





**STATE OF CALIFORNIA  
DEPARTMENT OF WATER RESOURCES**

**STATEMENT OF FINDINGS REGARDING THE  
DETERMINATION OF INCOMPLETE STATUS OF THE  
SAN JOAQUIN VALLEY – KERN COUNTY SUBBASIN  
GROUNDWATER SUSTAINABILITY PLANS**

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA), is likely to achieve the sustainability goal for the basin covered by the GSP, and whether the GSP 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 GSP within two years of its submission. (Water Code § 10733.4.)

SGMA allows for multiple GSPs implemented by multiple groundwater sustainability agencies (GSAs) and coordinated pursuant to a single coordination agreement that covers the entire basin to be an acceptable planning scenario. (Water Code § 10727.) In the San Joaquin Valley – Kern County Subbasin (Subbasin), five separate GSPs were prepared by 11 GSAs pursuant to the required coordination agreement. This Statement of Findings explains the Department’s decision regarding the multiple GSPs covering the Subbasin submitted jointly by the multiple GSAs. Collectively, the five GSPs and the coordination agreement are referred to as the Plan for the Subbasin. Individually, the GSPs include the following:

- *Kern Groundwater Authority Groundwater Sustainability Plan (KGA GSP) – prepared by the Kern Groundwater Authority (KGA) GSA, Semitropic Water Storage District (SWSD) GSA, Cawelo Water District (CWD) GSA, City of McFarland GSA, Pioneer GSA, and West Kern Water District (WKWD) GSA.*
  - *Divided into 15 management areas, 22 sub-management areas.*
- *Kern River Groundwater Sustainability Plan (Kern River GSP) – prepared by the Kern River GS and Greenfield County Water District GSA.*
  - *Divided into three management areas, 11 sub-management areas.*
- *Buena Vista Water Storage District GSA Groundwater Sustainability Plan (BV GSP) – prepared by the Buena Vista Water Storage District (BV) GSA.*
  - *Divided into two management areas.*
- *Olcese Groundwater Sustainability Agency Groundwater Sustainability Plan (Olcese GSP) – prepared by the Olcese Water District (OWD) GSA.*

## Statement of Findings

San Joaquin Valley – Kern County Subbasin (Basin No. 5-022.14)

- *Henry Miller Water District Groundwater Sustainability Plan* (Henry Miller GSP) – prepared by the Henry Miller Water District (HMWD) GSA.

Department management has reviewed the enclosed Staff Report, which recommends that the deficiencies identified should preclude approval of the Plan. Based on its review of the Staff Report, Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Plan and concurs with, and hereby adopts, staff's recommendation and all the corrective actions provided. The Department thus deems the Plan incomplete based on the Staff Report and the findings contained herein.

- A. The GSPs do not establish undesirable results that are consistent for the entire Subbasin.
  1. While the Coordination Agreement presents Subbasin-wide undesirable results, the Subbasin's fragmented approach towards establishing management criteria that define undesirable conditions in various parts of the Subbasin does not satisfy SGMA's requirement to use same data and methodologies.
- B. The Subbasin's chronic lowering of groundwater levels sustainable management criteria do not satisfy the requirements of SGMA and the GSP Regulations.
  1. The GSPs relied on disparate methods to develop groundwater level minimum thresholds across the numerous GSPs and management areas.
  2. The GSPs do not consistently and sufficiently document the effects of their selected minimum thresholds on beneficial uses and users in the Subbasin, nor explain how the minimum thresholds and measurable objectives that are set below historical lows will impact other applicable sustainability indicators, specifically water quality, land subsidence, and reduction of groundwater storage.
- C. The Subbasin's land subsidence sustainable management criteria do not satisfy the requirements of SGMA and the GSP Regulations.
  1. The Plan lacks a Subbasin-wide, coordinated approach to establishing land subsidence sustainable management criteria.
  2. The GSPs and management areas that use their minimum thresholds for the chronic lowering of groundwater levels as proxy criteria for subsidence do not sufficiently demonstrate that groundwater levels (specifically groundwater levels below historical lows) are a reasonable proxy to avoid land subsidence that would substantially interfere with surface land uses.

Statement of Findings

San Joaquin Valley – Kern County Subbasin (Basin No. 5-022.14)

Based on the above, the Plan submitted by the GSAs in the San Joaquin Valley – Kern County Subbasin is determined to be incomplete because the Plan does not satisfy the requirements of SGMA, nor does it substantially comply with the GSP Regulations. The corrective actions provided in the enclosed Staff Report are intended to address the deficiencies that, at this time, preclude the Plan's approval. The GSAs have up to 180 days to address the deficiencies outlined above and detailed in the Staff Report. Once the GSAs resubmit their respective GSPs and the required coordination agreement, the Department will review the revised Plan to evaluate whether the deficiencies were sufficiently addressed. Should the GSAs fail to take sufficient actions to correct the deficiencies identified by the Department, the Department shall disapprove the Plan if, after consultation with the State Water Resources Control Board, the Department determines the Plan to be inadequate pursuant to 23 CCR § 355.2(e)(3)(C).

Signed:



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Karla Nemeth, Director

Date: January 28, 2022

Enclosure: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Kern County Subbasin

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

Groundwater Basin Name: San Joaquin Valley Basin – Kern County Subbasin (No. 5-022.14)  
Number of GSPs: 5 (see list below)  
Number of GSAs: 11 (see list below)  
Point of Contact: Patricia Poire, Kern Groundwater Authority  
Recommendation: Incomplete  
Date: January 28, 2022

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The Sustainable Groundwater Management Act (SGMA)<sup>1</sup> allows for any of the three following planning scenarios: a single groundwater sustainability plan (GSP) developed and implemented by a single groundwater sustainability agency (GSA); a single GSP developed and implemented by multiple GSAs; and multiple GSPs implemented by multiple GSAs and coordinated pursuant to a single coordination agreement.<sup>2</sup> GSAs developing GSPs are expected to comply with SGMA and substantially comply with the Department of Water Resources’ (Department) GSP Regulations.<sup>3</sup> The Department is required to evaluate an adopted GSP within two years of its submittal date and issue a written assessment.<sup>4</sup>

In the Kern County Subbasin (Subbasin), multiple GSAs developed multiple GSPs for the entire Subbasin, which are coordinated pursuant to a required coordination agreement.<sup>5</sup> In total, five GSPs were prepared and will be implemented by 11 GSAs. The GSPs include 20 management areas and possibly 33 sub-management areas within the larger management areas.<sup>6</sup> The five GSPs include:

- *Kern Groundwater Authority Groundwater Sustainability Plan (KGA GSP)* – prepared by the Kern Groundwater Authority (KGA) GSA, Semitropic Water Storage District (SWSD) GSA, Cawelo Water District (CWD) GSA, City of McFarland GSA, Pioneer GSA, and West Kern Water District (WKWD) GSA.
  - Divided into 15 management areas, 22 sub-management areas.

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<sup>1</sup> Water Code § 10720 *et seq.*

<sup>2</sup> Water Code § 10727.

<sup>3</sup> 23 CCR § 350 *et seq.*

<sup>4</sup> Water Code § 10733.4(d); 23 CCR § 355.2(e).

<sup>5</sup> Water Code § 10733.4(b).

<sup>6</sup> A Total number of management areas and sub-management areas is not explicitly disclosed for the Plan; Department staff compiled these numbers from the review of all the GSPs.

- *Kern River Groundwater Sustainability Plan* (Kern River GSP) – prepared by the Kern River GS and Greenfield County Water District GSA.
  - Divided into three management areas, 11 sub-management areas.
- *Buena Vista Water Storage District GSA Groundwater Sustainability Plan* (Buena Vista GSP) – prepared by the Buena Vista Water Storage District (Buena Vista) GSA.
  - Divided into two management areas.
- *Olcese Groundwater Sustainability Agency Groundwater Sustainability Plan* (Olcese GSP) – prepared by the Olcese Water District (OWD) GSA.
- *Henry Miller Water District Groundwater Sustainability Plan* (Henry Miller GSP) – prepared by the Henry Miller Water District (HMWD) GSA.

Collectively, the five GSPs and the coordination agreement will, for evaluation and assessment purposes, be treated and referred to as the Plan for the Subbasin.

Of the five GSPs, the Kern Groundwater Authority (KGA) GSP is by far the largest in terms of both area covered and agencies involved. The KGA is made up of 16 member agencies legally bound by a joint powers agreement (JPA) which recognizes KGA as “assuming responsibility for development of a comprehensive GSP for an area which includes agricultural lands, urban and industrial development as well as oil fields.”<sup>7</sup> Of the 16 KGA member agencies, six agencies are GSAs through the process outlined in SGMA.<sup>8</sup> It is, therefore, Department staff’s understanding that KGA acts as the sole GSA for 10 member agencies and acts as the GSA for the purposes of developing a GSP for the remaining six member agencies that are also established GSAs. It is also Department staff’s understanding that, through the JPA, the KGA GSA operates as a facilitation and administrative entity only, leaving the authorities of SGMA implementation to the individual member agencies, some of which, as noted above, are GSAs and some of which are not.<sup>9</sup> The KGA GSP defined 15 management areas, each with its own management area plan (MAP); seven of those management areas are divided further into additional management areas, creating sub-management areas within the KGA GSA boundary.<sup>10</sup> Thus, the KGA GSP acts as an “umbrella plan” for the management area plans prepared by individual member agencies engaged in the JPA.

Table 1 summarizes the GSAs and agencies associated with management areas for the Subbasin.

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<sup>7</sup> KGA GSP, Section 1.1, p. 21; Appendix A, pp. 263-299.

<sup>8</sup> Water Code § 10723 *et seq.*

<sup>9</sup> KGA GSP, p. 31-32; KGA GSP, p. 266, 269-270, 278.

<sup>10</sup> KGA GSP, p. 183-184.

**Table 1. Summary of Kern County Subbasin GSPs, GSAs, and Management Areas**

GSP/GSAs	Management Areas (# of Sub-Management Areas)
<b>Kern Groundwater Authority GSP</b>	
1. Cawelo GSA 2. Kern Groundwater Authority GSA 3. McFarland GSA 4. Pioneer GSA 5. Semitropic Water Storage District (WSD) GSA 6. West Kern Water District (WD) GSA	1. Arvin-Edison WSD 2. Cawelo WD 3. Eastside Water Management Area 4. Kern Water Bank 5. Kern-Tulare WD (2) 6. North Kern WSD & Shafter-Wasco Irrigation District (3) 7. Kern County Water Agency – Pioneer 8. Rosedale-Rio Bravo WSD (2/5)* 9. Semitropic WSD (3) 10. Shafter-Wasco Irrigation District – 7th Standard Rd. 11. Southern San Joaquin Municipal Utility District (2) 12. Tejon WD (2) 13. West Kern WD (4/5)** 14. Westside District Authority 15. Wheeler Ridge-Maricopa WSD
<b>Kern River GSP</b>	
1. Greenfield County WD GSA 2. Kern River GSA	1. Agricultural (5) 2. Banking (3) 3. Urban (3)
<b>Buena Vista GSP</b>	
1. Buena Vista WSD GSA	1. Buttonwillow 2. Maples <sup>+</sup>
<b>Henry Miller GSP</b>	
1. Henry Miller WD GSA	N/A
<b>Olcese GSP</b>	
1. Olcese GSA	N/A

\* Rosedale-Rio Bravo WSD identifies four separate “Monitoring Zones” with sustainable management criteria. There are no sustainable management criteria associated with the areas identified as management areas.

