CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE
715 P Street, 8th Floor | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

July 6, 2023

Fritz Buchman
San Joaquin County Public Works
P.O. Box 1810
Stockton, CA 95201
info@esjgroundwater.org

RE: Approved Determination of the Revised Groundwater Sustainability Plan Submitted for the San Joaquin Valley – Eastern San Joaquin Subbasin

Dear Fritz Buchman,

The Department of Water Resources (Department) has evaluated the resubmitted groundwater sustainability plan (GSP) for the San Joaquin Valley – Eastern San Joaquin Subbasin in response to the Department's incomplete determination on January 28, 2022 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 groundwater sustainability agencies (GSAs) have taken sufficient action to correct deficiencies identified by the Department and the Eastern San Joaquin 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 the future.

Recognizing SGMA sets a long-term horizon for 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 Eastern San Joaquin GSP no later than January 29, 2025.

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 San Joaquin Valley – Eastern San Joaquin Groundwater Sustainability Plan (July 6, 2023)

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE SAN JOAQUIN VALLEY – EASTERN SAN JOAQUIN 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.) If a Plan is determined to be Incomplete, the Department identifies deficiencies that preclude approval of the Plan and identifies corrective actions required to make the Plan compliant with SGMA and the GSP Regulations. The GSA has up to 180 days from the date the Department issues its assessment to make the necessary corrections and submit a revised Plan. (23 CCR § 355.2(e)(2)). This Statement of Findings explains the Department's decision regarding the revised Plan submitted by the Central Delta Water Agency GSA, Central San Joaquin Water Conservation District GSA, City of Lodi GSA, City of Manteca GSA, City of Stockton GSA, County of San Joaquin GSA - Eastern San Joaquin 1, County of San Joaquin GSA - Eastern San Joaquin 2, Eastside San Joaquin GSA, Linden County Water District GSA, Lockeford Community Service District GSA, North San Joaquin Water Conservation District GSA, Oakdale Irrigation District GSA, South Delta Water Agency GSA, South San Joaquin GSA, Stockton East Water District GSA, and Woodbridge Irrigation District GSA (GSAs or Agencies) for the San Joaquin Valley – Eastern San Joaquin Subbasin (Subbasin) (Basin No. 5-022.01).

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

A. The initial Plan for the basin submitted by the GSA for the Department's evaluation satisfied the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.), and Department Staff therefore evaluated the initial Plan.

B. On January 28, 2022, the Department issued a Staff Report and Statement of Findings determining the initial GSP submitted by the Agencies for the Subbasin to be incomplete, because the GSP did not satisfy the requirements of SGMA, nor did it substantially comply with the GSP Regulations. At that time, the Department provided corrective actions in the Staff Report that were intended to address the deficiencies that precluded approval. Consistent with the GSP Regulations, the Department provided the Agencies with up to 180 days to address the deficiencies detailed in the Staff Report. On July 27, 2022, within the 180 days provided to remedy the deficiencies identified in the Staff Report related to the Department's initial incomplete determination, the Agencies resubmitted a revised 2022 GSP to the Department for evaluation. When evaluating a revised GSP that was initially determined to be incomplete, the Department reviews the materials (e.g., revised or amended GSP) that were submitted within the 180-day deadline and does not review or rely on materials that were submitted to the Department by the GSA after the resubmission deadline. Part of the Department's review focuses on how the Agencies have addressed the previously identified deficiencies that precluded approval of the initially submitted Plan. The Department shall find a Plan previously determined to be incomplete to be inadequate if, after consultation with the State Water Resources Control Board, the Department determines that the Agencies have not taken sufficient actions to correct the deficiencies previously identified by the Department. (23 CCR § 355.2(e)(3)(C).) The Department shall approve a Plan previously found to be incomplete if the Department determines the Agencies have sufficiently addressed the deficiencies that precluded approval. The Department may evaluate other components of the Plan, particularly to assess whether revisions to address deficiencies may have affected other components of a Plan or its likelihood of achieving sustainable groundwater management and may offer recommended corrective actions to deal with any issues of concern.

C. The Department's Staff Report, dated January 28, 2022, identified the deficiencies that precluded approval of the initially submitted Plan. After thorough evaluation of the revised Plan, the Department makes the following findings regarding the sufficiency of the actions taken by the Agencies to correct those deficiencies:

    1. Deficiency 1: The corrective action advised the Agencies to address several aspects of the Plan's discussion, analyses, and justification of groundwater level, subsidence, and interconnected surface waters sustainable management criteria and potential impacts to beneficial uses and users. The Department found that the initial GSP did not adequately justify why undesirable results would only occur during consecutive non-dry water years for the chronic lowering of groundwater levels, land subsidence, and depletion of interconnected

surface water sustainability indicators. The Department also found that the GSP lacked sufficient explanation for the established minimum thresholds and undesirable results for groundwater levels.

The 2023 Staff Report associated with the revised Plan indicates that the Agencies have taken sufficient actions to correct this deficiency such that, at this time, although the Staff Report includes recommended corrective actions to further align this aspect of the Plan with the GSP Regulations, the Department no longer finds the deficiency to preclude approval, and further finds that the Agencies have the ability to achieve the sustainability goal for the basin on SGMA timelines, and that the Department will be able to periodically monitor and evaluate the likelihood of Plan implementation to achieve sustainability.

2. Deficiency 2: The corrective action advised the Agencies to address the Plan's discussion supporting the use of chronic lowering of groundwater levels sustainable management criteria and monitoring network as a proxy for land subsidence. The initial GSP did not provide enough information supporting the use of groundwater levels as a proxy for subsidence.

   The 2023 Staff Report indicates that the Agencies have taken sufficient actions to correct this deficiency such that, at this time, although the Staff Report includes recommended corrective actions to further align this aspect of the Plan with the GSP Regulations, the Department finds Plan approval is not precluded, that the Agencies have the ability to achieve the sustainability goal for the basin on SGMA timelines, and that the Department will be able to periodically monitor and evaluate the likelihood of Plan implementation to achieve sustainability.

D. 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 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).)

   2. The Plan, either on its own or in coordination with other Plans, appears to cover the entire Basin sufficient to warrant a thorough evaluation. (23 CCR § 355.4(a)(3).)

E. The general standards the Department applied in its evaluation and assessment of the Plan are: (1) "conformance" with the specified statutory requirements, (2)

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

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

F. In making these findings and Plan determination, the Department also recognized that: (1) it maintains continuing oversight and jurisdiction to ensure the Plan is adequately implemented; (2) the Legislature intended SGMA to be implemented over many years; (3) SGMA provides Plans 20 years of implementation to achieve the sustainability goal in a 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.)

G. 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.

1. The sustainable management criteria and the GSP's goal to maintain an economically viable groundwater resource for the beneficial use of the people of the Subbasin by operating within its sustainable yield or by modifying existing management actions to address future conditions are sufficiently justified and explained. 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 Basin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)

2. The Plan demonstrates a thorough understanding of where data gaps exist (e.g., hydrogeological conceptual model, groundwater conditions, and water budgets) and demonstrates a commitment to eliminate those data gaps. The GSP intends to address these data gaps by incorporating new information into the numerical model and expanding the existing monitoring network. Filling these known data gaps, and others described in the Plan, should lead to the refinement of the GSAs' monitoring networks, the Subbasin's water model, and sustainable management criteria to better inform and guide future adaptive management strategies. (23 CCR § 355.4(b)(2).)

3. The sustainable management criteria and projects and management actions are 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 various interests of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests would be impacted by the established minimum thresholds. (23 CCR § 355.4(b)(4).)

5. The Plan's proposed projects and management actions appear feasible at this time and, if implemented expeditiously, appear likely to prevent undesirable results and ensure that the Subbasin is operated within its sustainable yield on SGMA timelines. 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 unlikely to 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. While no discussion was included on the potential impacts to adjacent basins, the Plan's water budget included subsurface outflows and inflows estimates between the adjacent subbasins. The Plan states that various inter-basin coordination meetings have taken place with the seven adjacent subbasins mainly discussing the elements of the critically over-drafted Subbasin and efforts to coordinate in the future. (23 CCR § 355.4(b)(7).)

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

9. The GSAs' member agencies are Central Delta Water Agency, Central San Joaquin Water Conservation District, City of Lodi, City of Manteca, City of Stockton, Calaveras County Water District, Stanislaus County, Rock Creek Water District, Linden County Water District, Lockeford Community Services District, North San Water Conservation District, Oakdale Irrigation District, San Joaquin County, North Delta Water Agency, San Joaquin County No. 2 (Cal Water), South Delta Water Agency, South San Joaquin Irrigation District, City of Ripon, City of Escalon, Stockton East Water District, and Woodbridge Irrigation District. Given the legal authority and financial resources of the GSAs' member agencies and the additional authorities granted the GSAs' under SGMA, the Department concludes the GSAs' likely 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).)

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

1. The Plan provides an assessment conducted by the GSA which evaluated potential impacts to beneficial uses and users based on the established sustainable management criteria. The assessment estimated impacts to domestic and municipal supply wells by evaluating the 10th percentile well depths and comparing those to the initial minimum thresholds values to establish the minimum thresholds at individual representative monitoring points which, if not exceeded, would be protective of approximately 90-percent of domestic or municipal wells in the Subbasin. The Department developed its GSP Regulations consistent with and intending to further the human right to water policy (Water Code § 106.3) 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 propose to use chronic groundwater level sustainable management criteria as proxy for the depletions of interconnected surface water sustainability indicator, however, the Department recognizes that many data gaps related to interconnected surface water exist within the Subbasin. The GSAs should fill data gaps, evaluate additional modeling data, and coordinate with agencies and interested parties to understand beneficial uses and users that may be impacted by depletions of interconnected surface water caused by groundwater pumping. Future updates to the Plan should aim to improve the sustainable management criteria as more information and improved methodologies become available.

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

Accordingly, the revised GSP submitted by the Agencies for the Eastern San Joaquin 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 29, 2025, 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 6, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Eastern San Joaquin Subbasin (July 6, 2023)

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

Groundwater Basin Name:	San Joaquin Valley – Eastern San Joaquin Subbasin (No. 5-022.01)
Submitting Agencies:	Central Delta Water Agency GSA; Central San Joaquin Water Conservation District GSA; City of Lodi GSA; City of Manteca GSA; City of Stockton GSA; County of San Joaquin GSA - Eastern San Joaquin 1; County of San Joaquin GSA - Eastern San Joaquin 2; Eastside San Joaquin GSA; Linden County Water District GSA; Lockeford Community Service District GSA; North San Joaquin Water Conservation District GSA; Oakdale Irrigation District GSA; South Delta Water Agency GSA; South San Joaquin GSA; Stockton East Water District GSA; Woodbridge Irrigation District GSA
Submittal Type:	Revised Plan in Response to Incomplete Determination of the 2020 Groundwater Sustainability Plan
Submittal Date:	July 27, 2022
Recommendation:	Approve
Date:	July 6, 2023

On July 27, 2022, the Central Delta Water Agency GSA, Central San Joaquin Water Conservation District GSA, City of Lodi GSA, City of Manteca GSA, City of Stockton GSA, County of San Joaquin GSA - Eastern San Joaquin 1, County of San Joaquin GSA - Eastern San Joaquin 2, Eastside San Joaquin GSA, Linden County Water District GSA, Lockeford Community Service District GSA, North San Joaquin Water Conservation District GSA, Oakdale Irrigation District GSA, South Delta Water Agency GSA, South San Joaquin GSA, Stockton East Water District GSA, and Woodbridge Irrigation District GSA (collectively, the GSAs or Agencies) submitted the Eastern San Joaquin Groundwater Subbasin Revised June 2022 Groundwater Sustainability Plan (GSP or Plan) for the San Joaquin Valley – Eastern San Joaquin Subbasin (Subbasin) to the Department of Water Resources (Department) in response to the Department's incomplete determination on

January 28, 2022,[1] for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)[2] and GSP Regulations.[3]

After evaluation and assessment, Department staff conclude the GSAs have taken sufficient actions to correct deficiencies identified by the Department and recommend approval of the 2022 Plan. Department staff have identified recommended corrective actions for the GSA to address by the Plan's first periodic evaluation.

Overall, Department staff believe the Plan contains 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 reasonable and supported sustainable management criteria to prevent undesirable results as defined in the Plan; has a reasonable monitoring network; and proposes a set of projects and management actions that, if successfully implemented, are likely to achieve the sustainability goal defined for the Subbasin.[4] Department staff will continue to monitor and evaluate the Subbasin's progress toward achieving the sustainability goal through annual reporting, periodic evaluations of the GSP, and GSP implementation.

This assessment includes six sections:

- **Section 1 – Summary:** Provides an overview of the Department'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 of a response to an incomplete determination to be evaluated by the Department.
- **Section 4 – Deficiency Evaluation:** Provides an assessment of whether and how the contents included in the GSP resubmittal addressed the deficiencies identified by the Department in the initial incomplete determination.
- **Section 5 – Plan Evaluation:** Provides a detailed assessment of the contents included in the GSP organized by each Subarticle outlined in the GSP Regulations.
- **Section 6 – Staff Recommendation:** Includes the staff recommendation for the Plan and any recommended corrective actions.

[1] Water Code § 10733.4(b); 23 CCR § 355.4(a)(4). https://sgma.water.ca.gov/portal/service/gspdocument/download/7777.
[2] Water Code § 10720 *et seq*.
[3] 23 CCR § 350 *et seq*.
[4] 23 CCR § 354.24.

1 SUMMARY

Department staff conclude that the GSAs took sufficient action to correct the deficiencies previously identified. Accordingly, Department staff recommend **approval** of the Groundwater Sustainability Plan for the Eastern San Joaquin Groundwater Subbasin, along with implementation of corrective actions described in this Staff Report, which should be addressed by the next periodic Plan evaluation to further improve Plan implementation and achievement of basin sustainability in accordance with SGMA timelines.

The GSAs have identified areas for improvement of their Plan (e.g., addressing data gaps related to the hydrogeologic conceptual model and monitoring networks, including the refinement of aquifer characteristics, depth-discrete groundwater level and groundwater quality data, shallow groundwater levels near surface waters and natural communities commonly associated with groundwater (NCCAGs), and groundwater level data in the east and northwest areas of the Subbasin). Department staff concur that those items are important and recommend that the GSAs address them as soon as possible. Department staff have also identified additional recommended corrective actions designed to address shortcomings of the Plan, as described in this Staff Report, that the GSAs should consider for the first periodic evaluation of the Plan (see Section 6). The recommended corrective actions generally focus on the following:

1) groundwater level sustainable management criteria and the evaluation of impacts to beneficial uses and users,
2) land subsidence sustainable management criteria and monitoring network,
3) clarification of water budget and sustainable yield estimates,
4) clarification of sustainable management criteria related to the reduction of groundwater in storage,
5) additional explanation of seawater intrusion sustainable management criteria and the effects on beneficial uses and users, and clarification related to development the seawater intrusion isocontour line,
6) additional explanation of potential impacts related to depletions of interconnected surface waters, and additional details regard the existing and proposed monitoring network for depletions of interconnected surface water,
7) recommendations related to the seawater intrusion and groundwater quality monitoring networks.

