2.3 BASIN COVERAGE

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.[44] 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.

[44] Water Code § 10727(b); 23 CCR § 355.4(a)(3).

3 PLAN EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department's assessment is based on a number of related factors[45] including whether the elements of a GSP were developed in the manner required by the GSP Regulations, [46] whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable,[47] 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.[48]

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.[49] 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.[50] 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.[51] In the context of utilizing the same data and methodologies, the coordination agreement must provide the following:[52]

- 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

[45] 23 CCR § 355.4.
[46] 23 CCR § 355.4(a)(1).
[47] 23 CCR § 355.4(b)(1).
[48] 23 CCR §§ 355.4(b)(5), 355.4(b)(6).
[49] Water Code § 10727(b)(3).
[50] Water Code §§ 10727.6, 10733.4(b)(2); 23 CCR § 357.4.
[51] 23 CCR § 357.4(a).
[52] 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.[53]

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).[54]

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.[55] 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.

[53] Water Code § 10733(b); 23 CCR § 355.4(b).
[54] 23 CCR § 354.20 *et seq*.
[55] 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,[56] 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

[56] Kern County Subbasin Coordination Agreement, p. 344.

adjacent areas experiencing undesirable results),[57] 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."[58] 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.[59] 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

[57] Kern County Subbasin Coordination Agreement, pp. 299-300.
[58] 23 CCR § 354.26(a).
[59] 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.[60]

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."[61] 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."[62]

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."

[60] 23 CCR § 354.28(b)(2).
[61] 23 CCR § 357.4(b)(3)(C).
[62] 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.[63] 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.[64]

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".

[63] KGA GSP, Cawelo WD MAP, p. 169.
[64] 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,[65] 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."[66]
- 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."[67] 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.[68]
- 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".[69]

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.[70] The

[65] KGA GSP Semitropic WSD MAP, p. 153.
[66] KGA GSP Semitropic WSD MAP, p. 162.
[67] KGA GSP Rosedale-Rio Bravo WSD MAP, p. 69.
[68] KGA GSP Rosedale-Rio Bravo WSD MAP, p. 69.
[69] Buena Vista WSD GSP, pp. 93-94, 126-128.
[70] 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.[71] 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.[72] 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.

[71] 23 CCR § 354.26(a).
[72] 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.[73]
- 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.[74]
- 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.[75]

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.[76] 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;[77] and
- Potential effects on other sustainability indicators.[78]

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."[79]

[73] 23 CCR § 354.28(b)(1).
[74] 23 CCR § 354.28(b)(2).
[75] 23 CCR §§ 354.26(b)(3), 354.28(b)(4).
[76] 23 CCR § 354.28(c)(1).
[77] 23 CCR § 354.28(c)(1)(A).
[78] 23 CCR § 354.28(c)(1)(B).
[79] 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.[80] 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

[80] 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

Kern Groundwater Authority GSP
Areas Outside of Management Areas (Umbrella Document)
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. <u>Corrective Action</u> 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.
Arvin-Edison Water Storage District Management Area
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. 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

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

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. [82]

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

[81] KGA GSP Arvin Edison MAP, pp. 216-220, 234-238, 286.
[82] 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."[83]

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.[84]

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

[83] KGS GSP Eastside MAP, pp. 94-95, 208.
[84] 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.[85]

Corrective Action

g. The KGA GSP must provide and 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

[85] 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.[86]

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.[87]

Corrective Action

l. 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.

[86] KGA GSP North Kern Water Storage District/Shafter-Wasco Irrigation District MAP, pp. 209-225.
[87] 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.[88]

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

[88] 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.[89]

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 (7th 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.

[89] 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.[90]

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.[91]

[90] KGA GSP Shafter-Wasco Irrigation District (7th Standard Rd.) MAP, pp. 149,150,164,165.
[91] 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.[92]

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.

[92] 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.[93]

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

[93] 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.[94]

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.[95]

[94] KGA GSP Westside District Authority MAP, p.141, 142, 221, 222, 226-231.
[95] 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.[96]

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.[97]

- 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

[96] Kern River GSP, pp. 276-279.
[97] 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.[98]

[98] 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.[99]

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

[99] 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.[100]

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.[101]

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

[100] Buena Vista GSP, pp. 125; Kern River GSP, p. 1173.
[101] Henry Miller GSP, pp. 155, 160.

quality and subsidence, both of which can be exacerbated by lowering groundwater levels.
OLCESE GSP
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.[102] Department staff do not recommend any corrective actions at this time related to the Olcese GSP definition of groundwater level minimum thresholds.
ALL GSPs
Corrective Action 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.

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.[103] When describing the sustainable management criteria for land subsidence, a plan must include the cause of the groundwater conditions that would

[102] Olcese GSP, pp. 142, 143.
[103] Water Code § 10721(x)(5); 23 CCR § 354.26(a).

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

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.[107]

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.[108]

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).[109] For basins that establish management areas, undesirable results are required to be consistently defined throughout the Subbasin.[110]

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*

[104] 23 CCR § 354.26(b)(1).
[105] 23 CCR § 354.26(b)(2).
[106] 23 CCR § 354.26(b)(3).
[107] 23 CCR § 354.28(c)(5).
[108] 23 CCR § 354.28(d).
[109] 23 CCR § 354.26(d).
[110] 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*.[111]

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."[112] 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.[113] 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."[114]

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.[115] In reviewing the KGA GSP management area plans, some management areas did establish thresholds based on a rate or amount of subsidence,[116] others used groundwater levels as a proxy, [117] and some stated that subsidence didn't apply.[118] 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

[111] Kern County Subbasin Coordination Agreement, p. 300.
[112] KGA GSP, p. 150.
[113] KGA GSP, p. 150.
[114] KGA GSP, p. 192.
[115] KGA GSP, pp. 192, 196.
[116] 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.
[117] 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.
[118] KGA GSP Eastside WMA MAP, pp. 89-90; KGA GSP Kern Water Bank Authority MAP, p. 40; KGA GSP Shafter-Wasco ID 7th 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,[119] 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.[120] 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.[121] 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

[119] Water Code § 10720.1(e).
[120] Olcese GSP, pp. 139, 145.
[121] 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.[122] 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.

[122] 23 CCR §§ 354.28(e), 354.26(d).

4 STAFF RECOMMENDATION

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.

Appendix B

Checklist for GSP Submittal

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.			**Introduction to Plan Contents**					
			This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
SubArticle 1.			**Administrative Information**					
§ 354.2.			**Introduction to Administrative Information**					
			This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.4.			**General Information**					
			Each Plan shall include the following general information:					
(a)			An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.	17:29	ES			
(b)			A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.	184:185	References and Technical Studies			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
§ 354.6.			**Agency Information**					
			When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:					
(a)			The name and mailing address of the Agency.	34	3.1			
(b)			The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.	34	3.2			
(c)			The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.	34	3.3			
(d)			The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.	35	3.4			
(e)			An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.	35, 184:185	19.2			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.8, 10727.2, and 10733.2, Water Code.					
§ 354.8.			**Description of Plan Area**					
			Each Plan shall include a description of the geographic areas covered, including the following information:					
(a)			One or more maps of the basin that depict the following, as applicable:					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.	38:39, 53	5.1.1	PA-1		
	(2)		Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.	39, 53	5.1.2	PA-1		
	(3)		Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.	39, 53:54	5.1.3	PA-1:PA-2		
	(4)		Existing land use designations and the identification of water use sector and water source type.	39:40, 55	5.1.4	PA-3		
	(5)		The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.	40, 56	5.1.5	PA-4		
(b)			A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.	38:40	5.1.1:5.1.5			
(c)			Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.	41	5.2.1			
(d)			A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.	41:42	5.2.2			
(e)			A description of conjunctive use programs in the basin.	42	5.2.3			
(f)			A plain language description of the land use elements or topic categories of applicable general plans that includes the following:					
	(1)		A summary of general plans and other land use plans governing the basin.	42:47, 57:58	5.3.1:5.3.2	PA-5:PA-6		
	(2)		A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects	42:47	5.3.1:5.3.2			
	(3)		A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.	42:47	5.3.1:5.3.2			
	(4)		A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.	47	5.3.3			
	(5)		To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.	N/A				Not applicable - no land use plans outside the basin are anticipated to affect the Agency's ability to achieve sustainability
(g)			A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.	48:49	5.4			

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10720.3, 10727.2, 10727.4, 10733, and 10733.2, Water Code.					
§ 354.10.			**Notice and Communication**					
			Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:					
(a)			A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.	49:50	5.5.1, Appendix C			
(b)			A list of public meetings at which the Plan was discussed or considered by the Agency.	50	5.5.2, Appendix C			
(c)			Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.	51, 53	5.5.3, Appendix C		PA-1	
(d)			A communication section of the Plan that includes the following:					
	(1)		An explanation of the Agency's decision-making process.	51	5.5.4, Appendix C			
	(2)		Identification of opportunities for public engagement and a discussion of how public input and response will be used.	52	5.5.4, Appendix C			
	(3)		A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.	52	5.5.4, Appendix C			
	(4)		The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.	52	5.5.4, Appendix C			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.8, 10728.4, and 10733.2, Water Code					
SubArticle 2.			**Basin Setting**					
§ 354.12.			**Introduction to Basin Setting**					
			This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.14.			**Hydrogeologic Conceptual Model**					
(a)			Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.	60:71, 72:87	7	HCM-1:HCM-16		
(b)			The hydrogeologic conceptual model shall be summarized in a written description that includes the following:					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.	60	7.1.1			
	(2)		Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.	61, 72:73	7.1.2	HCM-1:HCM-2		
	(3)		The definable bottom of the basin.	61:62	7.1.3			
	(4)		Principal aquifers and aquitards, including the following information:					
		(A)	Formation names, if defined.	63, 74	7.1.4	HCM-3		
		(B)	Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.	64, 73:77	7.1.4	HCM-2: HCM-5		
		(C)	Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.	64:65, 74	7.1.4	HCM-3		
		(D)	General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.	61, 74:75, 92	7.1.4, Appendix D	HCM-7:HCM-8	GWC-1	
		(E)	Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.	66, 80	7.1.4	HCM-9		
	(5)		Identification of data gaps and uncertainty within the hydrogeologic conceptual model	70	7.4			
(c)			The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.	66:68, 81:83	7.2	HCM-10: HCM-12		
(d)			Physical characteristics of the basin shall be represented on one or more maps that depict the following:					
	(1)		Topographic information derived from the U.S. Geological Survey or another reliable source.	68, 84	7.3.1	HCM-13		
	(2)		Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.	68:69, 73:74	7.3.2	HCM-2, HCM-3		
	(3)		Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.	69, 85	7.3.3	HCM-14		
	(4)		Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.	69, 74, 79	7.3.4	HCM-3, HCM-8		
	(5)		Surface water bodies that are significant to the management of the basin.	70, 86	7.3.5	HCM-15		
	(6)		The source and point of delivery for imported water supplies.	70, 87	7.3.6	HCM-16		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10733, and 10733.2, Water Code.					
§ 354.16.			**Groundwater Conditions**					
			Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:					
(a)			Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.	88:89	8.1			Available data are limited, and not conducive to development of contour maps
	(2)		Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.	88:89, 96:97	8.1	GWC-1:GWC-2		
(b)			A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.	89:90, 98	8.2	GWC-3	GWC-2	
(c)			Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.	91	8.3			
(d)			Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.	91, 94:95	8.4, Appendix D		GWC-1	
(e)			The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	91:92, 99	8.5	GWC-4		
(f)			Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	92	8.6			
(g)			Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	92:93, 100:101	8.7	GWC-5		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, and 10733.2, Water Code.					
§ 354.18.			**Water Budget**					
(a)			Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.	103:140	9	WB-1:WB-14	WB-1:WB-7	
(b)			The water budget shall quantify the following, either through direct measurements or estimates based on data:					
	(1)		Total surface water entering and leaving a basin by water source type.	107:108, 119, 129:130	9.2.1	WB-3:WB-4	WB-2	
	(2)		Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.	108:109, 120:121, 131:132	9.2.2	WB-5:WB-6	WB-3	
	(3)		Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.	108:109, 120:121, 131:132	9.2.2	WB-5:WB-6	WB-3	

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		The change in the annual volume of groundwater in storage between seasonal high conditions.	109:110, 122:124, 134:138	9.2.3	WB-7:WB-12	WB-4:WB-6	
	(5)		If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.	111:112	9.2.4			
	(6)		The water year type associated with the annual supply, demand, and change in groundwater stored.	112, 123, 135:136	9.2.5	WB-9:WB-10	WB-5	
	(7)		An estimate of sustainable yield for the basin.	112:113	9.2.6			
(c)			Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:					
	(1)		Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.	115, 119:124, 139	9.3.2	WB-13	WB-2:WB-6	
	(2)		Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:					
		(A)	A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.	113	9.3.1			
		(B)	A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.	114, 119:124, 129:132	9.3.1	WB-3:WB-6	WB-2:WB-6	
		(C)	A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.	114	9.3.1			
	(3)		Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:					
		(A)	Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.	116:117, 140	9.4.1	WB-14		

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(B)	Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.	116:117	9.4.1			
		(C)	Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.	117, 125:126	9.4.2		WB-7	
(d)			The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:					
	(1)		Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.	104:107	9.1, Appendix E			
	(2)		Current water budget information for temperature, water year type, evapotranspiration, and land use.	104:107	9.1, Appendix E			
	(3)		Projected water budget information for population, population growth, climate change, and sea level rise.	104:107	9.1, Appendix E			
(e)			Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.	104:107	9.1, Appendix E			
(f)			The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.	117	9.4.3			Basin-wide water budget modeling using C2VSim-FG-Kern is discussed in Section 9.4.3
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10727.6, 10729, and 10733.2, Water Code.					
§ 354.20.			**Management Areas**					
(a)			Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define 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.	141	10			

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(b)			A basin that includes one or more management areas shall describe the following in the Plan:					
	(1)		The reason for the creation of each management area.	141	10.1			
	(2)		The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.	141	10.2			
	(3)		The level of monitoring and analysis appropriate for each management area.	141	10.3			
	(4)		An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.	141	10.2			
(c)			If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.	141	10.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
SubArticle 3.			**Sustainable Management Criteria**					
§ 354.22.			**Introduction to Sustainable Management Criteria**					
			This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.24.			**Sustainability Goal**					
			Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.	144	12			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10727, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.26.			**Undesirable Results**					
(a)			Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.	145:154	13			
(b)			The description of undesirable results shall include the following:					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.	146, 148, 150, 152, 154	13.1.2, 13.2.2, 13.4.2, 13.5.2, 13.6.1			
	(2)		The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.	146:148, 150:151, 153, 154	13.1.3, 13.2.3, 13.4.3, 13.5.3, 13.6.2			
	(3)		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 from undesirable results.	147:147 151, 153, 154	13.1.4, 13.2.4, 13.4.4, 13.5.4, 13.6.3			
(c)			The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.	146:148	13.1.3, 13.2.3			
(d)			An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.	148:149	13.3			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.28.			**Minimum Thresholds**					
(a)			Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.	143, 155:159, 163	14	SMC-1	SMC-1	
(b)			The description of minimum thresholds shall include the following:					
	(1)		The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.	155:159	14			
	(2)		The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.	155:159	14			
	(3)		How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.	155:159	14			

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.	155:159	14			
	(5)		How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.	155:159	14			
	(6)		How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.	143, 155:159	14		SMC-1	
(c)			Minimum thresholds for each sustainability indicator shall be defined as follows:					
	(1)		Chronic Lowering of Groundwater Levels. The minimum threshold 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. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:					
		(A)	The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.	155:157	14.1		SMC-2	
		(B)	Potential effects on other sustainability indicators.	156:157	14.1			
	(2)		Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.	157	14.2			
	(3)		Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:					
		(A)	Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.	157	14.3			
		(B)	A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.	157	14.3			
	(4)		Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.	158	14.4			
	(5)		Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(A)	Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.	158	14.5			
		(B)	Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.	N/A	14.5	GWC-4		Figure GWC-4 presents available land subsidence data. No SMCs for subsidence are defined at this time.
	(6)		Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:					
		(A)	The location, quantity, and timing of depletions of interconnected surface water.	159	14.6			
		(B)	A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.	159	14.6			No SMCs for depletion of interconnected surface waters are defined at this time. Section 14.6 describes a project to monitor shallow groundwater levels to assess the degree of potential interconnection with surface water.
(d)			An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.	158	14.2			
(e)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.	157, 159	14.3, 14.6			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10733, 10733.2, and 10733.8, Water Code.					
§ 354.30.			**Measurable Objectives**					
(a)			Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.	160:163	15	SMC-1	SMC-3	
(b)			Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.	160:163	15			
(c)			Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.	160:162	15.1.1, 15.2, 15.4			

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(d)			An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.	161	15.2			
(e)			Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.	161	15.1.2			
(f)			Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.	N/A				Not applicable - no additional Plan elements were incorporated into Sustainability Criteria.
(g)			An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.	N/A				Not applicable - all measurable objectives tied to reasonable margin of operational flexibility.
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					
SubArticle 4.			**Monitoring Networks**					
§ 354.32.			**Introduction to Monitoring Networks**					
			This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.34.			**Monitoring Network**					
(a)			Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.	164:167, 170:172	16.1	MN-1	MN-1	
(b)			Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:					
	(1)		Demonstrate progress toward achieving measurable objectives described in the Plan.	164:167	16.1			
	(2)		Monitor impacts to the beneficial uses or users of groundwater.	164:167	16.1			

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.	164:167	16.1			
	(4)		Quantify annual changes in water budget components.	164:167	16.1			
(c)			Each monitoring network shall be designed to accomplish the following for each sustainability indicator:					
	(1)		Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:					
		(A)	A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.	165:166	16.1.1			
		(B)	Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.	165:166	16.1.1			
	(2)		Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.	166	16.1.2			
	(3)		Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.	166	16.1.3			
	(4)		Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.	166:167	16.1.4			
	(5)		Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.	167	16.1.5			
	(6)		Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:					
		(A)	Flow conditions including surface water discharge, surface water head, and baseflow contribution.	167	16.1.6			
		(B)	Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.	167	16.1.6			
		(C)	Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.	167	16.1.6			
		(D)	Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.	167	16.1.6			
(d)			The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.	164:167	16.1			

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(e)			A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.	164:167	16.1			
(f)			The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:					
	(1)		Amount of current and projected groundwater use.	164:167	16.1			
	(2)		Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.	164:167	16.1			
	(3)		Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.	164:167	16.1			
	(4)		Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.	164:167	16.1			
(g)			Each Plan shall describe the following information about the monitoring network:					
	(1)		Scientific rationale for the monitoring site selection process.	164:167	16.1			
	(2)		Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.	164:167	16.1			
	(3)		For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.	156, 164:167	16.1		SMC-3	
(h)			The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.	164:167, 170-172	16.1	MN-1	MN-1	
(i)			The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.	168	16.2, Appendix F			
(j)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.	166, 167	16.1.3, 16.1.6			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, 10728, 10733, 10733.2, and 10733.8, Water Code					
§ 354.36.			**Representative Monitoring**					
			Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(a)			Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.	168	16.3			
(b)			(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:					
	(1)		Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.	168	16.3			
	(2)		Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.	160	15.1.1			
(c)			The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.	168	16.3			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2 and 10733.2, Water Code					
§ 354.38.			**Assessment and Improvement of Monitoring Network**					
(a)			Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.	168	16.4			
(b)			Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.	168	16.4			
(c)			If the monitoring network contains data gaps, the Plan shall include a description of the following:					
	(1)		The location and reason for data gaps in the monitoring network.	168	16.4.2			
	(2)		Local issues and circumstances that limit or prevent monitoring.	168	16.4.2			
(d)			Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.	168	16.4.2			
(e)			Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:					
	(1)		Minimum threshold exceedances.	168	16.4			
	(2)		Highly variable spatial or temporal conditions.	168	16.4			
	(3)		Adverse impacts to beneficial uses and users of groundwater.	168	16.4			
	(4)		The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.	168	16.4			
			Note: Authority cited: Section 10733.2, Water Code.					

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Reference: Sections 10723.2, 10727.2, 10728.2, 10733, 10733.2, and 10733.8, Water Code					
§ 354.40.			**Reporting Monitoring Data to the Department**					
			Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.					
SubArticle 5.			**Projects and Management Actions**					
§ 354.42.			**Introduction to Projects and Management Actions**					
			This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.44.			**Projects and Management Actions**					
(a)			Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.	173:176	17, 18			
(b)			Each Plan shall include a description of the projects and management actions that include the following:					
	(1)		A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:					
		(A)	A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.	174:176	18		PMA-1	
		(B)	The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.	174:176	18		PMA-1	
	(2)		If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.	174:176	18		PMA-1	
	(3)		A summary of the permitting and regulatory process required for each project and management action.	174:176	18		PMA-1	

Article 5.			Plan Contents for Kern County Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.	174:176	18		PMA-1	
	(5)		An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.	174:176	18		PMA-1	
	(6)		An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.	174:176	18		PMA-1	
	(7)		A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.	174:176	18		PMA-1	
	(8)		A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.	174:176	18		PMA-1	
	(9)		A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.	174:176	18		PMA-1	
(c)			Projects and management actions shall be supported by best available information and best available science.	174:175	18			
(d)			An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.	174:175	18			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

Appendix C

Undistricted Lands Outside of Olcese GSA Area Covered by Olcese GSP

TABLE C-1

Undistricted Lands Outside of Olcese GSA Area Covered by Olcese GSP

Olcese Groundwater Sustainability Agency

Kern Subbasin

Property Owner Name	APN	Acres in Kern Basin	Total Acres	Land Use	Well Information (1)
Nickel Family LLC	093-291-24	35.7	240	Unirrigated	No wells, per DWR well completion report database
Nickel Family LLC	397-020-11	135.9	480	Unirrigated	No wells, per DWR well completion report database
Nickel Family LLC	397-040-05	49.1	625.24	Unirrigated	No wells, per DWR well completion report database
Nickel Family LLC	397-040-08	245.3	320	Unirrigated	Parcel may have a production well; to be verified
Nickel Family LLC	397-040-14	43.1	80	Unirrigated	Parcel may have a production well; to be verified
Nickel Family LLC	387-060-24	57.08	57.08	Unirrigated	Parcel may have a production well and/or domestic well; to be verified
Nickel Family LLC	387-060-05	76.96	76.96	Unirrigated	Parcel may have a production well and/or domestic well; to be verified
		TOTAL	**TOTAL**		
		643.14	1879.28		

Abbreviations

APN = Assessor's Parcel Number

DWR = California Department of Water Resources

GSP = Groundwater Sustainability Plan

Notes

(1) Well information based on DWR Well Completion Report Map Application, accessed 8/26/2019. (https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37

093-291-24

397-020-11

397-040-05

397-040-08

397-040-14

387-060-24

387-060-05

Legend

GSA Name (see Note 2)

- Olcese GSA
- Olcese Water District
- Kern County Subbasin (DWR 5-022.14)
- Undistricted Lands Covered by Olcese GSP (label shows APN)

Abbreviations

APN	= Assessor's Parcel Number
DWR	= California Department of Water Resources
GSA	= Groundwater Sustainability Agency
GSP	= Groundwater Sustainability Plan

Notes

1. All locations are approximate.
2. Only the Olcese GSA is shown.

Source

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User

N

0 0.6 1.2

Miles

Undistricted Lands Outside of Olcese GSA Area Covered by Olcese GSP

Olcese Water District
Kern County, CA
December 2019
B70052.03

Figure C-1

eki environment & water

Path: X:\B70052\Maps\20191121\Fig. B-1 UndistrictedLands.mxd

Sustainable Groundwater Management Act
GSA Inclusion Agreement with
Olcese Groundwater Sustainability Agency

This Sustainable Groundwater Management Act GSA Inclusion Agreement with Olcese Groundwater Sustainability Agency ("Agreement") is made and entered into this 6th day of January, 2020, by and between the **Olcese Groundwater Sustainability Agency** ("Olcese GSA") and **Nickel Family, LLC** ("Landowner"). Olcese GSA and Landowner are sometimes each individually referred to herein as a "Party" and collectively as the "Parties."

RECITALS

WHEREAS, Olcese Water District ("District") is a California Water District comprising approximately 5,100 acres situated in Kern County, California; and

WHEREAS, the Sustainable Groundwater Management Act ("SGMA") provides that all basins designated as critically overdrafted high-priority basins shall be managed under a Groundwater Sustainability Plan ("GSP") or a coordinated GSP by January 31, 2020; and

WHEREAS, in an effort to better serve its landowners and their lands located within the District boundaries and to provide for the sustainable management of groundwater underlying such lands, the District decided to become a Groundwater Sustainability Agency ("GSA") under SGMA and formed the Olcese Groundwater Sustainability Agency ("Olcese GSA"); and

WHEREAS, the Olcese GSA is the exclusive GSA under SGMA for those lands within the District boundaries that also overlie a portion of the Kern County Sub-basin (Basin Number 5-022.14, DWR Bulletin 118); and

WHEREAS, Landowner is an individual, or authorized agent of an entity, owning real property in Kern County, California, which is described on Exhibit A and generally shown on Exhibit B, attached hereto and incorporated by reference, the portion of those parcels overlying the Basin as currently existing or as modified in the future are identified herein as ("Landowner Land") and the subject of the Agreement; and

WHEREAS, the Olcese GSA's boundaries and the Landowner Land are both overlying the Kern County Sub-basin (Basin Number 5-022.14, DWR Bulletin 118) within the San Joaquin Valley Groundwater Basin ("Basin"), a California Department of Water Resources ("DWR") designated high-priority and critically overdrafted basin and, therefore, the Basin, and all portions thereof, must be managed by a local agency under a GSP by January 31, 2020; and

WHEREAS, Olcese GSA is working to develop and implement a GSP to manage its portion of the Kern County Sub-basin; and

WHEREAS, with respect to SGMA jurisdictional considerations, the Landowner Land is located outside of the boundaries of the Olcese GSA but within the jurisdictional boundaries of the Kern County Water Agency, which is a member of the Kern Groundwater Authority ("KGA"), but is not otherwise affiliated with a member of the KGA; and

WHEREAS, the Landowner Land is presently not covered by a GSP; and

WHEREAS, Landowner desires that the Landowner Land be included in, and subject to, the Olcese GSA to afford GSP coverage to the Landowner Land for the purpose of ensuring SGMA coverage for the Landowner Land through the GSP prepared by the Olcese GSA; and

WHEREAS, the Landowner intends to waive certain provisions of SGMA that may limit Olcese GSA's SGMA jurisdiction over the Landowner Land, and expressly requests that Landowner Land be managed pursuant to SGMA by the Olcese GSA; and

WHEREAS, the approval of any GSP governing the Landowner Land will ultimately lie with the Olcese GSA and the State of California, which will consider the completeness and effectiveness of the GSP to be developed under SGMA; and

WHEREAS, due to the mandated deadlines of SGMA and its associated regulations, the Olcese GSA agrees to initiate proceedings to amend the area to be covered by its GSP to include Landowner Land, but must also concurrently continue preparation of its GSP, and thus, the Landowner consents and authorizes the Olcese GSA to hire the necessary consultants on behalf of the Landowner to be included in the District's GSP and any such fees or costs of such consultants (i.e., engineers, attorneys, accountants, etc.) shall be borne solely by the Landowner and paid promptly upon being invoiced by the Olcese GSA: and

WHEREAS, the Parties do not intend that the inclusion of the Landowner Land within the Olcese GSA's GSP, or this Agreement, in any way provides Landowner Land with a right to any portion of the water supplies whatsoever, and that it is a material provision of this Agreement that Landowner knowingly and voluntarily waive any claim it may have for any additional water supplies from the District or the Olcese GSA; and

WHEREAS, the Olcese GSA has or will work with the KGA, DWR and all other necessary parties to modify GSA boundaries to reflect the addition of Landowner Land into the Olcese GSA, but it is understood that such a boundary adjustment may not occur until after GSPs are approved.

NOW, THEREFORE, in consideration of the foregoing Recitals and the following terms and conditions, it is agreed by and between the Parties as follows:

I. PURPOSE OF AGREEMENT

The Parties enter into this Agreement solely for the purpose of providing the Landowner with a process to attempt to comply with SGMA through the inclusion of the Landowner Land within the Olcese GSA and its GSP. Neither the Olcese GSA, the District, nor any landowners within the District's current boundaries are committing anything to the Landowner Land except for the inclusion of the Landowner Land within the Olcese GSA and its GSP, provided that Landowner complies with the terms of this Agreement. This Agreement is intended to form the basis of the Parties' understanding regarding the terms and conditions of including the Landowner Land within the Olcese GSA and its GSP, and their individual rights and responsibilities subsequent to such inclusion.

II. TERMS AND CONDITIONS OF INCLUDING LANDOWNER LAND WITHIN THE OLCESE GSA AND ITS GSP

1. Commitment to Include Landowner Land in Olcese GSA and its GSP. The Olcese GSA hereby agrees to make reasonable efforts to include the Landowner Land within the Olcese GSA and ultimately within the Olcese GSA's GSP, and the Landowner hereby agrees for the Landowner Land to be included within the Olcese GSA and its GSP, and Landowner consents to jurisdiction of the Olcese GSA to adopt and implement a GSP including the Landowner Land, provided that such inclusion is approved by all necessary governmental bodies and the Parties have complied with all provisions of this Agreement. In that regard, a condition precedent to this Agreement becoming and remaining effective is that the Olcese GSA maintain SGMA jurisdiction over the Landowner Land. Landowner acknowledges that there might be additional reporting requirements, monetary charges, or compliance measures imposed upon Landowner in connection with SGMA by DWR, the State Water Resources Control Board, the courts, or other agencies or bodies with the authority to enforce terms and conditions of SGMA separate from the Olcese GSA under this Agreement. Landowner acknowledges and agrees that the Olcese GSA has no duty under this Agreement to prevent such compliance measures from being imposed on Landowner.

