

Gail Hoffman

From: Bolzowski, Michael R. <mbolzowski@calwater.com>
Sent: Wednesday, November 13, 2019 4:31 PM
To: Central Kings, GSA
Cc: Johnson, Stephen; Hurley, Michael; Esfahanian, Elaheh
Subject: Central Kings GSP Draft comments

CKGSA, C/O Consolidated Irrigation District,

Please find the following comment for the Central Kings GSP Draft:

Overall, the plan is well documented, except in Chapter 6, the plan only covers recharge ponds as the only project to be implemented and no discussion of other potential projects as listed in Table 6-1. Is the GSA relying on this one project to see the outcome before looking at other projects?

Michael Bolzowski

P-5 Senior Engineer
CALIFORNIA WATER SERVICE
408-367-8338



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Central Kings GSP Public Comment: Potential impacts on small-scale farming operations

Ruth Dahlquist-Willard, University of California Agriculture and Natural Resources*
Alyssa DeVincentis, Darcy Bostic, and Jessica Rudnick, University of California, Davis*
Ellen Bruno, University of California, Berkeley*

Please address any questions on this comment to Ruth Dahlquist-Willard (rdwillard@ucanr.edu).

**Although we are university academics and students, any opinions or statements in this document we make as individuals and not as representatives of the University or any of its offices or units.*

Introduction

The Central Kings GSA (CKGSA) contains a large diversity of stakeholders, including disadvantaged communities and many small-scale family farms. The most economically vulnerable of these include Southeast Asian refugee farmers with diversified vegetable farms, particularly in the areas around Del Rey and Sanger, and Latino farmers growing vegetable crops for farmers markets and local packing houses. During the recent drought, many groundwater wells on small farms went dry during periods when surface water was not available. Small farms with older, shallower wells are more vulnerable to decreases in groundwater levels. Additionally, these farms are more financially limited than larger farms, and might be impacted more severely by increased costs and an ongoing decline in groundwater levels. In this comment, we analyze some of the potential effects of the draft Groundwater Sustainability Plan (GSP) on small farms in CKGSA. We recommend efforts to include small-scale farmers in the process of SGMA implementation and outline possible ways to mitigate potential financial impacts.

Summary of recommendations

- Form an advisory committee and/or outreach committee with diverse representation from communities and stakeholders within the CKGSA, including small-scale and socially disadvantaged farmers.
- Gather data on well depths for a wider diversity of crops and farming operations of different sizes and evaluate how diverse operations may be affected by the measurable objective and minimum thresholds and fee increases in the proposed GSP.

- Develop a mitigation plan for shallow agricultural wells on small-scale farms that may go dry under the measurable objectives (MOs) and minimum thresholds (MTs) established in the GSP.
 - A mitigation plan could be developed in coordination with funding agencies and other GSAs in the Kings sub-basin.
- Reassess measurable objectives and minimum thresholds for monitoring wells in areas where there is likely to be higher rates of well outage if currently designated thresholds are met (see Figures 1 and 2 below).
 - Consider areas of the GSA where the coverage of the monitoring network wells may be insufficient to track changes over time and evaluate impacts on surrounding groundwater users.
- Consider a progressive fee structure, so that project fee assessments operate on a tiered scale (i.e., for an acreage-based fee, farms <50 acres pay rate 1 per acre, farms 50-100 acres pay rate 2 per acre, where rate 1 is less than rate 2).

Suggestions for improving outreach to and participation by small-scale farmers

The GSP includes only a very brief mention of past and future plans for outreach efforts. While SGMA requires each GSA to conduct outreach and to consider the interests of all groundwater users in the basin (i.e. interested parties), outreach by CKGSA has been limited to a recently constructed website and monthly public board meetings (page 2-32). Mailers, town home meetings, and landowner outreach events are mentioned, but the plan does not detail when these occurred, who was included, how meetings were advertised, or what information was presented. The GSP describes maintenance and expansion of an email list to ensure overlying users “stay informed and have a *reasonable* opportunity in the process” but does not define what reasonable participation looks like. Opportunities for public engagement, input, and response, as well as “active involvement of diverse social, cultural, and economic elements of population within the basin” have been almost nonexistent.

Lack of outreach is a concern because of the population of small-scale, socially disadvantaged farmers living in the CKGSA service area. These include Hmong, other Southeast Asian, and Latino farmers cultivating vegetable crops for farmers markets and wholesale packing houses. While the numbers of these farmers are difficult to accurately estimate, their produce and economic activity has an important contribution to food security and rural livelihoods in the region. Additionally, the GSP does not identify the presence of disadvantaged communities in CKGSA’s service area, although several disadvantaged communities totaling over 25,000 people are part of the CKGSA. These

vulnerable populations include the communities of Caruthers (2,972), Monmouth (155), Selma (24,228), and Tombstone (>100) (<https://gis.water.ca.gov/app/dacs/>).

We recognize that the actions currently proposed by the CKGSA are unlikely to be burdensome to small-scale farmers in the short term, other than an increase in CID assessment fees. The plan focuses on increasing groundwater recharge areas through purchases of additional land, and it clearly intends to avoid potentially onerous management actions such as pumping restrictions, requirements to install monitoring equipment, and charges for groundwater use. In this context, the need for extensive outreach and participation may not be perceived as crucial. However, groundwater levels will continue to decline under the proposed MOs and MTs, and farmers with shallower wells are more likely to experience the loss of their wells if and when these thresholds are met. Additionally, the GSP includes a wide range of potential management decisions that could be implemented in the future if increased groundwater recharge alone is not sufficient to meet sustainability criteria. If any of these are implemented, outreach to and participation from diverse stakeholders will be essential to ensure that the impacts of these management actions do not disproportionately affect small, diverse farmers.

The GSP could benefit from a more detailed plan for how the GSA will solicit, respond to, and incorporate direct feedback from members of the small-scale, socially disadvantaged farming community. The GSP states that “agricultural users are represented on the CKGSA Board of Directors”. However, the GSA covers approximately 145,000 acres of agricultural production, and the characteristics of agricultural users vary across this large service area. The CKGSA is “essentially coterminous with the Consolidated Irrigation District (CID)” and CKGSA Board of Directors are the CID Board of Directors. This has the potential to overlook the unique needs of small-scale, socially disadvantaged farmers who do not have surface water access through CID and are entirely groundwater dependent. The GSP does not mention any committees such as an advisory committee, technical committee, or outreach committee. This makes it difficult to determine whether the CKGSA can sufficiently represent the spectrum of agricultural interests that exists in the region, including specific interests of small-scale farmers and the unique characteristics of their operations. Additionally, limiting outreach to a website and monthly board meetings excludes stakeholders with limited internet access and limited English skills.

The lack of representation of the diversity of agricultural operations including the small-scale, socially disadvantaged farming community could be addressed by forming an advisory committee and/or outreach committee with designated seats for representatives of small-scale, limited-resource farmers. Outreach efforts could be conducted in coordination with other GSAs in the sub-basin and could include regular outreach events

targeted towards small farmers or translating relevant materials on SGMA implementation into other languages. An advisory or outreach committee could also gather more information on the typical well depths and other relevant characteristics of small-scale vegetable farms in order to evaluate how they might be affected under implementation of the GSP.

Effects of funding GSA operational costs and project costs on small farms

CID will increase existing assessments to pay for CKGSA operational costs. It is beneficial to small farms that they will not need to sign up or register to be members of CKGSA, as this prevents adding to the already substantial requirements for membership and reporting from other agencies and regulatory programs in the state. The assessment will increase to fund the GSA operation and GSP implementation (table 1-2, page 1-7). Farmers owning land will pay the increased assessment directly to CID, while farmers renting land might see increases in land rental rates if the assessment is passed on to them in the cost of the lease. The near doubling in assessment price could disproportionately impact small farmers. This flat (instead of tiered) rate increase could cause greater financial hardship to lower income farmers because these additional costs likely constitute a larger portion of their revenue than that of large farms, particularly when combined with increased costs from other regulatory programs such as the Food Safety Modernization Act (FSMA) and the Irrigated Lands Regulatory Program (ILRP).

Analysis of wells that may go dry under measurable objectives and minimum thresholds

The GSP states that “undesirable results were not occurring” as of 2015 and that rural residential landowners have had the ability to respond to historically declining groundwater levels because they have happened gradually over time. The plan assumes that working agricultural wells are ~600 feet deep (page 4-25), sets objectives and thresholds to preserve these wells, and states that a change from 100- to 200- foot well levels over 10 years should not significantly change the depth of most agricultural wells (page 4-5). Additionally, the plan describes the change in groundwater levels associated with the most recent drought as “not positive, but [they] did not result in undesirable results” (page 4-5).

This assessment of groundwater levels does not take into account the shallower wells common on small-scale farms, especially those of socially disadvantaged farmers on rented land. A survey of Hmong farmers by UCCE in 2015 reported that 22% of their wells

had gone dry during the drought and that their well depths were between 80-120 feet. The CKGSA includes Hmong and other Southeast Asian farmers, primarily in the areas around Del Rey and Sanger. The experiences of the Hmong and other Southeast Asian farmers in the recent drought illustrate the social and economic consequences of shallow wells going dry due to groundwater overdraft. These farmers may experience similar changes in their groundwater levels because the GSA recognizes that “water levels will continue to decline until the overdraft within the basin... has been corrected.” The GSP also states that “during this time, the water level may decline below the depth of some wells within the basin... Until water levels have been stabilized and the basin has reached sustainability, the GSA does not view a well going dry as an undesirable result.” The GSA defines its own undesirable results as **“lowering of groundwater levels... that resulted in a majority of domestic wells associated with the farmsteads or rural residential neighborhoods within the GSA to become inoperable”**. However, this does not apply where pump lowering or well deepening is possible (page 4-5). This management approach leaves the fate of farmers without the resources to deepen their wells uncertain. While CKGSA is not required to prevent these shallow wells going dry, we recommend seeking funding to develop a well mitigation program similar to those being proposed for domestic wells that may go dry, in order to prevent the undesirable socioeconomic consequences of small-scale immigrant and refugee farmers losing their farms.

To analyze the potential for well outages under the designated MOs and MTs, we used publicly available data from the Online State Well Completion Report (OSWCR) database, which contains well location and depth information for all wells that filed Well Completion Reports in the state. We mapped 3,402 domestic and irrigation wells within the CKGSA boundary. A 3-mile radius was assumed around each of the GSP’s designated monitoring wells (since we did not find it otherwise specified in the Plan), and we compared the MOs and MTs set for each monitoring well to the depths of the wells within the 3-mile buffer. We focused only on agricultural wells. All wells where the total depth is less than the MO or MT for the closest monitoring well are assumed to go dry if those MOs and MTs are met.

The maps in figures 1 and 2 show the spatial analysis of agricultural wells that will go dry under the MOs and MTs for each monitoring well. These maps identify two main areas within the CKGSA where wells will go dry. One of these is the area near Del Rey and Sanger where many Southeast Asian vegetable farms are concentrated. Our analysis estimated that, at a *minimum*, 20 agricultural wells will go dry under the proposed MOs, and 71 agricultural wells would go dry under the proposed MTs. These represent 1.8% and 6.2% of all agricultural wells in the GSA, respectively. Many Southeast Asian farmers are renting land on parcels with older wells that are less likely to be recorded in the database. We interpret these numbers as an *underestimate* of the potential well outages

given the following limitations of the data available for the following reasons: 1) The analysis relies on total completed depth information of the well, but wells will go dry before hitting their absolute depth; 2) The OSCWR database is incomplete and may be missing older wells or wells where the well completion reports were not filed (which importantly may include many small-scale farms' wells); 3) The analysis could not be completed for over 300 wells that fell outside of the 3-mile radius around a monitoring well (144 agriculture wells in the GSA boundary).

We have significant concerns that 1) shallower wells will go dry based on the criteria developed based on the network on monitoring wells, 2) the monitoring network does not describe the entirety of the CKGSA service area, and 3) MOs and MTs were set differently for 13 monitoring wells and the GSP does not state how regions around the monitoring wells are defined and what thresholds they are being held to.

How many agricultural wells may go dry under the proposed thresholds?

If Measurable Objective is met at all monitoring wells		If Minimum Threshold is met at all monitoring wells	
# of wells going dry	% of ag wells	# of wells going dry	% of ag wells
20	1.76	71	6.23

Figure 1: Representative map of agricultural wells that will go dry (20 wells) when MOs for each monitoring network well are reached.

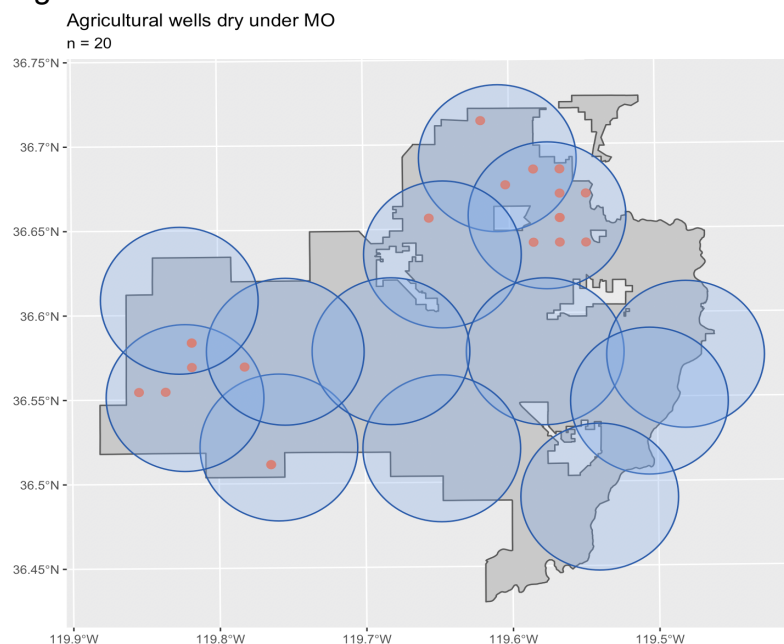
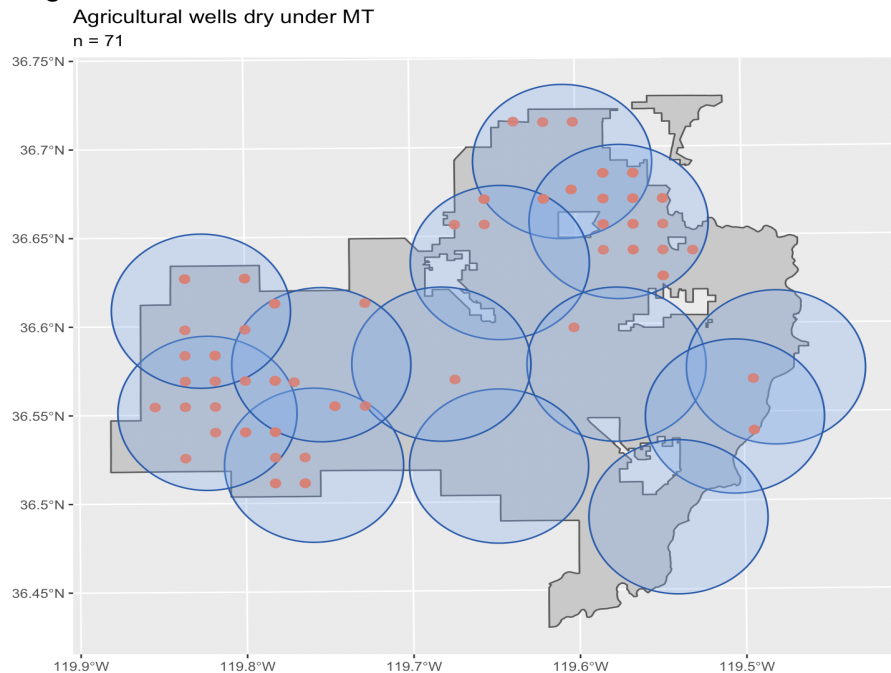


Figure 2: Representative map for agriculture wells that will go dry (71 wells) when MTs for all monitoring network wells are met.



NOTE on Figures 1 & 2: Red map makers may represent more than one individual well, when wells are in close proximity to one another. Thus, there are fewer markers on the map here than wells estimated to go dry under MOs (20 wells) or under MTs (71 wells).

Effects of the GSP management plan on small farms

The CKGSA management plan relies on the assumption that surface water will be plentiful to increase groundwater levels through managed aquifer recharge, and that the GSA “does not plan to use management actions to meet sustainability goals” (page 6-11). In order to not reduce pumping, the plan focuses on building substantial capacity for managed groundwater recharge. The details of GSP implementation focus entirely on the construction and use of groundwater recharge ponds. It estimates requiring at least 250 acres of land to build recharge ponds but suggests a total of 2,000 acres will be eventually converted over the next 20 years.

The GSP lists 37 potential management projects, to be implemented only if groundwater recharge is not sufficient to achieve sustainability goals. While in the short term these management actions will not be implemented, future reductions in surface water availability could make additional management actions necessary. The use of recharge ponds to mitigate groundwater overdraft is entirely dependent on reliable access to surface water diversions in the winter months, which are not certain according to climate change projections. During the recent drought, groundwater levels dropped due to

increased pumping despite the history of successful recharge in the basin. If another drought occurs during the process of SGMA implementation, recharge alone might not be sufficient to prevent further declines in groundwater levels due to reductions in surface water availability.

The potential projects to mitigate groundwater overdraft listed in Table 6-1 describe expected timelines of completion but include no other details. Many of these potential projects could have significant impacts on small-scale, socially disadvantaged farms. Given the possibility that surface water supplies will be substantially reduced during periods of drought, evaluation of how these potential practices may affect CKGSA stakeholders will be essential in the event they are to be implemented. Appropriate representation of a diversity of stakeholders on an advisory, outreach, or other committee would help to ensure that any additional management actions are pursued in an equitable way. This emphasizes the need for outreach and participation involving small-scale, socially disadvantaged farmers during the process of identifying appropriate management actions, should increased groundwater recharge not be sufficient to maintain groundwater levels at MOs and MTs.



October 25, 2019

Member Agencies

Bakman Water Company
Biola Community Services District
City of Clovis
City of Fresno
City of Kerman
County of Fresno
Fresno Irrigation District
Fresno Metropolitan Flood
Control District
Garfield Water District
International Water District

Via U.S. Mail and E-Mail (E-mail Address)

Board of Directors
Central Kings GSA
C/O Consolidated Irrigation District
2255 Chandler Street
P.O. Box 209
Selma, CA 93662

Board of Directors

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City of Clovis
Lee Brand
City of Fresno
Rhonda Armstrong
City of Kerman
Karl Kienow
Garfield Water District

**RE: Central Kings Groundwater Sustainability Agency's Draft
Groundwater Sustainability Plan**

Dear Board Members:

The North Kings Groundwater Sustainability Agency (NKGSA) consists of member agencies including Fresno Irrigation District, the cities of Fresno, Clovis and Kerman, Fresno County, Bakman Water Company, Biola Community Services District, International Water District, Garfield Water District, and the Fresno Metropolitan Flood Control District. The NKGSA also consists of disadvantaged communities, private well owners, and other landowners. The NKGSA and the Central Kings Groundwater Sustainability Agencies (CKGSA) are two of the seven groundwater sustainability agencies (GSAs) within the Kings Subbasin. The NKGSA submits this letter to the Central Kings Groundwater Sustainability Agency (GSA) on their groundwater sustainability plan (GSP) prepared for purposes of the Sustainable Groundwater Management Act (SGMA).

Executive Officer

Gary Serrato

Internet

www.NorthKingsGSA.org

Mail

North Kings GSA
c/o Fresno Irrigation District
2907 S. Maple Ave.
Fresno, CA 93725

Phone

559-233-7161

The NKGSA appreciates the opportunity to comment on the CKGSA GSP. A cursory review of the CKGSA draft GSP for public comment showed that the draft GSP was prepared in accordance with the agreed upon parameters for the GSAs within the Kings Subbasin. The draft GSP identifies projects to be completed within the GSA to create sustainable conditions within the GSA boundary and the Kings Subbasin. Given the NKGSA and the CKGSA are within the Kings Subbasin, the NKGSA kindly requests the CKGSA to consult with the NKGSA on proposed projects.

About NKGSA: The North Kings Groundwater Sustainability Agency is a Joint Powers Authority formed in December 2016. Composed of local public agencies and others engaged through binding agreements, the NKGSA is the governing body of a portion of the Kings Subbasin (DWR Bulletin 118, 5-22.08) in compliance with the Sustainable Groundwater Management Act of 2014. NKGSA members are Bakman Water Company, Biola Community Services District, City of Clovis, City of Fresno, City of Kerman, County of Fresno, Fresno Irrigation District, Fresno Metropolitan Flood Control District, Garfield Water District, and International Water District.

The NKGSA looks forward to continuing to collaborate with the CKGSA and other GSAs within the Kings Subbasin to create sustainable conditions in the basin. Please contact me at (559) 233-7161 should you have any questions.