\*\* West Kern WD MA-5 is not included in the KGA Umbrella Plan but is included in the West Kern WD management area plan.

Department staff have thoroughly evaluated the Plan, the Subbasin’s coordination agreement, and other information provided or available and known to staff and have identified deficiencies in the Plan that staff recommends should preclude its approval.<sup>11</sup> In addition, consistent with the GSP Regulations, Department staff have provided corrective actions that the GSAs should review while determining how and whether to

<sup>11</sup> 23 CCR §355.2(e)(2).



address the deficiencies in a coordinated manner.<sup>12</sup> The deficiencies and corrective actions are explained in greater detail in Section 3 of this staff report and are generally related to the need to further coordinate amongst the GSAs and to define sustainable management criteria in the manner that is consistent with SGMA and the GSP Regulations.

This assessment includes four sections:

- **Section 1 – Evaluation Criteria**: Describes the legislative requirements and the Department’s evaluation criteria.
- **Section 2 – Required Conditions**: Describes the submission requirements, Plan completeness, and basin coverage required for a Plan to be evaluated by the Department.
- **Section 3 – Plan Evaluation**: Provides a detailed assessment of identified deficiencies in the Plan. Consistent with the GSP Regulations, Department staff have provided corrective actions for the GSAs to address the deficiencies.
- **Section 4 – Staff Recommendation**: Provides staff’s recommendation regarding the Department’s determination.

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<sup>12</sup> 23 CCR §355.2(e)(2)(B).

# 1 EVALUATION CRITERIA

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The Department evaluates whether a Plan conforms to certain statutory requirements of SGMA<sup>13</sup> and is likely to achieve the basin’s sustainability goal.<sup>14</sup> To achieve the sustainability goal, 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.<sup>15</sup> Undesirable results are required to be defined quantitatively by the GSAs overlying a basin and occur when significant and unreasonable effects for any of the applicable sustainability indicators are caused by groundwater conditions occurring throughout the basin.<sup>16</sup> The Department is also required to evaluate whether the Plan will adversely affect the ability of an adjacent basin to implement its groundwater sustainability program or achieve its sustainability goal.<sup>17</sup>

For a Plan to be evaluated by the Department, it must first be determined that it was submitted by the statutory deadline<sup>18</sup> and that it is complete and covers the entire basin.<sup>19</sup> Additionally, for those GSAs choosing to develop multiple GSPs, the Plan submission must include a coordination agreement.<sup>20</sup> The coordination agreement must explain how the multiple GSPs in the basin have been developed and implemented utilizing the same data and methodologies and that the elements of the multiple GSPs are based upon consistent interpretations of the basin’s setting. If these required conditions are satisfied, the Department evaluates the Plan to determine whether it complies with SGMA and substantially complies with the GSP Regulations.<sup>21</sup> As stated in the GSP Regulations, “[s]ubstantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plan, and the Department determines that any discrepancy would not materially affect the ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plan to attain that goal.”<sup>22</sup>

When evaluating whether the Plan is likely to achieve the sustainability goal for the basin, Department staff review the information provided for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.<sup>23</sup> The Department’s review considers whether there is a reasonable relationship between the

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<sup>13</sup> Water Code §§ 10727.2, 10727.4, 10727.6.

<sup>14</sup> Water Code § 10733(a).

<sup>15</sup> Water Code § 10721(v).

<sup>16</sup> 23 CCR § 354.26.

<sup>17</sup> Water Code § 10733(c).

<sup>18</sup> 23 CCR § 355.4(a)(1).

<sup>19</sup> 23 CCR §§ 355.4(a)(2), 355.4(a)(3).

<sup>20</sup> 23 CCR § 357.4.

<sup>21</sup> 23 CCR § 350 *et seq.*

<sup>22</sup> 23 CCR § 355.4(b).

<sup>23</sup> 23 CCR § 351(h).

information provided by the GSAs and the assumptions and conclusions presented in the Plan, including whether the interests of the beneficial uses and users of groundwater in the basin have been considered; whether sustainable management criteria and projects and management actions described in the Plan are commensurate with the level of understanding of the basin setting; and whether those projects and management actions are feasible and likely to prevent undesirable results.<sup>24</sup> The Department also considers whether the GSAs have the legal authority and financial resources necessary to implement the Plan.<sup>25</sup>

To the extent overdraft is present in a basin, the Department evaluates whether the Plan provides a reasonable assessment of the overdraft and includes reasonable means to mitigate it.<sup>26</sup> When applicable, the Department will assess whether coordination agreements have been adopted by all relevant parties and satisfy the requirements of SGMA and the GSP Regulations.<sup>27</sup> The Department also considers whether the Plan provides reasonable measures and schedules to eliminate identified data gaps.<sup>28</sup> Lastly, the Department's review considers the comments submitted on the Plan and evaluates whether the GSAs have adequately responded to the comments that raise credible technical or policy issues with the Plan.<sup>29</sup>

The Department is required to evaluate the Plan within two years of its submittal date and issue a written assessment.<sup>30</sup> The assessment is required to include a determination of the Plan's status.<sup>31</sup> The GSP Regulations provide three options for determining the status of a Plan: approved,<sup>32</sup> incomplete,<sup>33</sup> or inadequate.<sup>34</sup>

After review of the Plan, Department staff may conclude that the information provided is not sufficiently detailed, or the analyses not sufficiently thorough and reasonable, to evaluate whether it is likely to achieve the sustainability goal for the basin. If the Department determines the deficiencies precluding approval may be capable of being corrected by the GSAs in a timely manner,<sup>35</sup> the Department will determine the status of the Plan to be incomplete. A formerly deemed incomplete Plan may be resubmitted to the Department for reevaluation after all deficiencies have been addressed and incorporated into the Plan within 180 days after the Department makes its incomplete determination. The Department will review the revised Plan to evaluate whether the identified deficiencies were sufficiently addressed. Depending on the outcome of that evaluation,

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<sup>24</sup> 23 CCR §§ 355.4(b)(1), (3), (4) and (5).

<sup>25</sup> 23 CCR § 355.4(b)(9).

<sup>26</sup> 23 CCR § 355.4(b)(6).

<sup>27</sup> 23 CCR § 355.4(b)(8).

<sup>28</sup> 23 CCR § 355.4(b)(2).

<sup>29</sup> 23 CCR § 355.4(b)(10).

<sup>30</sup> Water Code § 10733.4(d); 23 CCR § 355.2(e).

<sup>31</sup> Water Code § 10733.4(d); 23 CCR § 355.2(e).

<sup>32</sup> 23 CCR § 355.2(e)(1).

<sup>33</sup> 23 CCR § 355.2(e)(2).

<sup>34</sup> 23 CCR § 355.2(e)(3).

<sup>35</sup> 23 CCR § 355.2(e)(2)(B)(i).

the Department may determine the resubmitted Plan is approved. Alternatively, the Department may find a formerly deemed incomplete GSP is inadequate if, after consultation with the State Water Resources Control Board, it determines that the GSAs have not taken sufficient actions to correct any identified deficiencies.<sup>36</sup>

The staff assessment of the Plan involves the review of information presented by the GSAs, including models and assumptions, and an evaluation of that information based on scientific reasonableness. In conducting its assessment, the Department does not recalculate or reevaluate technical information provided in the Plan or perform its own geologic or engineering analysis of that information. The recommendation to approve a Plan 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 Plan, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSAs are supported by adequate, credible evidence, and are scientifically reasonable.

Lastly, the Department's review and assessment of an approved Plan is a continual process. Both SGMA and the GSP Regulations provide the Department with the ongoing authority and duty to review the implementation of the Plan.<sup>37</sup> Also, GSAs have an ongoing duty to reassess their GSPs, provide annual reports to the Department, and, when necessary, update or amend their GSPs.<sup>38</sup> The passage of time or new information may make what is reasonable and feasible at the time of this review to not be so in the future. The emphasis of the Department's periodic reviews will be to assess the GSA's progress toward achieving the basin's sustainability goal and whether implementation of the Plan adversely affects the ability of GSAs in adjacent basins to achieve their sustainability goals.

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<sup>36</sup> 23 CCR § 355.2(e)(3)(C).

<sup>37</sup> Water Code § 10733.8; 23 CCR § 355.6 *et seq.*

<sup>38</sup> Water Code §§ 10728 *et seq.*, 10728.2.

## 2 REQUIRED CONDITIONS

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A GSP, to be evaluated by the Department, must be submitted within the applicable statutory deadline.<sup>39</sup> The GSP must also be complete and must, either on its own or in coordination with other GSPs, cover the entire basin.<sup>40</sup> Additionally, when multiple GSPs are developed in a basin, the submission of all GSPs must include a coordination agreement.<sup>41</sup> The coordination agreement must explain how the multiple GSPs in the basin have been developed and implemented utilizing the same data and methodologies and that the elements of the multiple GSPs are based upon consistent interpretations of the basin's setting. If a Plan is determined to be incomplete, Department staff may require corrective actions that address minor or potentially significant deficiencies identified in the Plan. The GSAs in a basin, whether developing a single GSP covering the basin or multiple GSPs, must sufficiently address those required corrective actions within the time provided, not to exceed 180 days, for the Plan to be reevaluated by the Department and potentially approved.

### 2.1 SUBMISSION DEADLINE

SGMA required basins categorized as high- or medium-priority as of January 1, 2017 and that were subject to critical conditions of overdraft to submit a GSP no later than January 31, 2020.<sup>42</sup>

The Point of Contact representing 11 GSAs submitted the Subbasin's Plan on January 30, 2020, in compliance with the statutory deadline. The Plan consists of five GSPs and the required coordination agreement.

### 2.2 COMPLETENESS

GSP Regulations specify that the Department shall evaluate a Plan if that Plan is complete and includes the information required by SGMA and the GSP Regulations.<sup>43</sup> For those basins choosing to submit multiple GSPs, a coordination agreement is required.

The 11 GSAs submitted five adopted GSPs that cover the Subbasin. Department staff found the GSPs, and the collective Plan, to be complete and include the required information, sufficient to warrant an evaluation by the Department. The Department posted the Subbasin's five GSPs and coordination agreement to its website on February 19, 2020.

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<sup>39</sup> Water Code § 10720.7.

<sup>40</sup> 23 CCR § 355.4(a)(3).

<sup>41</sup> Water Code § 10733.4(b); 23 CCR § 357.4.

<sup>42</sup> Water Code § 10720.7(a)(1).

<sup>43</sup> 23 CCR § 355.4(a)(2).

### **2.3 BASIN COVERAGE**

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.<sup>44</sup> A Plan that intends to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting GSAs.

The Plan intends to manage the entire Kern County Subbasin and the jurisdictional boundaries of the submitting GSAs cover the entire Subbasin.

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<sup>44</sup> Water Code § 10727(b); 23 CCR § 355.4(a)(3).

### 3 PLAN EVALUATION

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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<sup>45</sup> including whether the elements of a GSP were developed in the manner required by the GSP Regulations,<sup>46</sup> whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable,<sup>47</sup> 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.<sup>48</sup>

Department staff have identified deficiencies in the GSPs, the most serious of which preclude staff from recommending approval of the Plan at this time. Department staff believe the GSAs may be able to correct the identified deficiencies within 180 days. Consistent with the GSP Regulations, Department staff are providing corrective actions related to the deficiencies, detailed below, including the general regulatory background, the specific deficiency identified in the Plan, and the specific actions to address the deficiency.