2. Landowner Cooperation. The Landowner shall be independently responsible to provide information and funding at the request of the Olcese GSA to maintain and support the efforts to include the Landowner Land within the Olcese GSA's GSP so as to comply with SGMA and any future statutory laws and regulations that may be adopted to amend SGMA, supplement SGMA, replace SGMA, or other laws or regulations adopted to engage in the sustainable management of groundwater in relation to the Landowner Land. Landowner shall comply with the Olcese GSA's GSP, as adopted and as may be amended from time to time.

3. Regulation Contingent on Funding. The Olcese GSA and the Landowner acknowledge that funding for the Olcese GSA's efforts hereunder shall be provided on a long-term basis through the development and subsequent payment by the Landowner of a land-based fee or assessment and/or water charge as authorized by SGMA or other legally

authorized fee or funding mechanism (collectively "Charges") as reasonably determined by the Olcese GSA. Landowner acknowledges and agrees that the inclusion of the Landowner Land within the Olcese GSA and its GSP are contingent upon Landowner's regular and timely payment of the Charges which may include, but are not limited to, (1) the general administrative expenses attributable to the Olcese GSA's efforts hereunder, (2) the Landowner's pro-rata share of costs for consultants retained by the Olcese GSA, and (3) any other costs incurred by the Olcese GSA which are attributable to the inclusion of the Landowner Land.

Upon final execution of this Agreement, Landowner shall pay the Olcese GSA Twenty-Five Dollars ($25.00) per acre of Landowner Land as an initial payment to assist the funding of the Olcese GSA's (and necessary consultants') efforts made to include the Landowner Land in the Olcese GSA, and any other activities related to the GSP processes.

4. Determination of Funding Obligation. The amount of any additional payments required for Charges and/or services rendered by the Olcese GSA or others for the purposes of fulfilling the obligations set forth herein, or the formula for the calculation of such payments, and the method of such payments, shall be determined by the Olcese GSA, in consultation with the Landowner. Notwithstanding any provision of law, the Landowner consents to a fee, charge and/or assessment being levied on Landowner Land for such Charges.

5. Failure to Satisfy Funding Obligation & GSP Requirements. Landowner acknowledges and agrees that if, for any reason, the Landowner refuses or otherwise fails to remit any payment required hereunder, in the amount and using the method determined and requested by the Olcese GSA, or fails to comply with the requirements of the GSP and its management and regulation ("Defaulted Landowner"), the Olcese GSA:

(a) shall be relieved of any and all obligation to proceed with including the Defaulted Landowner Land within the Olcese GSP and Olcese GSA, if and to the extent the Landowner Land has not been included within the Olcese GSA; and

(b) shall be relieved of any and all obligation to provide the services and obligations enumerated in this Agreement to the Defaulted Landowner; and

(c) may, in its sole and absolute discretion, seek to remove the Defaulted Landowner Land from the Olcese GSA and its GSP at Defaulted Landowner's expense, and in such event, the Defaulted Landowner agrees to obtain regulation under, and compliance with, SGMA by some other method separate and apart from the Olcese GSA; and

(d) may, in its sole and absolute discretion, place a lien upon the Landowner Land for amounts due but not paid, and/or seek specific

performance or obtain any other remedy or relief available at law or in equity; and

(e) may, in its sole and absolute discretion, apply amounts due under this Agreement but not paid to the assessment/charges/water tolls assessed or charged to lands within the District that Landowner owns; and

(f) shall have no obligation to reimburse Landowner for any Charges paid to date.

6. No Protest in Case of Removal of Defaulted Landowner Land; Duty to Cooperate. Landowner hereby agrees that if the Landowner breaches the terms of this Agreement, including but not limited to, by refusing or failing to remit any payment required herein, following thirty (30) days written notice of alleged breach and Defaulted Landowner's failure to timely cure such breach, the Olcese GSA may, in its sole and absolute discretion, seek to remove the Defaulted Landowner Land, at the Defaulted Landowner's expense, from the Olcese GSA and GSP, and if the Olcese GSA does so, the Landowner shall not lodge any protest, participate in any protest hearing, or act in any way to influence the outcome of the Olcese GSA's decision, and the Olcese GSA shall have no further obligation to Landowner to provide any services hereunder. Landowner further agrees to work in good faith with the Olcsse GSA to provide the Olcese GSA any materials or information in Landowner's possession or control that may, in the Olcese GSA's sole determination, be necessary or appropriate to effectuate the Olcese GSA's decision to remove the Defaulted Landowner Land from the Olcese GSA and its GSP, including, but not limited to, providing timely responses to requests for information and meetings with Olcese GSA representatives to establish terms of removal.

7. Disclaim Water Rights. (a) Landowner expressly disclaims any right to any District water rights or supplies (surface or groundwater) or facility now or in the future, except as may be obtained through a negotiated purchase, transfer, or exchange that Landowner has obtained or may obtain wholly outside of this Agreement and not related to this Agreement. Landowner understands and agrees that as a result of the foregoing disclaimer, among other things, inclusion of the Landowner Land within the Olcese GSA or it GSP will not entitle the Landowner to receive any portion of the District's water supply or other District facilities or assets. Landowner further understands and agrees that the sole purpose of this Agreement is to provide the Landowner a process to obtain coverage by the Olcese GSA's GSP, and thus, SGMA compliance for the Landowner by affording Landowner the benefit of inclusion within the Olcese GSA. The Landowner further understands and agrees that any other benefits accruing to the Landowner Land and/or to Landowner as a result of this Agreement are purely incidental and shall not give rise to any expectation, entitlement, or right to District water supplies or assets of any kind, including, but not limited to, Kern River water, State Water Project water, Central Valley Project water, carryover supplies, supplies from any lake, river, stream, creek, manmade conveyance, or aquifer that the District purchases, acquires, transfers, exchanges, takes receipt of or otherwise controls, including groundwater supplies or any return flows that may enter the underground aquifer as a result of delivery within District of any of the

foregoing water supplies, or any District-banked supplies including banking losses of water management programs, or any other designation or classification of District water whatsoever, whether in existence at the time this Agreement is executed or created at some future time.

(b) As a material provision of this Agreement, Landowner expressly agrees, acknowledges, and understands that the Olcese GSA was formed to better serve the Olcese Water District landowners located within the District boundaries and to provide for the sustainable management of groundwater underlying such lands, and that to the extent any additional water supplies may be needed for sustainability purposes now or in the future, such water supplies would be obtained by the District for the benefit of District lands. **Landowner expressly disclaims and waives any claim or right that the Olcese GSA must or should obtain any water supplies, and understands that to the extent water supplies are needed, such supplies will be obtained by the Olcese Water District for the benefit of Olcese Water District lands, and will not be obtained by the Olcese GSA, and hence, would not be available to lands outside the District boundaries.**

(c) Landowner recognizes that absent an imported supplemental surface water supply presently available to Landowner Land, which is either provided directly by the District or other sources, or indirectly through the District's project, and through the approved GSP, the **Landowner's ability to pump groundwater for use upon Landowner Land in the future may be limited.**

8. No Voluntary Consent. Once the Landowner Land is included within the Olcese GSA's GSP and the GSP is approved by DWR, the Landowner hereby agrees not to consent to the inclusion of any portion of the Landowner Land within another GSP developed by any entity other than the Olcese GSA without the Olcese GSA's express prior written consent.

9. Withdrawal of Landowner. Until the GSP is adopted by the Olcese GSA, the Landowner may elect to withdraw from this Agreement and be excluded from the Olcese GSA and its GSP, and instead be included within another GSP developed by another GSA or otherwise seek alternative lawful SGMA compliance, by providing written notice to the Olcese GSA. If Landowner elects to withdraw, then the Landowner shall be responsible for advance payment of all costs and obligations associated with the withdrawal, including but not limited to, any amendments or revisions of the Olcese GSA's GSP that may be required to maintain compliance with SGMA in the event of their withdrawal. The Olcese GSA may impose additional requirements upon any withdrawing Landowner, to ensure compliance with SGMA, the GSP, and to satisfy any financial obligations resulting from the withdrawal of such Landowner. Upon withdrawal, the Landowner shall arrange for the withdrawn lands to be covered by another GSP developed by another GSA or otherwise seek alternative lawful SGMA compliance, so that such lands of the withdrawing Landowner would continue to be compliant with SGMA. Any withdrawal from Olcese GSA's GSP shall not be effective unless and until the withdrawing Landowner has made such arrangements and the alternative means of SGMA compliance is effective for such lands of the withdrawing Landowner.

10. Covenant Not to Sue or Contest. In consideration of the Olcese GSA's inclusion of Landowner Land into the Olcese GSA's GSP Chapter, Landowner shall not (1) sue or take any judicial or administrative action against the Olcese GSA, for any claims related to the Olcese GSA's GSP or SGMA, or (2) contest or challenge, directly or indirectly, the Olcese GSA's GSP, as adopted and as may be amended. The Landowner acknowledges and agrees that initiation of a lawsuit, judicial, or administrative action against the Olcese GSA for claims related to the Olcese GSA's GSP or SGMA will render the Landowner initiating the action a Defaulted Landowner (as defined by Section 4 of this Agreement).

11. Notice of Agreement. The Landowner agrees to provide a copy of this Agreement to each and every person who receives any interest in any portion of the Landowner Land.

12. Runs with the Land. The benefits and burdens of this Agreement are intended to attach to and run with the land particularly described in Exhibit A to this Agreement which also overlies the Basin, are related to the direct benefit, use, maintenance and improvement of the Landowner Land, and shall be binding on and inure to the benefit of the Parties and their respective legal representatives, successors, heirs and assigns. It is the intent of the Landowner, from the date of this Agreement, that the equitable servitudes, covenants, conditions, restrictions, assessments and other duties and obligations herein contained, as may be required from time to time by the Olcese GSA, or contained in the Olcese GSA's GSP, as may be amended from time to time (so long as such lands have not been withdrawn pursuant to Section 9 hereof), run with the land and shall be binding on any successors or assigns. All persons or entities claiming under the Parties, or who accept deeds, leases, easements or other grants of conveyances to any portion of the Landowner Land, agree that they shall be personally bound by all of the provisions of this Agreement, and shall conform to and observe the provisions of this Agreement and the Olcese GSA's GSP. The Parties agree that a covenant evidencing this Agreement and its nature as attaching to and running with the land, shall be executed by the Landowner and recorded with the Clerk/Recorder of the County of Kern as a condition to the inclusion of the Landowner Land within the Olcese GSA's GSP. Upon withdrawal of Landowner Land, pursuant to Section 9 hereof, a notice to such effect shall also be executed and recorded.

13. Entire Agreement; Amendments or Modifications. The Parties agree that this Agreement contains the entire Agreement and understanding concerning the subject matter among the Parties and supersedes and replaces all prior negotiations of proposed agreements, written or oral, if any. This Agreement shall not be amended or modified except in writing, executed and agreed to by all of the Parties to this Agreement.

14. Effective Illegality. If any paragraph, sentence, clause, or phrase becomes illegal, null, or void for any reason or is held by any court of competent jurisdiction to be illegal, null, void, or against public policy, the remaining paragraphs, sentences, clauses, or phrases are not affected, and the Parties must negotiate an equitable adjustment of the affected provision with a view toward effecting the purpose of this Agreement.

15. Construction of Agreement. Headings are used for convenience only and have no force or effect in the construction or interpretation of this Agreement. As used in this Agreement, the singular includes the plural and the masculine includes the feminine and neuter. This Agreement is a joint product of all Parties and is to be interpreted as such. This Agreement: (1) shall not be construed against the Party preparing it; (2) shall be construed as if the Parties had jointly prepared this Agreement; and (3) shall be deemed their joint work product. Each and every provision of this Agreement shall be construed as though the Parties participated equally in the drafting hereof, and, therefore, any uncertainty or ambiguity shall not be interpreted against any one Party. As a result of the foregoing, any rule of construction that a document is to be construed against the drafter shall not be applicable.

16. No Third-Party Rights. Nothing in this Agreement, whether expressed or implied, either is intended, or is to be construed, or otherwise interpreted as, conferring any rights or remedies on any third parties. Also, nothing in this Agreement gives any third parties any rights of subrogation against any Party.

17. Governing Law and Venue. This Agreement is entered into and performed in the State of California and is to be interpreted pursuant to the internal substantive law, and not the law of conflicts, of the State of California. Venue in any action brought under this Agreement shall be in the Superior Court of the County of Kern, State of California.

18. Indemnification. The Landowner ("Indemnifying Party") shall protect, defend, indemnify and hold harmless the Olcese GSA and its directors, officials, officers, managers, employees, contractors and agents ("Indemnified Party") from and against all liabilities, obligations, claims, damages, penalties, causes of action, costs and expenses (including, without limitation, attorneys' fees and expenses) imposed upon, incurred by, or asserted against an Indemnified Party arising out of, resulting from, or in connection with (a) any indemnification obligation undertaken by the Olcese GSA with respect to the Landowner or the Landowner Land, or (b) any action taken or omitted to be taken by the Indemnifying Party under or related to this Agreement, including but not limited to the following: (i) the actions or omissions by Landowner or Landowner's affiliates, members, managers, employees, contractors and agents related to this Agreement and/or the Olcese GSA's GSP; (ii) the Landowner's or Landowner's affiliates', members', managers', employees', contractors' and agents' violation of any applicable laws or regulations; (iii) the failure on the part of Landowner or Landowner's affiliates to perform or comply with any of the terms of this Agreement and/or the Olcese GSA's GSP, or (iv) the inclusion of the Landowner Land in the Olcese GSA's GSP, provided, however, that such indemnity shall not extend to any such suit, claim, or damage to the extent caused solely by the negligent or wrongful acts or omissions of any Indemnified Party. The indemnification provisions in this section shall survive expiration or termination of this Agreement, and shall not be restricted to insurance proceeds, if any, received by the Olcese GSA or its directors, officials, officers, managers, employees, contractors and agents.

19. SGMA Jurisdictional Waiver. Landowner knowingly and voluntarily waives any provision of SGMA, the regulations implementing SGMA, or other provision of law that limits or restricts Olcese GSA's SGMA jurisdiction over Landowner Land, including the provision of Water Code section 10726.8 (b) which states, among other matters, "Nothing in this part shall be construed as authorizing a local agency to ... impose fees or regulatory requirements on activities outside the boundaries of the local agency." Landowner expressly waives such provision(s) and expressly requests and authorizes the Olcese GSA to impose SGMA-related fees and regulatory requirements on activities related to Landowner Land, as set forth in this Agreement.

20. Effective Date and Term of Agreement. The effective date of this Agreement shall be the date last signed below. This Agreement shall remain in effect with respect to each particular Landowner unless and until (a) such Landowner fails to perform according to the terms of this Agreement; (b) such Landowner withdraws from the Agreement, and the Olcese GSA approves the withdrawal, pursuant to Section 9 hereof; (c) the Landowner fails to perform according to the terms of this Agreement; or (d) inability of Olcese GSA to include Landowner Land within the Olcese GSA within a reasonable time..

[*signatures and property descriptions on following pages*]

LANDOWNER

Signature

James L. Nickel, President

Name and Title

01-07-2020

Date

OLCESE GROUNDWATER SUSTAINABILITY AGENCY

Signature

James L. Nickel, President

Name and Title

01-07-2020

Date

EXHIBIT A

Landowner Land Property Descriptions
Total of 643.14 Acres

The 35.7 acres of APN 093-291-24, Section 33, Township 28S, Range 29E located in the Kern Sub-basin owned by Nickel Family LLC

The 135.9 acres of APN 397-020-11, Section 8, Township 29S, Range 30E located in the Kern Sub-basin owned by Nickel Family LLC

The 49.1 acres of APN 397-040-05, Section 16, Township 29S, Range 30E located in the Kern Sub-basin owned by Nickel Family LLC

The 245.3 acres of APN 397-040-08, Section 20, Township 29S, Range 30E located in the Kern Sub-basin owned by Nickel Family LLC

The 43.1 acres of APN 397-040-14, Section 20, Township 29S, Range 30E located in the Kern Sub-basin owned by Nickel Family LLC

The 57.08 acres of APN 387-060-24, NE Quarter Section 24, Township 29S, Range 29E located in the Kern Sub-basin owned by Nickel Family LLC

The 76.96 acres of APN 387-060-05, Section 24, Township 29S, Range 29E located in the Kern Sub-basin owned by Nickel Family LLC

EXHIBIT B
Landowner Map

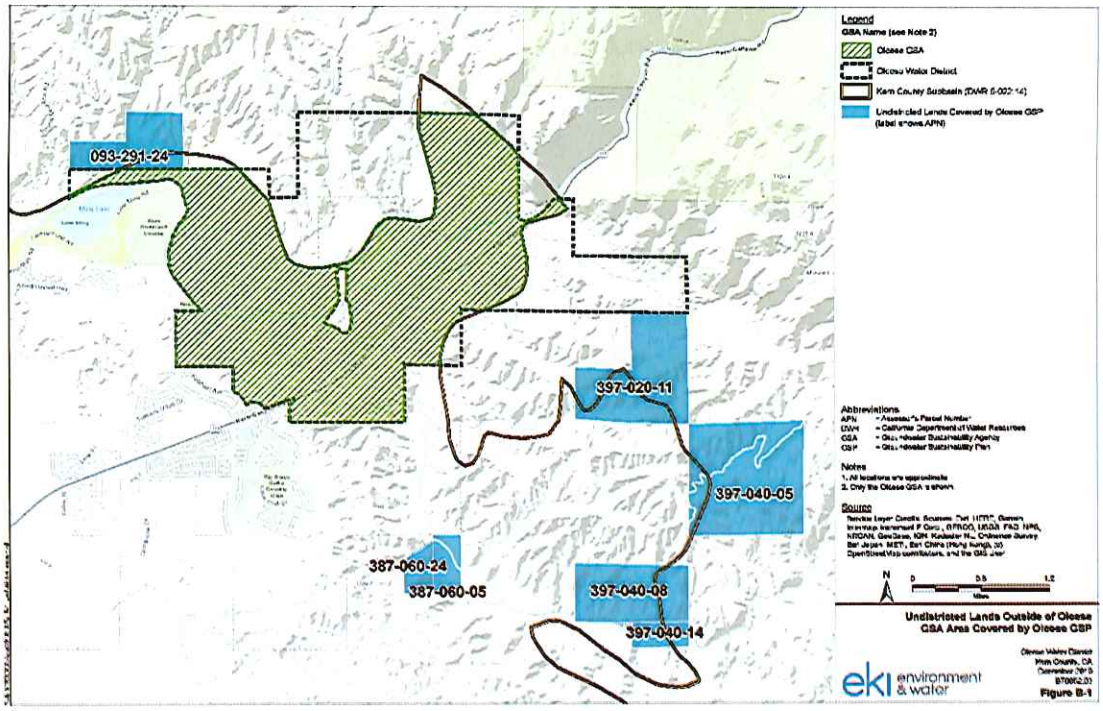

TABLE B-1
Undistricted Lands Outside of Olcese GSA Area Covered by Olcese GSP
Olcese Groundwater Sustainability Agency
Kern Subbasin

Property Owner Name	APN	Acres in Kern Basin	Total Acres	Land Use	Well Information (1)
Nickel Family LLC	093-291-24	35.7	240	Unirrigated	No wells, per DWR well completion report database
Nickel Family LLC	397-020-11	349.9	480	Unirrigated	No wells, per DWR well completion report database
Nickel Family LLC	397-040-05	49.1	625.24	Unirrigated	No wells, per DWR well completion report database
Nickel Family LLC	397-040-08	245.3	320	Unirrigated	Parcel may have a production well; to be verified
Nickel Family LLC	397-040-14	43.1	80	Unirrigated	Parcel may have a production well; to be verified
Nickel Family LLC	387-060-24	57.08	57.08	Unirrigated	Parcel may have a production well and/or domestic well; to be verified
Nickel Family LLC	387-060-05	76.96	76.96	Unirrigated	Parcel may have a production well and/or domestic well; to be verified
		TOTAL	TOTAL		
		643.14	1879.28		

Abbreviations
APN = Assessor's Parcel Number
DWR = California Department of Water Resources
GSP = Groundwater Sustainability Plan

Notes
(1) Well information based on DWR Well Completion Report Map Application, accessed 8/26/2019. (https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2du28f8623a37)

EXHIBIT C

Proof of Recordation of this Agreement

CALIFORNIA CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)

County of Kern)

On January 7, 2020 before me, Stefanie Wickensheimer, Notary Public
(here insert name and title of the officer)

personally appeared James L. Nickel

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____ (Seal)

STEFANIE WICKENSHEIMER
COMM. #2160280
Notary Public - California
Kern County
My Comm. Expires July 18, 2020

Optional Information

Although the information in this section is not required by law, it could prevent fraudulent removal and reattachment of this acknowledgment to an unauthorized document and may prove useful to persons relying on the attached document.

Description of Attached Document

The preceding Certificate of Acknowledgment is attached to a document titled/for the purpose of _____

containing _____ pages, and dated _____.

The signer(s) capacity or authority is/are as:

- ☐ Individual(s)
- ☐ Attorney-in-Fact
- ☐ Corporate Officer(s) _____ Title(s)
- ☐ Guardian/Conservator
- ☐ Partner - Limited/General
- ☐ Trustee(s)
- ☐ Other: _____

representing: _____ Name(s) of Person(s) or Entity(ies) Signer is Representing

Additional Information

Method of Signer Identification

Proved to me on the basis of satisfactory evidence:
○ form(s) of identification ○ credible witness(es)

Notarial event is detailed in notary journal on:
Page # _____ Entry # _____

Notary contact: _____

Other

☐ Additional Signer(s) ☐ Signer(s) Thumbprint(s)

☐ _____

CALIFORNIA CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

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personally appeared James L. Nickel

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who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

STEFANIE WICKENSHEIMER
COMM. #2160280
Notary Public - California
Kern County
My Comm. Expires July 18, 2020

Signature _____

(Seal)

Optional Information

Although the information in this section is not required by law, it could prevent fraudulent removal and reattachment of this acknowledgment to an unauthorized document and may prove useful to persons relying on the attached document.

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titled/for the purpose of _____

_____,

containing _____ pages, and dated _____.

The signer(s) capacity or authority is/are as:

- ☐ Individual(s)
- ☐ Attorney-in-Fact
- ☐ Corporate Officer(s) _____
  Title(s)
  _____
- ☐ Guardian/Conservator
- ☐ Partner - Limited/General
- ☐ Trustee(s)
- ☐ Other: _____

representing: _____
Name(s) of Person(s) or Entity(ies) Signer is Representing

_____.

Additional Information

Method of Signer Identification

Proved to me on the basis of satisfactory evidence:
○ form(s) of identification ○ credible witness(es)

Notarial event is detailed in notary journal on:
Page # _____ Entry # _____

Notary contact: _____

Other

☐ Additional Signer(s) ☐ Signer(s) Thumbprint(s)

☐ _____

Appendix D

Stakeholder Communications and Engagement Plan

Stakeholder Communication and Engagement Plan

Olcese Groundwater Sustainability Agency

Kern County Subbasin

FINAL

15 November 2018

Prepared by eki environment & water

TABLE OF CONTENTS

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Glossary / Abbreviations

CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
CDEC	California Data Exchange Center
CWC	California Water Code
C&E	Communications and Engagement
DOGGR	California Division of Oil, Gas and Geothermal Resources
DWR	California Department of Water Resources
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
OWD	Olcese Water District
PLSS	Public Land Survey System
SCEP	Stakeholder Communication and Engagement Plan
SGMA	Sustainable Groundwater Management Act

1. INTRODUCTION

> *§ 354.10. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
> *(a) A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.*
> *(b) A list of public meetings at which the Plan was discussed or considered by the Agency.*
> *(c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.*
> *(d) A communication section of the Plan that includes the following:*
> *(1) An explanation of the Agency's decision-making process.*
> *(2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.*
> *(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.*
> *(4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.*

The Olcese Groundwater Sustainability Agency (Olcese GSA) has developed this Stakeholder Communication and Engagement Plan (SCEP) to describe its approach to communication and engagement throughout the Groundwater Sustainability Plan (GSP) development process. This SCEP was prepared in accordance with California Water Code (CWC), the GSP Regulations (Title 23 of the California Code of Regulations [CCR] §354.10 [see above]), and the California Department of Water Resources (DWR) *Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement* (DWR, 2018), as well as additional reference documents recommended by DWR for guidance.

Communication and engagement efforts carried out as described in this SCEP will help to ensure that local beneficial uses and users of groundwater are adequately considered in the GSP development process as required by GSP Regulations (23-CCR §354.10). Specifically, in this SCEP:

- **Section 2** describes the Olcese GSA decision-making process (23-CCR §354.10(d)(1));
- **Section 3** identifies stakeholders;
- **Section 4** describes how the Olcese GSA intends to build upon its current understanding of stakeholders in the Plan Area (23-CCR §354.10(d)(3) and CWC §10723.4);
- **Section 5** describes the key messages for communication and engagement efforts, and anticipated questions as well as possible responses (23-CCR §354.10(d)(4));
- **Section 6** identifies opportunities for public engagement and how public input and response will be used (23-CCR §354.10(d)(2));
- **Section 7** describes the Communications and Engagement (C&E) implementation timeline, including when this SCEP will be updated to inform the public about GSP implementation progress, including the status of projects and actions (23 CCR §354.10(d)(4));
- **Section 8** describes SCEP assessment and evaluation during the GSP development process.

2. GOALS AND DESIRED OUTCOMES

This SCEP is designed to effectively engage a variety of relevant stakeholders in the development of a GSP that will guide the Olcese GSA to demonstrate sustainability by 31 January 2040 and maintain sustainability through the Sustainable Groundwater Management Act (SGMA)'s planning timeline (i.e., through 2070).

2.1. GSA Area Description

The Olcese Water District (OWD or District) and Olcese GSA boundaries are shown on Figure 1. The Olcese GSA Area is located approximately 10 miles northeast of Bakersfield along Kern Canyon Road (CA Highway 178). The District provides agricultural water to lands within its approximately 5,000-acre service area, which is situated on both sides of the Kern River just downstream of the Kern Gorge Fault where the river flows out of Kern River Canyon. Approximately two-thirds of the District's service area intersects a small portion of the Kern County Subbasin (Kern Subbasin or basin), along with the basin's eastern-most boundary. The Kern Subbasin is a high priority basin and has been designated as being in critical groundwater overdraft condition, and thus has a required GSP submission deadline of 31 January 2020.

The Olcese GSA covers the portion of the District service area that is contained within the current Kern Subbasin boundaries and is approximately 3,200 acres in size. The Olcese GSA service area is bounded on the northern and eastern sides by the existing Kern Subbasin boundary, and on the southern and western sides by the District's administrative boundaries (see Figure 1).

2.2. Olcese GSA Structure and Decision-Making Process

Key GSP development and implementation decisions are made by the Olcese GSA Board of Directors, which includes all of the OWD Board of Directors. The OWD staff help to guide the GSP development technical consultant team and provide feedback on draft work products.

As above, the District and the Olcese GSA is governed by a Board of Directors. Regular quarterly Board meetings, open to the public, are held on the third Monday at 4:00 p.m. (unless otherwise noticed in the District Headquarters and website) in the months of February, May, August, and November. Additional meetings will be held, as needed, to have SGMA-related presentations. Board meeting agendas are posted to the OWD website (https://olcesewaterdistrict.org/).

2.3. Desired Outcome

The Olcese GSA aims to develop a GSP that sets the Olcese GSA Area on a path to maintain sustainability through SGMA's 50-year planning timeline.

2.4. Communication Objectives to Support the GSP

The Olcese GSA SCEP efforts aim to support the development of a GSP that meets the needs of beneficial uses and users of groundwater in the Olcese GSA Area and reflects and incorporates stakeholder input as appropriate. The Olcese GSA aims to be knowledgeable about and anticipate stakeholder interests and concerns.

2.5. Challenges for the Plan Area

The District is aware of and plans to address the following challenges:

- Irrigated agriculture is the primary water user in the District. It is anticipated that there will be concerns regarding how SGMA compliance could impact that land and water use. Specifically, whether SGMA implementation could result in restrictions to agricultural development, or less flexibility in terms of future land management or development.
- Groundwater conditions within the Olcese GSA Area are unique relative to the rest of the Kern Subbasin. For example, the District pumps from a deep, confined water-bearing unit (the Olcese Sand Aquifer Unit) that it is not hydraulically connected to the pumped units of the larger Kern Subbasin. Therefore, groundwater modeling and allocation policies being developed for the larger Kern Subbasin have little relevance for groundwater management in the Olcese GSA Area.
- The Olcese GSP will be one of multiple GSPs that are prepared for the Kern Subbasin. A coordination agreement will need to be signed by the relevant GSAs to ensure that all of the GSPs are coordinated and collectively support the achievement of sustainability in the Kern Subbasin.

3. STAKEHOLDER IDENTIFICATION

The Olcese GSA has identified current beneficial uses and users of groundwater in the accordance with the interests listed in CWC §10723.2. The following are the identified beneficial uses and users of groundwater within the GSA. Representatives of specific organizations on this list form the basis of the Olcese GSA's list of interested parties, as required by CWC §10723.2.

3.1. Holders of Overlying Groundwater Rights

3.1.1. Agricultural Users

The primary water user in the Olcese GSA Area is agriculture. The OWD provides water service to meet all agricultural water needs.

3.1.2. Domestic Well Owners

According to well completion reports compiled by the DWR[1], there are five domestic wells within Public Land Survey System (PLSS) sections that overlie, at least partially, the Olcese GSA Area. However, the extent of active wells is currently unknown. Based on District knowledge, there are no active domestic wells.

3.1.3. Commercial and Industrial Users

No commercial or industrial groundwater users have been identified within the Olcese GSA Area. The California Division of Oil, Gas & Geothermal Resources (DOGGR) identifies the presence of wells in the GSA Area, however, according to DOGGR data, the current status of these wells is "plugged and abandoned".

3.2. Municipal Well Operators

There are currently no identified municipal well operators within the Olcese GSA Area.