Sincerely,

Haseyo D. Chauhan

for Gary R. Serrato
Executive Officer



Sent via Email

Earl Hudson, President
Ray Moles, Vice President
Thomas Benzler, Director
Anthony Lewis, Director
Mitch Richie, Director
Phil Desatoff, General Manager

October 13, 2019

Re: Comments on Central Kings GSA Draft Groundwater Sustainability Plan

Dear Central Kings GSA Board of Directors,

Leadership Counsel for Justice and Accountability works alongside low income communities of color in the San Joaquin Valley and the Eastern Coachella Valley. As is most relevant here, we work in partnership with community leaders in the community of the Tombstone Territory to advocate for local, regional and state government entities to address their community's needs for the basic elements that make up a safe and healthy community, including safe and affordable drinking water, affordable housing, effective and safe transportation, efficient and affordable energy, green spaces, and clean air.

We have been engaged in the Sustainable Groundwater Management Act (SGMA) implementation process because most of the communities with which we work are wholly dependent on groundwater for their drinking water supplies, and many have already experienced groundwater quality and supply issues. Communities we work have not been included in decision-making about their precious water resources, and their needs are not at the forefront of such decisions. In 2012, California recognized the Human Right to Water for domestic purposes, and required that state agencies consider this human right in their activities. State law also requires that GSAs avoid disparate impacts on protected classes. SGMA's requirements for a transparent and inclusive process, presents an opportunity in the context of groundwater management to meaningfully include disadvantaged communities in decision-making, and to create groundwater management plans that understand their unique vulnerabilities, are sensitive to their drinking water needs, and avoid causing disparate negative impacts on low-income communities of color.

We submit these comments to elevate our concerns that the Central Kings Groundwater Sustainability Agency's (GSAs) Draft Groundwater Sustainability Plan (Draft GSP) is incomplete, does not adequately analyze drinking water impacts, does not consider drinking water impacts in its policy decisions about groundwater management, lacks basic elements required under SGMA, and does not include projects and management actions to protect protected groups from severe and widespread drinking water impacts. Our review shows that the Draft GSP neither adequately



analyzes nor incorporates input from disadvantaged communities and domestic well users, and will create a disparate impact on protected classes unless modified to protect drinking water resources for disadvantaged communities unless significant changes are made. We include herein our comments with respect to deficiencies in the Draft GSP as well as recommendations for improvements.

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The Draft GSP is Incomplete

The Draft GSP omits critical data regarding the water budget, drinking water impacts, projects and management actions. For example, there has been no analysis of how many wells will go dry or become potentially contaminated from the policies proposed in the Draft GSP, including the proposed sustainable management criteria. Additionally, as explored below the GSP’s description of the water budgets lacks the necessary data, assumptions and approaches used to determine the water budgets, maps of the basins, and in some cases there have been sections left completely empty. The Draft GSP also lacks information on the impact of and timelines for the key projects and management action and for the GSP implementation process.

The Draft GSP cannot be adopted until all information on data and assumptions used in the development of the water budget, drinking water impacts from all sustainable management criteria, and details about projects and management action, are made available to the public for public review during a new review period. In re circulating the GSP for public review, Central Kings GSA must analyze the drinking water impacts of setting sustainable management criteria, follow a concrete methodology for considering those impacts in creating new sustainable management criteria, and include that impacts analysis and methodology in the revised Draft GSP.

Central Kings GSA is responsible for the disproportionate and disparate impacts that its policies and activities will have on domestic well users and disadvantaged communities.

Central Kings GSA must prioritize drinking water as an essential pillar of the proposed groundwater sustainability plan. The Draft GSP erroneously attempts to avoid responsibility for significant and disparate impacts on protected groups resulting from its actions.

The draft GSP states that, as of 2015, “[t]he historic change in groundwater levels had not resulted



in declining levels that caused wells to go dry.”¹ The GSP states that there are shallow wells in the GSA area that are “recognized as being past their useful life,” and “[a]s the gradual groundwater conditions have dropped, newer wells that have replaced these older wells have been drilled differently generally, deeper and gravel packed. Thus, the useful life of most wells has been maintained and the gradual decline has not resulted in an undesirable result.”² The GSP then goes on to state that the drought did not cause any undesirable results, and the decline in groundwater levels “has been gradual and has allowed those reliant on this source of water supply an ability to respond, and has not led to an undesirable result,” and that rural residential users have not experienced undesirable results.³ The GSA then states that it “does not view a well going dry as an undesirable result” because water levels will continue to decline until overdraft is corrected, well depths are unknown, and some wells “may have been poorly constructed or constructed too shallow for long term operation.”⁴

This information is incorrect, and communicates a lack of understanding of groundwater conditions affecting disadvantaged communities in the GSA area. Over half of the homes in Tombstone Territory began to experience dry wells in 2014, and many families were not able to drill deeper wells to meet the quickly declining groundwater levels. Some families had to move away from the community, and some went three to four months without water in their homes to drink, cook, bathe, flush the toilet. Residents had to get water from neighbors’ hoses, or fill up tanks and carry water through their homes to provide their families with basic health and sanitation needs. This experience was traumatizing for many residents, particularly those who have children, or who have physical ailments that make it difficult to transport water. To this day, residents live with the constant fear that their wells will go dry at any moment. Another well has just gone dry on Greenwood in Tombstone Territory, and residents’ fear that their well may be next is palpable. Many community residents hope to connect to Sanger’s water system so that they will have a stable and clean source of drinking water, but such a project will take roughly three years to complete.

In addition to rapidly declining water levels, Leadership Counsel and partnering organizations have conducted numerous water quality tests throughout the community. In Tombstone we have found traces of, 1,2,3, trichloropropane, total colorfirm, and nitrate all above the MCL. These test results have resulted in residents being delivered bottled water through state grants, as the water in Tombstone is not safe to drink.

The policies proposed in the Draft GSP will result in many more dry wells, causing severe harm to Tombstone Territory residents’ health and daily lives. Additionally, the Draft GSP contains no measures for preventing increased drinking water contamination in communities like Tombstone, and will not detect increased concentrations of drinking water contaminants in domestic well areas.

It is evident that the GSA seeks to evade responsibility for drinking water impacts based on proposed policy decisions and actions included in the Draft GSP. This stance is incorrect, however; while in the past there has been no limitation on groundwater pumping, SGMA

¹ Central Kings Draft GSP p. 4-4, dated August 2019

² Central Kings Draft GSP p. 4-4 and 4-5, dated August 2019

³ Central Kings Draft GSP p. 4-5, dated August 2019

⁴ Central Kings Draft GSP p. 4-5, dated August 2019

establishes a new regime in which the state has recognized that unlimited pumping harms this common good and that pumping therefore must be regulated. The GSAs are now tasked with determining how to regulate the use and management of groundwater, and must do so in a way that complies with state law.

Under SGMA, the GSA is tasked with managing groundwater in a way that does not cause “significant and unreasonable impacts” to the beneficial uses and users of groundwater in the subbasin. The GSA’s activities cannot avoid impacts only on certain types of beneficial users; under SGMA it must “consider the interests of” an enumerated list of all types of beneficial users, including disadvantaged communities on domestic wells and community water systems.⁵ Furthermore, state law provides that no person shall, on the basis of race, national origin, ethnic group identification, and other protected classes, be unlawfully denied full and equal access to the benefits of, or be unlawfully subjected to discrimination under, any program or activity that is conducted, operated, or administered by the state.⁶ In addition, the state’s Fair Employment and Housing Act guarantees all Californians the right to hold and enjoy housing without discrimination based on race, color, or national origin.⁷ Lastly, the Department of Water Resources is required to consider the Human Right to Water in its evaluation of the GSA’s proposed Groundwater Sustainability Plan, so the drinking water impacts of the GSP are of utmost importance in its approval.⁸

Central Kings must consider the drinking water needs of the community of Tombstone Territory and other disadvantaged communities in the GSA area. The potential consolidation of Tombstone Territory into the City of Sanger will at minimum take three years for full completion. In the meantime, community members will continue to use their domestic wells, many of which are at risk of being dewatered. Central Kings GSA is responsible for ensuring a reliable source of drinking water for the community while they are on wells and even once they become consolidated into Sanger’s water system, given that the community is within the GSA’s boundaries.

Inadequate Transparency, Public Process, Consideration of Public Input and Representation Undermine the Value and Efficacy of the Draft GSP

SGMA requires that a GSA “shall consider the interests of all beneficial uses and users of groundwater,” which expressly includes “[h]olders of overlying rights” and “[d]isadvantaged communities, including, but not limited to, those served by private domestic wells or small

⁵ Water Code § 10723.2.

⁶ Gov. Code § 11135 [“No person in the State of California shall, on the basis of sex, race, color, religion, ancestry, national origin, ethnic group identification, age, mental disability, physical disability, medical condition, genetic information, marital status, or sexual orientation, be unlawfully denied full and equal access to the benefits of, or be unlawfully subjected to discrimination under, any program or activity that is conducted, operated, or administered by the state or by any state agency, is funded directly by the state, or receives any financial assistance from the state.”]; Gov. Code § 65008 [Any discriminatory action taken “pursuant to this title by any city, county, city and county, or other local governmental agency in this state is null and void if it denies to any individual or group of individuals the enjoyment of residence, land ownership, tenancy, or any other land use in this state...”]; Government Code §§ 12955, subd. (l) [unlawful to discriminate through public or private land use practices, decisions or authorizations].

⁷ Gov. Code § 12900 et seq.

⁸ Water Code § 106.3.



community water systems.”⁹ The emergency regulations similarly require that a Draft GSP summarize and identify “opportunities for public engagement and a discussion of how public input and response will be used.”¹⁰ The GSA thus must engage “diverse social, cultural, and economic elements of the population within the basin.”¹¹

Throughout the GSP development process, the Central Kings GSA did not accept assistance from our organization to help the GSA conduct outreach to disadvantaged communities.¹² Board members and staff have voiced that it is unnecessary to do such outreach, and that they were going to protect the interests of all disadvantaged communities in their service area, yet were not aware of Tombstone Territory’s existence until our organization alerted them to its location and past water issues at a board meeting.¹³ The draft GSP does not acknowledge the existence of this community nor any other disadvantaged community within the subbasin.

Related to the above point, as public agencies, GSAs are subject to the requirements of the Brown Act, which requires transparency of public agencies through notice of meetings and prior posting of agendas, posting of meeting minutes after meetings, and public access to meeting materials upon request by a member of the public. In addition to Brown Act requirements, GSAs must also adhere to the specific public participation and inclusivity requirements for GSP development laid out in SGMA. SGMA specifically requires GSAs to “encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan.”¹⁴

Central Kings GSA board meetings are hostile to public participation, and are often conducted in violation of the Brown Act, thus threatening to invalidate decisions made at board meetings. Board meetings often move through agenda items without asking for comments from the public, in violation of the Brown Act requirement for public agencies to solicit public comments for each agenda item.¹⁵ On several occasions we have had to interject as meetings were being adjourned in order to make public comments. Additionally, staff and board members’ responses to many of our comments and recommendations at board meetings were dismissive, creating an atmosphere that is hostile to public participation. No details about the draft GSP were presented at GSA meetings; instead, the GSA meetings reviewed administrative issues and staff refused to give us concrete answers to our questions regarding the substance of the plan. Particularly because we attend meetings to represent the interests of a specific beneficial user group specifically named in the Act, these practices are against the mandates under SGMA to consider the interests of all beneficial user groups, and encourage the involvement of diverse elements of the population.

⁹ Water Code § 10723.2.

¹⁰ 23 CCR 354.10(d).

¹¹ Guidance Document for Groundwater Sustainability Plan; Stakeholder Communication and Engagement, p. 1.

¹² The Central Kings GSA denied our request for a letter of support to obtain state funding to work on SDAC engagement in the GSA area. Board Meeting, August 8th, 2018.

¹³ Central Kings GSA Board Meeting, August 8th, 2018.

¹⁴ Water Code § 10727.8

¹⁵ Gov Code § 54954.3(a)



Last, the draft GSP does not present any details about the development of the draft GSP nor how public feedback was incorporated into the draft GSP. This information was not available in public meetings, and the Central Kings GSA denied our requests for details at several of their board meetings.¹⁶

To address concerns over public engagement, transparency, and inclusivity, the GSAs must:

- Meaningfully consult with all beneficial user groups to shape policies that reflect the priorities of all beneficial user groups in the GSA area. Then recirculate a new Draft GSP for the public to review.
- Ensure that all future GSA activities comply with the Brown Act and the requirements in SGMA to consult with all beneficial user groups including disadvantaged communities, and engage diverse segments of the population.
- Work with local community-based groups to create and implement a successful public engagement plan for all future GSA activities.

The Water Budget is Inadequate

Under SGMA, the water budget must contain 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.¹⁷ Based on our technical analysis, the Draft GSP does not conform to this regulation. The Draft GSP's Water Budget is incomplete, and contains inaccurate assumptions and data. The resulting estimates for annual overdraft reflect an "average" year and do not address the extremes of wet years, dry years, and the possibility of new extremes under climate change.

For the historical water budget, the Draft GSP states that it was "impractical" to include the extreme drought years of 2012-2016, without explaining why.¹⁸ However, climate change has had and will continue to impact California's hydrology leading to more and more variability in wet and dry years. In this past drought, several wells in the Kings basin were dewatered. Additionally, the Draft GSP estimates large variability in historical changes in groundwater storage based on water year type, showing a common occurrence of extreme wet and extreme dry years.¹⁹ By the GSA's own estimates, the current water budget shows similar variability, but this variability is not reflected in the Draft GSP's future water budget.²⁰ Despite the common occurrence of extreme wet and dry years, the Central Kings GSA estimates an average depletion of 17000 AF/year, which

¹⁶ Central Kings GSA Board Meetings on April 10th, 2019 and June 13th, 2019; Email to Phil Desatoff on May 17th, 2019, with no response, Letter of Recommendations and Concerns emailed to Phil Desatoff on July 10th, 2019, with no response.

¹⁷ 23 CCR § 354.18.

¹⁸ Central Kings Draft GSP p.3-93, dated August 2019

¹⁹ Central Kings Draft GSP p.3-106 to 3-109, dated August 2019

²⁰ Central Kings Draft GSP p.3-109, dated August 2019; Central Kings Draft GSP p.3-119, dated August 2019

was consequently utilized to establish measurable objectives and minimum thresholds for groundwater levels and groundwater storage.²¹

The Draft GSP states that the quantification of current water budget components was constrained by the timeline and limited funding and they had to use the “best available data that is obtainable at the time the GSP is developed.”²² As a result, all parameters have a confidence interval ranging from 5%-50%, making their budget merely an approximate of the hydrology in the GSA.²³ Furthermore, there are critical uncertainties in the water budget because only one parameter, surface water diversions, was directly measured. The largest component of the budget (evapotranspiration of applied water) has 15% confidence intervals due to uncertainty in cropping pattern surveys, indirect estimates of unit evapotranspiration rates for crop types, and varieties in management practices. This is very concerning as these values were utilized to create measurable objectives and minimum thresholds for groundwater levels and groundwater storage.

In regards to inflows to the basin, riparian surface water for irrigation was estimated to be 3 acre-feet/acre. However, this may not be a fair assumption for many crops in the region; for example, perennial nut trees have water requirements that range from 40 to 55 inches per year.

Additionally, the Draft GSP’s unconfined groundwater inflow calculations use water levels from spring (before agricultural pressures of summer) and assume that “the aquifer is relatively homogeneous and isotropic,”²⁴ but do not explain the foundation of this assumption or address the unlikelihood that this assumption is accurate. Confined groundwater inflows were computed similarly, but “groundwater level data available to compute the subsurface flows was more limited and has a greater degree of uncertainty than the unconfined groundwater inflows.”²⁵

Furthermore, the calculations for deep percolation greatly over-estimate irrigation efficiency. Calculations for inflows to the groundwater system include deep percolation of irrigation water (only in rural areas), 100% indoor water use and 25% of outdoor water use, seepage of channels and pipelines, urban stormwater recharge, local streams recharge (31,200 AF), and other recharge. Deep percolation assumes 84% irrigation efficiency throughout the entire GSA. This assumption greatly over-estimates irrigation efficiency and is likely not representative of actual land use and agricultural practices in this region, and thus has the potential to introduce significant error in the water budget. Further, these calculations include many assumptions for water use and percolation rates without citations and references.

As per calculations for outflows from the groundwater system calculations, pumping rates were determined based on water demands calculated from crop evapotranspiration (minus effective precipitation) with irrigation efficiencies specific to crop types from local agency staff.²⁶ Field

²¹ Central Kings Draft GSP p.3-106, dated August 2019

²² Central Kings Draft GSP p.3-94, dated August 2019

²³ Central Kings Draft GSP p.3-94, dated August 2019

²⁴ Central Kings Draft GSP p.3-98, dated August 2019

²⁵ Central Kings Draft GSP p.3-98, dated August 2019

²⁶ Central Kings Draft GSP p.3-102, dated August 2019

crops assumed to be flood irrigation (70% efficiency) with trees and vines assumed to be micro irrigated (85% efficiency).²⁷ This section, 3.3.6, is inconsistent with the description of assumed irrigation efficiencies in section 3.3.5. Pumping for indoor use assumes 70 gallons/capita/day and each parcel has 4 residents, which may be an underestimate.²⁸ Outflows from basin include evapotranspiration of applied irrigation water, applied municipal and industrial water, effective precipitation, conveyance channels, reservoirs and recharge basins, etc. and runoff of precipitation, operational spills, groundwater exports, and groundwater outflow (35,400 AF).²⁹ Land use data was estimated by the Department of Water and Resource's Land Use data by county (Fresno-1994, 2000, 2009; Kings - 1996, 2003; Tulare - 1999, 2007), which are sporadic and likely insufficient data sources.³⁰

Last, we would like to highlight that the sustainable yield, 1,140,000 AF/year, is a basin-wide value.³¹ Consequently, this value cannot be used to estimate sustainable yield in local areas. Central Kings GSA fails to state how the sustainable yield per acre will be determined, which will be different for each GSA within the Kings Basin.

The water budget is central to establishing effective policies for sustainable groundwater management in the GSA area. Before it can submit a valid GSP, the Central Kings GSA must redo its water budget calculations to correct the above inaccuracies and incorrect assumptions.

The Administrative Draft's Sustainable Management Criteria for Groundwater Levels are Not Adequate

The sustainable management criteria for groundwater levels must be made after considering the interests of all beneficial user groups, including disadvantaged communities on domestic wells and community water systems.³² These policy decisions must also avoid disparate impacts on protected groups pursuant to state and federal law.³³

The GSA has not shown how it has considered the interests of beneficial users including domestic well owners and disadvantaged communities. The resulting impact from the proposed sustainable management criteria will likely lead to disparate impacts on protected groups pursuant to state and federal law.

Furthermore, the Draft GSP does not show how the sustainable management criteria for groundwater levels will comply with the sustainability goal of assuring that "the basin is being operated to maintain a reliable water supply for current and future beneficial uses without experiencing undesirable results."³⁴

²⁷ Central Kings Draft GSP p.3-102, dated August 2019

²⁸ Central Kings Draft GSP p.3-103, dated August 2019

²⁹ Central Kings Draft GSP p.3-105, dated August 2019

³⁰ Central Kings Draft GSP p.3-103, dated August 2019

³¹ Central Kings Draft GSP p.3-121, dated August 2019

³² Water Code § 10723.2.

³³ Gov. Code § 11135; Gov. Code § 65008; Government Code §§ 12955, subd. (l).

³⁴ Central Kings Draft GSP p.1-1, dated August 2019

The Proposed Undesirable Result for Groundwater Levels is Inadequate

Undesirable results are the point at which “significant and unreasonable” impacts on beneficial users caused by declining groundwater levels. The SGMA regulations require GSAs to justify their undesirable results by including the “[p]otential effects on the beneficial uses and users of groundwater.”³⁵ GSAs must also describe the “processes and criteria relied upon to define undesirable results.”³⁶

The Draft GSP states that “chronic lowering of the groundwater level is an undesirable result.”³⁷ It is not clear what is meant by “chronic lowering,” and it is not clear what effect this phenomenon would have on beneficial users. The undesirable results for groundwater levels therefore does not comply with the requirements under SGMA because it is too vague and does not show how the GSA considered the interests of beneficial users in shaping this definition.

To comply with its legal obligations regarding undesirable results under SGMA, the GSA should do the following:

- Establish a public process to allow all beneficial users to provide feedback on the undesirable result. The undesirable result should be taken out to all beneficial user groups for feedback, and shaped using their input about what is a significant and unreasonable impact to their groundwater needs. The GSA must collaborate with local community-based organizations to reach disadvantaged community beneficial users.
- To protect drinking water resources for disadvantaged communities, the undesirable result must be set at when any drinking water wells is at risk of being dewatered

The Proposed Measurable Objectives for Groundwater Levels are Inadequate

The SGMA regulations require the GSA to set measurable objectives that “achieve the sustainability goal for the basin within 20 years of Plan implementation and...continue to sustainably manage the groundwater basin over the planning and implementation horizon.”³⁸ In determining the measurable objectives, the GSA must consider the interests of all beneficial user groups and avoid disparate impacts on groups protected under state civil rights law.³⁹

The GSA has taken the 1997-2012 trend line and set the measurable objective for 2040 at the groundwater elevation reached by the trend line in 2040. The GSA has not evaluated how this groundwater elevation will affect domestic well users and disadvantaged communities, whose critical drinking water resources will be impacted by a decline in groundwater levels. In fact, the attached Focused Technical Report shows that approximately 515 of domestic wells in the GSA area will be dewatered if groundwater levels reach the measurable objectives. The GSA cannot therefore have considered the interests of this beneficial user group in determining its measurable

³⁵ 23 CCR § 354.26.