#### GENERAL BACKGROUND

SGMA allows for multiple GSPs to be implemented by multiple GSAs and coordinated pursuant to a single coordination agreement that covers an entire basin.<sup>49</sup> The GSP Regulations and SGMA detail the requirements for a coordination agreement and the elements of the GSPs necessary to be coordinated to achieve the basin’s sustainability goal.<sup>50</sup> The coordination agreement must provide both administrative and technical coordination and consistency between all the GSPs. The collective submittals for the basin are to be based upon consistent interpretations of the basin setting and utilize the same data and methodologies.<sup>51</sup> In the context of utilizing the same data and methodologies, the coordination agreement must provide the following:<sup>52</sup>

- a coordinated water budget for the basin, including groundwater extraction data, surface water supply, total water use, and change in groundwater in storage;
- a sustainable yield for the basin, supported by a description of the undesirable results for the basin, and an explanation of how the minimum thresholds and

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<sup>45</sup> 23 CCR § 355.4.

<sup>46</sup> 23 CCR § 355.4(a)(1).

<sup>47</sup> 23 CCR § 355.4(b)(1).

<sup>48</sup> 23 CCR §§ 355.4(b)(5), 355.4(b)(6).

<sup>49</sup> Water Code § 10727(b)(3).

<sup>50</sup> Water Code §§ 10727.6, 10733.4(b)(2); 23 CCR § 357.4.

<sup>51</sup> 23 CCR § 357.4(a).

<sup>52</sup> Water Code § 10727.6 *et al*; 23 CCR §§ 357.4(b)(3)(B), 357.4(b)(3)(C), 357.4(c).

measurable objectives defined by each GSP relate to those undesirable results, based on information described in the basin setting; and

- an explanation of how the GSPs implemented together satisfy the requirements of SGMA and are in substantial compliance with the GSP Regulations.

The Department is tasked with evaluating whether the GSPs, in coordination with one another, conform with the required regulatory contents and are likely to achieve the sustainability goal for the basin.<sup>53</sup>

With regard to management areas, the GSP Regulations require specific information and rationale, including the reason for creating management areas and how those management areas would operate (i.e., sustainable management criteria, projects and management actions, etc.) without causing undesirable results outside of the management area itself (i.e., cause undesirable results for the Subbasin at large).<sup>54</sup>

## EVALUATION SUMMARY

The Kern Subbasin is the largest and arguably most complicated Subbasin in terms of entities involved and demands placed on the Subbasin. To comply with SGMA and achieve sustainable groundwater management in the Kern Subbasin, a well-explained and coordinated approach is fundamental. Unfortunately, the Plan (i.e., the GSPs implemented together) that was developed for the Subbasin is, for key elements of the Plan, byzantine and fragmented. As such, Department staff have had a difficult time evaluating whether the Plan is likely to achieve the sustainability goal for the Subbasin.

Our general understanding of the Plan's approach is that individual water districts and water management entities in the Subbasin are proposing more than 180 projects and management actions that are intended to address the currently agreed upon overdraft identified in the Todd Groundwater Memorandum.<sup>55</sup> If implemented, the projects and management actions will address the overdraft and, as currently modeled, will keep groundwater levels above the various minimum thresholds set across the Subbasin.

To support the Plan's approach and demonstrate coordination, the GSAs worked together to develop a Subbasin-wide water budget and definitions of undesirable results. The coordinated water budget appears to set the "target" amount of overdraft that needs to be addressed through projects and management actions. The Subbasin undesirable results definitions appear to be an attempt to coordinate the individual GSPs and management areas definitions by determining an undesirable result occurs when a certain percentage of the Subbasin is exceeding the various, GSP and management area specific minimum thresholds. Thus, at a high level, the Plan appears to be coordinated.

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<sup>53</sup> Water Code § 10733(b); 23 CCR § 355.4(b).

<sup>54</sup> 23 CCR § 354.20 *et seq.*

<sup>55</sup> Kern County Subbasin Coordination Agreement, pp. 15-296.



However, in looking closer at the individual GSPs and management area plans, and in many cases sub-management areas, the purported coordination becomes tenuous as the plans put forward individualized water budgets, sustainable yields, undesirable results, and sustainable management criteria that are based on different data and methodologies and are not easily comparable between plans. The primary issue with the byzantine and fragmented approach to the Plan is that Department staff, and other stakeholders including the general public, cannot effectively or clearly understand when and how the groundwater conditions become unreasonable causing undesirable results to occur throughout the Subbasin. In concert with that lack of clarity, the Plan does not provide readily available or comparable data and information to evaluate potential impacts, comprehensively and quantitatively, to Subbasin-wide beneficial uses and users that may occur during the implementation of the various plans.

Department staff understand that if the projects and management actions are being implemented and the water supply augmentation is being realized, there is arguably a coordinated plan to address the initial estimate of overdraft and avoid undesirable results at a Subbasin-wide level. However, the estimated 324,326 acre-feet per year of overdraft,<sup>56</sup> from the Todd Groundwater Memorandum, is a significant amount, and that number may even increase as the water budget data is developed and the numerical model is refined. A pragmatic outlook is that a significant amount of the 324,326 acre-feet per year will not be realized through supply augmentation only. Without the “new” water and without additional demand management, significant overdraft may continue in the Subbasin. With that, Department staff are concerned that the varied and fragmented approaches to establish individual water budgets and sustainable management criteria might allow for groundwater conditions to worsen at a greater rate or extent than otherwise would have occurred with a more coordinated Plan.

For example, there is a possibility that the Subbasin’s groundwater conditions will demonstrate the Subbasin is in overdraft, but the GSP and management area specific water budgets will not clearly show where the overdraft is occurring, thus leaving open the questions of how the overdraft will be addressed and who is responsible for it. In addition, GSPs and management area plans put forward a variety of criteria for when undesirable results are present in the individual plans. For groundwater levels, some GSPs and management areas require that minimum thresholds must be exceeded not just at a certain percentage of wells but also over a course of multiple monitoring times, seasons, or years to cause a localized undesirable result. Thus, while the GSPs often state that the minimum thresholds were coordinated and compared, there appears to be no real analysis or understanding of the effects of the groundwater conditions if the minimum thresholds are exceeded and groundwater levels continue to decline for years before an undesirable result is declared. Moreover, the way the Subbasin-wide undesirable results are structured (30 percent of the Subbasin area or 15 percent of

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<sup>56</sup> Kern County Subbasin Coordination Agreement, p. 344.

adjacent areas experiencing undesirable results),<sup>57</sup> significant depletions of groundwater could occur before an undesirable result is considered to have occurred in the Subbasin.

The concern of the Department staff is that the way the undesirable results and sustainable management criteria are defined and set in the individual plans, and then defined at the Subbasin level, is that there is a real possibility of groundwater conditions being significantly worse than the established minimum thresholds in various portions of the Subbasin before the GSAs determine the Subbasin as a whole has experienced an undesirable result.

The deficiencies and corrective actions below identify issues with the Plan that, in the Department staff's opinion, should preclude approval. They are intended to address, in part, the overarching question of what groundwater conditions actually represent an undesirable result in the Kern Subbasin if the projects and management actions are not implemented or if only partly implemented. However, the key for the Kern Subbasin is for the projects and management actions to be implemented and for the water augmentation and savings to be realized. As such, Department staff considers the implementation of projects and management actions to be absolutely critical to assessing the progress toward sustainable groundwater management in the Kern Subbasin. To the extent projects and management actions are not diligently pursued, are significantly delayed, or are not likely to be implemented, Department staff do not believe the Kern Subbasin GSAs have the luxury of putting off finding another approach and still demonstrate adequate progress toward sustainability.

### **3.1 DEFICIENCY 1. THE GSPs DO NOT ESTABLISH UNDESIRABLE RESULTS THAT ARE CONSISTENT FOR THE ENTIRE SUBBASIN.**

#### **3.1.1 Background**

The GSP Regulations state an undesirable result occurs when “significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.”<sup>58</sup> GSAs are required to describe the process and criteria relied upon to define undesirable results including describing the cause of groundwater conditions occurring throughout the basin that would lead to an undesirable result, the quantitative combination of minimum threshold exceedances that cause significant and unreasonable effects, and the potential effects on beneficial uses and users of groundwater.<sup>59</sup> It is therefore incumbent on the GSAs to sufficiently understand the conditions throughout the entire Subbasin so that the Subbasin's undesirable results represent conditions that are significant and unreasonable. Additionally, the Plans are

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<sup>57</sup> Kern County Subbasin Coordination Agreement, pp. 299-300.

<sup>58</sup> 23 CCR § 354.26(a).

<sup>59</sup> 23 CCR § 354.26(b).

required to explain how the GSAs determined each minimum threshold will avoid Subbasin-wide conditions that would result in undesirable results.<sup>60</sup>

The GSP Regulations also require basins that prepare and implement multiple plans to describe, in the basin's coordination agreement, the undesirable results for the basin and provide "an explanation of how the minimum thresholds and measurable objectives defined by each Plan relate to those undesirable results based on information described in the basin setting."<sup>61</sup> For basins that establish management areas, the GSP Regulations state that management areas may establish "different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin."<sup>62</sup>

### 3.1.2 Deficiency Details

The first component of this deficiency relates to the Plan's lack of an explanation of the specific effects, occurring *throughout the Subbasin*, that, when significant and unreasonable, would be undesirable results. As described below, the Coordination Agreement includes a calculation framework for determining when a certain portion of the Subbasin experiences negative effects, which have been defined in isolation by a multitude of individual management areas. However, this calculation framework is not accompanied by any cogent description of *Subbasin-wide* effects caused by groundwater management that the entire Subbasin is attempting to avoid by implementing the Plan. For chronic lowering of groundwater levels, as an example, the Coordination Agreement's discussion of the Subbasin-wide effects is limited to the statement that it is "the point at which significant and unreasonable impacts over the planning and implementation horizon, as determined by depth/elevation of water, affect the reasonable and beneficial use of, and access to, groundwater by overlying users." The Plan provides no specific information on the Subbasin-wide effects of groundwater lowering related to accessing groundwater by beneficial uses and users. (See Corrective Action 1a.)

Notwithstanding the first component of this deficiency and taking the Subbasin's area-based approach at face value, the second component of this deficiency relates to the individual GSPs' and Management Area Plan's widely varying approaches to define the management-area-specific undesirable results. Again, using groundwater levels as an example, the Coordination Agreement states that an undesirable result occurs "when the minimum threshold for groundwater levels are exceeded in at least three (3) adjacent management areas that represent at least 15% of the Subbasin or greater than 30% of the Subbasin (as measured by each management area). Minimum thresholds shall be set by each of the management areas through their respective management area plans or Groundwater Sustainability Plans."

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<sup>60</sup> 23 CCR § 354.28(b)(2).

<sup>61</sup> 23 CCR § 357.4(b)(3)(C).

<sup>62</sup> 23 CCR § 354.20(a).