3.3. Public Water Systems

The Anne Sippi Clinic is the only drinking water system identified within the Olcese GSA Area, serving a population of 35 people.[2]

[1] DWR Well Completion Report Map Application website (https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37)

[2] California Environmental Health Tracking Program, Water System Map Viewer (http://www.cehtp.org/page/water/water_system_map_viewer)

3.4. Local Land Use Planning Agencies

3.4.1. Kern County

The Olcese GSA is comprised of unincorporated County land, for which the Kern County Planning and Community Development is responsible for land use planning.

3.4.2. City of Bakersfield

The Olcese GSA overlies a portion of the City of Bakersfield, therefore, it is subject to the Metropolitan Bakersfield General Plan (City of Bakersfield, 2016).

3.5. Environmental Users of Groundwater

As mapped by the DWR,[3] areas of vegetation that potentially constitute groundwater dependent ecosystems (GDEs) are present along the Kern River and Cottonwood Creek within the Olcese GSA Area. However, the District groundwater production within the Olcese GSA Area is sourced from the deep, confined Olcese Sand Aquifer Unit, withdrawals from which do not contribute to depletion of surface water flows or groundwater conditions in the shallow alluvium. Given that the groundwater pumped by the District is used for irrigation which, due to irrigation inefficiency, inevitably results in some deep percolation of applied water below the root zone, there is likely a net addition of water to the shallow subsurface on an annual basis. This suggests that the District's pumping operations are unlikely to have any detrimental effects on GDEs within the Olcese GSA Area.

3.6. Surface Water Users

Surface water features in the Olcese GSA Area include the Kern River and the Cottonwood Creek. The main source of water for the District (76%)[4] comes from riparian water rights on the Kern River.

3.7. Federal Government

There are no identified federal-owned lands within the Olcese GSA Area.

3.8. California Native American Tribes

There are no identified California Native American tribal lands within or near the Olcese GSA Area.

3.9. Disadvantaged Communities

There are no Disadvantaged Community Places, Tracts, or Block Groups identified within the Olcese GSA Area (U.S. Census, 2015).

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[3] DWR NC Dataset Viewer (https://gis.water.ca.gov/app/NCDatasetViewer/)

[4] From Olcese Water District internal water diversion records

3.10. Groundwater Monitoring Entities

The Olcese GSA submitted a notice to become a monitoring entity for its area under the California Statewide Groundwater Elevation Monitoring (CASGEM) Program in 2017 and was approved in February 2018 as the designated Monitoring Entity.

4. STAKEHOLDER SURVEY AND MAPPING

The Olcese GSA intends to update its list of stakeholders based on new information as appropriate. To learn more about its stakeholders, it will distribute a stakeholder survey and data request (Appendix A) by:

- Posting the survey on Olcese GSA website [https://olcesewaterdistrict.org/]; and
- Having copies of the survey available at OWD / Olcese GSA Board meetings and stakeholder workshops.

Based on current knowledge of stakeholders, the Olcese GSA has completed a "Lay of the Land" exercise in Table 1, identifying specific stakeholder organizations and groups, stakeholder type, key interests and issues, the sections of the GSP likely to be relevant to this stakeholder, and the level of engagement (e.g., inform, consult, involve) expected with each stakeholder organization/individual.

Given that the Olcese GSA will gain more knowledge of the interests, issues, and challenges of stakeholders over the course of GSP development, this SCEP will be updated as part of GSP development. Should the Olcese GSA need to learn more about specific stakeholders, individual meetings will be arranged to find out more about their issues, interests, and challenges.

Table 1 - Stakeholder Constituency - "Lay of the Land" Exercise

Organization/ Individual	Type of Stakeholder (a)	Anticipated Key Interests	Anticipated Key Issues (b)	Relevant GSP Sections	Level of Engagement and Rationale (c)
Agricultural Water Users	Agricultural Users	Preserving access to high-quality groundwater for irrigation	• Water quality degradation • Declining water levels • Potential curtailment of pumping	• Sustainable Management Criteria • Projects and Management Actions	Collaborate to ensure sustainable management of groundwater
Domestic Well Users	Domestic Well Owners (if present)	Preserving access to high-quality groundwater for domestic users	• Water quality degradation • Declining water levels • Potential curtailment of pumping	• Sustainable Management Criteria • Projects and Management Actions	Inform and involve to avoid negative impact to these users
Anne Sippi Clinic	Public Water System	Preserving access to high-quality groundwater for its water demands	• Water quality degradation • Potential curtailment of pumping • GSP development and implementation costs reflected in the cost of water	• Sustainable Management Criteria • Projects and Management Actions	Inform and involve to avoid negative impact to this user
Kern County Planning and Community Development	Local Land Use Planning Agency	Managing County-wide land use	*To be determined*	• Plan Area • Projects and Management Actions	Consult and involve to ensure land use policies are supporting GSPs

Abbreviations:
CWC = California Water Code
DWR = California Department of Water Resources
GSP = Groundwater Sustainability Plan

Notes:

(a) Type of stakeholder based on CWC §10723.2 (e.g., agricultural groundwater users, municipal well operators, etc.).

(b) Any documented issues (media coverage, statements, reports, etc.), specific issues such as past events, or issues that have been otherwise communicated to or are anticipated by the GSA.

(c) Level of engagement based on the International Association of Public Participation Spectrum of Public Participation, as referenced in DWR's Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement (DWR, 2018).

5. MESSAGES

The Olcese GSA aims to convey consistent high-level messaging to stakeholders throughout GSP development and implementation. The following are the key messages that will form the foundation for communication and engagement efforts:

1. The Olcese GSA aims to engage with diverse stakeholders to best represent their interests in the GSP development process;
2. Key GSP development decisions will be made in an open and transparent fashion during public District/GSA Board meetings; and
3. Technical GSP development progress will be communicated in an accessible manner to support stakeholder understanding and input.

Additionally, the Olcese GSA has developed Table 2 to document anticipated questions as well as possible responses. Table 2 will be updated, as needed, to add additional, frequently received questions as well as to build upon responses based on GSP development progress.

Table 2 - Likely Questions and Responses

Likely Questions	Responses
How can I participate in the GSP development and implementation process?	District / GSA Board meetings are open to the public and held at 4:00 PM on the third Monday in the months of February, May, August, and November unless otherwise noticed in the District Headquarters and website [15701 CA-178, Bakersfield, CA 93306]. Stakeholder workshops will be held throughout the GSP development process and will be publicized on the OWD website [https://olcesewaterdistrict.org/].
Will I have to fallow my land?	We are currently in the initial phases of GSP development. Projects and management actions to achieve sustainability will be discussed later in the process, with opportunity for stakeholder input.
What types of management actions or projects are going to occur in my area?	We are currently in the initial phases of GSP development. Projects and management actions to achieve sustainability will be discussed later in the process, with opportunity for stakeholder input.
Are pump meters going to be required? Who will pay for meters?	We are currently in the initial phases of GSP development. Projects and management actions to achieve sustainability will be discussed later in the process, with opportunity for stakeholder input.
Who is paying for GSP development and implementation?	The OWD will pay for GSP development and implementation.

6. VENUES FOR ENGAGING

The Olcese GSA intends to provide a variety of opportunities for engagement with stakeholders. Stakeholder input received will inform and be incorporated into corresponding sections of the GSP as appropriate.

6.1. District Board Meetings

As described in Section 2.2**.**, District /GSA Board meetings are open to the public and are a consistent venue for public engagement. The District welcomes residents within the Olcese GSA Area and interested stakeholders to attend its public board meetings.

6.2. Stakeholder Workshops

Stakeholder workshops will be held to communicate progress on GSP technical components to stakeholders and to receive input on upcoming decisions and work efforts. A stakeholder workshop and a public hearing will be held during GSP development:

- **Stakeholder Workshop #1** – 18 February 2019 at 10:00 a.m. – SGMA Overview, Basin Setting Information, Preliminary Undesirable Results, and Projects and Management Actions.
- **Public Hearing** – Review of the draft GSP.

The Olcese GSA will publicize all stakeholder workshops on its website (https://olcesewaterdistrict.org/) and to its list of interested parties and will coordinate with community organizations (e.g., Kern County Farm Bureau, Self-Help Enterprises, etc.) to send out emails and mailings as appropriate.

Additional stakeholder workshops may be held during GSP implementation. The timing and content of these stakeholder workshops will be determined when the GSP Implementation Plan is developed shortly before GSP submission.

6.3. Website Communication

The Olcese GSA will update its website with board meeting materials as described in Section 2.2, and will additionally update the website with key GSP updates.

6.4. Stakeholder Surveys

The Olcese GSA intends to learn about stakeholder interests using surveys that will be distributed as discussed in Section 4. This stakeholder survey is included in Appendix A.

7. IMPLEMENTATION TIMELINE

The Olcese GSA's C&E implementation timeline aligns with a four-phase GSP development timeline, as described in Table 3 below.

Table 3 GSP Development and C&E Efforts by Phase

Phase	Timeframe	Overall GSP Efforts (led by technical consultant team)	C&E Efforts (led by the OWD staff)
GSP Foundation	July 2018 – September 2018	• Gather available data and compile into a Data Management System (DMS) • Conduct data gaps assessment	• Develop SCEP • Distribute Stakeholder Survey
Basin Characterization and Analysis	July 2018 – September 2018	• Implement a plan for filling data gaps • Develop Hydrogeologic Conceptual Model (HCM) and definition of groundwater conditions • Develop water budget • Assess existing monitoring programs	
Sustainability Planning	September 2018 – December 2018	• Develop sustainable management criteria • Identify projects and management actions • Create GSP implementation plan • Finalize monitoring network and protocols	• Conduct Stakeholder Workshop #1
GSP Preparation and Submittal	December 2018 – January 2020	• Compile complete draft GSP • Revise draft GSP (if necessary) per stakeholder feedback • Finalize GSP and submit to DWR	• Distribute draft GSP • Hold Public Hearing on draft GSP • Assess C&E progress and plan for C&E related to GSP Implementation

The Olcese GSA will update this SCEP while creating a GSP Implementation Plan. This update will focus on informing stakeholders about GSP implementation progress, including the status of projects and actions (23-CCR §354.10(d)(4)).

8. EVALUATION AND ASSESSMENT

The Olcese GSA intends to assess its SCEP during GSP development, as shown in Table 3. The OWD staff will present brief summaries of SCEP implementation progress at District / GSA Board meetings and will lead a discussion about lessons learned and what can be improved as part of GSP implementation.

9. REFERENCES AND TECHNICAL STUDIES

California Environmental Health Trashing Program. Water System Map Viewer, accessed in August 2018. http://cehtp.org/page/water/water_system_map_viewer

City of Bakersfield, 2016. *Metropolitan Bakersfield General Plan,* City of Bakersfield.

CWC, 2015. Community Water Center. Collaborating for Success: Stakeholder Engagement for Sustainable Groundwater Management Act Implementation.

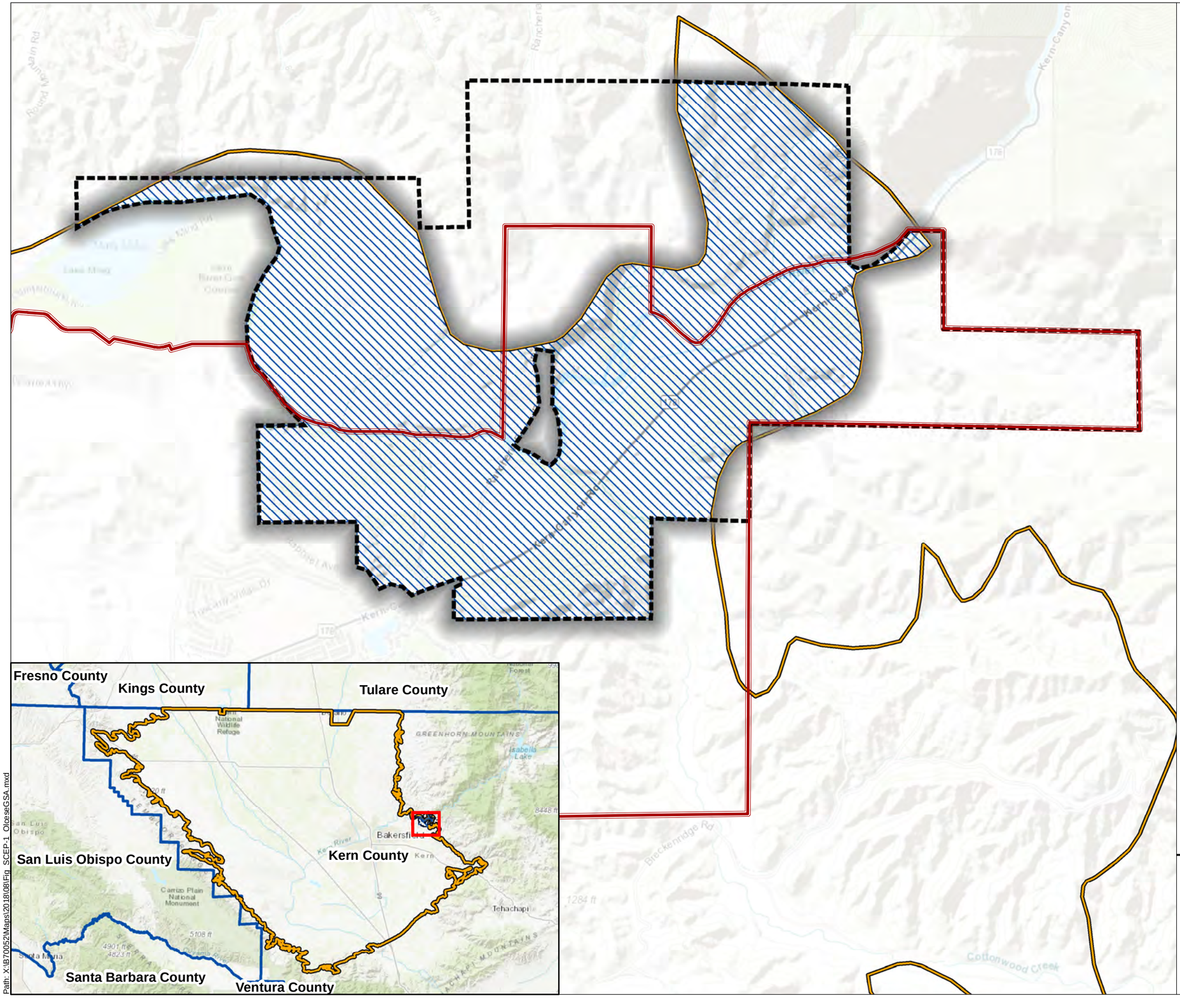
DWR, 2018. California Department of Water Resources. Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement.

DWR, 2018. California Data Exchange Center, stream gauges KRI and KGB, accessed in July 2018. https://cdec.water.ca.gov/

DWR, 2018. NC Dataset Viewer, accessed in August 2018. https://gis.water.ca.gov/app/NCDatasetViewer/

DWR, 2018. Well Completion Report Map Application website, accessed in August 2018. https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37

U.S. Census Bureau, 2010. 2010 U.S. Census American Community Survey.



Legend

- City of Bakersfield
- County Boundary
- Kern County Subbasin (DWR 5-022.14)
- Olcese Water District Service Area
- Olcese Water District GSA

Abbreviations

DWR	= California Department of Water Resources
GSA	= Groundwater Sustainability Agency
OWD	= Olcese Water District

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 24 August 2018.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - 2016 Update.
3. OWD boundary obtained from OWD on 12 April 2017.

N

0 0.5 1
Miles

DRAFT

Olcese Water District Groundwater Sustainability Agency - Jurisdictional Boundaries

Olcese Water District
Kern County, California
August 2018
B70052.03

Figure 1

eki environment & water

Path: X:\B70052\Maps\2018\08\Fig_SCEP-1_OlceseGSA.mxd

APPENDIX A – STAKEHOLDER SURVEY

Olcese Groundwater Sustainability Agency

Stakeholder Survey

The Olcese Groundwater Sustainability Agency (GSA) is conducting this survey to understand more about groundwater users (stakeholders) in its area. Any answers provided to these questions will help support the development of a more accurate, fair, and useful Groundwater Sustainability Plan (GSP).

Date: _____

Affiliated organization or business name (if applicable): _____

Contact information:

Name: _____

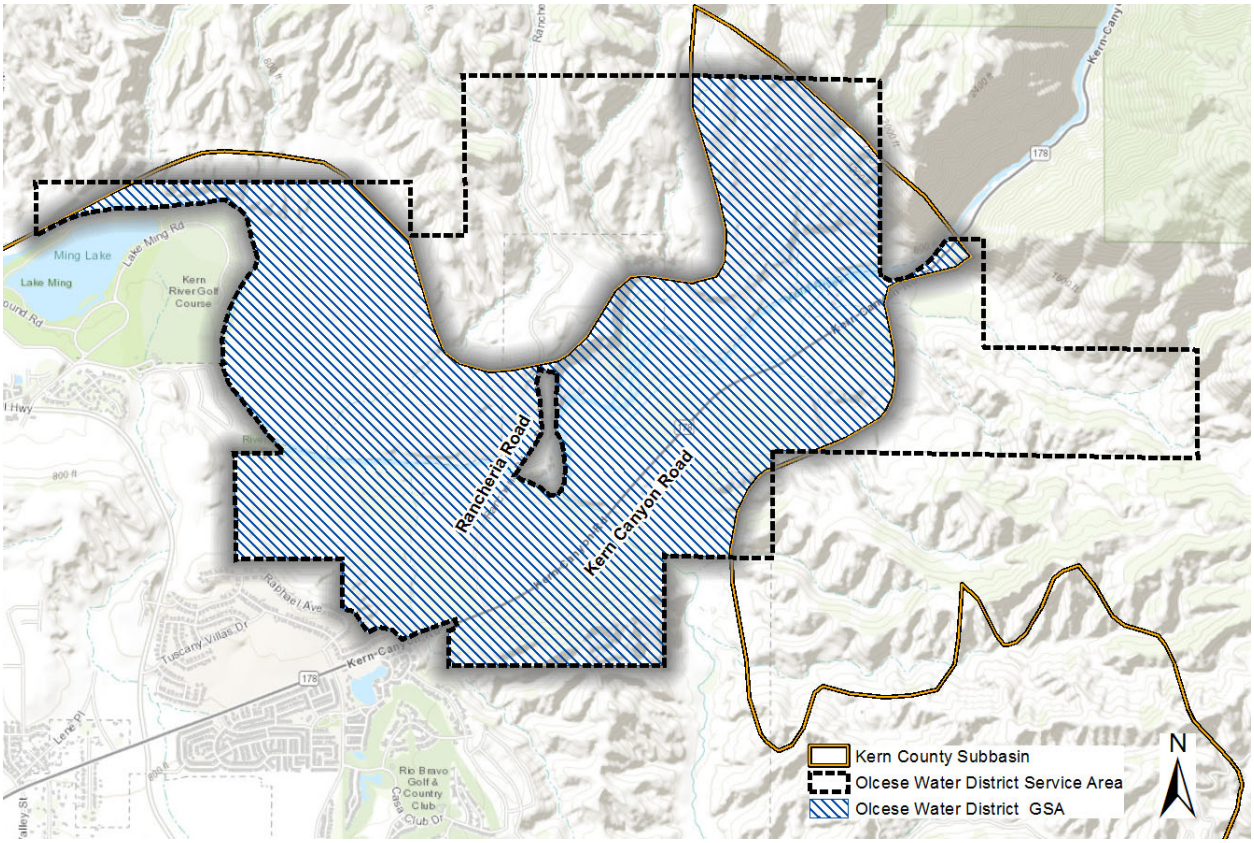
Email: _____

Phone Number: _____

Address: _____

Website: _____

Please mark the approximate location of your land, home, business, or well(s) with a dark-colored X on the map below of the Olcese GSA:



Olcese Groundwater Sustainability Agency

Stakeholder Survey

Stakeholder Type (check all that apply):

- ☐ Agricultural Groundwater User
- ☐ Domestic Well Owner/User
- ☐ Municipal Well Operator
- ☐ Commercial/Industrial Groundwater User
- ☐ Public Water System
- ☐ Local Land Use Planning Agency
- ☐ Environmental User
- ☐ Surface Water User
- ☐ Federal Government
- ☐ Native American Tribe
- ☐ Disadvantaged Community Resident or Organization
- ☐ City Resident
- ☐ Groundwater Monitoring Entity

Questions:

1. Are you familiar with the Sustainable Groundwater Management Act (SGMA) regulations?

2. Are you currently engaged in activities or discussions regarding groundwater management in this region?

3. Do you own or manage land in this region?

4. Where do you get your water supply?
   - ☐ City or Community Water System
   - ☐ Surface Water
   - ☐ Groundwater
   - ☐ Both
   - ☐ Unknown
5. What is your primary interest in land or water resources management?

6. (For agricultural and domestic well owners/users): Have any of your supply wells ever gone dry or otherwise been affected by declining water levels? If so, which wells and when?

7. Do you have concerns about groundwater management? If so, what are they?

8. Do you have recommendations that you would like the Olcese GSA to consider while developing a GSP? If so, what are they?

Olcese Groundwater Sustainability Agency

Stakeholder Communications and Engagement Plan

Dated 15 November 2018

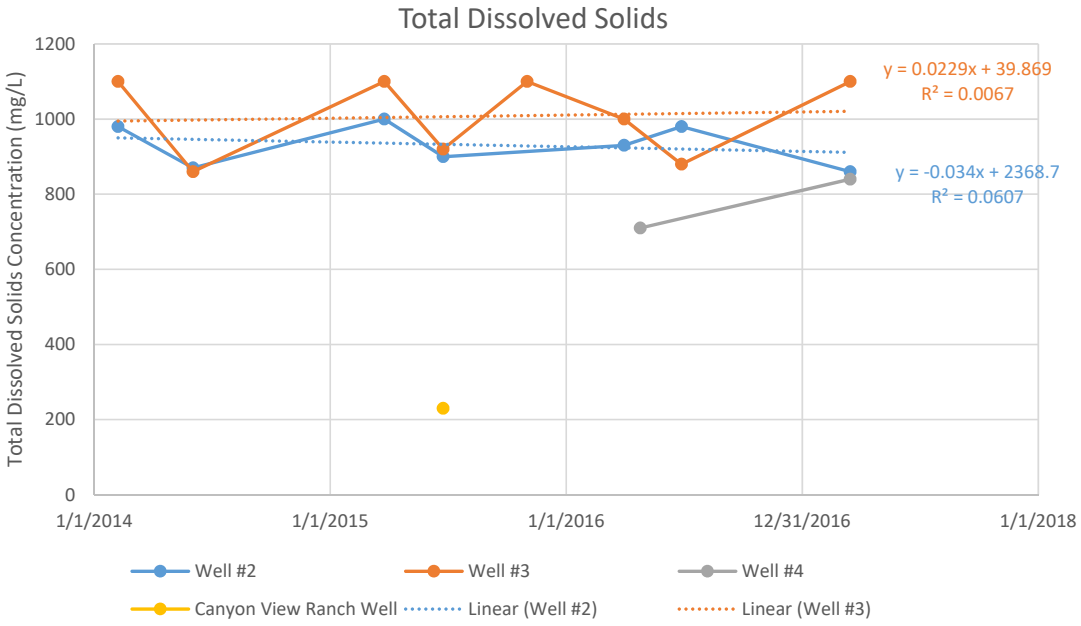
Errata, September 2019

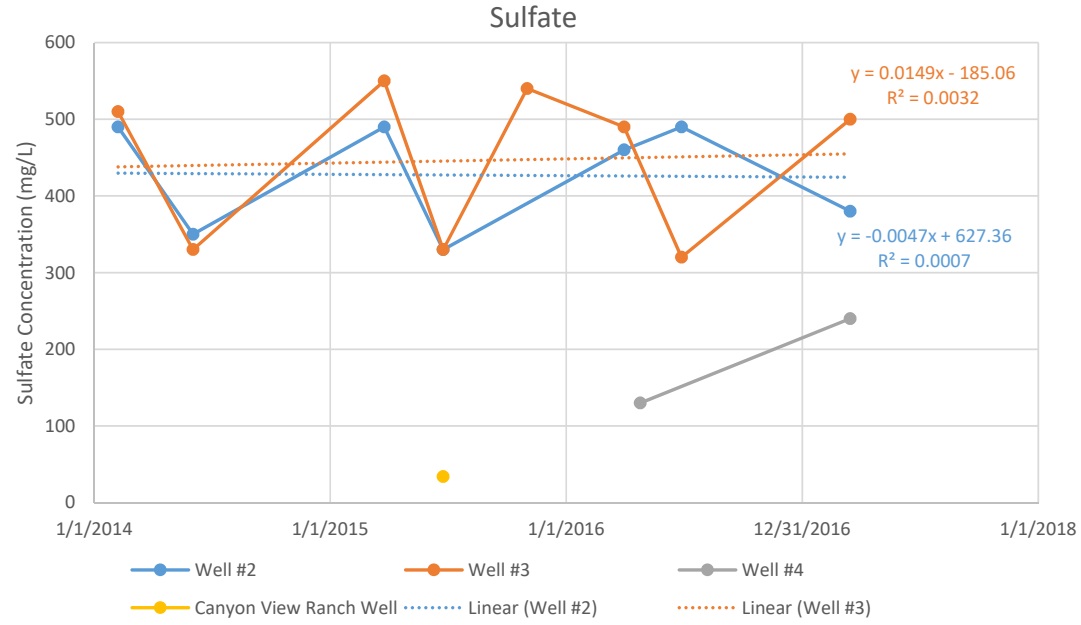
1. Page 5, Section 2.2: OWD Board meetings are now being held at 10:00 AM, not 4:00 PM.
2. Page 7, Section 3.1.2: It should be noted that the Anne Sippi Clinic water system uses water from the Canyon View Ranch Well, as discussed in Section 5.1.3 of the Olcese GSP.
3. Page 11, Table 1: the following entry is added to Table 1:

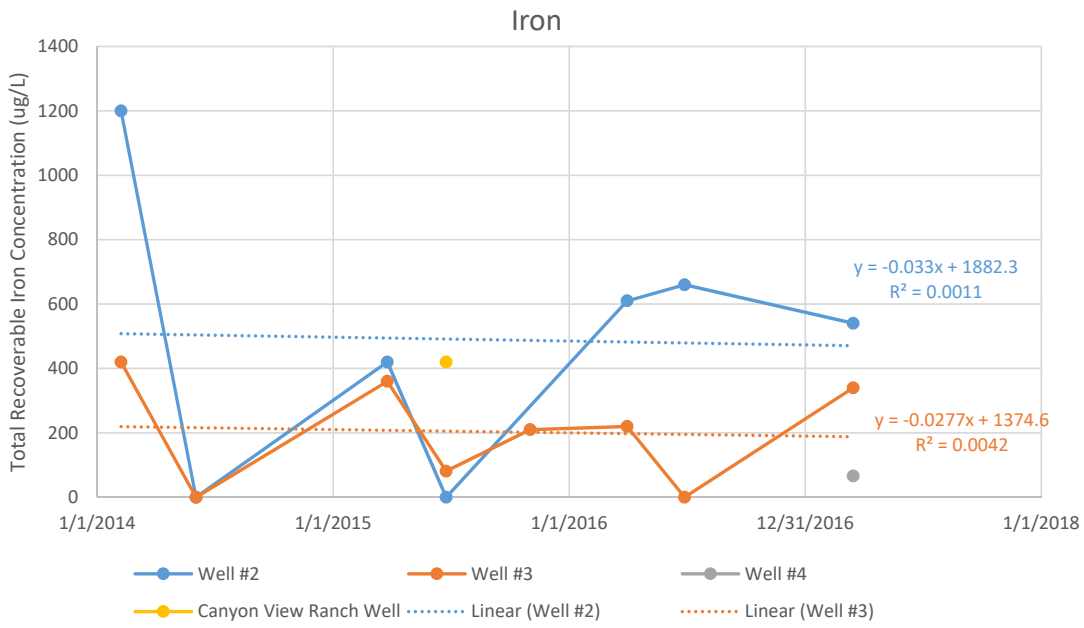
Organization / Individual:	City of Bakersfield
Type of Stakeholder:	Local Land Use Planning Agency
Anticipated Key Interests:	Managing land use within the City of Bakersfield boundaries
Anticipated Key Issues:	To be determined
Relevant GSP Sections:	Plan Area
Level of Engagement and Rationale:	Consult and involve to ensure land use policies are supporting GSPs.

Appendix E

Water Quality Trends Analysis


Total Dissolved Solids
Total Dissolved Solids Concentration (mg/L)
1200
1000
800
600
400
200
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
1/1/2018
y = 0.0229x + 39.869
R² = 0.0067
y = -0.034x + 2368.7
R² = 0.0607
Well #2
Well #3
Well #4
Canyon View Ranch Well
Linear (Well #2)
Linear (Well #3)


Sulfate
Sulfate Concentration (mg/L)
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
1/1/2018
y = 0.0149x - 185.06
R² = 0.0032
y = -0.0047x + 627.36
R² = 0.0007
Well #2
Well #3
Well #4
Canyon View Ranch Well
Linear (Well #2)
Linear (Well #3)



Note:

Iron concentration values plotted as zero in the graph above are "non detect". The detection limit is 30 ug/L.