³⁶ 23 CCR § 354.26.

³⁷ Central Kings Draft GSP p. 4-3, dated August 2019

³⁸ 23 CCR § 354.30(a)

³⁹ Water Code § 10723.2; Gov. Code § 11135; Gov. Code § 65008; Government Code §§ 12955, subd. (l).



objectives, and is likely to have a disparate impact on a protected group if it pursues this course of action.

In order to show that it has considered impacts on domestic well users and disadvantaged communities, and ensure that it is not causing a disparate impact on groups protected from such impact by state civil law, the GSA must conduct a complete analysis of how many wells will be impacted by this measurable objective, in particular domestic wells and small community system wells in disadvantaged communities. It should measure whether the impacts to wells are “significant and unreasonable” by consulting with domestic well owners and disadvantaged communities. If its current measurable objective will cause a disparate impact or cause significant and unreasonable impacts to these beneficial user groups, it must modify its measurable objective to comply with its legal obligations.

It is also unclear how the measurable objectives will achieve the sustainable yield. The GSA must clarify how achieving the measurable objectives at all representative monitoring wells will cumulatively result in attaining the sustainable yield for the GSA area.

The GSA must include the following in its Draft GSP to bring its measurable objectives into compliance with law:

- The GSA must clarify how its measurable objectives will achieve the sustainable yield.
- The GSA must analyze how many wells will be fully or partially dewatered at the groundwater elevation of the proposed measurable objective.
- The GSA must show how it has considered the needs of all beneficial users, including drinking water users, in setting its measurable objectives, by publishing the above analysis in the GSP and showing how it consulted with domestic well users and disadvantaged communities to set a measurable objective that avoids significant and unreasonable impacts to their beneficial user groups.
- Provide a robust drinking water warning system and drinking water protection program to prevent impacts to drinking water users and mitigate drinking water impacts that occur (see section below on Projects and Management Actions for more recommendations regarding these programs).

The Proposed Minimum Thresholds for Groundwater Levels are Inadequate

The groundwater levels sustainable management criteria set by a GSA must be the point that, “if exceeded, may cause undesirable results.”⁴⁰ Therefore it must have the purpose of avoiding “significant and unreasonable” impacts on beneficial users caused by declining groundwater levels.⁴¹ The GSA’s determination of what is “significant and unreasonable” must consider the impacts on all types of beneficial users, including disadvantaged communities.⁴² For groundwater

⁴⁰ 23 CCR § 354.28.

⁴¹ 23 CCR § 354.26.

⁴² Water Code § 10723.2.



levels specifically, GSAs must place minimum thresholds for each monitoring site at the level “that may lead to undesirable results.”⁴³ Under the SGMA regulations, the GSA should provide a description of “the information and criteria relied upon to establish minimum thresholds,” an explanation of how the proposed minimum thresholds will “avoid undesirable results,” and “how minimum thresholds may affect the interests of beneficial uses and users of groundwater.”⁴⁴ The GSA must also consider that drinking water use has been recognized as the “highest use of water” by the California legislature, and should consult with stakeholders to ensure that the minimum threshold is set in such a way as to guarantee the human right to drinking water to all individuals in the subbasin.⁴⁵

The Central Kings GSA’s approach to setting minimum thresholds does not “consider the interests of” drinking water beneficial users, and will allow large amounts of pumping to occur at the potential expense of more than a thousand of the domestic wells in the GSA area. The GSA has chosen to set the minimum threshold by taking the measurable objective and lowering it by the predicted elevation change that would occur from a 5-year drought.⁴⁶ It is unclear how this minimum threshold methodology was decided upon, but it is clear that this methodology did not consider the interests of disadvantaged communities on domestic wells. As the attached Focused Technical Report shows, approximately 1,036 of the domestic wells in the GSA area will be dewatered at the minimum thresholds proposed in the Draft GSP.⁴⁷ Since domestic well users are de minimis pumpers and are not part of this aquifer-depleting pumping, this will cause a disproportionately negative impact on domestic users, the majority of whom belong to a group protected by state civil rights law. This therefore will cause a disparate impact in violation of state civil rights law.

⁴³ 23 CCR § 354.28.

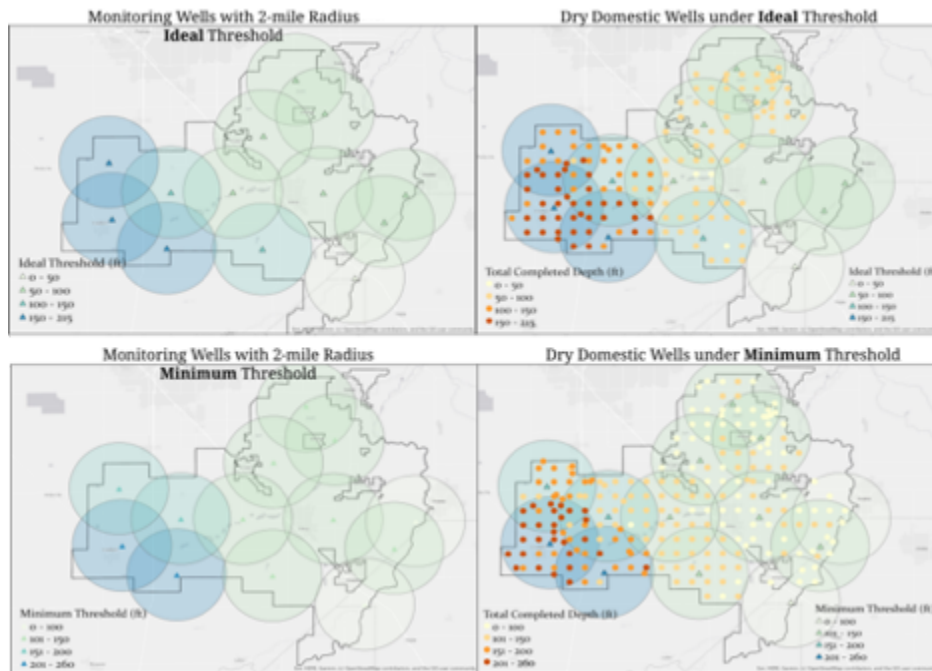
⁴⁴ 23 CCR § 354.28.

⁴⁵ Water Code § 106.

⁴⁶ Central Kings Draft GSP p.4-24, dated August 2019

⁴⁷ Central Kings GSP Technical Review

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In order to show that it has considered impacts on domestic well users and disadvantaged communities, and to ensure that it is not causing a disparate impact on protected groups, the GSA must conduct an analysis of how many wells will be impacted by reaching this minimum threshold, in particular domestic wells and small community system wells in disadvantaged communities. It should also quantify the increased pumping costs associated with the increased lift at the projected water levels. Then, it must measure whether the impacts to wells and household finances are “significant and unreasonable” by consulting with domestic well owners and disadvantaged communities. If its current choice of minimum threshold will cause a disparate impact or cause significant and unreasonable impacts to these beneficial user groups, it must modify its minimum threshold to comply with its legal obligations.

The Central Kings GSA must set minimum thresholds that consider the interests of drinking water beneficial users and do not create a disparate impact on protected groups by doing the following:

- Accurately evaluate the number of wells that will be impacted should water levels reach the proposed minimum thresholds, using publicly available OSWCR and local data and taking into account well screen depth, and the increased pumping costs associated with the increased lift at the projected water levels.
- Consider drinking water impacts in shaping minimum thresholds, and ensure that protected groups are protected from disparate and disproportionately negative impact.
- The GSA must show how it has considered the needs of all beneficial users, including drinking water users, in setting its minimum thresholds, by publishing the above analysis in the GSP and showing how it consulted with domestic well users and disadvantaged

communities to set a minimum threshold that avoids significant and unreasonable impacts to their beneficial user groups.

- In order to protect drinking water users, the GSAs should place the minimum threshold at a level above where the shallowest domestic well is *screened* in each Threshold Area.
- Provide a robust drinking water warning system and drinking water protection program to prevent impacts to drinking water users and mitigate drinking water impacts that occur (see section below on Projects and Management Actions for more recommendations regarding these programs).

The Draft GSP fails to Set Interim Milestones for Groundwater Levels

GSPs must include “interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan.”⁴⁸ The Central Kings GSA has failed to include interim milestones for groundwater levels. It is necessary to set interim milestones in to ensure that the overdraft is being corrected and the subbasin in moving towards sustainability. Not including interim milestones puts the Draft GSP at risk of not being approved by DWR.

To ensure the Central Kings GSA is in compliance with SGMA requirements, we strongly suggest the following:

- The Central Kings GSA must set interim milestones for groundwater levels in a way that ensures sustainability by 2040 by avoiding significant and unreasonable impacts to all beneficial users, including disadvantaged communities.

The Draft GSP Fails to Adequately Address Groundwater Quality

SGMA charged GSAs with the responsibility to protect water quality from further degradation due to groundwater management practices, and requires GSAs to establish sustainable management criteria to prevent degraded groundwater quality.⁴⁹ The only reasons why a GSA may decide not to set sustainable management criteria for a sustainability indicator are “where the Agency can demonstrate that [groundwater levels are] a reasonable proxy”⁵⁰ or where a sustainability indicator is “not present” or “not likely to occur” in a basin.⁵¹ The GSA has not shown that groundwater levels are a proxy for groundwater quality, and it has shown in the Basin Setting section that groundwater quality issues are present in the basin.⁵² As written, the Draft GSP leaves beneficial

⁴⁸ 23 CCR § 354.30(a)

⁴⁹ Water Code § 10721(w)(4); 23 CCR § 354.28(c)(4).

⁵⁰ 23 CCR § 354.28(d)

⁵¹ 23 CCR § 354.28(e)

⁵² Central Kings Draft GSP p.3-72, dated August 2019: In its Basin Setting, the Central Kings GSA notes a number of groundwater quality concerns affecting their region, including: Nitrate, Arsenic, DBCP (Dibromochloropropane), EDB (Ethylene dibromide), TCP (1,2,3-Trichloropropane), solvents like TCE (trichloroethylene) & PCE (Perchloroethylene), MTBE (methyl tert-butyl ether), hexavalent chromium, petroleum hydrocarbons, Gross Alpha, Nitrate, Uranium, landfill leachate within their area; other constituents of concern include boron, chloride, fluoride, and sodium (i.e. high salinity)



users unprotected from increased concentration and spread of existing groundwater contamination due to pumping patterns and groundwater management practices.

The GSA seeks to avoid responsibility for protecting against degraded groundwater quality by stating that contamination plumes are “already monitored and tracked by others,”⁵³ and that municipal water systems already ensure compliance with drinking water standards.”⁵⁴ However, SGMA does not exempt GSAs from monitoring groundwater if water is already being tested by other agencies for other purposes. Rather, the goal of SGMA is to ensure that GSAs are incorporating well testing data into their monitoring systems in order to ensure that *the GSA’s activities or policies* are not causing increased groundwater contamination. Therefore, regardless of other agencies’ groundwater quality management, it must still establish minimum thresholds and measurable objectives by which to measure whether its groundwater management activities are impacting groundwater quality, and it can collaborate with existing groundwater quality management programs to do so. As stated above, groundwater quality in this GSA does not fall into the exception of having a proxy or being absent, so Central Kings GSA must develop minimum thresholds, measurable objectives and interim milestones for this sustainability indicator.

The Draft GSP defines undesirable results for groundwater quality as “the significant and unreasonable reduction in groundwater quality such that the groundwater is no longer generally suitable for agricultural irrigation and domestic use.”⁵⁵ However, the Draft GSP does not set measurable objectives, interim milestones or minimum thresholds for degraded water quality, and states that the GSA does not plan on setting sustainable management criteria for groundwater quality until the 5-year GSP update.⁵⁶ Without concrete goals and measures by which to avoid its undesirable result, its undesirable result is meaningless, and it is in violation of its duties under SGMA.

SGMA also requires that the GSA consider the interests of all beneficial users including domestic well users and disadvantaged communities.⁵⁷ The GSA has not shown how it has considered the interests of beneficial users including domestic well owners and disadvantaged communities in making this decision to not have groundwater quality sustainable management criteria,⁵⁸ and may cause severe drinking water issues to occur for these beneficial users, who do not have the financial power to treat their water or purchase alternative water supplies. Given the demographic makeup of the disadvantaged unincorporated communities in the area, the resulting impact from the proposed sustainable management criteria will likely lead to disparate impact on protected groups, in conflict with state and federal law.⁵⁹

⁵³ Central Kings Draft GSP p.4-56, dated August 2019

⁵⁴ Central Kings Draft GSP p.4-58, dated August 2019

⁵⁵ Central Kings Draft GSP p.4-56, dated August 2019

⁵⁶ Central Kings Draft GSP p.4-56, dated August 2019

⁵⁷ Water Code §§ 10727.2(d)(2); 10721(x)(4)

⁵⁸ Water Code § 10723.2.

⁵⁹ Gov. Code § 11135; Gov. Code § 65008; Government Code §§ 12955, subd. (l).



The GSA Must Set Minimum Thresholds, Measurable Objectives and Interim Milestones for Degraded Water Quality

In order to comply with SGMA and its regulations, which require the GSA to set sustainable management criteria that will avoid undesirable results resulting from degraded water quality for all beneficial users in the basin, and avoid disparate impacts on protected groups, the GSP must include the following:

- The GSA must clearly describe the existing groundwater quality issues in the GSA area, and provide a map of contaminant plumes. It must show that it has considered all of the known contaminants and their potential impact on drinking water users in establishing its GSP policies, projects and management actions.
- Minimum thresholds for groundwater quality should be set at the best water quality since 2015 for each constituent, or at the Maximum Contaminant Level, whichever of the two reflects the better quality of water (lower contamination level).
- Where the minimum threshold exceeds the public health goal for any constituent, the GSP should, at a minimum, include a policy to strive for improvements to water quality to the point of meeting the relevant public health goal(s).
- Set a protective minimum threshold, measurable objective, and interim milestones for all constituents with primary drinking water standards, hexavalent chromium, and PFOSs/PFOAs that may be impacted by groundwater management activities, or failure to manage groundwater in a way that does not negatively impact groundwater quality.
- A detailed explanation as to how the groundwater quality minimum threshold, measurable objectives, and interim milestones will result in the protection of groundwater for disadvantaged communities and other drinking water users in the subbasin.
- Provide a robust drinking water warning system and drinking water protection program to prevent contamination impacts to drinking water users and mitigate drinking water contamination that occurs (see section below on Projects and Management Actions for more recommendations regarding these programs).

The Proposed Sustainability Goal for Groundwater Quality is Inadequate

The Draft GSP states that Central Kings GSA’s “groundwater quality sustainability goal is to maintain the overall groundwater quality in CKGSA at its general current state.”⁶⁰ This is overly vague, and ‘general state’ is not explicitly defined anywhere in the Draft GSP. Furthermore, considering the Central Kings GSA has decided not to set any measurable objectives, minimum thresholds, or interim milestones for groundwater quality, there is no reference as to how they plan to reach this vague sustainability goal.

⁶⁰ Central Kings Draft GSP p.4-55, dated August 2019



To ensure that the sustainability goal is protective of all beneficial users in the basin, the Central Kings GSA must do the following:

- Define the sustainability goal for groundwater quality to clearly prohibit any worsening of groundwater quality due to groundwater management activities and groundwater management decisions.

The GSP Should Ensure No Further Land Subsidence

As currently written, the sustainable management criteria for land subsidence are vague and do not protect for impacts on disadvantaged communities or domestic well users. The GSA must set sustainable management criteria that reflect the needs of all the stakeholders in the subbasin and protect all types of beneficial users from impacts from further land subsidence in the area.

Undesirable Result Must Consider the Interests of All Beneficial Users

The GSA must define the undesirable results for subsidence in a way that avoids subsidence that substantially interferes with *surface land uses*.⁶¹ The GSA must consider the interests of all beneficial user groups, including domestic well users and disadvantaged communities, in determining its undesirable result for land subsidence.

The Central Kings GSA has set an undesirable result as “the significant and unreasonable loss of functionality of structures, infrastructure, and major damage to roads within the Kings Basin due to land subsidence.”⁶² This undesirable result does not show whether it will protect infrastructure such as drinking water infrastructure, housing, sidewalks, piping, or other infrastructure that is fundamental to providing a healthy community environment. It is overly vague and does not show how it has taken into account the interests of all beneficial users in the GSA area.

To comply with its obligations under state law, Central Kings GSA must:

- Analyze the impact of land subsidence on all beneficial user groups, including potential impacts on drinking water wells, homes, piping, roads, etc.
- Define a local undesirable result for subsidence that takes into account the critical infrastructure needs of all beneficial user groups, including domestic well owners, and specifically impacts to homes, piping, and wells.

Minimum Threshold

In setting minimum thresholds for land subsidence, the GSA must consider the interests of all beneficial users including domestic well owners and disadvantaged communities,⁶³ and must avoid disparate impacts on protected groups.⁶⁴ Land subsidence due to groundwater extraction is known to cause surface deformation resulting in disturbances to water distribution networks and sewer

⁶¹ Water code sec. 10721.(x)(5)

⁶² Central Kings Draft GSP p.4-63, dated August 2019

⁶³ Water Code § 10723.2.

⁶⁴ Gov. Code § 11135; Gov. Code § 65008; Government Code §§ 12955, subd. (l).

systems,⁶⁵ and our local region has seen the land subsidence impacts of pumping.⁶⁶ Such impacts will likely affect infrastructure that is critical for the health and safety of domestic well users and disadvantaged communities in the GSA area. The Central Kings GSA has chosen not to set a minimum threshold for land subsidence and instead states that “the determination that undesirable results are occurring shall depend upon measurements from multiple monitoring sites from KRCD and InSAR mapping over the entire Basin.”⁶⁷

To avoid potential harms of land subsidence on all beneficial users the GSP must include the following:

- In defining critical infrastructure and setting undesirable results, minimum thresholds, and measurable objectives, the GSA should prioritize infrastructure for drinking water users by addressing the impacts of land subsidence on roads, homes, piping, and wells.
- In setting a minimum threshold for land subsidence, the GSA must show how it took into consideration the needs of all beneficial users in the basin.

Measurable Objective

As written, the measurable objective would allow for annual land subsidence of 6 inches/year over an area of 36 square miles and maximum cumulative land subsidence of 3 feet over 20 years. The increase in pumping during the recent drought has led to an acceleration in land subsidence.⁶⁸ Because the basin is in critical overdraft, the GSAs should aim to prevent any subsidence as a result of groundwater management activities, or from failure to manage groundwater in a way that does not aggravate land subsidence.

Furthermore, GSA staff stated at the GSP workshop on October 17th that the GSA area is not at risk from subsidence because of the way that the local irrigation district has conducted groundwater recharge. If that is the case, the GSA should be able to successfully set a measurable objective of zero subsidence.

To ensure that there is no further land subsidence in the basin, the GSP should:

⁶⁵ Pacheco-Martínez, Jesús, et al. "Land subsidence and ground failure associated to groundwater exploitation in the Aguascalientes Valley, México." *Engineering Geology* 164 (2013): 172-186; Abidin, H. Z., et al. "Land subsidence in coastal city of Semarang (Indonesia): characteristics, impacts and causes." *Geomatics, Natural Hazards and Risk* 4.3 (2013): 226-240; Hernández-Espriú, Antonio, et al. "The DRASTIC-Sg model: an extension to the DRASTIC approach for mapping groundwater vulnerability in aquifers subject to differential land subsidence, with application to Mexico City." *Hydrogeology Journal* 22.6 (2014): 1469-1485; Zektser, S., Hugo A. Loáiciga, and J. T. Wolf. "Environmental impacts of groundwater overdraft: selected case studies in the southwestern United States." *Environmental Geology* 47.3 (2005): 396-404.

⁶⁶ Faunt, Claudia C., et al. "Water availability and land subsidence in the Central Valley, California, USA." *Hydrogeology Journal* 24.3 (2016): 675-684.

⁶⁷ Central Kings Draft GSP p.4-65, dated August 2019

⁶⁸ Faunt, Claudia C., et al. "Water availability and land subsidence in the Central Valley, California, USA." *Hydrogeology Journal* 24.3 (2016): 675-684.

- Establish the measurable objective for land subsidence as zero change in subsidence resulting from groundwater management actions or from failure to manage groundwater in a way that does not aggravate land subsidence.

The Monitoring Network Is Inadequate With Respect to Groundwater Levels and Groundwater Quality

GSAs must monitor impacts to groundwater for drinking water beneficial users,⁶⁹ including disadvantaged communities on domestic wells,⁷⁰ and must avoid disparate impacts on protected groups pursuant to state law.⁷¹ The GSA's monitoring network does not comply with SGMA regulations, and fails to capture drinking water impacts to disadvantaged communities and domestic wells. The GSA has therefore not considered the interests of this beneficial user group and is likely to cause a disparate impact on protected groups who are dependent on domestic wells in the GSA area.

