subbasins. The GSP states that groundwater level minimum thresholds were developed in coordination with the Cosumnes Subbasin and North American Subbasin. Additionally, the GSP discusses plans of future collaboration with adjacent basins in attaining joint sustainability goals.[355]

Based on information available at this time, Department staff have no reason to believe that groundwater management in the South American Subbasin will adversely affect the ability of the adjacent basins to implement a GSP or impede achievement of sustainability goals in those subbasins. Department staff will continue to review periodic evaluations to the Plan to assess whether or how implementation of the GSP is potentially impacting the adjacent subbasins.

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.[356]

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:

[353] Water Code § 10733(c).
[354] 23 CCR § 354.28(b)(3).
[355] South American GSP, Table ES-7, p. 61, Section 3.3.1.2, p. 315.
[356] 23 CCR § 354.18.

1. Explore how their proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the Subbasin 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 Subbasin 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.
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 to evaluate how their Plan’s groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

5 Staff Recommendation

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

The recommended corrective actions include:

Recommended Corrective Action 1

Amend or update the sustainable management criteria for degraded water quality as follows:

a. Establish sustainable management criteria for arsenic or provide further clarification about why sustainable management criteria was not developed for this constituent.

b. Provide information regarding the Subbasin's groundwater quality conditions using specific conductivity or provide a better explanation of the relationship between total dissolved solids (TDS) and specific conductivity.

c. Amend the quantitative definition of undesirable results to account for localized threshold exceedances in a single aquifer zone or provide additional information to the GSP to support why undesirable results will not occur unless simultaneous exceedances occur in both aquifer zones.

Recommended Corrective Action 2

Revise the definition of undesirable results for land subsidence such that groundwater extraction and other factors, whether due to action or inaction of the GSAs with respect to Subbasin management, are considered and not excluded in the undesirable result definition. Additionally, update tables to provide a consistent definition of the undesirable result.

Recommended Corrective Action 3

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

a. Provide further clarification regarding the potential impacts to beneficial uses and users that may be affected by future depletions of interconnected surface water related to the projected decreased streamflow exceedance probabilities for the American and Sacramento Rivers due to climate change.

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 GSAs' jurisdictional area.

RECOMMENDED CORRECTIVE ACTION 4

Provide additional information on the monitoring network, including:

a. Define the monitoring site type and data collection frequency in tabular format for the degraded water quality monitoring network in the GSP.

b. Conduct a reconciliation between the details of the monitoring network provided in the GSP with the requirements of the data and reporting standards in the GSP Regulations. Where requirements of the data and reporting standards are not provided, the GSAs should include this information in the periodic evaluation of the GSP. As a reminder, modifications to the Subbasin's monitoring network must be reflected in the SGMA Portal's Monitoring Network Module.