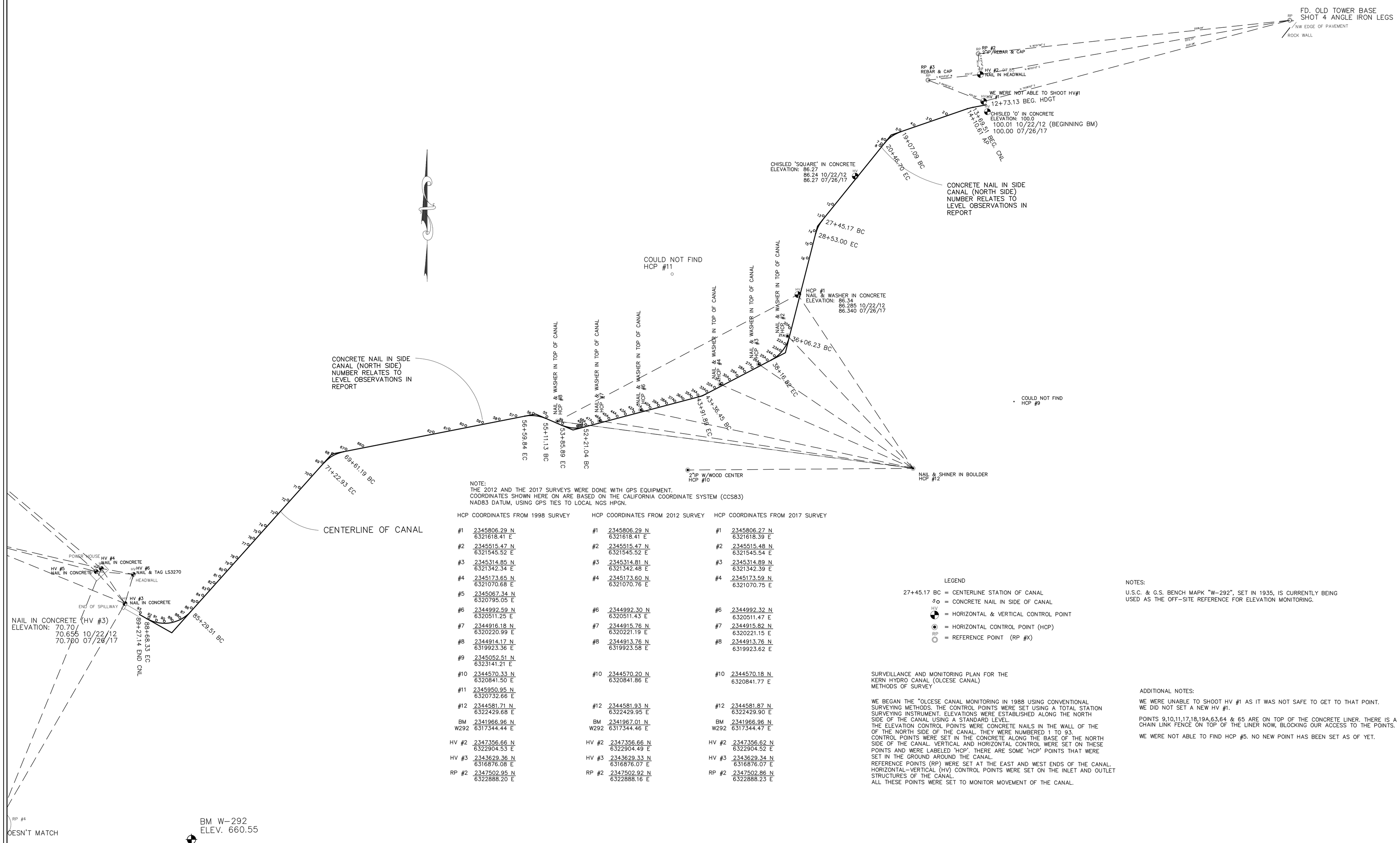
Abbreviations:

mg/L = milligrams per liter

ug/L = micrograms per liter

Appendix F

Benchmark Survey Data along Olcese Water District Canal



NOTE:
THE 2012 AND THE 2017 SURVEYS WERE DONE WITH GPS EQUIPMENT.
COORDINATES SHOWN HERE ON ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM (CCS83)
NAD83 DATUM, USING GPS TIES TO LOCAL NGS HPGN.

HCP COORDINATES FROM 1998 SURVEY		HCP COORDINATES FROM 2012 SURVEY		HCP COORDINATES FROM 2017 SURVEY	
#1	2345806.29 N 6321618.41 E	#1	2345806.29 N 6321618.41 E	#1	2345806.27 N 6321618.39 E
#2	2345515.47 N 6321545.52 E	#2	2345515.47 N 6321545.52 E	#2	2345515.48 N 6321545.54 E
#3	2345314.85 N 6321342.34 E	#3	2345314.81 N 6321342.48 E	#3	2345314.89 N 6321342.39 E
#4	2345173.65 N 6321070.68 E	#4	2345173.60 N 6321070.76 E	#4	2345173.59 N 6321070.75 E
#5	2345067.34 N 6320795.05 E				
#6	2344992.59 N 6320511.25 E	#6	2344992.30 N 6320511.43 E	#6	2344992.32 N 6320511.47 E
#7	2344916.18 N 6320220.99 E	#7	2344915.76 N 6320221.19 E	#7	2344915.82 N 6320221.15 E
#8	2344914.17 N 6319923.36 E	#8	2344913.76 N 6319923.58 E	#8	2344913.76 N 6319923.62 E
#9	2345052.51 N 6323141.21 E				
#10	2344570.33 N 6320841.50 E	#10	2344570.20 N 6320841.86 E	#10	2344570.18 N 6320841.77 E
#11	2345950.95 N 6320732.66 E				
#12	2344581.71 N 6322429.68 E	#12	2344581.93 N 6322429.95 E	#12	2344581.87 N 6322429.90 E
BM W292	2341966.96 N 6317344.44 E	BM W292	2341967.01 N 6317344.46 E	BM W292	2341966.96 N 6317344.47 E
HV #2	2347356.66 N 6322904.53 E	HV #2	2347356.66 N 6322904.49 E	HV #2	2347356.62 N 6322904.52 E
HV #3	2343629.36 N 6316876.08 E	HV #3	2343629.33 N 6316876.07 E	HV #3	2343629.34 N 6316876.07 E
RP #2	2347502.95 N 6322888.20 E	RP #2	2347502.92 N 6322888.16 E	RP #2	2347502.86 N 6322888.23 E

LEGEND

27+45.17 BC = CENTERLINE STATION OF CANAL
= CONCRETE NAIL IN SIDE OF CANAL
HV = HORIZONTAL & VERTICAL CONTROL POINT
= HORIZONTAL CONTROL POINT (HCP)
RP = REFERENCE POINT (RP #X)

NOTES:

U.S.C. & G.S. BENCH MAPK "W-292", SET IN 1935, IS CURRENTLY BEING USED AS THE OFF-SITE REFERENCE FOR ELEVATION MONITORING.

SURVEILLANCE AND MONITORING PLAN FOR THE
KERN HYDRO CANAL (OLCESE CANAL)
METHODS OF SURVEY

WE BEGAN THE "OLCESE CANAL MONITORING IN 1988 USING CONVENTIONAL SURVEYING METHODS. THE CONTROL POINTS WERE SET USING A TOTAL STATION SURVEYING INSTRUMENT. ELEVATIONS WERE ESTABLISHED ALONG THE NORTH SIDE OF THE CANAL USING A STANDARD LEVEL.
THE ELEVATION CONTROL POINTS WERE CONCRETE NAILS IN THE WALL OF THE OF THE NORTH SIDE OF THE CANAL. THEY WERE NUMBERED 1 TO 93. CONTROL POINTS WERE SET IN THE CONCRETE ALONG THE BASE OF THE NORTH SIDE OF THE CANAL. VERTICAL AND HORIZONTAL CONTROL WERE SET ON THESE POINTS AND WERE LABELED 'HCP'. THERE ARE SOME 'HCP' POINTS THAT WERE SET IN THE GROUND AROUND THE CANAL.
REFERENCE POINTS (RP) WERE SET AT THE EAST AND WEST ENDS OF THE CANAL.
HORIZONTAL-VERTICAL (HV) CONTROL POINTS WERE SET ON THE INLET AND OUTLET STRUCTURES OF THE CANAL.
ALL THESE POINTS WERE SET TO MONITOR MOVEMENT OF THE CANAL.

ADDITIONAL NOTES:

WE WERE UNABLE TO SHOOT HV #1 AS IT WAS NOT SAFE TO GET TO THAT POINT.
WE DID NOT SET A NEW HV #1.

POINTS 9,10,11,17,18,19A,63,64 & 65 ARE ON TOP OF THE CONCRETE LINER. THERE IS A CHAIN LINK FENCE ON TOP OF THE LINER NOW, BLOCKING OUR ACCESS TO THE POINTS.

WE WERE NOT ABLE TO FIND HCP #5. NO NEW POINT HAS BEEN SET AS OF YET.

REFERENCE DRAWINGS

REVISIONS

NO.	DATE	DESCRIPTION	BY

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SUITE 114
BAKERSFIELD, CA 93309
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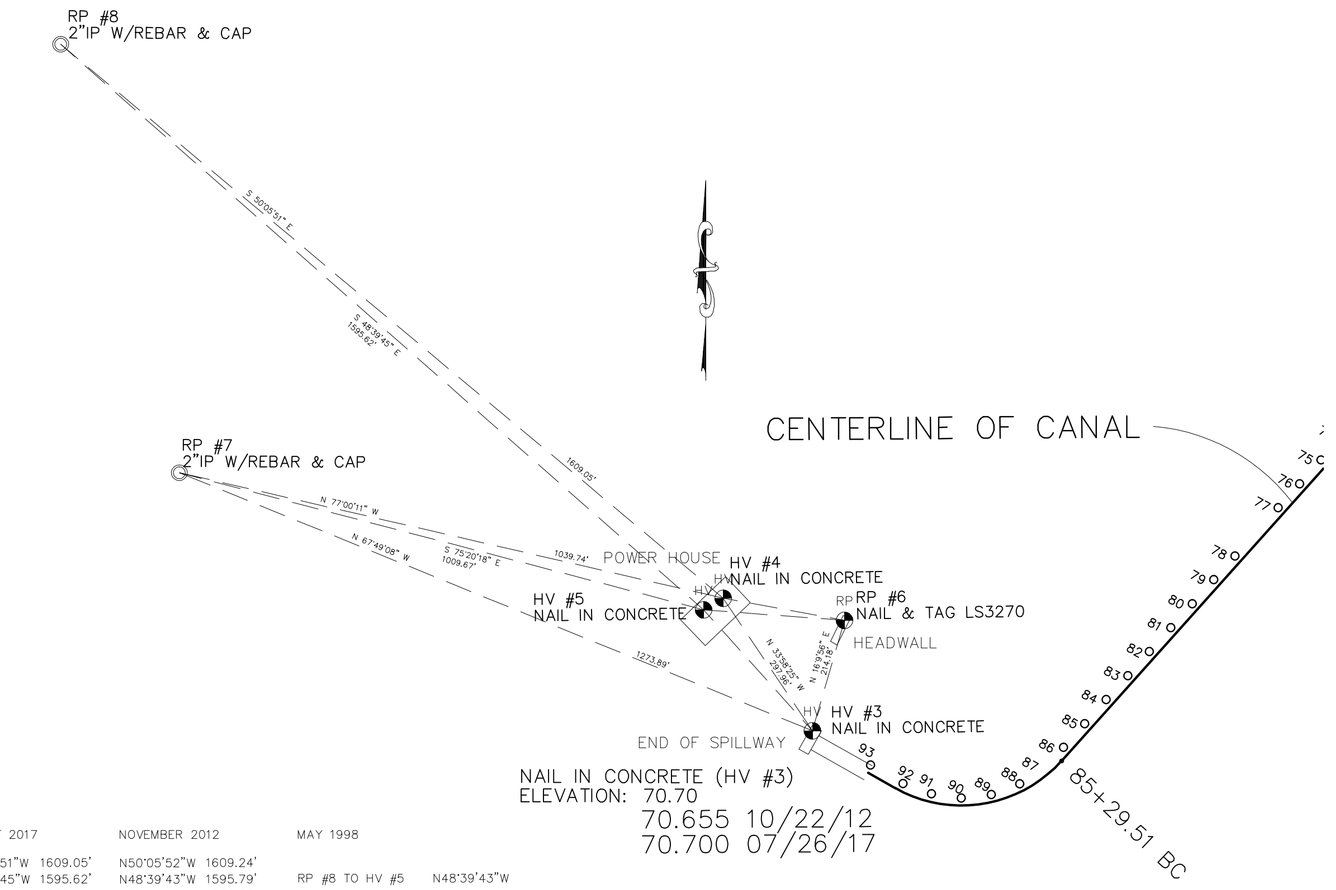
OLCESE CANAL HORIZONTAL CONTROL
SEC. 1 & 6, T29S, R30E, MDM

DRAWN BY: GGO JOB NO.: 17-032 DATE: 10/10/2017
CHECKED BY: GGO DRAWING NO.: 17032cntl SHEET 1 OF 3

RIO BRAVO DAM & CANAL SURVEY

OLCESE WATER DISTRICT



	AUGUST 2017		NOVEMBER 2012		MAY 1998	
RP #8 TO HV #4	N50°05'51"W	1609.05'	N50°05'52"W	1609.24'		
RP #8 TO HV #5	N48°39'45"W	1595.62'	N48°39'43"W	1595.79'	RP #8 TO HV #5	N48°39'43"W
RP #7 TO HV #4	N77°00'11"W	1039.74'	N77°00'05"W	1039.89'		
RP #7 TO HV #5	N75°20'18"W	1009.67'	N75°20'10"W	1009.78'	RP #7 TO HV #5	N75°20'10"W
RP #7 TO HV #3	N67°49'08"W	1273.89'	N67°49'06"W	1273.97'	RP #7 TO HV #3	N67°49'06"W
HV #3 TO HV #5	N41°59'03"W	303.21'	N41°59'04"W	303.17'	HV #3 TO HV #5	N41°59'04"W
HV #3 TO HV #4	N33°58'25"W	297.96'	N33°57'54"W	297.91'		
HV #3 TO HV #6	N16°09'56"E	214.18'	N16°10'37"E	214.15'	HV #3 TO HV #6	N16°10'37"E
HV #5 TO HV #6	N85°42'49"W	263.19'	N85°42'40"W	263.20'		

DESCRIPTION OF POINTS SET IN PRIOR YEARS

RP #1 OUTSIDE ANGLE PT. OF ANGLE IRON IN 24" ROUND CONC. TOWER LEG FOUNDATION OF THE N.W. FOUNDATION OF FOUR (4) AT THE MOUTH OF THE KERN RIVER CANYON, NORTH SIDE OF STATE HIGHWAY 178.

RP #2 SET 2" IRON PIPE WITH 1/2" REBAR & BERRY & ASSOC. CAP IN THE CENTER ON APPROX LINE BETWEEN HV #1 AND HV #2.

RP #3 1/2" REBAR & BERRY & ASSOC. CAP IN ROCK MOUND ON MANMADE SANDBAR.

RP #4 NAIL & TIN IN TOP OF 5' X 2' X 4' BOULDER

RP #5 SET SURE SET NAIL & TAG L.S. 3270 IN TOP OF CONC. CURB ON EAST SIDE OF GATE TO NICHOLS HOUSE.

RP #6 SET SURE SET NAIL & TAG L.S. 3270 IN TOP OF HEADWALL EAST END.

RP #7 2" IRON PIPE WITH BERRY & ASSOCIATES REBAR & CAP INSIDE.

RP #8 2" IRON PIPE WITH BERRY & ASSOCIATES REBAR & CAP INSIDE.

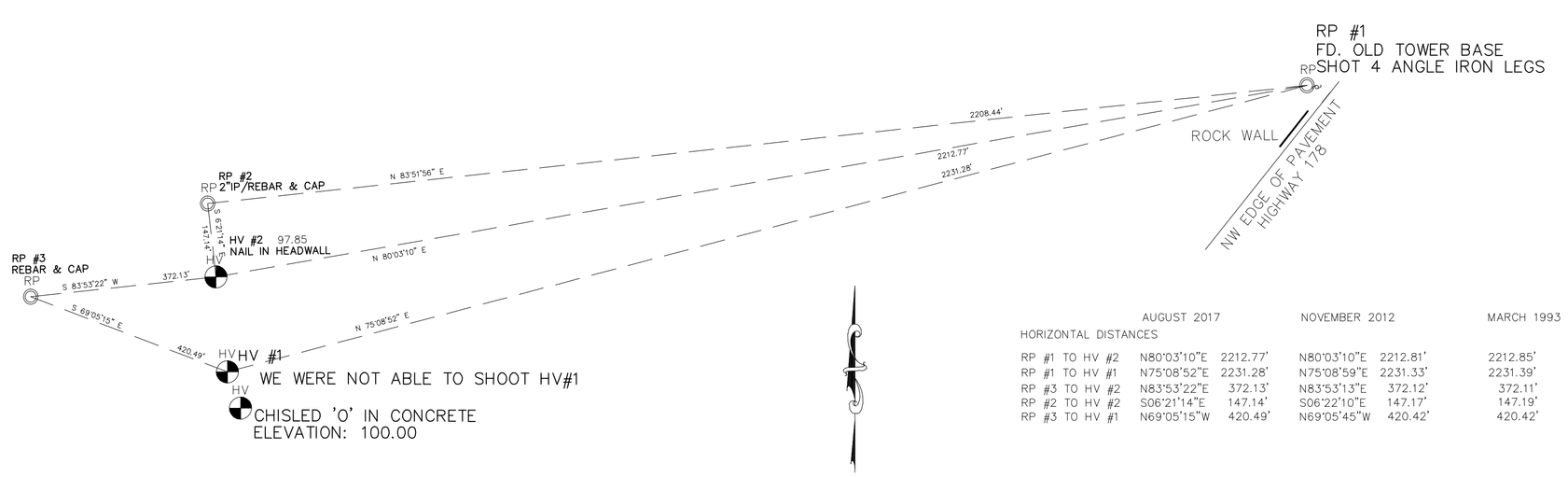
HV #1 NAIL IN LOWER PORTION OF THE NORTH SIDE OF THE SIDE OF THE SOUTH ABUTMENT OF DAM.

HV #2 NAIL AT THE ANGLE PT. OF THE NORTH ABUTMENT OF DAM.

HV #3 NAIL AT THE NORTHEAST CORNER OF DRIVE OVER THE NORTH END OF THE CANAL AT DISCHARGE.

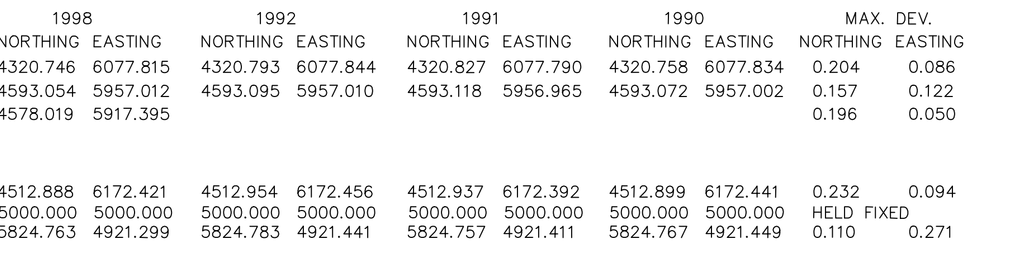
HV #4 NAIL IN CENTER OF STAIRWELL LEADING TO POWER HOUSE OFFICE.

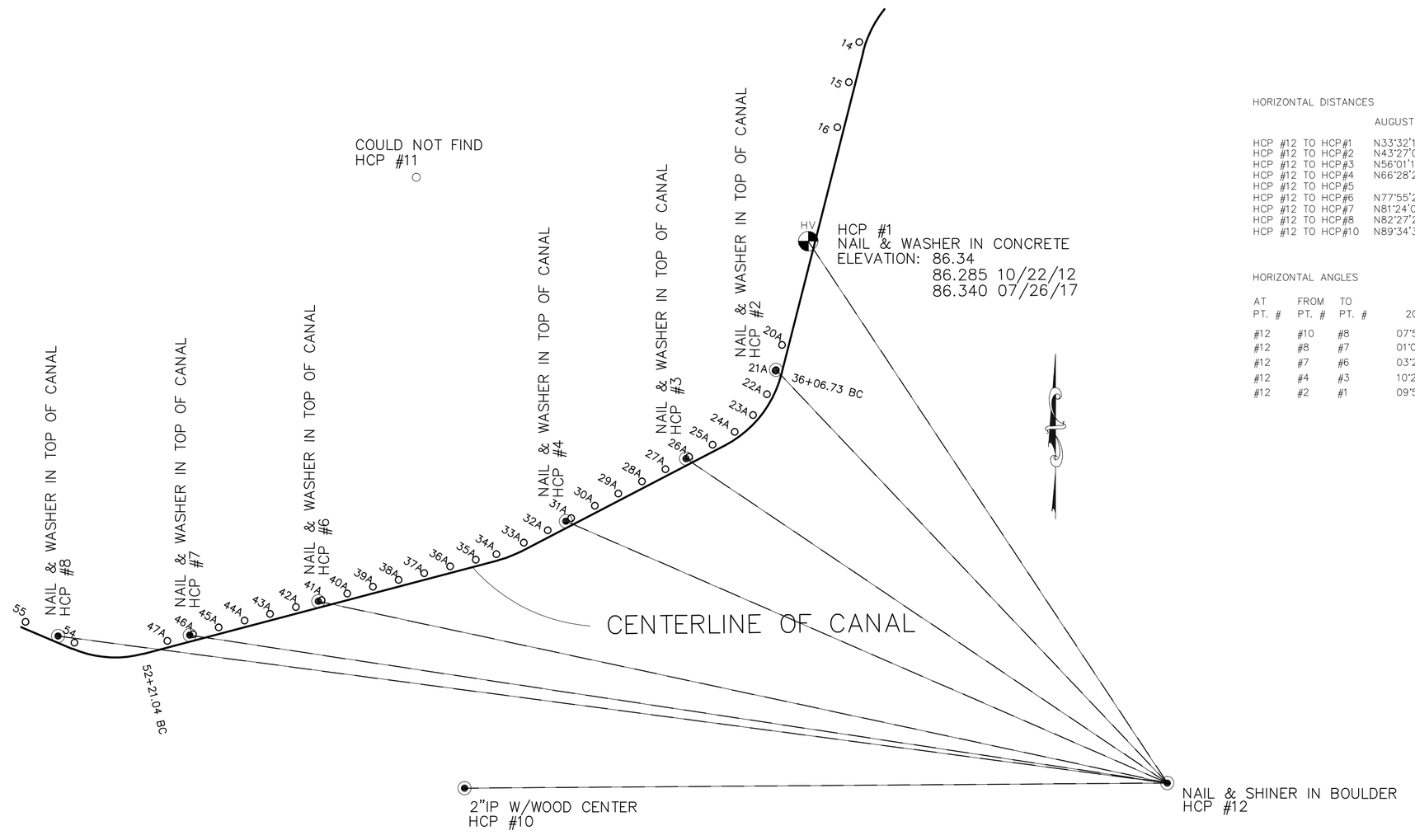
HV #5 HILTI NAIL AT APPROX. CENTER OF POWER HOUSE OUTLET STRUCTURE, 6.5' SOUTH OF NORTH FACE IN CONC. JOINT.



	AUGUST 2017		NOVEMBER 2012		MARCH 1993
HORIZONTAL DISTANCES					
RP #1 TO HV #2	N80°03'10"E	2212.77'	N80°03'10"E	2212.81'	2212.85'
RP #1 TO HV #1	N75°08'52"E	2231.28'	N75°08'59"E	2231.33'	2231.39'
RP #3 TO HV #2	N83°53'22"E	372.13'	N83°53'13"E	372.12'	372.11'
RP #2 TO HV #2	S06°21'14"E	147.14'	S06°22'10"E	147.17'	147.19'
RP #3 TO HV #1	N69°05'15"W	420.49'	N69°05'45"W	420.42'	420.42'

CONTROL POINT #	2017 NORTHING	2017 EASTING	2012 NORTHING	2012 EASTING	1998 NORTHING	1998 EASTING	1992 NORTHING	1992 EASTING	1991 NORTHING	1991 EASTING	1990 NORTHING	1990 EASTING	MAX. DEV. NORTHING	MAX. DEV. EASTING
HV-2	19978.805	20371.550	19978.693	20371.510	19978.676	20371.508	19978.631	20371.496	19978.679	20371.509	19978.686	20371.549	0.062	0.053
RP-1	20000.000	22584.190	20000.000	22584.215	20000.000	22584.276	20000.000	22584.242	20000.000	22584.236	20000.000	22584.266	0.000	0.061
RP-2	20125.610	20379.330	20125.654	20379.279	20125.669	20379.325	20125.618	20379.338	20125.667	20379.335	20125.673	20379.324	0.055	0.045
RP-3	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	20000.000	HELD FIXED	





	AUGUST 2017	NOVEMBER 2012
HORIZONTAL DISTANCES		
HCP #12 TO HCP#1	N33°32'16"W 1468.95'	N33°31'26"W 1468.92'
HCP #12 TO HCP#2	N43°27'03"W 1285.99'	N43°26'13"W 1285.93'
HCP #12 TO HCP#3	N56°01'10"W 1311.41'	N56°00'37"W 1311.41'
HCP #12 TO HCP#4	N66°28'21"W 1482.37'	N66°27'50"W 1482.32'
HCP #12 TO HCP#5		
HCP #12 TO HCP#6	N77°55'25"W 1961.91'	N77°54'41"W 1961.93'
HCP #12 TO HCP#7	N81°24'09"W 2233.83'	N81°23'21"W 2233.86'
HCP #12 TO HCP#8	N82°27'28"W 2528.20'	N82°26'38"W 2528.27'
HCP #12 TO HCP#10	N89°34'39"E 1588.15'	N89°35'22"E 1588.22'

AT PT. #	FROM PT. #	TO PT. #	HORIZONTAL ANGLES 2017	2012	1998
#12	#10	#8	07°57'53"	07°58'00"	07°58'01"
#12	#8	#7	01°03'20"	01°03'18"	01°03'13"
#12	#7	#6	03°28'44"	03°28'40"	03°28'44"
#12	#4	#3	10°27'11"	10°27'13"	10°27'07"
#12	#2	#1	09°54'48"	09°54'46"	09°54'48"

CONTROL POINT #	2017 NORTHING	2017 EASTING	2012 NORTHING	2012 EASTING	1998 NORTHING	1998 EASTING	1992 NORTHING	1992 EASTING	1991 NORTHING	1991 EASTING	1990 NORTHING	1990 EASTING	MAX. DEV. NORTHING	MAX. DEV. EASTING
HV-3	4320.950	6077.812	4320.782	6077.758	4320.746	6077.815	4320.793	6077.844	4320.827	6077.790	4320.758	6077.834	0.204	0.086
HV-4	4593.275	5956.890	4593.105	5956.934	4593.054	5957.012	4593.095	5957.010	4593.118	5956.965	4593.072	5957.002	0.157	0.122
HV-5	4578.215	5917.345	4578.046	5917.344	4578.019	5917.395							0.196	0.050
RP-4														
RP-5														
RP-6	4513.131	6172.362	4512.928	6172.363	4512.888	6172.421	4512.954	6172.456	4512.937	6172.392	4512.899	6172.441	0.232	0.094
RP-7	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	5000.000	HELD FIXED	
RP-8	5824.673	4921.178	5824.739	4921.239	5824.763	4921.299	5824.783	4921.441	5824.757	4921.411	5824.767	4921.449	0.110	0.271

REFERENCE DRAWINGS

REVISIONS

NO.	DATE	DESCRIPTION	BY

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OLCESE CANAL HORIZONTAL CONTROL
SEC. 1 & 6, T29S, R30E, MDM

DRAWN BY: GGO JOB NO.: 17-032 DATE: 10/10/2017
CHECKED BY: GGO DRAWING NO.: 17032cntl SHEET 2 OF 3

RIO BRAVO DAM & CANAL SURVEY

OLCESE WATER DISTRICT

BERRY & ASSOCIATES LAND SURVEYING

JOB #17-032 RIO BRAVO DAM & CANAL MONITORING

VERTICAL CONTROL OCTOBER 2017

CHISLED 'O' IN CONC.
(BENCHMARK) BM 'A' 100.00
(IN HEADWALL)

STATION NUMBER	ELEVATION 1998	ELEVATION 2000	ELEVATION 2012	DIFFERENCE	ELEVATION 2017	DIFFERENCE 1998 – 2017 2000 – 2017
2	78.599		78.60	0	78.59	−0.009
3	77.531		77.53	−0.001	77.52	−0.011
4	73.344		73.30	−0.044	73.33	−0.014
5 BC	75.879		75.83	−0.049	75.86	−0.019
6 EC	76.455		76.40	−0.055	76.43	−0.025
7	76.734		76.68	−0.054	76.74	+0.006
8	76.739		76.69	−0.049	76.73	−0.009
9	84.007		–			
10	84.023		–			
11	84.010		–			
12	80.179		80.10	−0.079	80.17	−0.009
13	80.024		79.92	−0.104	80.00	−0.024
14	80.900		80.81	−0.090	80.88	−0.020
15	80.062		79.97	−0.092	80.04	−0.022
16	79.988		79.905	−0.083	79.96	−0.028
17			–			
18		84.049	–			
19A		84.024	–			
20A		77.909	77.855	−0.054	77.92	+0.011
21A		76.996	76.935	−0.061	77.00	+0.004
22A		77.394	77.335	−0.059	77.40	+0.006
23A		77.280	77.225	−0.055	77.29	+0.010

SHEET 1 OF 4

STATION	ELEVATION 2000	ELEVATION 2012	DIFFERENCE	ELEVATION 2017	DIFFERENCE 2000 – 2017
24A	77.256	77.225	−0.031	77.26	+0.004
25A	76.699	76.635	−0.064	76.70	+0.001
26A	76.981	76.905	−0.076	76.96	−0.021
27A	77.079	76.995	−0.084	77.05	−0.029
28A	77.053	76.945	−0.108	77.01	−0.043
29A	76.856	76.75	−0.106	76.81	−0.046
30A	76.652	76.555	−0.097	76.61	−0.042
31A	76.790	76.705	−0.085	76.76	−0.030
32A	76.641	76.505	−0.136	76.56	−0.081
33A	76.759	76.62	−0.139	76.67	−0.089
34A	76.592	76.47	−0.122	76.52	−0.072
35A	76.708	76.59	−0.118	76.64	−0.068
36A	76.670	76.54	−0.130	76.59	−0.080
37A	76.546	76.43	−0.116	76.48	−0.068
38A	76.482	76.37	−0.112	76.40	−0.082
39A	76.613	76.51	−0.103	76.57	−0.043
40A	76.759	76.68	−0.079	76.73	−0.029
41A	76.654	76.55	−0.104	76.62	−0.034
42A	76.716	76.585	−0.131	76.66	−0.056
43A	76.471	76.40	−0.071	76.44	−0.031
44A	76.360	76.285	−.0075	76.32	−.0400
45A	76.432	76.365	−0.067	76.36	−0.072