Addressing the recommended corrective actions identified in Section 6 of this Staff Report 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 Department evaluates whether a Plan conforms to the statutory requirements of SGMA[5] and is likely to achieve the basin's sustainability goal,[6] whether evaluating a basin's first Plan,[7] a Plan previously determined incomplete,[8] an amended Plan,[9] or a GSA's periodic evaluation to an approved Plan.[10] To achieve the sustainability goal, each version of the Plan must demonstrate that implementation 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.[11] The Department is also required to evaluate, on an ongoing basis, whether the Plan will adversely affect the ability of an adjacent basin to implement its groundwater sustainability program or achieve its sustainability goal.[12]

The Plan evaluated in this Staff Report is a revision of the 2020 Plan, which was evaluated by the Department and found to be incomplete. An incomplete Plan is one which Department staff identified one or more deficiencies that preclude its initial approval. Deficiencies may include a lack of supporting information that is sufficiently detailed or analyses that are sufficiently thorough and reasonable, or where Department staff determine it is unlikely the GSA(s) in the basin/subbasin could achieve the sustainability goal under the proposed Plan. After GSAs have been afforded up to 180 days to address the deficiencies and based on the GSAs' efforts, the Department can either approve[13] the Plan or determine the Plan inadequate.[14]

The Department's evaluation and assessment of a revised or amended Plan, subsequent to the initial Plan being found to be incomplete, as presented in this Staff Report, continues to follow Article 6 of the GSP Regulations[15] to determine whether the Plan, with revisions or additions prepared by the GSA, complies with SGMA and substantially complies with the GSP Regulations.[16] As stated in the GSP Regulations, "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

[5] Water Code §§ 10727.2, 10727.4, 10727.6.
[6] Water Code § 10733; 23 CCR § 354.24.
[7] Water Code § 10720.7.
[8] 23 CCR § 355.2(e)(2).
[9] 23 CCR § 355.10.
[10] 23 CCR § 355.6.
[11] Water Code § 10721(v).
[12] Water Code § 10733(c).
[13] 23 CCR §§ 355.2(e)(1).
[14] 23 CCR §§ 355.2(e)(3).
[15] 23 CCR § 355 *et seq*.
[16] 23 CCR § 350 *et seq*.

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."[17]

When reviewing a revised or amended Plan that had previously been determined to be incomplete, Department staff primarily assess whether the GSA(s) have taken sufficient actions to correct any deficiencies identified by the Department.[18] A Plan approval does not signify that Department staff, were they to exercise the professional judgment required to develop a Plan for the basin, would make the same assumptions and interpretations as those contained in the revised Plan, but simply that Department staff have determined that the modified assumptions and interpretations relied upon by the submitting GSA(s) are supported by adequate, credible evidence, and are scientifically reasonable. Assessment of a revised or amended Plan previously determined to be incomplete may involve the review of new information presented by the GSA(s), including models and assumptions, and a reevaluation of that information based on scientific reasonableness. In conducting its assessment, Department staff does not recalculate or reevaluate technical information or perform its own geologic or engineering analysis of that information.

The recommendation to approve a Plan previously determined to be incomplete is based on a determination that the GSA(s) have taken sufficient actions (e.g., amended or revised the Plan) to correct the deficiencies previously identified by the Department that precluded earlier approval.

3 REQUIRED CONDITIONS

For a Plan that the Department determines to be incomplete, the Department identifies corrective actions to address those deficiencies that preclude approval of the Plan as initially submitted. The GSAs in a basin, whether developing a single GSP covering the basin or multiple GSPs, must attempt to sufficiently address those corrective actions within the time provided, not to exceed 180 days, for the Plan to be evaluated by the Department.

3.1 INCOMPLETE RESUBMITTAL

The GSP Regulations specify that the Department shall evaluate a revised GSP if the GSA has taken corrective actions to address deficiencies within 180 days from the date the Department issued an incomplete determination.[19]

The Department issued the incomplete determination on January 28, 2022. The GSAs submitted a revised GSP to the Department on July 27, 2022, within the 180-day deadline.

[17] 23 CCR § 355.4(b).
[18] 23 CCR §§ 355.2(e)(3)(C).
[19] 23 CCR § 355.4(a)(4).

4 DEFICIENCY 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.

In its initial incomplete determination, the Department identified deficiencies in the 2020 Plan which precluded that Plan's approval.[20] In January 2022 the GSAs were given 180 days to take corrective actions to remedy the identified deficiencies. Consistent with the GSP Regulations, Department staff have evaluated the revised 2022 Plan to determine if the GSAs have taken sufficient actions to correct the deficiencies.

4.1 DEFICIENCY 1. THE GSP LACKS SUFFICIENT JUSTIFICATION FOR DETERMINING THAT UNDESIRABLE RESULTS FOR CHRONIC LOWERING OF GROUNDWATER LEVELS, SUBSIDENCE, AND DEPLETION OF INTERCONNECTED SURFACE WATERS CAN ONLY OCCUR IN CONSECUTIVE NON-DRY WATER YEAR TYPES. THE GSP ALSO LACKS SUFFICIENT EXPLANATION FOR ITS MINIMUM THRESHOLDS AND UNDESIRABLE RESULTS FOR CHRONIC LOWERING OF GROUNDWATER LEVELS.

4.1.1 Corrective Action

The corrective actions issued by the Department in its January 28, 2022, assessment related to this deficiency are as follows:

> The GSAs must provide more detailed explanation and justification regarding the selection of the sustainable management criteria for groundwater levels, particularly the undesirable results and minimum thresholds, and the effects of those criteria on the interests of beneficial uses and users of groundwater. Department staff recommended the GSAs consider and address the following:
>
> 1a. Department staff believe the management approach described in the GSP, which couples minimum thresholds and measurable objectives that account for operational flexibility during dry periods with a definition of undesirable results that disregards minimum threshold exceedances in all years except consecutive below normal, above normal, or wet years, to be inconsistent with sustainable

[20] https://sgma.water.ca.gov/portal/service/gspdocument/download/7777.

groundwater management under SGMA. Therefore, the GSAs should remove the water-year type requirement from the GSP's undesirable result definition.

1b. The GSP should be revised to include specific projects and management actions the GSAs would implement to offset drought-year groundwater level declines.

1c. The GSAs should thoroughly explain how their management approach and minimum thresholds avoid undesirable results for subsidence and depletion of interconnected surface waters, in light of the fact that SGMA does not include an allowance or exemption for conditions that occur during periods of drought for those sustainability indicators.

1d. Removing the water-year type requirement from the definition of an undesirable result (item a, above) would result in a GSP with groundwater level minimum thresholds designed to be generally protective of 90 percent of domestic wells regardless of regional hydrologic conditions. In that scenario, the GSAs should explain the rationale for determining that groundwater levels can exceed those thresholds at 25 percent of monitoring sites for two consecutive years before the effects would be considered significant and unreasonable. The GSAs should also explain how other factors they identified as "potential undesirable results" (e.g., adverse impacts to environmental uses and users) were considered when developing and selecting minimum thresholds and describe anticipated effects of the thresholds on beneficial uses and users of groundwater. Furthermore, the GSAs should explain whether other drinking water users that may rely on shallow wells, such as public water systems and state small water systems, were considered in the GSAs' site-specific thresholds. If not, the GSAs should conduct outreach with those users and incorporate their shallow wells, as applicable, into the consideration of site-specific minimum thresholds and measurable objectives.

1e. The GSAs should revise the GSP to describe how they would address drinking water impacts caused by continued overdraft during the period between the start of GSP implementation and achieving the sustainability goal. If the GSP does not include projects or management actions to address those impacts, the GSP should contain a thorough discussion, with supporting facts and rationale, explaining how and why the GSAs determined not to include specific actions to address drinking water impacts from continued groundwater lowering below pre-SGMA levels.

1f. The GSP should be revised to explain how the GSAs will assess groundwater quality degradation in areas where further groundwater level decline, below historic lows, is allowed via the minimum thresholds. The GSAs should further describe how they will coordinate with the appropriate groundwater users, including drinking water, environmental, and irrigation users as identified in the GSP. The GSAs should also discuss efforts to coordinate with water quality regulatory agencies and programs in the Subbasin to understand and develop a process for determining if continued lowering of groundwater levels is resulting in degraded water quality

(e.g., increased concentrations of constituents of concern) in the Subbasin during GSP implementation.

4.1.2 Evaluation

In response to the multi-component corrective action provided for Deficiency 1, the Agencies submitted a revised GSP, including three new technical memoranda (Appendix 2-B, Appendix 3-D, and Appendix 3-E) address the deficiencies.

Deficiency 1a – relating to the exclusion of dry water year types in the identification of undesirable results for the chronic lowering of groundwater levels – was addressed in Appendix 2-B and Section 3.3.1.1.2 of the GSP.[21] To address Deficiency 1a, the revised GSP changes the definition of an undesirable result for the chronic lowering of groundwater levels to remove the non-dry water year type requirement. This change results in an undesirable result for the chronic lowering of groundwater levels to be defined as "when at least 25 percent of representative monitoring wells used to monitor groundwater levels (5 of 20 wells in the Subbasin) fall below their minimum level thresholds for two consecutive years."[22] Department staff conclude this change to be sufficient to address Deficiency 1a.

Deficiency 1b – relating to the identification of projects and management actions that will offset drought-related groundwater level declines – was addressed in Appendix 2-B. Deficiency 1b was initially recommended by Department staff as an alternative pathway to address the exclusion of dry and critical water year types in the identification of undesirable results for the chronic lowering of groundwater levels. With the removal of the water year type requirement, addressed in Deficiency 1a, Department staff believe that Deficiency 1b has already been addressed sufficiently; however, the GSP does provide an updated project list that includes potential surface water supplementation and in-lieu recharge estimates for different water year types and an updated modeling analysis of how projects will affect the groundwater budget and overdraft conditions in the Subbasin. The modeling results presented in the GSP indicate that even with the implementation of Category A Projects – defined as projects that are likely to advance in the next five years and have existing water rights or agreements – the Subbasin is projected to experience overdraft of 15,700 acre-feet per year when considering climate change.[23] The modeling results indicate that if Category A Projects are implemented as described, the Subbasin should not experience any undesirable results related to chronic lowering of groundwater levels (based on the updated definition), even under the climate change scenario; however, undesirable results may still occur (under the climate change scenario) if Category A Projects are not implemented as anticipated.[24] Based on these results, the GSP acknowledges that additional projects and management actions may be needed to address projected overdraft under climate change, and potential undesirable

[21] Eastern San Joaquin 2022 GSP, Appendix 2-B, pp. 1392-1393 and Section 3.3.1.1.2, p. 290.
[22] Eastern San Joaquin 2022 GSP, Section 3.3.1.1.2, p. 290.
[23] Eastern San Joaquin 2022 GSP, Appendix 2-B, p. 1402.
[24] Eastern San Joaquin 2022 GSP, Appendix 2-B, p. 1408.

results due to unforeseen changes in Category A Project implementation. The GSP indicates that an adaptive management approach will be utilized to address these concerns, and potential management actions and additional (Category B) projects were identified. [25] In general, Department staff conclude that the projects, potential management strategies and updated modeling results presented in the GSP provide a sufficient understanding of how the Agencies plan to manage the Subbasin under differing hydrologic conditions, even though the GSP acknowledges that additional, yet-to-be determined projects or management actions may be necessary to achieve sustainability.

Deficiency 1c, which requested additional justification to show how undesirable results for land subsidence and depletions of interconnected surface waters would not occur during dry water years where minimum thresholds are allowed to be exceeded (based on the previous definition of undesirable results and the use of groundwater levels as a proxy), was addressed sufficiently by the GSAs' response to Deficiency 1a. With the removal of the water-year type requirement from the identification of undesirable results for the chronic lowering of groundwater levels, Deficiency 1c is also addressed.

Deficiency 1d was addressed in Appendix 3-D. In explaining the rationale for how undesirable results related to the chronic lowering of groundwater levels would only occur when at least 25 percent of representative monitoring wells exceed their minimum thresholds for two consecutive years, the GSP describes that the 25-percent threshold (of representative monitoring well exceedances) was considered to be sufficient to identify subbasin-wide undesirable results, whereas less than 25 percent would be considered more localized events. Additionally, the GSP explains that two consecutive years of exceedances were selected to identify an undesirable result because two years would establish a pattern rather than an isolated event, but three years of exceedances was felt to be too extreme. [26] While the rationale presented in the GSP is understandable, Department staff cannot determine whether it is reasonable as the GSP provides no additional analysis of these thresholds that would describe the potential allowable impacts. For example, while the GSP indicates that minimum thresholds are generally protective of 90 percent of domestic (or municipal) wells in the Subbasin, if groundwater levels in up to four of 20 representative monitoring wells are allowed to exceed minimum thresholds (without triggering undesirable results), then 90 percent of domestic (or municipal) wells are not truly protected. Updated modeling scenarios included in the GSP indicate that minimum threshold exceedances will still occur in some areas of the Subbasin.[27] While Department staff do not believe this precludes approval at this time, they do believe that these modeling scenarios could be used to estimate potential impacts, particularly related to wells going dry, to support the notion that the proposed groundwater management approach will avoid significant and unreasonable undesirable results and recommend that minimum thresholds be evaluated in relation to the well depths of public water systems and state small water systems reliant on groundwater.

[25] Eastern San Joaquin 2022 GSP, Appendix 2-B, pp. 1410-1412.
[26] Eastern San Joaquin 2022 GSP, Appendix 3-D, p. 1595.
[27] Eastern San Joaquin 2022 GSP, Appendix 2-B, pp. 1402-1409.

While it may be reasonable to assume that wells in these systems are generally deeper than domestic wells, which were part of the minimum threshold analysis, Department staff recommend that an evaluation of these systems be disclosed by the GSP and an explanation for the selection of 25 percent exceedance for two years considered to be an undesirable result (see Recommended Corrective Action 1a).

Deficiency 1d also requested additional explanation for how other potential impacts, such as adverse impacts to environmental uses and users, were considered in the selection of minimum thresholds and the identification of undesirable results. In responding to this request, the Technical Memorandum included in Appendix 3-D essentially reiterated what was already presented in the original GSP. The revised GSP states that "[f]or the majority of the Subbasin, GSA representatives identified no undesirable results, even if groundwater were to reach historical low groundwater levels."[28] Additionally, while the explanation is somewhat unclear, the GSP implies that individual GSAs each "confirmed" that no undesirable results would occur if minimum thresholds were set deeper than historic lows (based on the established minimum thresholds).[29] The GSP does not disclose the potential impacts to environmental uses and users of groundwater related to the groundwater level minimum thresholds. Based on what is presented in the revised GSP, it is difficult for Department staff to evaluate the minimum thresholds and identification of undesirable results related to the chronic lowering of groundwater levels because no additional explanation or analysis was presented to describe how environmental uses and users would avoid experiencing significant and unreasonable impacts, particularly considering that groundwater level minimum thresholds are set below historic lows.

While it is understandable that the effects of changing groundwater levels on environmental uses and users may be difficult to observe and quantify than impacts that potentially affect groundwater wells or considered a data gap, the GSP does not present any analysis evaluating minimum thresholds in areas with identified GDEs. The GSP generally describes how the identification of GDEs will be further refined, and how new shallow monitoring wells will be constructed to collect additional data; however, there is no description for how this new data will be evaluated in conjunction with the minimum thresholds to evaluate impacts to environmental uses and users. While this does not preclude approval at this time, Department staff recommend the GSP include a more thorough evaluation of the impacts to environmental uses and users related to the groundwater level minimum thresholds, or, at minimum, provide a plan to evaluate impacts to environmental uses and users as additional data become available during GSP implementation (see Recommended Corrective Action 1b).

Additionally, Deficiency 1d requested explanation of how other groundwater users, such as public water systems and state small water systems, were considered in the development of minimum thresholds. In response to this request, the Technical

[28] Eastern San Joaquin 2022 GSP, Appendix 3-D, p. 1598.
[29] Eastern San Joaquin 2022 GSP, Appendix 3-D, p. 1598.

Memorandum included in Appendix 3-D reiterated the domestic and municipal well analysis presented in the original GSP.[30] The GSP states that domestic wells are generally shallower than agricultural and municipal wells, which is why their analysis focuses on domestic wells. This analysis determined the 10th percentile of domestic well depth for all domestic wells (with data available in the Department's Online System of Well Completion Reports [OSWCR] database) within a three-mile radius of each representative monitoring well (or two-mile radius for representative monitoring well 03N07E21L003 due to site-specific hydrogeologic conditions), and used this value as the minimum threshold (unless the historic low groundwater level plus buffer was shallower). For areas served by municipal wells, a similar analysis was done based on nearby municipals wells. Department staff do not believe this analysis to be unreasonable; however, the deficiency specifically requested an explanation for how public water systems and small state water systems were considered.