It is apparent to Department staff that the Coordination Agreement's use of the term "minimum thresholds" in the definition above does not refer to minimum thresholds as defined in the GSP Regulations. Instead, it refers to some, often byzantine, combination of several minimum threshold exceedances, at times coupled with a temporal constraint. For example, in the KGA GSP Cawelo Water District Management Area, Cawelo decided that its area would only contribute to the Coordination Agreement's 30 or 15 percent of land area undesirable result definition if 30 percent of their representative monitoring wells were below the minimum threshold for three successive spring measurements.<sup>63</sup> In another area, the KGA GSP Rosedale-Rio Bravo Management Area subdivides its management area into five zones and states that its land area would only contribute to the Coordination Agreement's undesirable result definition if, at any time, the average groundwater level in one of two zones exceeds the minimum thresholds or, for the three remaining zones, if the average groundwater level in two of those three were below the minimum threshold.<sup>64</sup>

In some areas, those conditions could be met in near-real time and would fluctuate as groundwater conditions change. Other areas, particularly those with multi-year temporal constraints, could tangibly be experiencing minimum threshold exceedances at a large number of sites for a sustained period without being observed by the Subbasin's management as being undesirable. This complexity is problematic because it allows for situations where groundwater conditions could degrade for potentially sustained periods of time in potentially significant portions of the Subbasin without triggering the Subbasin's definition of an undesirable result. Department staff do not consider this combination of disparate management area definitions a reasonable approach to achieving sustainable management and avoiding undesirable results in the Subbasin without a commitment to documenting and evaluating whether any minimum threshold exceedance, for any amount of time and in any area, is causing effects that could be significant and unreasonable. (See Corrective Action 1b.)

The final component of this deficiency is related to the Plan's incomplete descriptions of the conditions under which an undesirable result would occur, according to the Coordination Agreement's land area calculation framework and the various GSPs and Management Area Plans. By the Subbasin's definition of an undesirable result, as stated above, tracking which management area(s) have been triggered as "undesirable" (note that some GSPs or Management Area Plans refer to these management areas with "undesirable" local conditions as "watch areas" but the terminology used in the plans is inconsistent and should be standardized) is paramount to determining when an undesirable result occurs. However, as shown by the following example, the GSPs do not contain sufficient and consistent information for interested parties to track when the groundwater conditions in the management areas are "undesirable" or become "watch areas".

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<sup>63</sup> KGA GSP, Cawelo WD MAP, p. 169.

<sup>64</sup> KGA GSP, Rosedale-Rio Bravo WSD MAP, p. 69.

The KGA GSP Semitropic management area, KGA GSP Rosedale-Rio Bravo management area, and the Buena Vista GSP Buttonwillow management area are adjacent and represent slightly more than 15 percent of the Subbasin area. Each of these agencies have identified different conditions representing when a localized undesirable result for chronic lowering of groundwater levels occurs, as briefly explained below:

- The KGA GSP Semitropic management area, which is further divided into three management areas,<sup>65</sup> describes “a management area will be considered an undesirable result watch area when 51% of the representative monitoring sites in a management area (i.e., sub-management area) violate their minimum threshold for groundwater levels.”<sup>66</sup>
- The KGA GSP Rosedale-Rio Bravo management area plan establishes minimum thresholds for five monitoring zones and states that if the average water level in a zone exceeds the minimum threshold “it will be considered an undesirable result.”<sup>67</sup> However, the plan further states that if either (1) two or more of the North, Central, or South of the River monitoring zones or (2) any one of either South or East monitoring zones meets the aforementioned criterion of the average level exceeding the minimum threshold then *that* would be considered an undesirable result.<sup>68</sup>
- The Buena Vista GSP defines minimum thresholds for its Buttonwillow Management Area but does not define the combination of minimum threshold exceedances that would cause this management area to become “undesirable”.<sup>69</sup>

As demonstrated by the above example, the Plan, while purporting to be coordinated, presents a disparate range of definitions for what conditions in each area would be “undesirable” and could, therefore, contribute to the Coordination Agreement’s defined undesirable result. Department staff found this to be true for all applicable sustainability indicators. The Plan’s fragmented approach makes tracking Subbasin-wide SGMA implementation and the achievement of sustainability challenging for Department staff, interested parties, and the Subbasin’s beneficial uses and users of groundwater. (See Corrective Action 1c.)

### 3.1.3 Corrective Action 1

- a. The Plan’s Coordination Agreement should be revised to explain how the undesirable results definitions are consistent with the requirements of SGMA and the GSP Regulations, which specify that undesirable results represent effects caused by groundwater conditions occurring throughout the Subbasin.<sup>70</sup> The

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<sup>65</sup> KGA GSP Semitropic WSD MAP, p. 153.

<sup>66</sup> KGA GSP Semitropic WSD MAP, p. 162.

<sup>67</sup> KGA GSP Rosedale-Rio Bravo WSD MAP, p. 69.

<sup>68</sup> KGA GSP Rosedale-Rio Bravo WSD MAP, p. 69.

<sup>69</sup> Buena Vista WSD GSP, pp. 93-94, 126-128.

<sup>70</sup> 23 CCR §354.26(a).

discussion should include descriptions of how the Plans have utilized the same data and methodologies to define the Subbasin-wide undesirable results and how the Plan has considered the interests of beneficial uses and users of groundwater.

- b. Because of the fragmented approach used in the Subbasin that could allow for substantial exceedances of locally defined minimum thresholds over sustained periods of time, the GSAs must commit to comprehensively reporting on the status of minimum threshold exceedances by area in the annual reports and describe how groundwater conditions at or below the minimum thresholds may impact beneficial uses and users prior to the occurrence of a formal undesirable result.
- c. The GSAs must adopt clear and consistent terminology to ensure the various plans are comparable and reviewable by the GSAs, interested parties, and Department staff. This terminology should also adhere to the definitions of various terms in SGMA and the GSP Regulations including the understanding that undesirable results are conditions occurring throughout the Subbasin.<sup>71</sup> The Plan and associated coordination materials must also be revised to clearly document how all of the various undesirable results definitions and methodologies achieve the same common sustainability goal.<sup>72</sup> Department staff recommend the revisions should include, at minimum:
  - A map of the entire Subbasin showing each of the GSP areas, including management areas and the management areas within the management area plans, associated monitoring zones, etc. that have a locally defined “undesirable result” that can contribute to the Subbasin’s undesirable result area-based definitions described in the Coordination Agreement
  - A comprehensive table or another organized form of identifying each of the areas, the land coverage – both absolutely and as a percentage – of each of those listed areas in comparison to the Subbasin in total, and a clear and concise description of the conditions that would cause that area to trigger a localized undesirable result (i.e., a watch area, etc.). These materials should demonstrate that 100 percent of the Subbasin area is being managed under the various GSPs with reasonable definitions for undesirable results.

In addition to the graphical and tabular representation of the definition of the Subbasin-wide undesirable results, and if the GSAs elect to maintain the percentage of land area definition for undesirable results, the GSAs need to provide a comprehensive description of the groundwater conditions that would lead to localized undesirable results in the GSAs and other management areas which ultimately contribute to the 15 percent or 30 percent of land area criteria.

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<sup>71</sup> 23 CCR § 354.26(a).

<sup>72</sup> 23 CCR § 357.4(a).

## **3.2 DEFICIENCY 2. THE PLAN DOES NOT SET MINIMUM THRESHOLDS FOR CHRONIC LOWERING OF GROUNDWATER LEVELS IN A MANNER CONSISTENT WITH THE REQUIREMENTS OF SGMA AND THE GSP REGULATIONS**

### **3.2.1 Background**

The GSP Regulations state the description of minimum thresholds must include the following, among other items:

- Information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The information and criteria relied upon to establish minimum thresholds for chronic lowering of groundwater levels, supported by information from the basin setting, and other data or models as appropriate.<sup>73</sup>
- The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the GSA has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.<sup>74</sup>
- A discussion of the potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring in the Subbasin.<sup>75</sup>

The GSP Regulations also state that minimum thresholds for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results.<sup>76</sup> These quantitative values should be supported by:

- The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin;<sup>77</sup> and
- Potential effects on other sustainability indicators.<sup>78</sup>

Additionally, the Department must consider “whether the assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are reasonable and supported by the best available information and best available science.”<sup>79</sup>

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<sup>73</sup> 23 CCR § 354.28(b)(1).

<sup>74</sup> 23 CCR § 354.28(b)(2).

<sup>75</sup> 23 CCR §§ 354.26(b)(3), 354.28(b)(4).

<sup>76</sup> 23 CCR § 354.28(c)(1).

<sup>77</sup> 23 CCR § 354.28(c)(1)(A).

<sup>78</sup> 23 CCR § 354.28(c)(1)(B).

<sup>79</sup> 23 CCR § 355.4(b)(1).

### 3.2.2 Deficiency Details and Corrective Action 2

As noted above, the GSP Regulations state minimum thresholds for groundwater levels are the site-specific levels that represent a depletion of supply that could cause undesirable results. Department staff have assessed the various minimum thresholds to evaluate whether they are reasonable, supported by best available science, and whether they have reasonably considered the interests of beneficial uses and users of groundwater.

Table 2 presents a brief summary, based on Department staff's review, of the variety of methods used to develop groundwater level minimum thresholds across the numerous GSPs. As documented in Table 2, the approaches used and the level of analysis to support those approaches, is disparate across the various plans. Some take an approach of limiting declines to no worse than were observed during recent 2013-2016 drought. Others allow for additional lowering of groundwater levels but include adequate explanation of the beneficial uses and users in their areas to support why that is a reasonable approach, or they propose to mitigate for impacts (e.g., to domestic well users) that may occur due to the planned lowering. Other plans offer less rigorous approaches, with some simply projecting a future rate of decline based on pre-SGMA rates of decline, with limited to no analysis of the effects of that lowering on beneficial uses and users. Department staff have included corrective actions in Table 2 where the approaches in the individual management areas are deficient. Department staff believe that addressing the following corrective actions will align the minimum thresholds for chronic lowering of groundwater levels with the requirements of SGMA and the GSP Regulations.

The GSPs also do not consistently explain how the lowering of groundwater levels minimum thresholds and measurable objectives that are set below historical lows will impact other applicable sustainability indicators specifically water quality, land subsidence, and reduction of groundwater storage. Based on the groundwater level declines allowed for by many of the minimum thresholds, the GSPs need to explain how those groundwater level declines relate to the degradation of groundwater quality sustainability indicator. The GSPs must describe, among other items, the relationship between minimum thresholds for a given sustainability indicator (in this case, chronic lowering of groundwater levels) and the other sustainability indicators, degradation of water quality in particular.<sup>80</sup> The GSPs generally commit to monitoring a wide range of water quality constituents, but they do not establish a consistent definition of undesirable results. Additionally, the GSPs use differing constituents and methods to establish minimum thresholds including some GSPs using groundwater levels as a proxy for degradation of water quality. Department staff recognize that a subbasin the size of the Kern County Subbasin will have a wide variety of water quality concerns requiring different management strategies; however, at this time, it is clear that the GSPs do not consider, or at least do not document, the potential for degradation to occur due to further

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<sup>80</sup> 23 CCR § 354.28(b)(2).



lowering of groundwater levels beyond the historic lows. The GSPs should also consider and discuss the opportunities to coordinate and leverage existing programs and agencies to help understand whether implementation of the GSPs is resulting in degradation of water quality.