Groundwater Levels Monitoring Network

The SGMA regulations state that monitoring networks must include 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.⁷² The Central Kings GSA claims that it maintains 80 groundwater monitoring wells, located on a 2-mile square grid pattern.⁷³ However, the Central Kings GSA monitoring network for groundwater levels only has 13 representative monitoring wells that will be used to establish measurable objectives and minimum thresholds. As the Draft GSP states, this amounts to only one well for every 10,000 acres.⁷⁴

Furthermore, the assumption that monitoring wells that represents a 2-mile radius will adequately account for the changing groundwater level gradients in the area, is false. This is particularly questionable claim considering the differing groundwater conditions found within the subbasin, a point the Draft GSP highlights.⁷⁵ The proposed monitoring network is far too sparse and leaves disadvantaged communities without monitoring.

The GSA should therefore make the following changes to its groundwater level monitoring network:

- Expand the number of representative monitoring wells to ensure that disadvantaged communities and domestic wells users are represented in the monitoring network

⁶⁹ 23 CCR § 354.34

⁷⁰ Water Code § 10723.2.

⁷¹ Gov. Code § 11135; Gov. Code § 65008; Government Code §§ 12955, subd. (l).

⁷² 23 CCR § 354.34(c)(1)(A)

⁷³ Central Kings Draft GSP p.2-10, dated August 2019

⁷⁴ Central Kings Draft GSP p.4-6, dated August 2019

⁷⁵ Central Kings Draft GSP p.4-24, dated August 2019

- The GSA must invest in constructing more dedicated monitoring wells and needs to explain how they plan to transition current wells in the monitoring network into dedicated monitoring wells.
- All 80 wells in the monitoring network must be properly retrofitted as representative monitoring wells. Currently, only 13 of the 80 existing wells in the monitoring network are representative.

Groundwater Quality Monitoring Network

SGMA regulations require that GSPs create a groundwater quality monitoring network that will “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.”⁷⁶

Despite having identified many known water quality issues in the Basin Setting chapter,⁷⁷ the Draft GSP fails to do a comprehensive analysis of whether the sites being monitored by existing programs will adequately “address known water quality issues” and their impacts on all beneficial users in the GSA area.⁷⁸ As proposed, it is unclear which monitoring wells in the monitoring network will monitor for which contaminants, and whether monitoring wells will detect groundwater quality impacts on domestic well users and disadvantaged communities. From the description of the existing programs, we can infer that groundwater quality will be measured in communities and cities that have public water systems; however, in unincorporated areas the only groundwater quality monitoring programs are agricultural water suppliers, agencies monitoring for toxic waste from specific facilities, and ILRP. These programs will not capture changes in extent or concentration of drinking water contaminants identified in the Basin Setting, such as 123-TCP, Arsenic, DBCP, and others.

Therefore the monitoring network as written violates the GSA’s responsibility to collect sufficient data to determine trends and address known water quality issues affecting beneficial users in the GSA area. As written, the monitoring network would allow severe drinking water impacts to occur on domestic well users and in unincorporated communities.

To ensure that the representative wells within the monitoring network accurately monitor impacts to groundwater management for drinking water beneficial users, we make the following recommendations:

- The GSA must specify which contaminants will be monitored at which groundwater quality monitoring well in its monitoring network.

⁷⁶ 23 CCR § 354.34(c)(4)

⁷⁷ Central Kings Draft GSP p.3-72, dated August 2019: In its Basin Setting, the Central Kings GSA notes a number of groundwater quality concerns affecting their region, including: Nitrate, Arsenic, DBCP (Dibromochloropropane), EDB (Ethylene dibromide), TCP (1,2,3-Trichloropropane), solvents like TCE (trichloroethylene) & PCE (Perchloroethylene), MTBE (methyl tert-butyl ether), hexavalent chromium, petroleum hydrocarbons, Gross Alpha, Nitrate, Uranium, landfill leachate within their area; other constituents of concern include boron, chloride, fluoride, and sodium (i.e. high salinity)

⁷⁸ Central Kings Draft GSP p.5-18, dated August 2019

- The GSA must ensure that the groundwater quality monitoring network adequately captures increases in the extent and concentration of all known contaminants in the GSA area that are harmful to human health.
- The GSA must ensure that the groundwater quality monitoring network will detect impacts from groundwater quality on all types of beneficial users, most importantly drinking water users who have limited financial ability to treat their drinking water sources. To this end, the GSA should ensure that existing representative wells are in or near such communities or domestic wells, or that it has a concrete plan for installing new monitoring wells that will detect these impacts or working with domestic well users to regularly test their wells and incorporate that data into its monitoring network.

Projects and Management Actions

The GSA must consider the interests of all beneficial users including domestic well owners and disadvantaged communities⁷⁹ and avoid disparate impacts on protected groups. The projects and management actions set forth in the Draft GSP does not demonstrate a path towards achieving sustainability goals in the plan. As it is currently written, the draft GSP has proposed only one project and a related management action that is exclusively for the benefit of agricultural interest in the subbasin.

The only action Central Kings GSA has included in the plan is the addition of 80-acres of recharge areas.⁸⁰ The success of this management action is heavily dependent on our rain/snowmelt patterns. Considering the potential impacts of climate change, it seems highly illogical to make the sustainability of the basin reliant on the increase of surface water.

The Central Kings GSA provides a table of potential projects and programs that are being considered to mitigate groundwater overdraft, but give little to no information about the projects and programs, nor do they commit to moving forward with any of them.⁸¹ Additionally, the table that is provided gives no details as to who would benefit from these projects and programs, they state that all projects and programs would cost the how costs would be covered.

In order to protect drinking water resources for all beneficial users in the GSA area, and avoid a disparate impact on protected groups, we recommend that the GSA include the following management actions:

- **Metering:** In order to ensure precise measurement of groundwater use and to ensure achievement of the GSA's sustainability goal by 2040, GSAs are prescribed the authority to meter all production wells in the subbasin. Central Kings GSA must acknowledge and utilize the authority vested by the state of California to collect relevant groundwater

⁷⁹ Water Code § 10723.2.

⁸⁰ Central Kings Draft GSP p.6-3, dated August 2019

⁸¹ Central Kings Draft GSP p.6-4, dated August 2019



management data and to identify the largest water users. Central Kings GSA must reach sustainability therefore metering will be essential to effectively and accurately measuring water use. California Water Code section 10727.4 states that “a groundwater sustainability plan shall include, where appropriate and in collaboration with the appropriate indices” include “efficient water management practices...for the delivery of water and water conservation methods to improve the efficiency of water use.” With the data available Central Kings GSA and the Kings basin at large will be better equipped to reach sustainability. We recommend that the GSA prioritize subbasin-wide metering on large scale groundwater users.

- ***Drinking Water Warning System:*** Implementing a warning system so that the Central Kings GSA and stakeholders are aware of when wells are going dry, or when wells are going to become contaminated from groundwater management activities, so it can take action to prevent drinking water impacts. If drinking water wells are at risk of impacts, the Central Kings should help connect communities and individual homes to nearby reliable water systems. If consolidation is not possible, the Central Kings should deepen wells, install treatment facilities or POE/POU treatment in homes. In the interim, the GSA should provide emergency bottled water.
- ***Demand Reduction:*** The GSA should propose potential programs for requiring and incentivizing demand reduction. As discussed at the Central Kings GSP workshop on October 17th, given the factors outside of the GSA’s control, such as climate change and surface water allocation, it is unclear whether the GSA will be able to address its overdraft in a long term way with groundwater recharge alone. Therefore it is necessary for the GSA to include other potential management actions that would reduce groundwater demand, such as programs for land fallowing, more efficient irrigation practices, and other water conservation techniques.
- ***Drinking Water Protection Program:*** If the GSA’s policy decisions will lead to drinking water impacts on disadvantaged communities and communities protected from disparate impacts under state civil rights law, including wells going dry and increased drinking water contamination, the GSA must create a fund that will prevent these impacts, or mitigate those impacts should they occur. Such a fund should pay for projects including but not limited to digging deeper wells, replacing wells, connecting communities to a reliable drinking water source, and paying for the increased pumping costs of accessing water at deeper depths. We will gladly speak with you more in detail about how such a program could be structured and financed, and how residents would qualify.

Plan Implementation Section Is Incomplete

GSPs must include a planning and implementation horizon.⁸² However, the draft GSP fails to provide a timeline for when and how the GSP will be implemented. Under the schedule for implementation section, the Central Kings GSA only states that it will “add 100 acres of ponds annually. This program has been initiated following the passage of the Proposition 218 election in

⁸² Water Code § 10727.2.(c).



November 2018.”⁸³ The plan gives no detail as to how it plans to implement other aspects of the plan, such as groundwater level monitoring.

Additionally, the plan implementation chapter should contain basic information on annual reporting, periodic evaluation of the GSP, and how the costs of the GSP implementation will be covered. The Central Kings Draft GSP does not include this critical information.

As a public agency, the GSP must also establish processes by which it will seek and incorporate feedback from the public on an ongoing basis. It must do so through direct outreach to disadvantaged communities, collaboration with local community-based nonprofits, and public meetings or workshops that are held in locations and at times that are accessible to all beneficial user groups, with presentations and materials translated into all threshold languages.⁸⁴ Additionally, proposed changes to the plan must be publicly noticed and circulated for public review and comment prior to final adoption. None of these processes for public participation are outlined in the GSP.

To ensure that the GSP is implemented properly, the GSA must make the following modifications to the Plan Implementation section of the Draft GSP:

- Provide a clear implementation timeline for the GSP, including timelines for achieving sustainable management criteria, projects and management actions.
- The GSA must include a plan for public outreach for the GSP implementation process. This plan should include translation services in order to meaningfully consult with and consider the interest of all beneficial users. Workshops and meetings must be at an accessible time and locations for all stakeholders
- The GSA must include public outreach as part of annual reporting.
- The GSA must budget for public outreach. The budget should include translation services in order to meaningfully consult with and consider the interest of all beneficial users.
- Clarify in the GSP that the plan may be modified as data becomes available, and that the GSA will seek and accept feedback from the public on an ongoing basis throughout plan implementation.
- Clarify that any modification to the GSP must be in writing, noticed and provide sufficient time for public review and feedback.

⁸³

⁸⁴ Bilingual Services Act, Gov. Code, §§ 7293, 7295: a public agency must provide interpretation and translate materials into all languages for which there is a “substantial” number of people that it serves who speak that language.

Other Legal Considerations

The Draft GSP Threatens to Infringe on Water Rights

In enacting SGMA, the legislature found and declared that “[f]ailure to manage groundwater to prevent long-term overdraft infringes on groundwater rights.”⁸⁵ The test of SGMA further notes that “[n]othing in this part, or in any groundwater management plan adopted pursuant to this part, determines or alters surface water rights or groundwater rights under common law or any provision of law that determines or grants surface water rights.”⁸⁶ As discussed in detail above, the Draft GSP allows continued overdraft above the safe yield of the basin, such that drinking water wells (especially domestic wells) will continue to go dry, infringing on the rights of overlying users of groundwater. The GSP must be revised to protect the rights of residents of disadvantaged communities and/or low-income households who hold water rights to groundwater.

The Draft GSP Conflicts with the Reasonable And Beneficial Use Doctrine

The “reasonable and beneficial use” doctrine, to which SGMA expressly must comply,⁸⁷ is codified in the California Constitution. It requires that “the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.” (Cal Const, Art. X § 2; *see also United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 105 [“...superimposed on those basic principles defining water rights is the overriding constitutional limitation that the water be used as reasonably required for the beneficial use to be served.”].)

The reasonable and beneficial use doctrine applies here given the negative impacts of the Draft GSP on groundwater supply and quality, which are likely to unreasonably interfere with the use of groundwater for drinking water and other domestic uses. As the Draft GSP authorizes waste and unreasonable use, it conflicts with the reasonable and beneficial use doctrine and the California Constitution.

The Draft GSP Conflicts with the Public Trust Doctrine

The “public trust” doctrine applies to the waters of the State, and establishes that “the state, as trustee, has a duty to preserve this trust property from harmful diversions by water rights holders” and that thus “no one has a vested right to use water in a manner harmful to the state's waters.”⁸⁸

⁸⁵ AB 1739 (2014).

⁸⁶ Water Code § 10720.5(b).

⁸⁷ Water Code § 10720.1(a).

⁸⁸ *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 106; *see also Nat'l Audubon Soc'y v. Superior Court* (1983) 33 Cal.3d 419, 426 [“before state courts and agencies approve water diversions they should consider the effect of such diversions upon interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests.”].



The “public trust” doctrine has recently been applied to groundwater where there is a hydrological connection between the groundwater and a navigable surface water body.⁸⁹ In *Environmental Law Foundation*, the court held that the public trust doctrine applies to “the extraction of groundwater that adversely impacts a navigable waterway” and that the government has an affirmative duty to take the public trust into account in the planning and allocation of water resources.⁹⁰ The court also specifically held that SGMA does not supplant the requirements of the common law public trust doctrine.⁹¹ In contrast to these requirements, the Draft GSP does not consider impacts on public trust resources, or attempt to avoid insofar as feasible harm to the public’s interest in those resources.

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The Central Kings GSP must protect the most vulnerable drinking water users in the GSA area. We welcome the opportunity to discuss our recommendations with the Central Kings GSA board, staff and consultants to ensure compliance with state law. We are also in communication with the Department of Water Resources about current GSP development activities in the San Joaquin Valley, and hope to successfully work with GSAs, communities and DWR to ensure that groundwater management is equitable and sufficiently protective of vital drinking water resources.

Sincerely,

/s/

Nataly Escobedo Garcia and Amanda Monaco

Leadership Counsel for Justice and Accountability

CC:

Amanda Peisch-Derby
Senior Engineer
Department of Water Resources

Encl:

Technical Review, October 2019 Central Kings Groundwater Sustainability Agency Draft Groundwater Sustainability Plan (GSP)

⁸⁹ *Environmental Law Foundation v. State Water Resources Control Bd.* (2018) 26 Cal.App.5th 844, 844.

⁹⁰ *Id.* at 856-62.

⁹¹ *Id.* at 862-870.

Appendix A: Central Kings GSP Technical Review

Main points

- Based on the Plan's described Measurable Objectives and Minimum Thresholds, there are significant concerns that many shallow domestic drinking water wells will go dry (see map).
- The groundwater monitoring network the Plan relies on is insufficient. The assumption that each monitoring well represents a 2-mile radius does not adequately account for the changing groundwater level gradients in the area. The GSP includes no plans for monitoring water quality changes, stating that they will rely entirely on other water quality monitoring wells.
- The Plan's water budget included only 1 measured component and many assumptions (see section on water budget). The resulting estimates for annual overdraft reflect an "average" year and do not address the extremes of wet years, dry years, and the possibility of new extremes under climate change.
- Their management plans assume the area can expect consistent and excessive amounts of surface water in the future.
- The Plan severely under-assess water quality. Water quality concerns in the region are summarized, but the Plan states they have no plans for monitoring or managing water quality changes going forward, except to rely on other acting institutions that govern water quality.

How many wells will go dry?

Using data from OSWCR we were able to estimate the percentage of domestic wells that will be affected by groundwater levels reduced to the Measurable Objectives (MOs) and Minimum Thresholds (MTs). The analysis showed that the monitoring network is insufficient to cover land within the GSA boundaries. The GSA claims that CID maintains 80 groundwater monitoring wells, located on a 2-mile square grid pattern. However, the Minimum Thresholds and Measurable Objectives are stated for only 13 of these wells.

From this data set we found: 2,398 domestic wells that intersect a monitoring well (within a 2 mile radius), 210 domestic wells that are **not** within a 2 mile radius of any monitoring well, 4,935 wells where data is available on Total Completed Depth, a total of 5,975 wells clipped from the OSWCR data. **When the CKGSA Measurable Objectives are met, 515 wells will go dry. When Minimum Thresholds are reached, 1 036 domestic wells (43% within a 2 mile radius of a monitoring well) will go dry.**

If Measurable Objective is met at all monitoring wells		If Minimum Threshold is met at all monitoring wells	
# of wells going dry	% of all wells	# of wells going dry	% of all wells
515	9	1,036	20

Monitoring well and domestic well maps figure: (Left panels) 2 mile radius circles were drawn around each monitoring well in the GSP. Colors of the circles represent the Measurable Objective (top row) and the Minimum Threshold (bottom row) (see legends on each map). (Right panels) Only the domestic wells that will go dry under the Measurable Objective and Minimum Thresholds are plotted (n=1,036), because their total depth is shallower than the Plan's limits.

Important missing information in this section of the GSP include:

- Why/how these 13 monitoring wells were selected for setting MOs and MTs.
- Projected contours between these specific 13 wells.
- Projected MOs and MTs between these 13 monitoring wells. This is especially concerning considering that there are large differences in the thresholds set between the

nearest neighbors in the monitoring network. This problem becomes even more clear when evaluating the steep slopes of water contour levels between the monitoring wells selected (Page 3-49).

Related points to the undesirable result of lowering groundwater levels:

- The stated sustainability goal for CKGSA is to increase infiltration of surface water into groundwater aquifers, via intentional recharge in order to slow the lowering of the water table. There are no alternative plans to reduce the undesirable result of lowering groundwater levels (i.e. there has been no consideration of reducing groundwater pumping).
- Groundwater level changes and historic overdraft within the CID region were evaluated using groundwater elevation change data over a 50-year period between 1960-2010, which importantly did not include the historic, severe 2011-2015 drought (Page4-3). **It is crucial that the GSP plan for additional droughts of the scale and longevity of 2011-2015.**
- **The plan has inaccurately predicted the impacts of their MOs and MTs on domestic wells,** stating: “From the records it is understood that prior to 1975 domestic well depths were about 160 to 200 feet. Since that time, newer domestic wells are on the order of 350 feet.” This is a false assumption, and as our analysis using OSWCR data indicates, there are at least 1,000 new domestic wells (built after 1975) that are shallower than 350 feet and will go dry if the MOs or MTs are reached.
- The Plan states: “Rural residential landowners have had the ability to replace shallower wells that have matured past their useful life with deeper wells as needed. A change in 100- to 200- foot levels in 10 years, while not positive, would not be expected to be a significant change in depth of most agricultural wells.” **This statement simply is not true. There are many shallow irrigation wells and shallow domestic drinking water wells, where the average depth of domestic wells built after 1975 in CID is 189 feet (n=1,700 wells, with standard deviation of 100 feet)** (Reference: Pauloo, Rich (2018, April 30). An Exploratory Data Analysis of California's Well Completion Reports. Retrieved from https://richpauloo.github.io/oswcr_1.html)
- The Plan does not consider wells going dry an undesirable result (“The GSAs also recognize that during this time, the water level may decline below the depth of some wells within the basin... Some wells, even recently constructed, may have been poorly constructed or constructed too shallow for long term operation... Until water levels have been stabilized and the basin has reached sustainability, the GSA does not view a well going dry as an undesirable result (Page 4-5)). **This is extremely problematic, especially if the plan has not adequately assessed the level of a large number of current, in-use domestic wells. Further, this is likely to cause disproportionate impacts on low-income rural households.** At the same time, the Plan states: “Undesirable results for the GSA would be a lowering of groundwater levels at a faster rate than the historical, such that a level was realized that resulted in a majority of domestic wells associated with the farmsteads or in the rural residential neighborhoods within the GSA to become inoperable” (Page 4-5). Our analysis suggests that in fact, the MTs set across the GSA **will cause 43% of the domestic wells that are within a 2-mile radius of a monitoring well, to go**



dry. This does not account for the wells located outside of these 2-mile radii of monitoring sites (at least 210 wells).

Water budget review

For the **historical water budget**, a numerical water was **not** used for developing the water budget due to deficiencies in documentation, limited data for model development, and limited timeframe for model refinement, calibration, and validation, **even though a numerical model for the Kings Subbasin does exist and they mention that they will use it if it's updated in the future.** They do not mention the source of the existing model (that was not used) or provide clear explanation into why they did not use it. An analytical budget (spreadsheet) was used instead. The Plan states the model will be continually reviewed for usefulness and capability and data will be updated.

The historic budget from 1996-2011 based on average surface water diversions. Their budget **does not include the extreme drought conditions experienced from 2012-2016 because it was “impractical”.** While this time period represents an average year of Kings River surface water diversions, it only includes 3 “dry” years, as calculated in Table 3-1 on page 3-96 of the plan.

Quantification of water budget components was constrained by the timeline and limited funding and they had to use the “best available data that is obtainable at the time the GSP is developed” (Page 3-94). This resulted in confidence intervals for each parameter ranging from 5%-50%. **They describe their water budget as “merely an approximation of the hydrologic system in the GSA”** (Page 3-94). This is highly concerning considering that these values were used to create Measurable Objectives and Minimum Thresholds that will cause many wells to dry up, as explained in the previous section.