SHEET 2 OF 4

STATION	ELEVATION 1998	ELEVATION 2000	ELEVATION 2012	DIFFERENCE	ELEVATION 2017	DIFFERENCE 2000 – 2017
46A		76.321	76.315	−0.006	76.26	−0.061
47A		76.302	76.215	−0.087	76.26	−0.042
48A		76.067	75.965	−0.102	76.00	−0.067
49A		76.165	76.04	−0.125	76.08	−0.085
50A		76.044	75.925	−0.119	75.96	−0.084
51A		76.326	76.205	−0.121	76.24	−0.086
52A		76.568	76.515	−0.053	76.49	−0.078
53A		76.728	76.635	−0.093	76.67	−0.058
54		79.045	78.995	−0.050	76.04	−0.005
55	79.991		79.915	−0.076	79.97	−0.021
56	79.831		79.75	−0.081	79.80	−0.031
57	80.030		79.95	−0.080	80.00	−0.03
58	80.003		79.92	−0.083	79.97	−0.033
59	80.065		79.98	−0.085	80.03	−0.035
60	80.316		80.24	−0.076	80.29	−0.026
61	80.183		80.11	−0.073	80.16	−0.023
62	80.082		80.01	−0.081	80.05	−0.032
63	84.012					
64	84.064					
65	84.022					
66	80.197		80.115	−0.082	80.18	−0.017
67	79.966		79.875	−0.091	79.96	−0.006
68	79.973		79.885	−0.088	79.96	−0.018
69	79.808		79.73	−0.078	79.80	−0.008
70	79.948		79.87	−0.078	79.94	−0.008
71	80.086		80.00	−0.086	80.09	+0.004
72	80.189		80.11	−0.079	80.18	−0.009
73	79.988		79.91	−0.078	79.98	−0.008
74	79.724		79.65	−0.074	79.71	−0.014

SHEET 3 OF 4

STATION	ELEVATION 1998	ELEVATION 2000	ELEVATION 2012	DIFFERENCE	ELEVATION 2017	DIFFERENCE 1998 – 2017
75	79.845		79.75	−0.095	79.82	−0.025
76	79.856		79.79	−0.066	79.82	−0.036
77	79.752		79.685	−0.067	79.73	−0.022
78	71.518		71.445	−0.073	71.50	−0.018
79	71.815		71.735	−0.080	71.80	−0.015
80	71.931		71.83	−0.101	71.91	−0.021
81	72.012		71.93	−0.082	72.00	−0.012
82	71.950		71.84	−0.101	71.94	−0.010
83	71.970		71.88	−0.090	71.96	−0.010
84	72.182		72.10	−0.082	72.17	−0.012
85	72.103		72.03	−0.073	72.09	−0.013
86	71.735		71.69	−0.045	71.73	−0.005
87	71.835		71.76	−0.075	71.82	−0.015
88	71.785		71.71	−0.075	71.78	−0.005
89	71.827		71.76	−0.067	71.81	−0.017
90	71.901		71.83	−0.071	71.90	−0.001
91	71.910		71.85	−0.060	71.89	−0.020
92	71.808		71.71	−0.098	71.79	−0.018
93	71.918		71.845	−0.073	71.88	−0.028
94	71.863				71.84	−0.023

SHEET 4 OF 4

REFERENCE DRAWINGS		

REVISIONS			
NO.	DATE	DESCRIPTION	BY

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CHECKED BY: GGO DRAWING NO.: 17032cntl SHEET 3 OF 3

RIO BRAVO DAM & CANAL SURVEY

OLCESE WATER DISTRICT

Appendix G

Methods and Data Used in the Water Budget Spreadsheet Model Approach

APPENDIX G
METHODS AND DATA USED IN THE WATER BUDGET SPREADSHEET MODEL APPROACH

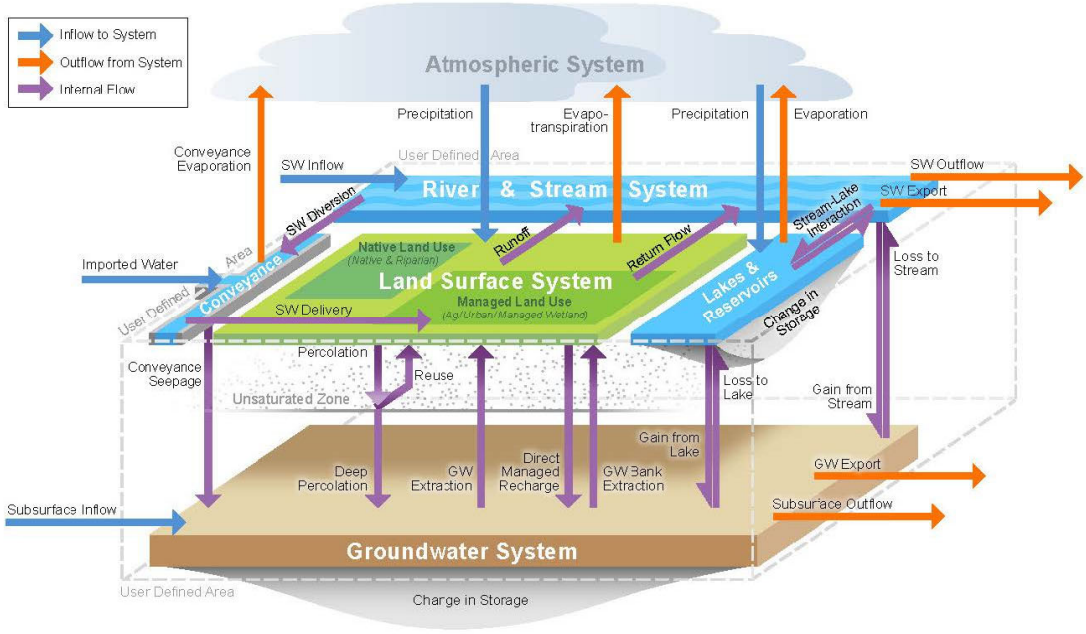
1. WATER BUDGET MODEL OVERVIEW

A water budget is an accounting of all water inflows to and outflows from a given spatial domain and enforces the principle of mass balance through use of a change in water storage term. A water budget is expressed by the following simple equation:

Inflows - Outflows = Change in Storage

The above fundamental equation holds true for any defined domain (e.g., parcel, watershed, basin, etc.) and length of time (e.g., day, month, year, etc.) and, when properly constructed using process- and/or physics-based components, serves as a powerful tool for understanding water flow through a system.

Figure G-1: DWR Water Budget Schematic (Fig. 7 from DWR's SGMA BMP #4, pg. 30)



Description of Water Budget Framework

A water budget "framework" has been developed to inform the development of a water budget model for the Olcese GSA Area that is consistent with the requirements of the Sustainable Groundwater Management Act (SGMA) and aligns with the historical water budget period of other agencies within the Kern County Subbasin ("Kern Subbasin").[1] The conceptual water budget model is depicted on **Figures WB-1 and WB-2** of the Olcese GSP and is further described below.

[1] The water budget component of this GSP is provided to comply with SGMA/GSP regulations. The water budget, and the data used therein, is believed to be the best and most accurate available. However, it is acknowledged

Water Budget Subdomains

The water budget is divided into five internal subdomains, each influenced by a number of flow components and within which mass-balance is enforced (i.e., the sum of inflow components is balanced by the sum of outflow components and/or a change in storage component). **Figure WB-1** shows the water budget domain and the following internal subdomains:

a. Pipelines, Artificial Channels, and Reservoirs
b. Natural Channels
c. Agricultural Lands
d. Urban Lands
e. Groundwater System

The Natural Channels subdomain is conceptualized to include both the surface water of the Kern River itself as well as the hydraulically-connected Shallow Alluvium within the Kern River floodplain/valley. In addition to the five internal subdomains, several external subdomains are incorporated into the spreadsheet model. These include the watersheds that contribute streamflow to streams entering the Olcese GSA Area, and the atmosphere which is a source of precipitation and sink for evapotranspiration, and adjacent groundwater which is the connected groundwater system within the Kern Subbasin outside of the Olcese GSA Area. The spreadsheet model does not explicitly account for the vadose (unsaturated) zone between the land surface and the (saturated) groundwater system, but instead incorporates temporal lag factors to account for the movement of water through this zone. An implicit assumption in this approach, therefore, is that the vadose zone does not experience any change in storage over time. The spreadsheet model also does not include the non-agricultural lands which make up the remainder of the Olcese GSA Area.

Water Budget Flow Components

Within and between each subdomain are 27 water budget flow components that route water through the Olcese GSA Area. **Figure WB-2** shows a conceptual diagram of the individual water budget flow components between subdomains as well as flow components that are external to the overall water budget domain (i.e., serve only as an inflow or outflow to the entire system, rather than a flow between subdomains). The 27 conceptual water budget flow components are listed in **Table G-1**, along with an overview of their estimation methods**.**

Certain components are based on "raw" data which are directly measured and based on historical records. These "raw" components are considered to have a relatively high degree of certainty. Other components are estimated using a variety of analytical methods (e.g., Darcy's Law to calculate subsurface flows across the domain's external boundaries) and are thus subject to greater uncertainty based on the parameters used in their estimation. Some components (i.e., groundwater pumping for agricultural use) constitute major proportions of the overall water budget and have thus been given significant attention. Others are relatively minor in magnitude (e.g., seepage from artificial channels) are, to some degree, less significant to the overall water budget and less well defined.

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that new, additional, and/or more accurate information/data may be later obtained. Therefore, this water budget, and data in this GSP, may be updated or modified as the Olcese GSA deems necessary and as may be required to avoid Undesirable Results in the Olcese GSA portion of the Kern Subbasin.

While the various subdomains and linkages shown on **Figures WB-1 and WB-2** and in **Table G-1** indicate a highly complex system, the use of such a component-based bottom-up approach allows each component to be considered separately which can benefit water budget model development and application. For example, if new data or methods become available for a certain component they can be easily plugged into the appropriate component without disturbing the rest of the model.

Water Budget Spreadsheet Model Design and Functionality

The water budget spreadsheet model was developed using Microsoft Excel. The spreadsheet model contains various tabs, described below.

The calculations for most water budget components occur within the following "master" tab of the spreadsheet: *"Master_monthly_WB"*. In this tab, each row (besides the top header rows) represents one month, and each column represents an input or calculated value. All values are in acre-feet (AF). Rows 7-9 of the master water budget tab show a number (from 1 to 27) which corresponds to the water budget component as described in this Appendix and its tables and figures.

User input values are shown in blue shaded cells. These include various "User Input Parameters" above the header rows (rows 4-6), including:

- Precipitation Multipliers (see **Section 2**)
- Open Water Evaporation Coefficient
- Artificial Channels Seepage Rate
- Watershed Consumptive Use Fraction (used in the estimation of watershed runoff between the Olcese GSA Area boundary and the Kern River gauges, and additional runoff from surrounding watersheds; see **Section 2**)
- Watershed Precipitation Threshold for Runoff (used in the estimation of watershed additional runoff between the Olcese GSA Area boundary and the Kern River gauges: see **Section 2**)
- Recharge Rate from Kern River (see **Section 2**)
- Effective Olcese Sand Outcrop Area (see **Section 2**))
- Olcese Sand Outcrops Seepage Lag
- Transmissivity & portion of the boundary where water flows outside the Olcese GSA Area (to estimate subsurface outflow)
- Municipal & Industrial Consumptive Use Fraction
- Storage Coefficient
- Hydraulic Gradient near Olcese GSA Area Boundary.

These "User Input Parameters" were adjusted within the model to reflect best available information and/or calibrated to optimize model response but can be adjusted manually to reflect updated information or to test model response. Adjustments to the User Input Parameters are made within the "*Calibration*" tab, and the values within the "*Master_monthly_WB*" tab update automatically. Additionally, the "raw" temporal data included within the monthly budget are denoted in blue shaded

cells; however, in all cases, this data has already been populated with input data (as available) and should not be edited unless intending to override the existing data with updated inputs. Raw inputs that remain questionable, due to either a lack of data or uncertain data quality, are shaded in red within these raw input columns. Unshaded cells contain formulas and should not be edited.

Tables and figures that are not included in-line within the GSP text can be found in the blue shaded tabs.

All other tabs within the spreadsheet contain various input data and calculations used to support water budget calculations in the master water balance tab and should not be edited. Uncolored tabs correspond to various raw input data, including:

- *"Monthly Diversions raw"*
- *"Annual Diversions"*
- *"Artificial Channels"*
- *"Monthly ITRC Sum"*
- *"Olcese Outcrops"*
- *"Water Year Types"*
- *"Rio Bravo homes"*

Pink shaded tabs include a calculation or series of calculations for incorporation into the master water budget tab. These tabs include:

- *"Precipitation Multipliers"* (see **Section 2**)
- *"Streamflow Data"* (see **Section 2**)
- *"Monthly Diversions"* and *"Unit Hydrographs"*– used to estimate monthly diversions into Olcese Water District ("District") lands based on annual data and observed monthly patterns (see **Section 3**)

And finally, the purple shaded tab, "*Calibration*", contains the active module used to calibrate the water budget, along with corresponding fitting statistics and figures (see **Section 4**).

2. DESCRIPTION OF PRECIPITATION AND CONTRIBUTING STREAMFLOW ESTIMATES

This section documents the processes used to derive estimates of precipitation on Olcese GSA Area lands and the surrounding watersheds contributing to streamflow into the Olcese GSA Area.

Selection of Climate Stations

Precipitation on Olcese GSA Area lands and surrounding watersheds is estimated using the closest rainfall gauge, (station "Arvin-Edison (Station 125)" from the California Irrigation Management Information System, CIMIS) and 30-year Normal Precipitation from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) Climate Group to estimate the spatial variability with respect such station.

Spatial Representation of Precipitation Data

Precipitation is a spatially-variable phenomenon which is typically only observed and recorded at discrete points (i.e., at climate station locations). Additionally, precipitation is affected by topography, and the orographic effect must be considered when deriving rainfall estimates over watershed areas with significant elevation range. The nearly 5,000 ft range in elevation between Olcese GSA Area lands and the peaks of the surrounding watersheds in the Southern Sierra Nevada results in an orographic effect in this area. Therefore, spatial variation of precipitation in our area of interest was accounted for by scaling time-series precipitation data from the nearby CIMIS station by scaling factors derived from the spatially-variable PRISM data.

The PRISM 30-Year Normals Dataset consist of average values for temperature and precipitation over the preceding 30 years (1981-2010) on a spatial resolution of 4 km. To represent the spatial variability of precipitation, we defined two zones: (1) the Olcese GSA Area and surrounding watersheds, and (2) upstream watersheds draining into the Olcese GSA Area. The 30-year Normals values of precipitation within each area were then averaged to get a single representative value of precipitation for each zone. Finally, to obtain the precipitation multipliers, these representative values were normalized by the value of the 30-Year Normal value of the grid cell that contains the Arvin-Edison CIMIS station. The precipitation multipliers for the Olcese GSA Area and surrounding watersheds and for the upstream watershed area are 1.17 and 2.31, respectively.

Calculation of Rainfall and Contributing Streamflow

Following the spatial delineation process described above, total areas represented by each precipitation multiplier were calculated for lands within the Olcese GSA Area, as well as for the surrounding watershed area.

The volume of monthly rainfall (acre-feet per month; [AF/mo]) on the Olcese GSA Area and on surrounding watersheds was then estimated as follows:

$$Rainfall = \sum \frac{p}{12} * P_i * A_i \qquad (1)$$

where p = monthly precipitation from Station 125 [in/mo], P_i = precipitation multiplier of zone i, and A = area of zone i.

The model considers two sources of surface water inflow into the natural channels subdomain: Kern River streamflow, and tributary creeks from surrounding watersheds. Kern River streamflow data were obtained from the California Data Exchange Center (CDEC) and consist of monthly flow volumes at two gauged locations: the first (station ID "KRI") is located just downstream of Isabella Dam (i.e., about 22 miles upstream of the eastern District boundary), and the second (station ID "KRB") is located about 4 miles downstream of the western District boundary.

Additional Kern River streamflow entering between these gauges, and runoff entering through surrounding creeks was then calculated from the Rainfall on Watersheds using a linear equation with two parameters: A Precipitation Threshold for Runoff Initiation and a Watershed Consumptive Use Fraction. These parameters are defined as "User Input Parameters" in the water budget spreadsheet model (see **Section 1**). Additional streamflow into the Olcese GSA Area is calculated as:

$$Streamflow\ into\ Olcese\ GSA\ Area =$$

$$max\left(0, ppt_{watershed} - \frac{ppt_{threshold}}{12} * A_{watershed}\right) * (1 - CU_{watershed}) \quad (2)$$

where $ppt_{watershed}$ = rainfall on surrounding watersheds [in], $ppt_{threshold}$ = Precipitation Threshold for Runoff Initiation [in], $CU_{watershed}$ = Watershed Consumptive Use Fraction [dimensionless], and $A_{watershed}$ = total area of surrounding watersheds [acres].

Ultimately, a Watershed Consumptive Use Fraction of 96% and a Precipitation Threshold for Runoff of 0.8 inches was employed to estimate resultant additional streamflow into the Olcese GSA Area. See **Section 4** for further details regarding the water budget calibration process.

3. DESCRIPTION OF THE AGRICULTURAL LANDS WATER BUDGET SUBDOMAIN

This section describes the process for calculating water budget components within the Agricultural Lands subdomain of the Olcese GSA Area Long-term Water Budget (for January 1994 – December 2015). This analysis was based on the following data sources:

- **Satellite Evapotranspiration (ET) Data** from the Irrigation Training & Research Center (ITRC)[2] "Mapping Evapotranspiration at High Resolution with Internalized Calibration" (ITRC-METRIC) Study, funded by the Kern Groundwater Authority (KGA)[3]
    - *monthly resolution, January 1994 – December 2015* [4]
- **Groundwater pumpage and water diversions** from Olcese Water District records, *monthly resolution, January 1994 – December 2015*
- **Precipitation Records** from the Arvin-Edison CIMIS station, *monthly resolution, January 1994 – December 2015*

Total Evapotranspiration on Irrigated Lands

Description of ITRC-METRIC ET Dataset

The ITRC-METRIC ET Dataset uses satellite-based remote sensing of radiant energy and the METRIC energy balance theory to quantify actual water flux to the atmosphere from the land surface (including ET and evaporation from wetted bare soil and open water). This approach differs from other commonly-used methods that estimate ET based on land use (i.e., cropping) patterns and reference ET data and/or crop water use coefficients. There are several advantages of the ITRC-METRIC approach over conventional crop coefficient methods:

- ITRC-METRIC provides the ability to measure actual ET over large areas without any previous knowledge of land use or climate variables, whereas crop coefficients will estimate ET based on known cropping acreages and assumed crop water use properties.

[2] The Irrigation Training & Research Center is part of the California Polytechnic State University, San Luis Obispo.
[3] Howes, D., 2018, *1993-2016 ITRC-METRIC ETc for Kern County*, prepared for the Kern Groundwater Authority on behalf of the Cal Poly Irrigation Training & Research Center.
[4] There is no ITRC satellite ET data for calendar year 2012, as the Landsat satellite system employed in the METRIC analysis was out of order during this period.

- ITRC-METRIC provides rasterized ET data at a high spatial resolution (satellite image pixel size of 30 x 30 meters) for an area of study, whereas crop coefficient-based ET estimates are limited to the resolution of the land use dataset being employed.
- ITRC-METRIC allows for ET measurement at a relatively frequent temporal resolution (e.g., approximately every 16 days)[5], whereas crop coefficient methods are typically only available on a seasonal, or at best monthly, basis.

Due to these advantages, ET data developed using the ITRC-METRIC method will intrinsically reflect spatial and temporal variabilities in ET due to factors that cannot be fully accounted for using conventional crop coefficient methods. For example, the ITRC-METRIC ET rasters (image files) will reflect impacts on ET due to crop stresses from drought conditions, ET for crops at various stages of growth, ET for land parcels with multiple growing seasons (i.e., double cropping) and/or interbedded crops, and evaporation from surface water features (such as canals, reservoirs, spreading basins, etc.).

Deliveries to Irrigated Lands

Total applied water to irrigated lands in the Olcese GSA Area is obtained from the District's monthly records of supply sources. For periods when monthly information was not available, annual records were used. When annual values were used, they were distributed to each month by applying scaling factors based on the averages of observed monthly values. When neither annual nor monthly data were available, long-term monthly average values were used. The tab *"Monthly Diversions"* shows monthly data (observed or estimated) of total applied water by source for the entire period of interest.

4. WATER BUDGET MODEL CALIBRATION

This section documents the process used to calibrate the Olcese GSA Long-Term (1994 – 2015) Water Budget Spreadsheet Model and reports the final water budget calibration results.

Calibration Process

As described in **Section 1**, the water budget model is a spreadsheet-based tool that quantifies 27 individual hydrologic flow components and then uses mass balance principles to link components and calculate a residual change in storage from the groundwater system at a monthly timestep.

Included in the water budget spreadsheet model are various "User Input Parameters" that can be adjusted to improve model performance. Values for these adjustable parameters were initially set to reasonable values based on a review of previous relevant studies and local information, where possible (see **Sections 1** through **3**) and were subsequently adjusted to minimize the difference between model-calculated and observed groundwater elevation.

Water Budget Calibration to Observed Groundwater Elevation

User Input Parameters specified within the water budget spreadsheet model were subsequently adjusted within reasonable limits to improve the fit between the water budget-calculated water levels and historical groundwater levels measured in District's wells. Calibration was conducted by systematically adjusting the values of key parameters to try to minimize the difference between the observed water level records and the water budget model-calculated water levels. These adjustments were made based on

[5] The ITRC-METRIC study did not use satellite imagery data from all available times during the period of interest, but rather used selected dates (between 9 and 13 each year) and used interpolation methods to fill in between.

visual comparison of the modeled and observed data since the density of groundwater elevation data did not justify performing a quantitative calibration (i.e., using Root Mean Square Error or a similar method).

Calibration Results

Table G-2 below reports the final calibrated values of each User Input Parameter in the water budget model spreadsheet. Parameters listed in **bold** are those whose values were adjusted during the calibration process; all other parameters were held at their initial values during calibration.

Table G-2. Results of Water Budget Sensitivity Analysis

Parameter	Calibrated Value
District and Surrounding Watersheds Precipitation Multiplier (-)	1.17
Upstream Watersheds Precipitation Multiplier (-)	2.31
Open Water Evaporation Coefficient (-)	1.05
Artificial Canals Seepage Rate (ft/day)	0.01
Watersheds Consumptive Use Fraction (-)	0.96
Watershed Precipitation Threshold for Runoff (in/month)	0.8
Recharge Rate from Kern River [1] (AF/month)	**61**
Effective Olcese Sand Outcrop Area [2] (ac)	**3,030**
Olcese Sand Outcrops Seepage Lag (months)	**3**
Olcese Sand Aquifer Transmissivity (ft^2/day)	**3,750**
Outflow Boundary Width (feet)	14,000
M&I Consumptive Use Fraction (-)	0.9
Storage Coefficient	**0.01**
Hydraulic Gradient near Olcese GSA Area Boundary (-)	0.005

Abbreviations:

AF = acre-feet; ft/day = feet per day; ft^2/day = squared feet per day; in = inches; M&I = municipal and industrial

Notes:

1. Based on stable isotope analysis of samples collected from wells penetrating the Olcese Sand Aquifer Unit, Kern River water constitutes approximately 25% of the recharge to the aquifer. Therefore, a constant recharge rate was set to achieve this ratio on average for the period of interest (January 1994 - December 2015).
2. The effective Olcese San Outcrop Area functions as a surrogate for the combination of different mechanisms of infiltrated precipitation to the Olcese Sand Aquifer Unit. The contribution of each mechanism is unknown, but stable isotope data have shown that local rainfall contributes approximately 75% of the recharge to the portion of the aquifer within the GSA. This factor was set to achieve that recharge ratio.

Figures WB-11 and **WB-12** of the Olcese GSP show the results of the water budget model calibration in terms of the model-calculated groundwater elevations compared to observations. These figures demonstrate that the water budget spreadsheet model replicates, with reasonable accuracy, groundwater elevations in the period of analysis. However, uncertainty remains regarding the "User Input

Parameters" since other value combinations of these parameters could achieve a similar fit. As more information becomes available, these parameters could be refined or confirmed. In particular, information about recharge mechanisms to the Olcese Sand Aquifer and groundwater elevations would be helpful to refine and confirm the calibration.

TABLE G-1
Summary of Water Budget Components and Estimation Methods
Olcese Groundwater Sustainability Agency
Kern Subbasin

Component Number	Water Balance Component	Component's Role in Overall Water Budget Domain	Watersheds (not part of Water Budget Domain)	Artificial Channels and Reservoirs	Agricultural Lands within Olcese GSA Area	Natural Channels / Shallow Alluvium	Groundwater System (Olcese Sand Aquifer)	Urban Areas	Estimation / Calculation Method	Relevant Factors / Notes
1	Rainfall onto Contributing Watersheds	External	In						CIMIS Precip * PRISM Scaling factor * Watershed Area	PRISM Scaling Factor: 1.17 Watershed Area: 41,267 ac
2	Net Consumptive Use in Watersheds	External	Out						if CIMIS Precip * PRISM Scaling Factor < Runoff Threshold, then equals Rainfall on Watersheds [1] else equals Rainfall on Watersheds [1] * Watershed CU Factor	PRISM Scaling Factor = 1.17 Runoff Threshold: 0.8 in Watershed CU Factor: 0.958 (calibrated)
3	Smaller Streamflow into District Area	Inflow	Out			In			Rainfall on Watersheds [1] - Consumptive Use in Watersheds [2]	
4	Kern River Diversions	Internal Linkage		In		Out			District Operations Records	Includes OWD Kern River riparian, City of Bakersfield (for GC), and Carmel Right; Monthly data when available; when monthly data not available, equals annual value scaled by average monthly fraction
5	Groundwater Pumping from District Wells	Internal Linkage		In			Out		District Operations Records	Includes OWD Wells #1, #2, #3, #4, and Canyon View Ranch; Monthly data when available; when monthly data not available, equals annual value scaled by average monthly fraction
6	Rainfall onto Artificial Channels and Reservoirs	Inflow		In					CIMIS Precip * PRISM Scaling Factor * Channel & Reservoir Area	PRISM Scaling Factor: 1.17 Channel & Reservoir Area: 14.93 ac
7	District Deliveries to Ag Lands	Internal Linkage		Out	In				Residual of Artifical Channels subdomain ([4]+[5]+[6]-[8]-[9]-[10]-Exports to GC/sales), scaled by Area fraction inside GSA Area	Area fraction inside GSA Area: 0.88
8	Seepage from Artificial Channels	Internal Linkage		Out		In			Seepage Rate * Channel & Reservoir Area	Seepage Rate: 0.01 ft/d Channel & Reservoir Area: 14.93 ac
9	M&I Deliveries (Anne Sippi)	Internal Linkage		Out				In	District Operations Records	Monthly data when available; when monthly data not available, equals annual value scaled by average monthly fraction
10	Evaporation from Artificial Channels	Outflow		Out					CIMIS ETo * Open Water Evap Coeff * Channel & Reservoir Area	Open Water Evap Coeff: 1.05 Channel & Reservoir Area: 14.93 ac
11	Exports (to GC, sales, or ag lands outside of GSA Area)	Outflow		Out					Exports to GC/Sales: District Operations Records Deliveries to Ag Lands Outside of GSA Area: Residual of Artifical Channels Subdomain ([4]+[5]+[6]-[8]-[9]-[10]-Exports to GC/sales), scaled by Area fraction outside GSA Area	District records: Monthly data when available; when monthly data not available, equals annual value scaled by average monthly fraction; Area fraction outside GSA Area: 0.12
12	Rainfall onto Agricultural Lands	Inflow			In				CIMIS Precip * PRISM Scaling Factor * Ag Lands Area	PRISM Scaling Factor: 1.17 Ag Lands Area: 1,312.7 ac
13	Infiltration of Rainfall and Applied Water	Internal Linkage			Out	In			Residual of Agricultural Lands subdomain ([7]+[12]-[14])	
14	Evapotranspiration of Rainfall and Applied Water	Outflow			Out				ITRC METRIC ET on Ag Lands	Missing data (i.e., calendar year 2012) filled using average monthly values from years with data
15	Kern River Flow into District Area	Inflow				In			Kern River at Isabella (KRI) + Additional Runoff from Watersheds below Isabella Dam	Additional Runoff below Isabella Dam estimated in same way as [3]; Upstream Watershed Area: 149,469 ac Upstream Watersheds PRISM Scaling Factor: 2.31
16	Rainfall onto Natural Channels	Inflow				In			CIMIS Precip * PRISM Scaling Factor * Natural Channels Area	PRISM Scaling Factor: 1.17 Natural Channels Area: 65.21 ac
17	Recharge from Natural Channels	Internal Linkage				Out	In		Seepage Rate * Olcese Sand Aquifer-Kern River Interface Area	Olcese Sand Aquifer-Kern River Interface Area: 2.5 ac (calibrated) Seepage Rate: 0.8 ft/d (calibrated); calibration based on stable isotope data
18	Evaporation from Natural Channels	Outflow				Out			CIMIS ETo * Open Water Evap Coeff * Natural Channels Area	Open Water Evap Coeff: 1.05 Natural Channels Area: 65.21 ac

TABLE G-1
Summary of Water Budget Components and Estimation Methods
Olcese Groundwater Sustainability Agency
Kern Subbasin

Component Number	Water Balance Component	Component's Role in Overall Water Budget Domain	Watersheds (not part of Water Budget Domain)	Artificial Channels and Reservoirs	Agricultural Lands within Olcese GSA Area	Natural Channels / Shallow Alluvium	Groundwater System (Olcese Sand Aquifer)	Urban Areas	Estimation / Calculation Method	Relevant Factors / Notes
19	Kern River Flow out of District Area	Outflow				Out			Residual of Natural Channels subdomain ([13]+[15]+[16]-[17]-[18]-[19])	
20	Infiltration of M&I Water	Internal Linkage				In		Out	Residual of Urban Lands subdomain ([9]+[24]+[25]-[26])	
21	Subsurface Groundwater Inflow	Inflow					In		Set equal to zero	Assumes no upgradient basin
22	Change in Groundwater Storage	Mass Balance							Residual in Groundwater subdomain	
23	Subsurface Groundwater Outflow	Outflow					Out		Darcy's Law: equals Transmissivity * Boundary Width * Gradient	Transmissivity: 3,750 ft^2/d (calibrated) Boundary Width: 14,000 ft Gradient: 0.005 ft/ft
24	Cal Water Deliveries to Rio Bravo Area	Inflow						In	Home Count * Single-family Water Use * Multiplier	Home Count: 11 (based on review of aerial photos) Single-family Water Use: 0.534 AFY (est. from Cal Water 2015 UWMP) Multiplier: 5 (to account for larger than average homes)
25	Rainfall onto Urban Areas	Inflow						In	CIMIS Precip * PRISM Scaling Factor * Urban Lands Area	PRISM Scaling Factor: 1.17 Urban Lands Area: 44.25 ac
26	Consumptive Use of M&I Water	Outflow						Out	M&I Delivieres (Anne Sippi [9] + Cal Water [24]) * M&I CU Factor	M&I CU Factor: 0.9
27	Infiltration of Precipitation on Olcese Sand Outcrops	Inflow					In		min(CIMIS Precip * PRISM Scaling Factor, Max Monthly Outcrop Recharge Rate) * Effective Olcese Sand Outcrop Area	PRISM Scaling Factor: 1.17 Max Monthly Outcrop Recharge Rate: 4 in Effective Olcese Sand Outcrop Area: 3,030 ac (calibrated)

Abbreviations

ac = acres
CIMIS = California Irrigation Management Information System (Arvin Station)
CU = Consumptive Use
ft = feet
ft/d = feet per day
ft^2/d = feet squared per day
GSA = Groundwater Sustainabiltiy Agency
in = inches
M&I = Municipal & Industrial (Domestic)
UWMP = Urban Water Management Plan

Appendix H

CASGEM Monitoring Plan

Olcese Water District GSA
CASGEM Monitoring Plan

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APPENDICES

1. Introduction

The Olcese Water District Groundwater Sustainability Agency (Olcese GSA) has notified the Department of Water Resources (DWR) that it intends to be the monitoring entity for the portion of the Kern County Groundwater Subbasin (DWR Basin No. 5-022.14, herein "Kern Subbasin") underlying its service area, pursuant to the California Statewide Groundwater Elevation Monitoring (CASGEM) program. The Olcese GSA was formed in December 2016 and is working to bring its service area into compliance with the CASGEM program.