**Table 2. Kern Subbasin groundwater level threshold summaries and corrective actions**

<b>Kern Groundwater Authority GSP</b>
<i>Areas Outside of Management Areas (Umbrella Document)</i>
<p>The KGA GSP is predominantly subdivided into management areas, each of which has its own management area plan, which are discussed below. However, a portion of the KGA area lies outside of any of the defined management areas. The KGA GSP provides little information on the characteristics of these non-management-area portions of its GSP area and does not appear to set any sustainable management criteria for these areas. The table on page 297 of the Coordination Agreement indicates that non-districted lands account for 18,013 acre-feet per year of total demand, which Department staff note is a larger volume than occurs in many of the areas covered by the management area plans.</p> <p><u>Corrective Action</u></p> <ol style="list-style-type: none"> <li>a. Provide a comprehensive discussion of areas covered by the KGA GSP, but that are not contained within the various management area plans. Among other items, provide maps of these areas, describe the uses and users of groundwater in these areas, and either set sustainable management criteria for these areas or include robust discussions justifying why sustainable management criteria are not required.</li> </ol>
<i>Arvin-Edison Water Storage District Management Area</i>
<p>The KGA GSP Arvin-Edison management area set groundwater level thresholds based on a multi-step process that first assigned an initial threshold to each groundwater level monitoring site based on the minimum of either the historical low minus a “variability correction factor” or the recent low minus a correction factor that accounted for variability and continuation of recent trends. Arvin-Edison then adjusted thresholds for sites within 1-mile of critical infrastructure to be no lower than the historical low to prevent additional subsidence. Finally, Arvin-Edison generalized the site-specific thresholds into four zones of similarity to account for the fact that wells with historical data upon which the analysis was based may not be available for future long-term monitoring. Thus, they could select another existing or new well in a particular zone to use for monitoring during implementation.</p> <p>Arvin- Edison examined the potential for dewatering of wells if groundwater levels declined to the minimum threshold values for domestic, production (which Department staff assume to be for agricultural production), and public supply wells. In the context of the groundwater level minimum thresholds, Arvin-Edison includes brief description of an Impacted Well Mitigation Program to remedy well impacts through actions such</p>

as pump lowering, well deepening, well replacement, or alternative water sources, but does not set a schedule for when this program would be implemented.<sup>81</sup>

Corrective Action

- b. As the Arvin Edison management area plan appears to rely, at least to some extent, on the Impacted Well Mitigation Program to justify its minimum thresholds, which allow for continued lowering of groundwater levels in some areas, the KGA GSP must provide specific details, including timeline for implementation, of the program. Describe the scope of the program and how users impacted by continued groundwater level decline, particularly early in implementation of the Plan, will be addressed.

*Cawelo Water District Management Area*

The KGA GSP Cawelo management area established minimum thresholds for chronic lowering of groundwater levels based on the conditions experienced over the past 10 years. Because groundwater levels declined 80 feet between 2007 through 2016, the minimum threshold is set to 80 feet below the low groundwater level that was experienced during that period and allowing for operational flexibility in the event that another similar extended drought period occurs during the GSP implementation. Cawelo states that most wells have been drilled deeper and undesirable results associated with drought are unlikely.

While it appears that during a meeting held in 2019 Cawelo received a presentation on the impacts to wells given various scenarios of minimum thresholds, a discussion of impacts to beneficial uses and users of the adopted minimum thresholds is not provided.<sup>82</sup>

Corrective Action

- c. The KGA GSP must describe how the minimum thresholds in the Cawelo management area may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

*Eastside Water Management Area*

Due to the lack of historical well data, the KGA GSP Eastside management area has established minimum thresholds at each individual well site based on the allowance of drawdown to 20% of the saturated water column height above the bottom of the well, as measured in 2015 or closest measurement to that time frame. This resulting value, the corresponding 80% of the water column, was then increased on a well-by-well basis if the water level did not provide at least 30 feet of head above the existing pump intake.

While it appears that Eastside is protective of dewatering wells, all the minimum thresholds are below historical lows and the impacts of the established minimum thresholds for chronic lowering of groundwater levels on beneficial uses and users are not discussed. Eastside is aware that there are domestic wells within the management

<sup>81</sup> KGA GSP Arvin Edison MAP, pp. 216-220, 234-238, 286.

<sup>82</sup> KGA GSP Cawelo MAP, pp. 165-169, 402-407.

area; however, “the full extent and distribution of active domestic wells within the Management Area is currently unknown.”<sup>83</sup>

Corrective Action

- d. The KGA GSP must describe how the minimum thresholds in the Eastside management area may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

*Kern Water Bank Management Area*

The KGA GSP Kern Water Bank management area can only recover groundwater that has previously been stored minus losses that have been applied. The Kern Water Bank states that “[a]n extensive Mitigation Monitoring and Reporting Program (MMRP) has been developed by DWR for the KWB Storage Project that reduces impacts from operations to less-than-significant, and undesirable results are not present or are not likely to occur.” It is acknowledged that pumping operations can cause lowering of groundwater levels in adjacent areas and threshold water levels have been established in the Joint Operation Plan. The threshold water levels in the Joint Operation Plan are based on the DWR KWB Model and a model developed by Rosedale-Rio Bravo Water Storage District. “When the With-Project conditions are fifteen (15) or forty-five (45) feet deeper than the Without-Project conditions at any operative domestic or agricultural well, respectively, and mechanical failure or other operational problems have occurred or are reasonably likely to occur due to declining water levels, mitigation will be provided ...” The 15-foot threshold is essentially the point when the projects have had a discernable influence on a domestic well. The 45-foot threshold for agricultural wells recognizes the significant economic benefits resulting from higher groundwater elevations provided by the projects through time, and that agricultural wells in the area are completed to greater depths.<sup>84</sup>

Corrective Action

- e. While the Department understands the unique circumstances with the Kern Water Bank, compliance with SGMA and the GSP Regulations is still a requirement and while the thresholds established in the Joint Operation Plan are being utilized to meet these requirements, all parts of the GSP Regulations related to the sustainable management criteria must be addressed. The KGA GSP must provide an explanation of how the Joint Operation Plan meets the requirements of SGMA and the GSP Regulations.
- f. It is also noted that the Joint Operation Plan expired on January 31, 2019. Provide an updated explanation if these thresholds have changed and the latest Joint Operation Plan if applicable.

*Kern-Tulare Water District Management Area*

The KGA GSP Kern-Tulare Water District management area spans both the Kern Subbasin and the Tule Subbasin. The management area plan states that chronic lowering of groundwater levels is the major cause of undesirable results for reduction in groundwater storage and land subsidence. Kern-Tulare management area plan

<sup>83</sup> KGS GSP Eastside MAP, pp. 94-95, 208.

<sup>84</sup> KGA Kern Water Bank MAP, pp. 38, 39, 175-180.

utilized historical groundwater level data from 2006 to 2018 for wells perforated in the Santa Margarita Formation and projected out the trendline to 2040. These values ranged from -120 feet to -190 feet mean sea level. The District then selected -150 feet mean sea level as the minimum threshold for each of the well sites. The lowest groundwater level the management area has experienced is -51.8 feet.

The Kern-Tulare management area plan states that “water users within the District are the predominant users of the Santa Margarita Formation” and that minimum thresholds may impact groundwater users within the management area by requiring an overall reduction in groundwater pumping to ensure the minimum threshold is met; however, no discussion is provided describing the impacts to beneficial uses and users.<sup>85</sup>

#### Corrective Action

- g. The KGA GSP must provide an explanation of how minimum thresholds within the Kern-Tulare management area at the monitoring sites are consistent with the requirement to be based on a groundwater elevation indicating a significant and unreasonable depletion of supply at a given location. If the minimum thresholds were not set consistent with levels indicating an undesirable depletion of supply, the thresholds should be revised accordingly.
- h. Provide a discussion identifying how the minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

#### *North Kern Water Storage District/Shafter-Wasco Irrigation District Management Area*

The KGA GSP North Kern/Shafter-Wasco management area plan identifies three management areas, two managed by North Kern Water Storage District and the third managed by Shafter-Wasco Irrigation District. In establishing minimum thresholds for chronic lowering of groundwater levels, the area covered by these management areas was divided into hydrogeologic zones (HZ). The management area then looked at the 2006-2016 spring water levels for each HZ, identified a trend, and projected the trend out to 2040. The result of each 2040 projection is the minimum threshold for each HZ and the monitoring sites in those HZs are assigned the correlating minimum threshold. This is to establish the worst-case scenario for the management areas. The minimum thresholds for two wells closest the Kern River GSP area within the SWID-MA-1 were raised from 20 feet above the 2040 projection at the request of Kern River so as not to cause undesirable results within the Kern River GSP area. In looking at Figure 3-2, management area NKWSD-MA-2 does not have minimum thresholds established.

A well impact analysis of the equivalent minimum threshold average values (represented as depth to water values) for each HZ was used to determine that a portion of the existing wells are impacted to varying extents. A subset of the total wells within the three management areas and the average 2040 minimum thresholds were used in the analysis. Based on results of the well impact analysis, the management area plan states that it can be assumed many wells will remain operational and that

<sup>85</sup> KGA GSP Kern-Tulare Water District MAP, pp. 16, 69, 70.

the water levels can drop without causing undesirable results which cannot be mitigated. It was stated that agricultural wells would be mitigated by landowners to the extent that declining groundwater levels was created by localized actions by those landowners. While the management area plan states that mitigation to domestic wells would be necessary, there is no mention of who would implement the mitigation effort.<sup>86</sup>

#### Corrective Actions

- i. The KGA GSP must establish sustainable management criteria for management area NKWSD-MA-2.
- j. The KGA GSP must be revised to explain how minimum thresholds within the North Kern Water Storage District/Shafter-Wasco Irrigation District management area at the monitoring sites are consistent with the requirement to be based on a groundwater elevation indicating a significant and unreasonable depletion of supply at a given location. If the minimum thresholds were not set consistent with levels indicating an undesirable depletion of supply, the thresholds should be revised accordingly.
- k. Verify how the subset of wells used in the well impact analysis is representative of the wells in the management area. Provide an explanation of the mitigation plan for domestic wells.

#### *Kern County Water Agency Pioneer GSA Management Area*

The Pioneer management area minimum thresholds are “calculated for each representative well by using the difference between the historical maximum and minimum values, calculating 20 percent of that range and subtracting the 20 percent value from the historical minimum value.” However, the management area provides no further information or description (e.g., details of the well and pump information) for beneficial uses and users. Based on Table 7-1, it appears the minimum threshold represents a substantial reduction in groundwater levels relative to recent (i.e., 2011-2019) levels, which, at their lowest point, appear to be just over 250 feet below ground surface. Without any further description provided in the management area plan, Department staff cannot assess whether these minimum thresholds are reasonable and substantially comply with the GSP Regulations.<sup>87</sup>

#### Corrective Action

- i. The KGA GSP must explain the selection of groundwater level minimum thresholds for the Pioneer management area, including how they represent site-specific levels of depletion that could cause undesirable results, how they may affect the interests of beneficial uses and users of groundwater, and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels.

<sup>86</sup> KGA GSP North Kern Water Storage District/Shafter-Wasco Irrigation District MAP, pp. 209-225.

<sup>87</sup> KGA GSP Pioneer MAP, pp. 146-148.