Inflows to the basin include Kings River delivery water, estimates of Kings River Riparian water, recharge volume (based on study from 1993), precipitation from NOAA (estimated to be 10.51 inches from 1997-2011), and groundwater inflow. Riparian surface water for irrigation was estimated to be 3 acre-feet/acre, however **this may not be a fair assumption for many crops in the region (for example perennial nut tree water requirements can range from 40-55 inches per year).** Unconfined groundwater inflow calculations use water levels from spring (before agricultural pressures of summer) and **assume that “the aquifer is relatively homogeneous and isotropic”** (page 3-98), **but do not explain the foundation of this assumption or address the unlikelihood that this assumption is accurate.** Confined groundwater inflows were computed similarly, but “groundwater level data available to compute the subsurface flows was more limited and has a greater degree of uncertainty than the unconfined groundwater inflows”.

Inflows to groundwater system include deep percolation of irrigation water (only in rural areas), 100% indoor water use and 25% of outdoor water use, seepage of channels and pipelines, urban stormwater recharge, local streams recharge (31,200 AF), and other recharge. Deep percolation assumes 84% irrigation efficiency throughout the entire GSA. **This assumption greatly overestimates irrigation efficiency and is likely not representative of actual land use and agricultural practices in this region, and thus has the potential to introduce significant error in the water budget.** Further, these calculations include **many assumptions for water use and percolation rates without citations and references** (e.g. assume indoor water use is 35% of rural and that all effluent from municipal water ends up in recharge basins).

Outflows from groundwater system include pumping for irrigation and M&I. Pumping rates were determined based on water demands calculated from crop evapotranspiration (minus effective precipitation) with irrigation efficiencies specific to crop types from local agency staff. Field crops assumed to be flood irrigation (70% efficiency) with trees and vines assumed to be micro irrigated (85% efficiency). **This section (3.3.6) is inconsistent with the description of assumed irrigation efficiencies in 3.3.5.** Pumping for indoor use assumes 70 gallons/capita/day and each parcel has 4 residents, which may be an underestimate.

Outflows from basin include evapotranspiration of applied irrigation water, applied M&I water, effective precipitation, conveyance channels, reservoirs and recharge basins, et and runoff of precipitation, operational spills, groundwater exports, and groundwater outflow (35,400 AF). Land use data was estimated by DWR Land Use data by county (Fresno- 1994, 2000, 2009; Kings - 1996, 2003; Tulare - 1999, 2007), which are **sporadic and likely insufficient data sources.** Other questionable methodology from this section include: assumed almond orchards and replacement every 20 years, only calculated losses due to evaporation for conveyance channels in Consolidated Irrigation District, and assumed that groundwater exports between landowners were negligible.

There seems to be a significant amount of information and calculations shared by the GSPs of the 7 GSAs within the Kings Subbasin. The repetition of information and reference to GSPs of neighboring GSAs highlight the **inefficiency of developing multiple GSPs to manage the 1 basin.** The GSPs use the same seepage rates based on soil type, outdoor water use rates, and evaporation from channels, reservoirs, recharge basins, to name a few.

Changes in groundwater storage were calculated based on data from 900 wells in spring 1997 and 2012. To prepare contour maps, “well levels that appeared insistent with the majority of other wells in an area were not used”. Specific yield data from USGS to calculate change in groundwater storage (level * specific yield). A significant amount of **methodology is unavailable** because it is documented in P&P Technical Memorandum. Estimated change in unconfined groundwater storage in CKGSA was **-17,000 AF/year.**

Two methods were used to calculate annual decline in groundwater storage. The Plan relies on the method that results in the lower estimate of 134 000 AF/year of overdraft. They state that it was validated by the results of the water budget estimate (159 000 AF/year) because the difference is <3% of annual ETAW and an acceptable number. The appropriateness of this assumption is unclear and should be a main point of discussion for DWR review.

Estimated **historical changes in groundwater storage differ greatly by water year type** (page 3-109). The estimated annual change in groundwater storage ranges from -226,200 in a dry year to +277,100 in a wet year. The **current water budget** uses majority of same assumption and looks at 2016 and 2017 for wet and dry extreme years. They show similar results of extreme surpluses and depletions (-224,400 to +278,900 in dry and wet years respectively). **Despite the common occurrence of extreme wet and dry years in the historical record, and “average” depletion of 17 000 AF/year was used to establish MOs and MTs.**

Projected water budget provides estimates to 2040 and 2070 including estimated changes in demand and impacts on climate change. For climate change projections, **only used central tendency** projections and did not include bookend analysis for more extreme conditions. In this conservative assessment, there are huge shifts runoff patterns (timing and volume) which will require “significant changes in water management” but “the assumption was made that Kings River water supplies... will be managed in the future to maintain historical levels of water supplies” (page 3-115). Assume that project rainfall will remain the same as historical and that evapotranspiration rates would increase for perennial crops.

Related points

- Although the water budget results show consistent decline in groundwater storage, there are no data sources cited for the claim that “land subsidence has been minimal in CKGSA” on page 3-106.
- **Huge amounts of uncertainty exist in the water budget.** Only 1 parameter was directly measured: surface water diversions. The largest component of the budget (evapotranspiration of applied water) has **15% confidence intervals** due to uncertainty in cropping pattern surveys, indirect estimates of unit evapotranspiration rates for crop types, and varieties in management practices.
- **Sustainable yield:** 1,140,000 AF/year is basin-wide value and **cannot be used to estimate sustainable yield in local areas, but there is no mention of how sustainable yield per acre will be determined, which will be different for each GSA.**

Water quality impacts

SGMA requires the GSP evaluate “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” (§354.16(d)). The CKGSA GSP does note a number of water quality concerns affecting their region, including: Arsenic, DBCP (Dibromochloropropane), EDB (Ethylene dibromide), TCP (1,2,3-Trichloropropane), solvents like TCE (trichloroethylene) & PCE (Perchloroethylene), MTBE (methyl tert-butyl ether), hexavalent chromium, petroleum hydrocarbons, Gross Alpha, Nitrate, Uranium, landfill leachate within their area; other constituents of concern include boron, chloride, fluoride, and sodium (i.e. high salinity). **However, the Plan does not propose any actions for continual monitoring or management of water quality in their region, stating that they will rely on other governing institutions to monitor and manage groundwater quality concerns.**

The Plan openly states that it “has not developed an in-depth accounting of the water quality issues and has reached out” to other entities (e.g. cities, South Kings GSA, Irrigated Lands Regulatory Program Water Quality Coalitions) for their information on water quality (Page 2-16).

- The Plan cites many existing federal and state programs that are tracking water quality and implementing management plans; however, it is a requirement of SGMA that the GSP address potential water quality issues and ensure that water quality Undesirable Results are not reached
- The Plan states that “despite the water quality concerns documented above, the groundwater is generally good for irrigation and adequate for domestic consumption” (page 3-74). **They note, albeit vaguely, that the wells most at risk for contamination risks are private domestic wells that are typically shallower.**
- The Plan includes no management plans to manage or mitigate groundwater quality concerns, saying that there are many other federal, state and local processes that will manage water quality concerns.
 - The Plan claims that the full area under their GSA is covered under the Kings River Water Quality Coalition, established in 2009 under the Irrigated Lands Regulatory Program, and states that regional information on surface and groundwater quality is available from the Coalition (Page 2-16).
 - The Plan states the GSA will rely on ILRP on-farm domestic well water quality data that they anticipate being generated once the new ILRP Order is adopted for the rest of the SJV in early 2020.

The Plan states that the GSA’s “groundwater quality sustainability goal is to maintain the overall groundwater quality in CKGSA at its general current state”. **This is vague and ambiguous, and ‘general state’ is not characterized anywhere in the plan**(Page 4-55). Additional problems in the ambiguity of sustainability goals include:

- **They have not designated any Measurable Objectives of Minimum Thresholds for groundwater quality criteria.** They anticipate the MT levels will be based on a combination of the baseline groundwater quality data and the federal and state MCLs and will be included in subsequent GSP updates.

- In regard to Rural Residential users, the Plan states “Insufficient data exists to establish a baseline for determining the sustainable management criteria at this time”. **This is simply an insufficient analysis of water quality issues and how they may be exacerbated or improved by groundwater supply management.**
- In regard to municipal groundwater use, the Plan states there is little to no action the CKGSA can take with regards to municipal groundwater quality, claiming “CKGSA has no responsibility with regards to municipal groundwater” (Page 4-58). They do not anticipate quality issues, as they state municipal wells are routinely monitored and if an exceedance is identified, it is rectified through treatment (page 4-56). The plan states MTs for municipal water will not be developed until the 5-year GSP update.
 - They acknowledge the City of Selma as their only relevant municipal groundwater user.
- In Section 4.5.2.2 on “Causes of groundwater conditions that would lead to undesirable results”, the Plan states simply, “No known information exists that suggests there are conditions that will lead to undesirable results”.
- Section 4.5.4.x is completely empty at this time.

The characterization of water quality issues is problematic in additional ways:

- Section 3.2.5 discusses water quality exceedances, in a fairly obscure way, citing federal MCLs often in ug/ L, and reporting the historic levels of constituents and exceedances in the basin in ppt or ppb.
- Section 3.2.5 cites a map of water quality exceedances in the basin (a requirement of SGMA), though the map was not provided in this version of the draft.
- The Plan is not consistent throughout all sections in identifying all of the water quality concerns, and in the many different places throughout the Plan where water quality is mentioned, different combinations of constituents are cited.

Other comments

Coordination between all GSPs in the Kings Subbasin:

The Kings Subbasin GSAs coordinated and used “consistent” approaches to develop water budgets. They agreed to use an analytical water budgeting approach, as opposed to a numerical method. The plan states on Page 4-2: “Activities of the basin will be coordinated to monitor... groundwater levels and coordinate this information for evaluation of meeting objectives...” **but specifics on how this coordination will be done across GSAs is not indicated.**

Climate/ long-term planning horizons:

The plan does not consider how climate change will influence how much surface water will be available, and how much variability one may expect in surface water changes; they cite that DWR suggests warmer conditions could lead to more rain and/or earlier runoff. It is a critical oversight not to consider the climate projects that indicate more variability in water and the potential for more, long term droughts. If the plan does not indicate any preparedness for another severe

drought, **they are vastly overestimating how much surface water they have to work with for recharge.**

Defining undesirable results:

They continuously state that **negative changes did NOT result in undesirable results**, which does not consider the vast amount of research that indicates likely changes to water conditions in the Central Valley.

- “Changes in groundwater levels associated with most recent drought years for 2014-2016... resulted in change in groundwater level from 30 to 80 feet... while not positive, did not result in undesirable results.”
- “At present there are no conditions that result in undesirable results.”
- “As of 2015, undesirable results were not occurring. The historic change in groundwater levels had not resulted in declining levels that caused wells to go dry.” (Page 4-4)

Monitoring network:

The plan states “Management objectives and minimum thresholds will be set at certain monitor sites, representative for an area of the region” but **does not clearly state how these regions around monitoring wells are defined. What is the radius of each monitoring well that results will be extrapolated over?**

They’re only using 13 wells as monitoring wells used to establish measurable objectives and minimum thresholds. As the plan states, this amounts to 1 well for every 10,000 acres, which seems too sparse, especially because in the plan itself the GSA states that “there are vastly differing groundwater conditions across the CKGSA” (Page 4-24).

It appears that there are some clear gaps in monitoring, which is particularly problematic in areas within the GSA where there has been more groundwater level decline; for example, the far southern corner boundary, south of Kingsburg and southwest of Monitoring Well #41, is not being monitored, but has seen greater groundwater decline. There has also been more groundwater decline in the western reaches of the GSA, between monitoring wells 48, 56, 67, 74.

Section 3.5 summarizes the “Management Areas”, but the plan in this section is essentially empty, saying that the CKGSA will be managed as one unit. The problem with this is that the monitoring network established clearly shows heterogeneity in the aquifer conditions (groundwater levels, quality, etc.) across the basin, and MOs and MTs have been set at different levels across the basin, so in practice the basin *will* have different conditions and held do different conditions, thus functionally it will be managed differently across the basin area.

Interested parties:



Current interested parties are agricultural users, domestic well users, and the city of Selma. The plan does not mention the disadvantaged community designation for communities within GSA boundaries that include >27 000 people: Caruthers (2 972), Monmouth (155), Selma (24 228), and Tombstone (~180) (<https://gis.water.ca.gov/app/dacs/>).

Missing information:

There is very little information in general about plan implementation (Section 7), where there are vague and general statements about monitoring, raising fees, evaluation of the plan, with no specifics. The Plan (Section 8) cites many technical appendices, that appear to be missing including:

- Technical Appendices (8.5)
- Groundwater modelling documentation (8.6)



GSP Comment Card

Name/Organization: Nikiko Masumoto, Masumoto Family Farm

Address: 9336 E. Lincoln Ave, Del Rey, CA 93616

Email: nikmasu@gmail.com

Hello! Thanks for all the work so far on the GSP!
I'm wondering if there's thought about adding anything about the potential ~~on~~ for on-farm recharge in really wet years? Both in ~~them~~ terms of another tool in the toolbox of groundwater re-charge and the potential benefits of keeping land in ag. Thanks!

October 28, 2019

Central Kings Groundwater Sustainability Agency
c/o Consolidated Irrigation District
2255 Chandler Street – P.O. Box 209
Selma, CA 93662

Submitted via email to info@ckgsa.org

Re: Central Kings Groundwater Sustainability Plan (GSP)

Dear Basin Representatives,

The Nature Conservancy (TNC) appreciates the opportunity to comment on the Central Kings Groundwater Sustainability Plan being prepared under the Sustainable Groundwater Management Act (SGMA).

TNC as a Stakeholder Representative for the Environment

TNC is a global, nonprofit organization dedicated to conserving the lands and waters on which all life depends. We seek to achieve our mission through science-based planning and implementation of conservation strategies. For decades, we have dedicated resources to establishing diverse partnerships and developing foundational science products for achieving positive outcomes for people and nature in California. TNC was part of a stakeholder group formed by the Water Foundation in early 2014 to develop recommendations for groundwater reform and actively worked to shape and pass SGMA.

Our reason for engaging is simple: California's freshwater biodiversity is highly imperiled. We have lost more than 90 percent of our native wetland and river habitats, leading to precipitous declines in native plants and the populations of animals that call these places home. These natural resources are intricately connected to California's economy providing direct benefits through industries such as fisheries, timber and hunting, as well as indirect benefits such as clean water supplies. SGMA must be successful for us to achieve a sustainable future, in which people and nature can thrive within the Central Kings GSA area and California.

We believe that the success of SGMA depends on bringing the best available science to the table, engaging all stakeholders in robust dialog, providing strong incentives for beneficial outcomes and rigorous enforcement by the State of California.

Given our mission, we are particularly concerned about the inclusion of nature, as required, in GSPs. The Nature Conservancy (TNC) has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at GroundwaterResourceHub.org. TNC's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Addressing Nature's Water Needs in GSPs

SGMA requires that all beneficial uses and users, including environmental users of groundwater, be considered in the development and implementation of GSPs (Water Code § 10723.2).

The GSP Regulations include specific requirements to identify and consider groundwater-dependent ecosystems (GDEs) [23 CCR §354.16(g)] when determining whether groundwater conditions are having potential effects on beneficial uses and users. GSAs must also assess whether sustainable management criteria may cause adverse impacts to beneficial uses and users, which include environmental uses, such as plants and animals. TNC has identified each part of GSPs where consideration of beneficial uses and users are required. That list is available here: <https://groundwaterresourcehub.org/importance-of-gdes/provisions-related-to-groundwater-dependent-ecosystems-in-the-groundwater-s>. Please ensure that environmental beneficial users are addressed accordingly throughout the GSP. Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decision, and using data collected through monitoring to revise decisions in the future. Over time, GSPs should improve as data gaps are reduced and uncertainties addressed.

To help ensure that GSPs adequately address nature as required under SGMA, TNC has prepared a checklist (**Attachment A**) for GSAs and their consultants to use. TNC believes the following elements are foundational for 2020 GSP submittals. For detailed guidance on how to address the checklist items, please also see our publication, *GDEs under SGMA: Guidance for Preparing GSPs*¹.

1. Environmental Representation

SGMA requires that groundwater sustainability agencies (GSAs) consider the interests of all beneficial uses and users of groundwater. To meet this requirement, we recommend actively engaging environmental stakeholders by including environmental representation on the GSA board, technical advisory group, and/or working groups. This could include local staff from state and federal resource agencies, nonprofit organizations and other environmental interests. By engaging these stakeholders, GSAs will benefit from access to additional data and resources, as well as a more robust and inclusive GSP.

2. Basin GDE and ISW Maps

SGMA requires that GDEs and interconnected surface waters (ISWs) be identified in the GSP. We recommend using the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) provided online² by the Department of Water Resources (DWR) as a starting point for the GDE map. The NC Dataset was developed through a collaboration between DWR, the Department of Fish and Wildlife and TNC. We also recommend using GDE Pulse, which is also available on the internet at <https://gde.codefornature.org/#/home>.

3. Potential Effects on Environmental Beneficial Users

¹GDEs under SGMA: Guidance for Preparing GSPs is available at:

https://groundwaterresourcehub.org/public/uploads/pdfs/GWR_Hub_GDE_Guidance_Doc_2-1-18.pdf

² The Department of Water Resources' Natural Communities Commonly Associated with Groundwater dataset is available at: <https://gis.water.ca.gov/app/NCDatasetViewer/>

SGMA requires that potential effects on GDEs and environmental surface water users be described when defining undesirable results. In addition to identifying GDEs in the basin, TNC recommends identifying beneficial users of surface water, which include environmental users. This is a critical step, as it is impossible to define “significant and unreasonable adverse impacts” without knowing *what* is being impacted. For your convenience, we’ve provided a list of freshwater species within the boundary of the Kings Subbasin (Subbasin) in **Attachment C**. Our hope is that this information will help your GSA better evaluate the impacts of groundwater management on environmental beneficial users of surface water. We recommend that after identifying which freshwater species exist in your basin, especially federal- and state-listed species, that you contact staff at the California Department of Fish and Wildlife (CDFW), United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the GSA’s freshwater species list. We also refer you to the Critical Species Lookbook³ prepared by TNC and partner organizations for additional background information on the water needs and groundwater reliance of critical species. Since effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs.

4. Biological and Hydrological Monitoring

If sufficient hydrological and biological data in and around GDEs is not available in time for the 2020/2022 plan, data gaps should be identified along with actions to reconcile the gaps in the monitoring network.

TNC has reviewed the Central Kings Draft GSP and appreciates the work that has gone into the preparation of various elements of this plan. However, we consider it to be **inadequate** under SGMA since key environmental beneficial uses and users are not adequately identified and considered. In particular, GDEs are not adequately identified and evaluated for ecological importance or adequately considered in the basin’s sustainable management criteria. **Please present a more thorough analysis of the identification and evaluation of GDEs in subsequent drafts of the GSP. Once GDEs are identified, they must be considered when defining undesirable results and evaluated for further monitoring needs.**

Our specific comments related to the Central Kings GSP are provided in detail in **Attachment B** and are in reference to the numbered items in **Attachment A**. **Attachment C** provides a list of the freshwater species located in the Kings Subbasin. **Attachment D** describes six best practices that GSAs and their consultants can apply when using local groundwater data to confirm a connection to groundwater for DWR’s NC Dataset. **Attachment E** provides an overview of a new, free online tool (i.e., GDE Pulse) that allows GSAs to assess changes in GDE health using satellite, rainfall, and groundwater data.

Thank you for fully considering our comments as you develop your GSP.

Best Regards,



Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

³ Available online at: <https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/>

Attachment A

Environmental User Checklist

The Nature Conservancy is neither dispensing legal advice nor warranting any outcome that could result from the use of this checklist. Following this checklist does not guarantee approval of a GSP or compliance with SGMA, both of which will be determined by DWR and the State Water Resources Control Board.