Department staff suggest that a more detailed analysis of these smaller water systems be included in future GSP updates. The analysis should identify locations for public water systems and state small water systems in the Subbasin that rely on groundwater and evaluate whether minimum thresholds for nearby representative monitoring wells are sufficient to prevent significant and unreasonable impacts to these wells. While it may be assumed by GSAs that these small water systems are deeper than the 10th percentile domestic well depth and, thus, protected by the current minimum thresholds, Department staff would like evidence of this assumption disclosed in the Plan (see Recommended Corrective Action 1c).

Deficiency 1e identified the need for a description of drinking water impacts caused by continued overdraft during Plan implementation. This deficiency generally related to the continued overdraft and lowering of groundwater levels that would be allowed by the GSP in dry water years where minimum thresholds could be exceeded without triggering an undesirable result. The 2022 Plan addresses Deficiency 1e in Appendix 3-D. The information presented in Appendix 3-D indicates that the GSP plans to address long-term overdraft through the implementation of projects, but the GSP does not include any projects or management actions related to short-term impacts associated with drought. The GSP indicates that existing water suppliers and the County Office of Emergency Services have programs or plans in place to address short-term drought-related emergency water supply issues, and that SGMA legislation does not require GSPs to include water supply contingency or dry well mitigation plans.[31] The GSP also states that impacts to drinking water users were considered during the development of minimum thresholds, and with the removal of the water year type requirement, the established minimum thresholds will prevent a continued lowering of groundwater levels which should be sufficiently protective of most shallow domestic well users. The GSP indicates that an adaptive management approach will be utilized, and if impacts to drinking water users are

[30] Eastern San Joaquin 2022 GSP, Appendix 3-D, pp. 1599-1600.
[31] Eastern San Joaquin 2022 GSP, Appendix 3-D, pp. 1601-1603.

identified during GSP implementation, minimum thresholds could be revised, or additional projects or management actions could be implemented.[32] Department staff note that while the removal of the water year type requirement in the identification of undesirable results should lessen the chance for potential impacts to drinking water users, the minimum thresholds still allow for the lowering of groundwater levels below historic lows (ranging from 7.3 to 54.4 feet below historic low, depending on representative monitoring well site). Additionally, up to four of 20 representative monitoring wells are allowed to exceed these minimum thresholds without being considered an undesirable result, potentially resulting in undisclosed impacts to drinking water users across 20 percent of the Subbasin. Due to these factors, and as recommended previously under Recommended Corrective Action 1a, Department staff suggest that impacts to drinking water users (i.e., shallow domestic wells and small water systems) be evaluated using the updated modeling scenarios so that projected impacts under these scenarios can be used to guide future projects or management actions, if warranted.

Deficiency 1f requests that the GSP explain how groundwater quality degradation related to continued lowering of groundwater levels will be assessed. This deficiency was addressed in Technical Memorandum No. 3, included in Appendix 3-E. While the removal of the water year type requirement from the identification of undesirable results lessens the potential for continued lowering of groundwater levels Subbasin-wide, minimum thresholds still allow for groundwater levels to drop below historic lows. The GSP states that the only known correlation between groundwater quality and declining groundwater levels is related to the potential for saline water from the Delta to migrate inland when groundwater levels decline. The GSP states that "[t]hese sustainable management criteria were set specifically to help prevent the further migration of saline water."[33] Department staff cannot identify where the GSP describes how the migration of saline water was evaluated in relation to the groundwater level minimum thresholds, as minimum thresholds were only described as being defined as the shallower of either the 10th percentile of domestic well depth, or the historic low groundwater level minus a buffer that represented the range of historic groundwater level fluctuations, as discussed above. The GSP also states that "[aside from potential saline water migration] there is no evidence or historical data to indicate there is a relationship between lowering of groundwater levels and groundwater quality degradation."[34] While there may currently be no known correlation between groundwater levels and groundwater quality in the Subbasin, the GSP describes that groundwater quality results collected through GSP implementation, and also data from other water quality programs, will be evaluated in areas where groundwater level minimum thresholds are exceeded – and if groundwater quality secondary maximum contaminant levels (SMCLs) or minimum thresholds are also

[32] Eastern San Joaquin 2022 GSP, Appendix 3-D, pp. 1602-1603.
[33] Eastern San Joaquin 2022 GSP, Appendix 3-E, p. 1621.
[34] Eastern San Joaquin 2022 GSP, Appendix 3-E, p. 1621.

exceeded, the Agencies will convene a working group to assess whether groundwater management activities resulted in the groundwater quality exceedances.[35]

Department staff are encouraged by the commitment to evaluate groundwater quality data in areas where groundwater levels exceed minimum thresholds; however, the GSP presents little details on what the evaluation would entail. The GSP describes that groundwater quality degradation related to groundwater level declines will be evaluated in areas where groundwater levels fall below minimum thresholds. Considering that none of the representative monitoring wells in the groundwater level network are also sampled for groundwater quality (as part of the described GSP monitoring efforts), it is unclear how groundwater level declines observed in these wells will be correlated with changing groundwater quality conditions, particularly if no evaluation will be conducted until minimum thresholds are exceeded. In order to evaluate the changes in groundwater quality, sufficient groundwater quality data in the vicinity of the representative monitoring wells must be collected prior to the groundwater level declines occurring. Department staff recommend that as GSP implementation continues, the Agencies develop a more detailed plan describing how this assessment will be conducted, including identifying specific analyses, well locations (either wells already monitored as part of GSP implementation or wells monitored by other programs), sampling frequency, and data gaps (see Recommended Corrective Action 1d).

Deficiency 1f also requests additional information for how the Agencies plan to coordinate with groundwater users regarding groundwater quality degradation, and for how the Agencies plan to coordinate with other regulatory agencies or programs to develop a process to evaluate the effect of declining groundwater levels on groundwater quality in the Subbasin. The GSP provides a summary of how groundwater users will generally be involved or communicated with, including through stakeholder outreach and engagement efforts, a website, a future database management system, and the annual reporting.[36] Regarding coordination with other groundwater quality programs, the revised GSP provides additional management actions to enhance the coordination and evaluation of groundwater quality results among the different programs in the Subbasin.[37] These management actions include establishing a process for regular coordination by having an annual meeting or workshop with other water quality programs and inviting Water Board staff to participate in regular Technical Advisory Committee meetings; developing monitoring data sharing agreements; including water quality data from external programs in the Subbasin's data management system and evaluating these data with groundwater levels to identify whether a correlation exists; and including water quality data from other programs in the annual reporting. Department staff believe these coordination efforts described by the GSP to be sufficient.

[35] Eastern San Joaquin 2022 GSP, Appendix 3-E, p. 1623.
[36] Eastern San Joaquin 2022 GSP, Appendix 3-E, pp. 1623-1624.
[37] Eastern San Joaquin 2022 GSP, Appendix 3-E, pp. 1625-1626.

4.1.3 Conclusion

Overall, Department staff believe the GSAs have taken sufficient action to correct Deficiency 1 by removing the water year type requirement from the definition of undesirable results for the chronic lowering of groundwater levels, further describing the undesirable results, providing updated modeling analyses, and describing new management actions, as described above and in the revised GSP. However, Department staff have identified four recommended corrective actions related to Deficiency 1 that do not preclude approval at this time but would further improve the GSP. GSAs should consider addressing Recommended Corrective Actions 1a through 1d, described below, by the next periodic evaluation.

4.2 Deficiency 2. The GSP does not provide enough information to support the use of the chronic lowering of groundwater level sustainable management criteria and representative monitoring network as a proxy for land subsidence.

4.2.1 Corrective Action

The corrective actions issued by the Department in its January 28, 2022, assessment related to this deficiency are as follows:

> The GSAs must provide detailed information to demonstrate how the use of the chronic lowering of groundwater level minimum thresholds are sufficient as a proxy to detect and avoid significant and unreasonable land subsidence that substantially interferes with surface land uses. Alternatively, the GSAs could commit to utilizing direct monitoring for subsidence, e.g., with remotely sensed subsidence data provided by the Department. In that case, the GSAs should develop sustainable management criteria based on rates and extents of subsidence. Department staff suggest the GSAs consider and address the following issues:
>
> 2a. The GSAs should revise the GSP to identify the total extent and rates of subsidence that critical infrastructure in the Subbasin can tolerate during GSP implementation. Support this identification with information on the effects of subsidence on land surface beneficial uses and users and the amount of subsidence that would substantially interfere with those uses and users.
>
> 2b. The GSAs should revise the GSP to document a significant correlation between groundwater levels and specific amounts or rates of land subsidence. The analysis should account for potential subsidence related to groundwater level declines below historical lows and further declines that would exceed minimum threshold levels (i.e., during non-consecutive non-dry years, if applicable based on the resolution to Deficiency 1, above). This analysis should demonstrate that groundwater level declines allowed during GSP implementation are preventative of the rates and extent of land subsidence considered significant and unreasonable based on the identified infrastructure of concern. If there is not sufficient data to

establish a correlation, the GSAs should consider other options such as direct monitoring of land subsidence (e.g., remotely sensed data provided by the Department, extensometers, GPS stations, etc.) until such time that the GSAs can establish a correlation.

2c. The GSAs should explain how the groundwater level representative monitoring network is sufficient to detect significant and unreasonable rates or extents of subsidence that may substantially interfere with land uses, specifically any identified infrastructure of concern. If the groundwater level monitoring network alone is not adequate, based on specific infrastructure locations, Department staff suggest incorporating continued analysis of available InSAR [Interferometric Synthetic Aperture Radar] data to cover areas with data gaps.

4.2.2 Evaluation

Deficiency 2 was addressed in Technical Memorandum No. 4, included in the GSP as Appendix 3-F.[38] The Technical Memorandum provides additional information related to land subsidence in the Subbasin, including expanded discussions of critical infrastructure that would at risk due to land subsidence and the correlation between groundwater levels and land subsidence. Additionally, the Technical Memorandum proposes new management actions related to the monitoring of land subsidence in the Subbasin.

Deficiency 2a requests that the GSP describe the rate and extent of subsidence that would be considered significant and unreasonable, with respect to infrastructure of concern identified in the Subbasin. The revised GSP provides a general discussion of critical infrastructure types but does not identify specific infrastructure, stating “due to the sensitive nature of the critical infrastructure, specific infrastructure are not named.”[39] The GSP does not define specific rates or extents of subsidence that would potentially impact this infrastructure or be considered significant and unreasonable. Regarding the evaluation of land subsidence in relation to critical infrastructure, the GSP only states that “[t]hrough input from OES, the critical infrastructure in the Subbasin can generally tolerate a significant amount of uniform settlement due to subsidence across the Subbasin, though the total amount of settlement that can be tolerated is dependent on the design of the specific infrastructure. Differential settlement across facilities in a locale, on the other hand, will result in more damage.”[40] While this does not preclude approval at this time, based on the information provided, Department Staff believe additional information is needed to address Deficiency 2a, as the GSP does not provide a numerical rate and extent of land subsidence that would be associated with significant and unreasonable impacts Subbasin-wide. Department staff have provided an explanation in the conclusion (see Conclusion and Recommended Corrective Action 2).

[38] Eastern San Joaquin 2022 GSP, Appendix 3-F, pp. 1629-1656.
[39] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1631.
[40] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1632.

Deficiency 2b requests that the GSP be revised to describe the correlation between groundwater levels and land subsidence, to show that the use of groundwater level minimum thresholds as a proxy for land subsidence are protective of the rates and extents of land subsidence considered significant and unreasonable. The GSP reiterates what was presented in the original GSP, stating that "there are no historical records of impacts from land subsidence in the Eastern San Joaquin Subbasin." Additionally, the GSP implies that minimum thresholds for groundwater levels will only allow for the dewatering of geologic units similar to those dewatered historically, which have shown no signs of subsidence historically.[41] Finally, the GSP describes that compressible clays that are prone to subsidence are "not known to be common" in the Subbasin, with the exception of the Corcoran Clay being present in a small are in the southwest corner of the Subbasin.[42] In this area of the Subbasin the top of the Corcoran Clay unit is located at an elevation of approximately -176 feet mean sea level (ft msl). The GSP states that the minimum threshold for representative monitoring well 02S07E31N001M in this area is set well above Corcoran Clay depth, at 1.5 ft msl; however, the GSP has also established a separate groundwater level trigger in this area of -150 ft msl, which is intended to alert the Agencies when the potential for subsidence would become a concern, prior to dewatering the Corcoran Clay.[43]

The GSP indicates that groundwater level minimum thresholds will still be used as a proxy for land subsidence; however, the GSP does not clarify what constitutes an undesirable result for land subsidence. Assuming an undesirable result for land subsidence is defined similarly to that for the chronic lowering of groundwater levels, Department staff recognize that with the removal of the water year type exclusion, the potential for continued Subbasin-wide groundwater level declines below the established minimum thresholds is lessened. However, because groundwater level minimum thresholds can be exceeded in up to four of 20 representative monitoring wells without being considered an indicator of potential undesirable results in the basin, there is the potential to dewater deep geologic units below minimum thresholds which were not evaluated in the GSP with regard to land subsidence. The GSP indicates that the correlation between groundwater levels and land subsidence will be further evaluated during GSP implementation by incorporating data such as continuous global positioning system (CGPS) data, and InSAR data, airborne electromagnetic data, as available, and that the representative monitoring well network or subsidence monitoring methods will be updated as needed.[44] While not precluding approval at this time, Department staff believe that the GSP does not provide sufficient evidence to support the use of groundwater levels as a proxy for land subsidence and have provided an explanation and recommended corrective action in the conclusion (see Conclusion and Recommended Corrective Action 2).

[41] Eastern San Joaquin 2022 GSP, Section 3.3.5.2, p. 313.
[42] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1633.
[43] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1633.
[44] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1634.

Deficiency 2c asks that the GSP describe how the existing groundwater monitoring network is sufficient to detect significant and unreasonable land subsidence in relation to the identified infrastructure of concern. The revised GSP does not attempt to describe how the existing groundwater monitoring network is sufficient; rather, the GSP commits to evaluating other forms of land subsidence monitoring data, such as CGPS and InSAR data. The revised GSP also establishes a trigger value of 0.25 feet of annual land subsidence (based on available InSAR or CGPS data) which will initiate further evaluation to determine whether the subsidence is the result of groundwater management activities. Department staff note that the evaluation process related to determining the effect of groundwater management on subsidence is not described, though the GSP states that the results of the evaluation could potentially lead to additional projects or management actions.[45] Department staff believe that the GSP's incorporation of InSAR data to monitor for land subsidence is a step in the right direction but has provided a recommended corrective action in the conclusion (see Conclusion and Recommended Corrective Action 2).

4.2.3 Conclusion

Due to the lack of historical land subsidence in the Subbasin, and the likely minimal risk for land subsidence in the near-term, Department staff conclude that by adding the evaluation of direct subsidence monitoring data and annual trigger value of 0.25 feet, the Agencies' response to Deficiency 2 is sufficient at this time and does not preclude approval. However, Department staff also believe that the use of groundwater levels as a proxy for land subsidence sustainable management criteria and the use of the representative groundwater level monitoring network to identify undesirable results related to land subsidence to be poorly supported based on the information presented in the GSP. Department staff recommend the use of InSAR data for the land subsidence monitoring network, with supplemental groundwater level data being utilized to evaluate whether detected land subsidence is the result of declining groundwater levels and believe this should be addressed by the first periodic evaluation.

[45] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1642.

5 PLAN EVALUATION

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

The Department staff's evaluation of the likelihood of the Plan to attain the sustainability goal for the Basin is provided below. Department staff consider the information presented in the Plan to satisfy the general requirements of the GSP Regulations.