### *Rosedale Rio Bravo Management Area*

The Rosedale Rio Bravo management area plan explains that groundwater level decline during the 2012-2016 drought resulted in significant expense to landowners in their management area due to pump lowering, well replacement, well-head treatment, and increased energy costs. Rosedale Rio Bravo conducted an analysis of the economic impacts of continued groundwater lowering, examining the costs for each 25-foot increment of lowering (e.g., lowering an initial 25 feet would lead to \$371 million in impacts across the domestic, agricultural, and municipal/public categories of wells), and concluded that any “additional reinvestment in groundwater facilities [beyond those already experienced] ... would be deemed an undesirable result.” Therefore, groundwater level thresholds are set at the low point of the last drought. Rosedale Rio Bravo divided its area into five monitoring zones and grouped monitoring wells in each zone to determine a zone-specific minimum threshold. The management area plan states that they will attempt to maintain at least two wells per zone and will compute the average groundwater level for each well in a zone to determine if the threshold has been exceeded during a given monitoring event. The management area plan states that they would consider an undesirable result to occur if two of either the North, Central, or South of the River zones exceed their thresholds, or if the threshold was exceeded in any one of the South or East zones. Why thresholds are allowed to be exceeded in one of the North, Central, or South of the River zones without the agency considering that to trigger an undesirable result was not adequately explained. Adequate explanation is also lacking regarding whether the triggering of an undesirable result in any one of these zones triggers the entire Rosedale Rio Bravo management area to become an undesirable result watch area, or if only the area of the triggering monitoring zone(s) would contribute to the Subbasin-wide tracking of undesirable results.<sup>88</sup>

#### Corrective Action

- m. The KGA GSP must provide clarification regarding why minimum threshold exceedances are allowed to occur in one of the North, Central, or South of the River zones for this management area (i.e., why it takes two of those zones to exceed their threshold before the management area plan considers an undesirable result to have occurred). Describe any projects or management actions that may be implemented if the minimum threshold is exceeded in one of those areas and users are impacted but an undesirable result is not triggered.

### *Semitropic Water Storage District Management Area*

The KGA GSP Semitropic Water Storage District management area plan further divides the management area into three management areas. In establishing minimum thresholds for chronic lowering of groundwater levels, the area covered by these management areas was divided into hydrogeologic zones (HZ). The management area then evaluated the 2006-2016 spring water levels for each HZ, identified a trend, and projected the trend out to 2040. The result of each 2040 projection is the minimum threshold for each HZ and the monitoring sites in those HZs are assigned the corresponding minimum threshold. This is to establish the worst-case scenario for the

<sup>88</sup> Rosedale Rio Bravo MAP, pp. 68-75.

management areas. In comparing the map of the monitoring well sites (Figure 3-1) and Table 3-1 which summarizes the minimum thresholds, Department staff were unable to correlate the two.

The management area plan states that there are thresholds for the upper zone wells in Appendix B-3; however, Department staff could not locate this appendix and it is not clear how these thresholds were established and the location of the monitoring sites assigned these minimum thresholds.

A well impact analysis of the equivalent minimum threshold average values (represented as depth to water values) for each HZ was used to determine that a portion of the existing wells are impacted to varying degrees. A subset of the total wells within the three management areas and the average 2040 minimum threshold values were used in the analysis. Based on results of the well impact analysis, the management area plan states that it can be assumed many wells will remain operational and that the water levels can drop without causing undesirable results which cannot be mitigated. The management area plan states that impacts to agricultural wells would be mitigated by landowners. While the management area plan states that mitigation to domestic wells would be necessary, there is no mention of who would implement the mitigation effort.<sup>89</sup>

#### Corrective Action

- n. The KGA GSP must explain the selection of groundwater level minimum thresholds for the Semitropic Water Storage District management area, including how they represent site-specific levels of depletion that could cause undesirable results and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels. If minimum thresholds were not set consistent with levels indicating a depletion of supply, the minimum thresholds should be revised accordingly.
- o. Reconcile Figure 3-1 and Table 3-1 to utilize the same well naming convention so that Department staff and other interested parties may correlate the two.
- p. Verify how the subset of wells used in the well impact analysis is representative of the wells in the management area. Provide an explanation of the mitigation plan for domestic wells.

#### *Shafter-Wasco Irrigation District (7<sup>th</sup> Standard Rd.) Management Area*

The KGA GSP Shafter-Wasco Irrigation District management area calculates the minimum thresholds for chronic lowering of groundwater levels by “projecting a theoretical future water groundwater elevation based on the assumption that the conditions experienced over the ten-year period 2006-2016 (Spring measurements) continue from 2016 through 2040” at each of the three well sites. The management area plan claims this was done to be consistent with what is being used by surrounding management areas.

<sup>89</sup> KGA GSP Semitropic Water Storage District Management Area, pp. 166-173, 187, 188, 329-353.

The management area plan examined the impacts of the minimum thresholds and measurable objectives on wells within the area and determined that there they would potentially experience “excessive dewatering, [but] the impacts would not be unreasonable and would be mitigated through an Impacted Well Mitigation Program.” It’s unclear if all the wells in the management area were included in this impact analysis.<sup>90</sup>

#### Corrective Actions

- q. The KGA GSP must explain the selection of groundwater level minimum thresholds for the Shafter-Wasco Irrigation District management area, including how they represent site-specific levels of depletion that could cause undesirable results and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels. If minimum thresholds were not set consistent with levels indicating a depletion of supply, the minimum thresholds should be revised accordingly.

#### *Southern San Joaquin Municipal Utility District Management Area*

In the KGA GSP Southern San Joaquin Municipal Utilities District management area, in establishing minimum thresholds for chronic lowering of groundwater levels, the management area was divided into hydrogeologic zones (HZ). The management area then looked at the 2006-2016 spring water levels for each HZ, identified a trend, and projected the trend out to 2040. The result of each 2040 projection is the minimum threshold for each HZ and the monitoring sites in those HZs are assigned the correlating minimum threshold. This is to establish the worst-case scenario for the management area. The minimum thresholds for two wells closest the Kern River GSP area within the SWID-MA-1 were raised from 20 feet above the 2040 projection at the request of Kern River so as not to cause undesirable results within the Kern River GSP area. In looking at Figure 3-2, management area NKWSD-MA-2 does not have minimum thresholds established.

A well impact analysis of the equivalent minimum threshold average values (represented as depth to water values) for each HZ was used to determine that a portion of the existing wells are impacted to varying extents. A subset of the total wells within management area and average 2040 minimum thresholds values were used in the analysis. Based on results of the well impact analysis, the management area plan states that it can be assumed most wells will remain operational and that the water levels can drop without causing undesirable results which cannot be mitigated. It was stated that agricultural wells would be mitigated by landowners to the extent that declining groundwater levels was created by localized actions by those landowners. While the management area plan states that mitigation to domestic wells would be necessary, there is no mention of who would implement the mitigation effort.<sup>91</sup>

<sup>90</sup> KGA GSP Shafter-Wasco Irrigation District (7<sup>th</sup> Standard Rd.) MAP, pp. 149,150,164,165.

<sup>91</sup> KGA GSP Southern San Joaquin Municipal Utility District MAP, pp. 163-173.



Corrective Actions

- r. The KGA GSP must explain the selection of groundwater level minimum thresholds for the Southern San Joaquin Municipal Utilities District management area, including how they represent site-specific levels of depletion that could cause undesirable results, how they may affect the interests of beneficial uses and users of groundwater, and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels. If minimum thresholds were not set consistent with levels indicating a depletion of supply, the minimum thresholds should be revised accordingly.
- s. Verify how the subset of wells used in the well impact analysis is representative of the wells in the management area. Provide an explanation of the mitigation plan for domestic wells.

*Tejon-Castac Water District Management Area*

The minimum threshold for the KGA GSP Tejon-Castac management area is set to 50 feet above mean sea level at one well site and is based on the approximate average historical low value for wells in the neighboring Arvin-Edison Water Storage District due to the lack of historical data within the Tejon-Castac management area. The management area believes this use of the available historical low is appropriate because at such lows there have been no known problems and land subsidence typically doesn't happen unless groundwater levels fall below historical lows for a sufficient period of time. Therefore, the management area assumes this is protective of beneficial uses and users. See the summary for Arvin-Edison above regarding how their minimum thresholds were established.

The management area plan provides no further information or description (e.g., details of the well and pump information) for beneficial uses and users or evidence that groundwater level declines allowed by the threshold will not cause impacts to other sustainability indicators. It's unclear why the management area has no historical information for the management area. Without any further description provided for this management area, Department staff cannot evaluate whether the minimum threshold is reasonable and substantially compliant with the GSP Regulations.<sup>92</sup>

Corrective Action

- t. The KGA GSP must explain the selection of groundwater level minimum thresholds for the Tejon-Castac management area, including how they represent site-specific levels of depletion that could cause undesirable results, how they may affect the interests of beneficial uses and users of groundwater, and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels. If minimum thresholds were not set consistent with levels indicating a depletion of supply, the minimum thresholds should be revised accordingly.

<sup>92</sup> KGA GSP Tejon-Castac Water District MAP, p. 102.

### *West Kern Water District Management Area*

The KGA GSP West Kern Water District management area plan describes it being divided into four management areas (Lake, North Project, South Project, and Western). Department staff note that Figure 1-2 shows an additional management area (Little Santa Maria Valley) and Appendix H consists of a draft GSP for this additional management area. Minimum thresholds for the North Project management area “were calculated by finding the maximum and minimum historical values for each well; 20 percent of the difference between these elevations was calculated, and then subtracted from the minimum historical value to obtain the numerical MT value.” Because the South Project management area groundwater conditions and well use are like those in the North Project, the same calculations were used to determine MT values. No sustainable management criteria were determined for the Lake management area because the District was unable to procure the groundwater level data for the production wells in area. No sustainable management criteria were established for the Western management area because there is no groundwater usage in the area; however, earlier parts of the management area plan describe groundwater usage in this area as de minimis without further explanation of the type of de minimis users within the area. Due to the draft nature of the material provided for Little Santa Maria Valley, Department staff is unable to review the sustainable management criteria for that portion of the KGA GSP.<sup>93</sup>

#### Corrective Action

- u. The KGA GSP must provide sustainable management criteria for all identified management areas.
- v. The minimum thresholds must include a description of the selection of groundwater level minimum thresholds, including how they represent site-specific levels of significant and unreasonable depletion of supply that could cause undesirable results, how they may affect the interests of beneficial uses and users of groundwater, and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels.

### *Westside District Authority Management Area*

The KGA GSP Westside management area states that total groundwater demand is about 3,000 acre-feet per year due to water quality; therefore, the potential for significant lowering of groundwater levels due to pumping is believed to be minimal. In establishing the minimum thresholds, the management area first divided the area into two sentry coordination zones along the north and east boundaries of the management area (shown in Figure 30a and Figure 30b). There is one minimum threshold established for Sentry Zone #1 and three for Sentry Zone #2. These minimum thresholds values are not explained or justified. The established minimum thresholds do not apply for the majority of the management area and the rest of the management area is not being monitored for water levels. The management area plan states that minimal pumping takes place within the management area due to water

<sup>93</sup> KGA GSP West Kern Water District MAP, pp. 26, 27, 178-183, 353-442.

quality; however, based on Figure 28a and Figure 28b, there is subsidence appears to be occurring within the middle of the management area. For this reason, sustainable management criteria must be applied to the entirety of the management area, including the establishment of thresholds and monitoring.<sup>94</sup>

#### Corrective Action

- w. The KGA GSP must explain the selection of groundwater level minimum thresholds for the Westside management area, including how they represent site-specific levels of depletion that could cause undesirable results, how they may affect the interests of beneficial uses and users of groundwater, and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater quality and subsidence, both of which can be exacerbated by lowering groundwater levels. If minimum thresholds were not set consistent with levels indicating a depletion of supply, the minimum thresholds should be revised accordingly.
- x. The larger portion of the management area must establish sustainable management criteria, including the establishment of minimum thresholds and monitoring; otherwise, further evaluation and justification is needed to negate management criteria in this portion of the management area.