GSP Plan Element*		GDE Inclusion in GSPs: Identification and Consideration Elements	Check Box
Admin Info	2.1.5 Notice & Communication 23 CCR §354.10	Description of the types of environmental beneficial uses of groundwater that exist within GDEs and a description of how environmental stakeholders were engaged throughout the development of the GSP.	1
Planning Framework	2.1.2 to 2.1.4 Description of Plan Area 23 CCR §354.8	Description of jurisdictional boundaries, existing land use designations, water use management and monitoring programs; general plans and other land use plans relevant to GDEs and their relationship to the GSP.	2
		Description of instream flow requirements, threatened and endangered species habitat, critical habitat, and protected areas.	3
		Summary of process for permitting new or replacement wells for the basin, and how the process incorporates any protection of GDEs	4
Basin Setting	2.2.1 Hydrogeologic Conceptual Model 23 CCR §354.14	Basin Bottom Boundary: Is the bottom of the basin defined as at least as deep as the deepest groundwater extractions?	5
		Principal aquifers and aquitards: Are shallow aquifers adequately described, so that interconnections with surface water and vertical groundwater gradients with other aquifers can be characterized?	6
		Basin cross sections: Do cross-sections illustrate the relationships between GDEs, surface waters and principal aquifers?	7
	2.2.2 Current & Historical Groundwater Conditions 23 CCR §354.16	Interconnected surface waters:	8
		Interconnected surface water maps for the basin with gaining and losing reaches defined (included as a figure in GSP & submitted as a shapefile on SGMA portal).	9
		Estimates of current and historical surface water depletions for interconnected surface waters quantified and described by reach, season, and water year type.	10
		Basin GDE map included (as figure in text & submitted as a shapefile on SGMA Portal).	11

		If NC Dataset was used:	Basin GDE map denotes which polygons were kept, removed, and added from NC Dataset (Worksheet 1, can be attached in GSP section 6.0).	12
			The basin's GDE shapefile, which is submitted via the SGMA Portal, includes two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed).	13
			GDEs polygons are consolidated into larger units and named for easier identification throughout GSP.	14
		If NC Dataset was <i>not</i> used:	Description of why NC dataset was not used, and how an alternative dataset and/or mapping approach used is best available information.	15
		Description of GDEs included:		16
		Historical and current groundwater conditions and variability are described in each GDE unit.		17
		Historical and current ecological conditions and variability are described in each GDE unit.		18
		Each GDE unit has been characterized as having high, moderate, or low ecological value.		19
		Inventory of species, habitats, and protected lands for each GDE unit with ecological importance (Worksheet 2, can be attached in GSP section 6.0).		20
	2.2.3 Water Budget 23 CCR §354.18	Groundwater inputs and outputs (e.g., evapotranspiration) of native vegetation and managed wetlands are included in the basin's historical and current water budget.		21
		Potential impacts to groundwater conditions due to land use changes, climate change, and population growth to GDEs and aquatic ecosystems are considered in the projected water budget.		22
Sustainable Management Criteria	3.1 Sustainability Goal 23 CCR §354.24	Environmental stakeholders/representatives were consulted.		23
		Sustainability goal mentions GDEs or species and habitats that are of particular concern or interest.		24
		Sustainability goal mentions whether the intention is to address pre-SGMA impacts, maintain or improve conditions within GDEs or species and habitats that are of particular concern or interest.		25
	3.2 Measurable Objectives 23 CCR §354.30	Description of how GDEs were considered and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.		26
	3.3 Minimum Thresholds 23 CCR §354.28	Description of how GDEs and environmental uses of surface water were considered when setting minimum thresholds for relevant sustainability indicators:		27
		Will adverse impacts to GDEs and/or aquatic ecosystems dependent on interconnected surface waters (beneficial user of surface water) be avoided with the selected minimum thresholds?		28
		Are there any differences between the selected minimum threshold and state, federal, or local standards relevant to the species or habitats residing in GDEs or aquatic ecosystems dependent on interconnected surface waters?		29
	3.4 Undesirable Results 23 CCR §354.26	For GDEs, hydrological data are compiled and synthesized for each GDE unit:		30
		If hydrological data <i>are available</i> within/nearby the GDE	Hydrological datasets are plotted and provided for each GDE unit (Worksheet 3, can be attached in GSP Section 6.0).	31
			Baseline period in the hydrologic data is defined.	32

			GDE unit is classified as having high, moderate, or low susceptibility to changes in groundwater.	33
			Cause-and-effect relationships between groundwater changes and GDEs are explored.	34
		If hydrological data <i>are not available</i> within/nearby the GDE	Data gaps/insufficiencies are described.	35
			Plans to reconcile data gaps in the monitoring network are stated.	36
		For GDEs, biological data are compiled and synthesized for each GDE unit:		37
		Biological datasets are plotted and provided for each GDE unit, and when possible provide baseline conditions for assessment of trends and variability.		38
		Data gaps/insufficiencies are described.		39
		Plans to reconcile data gaps in the monitoring network are stated.		40
		Description of potential effects on GDEs, land uses and property interests:		41
		Cause-and-effect relationships between GDE and groundwater conditions are described.		42
		Impacts to GDEs that are considered to be “significant and unreasonable” are described.		43
		Known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for significant impacts to relevant species or ecological communities are reported.		44
		Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).		45
		Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.		46
Sustainable Management Criteria	3.5 Monitoring Network 23 CCR §354.34	Description of whether hydrological data are spatially and temporally sufficient to monitor groundwater conditions for each GDE unit.		47
		Description of how hydrological data gaps and insufficiencies will be reconciled in the monitoring network.		48
		Description of how impacts to GDEs and environmental surface water users, as detected by biological responses, will be monitored and which GDE monitoring methods will be used in conjunction with hydrologic data to evaluate cause-and-effect relationships with groundwater conditions.		49
Projects & Mgmt Actions	4.0. Projects & Mgmt Actions to Achieve Sustainability Goal 23 CCR §354.44	Description of how GDEs will benefit from relevant project or management actions.		50
		Description of how projects and management actions will be evaluated to assess whether adverse impacts to the GDE will be mitigated or prevented.		51

* In reference to DWR’s GSP annotated outline guidance document, available at:
https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/GD_GSP_Outline_Final_2016-12-23.pdf

Attachment B

TNC Evaluation of the Central Kings Area Groundwater Sustainability Plan, Public Review Draft

A complete draft of the Central Kings Area Groundwater Sustainability Plan (GSP) was provided for public review on August 26, 2019. This attachment summarizes our comments on the complete public draft GSP. Comments are provided in the order of the checklist items included as Attachment A.

Checklist Item 1 - Notice & Communication (23 CCR §354.10)

[Section 2.5.1 Description of Beneficial Uses and Users (p. 2-30)]

- The discussion of beneficial uses and users of groundwater focused on agricultural users, domestic well users, and City of Selma users, but environmental groups were not listed. **Please discuss how environmental groups were engaged during the GSP development process.**
- **Please identify whether or not the following beneficial uses and users of groundwater in the Subbasin are present: Protected Lands, including refuges, conservation areas, and recreational areas; and Public Trust Uses, including wildlife, aquatic habitat, fisheries, and recreation.**
- The types and locations of environmental uses, species and habitats supported, instream flow requirements, and other designated beneficial environmental uses of surface waters that may be affected by groundwater extraction in the Subbasin should be specified. **To identify environmental users, please refer to the following:**
 - The NC Dataset (<https://gis.water.ca.gov/app/NCDataSetViewer/>) which identifies the potential presence of groundwater dependent ecosystems in this basin.
 - The list of freshwater species located in the Kings Subbasin in Attachment C of this letter. Please take particular note of the species with protected status.
 - CDFW's California Natural Diversity Database (CNDDB) - <https://www.wildlife.ca.gov/Data/CNDDB>
 - USFWS's IPAC report for the Central Kings GSA (CKGSA) area - <https://ecos.fws.gov/ipac/>

Checklist Items 2 to 4 - Description of general plans and other land use plans relevant to GDEs and their relationship to the GSP (23 CCR §354.8).

[Section 2.2.1 Monitoring and Management Programs (p. 2-10 to 2-22)]

- [Groundwater Level Monitoring (p. 2-10)] Consolidated Irrigation District (CID) has maintained a network of about 80 wells since 2001. The groundwater levels in these wells are currently measured two times per year. The Kings River Conservation District (KRCD) began studying groundwater level trends in 1987 and prepared annual groundwater reports between 2003 and 2014 that included regional

groundwater contour maps. **Please describe how existing groundwater monitoring programs are protective of GDEs or propose additional monitoring that specifically targets GDEs.**

- [Groundwater Extraction Monitoring (p. 2-15)] The CID does not own or operate any municipal wells. Most private wells are not metered, so the volume extracted is not known. This omission means that the groundwater used must be estimated using factors such as water use per capita and crop water demand per acre, which contributes to the uncertainty of the water budget. **Please describe how this data gap will be filled in the future.**
- [Surface Water Monitoring (p. 2-15)] This section states that the Kings River is monitored by “numerous agencies” (p. 2-15) but lists only the Kings River Water Association. The Kings River Fisheries Management Program is described in Section 2.2.2 Impacts to Operational Flexibility. The Kings River program includes maintenance of a 10 percent minimum capacity in the Pine Flats Reservoir for improved temperature control and year-round fish releases below the reservoir. There is no mention of ISWs or GDEs or how they are monitored. **Please explain the relationship of existing stream flow monitoring to the protection of ISWs and GDEs, and if there are instream flow criteria for the ISWs.**

[Section 2.3 Relation to General Plans (p. 2-19 to 2-25)]

- The Fresno, Kings and Tulare County General Plan were adopted prior to the development of the CKGSA. This section should be modified to include a discussion of General Plan goals and policies related to the protection and management of GDEs and aquatic resources that could be affected by groundwater withdrawals. **Please include a discussion of how implementation of the GSP may affect and be coordinated with General Plan policies and procedures regarding the protection of wetlands, aquatic resources and other GDEs and ISWs.**
- This section should identify Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) within the Subbasin and if they are associated with critical, GDE or ISW habitats. **Please identify all relevant HCPs and NCCPs within the Subbasin, and address how GSP implementation will coordinate with the goals of these HCPs or NCCPs.**
- Please refer to the Critical Species Lookbook⁴ to review and discuss the potential groundwater reliance of critical species in the basin. **Please include a discussion regarding the management of critical habitat for these aquatic species and its relationship to the GSP.**

[Section 2.3.4 Permitting of New Wells (p. 2-24)]

- Well permitting is handled currently by County Health Departments. The GSP states that CID will work with counties to review new well applications. **Please include a discussion of how future well permitting will be coordinated with the GSP to assure achievement of the Plan’s sustainability goals.**

⁴ Available online at: <https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/>

- The State Third Appellate District recently found that Counties have a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting new wells near streams with public trust uses (ELF vs. SWRCB and Siskiyou County, No. C083239). **Compliance of well permitting programs with this requirement should be stated in the GSP.**

[Section 2.4.4 Well Abandonment/Well Destruction Program (p. 2-28)]

- The county of Fresno has the authority to require permits for well abandonment/well destruction, but due to staffing and funding limitations the GSP notes that enforcement of this requirement is limited. **Please describe what actions will be taken by CKGSA to make sure that wells are properly abandoned.**

Checklist Items 5, 6, and 7 – Hydrogeologic Conceptual Model (23 CCR §354.14)

[Section 3 Basin Setting (p. 3-1 to 3-42)]

- The following figures in Section 3 do not show up correctly in the GSP and cause the pdf application to crash: Figures 3-9, 3-19, 3-24, and 3-25. **Please correct these figures in subsequent versions of the GSP.**

[Section 3.1.7 Cross-Sections (p. 3-14)]

- The basin-wide cross sections provided in Figures 3-10 through 3-15 (pp. 3-17 to 3-22) are regional, and do not include a graphical representation of the manner in which shallow groundwater may interact with ISWs or GDEs that would allow the reader to understand this topic. The cross-sections have been taken from a 1969 source and, as reproduced in the GSP, are very difficult to read and understand. **Please reproduce the regional cross-sections so that they can be understood by the reader and update them to illustrate data obtained from more recent well installations. Include an example near-surface cross sections that depicts the conceptual understanding of shallow groundwater and river interactions at different locations, as well as any potential GDEs and ISWs.**

[Section 3.1.8.1 Aquifer Characteristics and Properties (p. 3-26)]

- In the Central Kings Subbasin, the base of the usable aquifer corresponds with the base of freshwater, generally defined as groundwater with total dissolved solids (TDS) of 2,000 milligrams per liter (mg/l), consistent with other GSAs in the Kings subbasin. In the far eastern part of the Central Kings subbasin, the base of the aquifer is defined by the top of the basement complex. As noted on page 9 of DWR's Hydrogeologic Conceptual Model BMP (https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_HCM_Final_2016-12-23.pdf) "the definable bottom of the basin should be at least as deep as the deepest groundwater extractions". **Thus, groundwater extraction well depth data should also be included in the determination of the basin bottom.** Properly defining the bottom of the basin will prevent the possibility of extractors with wells

deeper than the basin boundary from claiming exemption from SGMA due to their well residing outside the vertical extent of the basin boundary.

[Section 3.1.12 Recharge and Discharge Areas (p. 3-35 to 3-40)]

- The GSP states that there are natural recharge areas, stormwater basins and constructed recharge basins. **Please include a description of these areas and note whether any features are present that attract wildlife. Please indicate whether the recharge basins are or could be operated as multiple-benefit projects that provide habitat suitable for migrating birds or other species, and could be included in an HCP or NCCP.**
- Wetlands were mapped along the Kings River, as identified from US Forest Service's National Wetland Inventory, according to the GSP. **Please discuss in the GSP that these wetlands are considered potential GDEs and refer to Figure 3-59. Also, if the Wetland Inventory was in fact the US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), then correct the text and reevaluate the data. The NWI does not always include or segregate separate existing wetlands that are on the periphery of other features. Please describe the wetland types in more detail. If they are truly vernal pools confined by a clay layer then they are not GDEs, but they must meet the criteria of a vernal pool as described by the California Rapid Assessment Methodology or the United States Army Corps of Engineers to qualify.**

Checklist Items 8, 9, and 10 – Interconnected Surface Waters (ISW) (23 CCR §354.16)

[Section 3.2.7 Surface Water and Groundwater Interconnection (pp. 3-85 to 3-87)]

- ISWs are best estimated by first determining which reaches are completely disconnected from groundwater. This approach would involve comparing groundwater elevations with a land surface Digital Elevation Model (DEM) that could identify which surface waters have groundwater consistently below surface water features, such that an unsaturated zone would separate surface water from groundwater. **Please provide or refer to depth to groundwater contour maps in this section. See Attachment D for best practices for completing this step. Specifically, ensure that the first step is contouring groundwater elevations, and the subtracting this layer from land surface elevations from a DEM to estimate depth to groundwater contours across the landscape.** This will provide much more accurate contours of depth to groundwater along streams and other land surface depressions where GDEs are commonly found. Contours developed from depth to groundwater measurements at wells assumes that the land surface is constant, which is a poor assumption to make.
- In the Kings River between Highway 180 and Sanger, shallow wells were installed at proposed gravel processing facilities and wastewater facilities by KDSA (KDSA 2017). The GSP states that the "KDSA further indicates that along the reach of the Kings River upstream of the Reedley narrows, the groundwater is indicated to be in direct hydraulic communication with streamflow in the Kings River" (p. 3-87). The

groundwater in this area is shallow based on DWR measurements. This finding needs to be illustrated using cross-sections with measured channel bed elevations and depths to groundwater. **Please provide a cross-section at this location to show the relationship between the depth to groundwater and the bed of the river channel. If channel bed elevations are not known, please identify as a data gap and further discuss in the Monitoring section of the GSP.**

Checklist Items 11 to 15, Identifying and Mapping GDEs (23 CCR §354.16)

[Section 3.2.8 Groundwater Dependent Ecosystems (p. 3-87)]

- The NC dataset is a starting point for GSAs to identify GDEs in their basin/subbasin. The NC dataset has 991 acres of potential GDEs mapped within the CKGSA area, representing a significant amount of GDEs to be considered. Note that this is a starting point, thus not all potential GDEs are mapped and not all ecosystems mapped are GDEs. **Please refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC dataset are supported by groundwater in an aquifer. If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled by the monitoring network.** Specifically, please note:
 - The text refers to Spring of 2017 depth to groundwater contours, however these contours are not shown. Figure 3-49 shows depth to groundwater contours for Spring 2015, however this figure is not referred to in this section. **Please note the following best practices for developing depth to groundwater contours:**
 - Only wells monitoring the upper unconfined aquifer are being used to verify whether polygons in the NC dataset are supported by groundwater;
 - The wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons reflect local conditions relevant to ecosystems;
 - The wells used for interpolating depth to groundwater are screened within the surficial unconfined aquifer and capable of measuring the true water table; and
 - Depth to groundwater is contoured using groundwater elevations at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a DEM to estimate depth to groundwater contours across the landscape. This will provide much more accurate contours of depth to groundwater along streams and other land surface depressions where GDEs are commonly found. Depth to groundwater contours developed from measurements at wells assume that the land surface is constant, which is a poor assumption to make. It is better to assume that water surface elevations are constant in between wells,

and then calculate depth to groundwater using a DEM of the land surface to create the contour map.

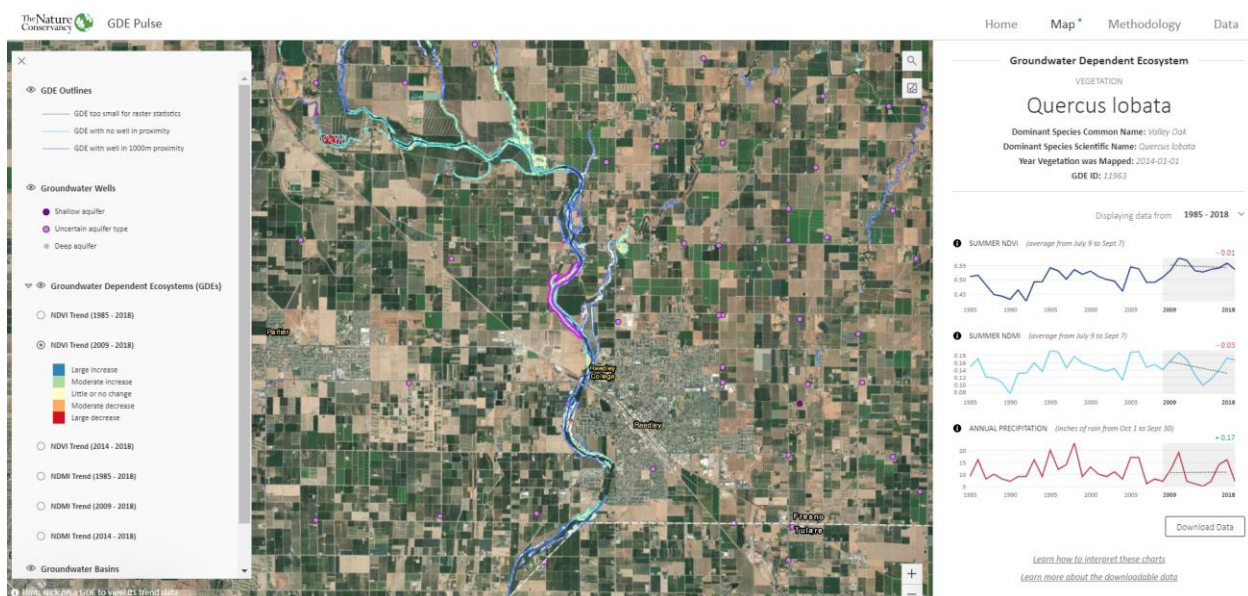
- It is highly advised that seasonal and interannual groundwater fluctuations in the groundwater regime are taken into consideration. Utilizing groundwater data from one point in time (e.g., Spring 2017) can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. **We highly recommend using depth to groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. Ensure that groundwater condition data prior to the SGMA benchmark date of January 1, 2015 is included in the analysis. Please refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network.**
- **Please provide rationale for the 30-foot criteria cited in the text.** The text states (p. 3-87): "Recognizing that much of the Kings Subbasin has a depth to groundwater greater than the deepest vegetative GDE rooting depth of thirty feet, many of the GDEs identified in the NC Dataset Viewer were mischaracterized." In TNC's GDE Guidance, the depth criteria of 30 feet is presented as a criterion for *inclusion*, not a standalone criterion for *exclusion*. In other words, if groundwater is within 30 feet of the ground surface, then a GDE can be identified. If it is not, then further analysis must be conducted (see Appendix III of the GDE Guidance, Worksheet 1, for other indicators of GDEs). **Please indicate what vegetation is present in the possible GDEs.** The actual rooting depth of vegetation growing in the area should be considered, and this will vary by species dominance and habitats present. For example, some phreatophytes can root to 120-feet deep in more arid and drought stressed environments. Furthermore, rooting depths are likely to spatially vary based on the local hydrologic conditions available to the plant. Maximum rooting depths do not take capillary action into consideration, which will vary with soil type and is an important consideration since woody phreatophytes generally do not prefer to have their roots submerged in groundwater for extended periods of time, and hence can access groundwater at deeper depths.
- The text states: "The Kings Subbasin also categorized GDEs within 100 feet of the Kings River and the San Joaquin River as "Possible GDEs." **Please clarify how the 100-foot buffer was used to include or exclude GDEs in the CKGSA area, and how this is supported by groundwater level and plant physiological data. If there is a potential GDE near the river, we suggest the entire GDE is included, rather than using an arbitrary 100-foot cutoff.**

- The text states (p. 3-87): "Spring 2017 depth to groundwater contours and NC Dataset viewer GDEs were overlaid to identify GDEs in areas with depth to groundwater greater than 30 feet. GDEs meeting this criterion were categorized as 'Rejected GDEs' and depicted in purple in Figure 3-58 and 3-59." However, Figure 3-58 shows rejected GDEs in light green and pink. Figure 3-59 shows wetlands in purple (not rejected GDEs). **Please correct the callouts and description of these figures. The basin's GDE shapefile, which is submitted via the SGMA Portal, should include two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed). In addition, in the text please cite the acreage of GDEs retained and removed.**

Checklist Items 16 to 20, Describing GDEs (23 CCR §354.16)

[Section 3.2.8 Groundwater Dependent Ecosystems (p. 3-87)]

- **Please provide information on the historical or current groundwater conditions in the GDEs or the ecological conditions present.** Refer to GDE Pulse (<https://gde.codefornature.org>; See Attachment E of this letter for more details) or any other locally available data to describe depth to groundwater trends in and around GDE areas, as well as trends in plant growth (e.g., NDVI) and plant moisture (e.g., NDMI). Below is a screenshot example of data available in GDE Pulse for NC dataset polygons found in the CKGSA area:



- **Please provide an ecological inventory (see Appendix III, Worksheet 2 of the GDE Guidance) for all potential GDEs that includes the vegetation types or habitat types and rank the GDEs as having a high, moderate or low value; and what characterizes the rank.**

- **Please identify whether any endangered or threatened freshwater species of animals and plants, or areas with critical habitat, were found in or near any of the GDEs, since some organisms rely on uplands and wetlands during different stages of their lifecycle.** Resources for this include the list of freshwater species located in the Kings Subbasin that can be found in Attachment C of this letter, the Critical Species Lookbook, and CDFW's CNDDDB database.
- **For each identifiable GDE unit with supporting hydrological datasets please include the following:**
 - Plot and provide hydrological datasets for each GDE.
 - Define the baseline period in the hydrologic data.
 - Classify GDE units as having high, moderate, or low susceptibility to changes in groundwater.
 - Explore cause-and-effect relationships between groundwater changes and GDEs.
- **For each identifiable GDE unit without supporting hydrological datasets please describe data gaps and/or insufficiencies.**
- **Compile and synthesize biological data for each GDE unit by including:**
 - Plots of biological datasets for each GDE unit, and when possible provide baseline conditions for assessment of trends and variability.
 - Describe data gaps/insufficiencies.
- **Description of potential effects on GDEs, land uses, and property interests, including:**
 - Cause-and-effect relationships between GDE and groundwater conditions.
 - Impacts to GDEs that are considered to be "significant and unreasonable".
 - Report known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for significant impacts to relevant species or ecological communities.
 - Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).
 - Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.