5.1 ADMINISTRATIVE INFORMATION

The GSP Regulations require each Plan to include administrative information identifying the submitting Agency, describing the plan area, and demonstrating the legal authority and ability of the submitting Agency to develop and implement a Plan for that area.[46]

The GSP was developed by the Eastern San Joaquin Groundwater Authority (ESJGWA), a joint powers authority comprised of 16 individual GSAs in the Subbasin. Each GSA has two appointed representatives on the ESJGWA Board of Directors (Board) - one Board member and one alternate member. The GSP describes that GSP implementation will be conducted though the ESJGWA as the coordinating agency, and that the GSP covers the entire geographic extent of the Subbasin. Decisions regarding Subbasin-wide GSP implementation are generally approved by a majority vote of the 16 Board members; however, a two-thirds supermajority is needed for certain items such as approval of the annual budget, levying of taxes or fees, decisions on curtailment of pumping, and adoption of new rules that govern the ESJGWA.[47] The GSP provides a brief description of each GSA, and also describes the legal authorities of the GSAs and the ESJGWA.[48] In addition to the ESJGWA Board, the GSP describes that an Advisory Committee, made up of one member from each GSA, provides guidance to the Board regarding development of the GSP including groundwater conditions, sustainable management criteria, and projects and management actions.[49] The Subbasin also has a Groundwater Sustainability Workgroup (Workgroup) which also provides input to the Board. The

[46] 23 CCR § 354.2 *et seq*.
[47] Eastern San Joaquin 2022 GSP, Section 1.1.4.2, pp. 43-44.
[48] Eastern San Joaquin 2022 GSP, Section 1.1.4.3, pp. 44-48 and Section 1.1.4.4, p. 48.
[49] Eastern San Joaquin 2022 GSP, Section 1.1.4.2, p. 43.

Workgroup is described by the GSP as being comprised of 23 community members that represent a diverse range of stakeholders in the community.[50]

The GSP describes that the Subbasin encompasses approximately 1,195 square miles and is part of the larger San Joaquin Valley Groundwater Basin. The GSP states that the Plan Area covers the entire Subbasin. The Subbasin is generally bound by Dry Creek on the north, the San Joaquin River on the west, the crystalline bedrock of the Sierra Nevada foothills on the east, and either the San Joaquin County line or the Stanislaus River on the south.[51] Adjacent subbasins include the Consumnes, Solano, and South American to the north, East Contra Costa and Tracy to the west, and the Delta Mendota and Modesto to the south. A map showing the Subbasin and adjacent subbasins is shown in Figure 1 below.

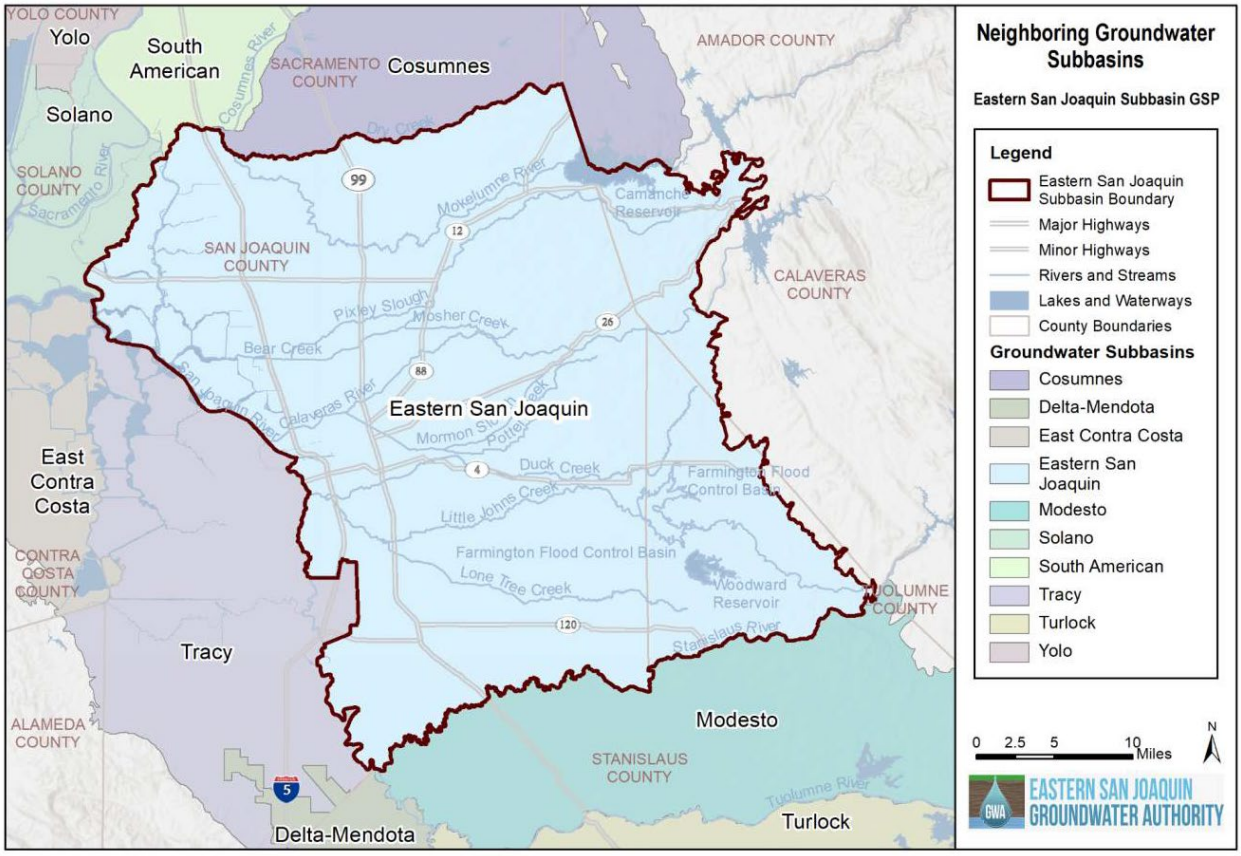

Figure 1. Eastern San Joaquin Subbasin Location Map

The GSP provides various figures displaying jurisdictional boundaries in the Subbasin, including GSAs, Cities, Counties, Federal and State lands, and disadvantaged communities (DACs). The GSP also includes maps and descriptions of land use characteristics including general land use types, crop types, and well density maps for

[50] Eastern San Joaquin 2022 GSP, Section 1.1.4.2, pp. 43-44.
[51] Eastern San Joaquin 2022 GSP, Section 1.2.1.1, pp. 49-53.

domestic, agricultural, and public wells.[52] The GSP describes that the majority of land use in the Subbasin is for agriculture, with the dominant crop types being fruit and nut trees and vine crops.[53]

The GSP lists the general categories of the beneficial uses and users of groundwater in the Subbasin as being consistent with those identified in Water Code §10723.2. Of these general categories, the GSP identifies specific local agencies, DACs, and community water systems that are considered beneficial users in the Subbasin.[54] Environmental users, such as groundwater dependent ecosystems (GDEs) and freshwater species reliant on instream flows are also identified (where data was available).[55] The GSP provides a list of public meetings held during GSP development to obtain input from stakeholders and the community, and also describes additional outreach efforts, such as a website, a stakeholder database, a situation assessment conducted through the Department Facilitation Support Services, and a Stakeholder Outreach and Engagement Plan.[56] Additionally, the GSP describes that the draft GSP was available for a 45-day public comment period (prior to submission to the Department). Public comments received for the GSP and responses to those comments are included as appendices.[57]

The GSP's discussion and presentation of administrative information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data. 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.

5.2 Basin Setting

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

5.2.1 Hydrogeologic Conceptual Model

The GSP Regulations require a descriptive hydrogeologic conceptual model of the basin that includes a written description supported by cross sections and maps.[59] The hydrogeologic conceptual model is a non-numerical model of the physical setting,

[52] Eastern San Joaquin 2022 GSP, Section 1.2.1.1, pp. 52-61.
[53] Eastern San Joaquin 2022 GSP, Section 1.2.1.1, p. 55.
[54] Eastern San Joaquin 2022 GSP, Section 1.3.1, pp. 80-81 and Appendix 1-F, pp. 534-548.
[55] Eastern San Joaquin 2022 GSP, Section 1.3.1, pp. 80, Figure 2-73, p. 209, Appendix 1-G, pp. 550-569.
[56] Eastern San Joaquin 2022 GSP, Section 1.3, pp. 81-92.
[57] Eastern San Joaquin 2022 GSP, Appendix 1-I, pp. 588-944 and Appendix 1-J, pp. 946-992.
[58] 23 CCR § 354.12 *et seq*.
[59] 23 CCR § 354.12 *et seq*.

characteristics, and processes that govern groundwater occurrence within a basin, and represents a GSA'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.[60]

The hydrogeologic conceptual model presented in the GSP describes the physical components of the Subbasin and provides a general understanding for how the components relate to the groundwater system and the interaction between surface water and groundwater. The GSP provides maps and descriptions of surficial features including topography, major surface water features, watersheds, soil types, depositional environments, and recharge and discharge areas.[61] The GSP indicates that the Subbasin does not rely on imported surface water and that water for the Subbasin is supplied by either groundwater or local surface water.[62] The GSP describes the regional and local geologic setting, with supporting figures such as a block diagram, geologic map, and five geologic cross-sections. Geologic formations underlying the Subbasin are also identified and described.[63]

The GSP describes that the Subbasin is part of the larger San Joaquin Valley groundwater basin and the lateral boundaries of the Subbasin generally consist of the crystalline bedrock of the Sierra Nevada foothills to the east, Dry Creek to the north, the Mokelumne River to the northwest, the San Joaquin River to the west, and the Stanislaus River to the south.[64] The bottom of the Subbasin is defined as the base of freshwater, which represents the approximate maximum extent of non-saline freshwater beneath the Subbasin. The base of freshwater in the Subbasin varies from approximately 650 to 2,000 feet below ground surface.[65] The GSP identifies three major structural features in the Subbasin: the Stockton Fault, the Vernalis Fault, and the Stockton Arch. The GSP does not indicate whether these structures have any effect on the flow of groundwater; however, based on when they are estimated to have occurred, it appears that the freshwater bearing units were generally deposited during later time periods.[66]

The GSP identifies one principal aquifer that provides groundwater for domestic, agricultural, and municipal supply.[67] The GSP indicates that there are no regionally extensive aquitards in the Subbasin, except for a small area in the southwest portion of

[60] Department of Water Resources 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.
[61] Eastern San Joaquin 2022 GSP, Section 2.1.4, pp. 109-123.
[62] Eastern San Joaquin 2022 GSP, Section 2.1.4.4, p. 119.
[63] Eastern San Joaquin 2022 GSP, Section 2.1.2, p. 108, Section 2.1.3, p. 109, Section 2.1.5, pp. 123-130, Section 2.1.7, pp. 134-139.
[64] Eastern San Joaquin 2022 GSP, Section 2.1.8, pp. 141-142.
[65] Eastern San Joaquin 2022 GSP, Section 2.1.8.2, p. 142.
[66] Eastern San Joaquin 2022 GSP, Section 2.1.6, p. 131.
[67] Eastern San Joaquin 2022 GSP, Section 2.1.9, p. 142.

the Subbasin that contains the Corcoran Clay. The GSP describes that, in general, the principal aquifer is comprised of laterally extensive and interbedded layers of high and low permeability deposits, and there is evidence to support a hydraulic connection for the entire vertical extent of the aquifer.[68] While only one principal aquifer was defined, the GSP differentiates between shallow, intermediate, and deep water-bearing zones. The shallow zone is comprised of recent alluvium, the Modesto formation, the Riverbank formation, and the upper unit of the Turlock Lake formation. The intermediate zone is comprised of the lower unit of the Turlock Lake formation and the Laguna formation. The deep zone consists of the Mehrten formation. Depths and thicknesses of the geologic formations (and associated aquifer zones) can be visualized on the provided cross sections. The GSP presents estimates of transmissivity, specific yield or storage coefficient, and vertical permeability for each water-bearing zone.[69]

Regarding data gaps and uncertainties associated with the hydrogeological conceptual model, the GSP identified the following: aquifer characteristics (such as hydraulic conductivity, transmissivity, and storage parameters); depth-specific groundwater level data; shallow groundwater level data near surface waters and NCCAGs; groundwater level data in the east and northwest areas of the Subbasin; groundwater level data near major creeks, rivers, and subbasin boundaries to evaluate subsurface flow and groundwater-surface water interaction; depth-specific groundwater quality data, the effect of the Stockton Fault on base of freshwater; and characterization of soil conditions related to recharge.[70] While these data gaps related to the hydrogeologic conceptual model are identified, the GSP provides little details on addressing some of the identified data gaps. The proposed plans to fill data gaps mainly focus on collecting additional groundwater level and groundwater quality data from existing or newly constructed wells during the implementation period and updating or refining the numerical model;[71] however, the GSP does not describe plans for addressing data gaps related to aquifer parameters, soil recharge areas, or the effects of the Stockton Fault on groundwater conditions.

While the GSP does not provide plans to address every data gap identified, overall, 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 Subbasin's physical characteristics, 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.

[68] Eastern San Joaquin 2022 GSP, Section 2.1.9.1.4, p. 146.
[69] Eastern San Joaquin 2022 GSP, Section 2.1.9.1, pp. 142-145.
[70] Eastern San Joaquin 2022 GSP, Section 2.1.10, pp. 159-160.
[71] Eastern San Joaquin 2022 GSP, Section 4.7.5, pp. 330-332.

5.2.2 Groundwater Conditions

The GSP Regulations require a written description of historical and current groundwater conditions for each of the six sustainability indicators and GDEs.[72]

The GSP provides a description of current and historical groundwater level conditions in the Subbasin, and presents supporting documentation in the form of hydrographs, contour maps, and references to historical reports. The GSP describes that, in general, groundwater levels in the Subbasin have shown declining trends throughout much of their period of record. The GSP presents a figure that displays ten hydrographs with at least 40 years of historical data located throughout the Subbasin.[73] Based on the figure, groundwater levels across the Subbasin have generally displayed steady groundwater level declines, with major fluctuations (increases and decreases) generally corresponding to prolonged or extreme wet or dry periods, such as the 1982 to 1984 wet and above normal water years or early 1990s drought period. The GSP describes that, based on information from historical reports, the Subbasin historically had a westerly groundwater flow direction that parallels topography; however, groundwater elevation maps from the 1950s and 1960s displayed a groundwater depression near the City of Stockton that resulted in groundwater flowing east toward the City of Stockton from the Delta.[74] The GSP presents groundwater elevation contour maps based on first quarter 2017 and fourth quarter 2017 data to display current groundwater conditions.[75] Based on these figures, there is currently a large groundwater depression in the middle of the Subbasin, east of the City of Stockton. The GSP notes that this depression is "most significant to achieving sustainability in the Subbasin" (as compared to the groundwater depression in the north originating in the adjacent Consumnes Subbasin). Due to this central groundwater depression, current groundwater flow conditions are generally from the outer edges of the Subbasin towards the center.[76]

Groundwater storage conditions in the Subbasin were estimated using the Eastern San Joaquin Water Resources Model (ESJWRM), which is a numerical model for the Eastern San Joaquin Subbasin based on the Department's Integrated Water Flow Model (IWFM).[77] The GSP describes that historical changes in groundwater storage were estimated from 1996 to 2015, with a total cumulative change in storage of -0.91 million acre-feet (MAF) during that time period, and an average annual change in storage of -0.05 MAF. Current (2015) fresh (non-saline) groundwater in storage for the Subbasin is estimated to be 53.0 MAF.[78]

[72] 23 CCR § 354.16 (a-f).
[73] Eastern San Joaquin 2022 GSP, Figure 2-34, p. 163.
[74] Eastern San Joaquin 2022 GSP, Section 2.2.1.1, pp. 166-167.
[75] Eastern San Joaquin 2022 GSP, Figure 2-37, p. 168 and Figure 2-38, p. 169.
[76] Eastern San Joaquin 2022 GSP, Section 2.2.1.2, p. 167.
[77] Eastern San Joaquin 2022 GSP, Section 2.2.2, p. 180 and Section 2.3.1, p. 215.
[78] Eastern San Joaquin 2022 GSP, Section 2.2.2, p. 180.