This monitoring plan discusses the characteristics of the portion of the Kern Subbasin underlying the Olcese GSA service area, historical water levels, monitoring schedule, and field methods, and is intended to meet the requirements for monitoring groundwater levels pursuant to the CASGEM program.

2. Background

a. Location

The Olcese Water District (herein the "District") is located approximately 10 miles northeast of Bakersfield along Kern Canyon Road (CA Highway 178). The District provides agricultural water to lands within its 4,832 acre service area which is situated on both sides of the Kern River just downstream of the Kern Gorge Fault where the river flows out of Kern River Canyon (see Figure 1). The District's service area intersects a small portion of the Kern Subbasin along its eastern-most boundary, as currently delineated.

The Olcese GSA covers the portion of the District service area that is contained within the current Kern Subbasin boundaries and is approximately 3,206 acres in size. The Olcese GSA service area is bounded on the northern and eastern sides by the existing Kern Subbasin boundary, and on the southern and western sides by the District's administrative boundaries (see Figure 1).

b. Topography

The Olcese GSA service area is situated just downstream of the Kern Gorge Fault and the western terminus of the Sierra Nevada granodiorite bedrock. Elevations of the Kern River valley floor (where almost all District pumping and irrigation occurs) range from approximately 540 to 930 feet above mean sea level (ft msl) within the Olcese GSA service area, generally decreasing as you move downstream to the west and reaching its low point where the Kern River crosses the western GSA boundary. The Sierra Nevada bedrock is significantly uplifted on the northeastern side of the Kern Gorge Fault, with elevations at the top of the Kern River Canyon exceeding 2,500 ft msl just outside of the northeastern GSA boundary. Foothills to the north and south of the agricultural areas of the Kern River valley reach elevations of approximately 1,100 ft msl and 1,200 ft msl, respectively. Thus, the

Olcese GSA area is effectively comprised of a relatively flat terraced valley floor surrounded on its northern, eastern, and southern sides by elevated foothills.

c. Description of Local Hydrogeology

The Olcese GSA service area currently includes the portion of the Kern Subbasin that lies within the District. As such, the northern and eastern Olcese GSA boundaries generally trace the extent of the Quaternary alluvial sediments as shown on the California Division of Mines and Geology (CDMG) Geologic Map of California[1]. The northwest-southeast trending Kern Gorge Fault delineates the boundary between the non-water bearing pre-Tertiary granodiorite bedrock of the southern Sierra Nevada and the Tertiary water bearing sedimentary formations of the greater Kern Subbasin.

The Olcese GSA sits atop the eastern terminus of a sequence of mixed continental and marine sedimentary deposits that fill the asymmetrical structural trough that forms the regional San Joaquin Valley. These units, of Miocene age and older, are overlain by more recently deposited alluvial and terrace sediments associated with the Kern River. Running through the center of the Olcese GSA service area is a 50-300 foot thick unit of young (Pliestocene to Recent), coarse to medium-grained alluvium deposited by the Kern River as it outfalls from the steep granitic canyons of the Sierra Nevada.

Underlying this relatively young and unconsolidated alluvium unit is the middle/upper Miocene Round Mountain Silt, a marine siltstone and claystone which varies in thickness up to almost 800 feet thick within the Olcese GSA service area depending on location. The Round Mountain Silt acts as the impermeable base of the Shallow Alluvium. Additionally, local outcroppings of the Round Mountain Silt outcrop along the margins of the Shallow Alluvium on both sides of the Kern River within the Olcese GSA service area, as evidenced by United States Geological Survey (USGS) regional maps of surficial geology[2]. These local outcroppings act as a lateral hydrogeologic barrier to groundwater flow within the Shallow Alluvium, constraining outflows to within the narrow margins of the Kern River Channel.

Underlying the Round Mountain Silt is a set of older (Tertiary) sedimentary deposits of mixed marine and continental origin. The Tertiary sedimentary units generally dip to the southwest towards the center of the San Joaquin Valley. Based on geophysical logs from numerous exploratory oil and gas boreholes and wells, the most permeable of these Tertiary units is the lower Miocene Olcese Sands formation (hereafter the "Olcese Sands Aquifer Unit"), a fine- to coarse-grained sandstone with silty sandstone and sandy siltstone interbeds. The Olcese Sands Aquifer Unit is encountered at depths of approximately 200 to 800 feet below ground surface (ft bgs) under the Olcese GSA service area (approximately

[1] California Division of Mines and Geology, Geologic Map of California, Olaf P. Jenkins Edition, Bakersfield Sheet (1964)

[2] Bartow, J. Alan, 1984. Geologic Map and Cross Sections of the Southeastern Margin of the San Joaquin Valley, California, U.S. Geological Survey, Miscellaneous Investigation Series, Map I-1496.

600 to -300 ft msl) and extends to depths of approximately 2,000 ft bgs (-1,400 ft msl) as the unit generally dips and thins to the southwest. The average thickness of the Olcese Sands Aquifer Unit is roughly 1,000 feet in the vicinity of the Olcese GSA service area.

The Round Mountain Silt creates confined groundwater conditions within the Olcese Sands Aquifer Unit, as evidenced by artesian conditions (i.e. water levels well above the top of the unit) observed in wells screened within the unit. Additionally, the progressive thinning, dipping, and displacement via faulting of the Olcese Sands formation to the south and southwest serves to constrain usable groundwater resources to within the vicinity of the Olcese GSA service area. The top of the Olcese Sands formation dips to >2,300 ft bgs near the Ant Hill Oil Field (approximately 1.5 miles from the southwestern GSA boundary in the "down-dip" direction) and >3,500 ft bgs before pinching out northeast of Bakersfield, substantially below the overlying Kern River and Santa Margarita Formations that are primarily used for groundwater production in the greater Kern Subbasin. Water quality samples collected at the nearby Ant Hill Oil Field also indicate that groundwater in the Olcese Sands Aquifer Unit becomes brackish (Total Dissolved Solids concentrations > 3,000 mg/L) and contaminated with oil in this area, limiting the beneficial use of the water resource.

Underlying the Olcese Sands Aquifer Unit is the lower Miocene Freeman Silt formation, a marine siltstone unit that effectively serves as the bottom of the groundwater basin underlying the GSA service area.

d. Groundwater Production

Groundwater production within the District has ranged between zero and approximately 2,300 acre-feet per year (AFY) from 2000 through 2014, averaging approximately 800 AFY. The primary use of groundwater within the District is for irrigated agriculture, almost exclusively for citrus and other permanent tree crops. Groundwater is pumped from four active District production wells (i.e., Wells #2, #3, #4, and the Canyon View Ranch Well) to meet any excess demands for irrigation that are not met by the District's riparian rights to the Kern River (see Figure 2).

Based on available well construction information, water quality reports, and geologic information, the Olcese Sands Aquifer Unit is the primary source of groundwater underlying the Olcese GSA, and water levels measured in the District's four wells indicate that the Olcese Sands Aquifer Unit is confined by the overlying Round Mountain Silt in this area.

e. Historical Groundwater Levels

Groundwater levels within the Olcese GSA service area have been measured in select locations by the District since its first production well was completed in 1966 (Well #1). Based on available data from Well #1, annual groundwater levels ranged between 490 and 540 ft msl from 1966 through 1983. After a seven-year gap in the record, water level data

from Wells #1 and #2 showed groundwater elevation in the Olcese Sands Aquifer Unit had declined to between approximately 380 and 420 ft msl in 1990. Groundwater elevations then appeared to generally stabilize, fluctuating between approximately 350 and 470 ft msl from 1990 through 2016, reaching a high of 470 ft msl in 1997 and a low of 350 ft msl in 2014 (see Figure 3a).

More frequent water level data have been collected from Wells #2 and #3 since late 2014. These near-monthly data showed a yearly high in 2016 of 415 ft msl in early May and a yearly low of 357 ft msl in mid-August, indicating an approximate 60-foot range in groundwater levels over the 2016 summer pumping season (see Figure 3b). This seasonal fluctuation is generally consistent with the long-term records, where groundwater levels measured between the months of May and October (when groundwater is being pumped for irrigation supply) are drawn down and then recover during the months of December through March when pumping ceases.

3. Groundwater Elevation Monitoring Network

The Olcese GSA proposes to include two of the District's existing production wells in the CASGEM monitoring network, while the other two existing production wells will serve as voluntary monitoring wells. Well #4 and the Canyon View Ranch well will serve as dedicated CASGEM monitoring wells, while Well #2 and Well #3 will serve as voluntary monitoring wells (see Figure 4). Details of these wells are shown on Table 1.

The Canyon View Ranch well was selected as a CASGEM monitoring well due to its location on the eastern side of the Olcese GSA service area, and because it has the shallowest screened interval of all District wells (i.e., from 140 to 340 ft bgs). This will provide for adequate monitoring of groundwater conditions within the shallow portion of the Olcese Sands Aquifer Unit on the eastern side of the GSA service area. Though this well has not historically been monitored for groundwater elevations, the well head contains ample space to install a sounding tube for measuring water levels using an electric sounding tape.

Well #4 was selected as a CASGEM monitoring well due to its location on the western side of the Olcese GSA service area, and because it has the deepest screened interval of all District wells (i.e., screened from 860 to 2,000 ft bgs). This will provide for adequate monitoring of groundwater conditions within the deeper portion of the Olcese Sands Aquifer Unit on the western side of the GSA service area. This well was recently installed in 2016, and contains a dedicated sounding tube for measuring water levels with an electric sounding tape.

Though Well #2 and Well #3 are the District's only active wells with recent and historical groundwater level data, these wells have historically been monitored using an air-line measurement method, which is less accurate than steel/electric sounding tape or transducer methods. These wells do not have adequate space in the well head to employ a sounding wire and will therefore be included as voluntary wells in the Olcese GSA's CASGEM monitoring network.

4. Monitoring Network Data Gaps

Though nearly all groundwater pumping within the Olcese GSA service area is believed to occur from the Olcese Sand Aquifer Unit, it also is noted that the shallow (50-300 ft deep) alluvial deposits underlying the Kern River likely contain fresh, usable groundwater and could therefore be considered as a discrete aquifer unit in the local area. Currently, the District/Olcese GSA does not have any wells exclusively screening the Shallow Alluvium, nor has any groundwater level monitoring historically taken place within this unconfined aquifer unit.

The Olcese GSA recognizes the Shallow Alluvium as a monitoring network data gap, and will consider filling this data gap via installation of a dedicated monitoring well within the Shallow Alluvium upon procurement of necessary funding.

5. Monitoring Schedule

Water levels will be measured bi-annually (spring and fall) to, among other things, document seasonal fluctuations in groundwater levels. Specifically, spring levels represent a seasonal high prior to summer irrigation demands and as such the water levels are typically measured during March. Fall levels represent a seasonal low after the summer irrigation demands and as such, water levels are typically measured during October.

Please see the attached Table 2 for a description of the Olcese GSA's planned groundwater elevation monitoring schedule by well.

6. Description of Field Methods

Water level measurements will be collected by District staff or third-party technicians retained by the District on a bi-annual basis as described above. For the CASGEM-dedicated wells (Well #4 and Canyon View Ranch Well), depth to water will be measured to the nearest 0.01 foot using the electrical sounding tape method. For the voluntary wells (Wells #2 and #3), depth to water will be measured to the nearest 0.1 foot using the air-line method. Field methods for measuring and recording water levels will follow DWR's Groundwater Elevation Monitoring Guidelines published to the CASGEM website[3], which are largely based off the monitoring protocol outlined in the USGS National Field Manual[4]. A detailed description of field methods is provided below:

[3]DWR, 2010. *Final Groundwater Elevation Monitoring Guidelines (December 2010).* Accessed 13 October 2017. <http://www.water.ca.gov/groundwater/casgem/documents.cfm>
[4] USGS, 2006. Chapter A4. Collection of Water Samples (Version 2.0, 9/2006). *National Field Manual for the Collection of Water-Quality Data.* Accessed 13 October 2017. https://water.usgs.gov/owq/FieldManual/chapter4/html/Ch4_contents.html

a. Establishing the Reference Point

Designate a specific, easily identifiable reference point from which to measure depth to groundwater at each well, and record the distance from the reference point to the land surface around the well to the nearest 0.01 foot. The reference point should be clearly marked, with an image of each well head and reference point stored in the field folder, and should be checked before every measurement.

For the wells being monitored with an electric sounding tape method, the reference point will be top of the sounding tube. For wells being monitored with the air-line method, the reference point will be the top of the air-line.

b. Measuring Water Levels with the Electric Sounding Tape Method

The electric sounding tape should be calibrated at least annually against a steel tape in the field. To calibrate the electric sounding tape:

1. Compare water level measurements from several (unpumped) monitoring wells at various depths made with the electric sounding tape to those made with a steel tape.
2. The measurements should agree to within +/- 0.02 foot. If this accuracy is not met, apply a correction factor to the sensor to re-align measurements.
3. Record all calibration and maintenance data into a field log, noting any adjustments made to the sensor as well as the date of the most recent calibration.

Prior to making a measurement, the water level measurement technician will:

1. Ensure the electric sounding tape is adequately calibrated (see above for detailed calibration instructions).
2. Ensure there is not oil present in the well water. If oil is present, switch to a steel tape measurer and record this change in the field log.
3. Check the electric sounding tape is not hung up on an obstruction in the well.
4. Inspect the electric sounding tape and electrode probe for any wear or damage.
5. Check the distance from the electrode probe's sensor to the nearest foot marker on the tape to ensure that this distance puts the sensor at the zero-foot point for the tape; otherwise, record the correction factor necessary to align the sensor to the zero-foot point for the tape.
6. Prepare the field form (DWR Form 1213, or a similar form) and place any previous measured water level data for the well into the field folder.
7. Check the reference point is clearly marked on the well, and matches the description in the field folder; otherwise establish a new reference point following the procedure outlined above.
8. Check the circuitry of the electric sounding tape before lowing the electrode probe into the well. Test the tape by dipping the electrode probe into tap water and observe whether the indicator indicates a closed circuit.

9. Disinfect the electrode probe and lower 5 to 10 feet of the tape, rinse with deionized or tap water, and dry.

To make the water level measurement, the water level measurement technician will:

1. Estimate the length of tape that should be lowered into the well using data from the most recent water level measurement at the well, preferably from the same season.
2. Lower the electrode probe slowly into the well until the indicator shows that the circuit is closed and contact with the water surface has been made. Avoid touching the well casing with the tape.
3. Mark the insulated wire at the reference point and record the depth to water to the nearest 0.01 foot. Record this value as the depth to water at reference point ("Tape at RP" on DWR Form 1312), along with the corresponding date and time of measurement.
4. Slowly lift the electrode probe a few feet out of the water (until the indicator goes off), then lower and collect a second measurement following Steps 2 and 3 above.
5. If the second measurement does not agree with the first measurement by ~0.2 feet, make a third-measurement following Steps 2 through 4 above. If more than two measurements are taken, record the final depth to water at the reference point as the average of all reasonable measurements.

After making the measurement, the water level measurement technician will:

1. Wipe down the electrode probe and wetted section of the tape using a disinfectant wipe, rinse thoroughly with deionized or tap water, and let dry. Rewind the tape onto the tape reel only after it has completely dried.

c. Measuring Water Levels with the Air-Line Method

The submerged air-line method requires installation of the air-line and associated equipment. To install the air-line:

1. Lower the air-line into the annular space between the pump column and casing after the pump has been installed in the well, or by securing it to the pump and pump column with wire or tape as it is lowered into the well.
2. Attach a pipe tee to the top end of the air line, and attach a tire valve stem (or a Schrader valve stem) to the opposite end of the pipe tee.
3. Connect an altitude gauge (ft.) or a pressure gauge (psi) to the fitting on top of the pipe tee.
4. Connect a tire pump or other compressed air source to the tire valve stem fitting on the pipe tee.

After installation, the air-line and gauge must be calibrated to produce a depth-to-water measurement. This is normally done with a wetted steel tape. To calibrate the system:

1. Check the functionality of the pressure gauge by pressurizing the air-line and then releasing pressure and observing the change on the gauge. If the tubing is plugged or crushed, the gauge reading will not decrease after the pressure source is removed. If the tubing is cut or severed, the gauge reading will decrease quickly to zero once the pressure source is removed.
2. Use the steel tape to make an initial depth to water measurement (**d**) from the established reference point at the well**.** Use the compressed air source to force air into the air-line until all the water is expelled from the line. Once all water is displaced from the air line, record the maximum observed gauge reading as your initial air pressure (**h,** ft).
3. The air-line will be calibrated to a constant value **k**, where k = depth to water (**d**, ft) + air pressure (**h,** ft)**.**
    a. For a pressure gauge, **h** is the recorded air pressure times the ft/psi conversion factor. One pound per square inch of pressure can be created from a 1-in square column of water nearly **2.307 feet** high (**h** = pressure * 2.307 ft/psi).
    b. For an altitude gauge, **h** is simply the gauge reading (in feet).
4. Record and store the value of **k** as this will later be used to convert the air-line pressure measurement to a depth to water estimate.

Once the value of constant **k** has been established, the air-line can be used to measure the water level. To make the water level measurement, the surveyor will:

1. Use the compressed air source to pump compressed air into the air line until all the water is expelled from the line, and record the maximum gauge reading (**h**).
2. The depth to water from the reference point will then be calculated as **d = h – k** (in feet).

d. Data Entry

Water level data from all four wells be uploaded to the CASGEM portal twice annually. For spring water levels, data will be uploaded by July 1st of the same year. For fall water levels, data will be uploaded no later than January 1st of the following year.

Table 1
CASGEM Monitoring Network Well Information

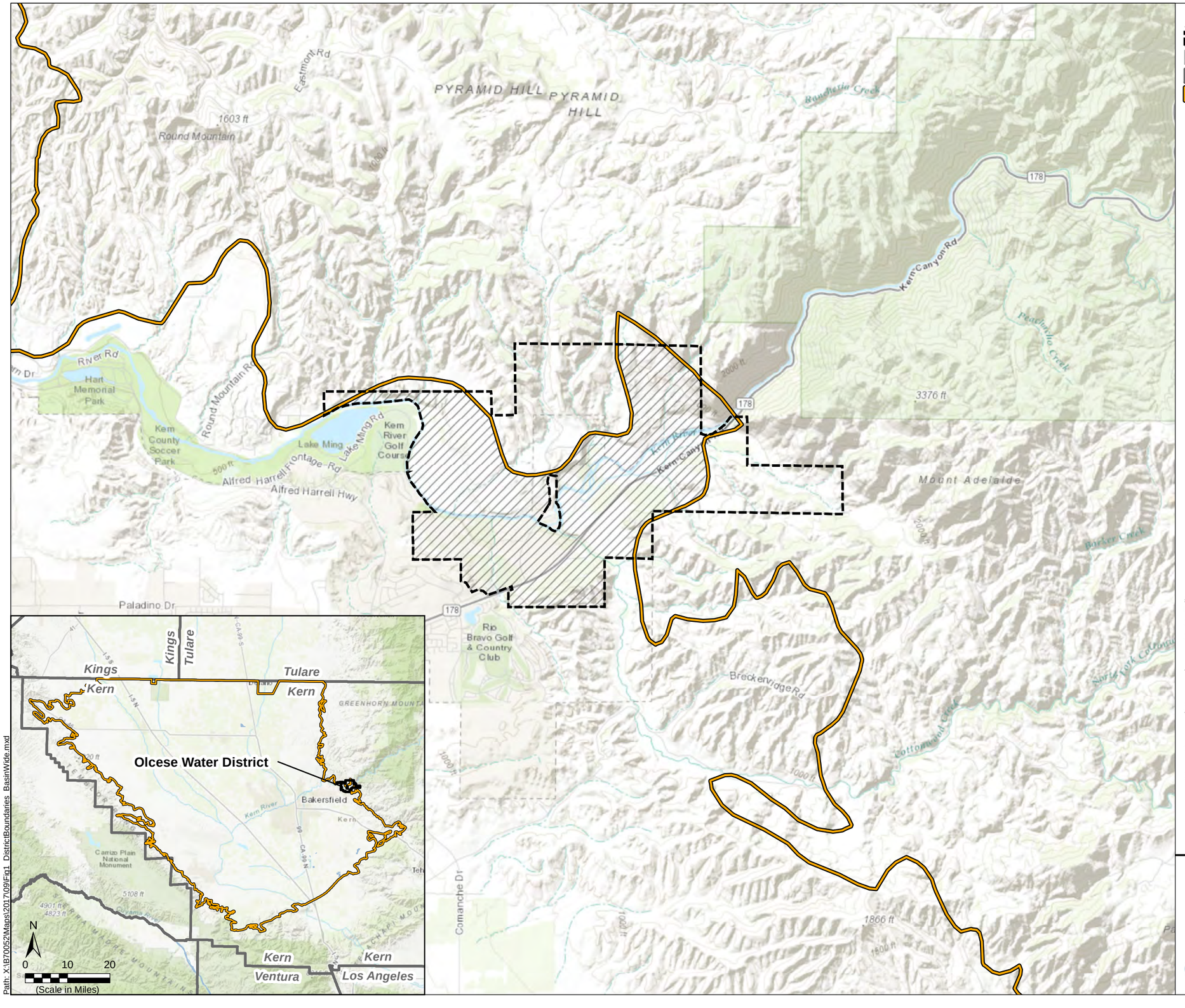
Well Type	**CASGEM**		**Voluntary**	
Local Well ID (and/or State Well Number)	**Well #4 (no State Well Number)**	**Canyon View Ranch Well (29S/30E-06F1)**	**Well #2 (29/29-1)**	**Well #3 (29S/20E-01 see comment below)**
Reference Point Elevation (feet, NAVD88)	584.40	673.51	635.21	723.26
Reference Point Description	Top of 1" dia. sounding tube marked "RP"	Top of 2-1/2" sounding tube marked "RP"	Top of airline marked "RP"	Top of airline marked "RP"
Ground Surface Elevation (feet NAVD88)	582.08	672.80	631.90	719.85
Method of Determining Elevation	GPS NAVD88	GPS NAVD88	GPS NAVD88	GPS NAVD88
Accuracy of Elevation Method	+/- 0.10	+/- 0.10	+/- 0.10	+/- 0.10
Well Use	irrigation	irrigation	irrigation	irrigation
Well Status (active or inactive)	active	active	active	active
Well Coordinates (decimal lat/long, NAD83)	35.430995 Lat, -118.8410557 Long	35.4386391 Lat, -118.8034723 Long	35.4334825 Lat, -118.8111530 Long	35.4298314 Lat, -118.8119323 Long
Method of Determining Coordinates	GPS NAD83	GPS NAD83	GPS NAD83	GPS NAD83
Accuracy of Coordinate Method	+/-0.20	+/-0.20	+/-0.20	+/-0.20
Well Completion Type (single or multi-completion)	single	single	single	multiple
Total Depth (feet)	2,000	340	1,612	1,900
Top and Bottom of Screened Intervals	860 - 2,000	140-340	560 - 1,612	800 - 900 905 - 1,890
Well Completion Report Number	e0306768	WCR0107769	WCR0021002	WCR0195795
Legacy WCR Number	e0306768	27558	23906	e0082660
Groundwater Basin of Well (or subbasin or portion)	Kern Subbasin (5-022.14)	Kern Subbasin (5-022.14)	Kern Subbasin (5-022.14)	Kern Subbasin (5-022.14)
Written Description of Well Location	800 feet north of Kern River and 3/4 mile west of Rancheria Road (from WCR)	2 mi. E. of Rancheria Rd. on Hwy. 178 then N. on dirt road 400 ft, then E. 1300 ft. along S. side of canal to well location	1 mi. E. of Rancheria Rd. on Hwy. 178 then N. on dirt road 1000 ft, then E. 1950 ft. along S. side of canal to crossing, then cross to N. side of canal, then E. 1500 ft. along N. side of canal, then 300 ft. N. to well location.	1.2 mi. E. of Rancheria Rd. on Hwy. 178 then S. on dirt road 500 ft, then E. 300 ft. to well location @ S.E. corner of reservoir
Any Additional Comments	WCR not found in DWR OSWCR database			DWR portion of WCR has the state well number incorrectly written as 29S/20E-01 when it should be 29S/29E-01

Abbreviations:

DWR = Department of Water Resources
OSWCR = Online System for Well Completion Reports
WCR = Well Completion Report

Table 2
CASGEM Proposed Monitoring Schedule

Well Type	CASGEM		Voluntary	
Local Well ID	Well #4	Canyon View Ranch Well	Well #2	Well #3
Frequency	Bi-annual	Bi-annual	Bi-annual	Bi-annual
Date of Seasonal High Measurement	March	March	March	March
Date of Seasonal Low Measurement	October	October	October	October



Path: X:\B70052\Maps\2017\09\Fig1_DistrictBoundaries_BasinWide.mxd

Legend

- OWD Service Area Boundary
- Olcese GSA Administrative Area
- County Boundaries
- Kern County Subbasin (DWR 5-022.14)

Abbreviations

DWR = California Department of Water Resources
GSA = Groundwater Sustainability Agency
OWD = Olcese Water District

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 16 October 2017.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2016 Update.
3. GSA boundaries are from DWR's SGMA Portal - GSA Map, accessed 21 August 2017.