#### *Wheeler Ridge-Maricopa Water Storage District Management Area*

The KGA GSP Wheeler Ridge-Maricopa management area set groundwater level thresholds based on a multi-step process that first assigned an initial threshold to each groundwater level monitoring site based on the minimum of either the historical low minus a “variability correction factor” or the recent low minus a correction factor that accounted for variability and continuation of recent trends. The management area then adjusted thresholds for sites within 1-mile of critical infrastructure to be no lower than the historical low to prevent additional subsidence. Finally, the management area generalized the site-specific thresholds into three zones of similarity to account for the fact that wells with historical data upon which the analysis was based may not be available for future long-term monitoring. Thus, they could select another existing or new well in a particular zone to use for monitoring during implementation.

The management area plan examined the potential for dewatering of wells if groundwater levels declined to the minimum threshold values for domestic, production (which Department staff assume to be for agricultural production), and public supply wells. In total, the minimum thresholds will dewater 1 well in the Western Zone. In the context of the groundwater level minimum thresholds, the management area plan includes a brief description of an Impacted Well Mitigation Program to remedy well impacts through actions such as pump lowering, well deepening, well replacement, or alternative water sources but does not set a schedule for when this program would be implemented.<sup>95</sup>

<sup>94</sup> KGA GSP Westside District Authority MAP, p.141, 142, 221, 222, 226-231.

<sup>95</sup> KGA GSP Wheeler Ridge-Maricopa Water Storage District MAP, pp. 189-194, 207-209.

**Corrective Action**

- y. As the KGA GSP Wheeler Ridge-Maricopa management area appears to rely, at least to some extent, on the Impacted Well Mitigation Program to justify its minimum thresholds, which allow for continued lowering of groundwater levels in some areas, provide specific details, including timeline for implementation, of the program. Describe the scope of the program and how users impacted by continued groundwater level decline, particularly early in implementation of the Plan, will be addressed.

**KERN RIVER GSP**

*KRGSA Urban Management Area*

The Kern River GSA subdivides the Urban Management Area into three subareas for the purposes of defining minimum thresholds and measurable objectives.

- For the “municipal wellfields” subarea, the GSP describes that groundwater providers, including the City of Bakersfield and California American Water (Cal Am) were significantly impacted by conditions in the 2015-2016 drought. The GSP states that, “given the economic impact, large number of municipal wells, and future risk to additional wells, the City has determined that the historic low water levels during Fall 2015 represent an undesirable result for the chronic lowering of water levels in the KRGSA Urban [management area municipal wellfields subarea].”
- For the “Northeast ENCSD Wellfield Subarea”, the GSP states that the East Niles Community Services District (ENCSD) was, at the time of GSP preparation, working to consolidate several small water systems into its current system and therefore, anticipated increased pumping would be required. Thus, ENCSD requested the GSA set the minimum threshold 50 feet lower than historical lows observed in the 2013-2016 drought to account for the need to increase pumping.
- For the final area, the “Northwest Agricultural Wells”, the GSA set the minimum threshold 20 feet below the historical lows observed in the 2013-2016 drought to account for the GSA’s observation that wells in this area outside the municipal well fields were less sensitive to factors such as short-term lowering of water levels and increase well inefficiency.<sup>96</sup>

Department staff do not recommend any specific corrective actions at this time related to the KRGSA Urban Management Area definition of groundwater level minimum thresholds; however, see the corrective action for All GSPs below.

*KRGSA Agricultural Management Area*

The Kern River GSA subdivides the Agricultural Management Area into subareas for the purposes of defining minimum thresholds and measurable objectives.<sup>97</sup>

- For the “Urban Wells along the southern Urban MA Boundary” subarea, which includes portions of the management area with drinking water users near the Urban Management Area as well as the Greenfield CWD, the GSA set the

<sup>96</sup> Kern River GSP, pp. 276-279.

<sup>97</sup> Kern River GSP, pp. 279-282.

minimum threshold at the historical low water level from the 2013-2016 drought (the same approach used for municipal well areas in the KRGSA Urban Management Area).

- Similarly, for the “Small Water Systems in the Eastern Agricultural MA” subarea, which includes the Lamont PUD and Fuller Acres Mutual Water Company, the GSA also set the minimum threshold at the 2013-2016 low water level.
- Other portions of the Agricultural Management Area are predominantly used for agriculture or groundwater banking purposes, and the GSP provides reasonable descriptions for why those users require greater fluctuation in groundwater levels. The GSA sets the minimum threshold at 50 feet below the 2013-2016 low water level (Department staff note that, for some portions of this subarea, the GSA set groundwater-level-based proxies for land subsidence that were set at 20 feet below the historical low; the GSP states that the shallower groundwater levels used for subsidence will be the controlling level). The GSA also describes efforts to characterize, identify, and engage shallow well users in the agricultural subareas, and acknowledges the presence of some small water systems and domestic wells that could be impacted by groundwater management to the minimum threshold. Therefore, the GSA states that they include a management action related to identification and documentation of active wells in the management area. However, Department staff were unable to ascertain which of the management actions listed in the GSP specifically addressed this item.

#### Corrective Action

- z. The Kern River GSP must provide clarification regarding the management action mentioned in the sustainable management criteria section of the GSP related to identification of well users, including domestic users and small water systems, in the agricultural subareas of the Agricultural Management Area.

#### *KRGSA Banking Management Area*

Kern River GSA describes that the Banking Management Area contains both groundwater banking recovery wells and municipal wells, and that the needs of both, which are at times opposed, were considered when setting the minimum thresholds. Subareas of the management area near sensitive municipal wells were assigned minimum thresholds of the low water level from the 2013-2016 drought, similar to other subareas in the GSP’s management areas with municipal wells. In one area where the GSAs foresee that projects to recharge groundwater will likely protect municipal wells, the GSAs set the minimum threshold at 20 feet below the low water level from the 2013-2016 drought.

Department staff do not recommend any specific corrective actions at this time related to the KRGSA Banking Management Area definition of groundwater level minimum thresholds; however, see the corrective action for All GSPs below.<sup>98</sup>

<sup>98</sup> Kern River GSP, pp. 282-284.

**BUENA VISTA GSP**

*Buttonwillow Management Area*

The GSA started with a “worst case” (i.e., ‘do nothing’ or continue pre-SGMA operations) set of water levels based on an extrapolation of 2011-2018 groundwater level trends out to 2040 at each of its nine representative monitoring wells. These extrapolations resulted in water levels that ranged from 20 feet of decline, relative to 2016, to more than 350 feet of decline relative to 2016. The GSA established operational minimum thresholds by adjusting the “worst case” water levels relative to production well screen intervals (i.e., domestic, agricultural, and municipal wells), geologic conditions (i.e., confining layers and water quality), and recognition that the steeply declining “worst case” water level gradient represents conditions influenced by groundwater banking projects outside of the GSAs control. The GSA displayed each final minimum threshold on figures showing the depths of clay layers and nearby domestic well screens (as applicable), and the depth of the original “worst case” threshold. The figures indicate when specific domestic wells would be impacted if groundwater levels were to decline to the threshold level. Department staff note that, for one of the threshold wells (DMW 12b), the figures show that all three nearby domestic wells could be impacted if groundwater levels fall to the minimum threshold. The GSA acknowledges that, while the thresholds were developed to minimize loss of production from domestic and supply wells, they will also develop a mitigation plan that they state will be modeled on mitigation plans that have been approved by DWR for mitigating effects of groundwater substitution transfer pumping. The GSP further describes this Well Rehabilitation project, outlining the process by which owners of wells with diminished capacity can report a claim and, if the capacity reduction is verified to be due to groundwater level decline, measures can be enacted to rectify the situation.

Department staff do not recommend any corrective actions at this time related to the Buena Vista GSP Buttonwillow Management Area definition of groundwater level minimum thresholds; however, see the corrective action for All GSPs below.<sup>99</sup>

*Maples Management Area*

The Buena Vista GSP states that the Maples Management Area is an isolated area (relative to the rest of the Buena Vista GSP area) located within the Kern River GSA’s GSP area. The Buena Vista GSP further states that the Maples Management Area “will follow the guidelines established by [the Kern River GSA] for setting [minimum thresholds] and [measurable objectives].” However, it does not appear that the Buena Vista GSP has actually set any minimum thresholds or measurable objectives for this area. The Buena Vista GSP does note that at least two wells have been routinely monitored and reported to the DWR CASGEM database, but Department staff did not find any evidence that sustainable management criteria had been developed for these wells, or any other wells in the Maples Management Area. The Kern River GSP acknowledges the “arrangement” regarding use of similar methodology with Maples Management Area but also does not contain minimum thresholds or other criteria for the Maples Management Area. This lack of any sustainable management criteria is

<sup>99</sup> Buena Vista GSP, pp. 126-151, 255.

problematic not only because it does not comply with the GSP Regulations, but also because the conditions under which an individual management area becomes a localized undesirable result are fundamental to the Subbasin’s definition of an undesirable result occurring throughout the Subbasin. Without sustainable management criteria, it is not clear how an undesirable result could occur in the Maples Management Area.<sup>100</sup>

Corrective Action

- aa. The Buena Vista GSP must be revised to include sustainable management criteria, including groundwater level minimum thresholds, for the Maples Management Area. Reference the specific methodologies from the Kern River GSP (of which there are several, depending on nearby beneficial uses and users, as noted herein) that guide development of the Maples Management Area’s criteria and describe how those criteria are consistent with the requirements of the GSP Regulations. Department staff recommend providing similar detail regarding the hydrogeologic and beneficial user considerations as were provided for the Buttonwillow Management Area sustainable management criteria development.

**HENRY MILLER GSP**

Henry Miller GSP states that the minimum threshold groundwater level is 350 feet below ground surface. The GSP states “This [minimum threshold] is based on historical groundwater levels, the potential for a future decline in levels due to an extended drought period, and the well and pump information for the production wells. It is expected that if the [minimum threshold] is avoided, issues stemming from pump depth or the compaction of significant clay layers will be avoided preventing effects on other sustainability indicators.” However, the GSP provides no further information or description (e.g., details of the well and pump information) for beneficial uses and users or evidence that groundwater level declines allowed by the thresholds would avoid compaction of significant clay layers. Based on figures in the GSP, it appears the minimum threshold represents a substantial reduction in groundwater levels relative to recent (i.e., 2011-2019) levels, which, at their lowest point, appear to be just over 250 feet below ground surface. Without any further description provided in the GSP, Department staff cannot evaluate whether these minimum thresholds are reasonable and substantially compliant with the GSP Regulations.<sup>101</sup>

Corrective Action

- bb. The Henry Miller GSP must provide a sufficient description of the selection of groundwater level minimum thresholds, including how they represent site-specific levels of significant and unreasonable depletion of supply that could cause undesirable results, how they may affect the interests of beneficial uses and users of groundwater, and the relationship between this sustainability indicator and other sustainability indicators such as degradation of groundwater

<sup>100</sup> Buena Vista GSP, pp. 125; Kern River GSP, p. 1173.

<sup>101</sup> Henry Miller GSP, pp. 155, 160.