Regarding seawater intrusion, the GSP states that "the Eastern San Joaquin Subbasin is not in a coastal area and seawater intrusion is not present."[79] The GSP acknowledges that under natural conditions brackish tidal water from San Francisco Bay could be brought into the Delta; however, the GSP describes that man-made infrastructure, including the construction of levees and the development of the State Water Project and Central Valley Project, has altered the inward movement of seawater and current management practices aim to maintain freshwater flows in the Delta. While the GSP does not consider seawater intrusion a current concern, salinity is identified as a potential groundwater quality issue and is discussed in the GSP's description of groundwater quality conditions.[80]

The GSP describes that groundwater quality in the Subbasin is generally sufficient for beneficial uses. The GSP identifies salinity, nitrate, arsenic, and point-source pollutants as the main constituents of concern in the Subbasin.[81] Current and historical groundwater quality conditions are evaluated using data from the Groundwater Ambient Monitoring and Assessment (GAMA) Program. Data from the GAMA Program was used to create maps displaying maximum contaminant level (MCL) and SMCL exceedances for salinity, nitrate, and arsenic, grouped by decade. GAMA data was also summarized into tables for each constituent. The GSP uses chloride and total dissolved solids (TDS) data to evaluate salinity in the Subbasin. In general, chloride and TDS exceedances, above their 250 milligram per liter (mg/L) and 500 mg/L SMCLs, respectively, have occurred mainly along the western margin of the Subbasin both historically and in more recent times.[82] Based on data presented in the GSP, the percentage of nitrate and arsenic concentrations detected above their 10 mg/L and 10 microgram per liter MCLs, respectively, has generally increased over time.[83] The GSP does not present any intra-well time series data, so it is unclear whether the changes in the percentage of MCL or SMCL exceedances for salinity, nitrate, or arsenic indicate notable changes in groundwater quality, or whether increased sampling frequency and sampling locations are only identifying areas where groundwater quality exceedances have already been occurring. The GSP describes the presence of various point source pollutants and contaminant plumes in the Subbasin. The GSP notes that these constituents and active sites are generally regulated by the Central Valley Regional Water Quality Control Board (RWQCB), the Department of Toxic Substances Control (DTSC), and the United States Environmental Protection Agency (USEPA).[84] While historical GAMA data for groundwater quality is available and utilized by the GSP, much of the available data lacks well construction information and the GSP identifies depth-discrete groundwater quality data as a data gap.

[79] Eastern San Joaquin 2022 GSP, Section 2.2.3, p. 182.
[80] Eastern San Joaquin 2022 GSP, Section 2.2.3, p. 182.
[81] Eastern San Joaquin 2022 GSP, Section 2.2.4, p. 182.
[82] Eastern San Joaquin 2022 GSP, Section 2.2.4.1, pp. 182-192.
[83] Eastern San Joaquin 2022 GSP, Section 2.2.4.2, pp. 193-195 and Section 2.2.4.3, pp. 196-198.
[84] Eastern San Joaquin 2022 GSP, Section 2.2.4.4, pp. 199-203.

The GSP presents a minimal discussion on historical and current land subsidence, stating that "there are no historical records of significant and unreasonable impacts from land subsidence in the Eastern San Joaquin Subbasin."[85] In the evaluation of current subsidence, the GSP presents a figure displaying the subsidence data from the Department's InSAR dataset, which displays no areas of land subsidence in the Subbasin between spring 2015 and summer 2017.[86]

The GSP identifies depletions of interconnected surface water in the Subbasin as a data gap. Due to the lack of available data, historical and current depletions of interconnected surface water were evaluated using the historical calibration scenario of the ESJWRM. The GSP describes that the ESJWRM was used to compare monthly groundwater levels to streambed elevations to determine where streams are interconnected.[87] The GSP presents two figures summarizing the model result. Figure 2-71 displays where streams are estimated to be interconnected at least 75 percent of the time or interconnected less than 25 percent of the time.[88] Figure 2-72 displays where streams were generally considered to be gaining (groundwater discharging to stream greater than 75 percent of the time), losing (surface water seeping into groundwater system more than 75 percent of the time), or mixed (gaining or losing less than 75 percent of the time).[89] The GSP does not describe the historical or current volume, rate, or timing of depletions; however, the historical, current, and projected water budgets presented in the GSP provide estimated average annual volumes of depletions (stream seepage) for the major rivers and streams in the Subbasin.[90]

The GSP describes the process used to identify GDEs in the Subbasin and provides multiple figures displaying the locations of GDEs or potential GDEs. The GSP describes that the NCCAG dataset was used as the starting point to identify GDEs. This dataset was then filtered based on groundwater levels and proximity to surface waters. NCCAGs in areas with groundwater levels greater than 30 feet below ground surface were not considered GDEs, as groundwater levels of that depth are considered too deep to be accessed by the vegetation. NCCAGs in close proximity to alternate water sources (including managed wetlands, irrigated agriculture, and perennial surface water bodies) were not considered GDEs, as these communities potentially rely on the alternate water sources rather than groundwater. The GSP notes that, while these NCCAG areas are not considered GDEs initially, additional investigation and ground-truthing of these areas is needed, thus, they have been classified as areas "data gap areas needing future refinement" and could potentially be included as GDEs in the future.[91] Figure 2-74

[85] Eastern San Joaquin 2022 GSP, Section 2.2.5, p. 203.
[86] Eastern San Joaquin 2022 GSP, Figure 2-70, p. 204.
[87] Eastern San Joaquin 2022 GSP, Section 2.2.6, p. 204.
[88] Eastern San Joaquin 2022 GSP, Figure 2-71, p. 206.
[89] Eastern San Joaquin 2022 GSP, Figure 2-72, p. 207.
[90] Eastern San Joaquin 2022 GSP, Table 2-13, p. 226.
[91] Eastern San Joaquin 2022 GSP, Section 2.2.7, pp. 208-211.

displays these GDE data gap areas, and Figure 2-75 displays areas presently considered to be GDEs.[92]

Overall, the Plan sufficiently describes the historical and current groundwater conditions throughout the Subbasin, and the information included in the Plan substantially complies with the requirements outlined in the GSP Regulations.

5.2.3 Water Budget

GSP Regulations require a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored, as applicable.[93]

The water budgets and sustainable yield estimate presented in the GSP were developed using the ESJWRM, a numerical surface water-groundwater model based on the Department's IWFM framework.[94] The GSP presents historical, current, and projected water budgets, and also a water budget for projected conditions under climate change. The historical water budget represents a 20-year period from 1996 to 2015 based on the best available historical data. The current water budget represents the current level of development (based on 2015 urban development footprint), agricultural water demand (based on 2014 cropping patterns), urban water demand (based on 2015 population), and water supply sources (based on average water supply sources from 2012 to 2015) over a 50-year hydrologic period (based on data from 1969 to 2018). The projected water budget is based on the projected changes in population, land use, and water use (not considering projects proposed by the GSP) over a 50-year hydrologic period.[95] The GSP describes the assumptions used for these water budgets and presents the water budget estimates in various tables and charts.[96]

In response to the incomplete determination,[97] the revised GSP provided updated water budget estimates (based on the revised ESJWRM Version 2.0 update) that extended the historical calibration scenario to 25 years, representing the time period from 1996 to 2020, and the projected conditions scenarios to 52 years.[98] Additionally, the revised GSP included an analysis on the effects of implementing 11 "Category A" projects, with and without climate change, on groundwater conditions in the Subbasin and included updated water budget estimates.[99] Based on the water budgets presented in the GSP, the Subbasin is projected to use less groundwater compared to the current groundwater demand, mainly due to the projected expansion of urban land development reducing the

[92] Eastern San Joaquin 2022 GSP, Figure 2-74, p. 212 and Figure 2-75, p. 214.
[93] 23 CCR § 354.18 *et seq*.
[94] Eastern San Joaquin 2022 GSP, Section 2.3.1, p. 215.
[95] Eastern San Joaquin 2022 GSP, Table 2-12, p. 218.
[96] Eastern San Joaquin 2022 GSP, Section 2.3.4, pp. 218-223, Section 2.3.5, pp. 223-248.
[97] https://sgma.water.ca.gov/portal/service/gspdocument/download/7777.
[98] Eastern San Joaquin 2022 GSP, Table 2-16, p. 232, Table 2-17, p. 234, Table 2-18, p. 236.
[99] Eastern San Joaquin 2022 GSP, Appendix 2-B, pp. 1390-1562.

amount of irrigated agriculture.[100] Additionally, the implementation of Category A projects is projected to result in an average annual surplus of groundwater in storage when climate change is not considered; however, with climate change considered an overdraft of 15,700 acre-feet per year is still expected even with the implementation of Category A projects.[101] Selected water budget components are summarized in Table 1 below.

Table 1. Selected Water Budget Estimates[102]

Modeling Scenario	Historical	Current	Projected	Projected with Climate Change	Projected with Category A Projects	Projected with Category A Projects and Climate Change
Model Version	ESJWRM V2	ESJWRM V1	ESJWRM V2	ESJWRM V2	ESJWRM V2	ESJWRM V2
Hydrologic Period	1996-2020	1969-2018	1969-2020	1969-2020	1969-2020	1969-2020
Groundwater Pumping, AFY	709,000	851,000	751,000	833,000	712,900	794,100
Change in GW Storage, AFY	-37,000	-48,000	-16,000	-38,000	5,300	-15,700

The sustainable yield for the Subbasin was estimated using the ESJWRM under conditions describes as the “Sustainable Conditions Scenario.” This modeling scenario was based on the projected conditions scenario and was developed by adjusting (reducing) groundwater pumping across the model domain until the 50-year annual average change in groundwater storage was close to or equal to zero.[103] Based on this modeling scenario, the sustainable yield for the Subbasin was estimated to be 715,000 ± 10 percent. The GSP indicates that climate change was not considered in the sustainable yield estimate. Additionally, the GSP notes that while the projected conditions scenario indicates an overdraft of only 34,000 acre-feet per year (based on the ESJWRM Version 1.0), to reach the sustainable yield approximately 78,000 acre-feet per year of additional recharge or reduced groundwater pumping would be needed.[104] Based on the information presented in the GSP, it is unclear if the sustainable yield and the estimated 78,000 acre-feet per year offset are based on the updated modeling from the ESJWRM Version 1.0 or the updated ESJWRM Version 2.0.

The GSP presents various modeling results to estimate the water budgets and sustainable yield for the Subbasin (multiple scenarios from both ESJWRM Version 1.0 and ESJWRM Version 2.0). Department staff recommend that in the first periodic evaluation of the GSP, only water budgets developed from the most recent or best available data be included. As currently presented, it is unclear whether the sustainable yield estimate and estimated groundwater offset required to achieve sustainability are based on the updated modeling results (based on ESJWRM Version 2.0) or are from the

[100] Eastern San Joaquin 2022 GSP, Section 2.3.5.3, p. 245.
[101] Eastern San Joaquin 2022 GSP, Section 2.3.7.6.2, p. 276, Section 2.3.7.7.2, pp. 280-281.
[102] Eastern San Joaquin 2022 GSP, Section 2.3.5, pp. 223-237, Section 2.3.7.6.2, p. 276, Section 2.3.7.7.2, pp. 280-281.
[103] Eastern San Joaquin 2022 GSP, Section 2.3.6, pp. 248-249.
[104] Eastern San Joaquin 2022 GSP, Section 2.3.6, p. 249.

modeling scenarios presented in the original GSP submitted in 2020 (based on ESJWRM Version 1.0) (see Recommended Corrective Action 3).

Aside from the additional clarification requested in Recommended Corrective Action 3, 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 of the Subbasin and projected future water demands.

5.2.4 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.[105]

The GSP does not designate any management areas in the Subbasin.

5.3 Sustainable Management Criteria

The 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.[106]

5.3.1 Sustainability Goal

The GSP describes that the sustainability goal for the Subbasin is "to maintain an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin by operating the Subbasin within its sustainable yield or by modification of existing management to address future conditions."[107] The GSP states that sustainability will be achieved through the implementation of both supply and demand type projects. While the GSP acknowledges that groundwater levels may continue to decline throughout GSP implementation, the GSP also states that the Subbasin will be managed to avoid undesirable results during the implementation period.[108]

[105] 23 CCR § 354.20.
[106] 23 CCR § 354.22 *et seq*.
[107] Eastern San Joaquin 2022 GSP, Section 3.1, p. 287.
[108] Eastern San Joaquin 2022 GSP, Section 3.1, p. 287.

5.3.2 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.[109] 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[110] – 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.

The following subsections include details about three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives for each sustainability indicator. GSAs are 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.[111]

5.3.2.1 Chronic Lowering of Groundwater Levels

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.[112]

The GSP describes that an undesirable result for the chronic lowering of groundwater levels in the Eastern San Joaquin Subbasin is experienced “if sustained groundwater levels are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP.” The GSP also lists potential undesirable results identified by stakeholders as significant and unreasonable:

- Number of wells going dry
- Reduction in the pumping capacity of existing wells
- Increase in pumping costs due to greater lift
- Need for deeper well installations or lowering of pumps

[109] 23 CCR § 351(ah).
[110] Water Code § 10721(x).
[111] 23 CCR § 354.26(d).
[112] 23 CCR § 354.28(c)(1).

- Adverse impacts to environmental uses and users, including interconnected surface waters and GDEs[113]

The GSP describes a quantitative identification of undesirable results for the chronic lowering of groundwater levels as occurring when "at least 25 percent of representative monitoring wells used to monitor groundwater levels (5 of 20 wells in the Subbasin) fall below their minimum level thresholds for two consecutive years."[114] These conditions were described by the GSP as being sufficient to identify a Subbasin-wide pattern of undesirable results, rather than either geographically-localized conditions or temporally isolated events.[115]

Minimum thresholds for the chronic lowering of groundwater levels were established for 20 representative monitoring wells.[116] The GSP describes the process for developing minimum thresholds, which included reviewing historic groundwater levels and existing groundwater-related planning documents, an analysis of nearby domestic or municipal supply well depths, and obtaining input from GSAs, the ESJGWA Advisory Committee, the ESJGWA Workgroup, and other stakeholders. To develop the minimum thresholds, the fall 1992 groundwater levels were first selected, as this period was identified in existing planning documents as a time of historic lows. The fall 1992 groundwater levels were then compared to both fall 2015 and fall 2016 groundwater levels to see whether groundwater levels declined even further during more recent drought periods. The GSAs then confirmed, either anecdotally or through an evaluation of available data, that no undesirable results occurred when groundwater levels were at their historic low values (whichever was deeper of the fall 1992 or fall 2015-2016 periods). Using these historic low groundwater levels as a starting point, a buffer was then added which would allow the groundwater levels to drop below historic low values while allowing operational flexibility. The buffer was developed by calculating the historic range of groundwater level fluctuations for each representative well (the historic high minus the historic low) and subtracting this value from the historic low. These calculated values (the historic low minus the buffer) were presented as the initial minimum threshold values.[117]

The GSP describes that the protection of existing water supply wells was considered a priority when developing the minimum thresholds, so the initial minimum threshold values were then compared to the 10th percentile of domestic well depth for domestic wells (with well construction information in the OSWCR database) within a 3-mile radius of each representative monitoring well.[118] For areas reliant on municipal supply wells, the 10th percentile of municipal supply well depth was used for the analysis. For each representative monitoring well, if the initial minimum threshold value (historic low minus buffer) was shallower than the 10th percentile well depth value, it was considered

[113] Eastern San Joaquin 2022 GSP, Section 3.3.1.1.1, pp. 289-290.
[114] Eastern San Joaquin 2022 GSP, Section 3.3.1.1.2, p. 290.
[115] Eastern San Joaquin 2022 GSP, Section 3.3.1.1.2, p. 290.
[116] Eastern San Joaquin 2022 GSP, Table 3-1, p. 296.
[117] Eastern San Joaquin 2022 GSP, Section 3.3.1.2, pp. 291-293.
[118] Eastern San Joaquin 2022 GSP, Section 3.3.1.2, p. 292.

sufficiently protective of nearby supply wells (domestic or municipal). If the initial minimum threshold value was deeper than the 10th percentile well depth value, then the 10th percentile well depth value was used for the minimum threshold. Overall, the GSP estimates that this analysis should be protective of approximately 90 percent of domestic or municipal wells in the Subbasin.[119] The GSP presents a summary table of the data used for the minimum threshold analysis, which indicates that the final minimum thresholds selected for the 20 representative monitoring wells range from 22.5 to 242.7 feet below ground surface, and the potential groundwater level declines below historic lows range from 7.3 to 54.4 feet.[120] The GSP describes that the final minimum threshold values, even though they allow for groundwater levels declines below historic lows, were considered to be sufficiently protective of undesirable results by the individual GSAs; however, the GSP notes that undesirable results related to GDEs is considered a data gap.[121] Additionally, the GSP describes that an adaptive management approach will be utilized, and if the established minimum thresholds result in impacts to groundwater users during implementation, minimum threshold may be revised, or additional projects or management actions may be implemented.[122]

The GSP defines the measurable objectives for the Subbasin as the deeper value of the fall 1992, fall 2015, or fall 2016 groundwater levels for each representative monitoring well. The GSP describes that these values were selected to allow for operational flexibility and active management of the Subbasin during dry periods without reaching minimum threshold values.[123] The GSP indicates that GSAs identified no undesirable results when historic groundwater levels were at these measurable objective values.[124] Interim milestones presented in the GSP represent stepwise trends from the current conditions (defined as fall 2015 groundwater levels) to the measurable objective, designated in five-year intervals from 2030 to 2040. The GSP indicates that the interim milestones remain the same as current conditions for the first 10 years of GSP implementation. In general, measurable objectives allow for declining groundwater levels compared to current conditions; however, because the current conditions are represented by fall 2015 data and some measurable objectives are also based on fall 2015 data, some representative monitoring wells are already at their measurable objective and, thus, have a goal of keeping groundwater levels at those locations stable through the implementation period. The GSP presents a summary table with current conditions, measurable objectives, and interim milestones for each representative monitoring well.[125]

Department staff conclude that the sustainable management criteria for the chronic lowering of groundwater levels are commensurate with the understanding of current conditions and reasonably protective of the groundwater uses and users in the Subbasin.