N

0 1 2
(Scale in Miles)

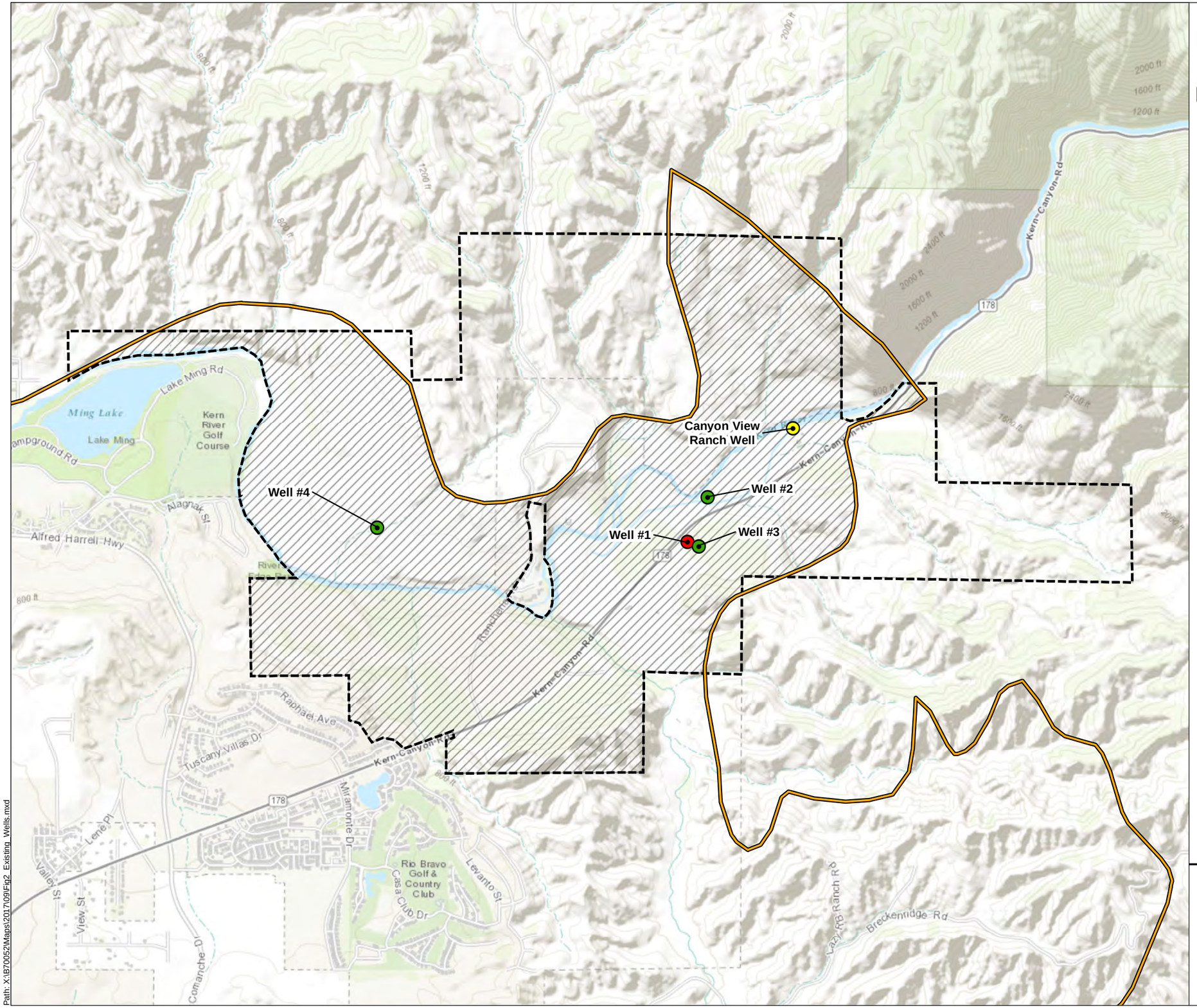
DRAFT

Olcese GSA Location and Administrative Boundaries

Olcese Water District
Kern County, CA
October 2017
B70052.00

Figure 1

eki environment & water



Legend

- OWD Service Area Boundary
- Olcese GSA Administrative Area
- County Boundaries
- Kern County Subbasin (DWR 5-022.14)

Olcese Water District Wells

- Active, Monitored
- Active, Not Monitored
- Inactive

Abbreviations

DWR = California Department of Water Resources
GSA = Groundwater Sustainability Agency
OWD = Olcese Water District

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 16 October 2017.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2016 Update.
3. GSA boundaries are from DWR's SGMA Portal - GSA Map, accessed 21 August 2017.

N

0 0.5 1

(Scale in Miles)

DRAFT

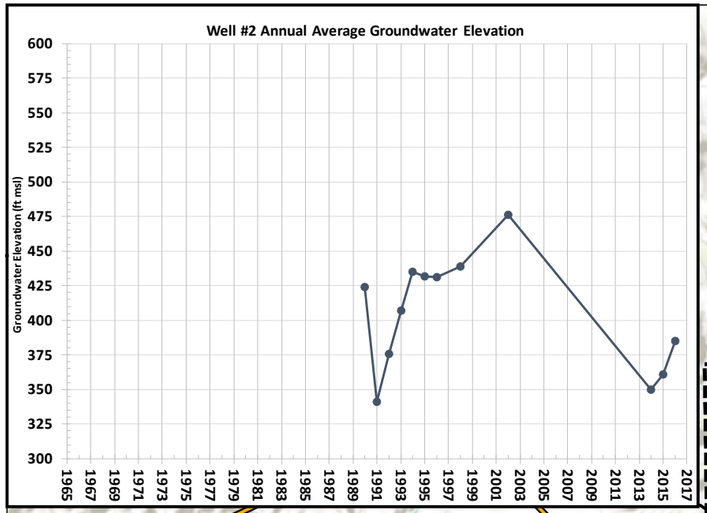
Olcese Water District
Existing Well Network

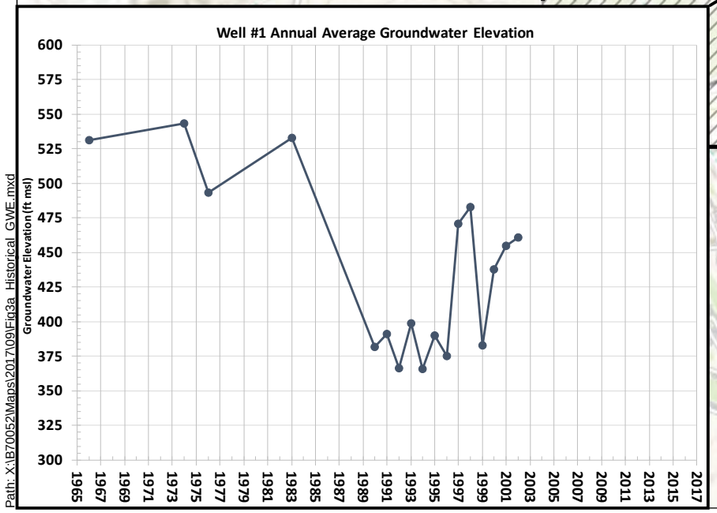
Olcese Water District
Kern County, CA
October 2017
B70052.00

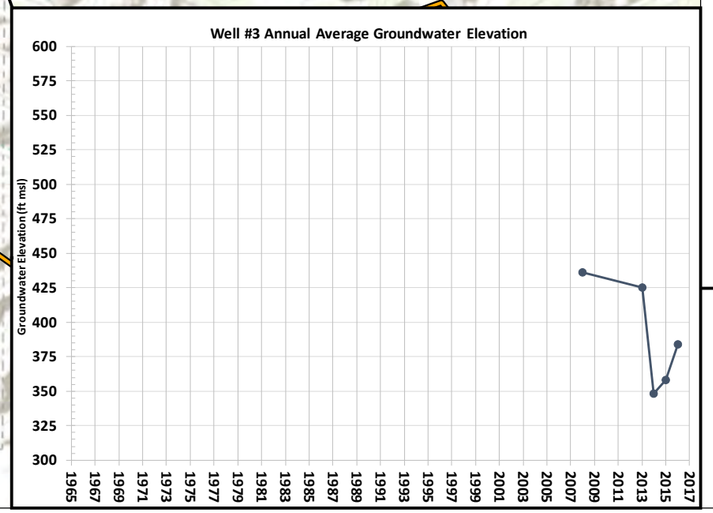
Figure 2

eki environment & water

Path: X:\B70052\Maps\2017\09\Fig2_Existing_Wells.mxd







Legend

- OWD Service Area Boundary
- Olcese GSA Administrative Area
- County Boundaries
- Kern County Subbasin (DWR 5-022.14)

Olcese Water District Wells

- Active, Monitored
- Active, Not Monitored
- Inactive

Abbreviations

DWR = California Department of Water Resources
GSA = Groundwater Sustainability Agency
ft msl = feet above mean sea level
SGMA = Sustainable Groundwater Management Act
OWD = Olcese Water District

Notes

1. All locations are approximate.
2. Groundwater elevations reported in ft msl.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 16 October 2017.
2. Historical water level data obtained from OWD Basin Boundary Modification Request on DWR SGMA Portal.
3. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2016 Update.
4. GSA boundaries are from DWR's SGMA Portal - GSA Map, accessed 21 August 2017.

N

0 0.5 1
(Scale in Miles)

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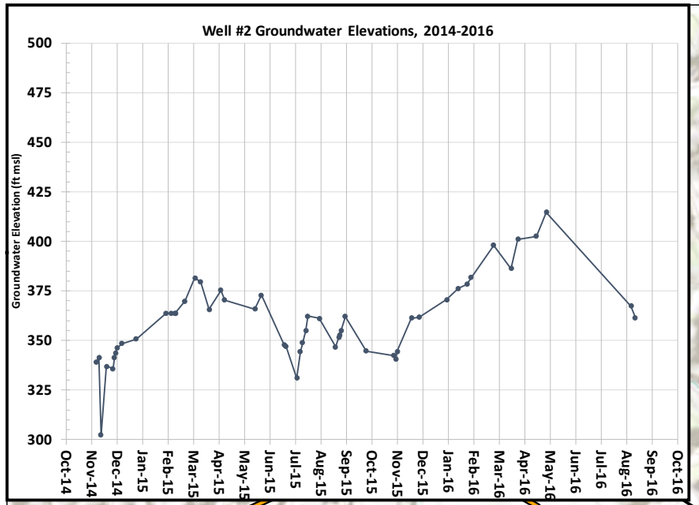
DRAFT **Historical Groundwater Elevations**

Olcese Water District
Kern County, CA
October 2017
B70052.00

Figure 3a

eki environment & water



Legend

- OWD Service Area Boundary
- Olcese GSA Administrative Area
- County Boundaries
- Kern County Subbasin (DWR 5-022.14)

Olcese Water District Wells

- Active, Monitored
- Active, Not Monitored
- Inactive

Abbreviations

DWR = California Department of Water Resources
GSA = Groundwater Sustainability Agency
ft msl = feet above mean sea level
OWD = Olcese Water District

Notes

1. All locations are approximate.
2. Recent groundwater elevation data provided for November 2014 - September 2016.
3. Groundwater elevations reported in ft msl.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 16 October 2017.
2. Well pumpage and water level data obtained from OWD on 18 May 2017.
3. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2016 Update.
4. GSA boundaries are from DWR's SGMA Portal - GSA Map, accessed 21 August 2017.

N

0 0.5 1

(Scale in Miles)

DRAFT

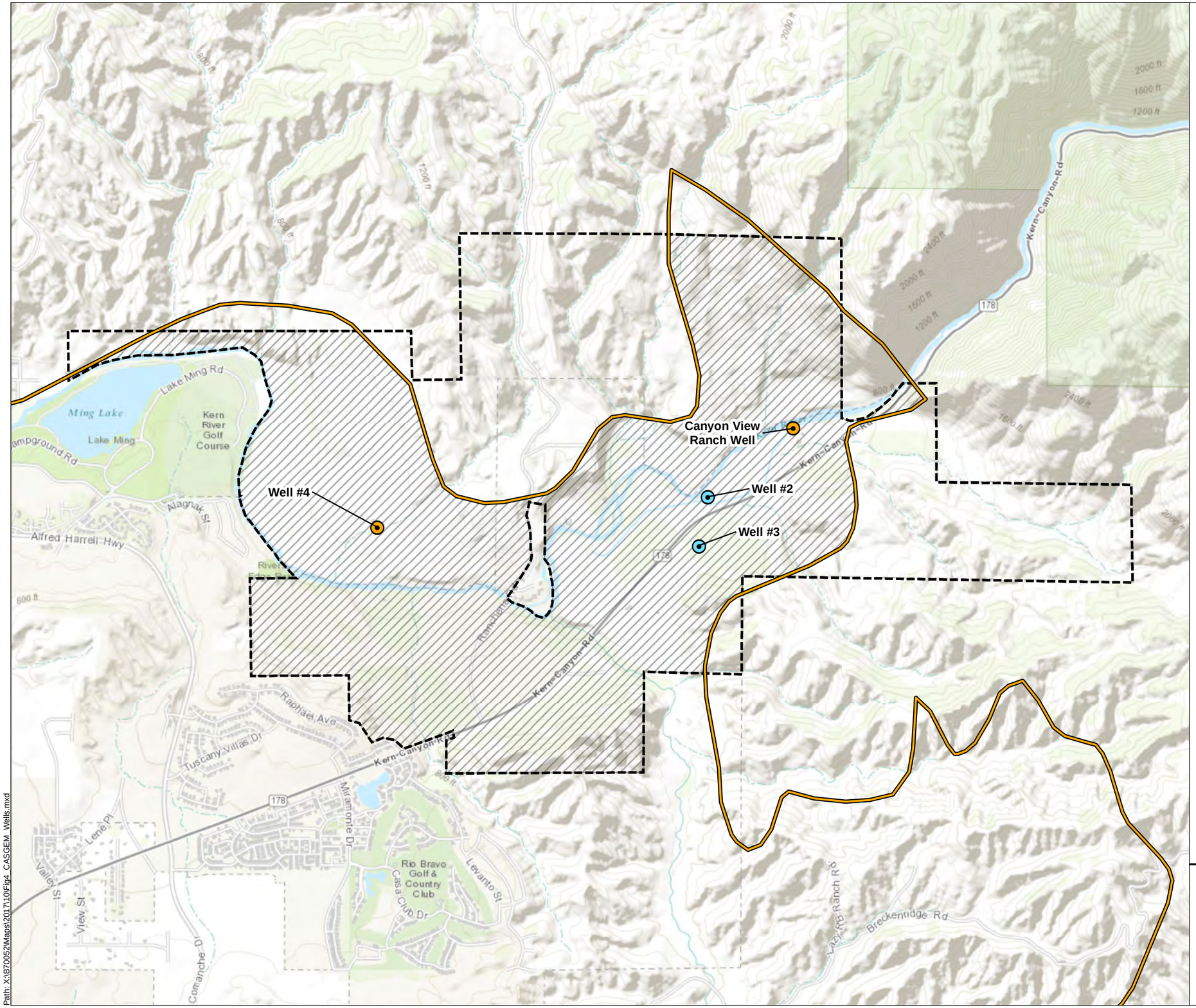
Recent Groundwater Elevations

Olcese Water District
Kern County, CA
October 2017
B70052.00

Figure 3b

eki environment & water

Path: X:\B70052\Maps\20170919Fig3b_Recent_GWE.mxd



Legend

- OWD Service Area Boundary
- Olcese GSA Administrative Area
- County Boundaries
- Kern County Subbasin (DWR 5-022.14)

Olcese GSA Monitoring Network

- CASGEM Wells
- Voluntary Wells

Abbreviations

CASGEM	= California Statewide Groundwater Elevation Monitoring Program
DWR	= California Department of Water Resources
GSA	= Groundwater Sustainability Agency
OWD	= Olcese Water District

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 16 October 2017.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2016 Update.
3. GSA boundaries are from DWR's SGMA Portal - GSA Map, accessed 21 August 2017.

N

0 0.5 1

(Scale in Miles)

DRAFT

Olcese GSA Proposed CASGEM Monitoring Network

Olcese Water District
Kern County, CA
October 2017
B70052.00

Figure 4

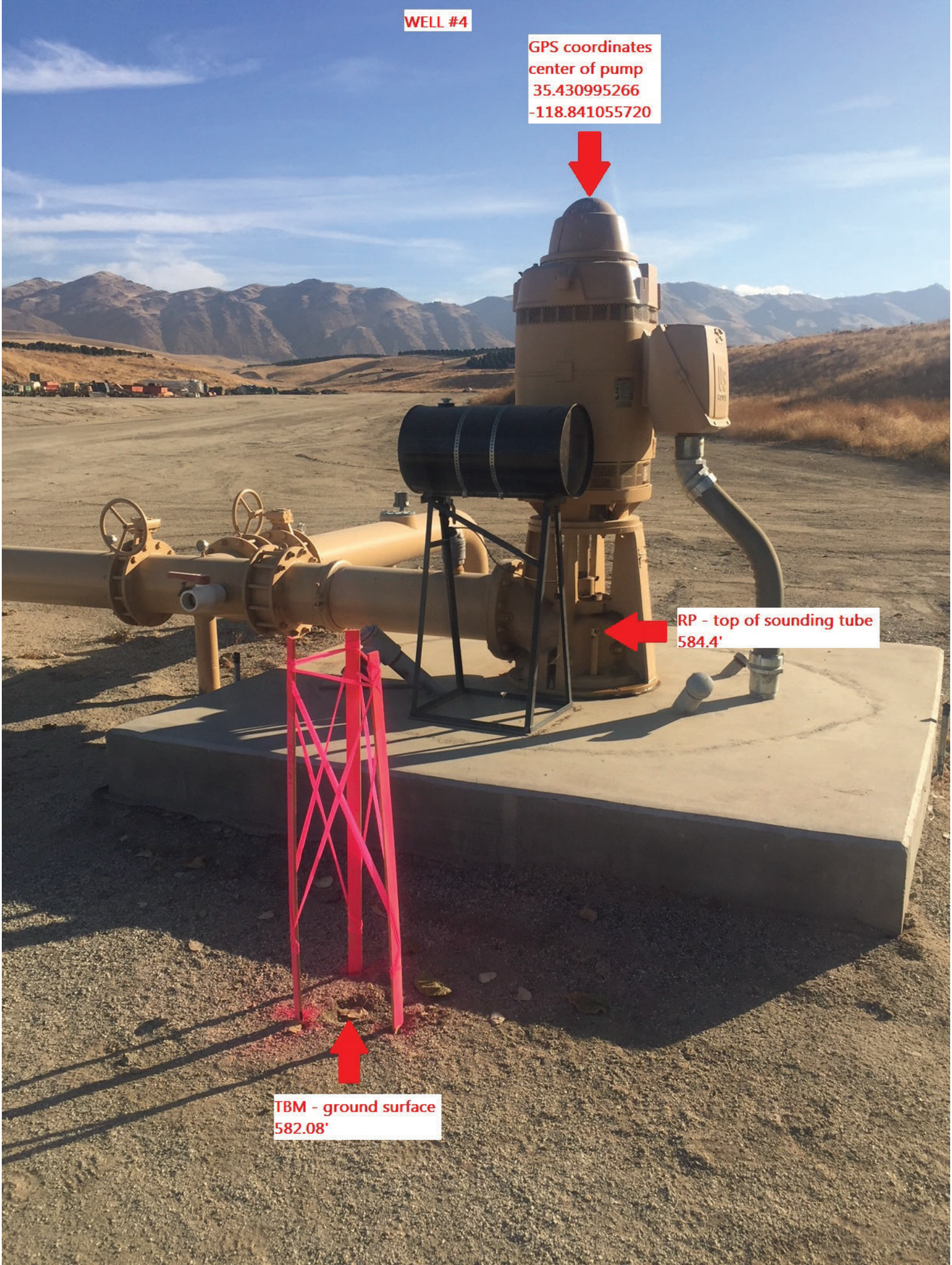
eki environment & water

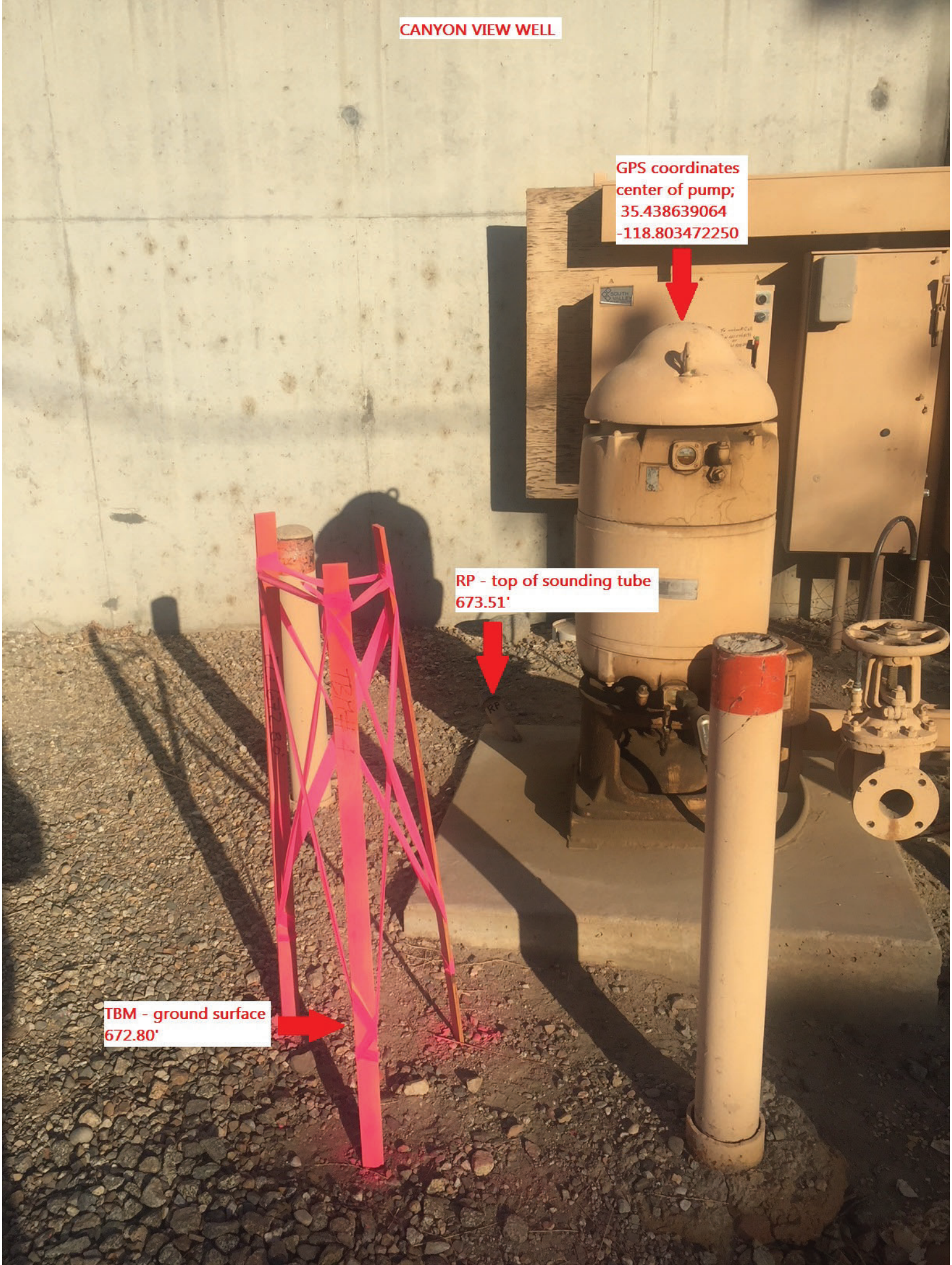
Path: X:\B70052\Maps\2017\10\Fig4_CASGEM_Wells.mxd

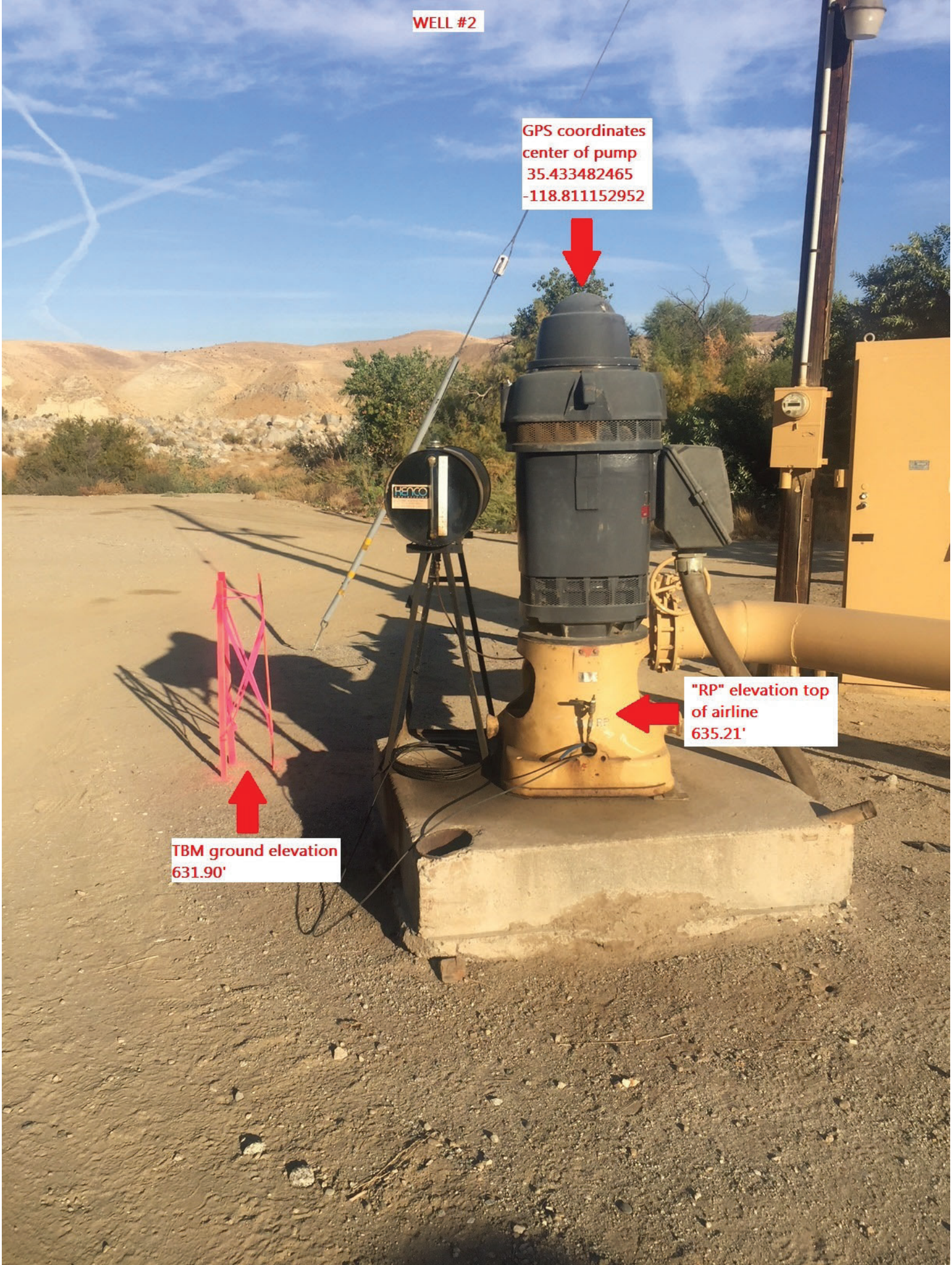
APPENDIX A

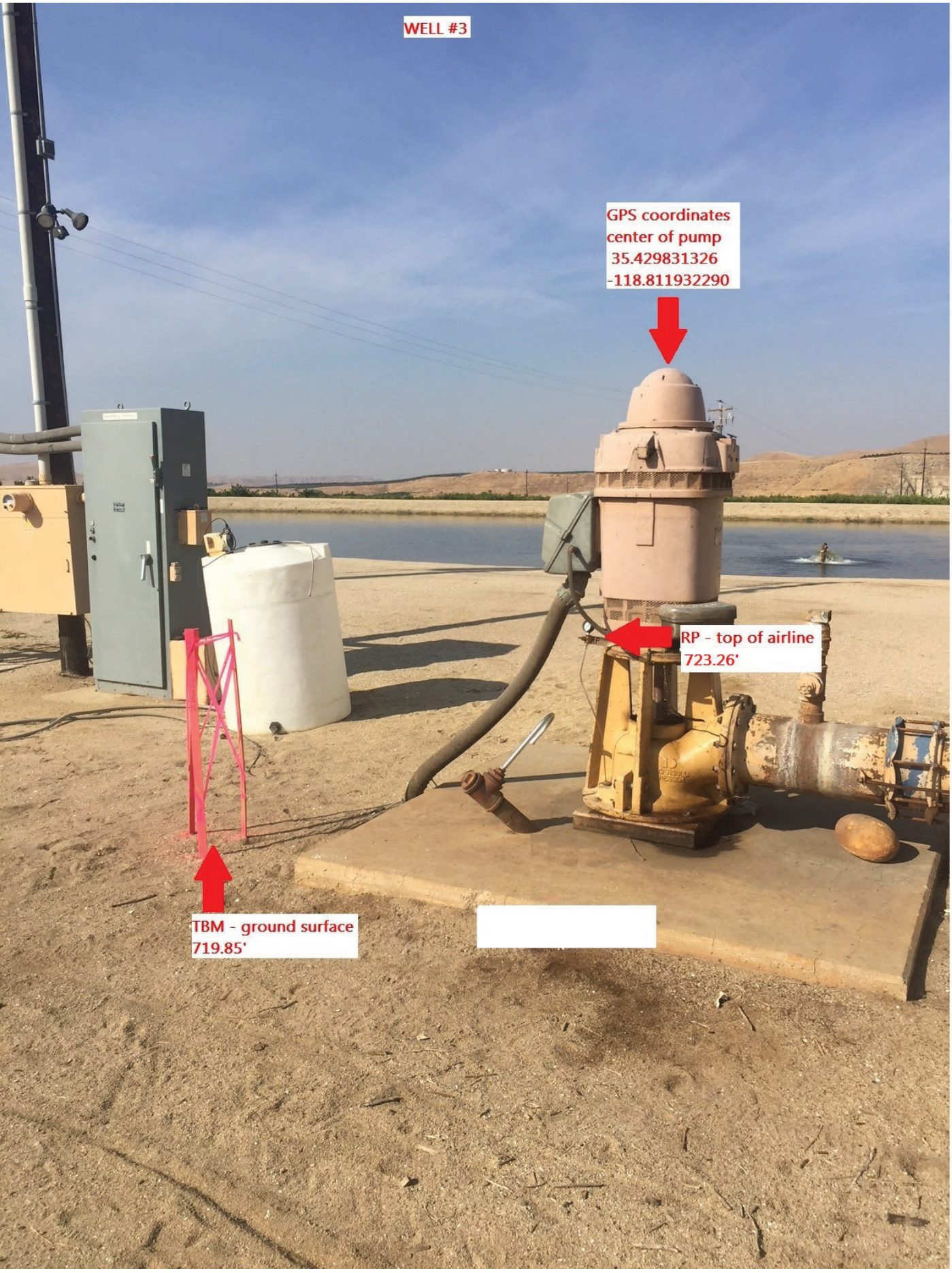
CASGEM Monitoring Network

Well Head Images


WELL #4
GPS coordinates
center of pump
35.430995266
-118.841055720
RP - top of sounding tube
584.4'
TBM - ground surface
582.08'


CANYON VIEW WELL
GPS coordinates
center of pump;
35.438639064
-118.803472250
RP - top of sounding tube
673.51'
RP
TBM - ground surface
672.80'


WELL #2
GPS coordinates
center of pump
35.433482465
-118.811152952
"RP" elevation top
of airline
635.21'
TBM ground elevation
631.90'


WELL #3
GPS coordinates
center of pump
35.429831326
-118.811932290
RP - top of airline
723.26'
TBM - ground surface
719.85'

Appendix I

Details of Shallow Monitoring Well Installed in 2019

ELECTRIC - GAMMA RAY-TEMPERATURE LOG

Pilot Borehole

boredata · Phone: (888) 908-5226 Fax: (661) 505-6561 · Web: www.boredata.com Email: ccorbell@boredata.com

Filing No.
WP 19863

Job No.
2749

COMPANY **CTL Well Drilling**

WELL **Nickel Family, LLC**

FIELD **Rio Bravo**

STATE **California** COUNTY **Kern**

LOCATION:
Farm Road and Cottonwod Creek

APN: 386-010-40

SEC: ____ TWP: ____ RGE: ____ LAT.: **35.43346** LONG.: **-118.81159**

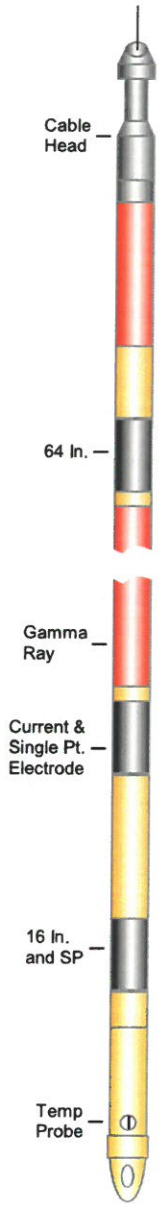
OTHER SERVICES:
None

Permanent Datum: **Ground Level** Elev.: **534** Ft. Elevs.: K.B. ____ Ft.
Log Measured From: **Ground Level** **0** Ft. Above Perm. Datum D.F. ____ Ft.
Drilling Measured From: **Ground Level** G.L. ____ Ft.