Checklist Items 21 and 22 – Water Budget (23 CCR §354.18)

[Section 3.3.8 Historical Water Budget (p. 3-106)]

- **Please clarify whether a term is included for native or riparian vegetation evapotranspiration and for wetlands in the CKGSA area historical, current, and future water budgets.**

[Section 3.3.10 Projected Water Budget (p. 3-113)]

- Given the uncertainty associated with Kings River water supply into the future, the assumption was made that the historical water delivery from the Kings River would be maintained. This assumption is highly uncertain and is not conservative. The diversion of Kings River flows may require additional provision for storage in the non-

irrigation or low-irrigation season. **Please add discussion of the potential impacts to the flow in the Kings River and to groundwater conditions on GDEs, aquatic ecosystems and instream flow requirements due to climate change.**

Checklist Items 23 to 25 – Sustainability Goal (23 CCR §354.24)

[Section 4.1 Sustainability Goal (p. 4-2)] The Sustainability Goal does not consider GDEs or ISWs.

- **Since GDEs are likely present in the CKGSA area (see comments under Checklist Items 16-20) they should be recognized as beneficial users of groundwater and should be included in the Sustainability Goal. In addition, a statement about any intention to address pre-SGMA impacts should be included.**
- The Plan states that there are ISWs along the Kings River. Information that supports the potential ISWs along this river include Figure 3-58 that identifies potential GDEs, and the depth to water data for Spring 1997 and Spring 2012 presented at the end of Section 3 (Appendix 3C, Technical Memorandum 4). **Please identify and describe all ISWs and include them in the GSP.**
- GDEs are dependent, in part, on suitable water quality; however, the Plan only considers water quality for irrigation and domestic use. **TNC recommends including ISWs and their potential GDEs in the sustainability goal and criteria. Since GDEs may be affected by water quality, they should be included in the Sustainability Goal.**

Checklist Item 26 – Measurable Objectives (23 CCR §354.30)

[Sections 4.2.3 Measurable Objectives for Groundwater Levels (p. 4-42)]

- This Measurable Objective does not consider GDEs. GDEs are often adjacent to streams or associated with riparian corridors where ISWs exist, even if only seasonally or discontinuously along a longitudinal or lateral profile. **Please include GDEs (see comments under Checklist Items 8-10) in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Sections 4.5.3 Measurable Objectives for Water Quality (p. 4-60)]

- This Measurable Objective does not consider water quality needs of GDEs. **Please include a discussion about GDEs and water quality and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Sections 4.7.2 Measurable Objectives for Interconnected Surface Water (p. 4-70)]

- The text states (p. 4-70): “Undesirable results to surface water related to groundwater pumping the Kings Basin are not likely to occur and criteria, including measurable objectives has therefore not been set for the Kings Basin under

regulation §354.26(d).” Because ISWs do occur in the CKGSA area (p. 3-87), then Sustainable Management Criteria including Measurable Objectives should be established. The GSP has not shown evidence that undesirable results related to this sustainability indicator are not likely to occur. **Please further discuss ISWs in this section and set measurable objectives and interim milestones to help achieve the sustainability goal as it pertains to the environment.**

Checklist Item 27-29 – Minimum Thresholds (23 CCR §354.28)

[Sections 4.2.2 Minimum Thresholds for Groundwater Levels (p. 4-24)]

- This Minimum Threshold does not consider GDEs. **Please include GDEs in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Sections 4.5.2 Minimum Thresholds for Groundwater Quality (p. 4-58)]

- This Minimum Threshold does not consider water quality needs of GDEs. **Please include a discussion about GDEs and water quality and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

Checklist Item 30-46 – Undesirable Results (23 CCR §354.26)

[Section 4.2.1 Undesirable Results for Groundwater Levels (p. 4-3)]

- This section only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses and users that could be adversely affected by chronic groundwater level decline. **Please add potential adverse impacts to GDEs and native freshwater species to the discussion of potential undesirable results presented in this section.**
- The [GDE Pulse](#) web application developed by TNC provides easy access to 35 years of satellite data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within and near the GSA. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture along the Kings River. An example screen shot from the GDE Pulse tool is presented under Checklist Items 11-15 above.

[Section 4.5.2 Undesirable Results for Groundwater Quality (p. 4-56)]

- This section describes undesirable results in terms of meeting drinking water standards. The following is a link to a paper by Smith, Knight and Fendorf (2018) titled “Overpumping leads to California groundwater arsenic threat”: (<https://www.nature.com/articles/s41467-018-04475-3>). **The section should be modified to state that overpumping and dewatering of aquitards has been identified as a potential source of elevated arsenic concentrations above drinking water standards in San Joaquin Valley aquifers. In addition, any potential undesirable results from degradation of water quality that may**

impact GDEs and freshwater species in the area should be discussed in this section.

[Section 4.7.1 Undesirable Results for Interconnected Surface Water (p. 4-70)]

- The text states (p. 4-70): "Due to existing river management programs and/or the lack of continuous interconnected surface water within the Kings Basin, undesirable results to surface water related to groundwater pumping are not likely to occur." GDEs are often adjacent to streams or associated with riparian corridors where ISWs exist, even if only seasonally or are discontinuous along a longitudinal profile. ISWs that are not continuously connected spatially and/or temporally are still ISWs and should not be excluded from this GSP. **Even when ISWs are not continuously connected, they should be included in the Measurable Objectives. Please include GDEs and ISWs in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**
- The analysis for potential depletion of ISWs in Section 4.7 should include all beneficial uses and users of surface water that could be affected by groundwater withdrawals, including environmental users. **Please state in this section whether there are any instream flow requirements and critical habitat designations and set measurable objectives and interim milestones to help achieve the sustainability goal as it pertains to the environment.**

Checklist Items 47, 48 and 49 – Monitoring Network (23 CCR §354.34)

[Section 5.2 Groundwater Level Monitoring (pp. 5-3 to 5-12)]

- **Please address how the need to link and correlate groundwater level declines to biological responses and significant and adverse impacts to GDEs and ISWs will be addressed by the monitoring network.**
- The proposed wells to be used for monitoring groundwater levels are shown in Figure 5-1 (p. 5-6). The figure shows which monitoring wells have well construction information. The text mentions areas to be monitored include the unconfined aquifer and the confined aquifer below the Corcoran Clay in the western part of the CKGSA area. No distinction is shown on Figure 5-1 for wells screened in the unconfined or confined aquifer. **Please distinguish on this figure which wells will be used to monitor the unconfined and confined aquifers. To accurately characterize GDEs, please clarify how the unconfined aquifer will be monitored and how many wells will be used.**

[Section 5.7 Depletion of Interconnected Surface Water Monitoring (pp. 5-31 to 5-36)]

- Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater and related surface conditions (emphasis added). Groundwater level monitoring alone may be insufficient to establish a linkage between groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The cause-effect relationship between groundwater levels and the biological responses that could result in significant and

unreasonable impacts to ISWs and GDEs depends on a number of complicated factors, and this relationship is not characterized or discussed. As such, it is not possible to determine whether the proposed monitoring is sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented.

To clarify if GDEs are present, consider adding monitoring of potential GDEs at any locations where ISWs are present regardless of their seasonal or discontinuous nature.

- The text states (p. 5-36): "The river invert adjacent to Wells 31 and 41 will be surveyed to determine the invert and compare to the levels depicted in the hydrographs." This is the only data gap identified with respect to ISWs. **Please further reconcile data gaps in monitoring for ISWs with specific recommendations (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features to improve ISW mapping and inform an adequate analysis.**

Checklist Items 50 and 51 – Projects and Management Actions to Achieve Sustainability Goal (23 CCR §354.44)

[Section 6.1 Introduction (pp. 6-3 to 6-5)]

- The CKGSA area includes GDEs and ISWs (see our comments under Checklist Items 8-10 and 16-20 above) that are beneficial uses and users of groundwater and may include potentially sensitive resources and protected lands. Environmental resource protection needs should be considered in establishing project priorities. In addition, consistent with existing grant and funding guidelines for SGMA-related work, priority should be given to multi-benefit projects that can address water quantity as well as providing environmental benefits or benefits to disadvantaged communities. **Please include environmental benefits and multiple benefits as criteria for assessing project priorities.**

[Section 6.2 Projects (pp. 6-6 to 6-11)]

- This section identifies multiple recharge projects; however, the descriptions of Measurable Objectives for these projects only identifies benefits to water level and storage. Because maintenance or recovery of groundwater levels, or construction of recharge facilities, may have potential environmental benefits in many cases it would be advantageous to demonstrate multiple benefits from a funding and prioritization perspective.
 - **For the projects already identified, please consider stating how ISWs and GDEs will benefit or be protected, or what other environmental benefits will accrue.**
 - If ISWs will not be adequately protected by those listed, **please include and describe additional management actions and projects targeted for protecting ISWs.**
 - Recharge ponds, reservoirs and facilities for managed stormwater recharge projects can be designed as multi-benefit projects that include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. In some cases, such facilities have been incorporated into local

Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs), more fully recognizing the value of the habitat that they provide and the species they support. **For projects that construct recharge ponds, consider identifying if there is habitat value incorporated into the design and how the recharge ponds will be managed to benefit environmental users. Grant and funding opportunities for SGMA-related work may apply to multi-benefit projects that can address water quantity as well as provide environmental benefits. Please include environmental benefits and multiple benefits as criteria for assessing project priorities.**

- For examples of case studies on how to incorporate environmental benefits into groundwater projects, please visit our website:
<https://groundwaterresourcehub.org/case-studies/recharge-case-studies/>

[Section 6.3 Management Actions (p. 6-11)]

- This section states that CKGSA does not plan to use Management Actions to meet sustainability goals (p. 6-11). **Please consider adding Management Actions which include education and outreach for protection of GDEs and ISWs as well as specific management of these ecosystems and the species they provide for.**

Attachment C

Freshwater Species Located in the Kings Subbasin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result “depletion of interconnected surface waters”, Attachment C provides a list of freshwater species located in the Kings Subbasin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the GSA’s boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015⁵. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife’s BIOS⁶ as well as on TNC’s science website⁷.

Scientific Name	Common Name	Legally Protected Species		
		Federal	State	Other
Birds				
Actitis macularius	Spotted Sandpiper			
Aechmophorus clarkii	Clark's Grebe			
Aechmophorus occidentalis	Western Grebe			
Agelaius tricolor	Tricolored Blackbird	BCC	SCC	BSSC - First priority
Aix sponsa	Wood Duck			
Anas acuta	Northern Pintail			
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas crecca	Green-winged Teal			
Anas cyanoptera	Cinnamon Teal			
Anas discors	Blue-winged Teal			
Anas platyrhynchos	Mallard			
Anas strepera	Gadwall			
Anser albifrons	Greater White-fronted Goose			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Aythya affinis	Lesser Scaup			
Aythya americana	Redhead		SCC	BSSC - Third priority
Aythya collaris	Ring-necked Duck			
Aythya marila	Greater Scaup			
Aythya valisineria	Canvasback		SCC	

⁵ Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoS ONE, 11(7). Available at: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710>

⁶ California Department of Fish and Wildlife BIOS: <https://www.wildlife.ca.gov/data/BIOS>

⁷ Science for Conservation: <https://www.scienceforconservation.org/products/california-freshwater-species-database>

<i>Botaurus lentiginosus</i>	American Bittern			
<i>Bucephala albeola</i>	Bufflehead			
<i>Bucephala clangula</i>	Common Goldeneye			
<i>Butorides virescens</i>	Green Heron			
<i>Calidris alpina</i>	Dunlin			
<i>Calidris mauri</i>	Western Sandpiper			
<i>Calidris minutilla</i>	Least Sandpiper			
<i>Chen caerulescens</i>	Snow Goose			
<i>Chen rossii</i>	Ross's Goose			
<i>Chlidonias niger</i>	Black Tern		SCC	BSSC - Second priority
<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull			
<i>Cinclus mexicanus</i>	American Dipper			
<i>Cistothorus palustris palustris</i>	Marsh Wren			
<i>Cypseloides niger</i>	Black Swift	BCC	SCC	BSSC - Third priority
<i>Egretta thula</i>	Snowy Egret			
<i>Empidonax traillii</i>	Willow Flycatcher	BCC	Endangered	
<i>Fulica americana</i>	American Coot			
<i>Gallinago delicata</i>	Wilson's Snipe			
<i>Gallinula chloropus</i>	Common Moorhen			
<i>Geothlypis trichas trichas</i>	Common Yellowthroat			
<i>Grus canadensis</i>	Sandhill Crane			
<i>Haliaeetus leucocephalus</i>	Bald Eagle	BCC	Endangered	
<i>Himantopus mexicanus</i>	Black-necked Stilt			
<i>Icteria virens</i>	Yellow-breasted Chat		SSC	BSSC - Third priority
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher			
<i>Lophodytes cucullatus</i>	Hooded Merganser			
<i>Megaceryle alcyon</i>	Belted Kingfisher			
<i>Mergus merganser</i>	Common Merganser			
<i>Mergus serrator</i>	Red-breasted Merganser			
<i>Numenius americanus</i>	Long-billed Curlew			
<i>Numenius phaeopus</i>	Whimbrel			
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron			
<i>Oxyura jamaicensis</i>	Ruddy Duck			

<i>Pandion haliaetus</i>	Osprey		Watch list	
<i>Pelecanus erythrorhynchos</i>	American White Pelican		SSC	BSSC - First priority
<i>Phalacrocorax auritus</i>	Double-crested Cormorant			
<i>Phalaropus tricolor</i>	Wilson's Phalarope			
<i>Piranga rubra</i>	Summer Tanager		SSC	BSSC - First priority
<i>Plegadis chihi</i>	White-faced Ibis		Watch list	
<i>Pluvialis squatarola</i>	Black-bellied Plover			
<i>Podiceps nigricollis</i>	Eared Grebe			
<i>Podilymbus podiceps</i>	Pied-billed Grebe			
<i>Porzana carolina</i>	Sora			
<i>Rallus limicola</i>	Virginia Rail			
<i>Recurvirostra americana</i>	American Avocet			
<i>Riparia riparia</i>	Bank Swallow		Threatened	
<i>Setophaga petechia</i>	Yellow Warbler			BSSC - Second priority
<i>Tachycineta bicolor</i>	Tree Swallow			
<i>Tringa melanoleuca</i>	Greater Yellowlegs			
<i>Tringa semipalmata</i>	Willet			
<i>Tringa solitaria</i>	Solitary Sandpiper			
<i>Vireo bellii</i>	Bell's Vireo			
<i>Vireo bellii pusillus</i>	Least Bell's Vireo	Endangered	Endangered	
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird		SSC	BSSC - Third priority
Crustaceans				
<i>Branchinecta lynchi</i>	Vernal Pool Fairy Shrimp	Threatened	SSC	IUCN - Vulnerable
<i>Branchinecta mesoallensis</i>	Midvalley Fairy Shrimp		SSC	
<i>Lepidurus packardii</i>	Vernal Pool Tadpole Shrimp	Endangered	SSC	IUCN - Endangered
<i>Lindneriella occidentalis</i>	California Fairy Shrimp		SSC	IUCN - Near Threatened
Fishes				
<i>Catostomus occidentalis</i>	Sacramento sucker			Least Concern - Moyle 2013
<i>Cottus asper</i> ssp. 1	Prickly sculpin			Least Concern - Moyle 2013
<i>Cottus gulosus</i>	Riffle sculpin		SSC	Near-Threatened - Moyle 2013
<i>Gasterosteus aculeatus microcephalus</i>	Inland threespine stickleback		SSC	Least Concern - Moyle 2013

Lampetra hubbsi	Kern brook lamprey		SSC	Vulnerable - Moyle 2013
Lavinia exilicauda exilicauda	Sacramento hitch		SSC	Near-Threatened - Moyle 2013
Lavinia symmetricus symmetricus	Central California roach		SSC	Near-Threatened - Moyle 2013
Mylopharodon conocephalus	Hardhead		SSC	Near-Threatened - Moyle 2013
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Oncorhynchus tshawytscha - CV fall	Central Valley fall Chinook salmon	SSC	SSC	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV late fall	Central Valley late fall Chinook salmon	SSC		Endangered - Moyle 2013
Orthodon microlepidotus	Sacramento blackfish			Least Concern - Moyle 2013
Ptychocheilus grandis	Sacramento pikeminnow			Least Concern - Moyle 2013
Herps				
Actinemys marmorata marmorata	Western Pond Turtle		SSC	ARSSC
Ambystoma californiense californiense	California Tiger Salamander	Threatened	Threatened	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Anaxyrus boreas halophilus	California Toad			ARSSC
Rana boylei	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	SSC	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	SSC	ARSSC
Spea hammondi	Western Spadefoot	Under Review in the Candidate or Petition Process	SSC	ARSSC
Taricha torosa	Coast Range Newt		SSC	ARSSC
Thamnophis couchii	Sierra Gartersnake			
Thamnophis elegans elegans	Mountain Gartersnake			Not on any status lists
Thamnophis gigas	Giant Gartersnake	Threatened	Threatened	
Thamnophis sirtalis fitchi	Valley Gartersnake			Not on any status lists
Thamnophis sirtalis sirtalis	Common Gartersnake			
Insects and Other Invertebrates				
Acentrella insignificans	A Mayfly			

Acentrella spp.	Acentrella spp.			
Anax junius	Common Green Darner			
Argia agrioides	California Dancer			
Argia emma	Emma's Dancer			
Argia nahuana	Aztec Dancer			
Argia spp.	Argia spp.			
Baetidae fam.	Baetidae fam.			
Baetis spp.	Baetis spp.			
Baetis tricaudatus	A Mayfly			
Brechmorhoga mendax	Pale-faced Clubskimmer			
Brillia spp.	Brillia spp.			
Chironomidae fam.	Chironomidae fam.			
Cordulegaster dorsalis	Pacific Spiketail			
Cricotopus spp.	Cricotopus spp.			
Enallagma carunculatum	Tule Bluet			
Enallagma civile	Familiar Bluet			
Enallagma cyathigerum				Not on any status lists
Epeorus spp.	Epeorus spp.			
Ephemerellidae fam.	Ephemerellidae fam.			
Erpetogomphus compositus	White-belted Ringtail			
Erythemis collocata	Western Pondhawk			
Eukiefferiella spp.	Eukiefferiella spp.			
Fallceon spp.	Fallceon spp.			
Glossosoma spp.	Glossosoma spp.			
Glossosomatidae fam.	Glossosomatidae fam.			
Heptageniidae fam.	Heptageniidae fam.			
Hetaerina americana	American Rubyspot			
Hydropsyche spp.	Hydropsyche spp.			
Hydropsychidae fam.	Hydropsychidae fam.			
Hydroptila spp.	Hydroptila spp.			
Ischnura cervula	Pacific Forktail			
Ischnura denticollis	Black-fronted Forktail			
Ischnura perparva	Western Forktail			
Lepidostoma baxea	A Caddisfly			
Lepidostoma spp.	Lepidostoma spp.			
Lestes congener	Spotted Spreadwing			