[119] Eastern San Joaquin 2022 GSP, Section 3.3.1.2, p. 293.
[120] Eastern San Joaquin 2022 GSP, Appendix 3-A, p. 1564.
[121] Eastern San Joaquin 2022 GSP, Section 3.3.1.1.4, p. 291 and Section 3.3.1.2, p. 292.
[122] Eastern San Joaquin 2022 GSP, Section 3.3.1.2, pp. 293-294.
[123] Eastern San Joaquin 2022 GSP, Section 3.3.1.3, p. 297.
[124] Eastern San Joaquin 2022 GSP, Section 3.3.1.2, p. 292.
[125] Eastern San Joaquin 2022 GSP, Table 3-3, p. 298.

While groundwater levels may continue to decline during implementation, the Plan provides a credible and sufficient assessment of the impacts the minimum thresholds would have on domestic and municipal supply wells by evaluating the 10th percentile well depths and comparing that to the initial minimum threshold values (based on the historic lows with a buffer) to establish the minimum thresholds at individual representative monitoring points which, if not exceeded, are protective of approximately 90-percent of domestic or municipal wells in the Subbasin. However, as highlighted in the recommended corrective actions described in the review of Deficiency 1, the GSP should include some additional supporting technical details that provide further description potential impacts related to the defined minimum thresholds.

5.3.2.2 Reduction of Groundwater Storage

The GSP Regulations require the minimum threshold for the reduction of groundwater storage to be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.[126]

The GSP describes that an undesirable result for the reduction of groundwater storage occurs when "sustained groundwater storage volumes are insufficient to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP."[127] The GSP describes how the Subbasin contains approximately 53 MAF of fresh groundwater in the aquifer, and historically there have been no undesirable results related to the reduction of groundwater storage. The GSP estimates a total volume of 23 MAF which, if depleted, would result in undesirable results for the Subbasin. This volume was estimated based on the depths of existing well infrastructure and potential future depths to which pumping would reasonably occur.[128] The GSP indicates that a reduction of groundwater in storage of this magnitude is highly unlikely during the implementation period, as modeling results only estimate a -0.91 MAF cumulative change in storage from 1996 to 2015.[129] While it may be unlikely to reduce groundwater in storage by 23 MAF before projects are implemented and sustainability is achieved, Department staff believe this estimate to be misleading, as there would likely be significant and unreasonable impacts prior to reaching a depletion of 23 MAF. For example, the GSP appears to be implying that a reduction of less than 23 MAF (e.g., 22 MAF) would not result in significant and unreasonable impacts to shallow groundwater users. While it is understandable that groundwater level sustainable management criteria will likely prevent reductions of groundwater in storage of this magnitude, Department staff feel that the estimate provided by the GSP is unreasonable and misleading regarding impacts to beneficial uses and users and should be revised. Department staff recommend the GSP provide a revised

[126] 23 CCR § 354.28(c)(2).
[127] Eastern San Joaquin 2022 GSP, Section 3.3.2.1.1, p. 299.
[128] Eastern San Joaquin 2022 GSP, Section 3.3.2.1.2, p. 299.
[129] Eastern San Joaquin 2022 GSP, Section 2.2.2, p. 180.

estimate for the reduction of groundwater storage volume that is considered an undesirable result. Alternatively, the GSP could highlight how the maximum reduction of groundwater storage related to the chronic lowering of groundwater level minimum thresholds would not result in significant and unreasonable impacts related to groundwater storage and omit the 23 MAF estimate (see Recommended Corrective Action 4).

The GSP proposes to use sustainable management criteria developed for the chronic lowering of groundwater levels as a proxy for reductions of groundwater storage. These criteria include the same minimum thresholds, measurable objectives, interim milestones, and representative monitoring network as described above for groundwater levels. The GSP indicates that if groundwater levels are maintained at the minimum threshold values across the Subbasin, the resulting reduction of groundwater in storage is estimated to be 1.2 MAF, which would not be considered an undesirable result.[130] Overall, Department staff conclude that the use of groundwater levels as a proxy for the reduction of groundwater storage to be appropriate, as the potential impacts related to reductions of groundwater storage are similar to those described for the chronic lowering of groundwater levels. Additionally, the GSP indicated that no undesirable results related to the reduction of groundwater in storage have occurred historically, thus, once sustainability is achieved and groundwater levels are maintained near measurable objective levels (which are generally based on historic lows), there should be no associated undesirable results.

5.3.2.3 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.[131]

The GSP describes that an undesirable result related to seawater intrusion is experienced "if sustained groundwater salinity levels caused by seawater intrusion and due to groundwater management practices are too high to satisfy beneficial uses within the basin over the planning and implementation horizon of this GSP."[132] The GSP describes that the Subbasin is not in a coastal area and seawater intrusion is not currently present because Delta management practices have limited the inward movement of seawater to maintain freshwater flows in the Delta.[133] The GSP states that undesirable results related to seawater intrusion are not expected to occur in the future; however, the GSP acknowledges that because the Subbasin is adjacent to the Delta, changes in Delta management practices or sea level rise due to climate change could potentially result in seawater intrusion in the future.

[130] Eastern San Joaquin 2022 GSP, Section 3.3.2.2, pp. 299-300.
[131] 23 CCR § 354.28(c)(3).
[132] Eastern San Joaquin 2022 GSP, Section 3.3.4.1.1, p. 306.
[133] Eastern San Joaquin 2022 GSP, Section 2.2.3, p. 182.

The GSP defines sustainable management criteria for seawater intrusion with the use of a pre-defined chloride isocontour line.[134] This line is described as "a demarcation of where the ESJGWA would consider seawater intrusion an undesirable result."[135] The minimum threshold for seawater intrusion is defined as this isocontour line at a chloride concentration value of 2,000 mg/L. The GSP identifies an undesirable result related to seawater intrusion as occurring when a 2,000 mg/L chloride isocontour line created using current data from the groundwater quality monitoring network crosses this pre-defined isocontour line. The measurable objective for seawater intrusion is defined using a 500 mg/L isocontour line demarked using the same isocontour line as the minimum threshold. The GSP indicates that interim milestones will follow a linear trend in five-year increments between the current conditions and the measurable objectives; however, the Plan provides no estimates of current conditions, so it is unclear whether measurable objectives proposed to allow for further degradation of groundwater quality or propose to improve groundwater quality over the implementation period.

Based on the figure, the pre-defined isocontour line is located in the western portion of the Subbasin and bisects the cities of Stockton and Manteca. The Plan does not provide a description for how the 2,000 mg/L threshold value would prevent significant and unreasonable impacts to groundwater users. Considering that the "recommended" SMCL for chloride is 250 mg/L and the SMCL "upper limit" is 500 mg/L, a chloride concentration of almost 2,000 mg/L (yet staying below the minimum threshold) would appear to be a significant degradation of groundwater quality that is not discussed by the Plan, particularly because the western portion of the Subbasin where seawater intrusion could potentially occur contains the Subbasin's larger cities where a larger portion of population may depend on groundwater for potable uses.

While Department staff believe the methodology and use of a chloride isocontour line to define sustainable management criteria to be reasonable and agree that seawater intrusion into the Subbasin may be unlikely in the near term, the Plan does not provide sufficient explanation describing how impacts to beneficial uses and users were considered when selecting the 2,000 mg/L minimum threshold. Department staff recommend the GSP provide additional explanation for how the 2,000 mg/L chloride isocontour line will prevent significant and unreasonable impacts to beneficial uses and users of groundwater. Even though seawater intrusion may be unlikely in the Subbasin, the currently defined minimum thresholds could allow for groundwater beneath the cities of Stockton and Manteca to approach chloride concentrations of almost 2,000 mg/L. If the GSAs consider this to be insignificant, considering the upper limit SMCL for chloride is 1,000 mg/L, the justification should be described and disclosed in the Plan. Additionally, the Plan should provide the current chloride conditions and interim milestones for seawater intrusion. As currently presented, the Plan does not describe these values and Department staff cannot determine whether the proposed measurable objective based on

[134] Eastern San Joaquin 2022 GSP, Figure 3-4, p. 307.
[135] Eastern San Joaquin 2022 GSP, Section 3.3.4.2, p. 307.

the 500 mg/L chloride isocontour line result in groundwater quality degradation or improvement over the implementation period (see Recommended Corrective Action 5).

5.3.2.4 Degraded Water Quality

The GSP Regulations require the minimum threshold for degraded water quality to be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.[136]

The GSP describes that an undesirable result for degraded groundwater quality "is experienced if SGMA-related groundwater management activities cause significant and unreasonable impacts to the long-term viability of domestic, agricultural, municipal, environmental, or other beneficial uses over the planning and implementation horizon of this GSP."[137] The GSP identifies salinity, arsenic, nitrate, and various point source contaminants as the main constituents of concern in the Subbasin; however, sustainable management criteria are only defined for salinity (through the measurement of total dissolved solids concentrations).[138] The GSP describes that nitrate, arsenic, and point source contaminants are generally regulated through other programs and agencies, such as the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) and the Irrigated Lands Regulatory Program (ILRP), and other programs through the RWQCB, DTSC, and USEPA.[139] Additionally, the GSP describes how currently there is no known causal nexus between nitrate or arsenic and groundwater management activities.[140] Even though no sustainable management criteria were established for some constituents of concern, the GSP describes that data from other programs will be evaluated in conjunction with groundwater level data to determine whether groundwater management activities or SGMA-related projects result in impacts relating to these constituents.[141] The GSP also commits to collecting arsenic and nitrate data from the Subbasin's groundwater quality network to evaluate trends and potentially establish sustainable management criteria for these constituents in the future, if warranted.[142]

The GSP defines sustainable management criteria for degraded water quality using TDS as an indicator of salinity. An undesirable result is defined as when more than 25 percent of representative groundwater quality monitoring wells (at least 3 of 10) exceed the minimum threshold for two consecutive years and where these concentrations are the

[136] 23 CCR § 354.28(c)(4).
[137] Eastern San Joaquin 2022 GSP, Section 3.3.3.1.1, p. 300.
[138] Eastern San Joaquin 2022 GSP, Section 2.2.4, p. 182.
[139] Eastern San Joaquin 2022 GSP, Section 3.3.3.1.1, p. 301.
[140] Eastern San Joaquin 2022 GSP, Section 2.2.4.2, p. 193 and Section 2.2.4.3, p. 196.
[141] Eastern San Joaquin 2022 GSP, Appendix 3-E, p. 1623.
[142] Eastern San Joaquin 2022 GSP, Section 3.3.3.4, p. 305.

result of groundwater management activities. The GSP indicates that changes to groundwater quality will be evaluated on an annual basis to determine whether groundwater management has contributed to groundwater quality degradation.[143] The GSP describes the potential causes of undesirable results and the possible effects on beneficial users and land use if undesirable results were to occur.[144]

The GSP defines the minimum threshold for TDS as a concentration of 1,000 mg/L for all groundwater quality representative monitoring wells. The GSP describes that the minimum threshold was developed with stakeholder input and based on concerns for both drinking water and agricultural users. The GSP states that the minimum threshold is equal to the State Water Resources Control Board Division of Drinking Water's (DDW) SMCL "upper limit" for TDS, which is a value defined for aesthetic reasons, rather than public health concerns. Additionally, the Plan describes that the major crops grown in the Subbasin can generally tolerate TDS ranges from 900 mg/L to 4,000 mg/L, thus, the 1,000 mg/L minimum threshold values is considered protective of the majority of Subbasin crops.[145]

Measurable objectives for degraded groundwater quality are defined as 600 mg/L TDS concentrations for all groundwater quality representative monitoring wells. The GSP describes that, while the DDW's SMCL "recommended limit" is defined as 500 mg/L, this value is based on aesthetic concerns and 600 mg/L is generally considered adequate for both drinking water and agricultural purposes. The Plan provides a table displaying current conditions for the representative monitoring wells (based on the average TDS concentrations for data available in recent years) compared to measurable objectives and interim milestones. The current conditions range from 280 mg/L to 510 mg/L TDS, indicating that the measurable objective allows for declining groundwater quality throughout the implementation period. The Interim milestones are defined based on a linear trend from the current conditions to the measurable objectives.

Department staff conclude that the proposed sustainable management criteria appear reasonable, even though the measurable objectives generally allow for a decline in groundwater quality compared to current conditions. While the GSP only sets sustainable management criteria for TDS, the commitment to monitoring for arsenic and nitrate and the proposed groundwater quality evaluation, coordination, data management, and reporting processes outlined by the Plan[146] and discussed previously in the review of Deficiency 1 appear to be sufficient to identify groundwater quality degradation that may occur in the future and can be adaptively managed by the GSAs.

5.3.2.5 Land Subsidence

SGMA defines the undesirable result for subsidence to be significant and unreasonable land subsidence that substantially interferes with surface land uses, caused by

[143] Eastern San Joaquin 2022 GSP, Section 3.3.3.1.2, p. 301.
[144] Eastern San Joaquin 2022 GSP, Section 3.3.3.1.3, p. 301 and Section 3.3.3.1.4, p. 302.
[145] Eastern San Joaquin 2022 GSP, Section 3.3.3.2, p. 302.
[146] Eastern San Joaquin 2022 GSP, Section 3.3.3.2, p. 304.

groundwater conditions occurring throughout the basin.[147] 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.[148] Minimum thresholds for subsidence shall be supported by the 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 threshold and measurable objectives.[149]

The GSP states that an undesirable result for land subsidence "is experienced if the occurrence of land subsidence substantially interferes with beneficial uses of groundwater and infrastructure within the Subbasin over the planning and implementation horizon of this GSP."[150] The GSP identifies general types of critical infrastructure in the Subbasin as:

- Major highways, roadways, and bridges
- Canals, pipelines, and levees
- Electrical transmission lines
- Schools
- Fire stations
- Hospitals and other medical facilities
- Law enforcement facilities (police stations, jails, correctional facilities)
- Water and wastewater treatment, distribution, and storage facilities
- Communication facilities[151]

While general infrastructure types are identified by the Plan, specific locations of infrastructure and the rate and extent of subsidence that would potentially cause impacts to the different infrastructure types was not described. The GSP indicates that specific infrastructure was not identified due to "the sensitive nature of the critical infrastructure."[152] The GSP indicates that the San Joaquin County Office of Emergency Services was consulted to determine the total subsidence the critical infrastructure can tolerate. From these discussions, the GSP only describes that the critical infrastructure can tolerate "a significant amount of uniform settlement due to subsidence across the Subbasin, though the total amount of settlement that can be tolerated is dependent on the design of the specific infrastructure."[153]

[147] Water Code § 10721(x)(5).
[148] 23 CCR § 354.28(c)(5).
[149] 23 CCR §§ 354.28(c)(5)(A-B).
[150] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.1, p. 308.
[151] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.1, p. 308.
[152] Eastern San Joaquin 2022 GSP, Appendix 3-F, p. 1631.
[153] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.1, p. 309.