Run	**One**				
Date	**Mar 11, 2019**				
Depth-Driller	**163** Ft	Ft	Ft	Ft	
Depth-Logger	**164** Ft	Ft	Ft	Ft	
Top Logged Interval	**5** Ft	Ft	Ft	Ft	
Btm Logged Interval	**164** Ft	Ft	Ft	Ft	
Casing-Driller	**N/A** In @ Ft	In @ Ft	In @ Ft	In @ Ft	
Casing - Logger In@Ft	In @ Ft	In @ Ft	In @ Ft	In @ Ft	
Bit Size	**12.25** In @ **164** Ft	In @ Ft	In @ Ft	In @ Ft	
Time On Bottom	**17:05**				
Type Fluid in Hole	**Bentonite**				
Density / Viscosity					
pH / Fluid Loss	ml	ml	ml	ml	
Source of Sample	**Circ**				
Rm @ Mea. Temp	**12.8** @ **75** °F	@ °F	@ °F	@ °F	
Rmf @ Mea. Temp	**12.8** @ **75** °F	@ °F	@ °F	@ °F	
Rmc @ Mea. Temp	@ °F	@ °F	@ °F	@ °F	
Source Rmf / Rmc	**Meas**				
Rm @ BHT	@ °F	@ °F	@ °F	@ °F	
Time Since Circ.	**2** Hr	Hr	Hr	Hr	
Max. Rec. Temp.	**81.2** °F	°F	°F	°F	
Van No. / Location	**BD-1** **VTU**				
Recorded By	**Craig Corbell**				
Witnessed By					

This Eagle Plot Heading Conforms To API RP 31A

ELECTRIC - GAMMA RAY-TEMPERATURE LOG TOOL



SPONTANEOUS POTENTIAL LOGS:
SP Logs record potentials or voltages developed between the borehole fluid and the surrounding formation and are representations of lithology and water quality. Recording of SP logs are limited to water-filled or mud-filled open holes.

NORMAL RESISTIIVITY LOGS:
Normal Resistivity Logs record the electrical resistivity of the borehole environment with lower resistivities indicative of clays and higher resistivities being sands and gravels. Normal resistivity logs are affected by bed thickness, Borehole diameter and borehole fluid.

SINGLE POINT RESISTIVITY LOGS:
Single Point Resistivity Logs record the electrical resistance from points within the borehole to an electrical ground at land surface. Single-point resistance logs are useful in the determination of lithology, water quality, and location of fracture zones.

GAMMA RAY LOGS:
Gamma Ray Logs record the amount of natural gamma radiation emitted by the rocks surrounding the borehole. The most significant naturally occurring sources of gamma radiation are potassium 40 and daughter products of the uranium and thorium decay series. Clay and shale bearing rocks commonly emit relatively high gamma radiation because they include weathering products of potassium feldspar and mica and tend to concentrate uranium and thorium by ion absorption and exchange.

TEMPERATURE LOGS:
Temperature Logs record the water temperature in the borehole. Temperature logs are useful for delineating water-bearing zones and identifying vertical flow in the borehole between zones of differing hydraulic head penetrated by wells. Borehole flow between zones is indicated by temperature gradients that are less than the regional geothermal gradient.

ELECTRIC LOG SPECIFICATIONS:

Diameter	1.73 Inches
Length	8.37 Feet
Weight	21.7 Lbs.
Max. Temp	158° F
Resist. Range	0 - 10,000 ohm-m
Gamma Ray	1.97 inches long x .98 inches diameter Scintillation crystal

NOTICE

All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

REMARKS

CTL Well Drilling
Nickel Family, LLC
Mar 11, 2019

ELECTRIC - GAMMA RAY-TEMPERATURE LOG

Mult. Pages
10"/100'

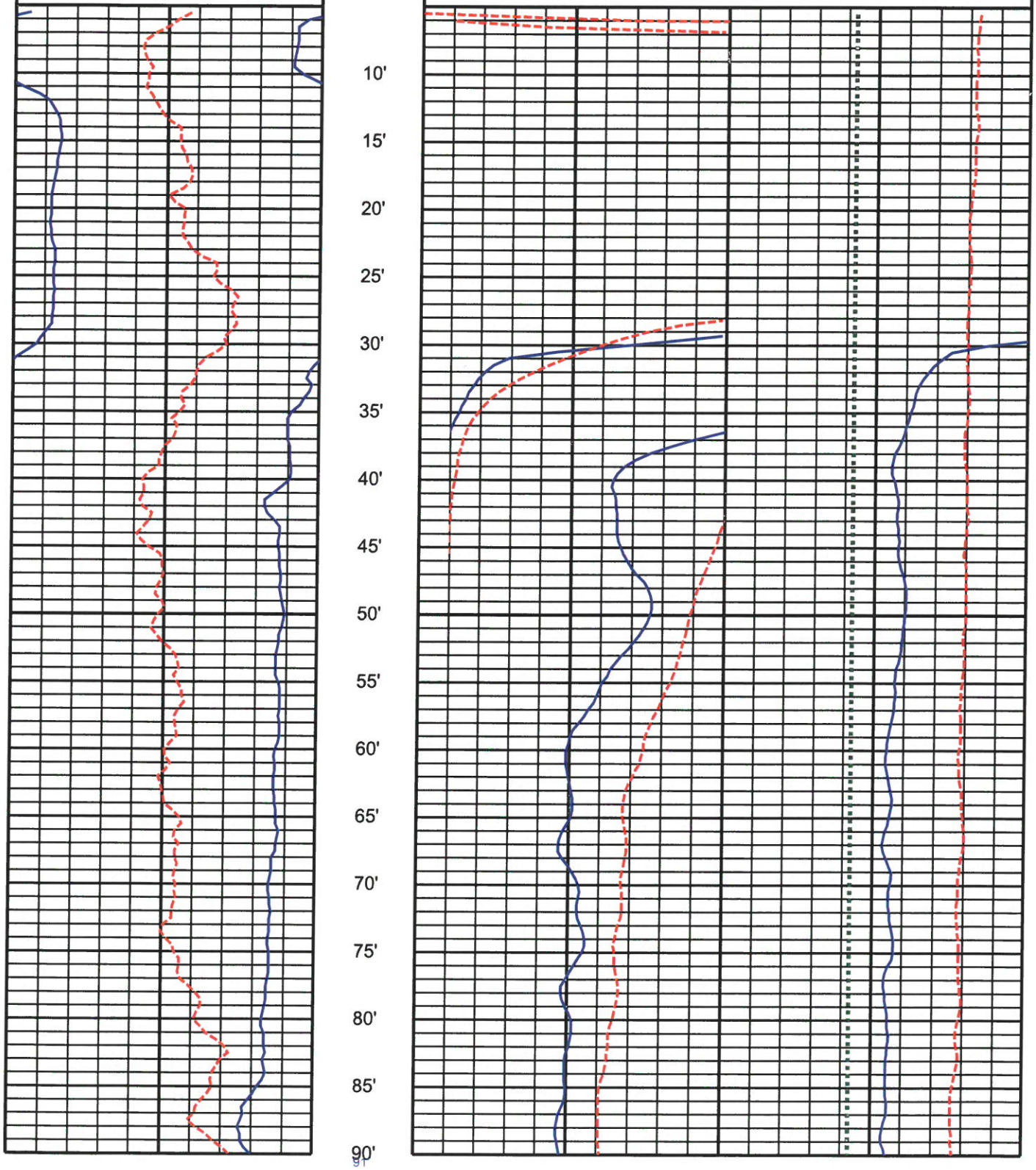
DEPTHS
(Feet)

< - S.P. (5 mV/div) S.P. + >

50 Gamma Ray(api) 150

30 64 Inch Normal (ohmm²/m) x10 300
0 64 Inch Normal (ohmm²/m) 30
30 16 Inch Normal (ohmm²/m) x10 300
0 16 Inch Normal (ohmm²/m) 30

0 Drilling Fluid (ohmmeter²/m) 30
0 Single Point(ohms) 50
73 Temperature (°F) 83



CTL Well Drilling
Nickel Family, LLC
Mar 11, 2019

ELECTRIC - GAMMA RAY-TEMPERATURE LOG

Mult. Pages
10"/100'

DEPTHS
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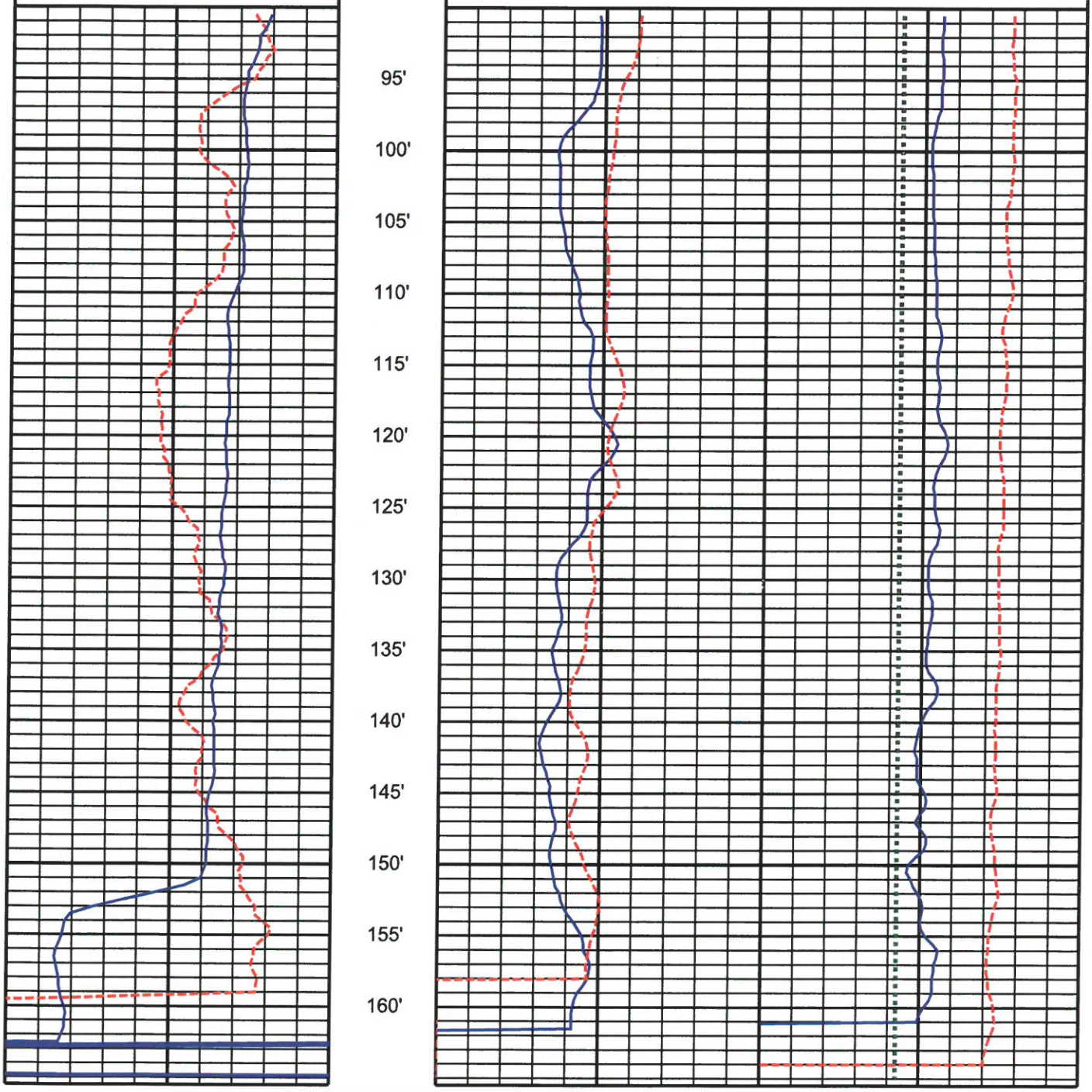
0 Single Point(ohms) 50

73 Temperature (°F) 83



Log Depth 164.5'

OSWCR: Thank you for submitting Well Completion Report WCR2019-005221

Print Trusted Blocked Delete Reply Reply to All Forward Previous Next Close

Full header

From: OSWCR-NoReply@water.ca.gov [OSWCR-NoReply@water.ca.gov]
Sent: 4/17/2019 7:35:14 AM
To: ctl@consolidatedtesting.com [ctl@consolidatedtesting.com]
Cc:
Subject: OSWCR: Thank you for submitting Well Completion Report WCR2019-005221
Attachments:

*******Please do not reply to this e-mail message*******

Thank you for submitting your Well Completion Report - A New Production or Monitoring Well, **WCR2019-005221**, using the Online System for Well Completion Reports (OSWCR). The Department of Water Resources will review it for completeness. You will be notified if additional information is required. If you have any questions, please call your local DWR Region Office WCR contact.

DWR South Central Region Office
Chris Guevara
(559)230-3356
Chris.Guevara@water.ca.gov

To view this record, log in to OSWCR, or use the following link:
https://civicnet.resources.ca.gov/DWR_WELLS/urlrouting.ashx?type=1000&Module=WellCompletion&capID1=19CAP&capID2=00000&capID3=004A5&agencyCode=DWR_WELLS

Licensed Contractor: CONSOLIDATED TESTING LABORATORIES INC License Number: 544541
Well Owner: Jeff Siemens Nickel Family LLC
Well Owner Address: PO Box 60679 Bakersfield CA 93386

Well Address: 12345 Farm RD, Bakersfield, CA 93386 County: Kern Parcel: 386-010-40
Latitude/Longitude: 35.4335°N, -118.8118°W
Submitted: 04/17/2019
Record Status: Submitted

State of California

Well Completion Report

Form DWR 188 Submitted 4/17/2019

WCR2019-005221

Owner's Well Number: MW-1 | Date Work Began: 03/11/2019 | Date Work Ended: 03/13/2019

Local Permit Agency: Department of Public Health Services - Environmental Health Department

Secondary Permit Agency: | Permit Number: WP 19863 | Permit Date: 02/21/2019

Well Owner (must remain confidential pursuant to Water Code 13752)

Name: NICKEL FAMILY LLC, Jeff Siemens

Mailing Address: PO Box 60679

City: Bakersfield | State: CA | Zip: 93386

Planned Use and Activity

Activity: New Well

Planned Use: Monitoring

Well Location

Address: 12345 Farm RD

City: Bakersfield | Zip: 93386 | County: Kern

Latitude: 35 Deg. 26 Min. 0.6 Sec. N | Longitude: -118 Deg. 48 Min. 42.48 Sec. W

Dec. Lat.: 35.4335 | Dec. Long.: -118.8118

Vertical Datum: | Horizontal Datum: WGS84

Location Accuracy: | Location Determination Method:

APN: 386-010-40

Township: 29 S

Range: 29 E

Section: 01

Baseline Meridian: Mount Diablo

Ground Surface Elevation:

Elevation Accuracy:

Elevation Determination Method:

Borehole Information

Orientation: Vertical | Specify:

Drilling Method: Direct Rotary | Drilling Fluid: Bentonite

Total Depth of Boring: 160 Feet

Total Depth of Completed Well: 155 Feet

Water Level and Yield of Completed Well

Depth to first water: (Feet below surface)

Depth to Static Water Level: 67 (Feet) | Date Measured: 03/13/2019

Estimated Yield*: 15 (GPM) | Test Type: Air Lift

Test Length: 1 (Hours) | Total Drawdown: (feet)

*May not be representative of a well's long term yield.

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	15	Sandy Silt; light yellowish brown, fine to very coarse.
15	50	Sandy clay w/ gravel; very dark brown, fine to coarse w/ gravel 2-12 mm.
50	80	Sandy clay w/ gravel; dark gray, fine to medium w/ gravel 10-20 mm.
80	119	Sandy clay; dark gray, fine to medium w/ occasional gravel 7-10 mm.
119	121	Cobbles w/ sandy clay, dark gray, fine to coarse sand.
121	129	Sandy clay; dark gray, fine to coarse w. gravel 4-15 mm.
129	131	Cobbles w/ sandy clay; dark gray, fine to coarse sand.
131	160	Sandy clay; dark gray, fine to coarse w/ gravel 4-15 mm.

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	55	Blank	PVC	OD: 6.625 in. | SDR: 17 | Thickness: 0.390 in.	0.39	6.625			
1	55	155	Screen	PVC	OD: 6.625 in. | SDR: 17 | Thickness: 0.390 in.	0.39	6.625	Milled Slots	0.032	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	50	Cement	Portland Cement/Neat Cement		
50	155	Filter Pack	Other Gravel Pack	Gravel 3/8	

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	160	12.25

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name: CONSOLIDATED TESTING LABORATORIES INC
Person, Firm or Corporation

710 SOUTH KAWEAH AVE | EXETER | CA | 93221
Address | City | State | Zip

Signed: *electronic signature received* | 04/17/2019 | 544541
C-57 Licensed Water Well Contractor | Date Signed | C-57 License Number

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

				N						W
Latitude Deg/Min/Sec					Longitude Deg/Min/Sec					

TRS:

APN:

Legend

- Olcese Water District
- Kern County Subbasin (DWR 5-022.14)
- Surveyed Locations (July 2019)

Abbreviations

DWR = California Department of Water Resources
OWD = Olcese Water District

Notes

1. All locations are approximate.
2. OWD's Well #2 and the new shallow monitoring well, MWS-1, were surveyed in July 2019 by Berry and Associates.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 August 2019.

N

0 50 100
Feet

Surveyed Well Locations (July 2019)

Olcese Water District
Kern County, California
August 2019
B70052.03

Figure I-1

eki environment & water

Path: X:\B70052\Maps\2019\08\Fig. G-1 July2019 surveyed locations.mxd

NICKEL FAMILY, LLC WELL MONITORING DATA:

All elevations and pump locations were shot with GPS NAD83, NAVD88
Accuracy of elevations: +/- 0.10

Well No. 2

Top of pump location: 35.2601 Lat, -118.4840 Long.
TBM: rebar and cap, 7 feet northwest of pump Elev. 631.90
Top of 2 ½"pipe mk'd 'RP' Elev. 633.71
Spot where 2 ½" pipe goes into conc. Pad Elev. 633.34
N2345061.35, E6320017.82

NEW SHALLOW GROUNDWATER MONITORING WELL
ADJACENT TO WELL #2:
Top of casing Elev. 631.84
Ground adjacent to casing Elev. 630.52
CENTERLINE OF CASING: N2345056.24, E6319888.16

PREPARED BY: BERRY & ASSOCIATES
661-325-1235 JULY, 2019

10/25/2017 job no. 17-052

Appendix J

Kern County Subbasin Coordination Agreement

The **Kern County Subbasin Coordination Agreement** can be found on the Department of Water Resources (DWR) SGMA Portal at the following web address:

https://sgma.water.ca.gov/portal/gsp/preview/44

Appendix K

Board Resolutions

BEFORE THE BOARD OF DIRECTORS OF
THE OLCESE GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. 431

IN THE MATTER OF:

OLCESE GROUNDWATER SUSTAINABILITY AGENCY'S DECISION TO ADOPT ITS GROUNDWATER SUSTAINABILITY PLAN

WHEREAS, in 2014, the California Legislature adopted, and the Governor signed into law, three bills (SB 1168, AB 1739 and SB 1319), collectively referred to as the "Sustainable Groundwater Management Act" ("SGMA"), that went into effect on January 1, 2015, and has been amended from time-to-time thereafter; and

WHEREAS, the stated purpose of SGMA, as set forth in California Water Code section 10720.1, is to provide for the sustainable management of groundwater basins at the local level by providing local groundwater agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires designation of groundwater sustainability agencies ("GSAs") for the purpose of achieving groundwater sustainability through the adoption and implementation of one or more groundwater sustainability plans ("GSPs") or an alternative plan for all medium- and high-priority basins designated by the California Department of Water Resources ("DWR"); and

WHEREAS, Olcese Water District has water supply, water management, or land use responsibilities within the Kem County Subbasin and is legally authorized under SGMA to become a GSA; and

WHEREAS, the Olcese Groundwater Sustainability Agency was duly formed and organized on November 28, 2016, and exists as the exclusive GSA recognized by DWR for a portion of the Kem County Subbasin, which is designated as subbasin number 5-022.14 in the most recent edition of DWR's Bulletin Number 118 ("Kem Basin"); and

WHEREAS, the Olcese GSA approved and adopted a GSP for its portion of the Kern County Subbasin following a duly noticed public hearing on January 6, 2020; and

WHEREAS, on January 28, 2022, DWR issued notice that the GSPs submitted to cover the Kern County was deemed incomplete and that certain amendments were required within 180 days; and

WHEREAS, the January 28, 2022 notice from DWR only recommended minor amendments to the Olcese GSA GSP; and

WHEREAS, the Olcese GSA has caused the necessary amendments to be made to its GSP as required by the January 28, 2022 notice from DWR and now desires to approved the amendments to the Olcese GSA GSP; and

WHEREAS, the Olcese GSA convened a duly noticed public meeting and conducted a public hearing on July 18, 2022, for the purpose of receiving and considering public comments to the GSP and to consider adoption of the Olcese GSA GSP; and

WHEREAS, the Olcese GSA reviewed and considered all comments received and consulted with any requesting city or county upon timely request; and

WHEREAS, the Board of Directors finds that the Olcese GSA has complied with all requirements of law, including those set forth in SGMA in analyzing, noticing, preparing, considering and now adopting the Amendments to the GSP and that adoption of the Amended GSP is in the best interest of the customers and landowners within Olcese GSA; and

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of Olcese Water District acting as the Board of Directors of the Olcese Groundwater Sustainability Agency as follows:

1. The Recitals set forth in this Resolution are true and correct statements and are incorporated herein as an operative part of this Resolution.

2. Pursuant to sections 10727 and 10728 of the California Water Code, the Olcese GSA adopts the Olcese GSA Amended Groundwater Sustainability Plan for the Kern Basin as set forth in the Attachment "A" to this Resolution and incorporated herein by this reference.

3. The Plan Manager of the Olcese GSA is authorized and directed to take such further action as necessary to comply with SGMA, including transmitting the GSP to the Kern County GSP Plan Manager and/or DWR in accordance with the requirements of section 10733, *et seq.,* of the California Water Code; and

4. If any section, subsection, sentence, clause or action in this Resolution or any part thereof, is for any reason held to be unconstitutional, invalid, or ineffective by any

court of competent jurisdiction, such decision shall not affect the validity or effectiveness of the remaining portions of this Resolution or any part thereof. The Board of Directors hereby declares that it would have adopted each section irrespective of the fact that any one or more of the sections, subsections, sentences, clauses or actions is declared to be unconstitutional, invalid, or ineffective.

5. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED at a special meeting of the Board of Directors of the Olcese Groundwater Sustainability Agency held on the 18th day of July, 2022, by the following rollcall vote, to wit:

AYES: Brian W. Grant, Jeff Siemens, Robert Teagarden

NOES:

ABSENT: James L. Nickel, Blaine Hanson

ABSTAIN:

James L. Nickel, President
Board of Directors, Olcese Water District

ATTESTED:

Robert O. Teagarden, Secretary
Olcese Water District

BEFORE THE BOARD OF DIRECTORS OF
THE OLCESE GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. 428

IN THE MATTER OF:

OLCESE GROUNDWATER SUSTAINABILITY AGENCY'S DECISION TO ADOPT ITS GROUNDWATER SUSTAINABILITY PLAN

WHEREAS, in 2014, the California Legislature adopted, and the Governor signed into law, three bills (SB 1168, AB 1739 and SB 1319), collectively referred to as the "Sustainable Groundwater Management Act" ("SGMA"), that went into effect on January 1, 2015, and has been amended from time-to-time thereafter; and

WHEREAS, the stated purpose of SGMA, as set forth in California Water Code section 10720.1, is to provide for the sustainable management of groundwater basins at the local level by providing local groundwater agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires designation of groundwater sustainability agencies ("GSAs") for the purpose of achieving groundwater sustainability through the adoption and implementation of one or more groundwater sustainability plans ("GSPs") or an alternative plan for all medium- and high-priority basins designated by the California Department of Water Resources ("DWR"); and

WHEREAS, Olcese Water District has water supply, water management, or land use responsibilities within the Kern County Subbasin and is legally authorized under SGMA to become a GSA; and

WHEREAS, the Olcese Groundwater Sustainability Agency was duly formed and organized on November 28, 2016, and exists as the exclusive GSA recognized by DWR for a portion of the Kern County Subbasin, which is designated as subbasin number 5-022.14 in the most recent edition of DWR's Bulletin Number 118 ("Kern Basin"); and

WHEREAS, GSAs for medium- and high-priority basins are required by California Water Code section 10727 to develop and implement a GSP or two or more coordinated GSPs pursuant to SGMA; and

WHEREAS, the Kern Basin is designated as high-priority; and

WHEREAS, prior to initiating development of a GSP, GSAs are required to provide an initial notification to DWR pursuant to Title 23, section 353.6 of the California Code of Regulations; and

WHEREAS, the Olcese GSA submitted the initial notification to DWR on December 22, 2016; and

WHEREAS, the Olcese GSA is authorized by California Water Code section 10728.4 to adopt the Olcese GSA GSP following a public hearing, held at least 90 days after providing notice to a city or county in the area of the proposed GSP; and

WHEREAS, the County of Kern was provided notice on September 11, 2019; and

WHEREAS, interested persons placed on the list required by California Water Code section 10723.4 received notices regarding GSP preparation, meeting announcements, and availability of the Draft Olcese GSA GSP, maps, and related documents; and

WHEREAS, the Olcese GSA reviewed and considered all comments received and consulted with any requesting city or county upon timely request; and

WHEREAS, the Olcese GSA convened a duly noticed public meeting and conducted a public hearing on January 6, 2020, for the purpose of receiving and considering public comments to the GSP and to consider adoption of the Olcese GSA GSP; and

WHEREAS, the Board of Directors finds that the Olcese GSA has complied with all requirements of law, including those set forth in SGMA and the SGMA regulations in analyzing, noticing, preparing, considering and now adopting the GSP and that adoption of the GSP is in the best interest of the customers and landowners within Olcese GSA; and

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of Olcese Water District acting as the Board of Directors of the Olcese Groundwater Sustainability Agency as follows:

1. The Recitals set forth in this Resolution are true and correct statements and are incorporated herein as an operative part of this Resolution.

2. Pursuant to sections 10727 and 10728 of the California Water Code, the Olcese GSA adopts the Olcese GSA Groundwater Sustainability Plan for the Kern Basin as set forth in the Attachment "A" to this Resolution and incorporated herein by this reference.

3. The Plan Manager of the Olcese GSA is authorized and directed to take such further action as necessary to comply with SGMA and the SGMA regulations, including transmitting the GSP to the Kern County GSP Plan Manager and/or DWR in accordance with the requirements of section 10733, *et seq.*, of the California Water Code; and

4. If any section, subsection, sentence, clause or action in this Resolution or any part thereof, is for any reason held to be unconstitutional, invalid, or ineffective by any

court of competent jurisdiction, such decision shall not affect the validity or effectiveness of the remaining portions of this Resolution or any part thereof. The Board of Directors hereby declares that it would have adopted each section irrespective of the fact that any one or more of the sections, subsections, sentences, clauses or actions is declared to be unconstitutional, invalid, or ineffective.

5. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED at a special meeting of the Board of Directors of the Olcese Groundwater Sustainability Agency held on the 6th day of January, 2020, by the following rollcall vote, to wit:

AYES: James L. Nickel, Robert O. Teagarden, Brian Grant, Blaine Hanson, Jeff Siemens

NOES:

ABSENT:

ABSTAIN:

James L. Nickel, President
Board of Directors, Olcese Water District

ATTESTED:

Robert O. Teagarden, Secretary
Olcese Water District