Libellula croceipennis	Neon Skimmer			
Libellula saturata	Flame Skimmer			
Limnophyes spp.	Limnophyes spp.			
Ochrotrichia burdicki	A Caddisfly			
Pachydiplax longipennis	Blue Dasher			
Pantala flavescens	Wandering Glider			
Pantala hymenaea	Spot-winged Glider			
Plathemis lydia	Common Whitetail			
Polypedilum spp.	Polypedilum spp.			
Protophila spp.	Protophila spp.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Rhionaeschna multicolor	Blue-eyed Darner			
Serratella micheneri	A Mayfly			
Simulium spp.	Simulium spp.			
Sperchon spp.	Sperchon spp.			
Stylurus olivaceus	Olive Clubtail			
Telebasis salva	Desert Firetail			
Tamea lacerata	Black Saddlebags			
Tricorythodes spp.	Tricorythodes spp.			
Zoniagrion exclamationis	Exclamation Damsel			
Mammals				
Castor canadensis	American Beaver			Not on any status lists
Lontra canadensis canadensis	North American River Otter			Not on any status lists
Neovison vison	American Mink			Not on any status lists
Ondatra zibethicus	Common Muskrat			Not on any status lists
Mollusks				
Anodonta californiensis	California Floater		SSC	
Ferrissia spp.	Ferrissia spp.			
Gyraulus spp.	Gyraulus spp.			
Margaritifera falcata	Western Pearlshell		SSC	
Menetus spp.	Menetus spp.			
Physa spp.	Physa spp.			
Physella virgata	Protean Physa			CS
Pisidium spp.	Pisidium spp.			
Planorbella tenuis	Mexican Rams-horn			CS
Planorbella trivolvis	Marsh Rams-horn			CS

Pyrgulopsis stearnsiana	Yaqui Springsnail			T
Sphaeriidae fam.	Sphaeriidae fam.			
Plants				
Alnus rhombifolia	White Alder			
Alopecurus carolinianus	Tufted Foxtail			
Alopecurus saccatus	Pacific Foxtail			
Anemopsis californica	Yerba Mansa			
Arundo donax	NA			
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Callitriche longipedunculata	Longstock Water-starwort			
Callitriche marginata	Winged Water-starwort			
Carex pellita	Woolly Sedge			
Castilleja campestris succulenta	Fleshy Owl's-clover	Threatened	Endangered	CRPR - 1B.2
Cephalanthus occidentalis	Common Buttonbush			
Chloropyron palmatum	NA	Endangered	SSC	CRPR - 1B.1
Cyperus acuminatus	Short-point Flatsedge			
Cyperus erythrorhizos	Red-root Flatsedge			
Cyperus squarrosus	Awned Cyperus			
Downingia bella	Hoover's Downingia			
Downingia cuspidata	Toothed Calicoflower			
Eleocharis acicularis acicularis	Least Spikerush			
Eleocharis macrostachya	Creeping Spikerush			
Elodea canadensis	Broad Waterweed			
Epilobium cleistogamum	Cleistogamous Spike-primrose			
Eryngium spinosepalum	Spiny Sepaled Coyote-thistle		SSC	CRPR - 1B.2
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle			Not on any status lists
Euphorbia hooveri	NA			Not on any status lists
Euthamia occidentalis	Western Fragrant Goldenrod			
Hydrocotyle umbellata	Many-flower Marsh-pennywort			
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort			

Hypericum anagalloides	Tinker's-penny			
Juncus acuminatus	Sharp-fruit Rush			
Juncus xiphioides	Iris-leaf Rush			
Lasthenia ferrisiae	Ferris' Goldfields		SSC	CRPR - 4.2
Lasthenia fremontii	Fremont's Goldfields			
Leersia oryzoides	Rice Cutgrass			
Lilium pardalinum pardalinum	Leopard Lily			
Ludwigia palustris	Marsh Seedbox			
Ludwigia peploides peploides	Floating Water Primrose			Not on any status lists
Marsilea vestita vestita	Hairy Pepperwort			Not on any status lists
Mimulus guttatus	Common Large Monkeyflower			
Mimulus latidens	Broad-tooth Monkeyflower			
Mimulus pilosus	Snouted Monkey Flower			Not on any status lists
Mimulus tricolor	Tricolor Monkeyflower			
Myosurus minimus	Little Mouse Tail			
Navarretia leucocephala leucocephala	White-flower Navarretia			
Orcuttia inaequalis	San Joaquin Valley Orcutt Grass	Threatened	Endangered	CRPR - 1B.1
Orcuttia pilosa	Hairy Orcutt Grass	Endangered	Endangered	CRPR - 1B.1
Persicaria hydropiperoides	Water Pepper			Not on any status lists
Persicaria lapathifolia	Common Knotweed			Not on any status lists
Persicaria punctata	Dotted Smartweed			Not on any status lists
Phalaris arundinacea	Reed Canarygrass			
Pilularia americana	Pillwort			
Plagiobothrys acanthocarpus	Adobe Popcorn-flower			
Plagiobothrys distantiflorus	California Popcorn-flower			
Plagiobothrys undulatus	Coast Allocarya			Not on any status lists
Platanus racemosa	California Sycamore			
Pogogyne douglasii	Douglas' Pogogyne			
Potamogeton diversifolius	Water-thread Pondweed			
Potamogeton nodosus	Longleaf Pondweed			

Potamogeton pusillus pusillus	Slender Pondweed			
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			
Psilocarphus oregonus	Oregon Woolly-heads			
Puccinellia simplex	Little Alkali Grass			
Rorippa palustris palustris	Bog Yellowcress			
Sagittaria sanfordii	Sanford's Arrowhead		SSC	CRPR - 1B.2
Salix exigua exigua	Narrowleaf Willow			
Salix gooddingii	Goodding's Willow			
Salix laevigata	Polished Willow			
Salix lasiolepis lasiolepis	Arroyo Willow			
Salix melanopsis	Dusky Willow			
Schoenoplectus acutus occidentalis	Hardstem Bulrush			
Sequoia sempervirens	Coast Redwood			
Sidalcea calycosa calycosa	Annual Checker-mallow			
Tuctoria greenei	Green's Awnless Orcutt Grass	Endangered	Rare	CRPR - 1B.1
Wolffia columbiana	Columbian Watermeal			
Wolffia globosa	Asian Watermeal			
Notes: ARSSC = At-Risk Species of Special Concern BCC = Bird of Conservation Concern BSSC = Bird Species of Special Concern CRPR = California Rare Plant Rank CS = Currently Stable IUCN = International Union for Conservation of Nature SSC = Species of Special Concern				

Attachment D

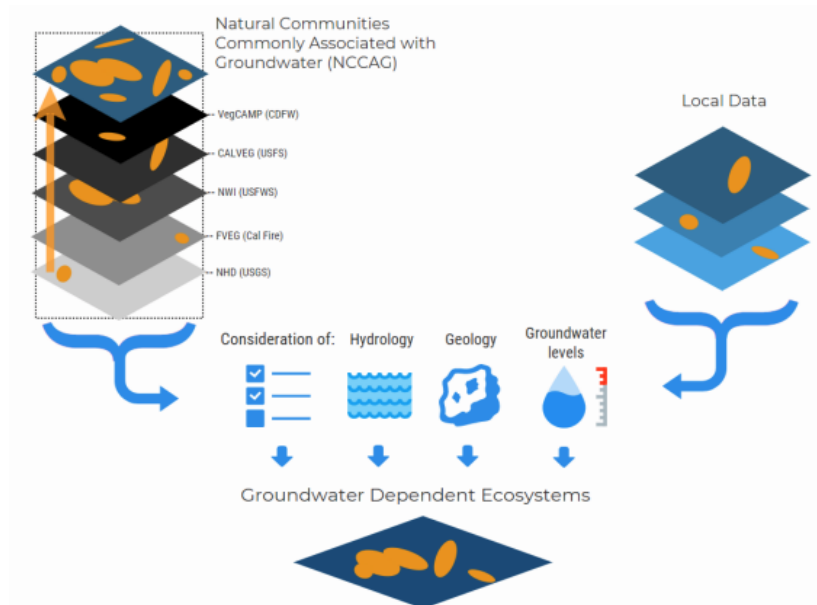


July 2019



IDENTIFYING GDEs UNDER SGMA Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online⁸ to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)⁹. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.



⁸ NC Dataset Online Viewer: <https://gis.water.ca.gov/app/NCDatasetViewer/>

⁹ California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: <https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf>

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California¹⁰. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset¹¹ on the Groundwater Resource Hub¹², a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should be done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

¹⁰ For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf

¹¹ "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: <https://groundwaterresourcehub.org/qde-tools/qsp-guidance-document/>

¹² The Groundwater Resource Hub: www.GroundwaterResourceHub.org

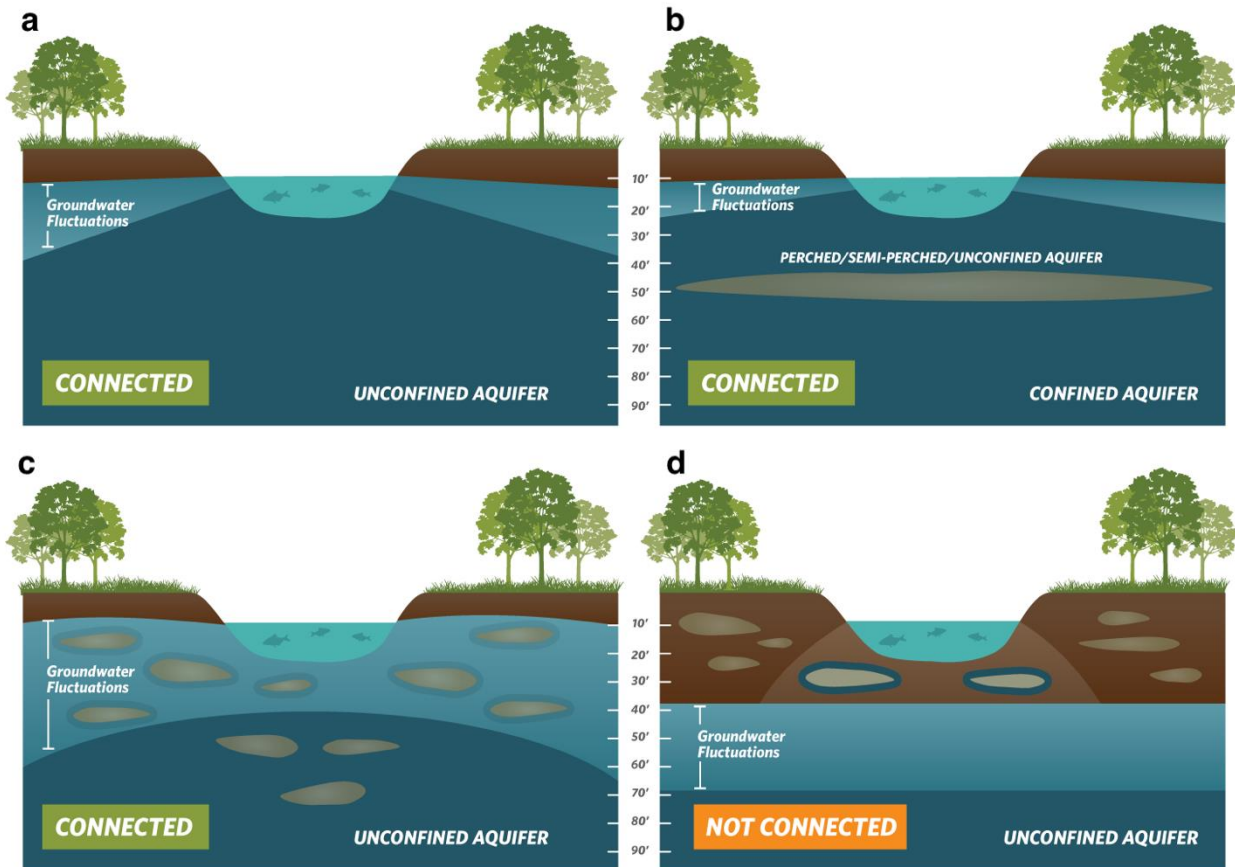


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. **Bottom: (c)** Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. **(d)** Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets¹³ recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline¹⁴ could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach¹⁵ for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document⁴, one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet⁴ of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer¹⁶. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

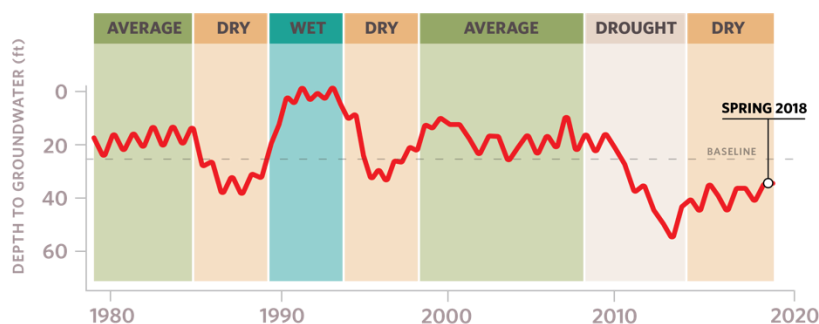


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

¹³ DWR. 2016. Water Budget Best Management Practice. Available at:

https://water.ca.gov/LegacyFiles/groundwater/sqm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

¹⁴ Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]

¹⁵ Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs⁴).

¹⁶ SGMA Data Viewer: <https://sgma.water.ca.gov/webqis/?appid=SGMADataViewer>

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals¹⁷, which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

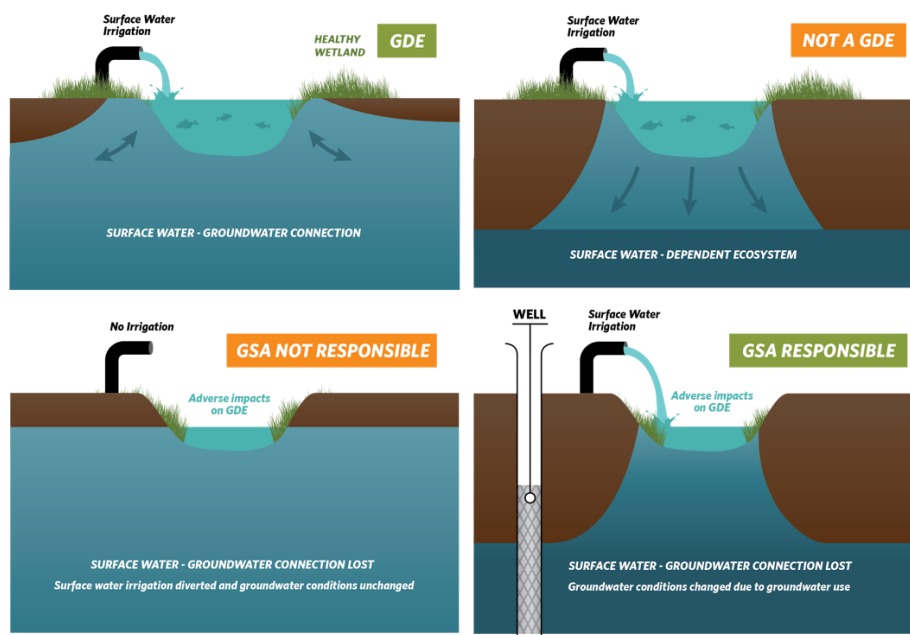


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **Bottom: (Left)** An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. **(Right)** Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

¹⁷ For a list of environmental beneficial users of surface water by basin, visit: <https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/>

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.
- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.
- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

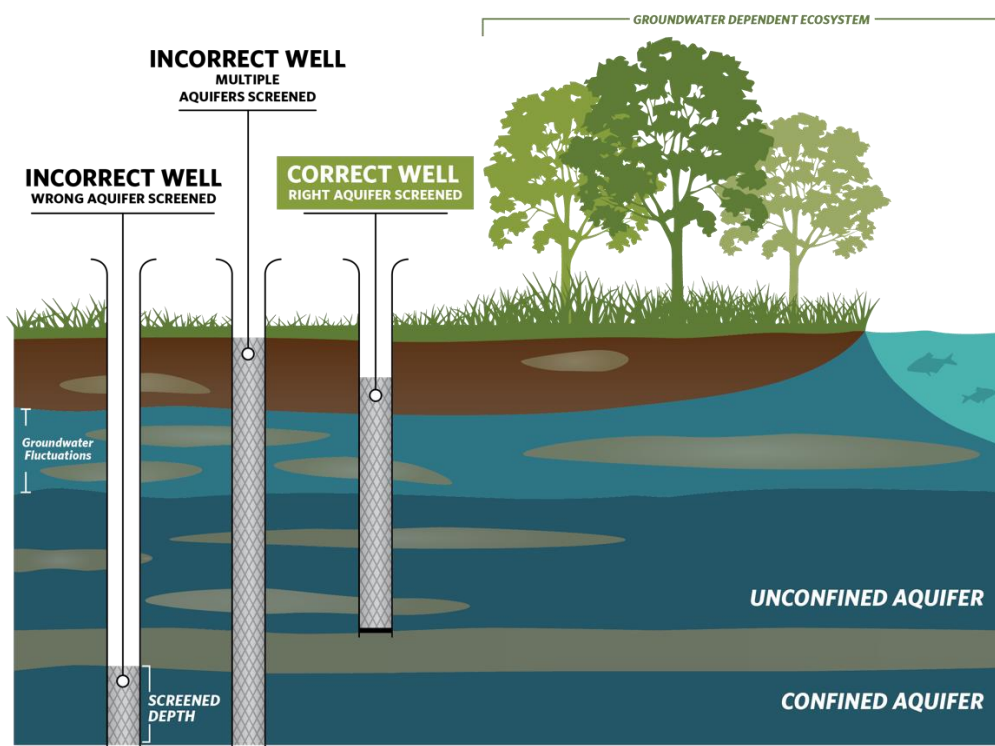


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate **groundwater elevations** at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)¹⁸ to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

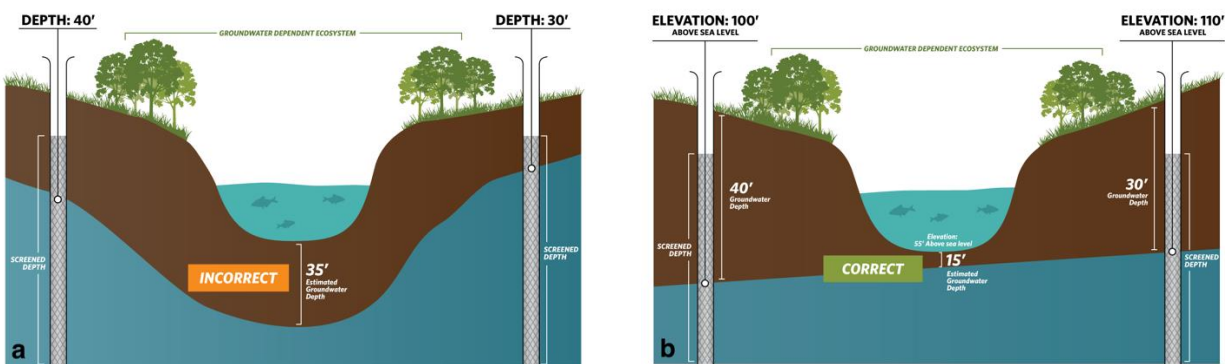


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

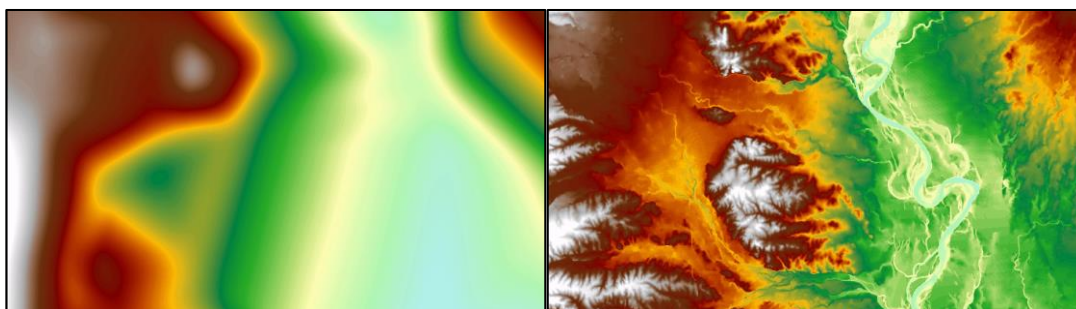


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

¹⁸ USGS Digital Elevation Model data products are described at: <https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services> and can be downloaded at: <https://viewer.nationalmap.gov/basic/>

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, **The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network.** Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. 23 CCR §341(g)(1)

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. 23 CCR §351(m)

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. 23 CCR §351(o)

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. 23 CCR §351(aa)

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Attachment E

GDE Pulse

A new, free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data.



Visit
<https://gde.codefornature.org/>



Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset¹⁹. The following datasets are included:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset²⁰. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

¹⁹ The Natural Communities Commonly Associated with Groundwater Dataset is hosted on the California Department of Water Resources' website: <https://gis.water.ca.gov/app/NCDataSetViewer/#>

²⁰ The PRISM dataset is hosted on Oregon State University's website: <http://www.prism.oregonstate.edu/>