The GSP does not provide a quantifiable metric that would identify undesirable results related to land subsidence. The GSP only states that "[a]n undesirable result occurs when subsidence substantially interferes with beneficial uses of groundwater and surface land uses." Additionally, the GSP states that undesirable results related to land subsidence will be identified using data collected from the (groundwater level) representative monitoring network, data collected by individual GSAs, and additional available data such as continuous GPS, InSAR, and data from UNAVCO's Plate Boundary Observatory Program.[154] While the potential for land subsidence in the Subbasin may be low based on the absence of historical land subsidence, GSP Regulations require that undesirable results be defined using a quantitative combination minimum threshold exceedances (see Recommended Corrective Action 2).

The representative groundwater level monitoring network and associated minimum thresholds are used as a proxy to define minimum thresholds for land subsidence. These minimum thresholds, based on the historic low water levels plus a buffer or the 10th percentile domestic/municipal well depth, allow for groundwater levels to drop below historic lows by approximately 7 to 54 feet, depending on well location. The GSP describes that these groundwater levels are considered protective of impacts caused by land subsidence because if the minimum thresholds are not exceeded, the additional declines in groundwater levels below historic lows are limited to geologic units that have historically not been prone to subsidence.[155] While Department staff believe this argument understandable, the GSP does not provide an analysis that takes into consideration potential minimum threshold exceedances, which could be allowed in the representative monitoring wells based on the proposed metrics used to identify an undesirable result for the chronic lowering of groundwater levels (i.e., an undesirable result is defined as minimum threshold exceedances in 5 of 20 monitoring wells for two consecutive years).

In addition to the use of groundwater levels as a proxy for land subsidence minimum thresholds, measurable objectives and interim milestones for groundwater levels are used as a proxy to define those same metrics for land subsidence.[156] Measurable objectives are based on the historic low groundwater levels and interim milestones are defined as a linear trend from the current conditions to the measurable objectives. Based on these values, if groundwater levels were maintained at the measurable objectives (i.e., historic lows), the potential for land subsidence would, in theory, be minimal.

The GSP states that the use of groundwater levels as a proxy is necessary "given the relative lack of direct monitoring for land subsidence in the Subbasin." The GSP also describes how additional land subsidence monitoring data (such as CGPS and InSAR data) will be evaluated in conjunction with groundwater levels to further evaluate the

[154] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.2, p. 309.
[155] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.2, p. 310.
[156] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.2, p. 310.

correlation.[157] In general, Department staff conclude these statements are contradictory, and it is unclear as to why the GSP does not establish sustainable management criteria for land subsidence using the available InSAR dataset that provides direct monitoring for land subsidence Subbasin-wide (see Recommended Corrective Action 2).

Even though the GSP proposes to use groundwater levels as a proxy for land subsidence minimum thresholds, the Plan also defines a "trigger value" of 0.25 feet of annual subsidence (from direct land subsidence monitoring data sources) that will initiate an analysis to determine whether subsidence is related to groundwater management activities. Based on results of this analysis, additional projects or management actions could be implemented.[158] Department staff conclude the commitment to evaluating direct subsidence monitoring data to be a step in the right direction; however, the GSP provides no details on the proposed "analysis" that will be conducted.

Based on the information presented in the GSP, Department staff agree that the potential for land subsidence in the Subbasin is generally lower than neighboring Subbasins that contain regionally extensive thick units of compressible clays, such as the Corcoran Clay. However, GSP Regulations require that minimum thresholds be defined by a rate and extent of land subsidence that could substantially interfere with land uses and may lead to undesirable results. While GSP Regulations allow for groundwater levels to be used as a proxy for other sustainability indicators, the GSP fails to provide the necessary supporting evidence sufficient to show how the established minimum thresholds and, particularly, the identification of undesirable results which allow minimum thresholds to be exceeded, will prevent significant and unreasonable impacts caused by land subsidence.

5.3.2.6 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.[159] 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.[160] The GSP Regulations further require that minimum thresholds be set based on the rate or volume of surface water depletions caused by groundwater use, supported by information including the location, quantity, and timing of depletions, that adversely impact beneficial uses of the surface water and may lead to undesirable results.[161]

The GSP defines an undesirable result related to depletions of interconnected surface water as "depletions that result in flow or levels of major rivers and streams that are

[157] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.2, p. 310.
[158] Eastern San Joaquin 2022 GSP, Section 3.3.5.1.2, p. 310.
[159] Water Code § 10721(x)(6).
[160] 23 CCR § 354.16(f).
[161] 23 CCR § 354.28(c)(6).

hydrologically connected to the basin such that the reduced surface water flow or levels have a significant and unreasonable adverse impact on beneficial uses and users of the surface water within the Subbasin over the planning and implementation horizon of this GSP."[162] The GSP indicates that depletions leading to undesirable results could result in a reduction in the flows in major rivers and streams such that there is insufficient surface water available to support diversions or to meet regulatory environmental flow requirements. The GSP identifies the Calaveras River, Dry Creek, the Mokelumne River, the San Joaquin River, and the Stanislaus River as the major rivers and streams that are potentially interconnected to the groundwater system in the Subbasin. Of these, the GSP indicates that the Mokelumne, Stanislaus, and San Joaquin rivers have defined regulatory flow requirements that are managed through various upstream reservoirs. The GSP notes that smaller creeks and streams in the Subbasin were not considered in the evaluation of depletions of interconnected surface water, as they are "substantially used for the conveyance of irrigation water."[163]

The GSP does not estimate the quantity, location, or timing of depletions that would result in significant and unreasonable impacts to surface water diverters or environmental users. Additionally, the GSP does not quantify what would be considered an undesirable result in terms of depletion. Instead, the GSP proposes to use the already defined groundwater level sustainable management criteria as a proxy for depletions of interconnected surface water (including minimum thresholds, measurable objectives, and interim milestones). Rather than defining groundwater level thresholds that are a proxy for the specific quantity of depletion that could cause undesirable results, the GSP argues that the minimum thresholds developed for chronic lowering of groundwater levels (which were informed by factors including domestic well depths), would protect against stream depletion undesirable results. In other words, the GSP implies that undesirable quantities of stream depletion, whatever that would be, would not occur unless groundwater levels fell below the chronic lowering of groundwater level minimum thresholds and, because that scenario would trigger an undesirable result related to the chronic lowering of groundwater levels, an undesirable result for depletions of interconnected surface water would be preemptively avoided.

In supporting the argument that groundwater level minimum thresholds would prevent undesirable results related to depletions of interconnected surface water, the GSP attempts to quantify the additional depletions that would be associated with groundwater level undesirable results. The GSP appears to quantify these additional depletions solely by comparing depletions estimated in the projected conditions modeling scenario to depletions estimated in the historical conditions modeling scenario (rather than by estimating depletions specifically associated with groundwater levels at minimum threshold values). As described previously, the historical conditions scenario represents the historical water budget and hydrologic conditions for a 20-year period from 1996 to

[162] Eastern San Joaquin 2022 GSP, Section 3.3.6.1.2, p. 311.
[163] Eastern San Joaquin 2022 GSP, Section 3.3.6.1, p. 311.

2015. The projected conditions scenario represents a 50-year period with the projected groundwater and surface water demand based on projected future changes in land use, population, and water supplies. While not many details are presented, the GSP states that the additional depletions occurring in the projected conditions scenario average 50,000 acre-feet per year compared to the historical conditions scenario.[164] The GSP indicates that these additional depletions are approximately one percent of total annual stream outflows and, thus, argues that depletions of this magnitude are not likely to cause impacts. Department staff conclude, generally, that arguments stating a particular effect is small relative to a large annual amount are not compelling. Comparing depletion quantity due to groundwater use in any Subbasin to the total annual surface water outflow from a large watershed will, in most, if not all, cases, show that the depletion quantity is small relative to the total annual outflow. Comparing to the total annual outflow is not, as a long-term solution to groundwater management, the only relevant metric. It ignores potential temporal or seasonal effects, where flows during certain (e.g., drier) times of the year may have a higher potential to be unreasonably or significantly affected by depletions that may appear small at other times or in the aggregate.

While Department staff generally conclude the GSP's discussion of stream depletion sustainable management criteria to be lacking sufficient detail, Department staff at this time do not believe that this issue substantially affects the immediate and near-term implementation of the GSP's management regime or the likelihood of the Subbasin to achieve its sustainability goals within 20 years. Based on the water budgets presented in the GSP and the additional modeling results which estimate the effects of implementing Category A projects (described in Section 5.5 below), the Subbasin's management strategy should result in reduced groundwater use over the GSP implementation period as compared to the current or baseline groundwater demand. Department staff recognize that, in general, when there is an interconnection between the surface water and groundwater systems, a reduction in groundwater use will generally have an associated reduction of streamflow depletions over the long term. Department staff also recognize that depletions of interconnected surface water has been identified as a data gap area by the GSP.

Due to these factors, Department staff do not consider the shortcoming of the current plan to preclude approval. Department staff understand that quantifying depletions of interconnected 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 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. Department staff

[164] Eastern San Joaquin 2022 GSP, Section 3.3.6.2, p. 312.

further advise that at this stage in SGMA implementation GSAs address deficiencies related to interconnected surface water depletion where GSAs are still working to fill data gaps related to interconnected surface water and where these data will be used to inform and establish sustainable management criteria based on timing, volume, and depletion as required by the GSP Regulations (see Recommended Corrective Action 6a).

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

5.4 Monitoring Network

The GSP Regulations describe the monitoring network that must be developed for each basin 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.[165] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[166] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[167] capture seasonal low and high conditions,[168] include required information such as location and well construction, and include maps and tables clearly showing the monitoring site type, location and frequency.[169] Department staff encourage GSAs to collect monitoring data as specified in the GSP, fill data gaps

[165] 23 CCR § 354.32.
[166] 23 CCR § 354.34(b)(2).
[167] 23 CCR § 354.34(b)(3).
[168] 23 CCR § 354.34(c)(1)(B).
[169] 23 CCR §§ 354.34(g-h).

identified in the GSP prior to the first periodic evaluation,[170] update monitoring network information as needed, follow monitoring best management practices,[171] 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. 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 monitoring network for the chronic lowering of groundwater levels includes 127 existing wells that will be measured semi-annually in March and October. The 127 wells are categorized into either the representative monitoring well network with 20 wells that will be used to evaluate compliance with sustainable management criteria, or the broad monitoring network with 107 wells that will be used to collect supplemental data throughout the Subbasin. The GSP includes figures that show the well locations and also tables that summarize well details such as well names, well construction information (if available), and monitoring agencies.[172] The GSP estimates that the spatial density of the combined groundwater level network is 10.6 wells per 100 square miles, and the representative monitoring well network is 1.7 wells per 100 square miles.[173] The GSP identifies data gaps for the groundwater level monitoring network as areas near streams and Subbasin boundaries, near the groundwater depression in the central portion of the Subbasin, and depth-discrete groundwater level data (i.e., a lack of multi-completion monitoring wells).[174] Additionally, data gaps identified for the hydrogeologic conceptual model indicated that there are groundwater level data gaps in the east and northwest portions of the Subbasin, and also for shallow groundwater levels near NCCAGs.[175] The GSP indicates that the plan to address these data gaps includes the construction of 12 new monitoring wells. Two of the new wells will be multi-completion monitoring wells, with one located along the northern boundary near Dry Creek, and the other located in the central portion of the Subbasin. The remaining 10 new wells will be shallow wells near streams, Subbasin boundaries, and the central groundwater depression.[176] Proposed well locations are displayed on a map with the existing monitoring network well locations.[177]

Groundwater storage will be monitored using the groundwater level monitoring network.[178] Because groundwater levels are used as a proxy for groundwater storage sustainable management criteria, Department staff believe that the use of the

[170] 23 CCR § 354.38(d).
[171] Department of Water Resources, 2016, Best Management Practices and Guidance Documents.
[172] Eastern San Joaquin 2022 GSP, Figure 3-2, p. 295, Figure 4-1, p. 319, Table 4-1, p. 316, Appendix 4-A, pp. 1657-1661.
[173] Eastern San Joaquin 2022 GSP, Table 4-3, p. 322.
[174] Eastern San Joaquin 2022 GSP, Section 4.7.1, p. 329.
[175] Eastern San Joaquin 2022 GSP, Section 2.1.10, p. 160.
[176] Eastern San Joaquin 2022 GSP, Section 4.7.5, p. 330.
[177] Eastern San Joaquin 2022 GSP, Figure 4-3, p. 331.
[178] Eastern San Joaquin 2022 GSP, Section 4.2, p. 322.

groundwater level monitoring network to evaluate changing storage conditions is appropriate.

The degraded groundwater quality network consists of 31 wells, all of which are also included as part of the broad groundwater level monitoring network. Wells in the groundwater quality network are divided into a representative monitoring well groundwater quality network with 10 wells and a broad groundwater quality network with the remaining 21 wells. The GSP provides maps showing the locations of wells in the representative monitoring well and broad monitoring networks and summarizes well names and construction information in tables.[179] The GSP states that the density of the combined groundwater quality network is 2.6 wells per 100 square miles and the representative monitoring well network is 0.8 wells per 100 square miles.[180] The GSP describes that the wells in the representative monitoring well and broad networks will be sampled semi-annually for TDS, cations and anions (including nitrate and chloride), arsenic, and various field parameters.[181] Based on the maps, all wells in the representative monitoring well network are located in the western portion of the Subbasin, and the majority of the broad network wells are also located in the western portion of the Subbasin with the exception of two wells located in the northeast. The GSP describes that the representative monitoring well locations were purposefully limited to these western areas where TDS concentrations in groundwater were historically high, or adjacent to these areas to observe potential movement of high TDS groundwater.[182]

The GSP identifies data gaps in the groundwater quality network including the spatial distribution of wells, well construction data to evaluate depth-discrete groundwater quality, the different monitoring frequencies between different agencies or programs, and the monitoring of additional constituents outside of salinity.[183] In general, some of the proposed monitoring efforts already address some of these data gaps, such as the semi-annual monitoring frequency and the monitoring for constituents other than TDS. The GSP also plans to add the 12 new monitoring wells, discussed previously for the groundwater level monitoring network, to the groundwater quality network. Based on the locations of proposed groundwater quality monitoring wells, the spatial distribution of the network should be improved compared to the existing network, but a large groundwater quality monitoring data gap in the central portion of the Subbasin appears to still exist even after the incorporation of the proposed new wells. Department staff believe the proposed groundwater quality network to be insufficient to identify baseline conditions across the Subbasin. Proposed new monitoring wells will fill some of the data gaps in the eastern portion of the Subbasin; however, based on their locations shown on Figure 4-3, there will still be a large groundwater quality data gap in the central portion of the

[179] Eastern San Joaquin 2022 GSP, Figure 3-3, p. 303, Figure 4-1, p. 325, Table 4-5, p. 323, Table 4-6, p. 326.
[180] Eastern San Joaquin 2022 GSP, Table 4-8, p. 328.
[181] Eastern San Joaquin 2022 GSP, Section 4.3, p. 322.
[182] Eastern San Joaquin 2022 GSP, Section 4.3.1, p. 323.
[183] Eastern San Joaquin 2022 GSP, Section 4.7.2, p. 329.