<p>quality and subsidence, both of which can be exacerbated by lowering groundwater levels.</p>
<p><b>OLCESE GSP</b></p>
<p>The Olcese GSP, located in the eastern extent of the Subbasin and covering just 0.2 percent of the Subbasin’s land area, has identified minimum thresholds at two monitoring sites. Both are based on the elevation of the top of the respective well screens. One well is shallow and is described as the only domestic supply well in the GSP area. The other is described as the shallowest well screen in the principal Olcese Sand Aquifer. Given the size of this GSP area, setting the minimum thresholds in this manner (i.e., to protect saturation of the well screen of the single domestic supply well and the shallowest production well in the principal aquifer) appears to be a reasonable approach.<sup>102</sup></p> <p>Department staff do not recommend any corrective actions at this time related to the Olcese GSP definition of groundwater level minimum thresholds.</p>
<p><b>ALL GSPs</b></p>
<p><u>Corrective Action</u></p> <p>cc. All the GSPs must demonstrate the relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the GSA has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.</p>

The GSAs should address the specific corrective actions identified for the various GSPs and management area plans, as well as the corrective actions that apply to all the GSPs identified in Table 2. Where addressing those corrective actions includes modifications to the respective GSPs minimum thresholds, the GSPs should evaluate whether the Subbasin’s ‘with-projects’ modeling scenarios still indicate that implementation of the projects and management actions would avoid minimum threshold exceedances. If not, the GSAs should modify their projects and management actions accordingly.

### **3.3 DEFICIENCY 3. THE PLAN’S LAND SUBSIDENCE SUSTAINABLE MANAGEMENT CRITERIA DO NOT SATISFY THE REQUIREMENTS OF SGMA AND THE GSP REGULATIONS.**

#### **3.3.1 Background**

SGMA defines undesirable results for land subsidence within the basin when significant and unreasonable subsidence is caused by groundwater conditions that substantially interferes with land uses.<sup>103</sup> When describing the sustainable management criteria for land subsidence, a plan must include the cause of the groundwater conditions that would

<sup>102</sup> Olcese GSP, pp. 142, 143.

<sup>103</sup> Water Code § 10721(x)(5); 23 CCR § 354.26(a).



lead or has led to the undesirable result;<sup>104</sup> the criteria that was used to define when and where the effects of the groundwater conditions cause undesirable results for subsidence;<sup>105</sup> and potential effects on the beneficial uses and users of groundwater, land uses, property interests that may occur or are occurring from undesirable results.<sup>106</sup>

The GSP Regulations state that minimum thresholds for land subsidence should identify the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. These quantitative values should be supported by:

- The identification of land uses or property interests potentially affected by land subsidence;
- An explanation of how impacts to those land uses or property interests were considered when establishing minimum thresholds;
- Maps or graphs showing the rates and extents of land subsidence defined by the minimum thresholds.<sup>107</sup>

The GSP Regulations allow the use of groundwater elevations as a proxy for land subsidence. However, GSAs must demonstrate a significant correlation between groundwater levels and land subsidence and must demonstrate that the groundwater level minimum threshold values represent a reasonable proxy for avoiding land subsidence undesirable results.<sup>108</sup>

Demonstration of applicability (or non-applicability) of sustainability indicators must be supported by best available information and science and should be provided in descriptions throughout the GSP (e.g., information describing basin setting, discussion of the interests of beneficial users and uses of groundwater).<sup>109</sup> For basins that establish management areas, undesirable results are required to be consistently defined throughout the Subbasin.<sup>110</sup>

### 3.3.2 Deficiency Details

The Coordination Agreement defines the Subbasin-wide undesirable result for land subsidence as:

*The point at which significant and unreasonable impacts, as determined by a subsidence rate and extent in the basin, that affects the surface land uses or critical infrastructure. This is determined when subsidence results in significant and*

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<sup>104</sup> 23 CCR § 354.26(b)(1).

<sup>105</sup> 23 CCR § 354.26(b)(2).

<sup>106</sup> 23 CCR § 354.26(b)(3).

<sup>107</sup> 23 CCR § 354.28(c)(5).

<sup>108</sup> 23 CCR § 354.28(d).

<sup>109</sup> 23 CCR § 354.26(d).

<sup>110</sup> 23 CCR § 354.20(a).

*unreasonable impacts to critical infrastructure as indicated by monitoring points established by a basin wide coordinated GSP subsidence monitoring plan.*<sup>111</sup>

However, based on Department staff's review of the Plan, it is apparent that the Subbasin does not have a "basin wide coordinated GSP subsidence monitoring plan", nor any coordinated, Subbasin-wide subsidence sustainable management criteria or assessment of critical infrastructure that would be susceptible to substantial interference from future subsidence. While some of the individual GSPs and management area plans include some discussion of subsidence, there does not appear to be a Subbasin-wide approach.

The GSPs provide evidence of subsidence occurring throughout the Subbasin. For example, the KGA GSP highlights that a 2014 study states "[s]ubsidence is on-going and leading to significant impairment of the California Aqueduct and the Friant-Kern Canal."<sup>112</sup> The results of monitoring studies show that, from March 2015 to June 2016, there was measured subsidence between 4 to 8 inches in the north central and southern parts of the Subbasin, and "up to 12 inches of subsidence along CA [California] Aqueduct" between east of Buena Vista Pumping Plant and Wind Gap Pumping Plant from April 2014 to June 2016.<sup>113</sup> The KGA GSP does not address these findings within its discussion of undesirable results caused by subsidence, stating that there are "generally no significant impacts to infrastructure within the Subbasin."<sup>114</sup>

The KGA GSP also states that no minimum thresholds for subsidence have been established, identifying the lack of thresholds as a data gap and stating that their development will be addressed in a 2025 update to the GSP.<sup>115</sup> In reviewing the KGA GSP management area plans, some management areas did establish thresholds based on a rate or amount of subsidence,<sup>116</sup> others used groundwater levels as a proxy,<sup>117</sup> and some stated that subsidence didn't apply.<sup>118</sup> Of those that set thresholds, few provided sufficient explanation for selection of those thresholds as required by the GSP Regulations.

While Department staff do not dispute that KGA may have identified some monitoring data gaps, Department staff do not believe that it is appropriate to set aside development of sustainable management criteria for an entire sustainability indicator that, by the information presented in the GSP, appears to be applicable (i.e., it is occurring and could

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<sup>111</sup> Kern County Subbasin Coordination Agreement, p. 300.

<sup>112</sup> KGA GSP, p. 150.

<sup>113</sup> KGA GSP, p. 150.

<sup>114</sup> KGA GSP, p. 192.

<sup>115</sup> KGA GSP, pp. 192, 196.

<sup>116</sup> KGA GSP Arvin-Edison WSD MAP, p. 224; KGA GSP Kern County Water Agency Pioneer MAP, p. 150; KGA GSP Rosedale-Rio Bravo WSD MAP, p. 78; KGA GSP West Kern WD MAP, p. 185; KGA GSP Wheeler-Ridge Maricopa WSD MAP, p. 201.

<sup>117</sup> KGA GSP Cawelo WD MAP, pp. 172-173; KGA GSP Kern-Tulare WD MAP, p. 71; KGA GSP North Kern WSD and Shafter-Wasco ID MAP, p. 226; KGA GSP Semitropic WSD MAP, pp. 173-174; KGA GSP Southern San Joaquin MUD MAP, p. 175; KGA GSP Tejon-Castac WD MAP, pp. 100, 103.

<sup>118</sup> KGA GSP Eastside WMA MAP, pp. 89-90; KGA GSP Kern Water Bank Authority MAP, p. 40; KGA GSP Shafter-Wasco ID 7<sup>th</sup> Standard MAP, p. 152; KGA GSP Westside District WA, p. 142.

substantially interfere with land surface uses). Lack of monitoring in some areas, or lack of identification of the specific parties whose pumping is responsible for subsidence, would not prevent the Subbasin from developing a management strategy for subsidence. For example, the GSAs could have identified that their management strategy was to avoid further land subsidence, consistent with the legislative intent of SGMA,<sup>119</sup> and set their measurable objective to zero additional active subsidence and their minimum thresholds commensurate with the expected residual or delayed subsidence.

In addition, the Olcese GSP does not establish sustainable management criteria for subsidence because they do not consider their conveyance canals as “critical infrastructure” and have not observed subsidence along Highway 178.<sup>120</sup> A robust discussion justifying the lack of sustainable management criteria is not provided for Olcese GSP.

Department staff conclude that the Plan, including the Coordination Agreement and all GSPs, should be revised to present a Subbasin-wide management approach for subsidence that includes the elements required by SGMA and the GSP Regulations. The Plan should include clearly defined undesirable and appropriate minimum thresholds and measurable objectives. Department staff note that the Department provides aerial, remotely sensed subsidence data that may be used by GSAs in their monitoring and development of sustainable management criteria.

Because the Plan lacks a coordinated, Subbasin-wide management approach for subsidence, Department staff cannot meaningfully and completely review the fragmented approaches to establish sustainable management criteria for subsidence in the various GSPs and management area plans. However, staff do note that some appear to use their minimum thresholds and measurable objectives developed for chronic lowering of groundwater levels as proxy criteria for subsidence, but do not include the required demonstration showing that the values developed for chronic lowering of groundwater levels are reasonable proxies for the amount of land subsidence that would substantially interfere with surface land uses.<sup>121</sup> While that required demonstration may be relatively straight forward for areas that choose to limit groundwater level lowering to no worse than historical levels, thereby limiting the likelihood of future subsidence, areas that propose to allow additional groundwater lowering, below historical lows, should thoroughly show that the allowed lowering of groundwater levels would not lead to land subsidence undesirable results.

### **3.3.3 Corrective Action 3**

The Subbasin’s GSAs should coordinate and collectively satisfy the requirements of SGMA and the GSP Regulations to develop the sustainable management criteria for land subsidence. The GSPs should document the conditions for undesirable results for which the GSAs are trying to avoid, supported by their understanding of land uses and critical infrastructure in the Subbasin and the amount of subsidence that would substantially

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<sup>119</sup> Water Code § 10720.1(e).

<sup>120</sup> Olcese GSP, pp. 139, 145.

<sup>121</sup> 23 CCR §§ 354.28(d), 354.30(d).

interfere with those uses. The revised Plan, and component GSPs and management areas, should identify the rate and extent of subsidence corresponding with substantial interference that will serve as the minimum threshold, or should thoroughly demonstrate that another metric can serve as a proxy for that rate and extent. As described in Deficiency 1, the Coordination Agreement should be revised to clearly identify the undesirable result parameters for each of the GSPs, management areas, and management area plans so it is clear how the various plans work together at the Subbasin level.

The revised Plan should explain how implementing projects and management actions proposed in the various GSPs is consistent with avoiding subsidence minimum thresholds, sufficient to avoid substantial interference, similar to the original Plan's assessment of whether implementation would avoid undesirable results for groundwater levels.

If land subsidence is not applicable to parts of the Subbasin, the GSPs must provide supported justification of such.<sup>122</sup> The supporting information must be sufficiently detailed and the analyses sufficiently thorough and reasonable and must be supported by the best available information and best available science.

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<sup>122</sup> 23 CCR §§ 354.28(e), 354.26(d).

## **4 STAFF RECOMMENDATION**

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Department staff believe that the deficiencies identified in this assessment should preclude approval of the Plan for the Kern County Subbasin. Department staff recommend that the Plan be determined incomplete.