Subbasin where the GSP has identified a large groundwater depression. Additionally, it is unclear why the GSP is relying on the construction of new wells to monitor groundwater quality in the eastern portion of the Subbasin, considering existing groundwater level wells have been identified in these areas, and there is likely many other options to monitor groundwater quality from existing agricultural or domestic wells. Department staff recommend that existing wells be evaluated to be included as part of the groundwater quality monitoring network to fill data gaps in the eastern portion of the Subbasin, until newly proposed monitoring wells are constructed. Additionally, Department staff recommend the final groundwater quality network identify a monitoring location in the central portion of the Subbasin where the existing groundwater depression was identified (see Recommended Corrective Action 7).[184]

The GSP states that the groundwater quality network will be used to evaluate seawater intrusion in the Subbasin through the measurement of chloride concentrations. Seawater intrusion sustainable management criteria is based on a chloride isocontour line that will be developed using data from the groundwater quality network. The GSP is unclear on whether chloride concentrations from both the representative monitoring well and broad groundwater quality networks, or only the representative monitoring well groundwater quality network will be used to develop the isocontour line. Figure 3-4, which displays the chloride isocontour line displays all groundwater quality monitoring wells;[185] however, the GSP states "[t]he seawater intrusion monitoring network uses the same monitoring wells and monitoring strategies as the groundwater quality representative monitoring network. Chloride concentrations will be monitored at the degraded water quality representative monitoring networks wells to develop a chloride isocontour line."[186] Department staff believe that the sole use of the representative monitoring well groundwater quality network (10 wells) is likely insufficient to interpolate the isocontour line as shown, as there do not appear to be enough representative monitoring wells on the western side of the isocontour (see Recommended Corrective Action 8).

As described in the evaluation of Deficiency 2, the GSP proposes to use the representative groundwater level monitoring network as a proxy for land subsidence. The GSP proposes to evaluate other forms of direct land subsidence monitoring data, such as InSAR and CGPS, as available, to identify areas where land subsidence may be occurring and to further evaluate the correlation between land subsidence and groundwater levels. As described in the evaluation of Deficiency 2 and in Recommended Corrective Action 2, Department staff believe that the representative groundwater level monitoring network is insufficient to identify undesirable results from land subsidence, particularly because minimum threshold exceedances are allowed to occur in up to four of 20 representative monitoring wells without being considered an undesirable result.

[184] Eastern San Joaquin 2022 GSP, Figure 4-3, p. 331.
[185] Eastern San Joaquin 2022 GSP, Figure 3-4, p. 307.
[186] Eastern San Joaquin 2022 GSP, Section 4.4, p. 328.

The GSP proposes to use the representative groundwater level monitoring network to monitor for depletions of interconnected surface water. The GSP also indicates that available stream gauge data will be evaluated to identify potential impacts to beneficial uses and users of surface water; however, the GSP does not identify stream gauge locations. The GSP identifies depletions of interconnected surface water as a data gap and acknowledges that there is a lack of shallow groundwater monitoring wells near the Subbasin's major rivers and streams. The GSP indicates that new shallow groundwater monitoring wells near streams will be constructed to fill data gaps.[187] Department staff believe that as the Agencies address Recommended Corrective Action 6, the monitoring network will also be updated as a result of identifying location, quantity, and timing of stream depletion due to ongoing.

While Department staff have some recommended corrective actions regarding the monitoring networks for seawater intrusion, land subsidence, and depletions of interconnected surface water, in general, 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. The GSP provides a good explanation for the conclusion that the monitoring network is supported by the best available information and data and is designed to ensure adequate coverage of sustainability indicators. The Plan also describes existing data gaps and the steps that will be taken to fill data gaps and improve the monitoring network. Department staff consider the information presented in the Plan to satisfy the general requirements of the GSP Regulations regarding monitoring network.

5.5 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.[188]

To achieve the sustainability goal and avoid undesirable results, the GSP proposes projects and management actions in a manner that is consistent and substantially complies with the GSP Regulations.[189]

In general, the GSP describes that the management strategy of the Subbasin is to achieve sustainability through the implementation of projects that either offset groundwater use by supplementing with additional surface water supplies or provide additional recharge to the groundwater basin. The GSP identifies some demand conservation projects;

[187] Eastern San Joaquin 2022 GSP, Section 4.7.3, p. 329.
[188] 23 CCR § 354.44 *et seq*.
[189] 23 CCR § 354.44 *et seq*.

however, they are relatively small in terms of total groundwater offset. The ultimate goal of the projects is to offset the estimated 78,000 acre-feet per year of groundwater recharge or reduced pumping demand needed to reach the sustainable yield estimate.

The GSP presents numerous projects that could be implemented for the Subbasin to reach its sustainable yield estimate. Initially, the GSP presented a list, maps, and descriptions of 23 projects categorized as “Planned”, “Potential”, and “Longer Term or Conceptual”.[190] In response to the incomplete determination, the GSAs presented an updated project list that grouped projects into Category A or Category B projects. The updated list presented 26 total projects with 11 Category A projects – considered to be projects that are likely to be implemented within the next five years and have existing water rights, and 15 Category B projects – considered to be projects that will not be implemented in the next five years, but could be pursued if additional groundwater offset is needed to reach sustainability and the projects appear feasible after additional planning and studies are conducted.[191] In addition to the updated project list, the GSP included updated modeling scenarios that estimate the effects of Category A projects on the projected future water budget. Based on the modeling results, implementing all Category A projects will result in an average annual groundwater storage surplus for the Subbasin of 5,300 acre-feet per year in the projected groundwater budget without climate change.[192] However, with climate change considered, modeling results indicate an average annual groundwater storage deficit of 15,700 acre-feet per year, even with the implementation of all Category A projects.[193] Based on these results, the GSP acknowledges that additional projects of management actions may be needed to reach the sustainable yield estimate.

The GSP indicates that there are currently no plans for groundwater demand management actions; however, the GSP states that GSAs may implement management actions in the future should conditions warrant.[194] The GSP describes existing conservation or demand management actions that have been in place prior to GSP development through various Urban Water Management Plans and Agricultural Water Management Plans in the Subbasin.[195] Additionally, the GSP describes various adaptive management strategies that may be considered if it appears that Subbasin’s proposed projects are not enough on their own for the Subbasin to reach sustainability. These potential adaptive management strategies include groundwater extraction fees, rotational or permanent fallowing of crop lands, conservation programming for demand reduction, and mandatory demand reduction.[196]

[190] Eastern San Joaquin 2022 GSP, Section 6.1, pp. 341-376.
[191] Eastern San Joaquin 2022 GSP, Section 6.5, pp. 380-385.
[192] Eastern San Joaquin 2022 GSP, Section 2.3.7.6.2, p. 276.
[193] Eastern San Joaquin 2022 GSP, Section 2.3.7.7.2, p. 281.
[194] Eastern San Joaquin 2022 GSP, Section 6.3, p. 376.
[195] Eastern San Joaquin 2022 GSP, Section 6.3, pp. 377-378.
[196] Eastern San Joaquin 2022 GSP, Section 6.4, pp. 378-379.

The Plan adequately describes proposed projects and management actions in a manner that is generally consistent and substantially complies with the GSP Regulations.[197] The projects and management actions, which focus largely on projects that offset groundwater use with additional surface water supplies or projects that increase groundwater recharge, are directly related to the sustainable management criteria and present a generally feasible approach to achieving the sustainability goal of the Subbasin.

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

5.6 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."[198] 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.[199]

The Eastern San Joaquin Subbasin has seven adjacent subbasins, the Delta Mendota, Consumnes, East Contra Costa, Modesto, Solano, South American, and Tracy subbasins. All adjacent Subbasins are high and medium priority subbasins, which are currently required to be managed under a GSP.

The Plan does not include a discussion of its potential impacts to the adjacent subbasins; however, the GSP does indicate that various inter-basin coordination meetings have taken place with the Consumnes, Tracy, Modesto, South American, Solano, and East Contra Costa subbasins. Of these subbasins, Eastern San Joaquin is the only critically overdrafted basin, thus, at the time of GSP development, these meetings mainly discussed elements of the Eastern San Joaquin GSP, and efforts to coordinate in the future.[200] While potential impacts to adjacent subbasins are not discussed, the GSP's water budget estimates include subsurface outflows and inflows between adjacent basins.[201] A public comment from the Sacramento County GSA, on behalf of the Consumnes Subbasin, encourages increased coordination for future subsurface flow estimates related to the water budgets, addressing data gaps related to surface water / groundwater interaction along Dry Creek, and potentially re-evaluating the minimum threshold for representative monitoring well 04N07E20H003 to reduce the potential for subsurface flow from the Consumnes to the Eastern San Joaquin Subbasin. No additional comments relating to impacts to adjacent basins were received by the Department.

[197] 23 CCR §§ 354.44 *et seq*.
[198] Water Code § 10733(c).
[199] 23 CCR § 354.28(b)(3).
[200] Eastern San Joaquin 2022 GSP, Section 1.3.5, p. 94.
[201] Eastern San Joaquin 2022 GSP, Section 2.3.5, p. 230.

Based on information available at this time, Department staff have no reason to believe that groundwater management in the Eastern San Joaquin Subbasin will adversely affect groundwater conditions in the adjacent subbasins at this time. Department staff will continue to review periodic evaluations to the Plan to assess whether implementation of the Eastern San Joaquin Subbasin Groundwater Sustainability Plan is potentially impacting adjacent basins.

5.7 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.[202]

Since the original GSP was adopted and submitted in 2020, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, dryer conditions will result in a loss of 10 percent 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 explore how the proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the basin based on current and future drought conditions. The Department encourages GSAs to also explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought. Lastly, the Department encourages GSAs to 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[203] to evaluate how the Agency's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

[202] 23 CCR § 354.18.
[203] Water Code § 10609.50.

6 STAFF RECOMMENDATION

Department staff believe sufficient action has been taken by the GSAs to the deficiencies identified. Department staff recommend **APPROVAL** of the 2022 Plan with the recommended corrective actions listed below. The Plan conforms with Water Code Sections 10727.2 and 10727.4 of SGMA and substantially complies with the GSP Regulations. Implementation of the Plan will likely achieve the sustainability goal for the Eastern San Joaquin Subbasin. The GSAs have identified several areas for improvement of its Plan and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have identified recommended corrective actions that should be considered by the GSAs for the first periodic evaluation of its GSP. Addressing these recommended corrective actions will be important to demonstrate that implementation of the Plan is likely to achieve the sustainability goal. The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

The GSP does not provide a sufficient evaluation of the potential impacts to various beneficial uses and users of groundwater related to the chronic lowering of groundwater level minimum thresholds and criteria used to identify undesirable results. The following items should be addressed:

1a. Department staff recommend the Agencies explain the selection of 25 percent of exceedances as considered undesirable, including details describing the groundwater conditions and how those conditions constitute a significant and unreasonable effect of beneficial uses and users.

Department staff also recommend that the updated modeling results be used to quantify and disclose the potential impacts to groundwater well users during projected conditions where minimum thresholds are exceeded but undesirable results do not occur. In addition to impacts to domestic and municipal wells, this evaluation should include impacts to smaller water systems reliant on groundwater wells. Department staff also recommend that the GSAs review the Department's April 2023 guidance document titled Considerations for Identifying and Addressing Drinking Water Well Impacts guidance to assist its adaptive management efforts.

1b. Department staff recommend the GSP include a more thorough evaluation of the impacts to environmental uses and users related to the groundwater level minimum thresholds, or, at minimum, describe a plan to perform this evaluation in the future when additional data become available.

1c. The GSP should evaluate the minimum thresholds in relation to the depths of nearby public water systems and state small water systems reliant on groundwater wells. While it may be reasonable to assume that wells in these systems are generally deeper than domestic wells, which were part of the minimum threshold

analysis, Department staff recommend that an evaluation of these smaller water systems be disclosed by the GSP.

1d. Department staff recommend the Agencies develop a more detailed plan describing how the assessment of groundwater quality in relation to declining groundwater levels will be conducted, including identifying specific analyses, well locations (either wells already monitored as part of GSP implementation or wells monitored by other programs), sampling frequency, and data gaps.

RECOMMENDED CORRECTIVE ACTION 2

Until a correlation between groundwater levels and land subsidence is established, the GSP should use direct subsidence monitoring data, such as InSAR or CGPS, to define sustainable management criteria (minimum thresholds and undesirable results). In general, the Agencies describe that land subsidence has never been a problem in the Subbasin and imply that land subsidence should not be a problem in the future. If this is accurate, setting land subsidence minimum thresholds using direct monitoring data should not trigger undesirable results and would also be the easiest pathway to developing sustainable management criteria for land subsidence, since a correlation between groundwater levels and land subsidence would no longer need to be established.

Department staff recommend Agencies clearly describe how potential subsidence associated with groundwater level declines below minimum thresholds would not have the potential to cause significant and unreasonable impacts and undesirable results to related to subsidence and the use of InSAR data for the land subsidence monitoring network, with supplemental groundwater level data being utilized to evaluate whether detected land subsidence is the result of declining groundwater levels. The use of InSAR data is also recommended for use in establishing a rate and extent in defining significant and unreasonable impacts considered not to cause undesirable results to the Subbasin.

RECOMMENDED CORRECTIVE ACTION 3

Department staff recommend that in the first periodic evaluation of the GSP, only water budgets developed from the most recent or best available data be included. As currently presented, it is unclear whether the sustainable yield estimate and estimated groundwater offset required to achieve sustainability are based on the updated modeling results (based on ESJWRM Version 2.0) or are from the modeling scenarios presented in the original GSP submitted in 2020 (based on ESJWRM Version 1.0).

RECOMMENDED CORRECTIVE ACTION 4

Department staff recommend the GSP provide a revised estimate for the reduction of groundwater storage volume that is considered an undesirable result. Alternatively, the GSP could highlight how the maximum reduction of groundwater storage related to the

chronic lowering of groundwater level minimum thresholds would not result in significant and unreasonable impacts related to groundwater storage and omit the 23 MAF estimate.

RECOMMENDED CORRECTIVE ACTION 5

Department staff recommend the GSP provide additional explanation for how the 2,000 mg/L chloride isocontour line will prevent significant and unreasonable impacts to beneficial uses and users of groundwater. Additionally, the Plan should provide the current chloride conditions and interim milestones for seawater intrusion.

RECOMMENDED CORRECTIVE ACTION 6

Department staff understand that estimating the location, quantity, and timing of stream depletion due to ongoing, Subbasin-wide pumping is a complex task and that developing suitable tools may take additional time; however, it is critical for the Department's ongoing and future evaluations of whether GSP implementation is on track to achieve sustainable groundwater management. The Department plans to provide guidance on methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water and support for establishing specific sustainable management criteria in the near future. This guidance is intended to assist GSAs to sustainably manage depletions of interconnected surface water.

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

a. Work to establish undesirable results, minimum thresholds, and measurable objectives consistent with the GSP Regulations. Measurable objectives are to use the same metric used for minimum thresholds, including quantifying the location, quantity, and timing of depletions of interconnected surface water due to groundwater extraction. Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department.

b. Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing. The monitoring network should be updated to reflect any corresponding changes and approaches.

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

RECOMMENDED CORRECTIVE ACTION 7

Department staff recommend that existing wells be evaluated to be included as part of the groundwater quality monitoring network to fill data gaps in the eastern portion of the

Subbasin, until newly proposed monitoring wells are constructed. Additionally, Department staff recommend the final groundwater quality network identify a monitoring location in the central portion of the Subbasin where the existing groundwater depression was identified.

RECOMMENDED CORRECTIVE ACTION 8

The GSP currently states that only groundwater quality wells from the representative monitoring network will be utilized to create the chloride isocontour line that will be used to evaluate seawater intrusion sustainable management criteria. As currently depicted, very few representative monitoring wells are on the western side of the isocontour line. Department staff recommend that development of the chloride isocontour line utilize all groundwater quality wells in the western portion of the Subbasin, as appropriate considering well construction information.