- *Date Submitted:* October 21, 2019

- *Submitted by:* Jeff Hillberg
VP of Operations
AgIS Property Management
P.O. Box 1332
Turlock, CA 95381
Office: (209)262-1997

- *APNs:* 020-160-016-000, 020-190-009-000, 020-220-003-000, 021-100-014-000, 021-100-015-000, 021-100-016

- *Located in Madera County GSA*

- *Affiliation – Irrigated Ag*

- *Comment:*

    - The description of <u>Demand Management</u> in Section 4.2.3 (Page 4-27) is confusing and unclear. Section 4.2.3.1 (Page 4-28) <u>Project Overview</u> lists a number of demand management actions as **options** (emphasis added) to be implemented by growers, but goes on to list additional methods (allocation, markets, fees and fallowing) that lack any detail as to how they would be implemented as alternatives. The discussion then shifts to **enforcement** of pumping to ensure compliance with demand reduction targets. Further clarification of how these elements will be developed and implemented is necessary. The GSP lacks sufficient detail in defining how these reductions will be applied, measured, enforced and responded to if not met. These are critical details that must be addressed. For example, the baseline pumping period that the reductions will be applied to must be, at a minimum, a period of multiple years to avoid unnecessary and perhaps unintended penalization of lands in redevelopment or not yet in full demand due to planting schedules. Additionally, there is no significant discussion of how use will be measured and calculated, or of the costs to perform these activities.

    - Section 4.2.3.2 (Page 4/28) <u>Implementation</u> includes a discussion of Allocations that may be implemented as a demand management component. The discussion identifies various approaches to allocation. The GSAs in the Basin should initiate a stakeholder-driven process to develop a methodology for establishing landowner-level allocations of native yield that are coordinated across the basin. The allocation methodology should be consistent with various legal considerations drawn from applicable case law and attempt to be consistent with groundwater rights, recognizing that GSAs do not have statutory authority to make a final determination of water rights. An equal-per-gross acre approach to allocations is not likely to be consistent with established water rights doctrine, which must take into account many equitable considerations, in addition to acreage owned, to determine a legally defensible allocation.

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Clayton Water District

P.O. Box 35
El Nido, CA 95317

November 5, 2019

Stephanie Anagnoson
Water and Natural Resources Department
Madera County
200 W. 4th Street
Madera, CA 93637

Dear Stephanie:

Thank you for the opportunity to comment on the Draft Chowchilla Subbasin Groundwater Sustainability Plan ("the Plan). Clayton Water District (CLWD) offers the following comments:

1. Eastside Bypass Water Rights Application – There is mention (on executive summary graphics) of the application, but only credits Triangle T Water District (TTWD) with involvement, when in fact Clayton Water District is funding the application and is applying for 2 diversion points in the Madera West Management Area, within the CLWD boundary. Flood MAR and Recharge Basins need to be added to our Madera West Management Area category as well in the graphic.

   Costs identified in the Plan associated with the Eastside Bypass diversions and recharge basins seem high. Is Madera County planning to submit its own application? If so, Clayton will not be interested in paying for this work twice. Secondly, the O& M costs seem very high at $450,000. Are these costs annual or across 20 years? What would these charges be for if CLWD and TTWD are going to maintain the sites? Unless perhaps the County is offering to chip money in on CLWD's behalf?

2. Page 31, Section 4.2.1 states that "deep aquifer recharge" will occur. We know that only shallow aquifer recharging will be possible.

3. There are a couple of deep aquifer typos in our Madera West sections, which should be corrected.

4. The plan mentions Fresno River Rights and credit for water diverted - This may be one of the most concerning items in the Chowchilla GSP from the perspective of Madera County GSA. The water diverted from the Fresno River is 100% allocated to Triangle T GSA as it reads in the Plan

currently. This is incorrect. Triangle T only has a right to divert 60% of the flows from the Fresno River each year. Portions of the other 40% is allocated to landowners in the Madera County GSA: Case Vlot and Harman. This is technically Vlot (all Chowchilla Subbasin), Harman (portions mostly in Chowchilla and some in Merced Subbasin) and Menefee (Merced Subbasin).

5. The plan talks about land retirement and specifically purchasing current farm ground in the Madera West Management Area for recharge purposes. From whom? And where? This may be an unnecessary step given the crops being grown in this area (winter forage, alfalfa and grapes) can use the recharge water for irrigation purposes and/or can be flooded during dormancy Flood MAR projects. Win-Win for the farmer and the county with respect to recharge and taxes.
    a. If we still need to reduce water in Madera West Management Area, perhaps explore the idea of limiting land to a single irrigated crop per year (minus the ground directly linked to dairy lagoon water). This would give still give the farmers the ability to dry land farm winter crops and conserve a large amount of water without explicitly fallowing ground.

6. If much of CLWD is sustainable on shallow aquifers (given relatively constant groundwater levels for the last 25+ years documented by the Bureau), why would land fallowing be appropriate for this area, opposed to land locked areas in the county that are not easily recharged to our East?

7. Recharge ponds- growers may wish to plant a dryland crop to keep invasive species (i.e. tumbleweeds) out of basins – however, this will give a signature of water use with satellite imagery. How do growers prove that they aren't using/pumping groundwater?

8. There should be a recognition that Sustainable Yield is higher in the shallow aquifer vs. the lower aquifer.

9. There needs to be an accounting for past recharge and losses from the Eastside Bypass in the areas affected, and credit/accounting for actual recharge and diversions from the Bypass in the past.

10. Evapotranspiration: question of quantification vs. meters: how will actual water use be verified?

Again, thank you for the opportunity to comment. Do not hesitate to reach out to us in the future for any reason.

Sincerely,

LARKIN HARMAN
President
CLWD Board of Directors

PROVOST & PRITCHARD
EST. 1968
CONSULTING GROUP
An Employee Owned Company

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Memorandum

To:	Stephanie Anagnoson, Director of Water and Natural Resources, Madera County
CC:	Larkin Harman and Julia Berry, Clayton Water District
From:	Rick Iger (P&P) and Keasha Blew (former P&P)
Subject:	Dairy Water Budget Parameters
Date:	11/1/2019 Revised from 10/3/2018 Internal Draft

Introduction and Summary:

After attending the confined animal Ad Hoc Committee on October 3, 2019, I was concerned that the calculation of Dairy water use was not well developed in the Madera and Chowchilla Basin GSPs. Provost & Pritchard Consulting Group has been working on understanding Dairy use of groundwater for several years. We would like to share our methodology with the County to demonstrate how the consumptive use of dairies has been handled in the past and in other GSPs. Dairy water budgeting parameters, calculations, and data sources have been based on field calculations, canal turnout and water well measurements, annual dairy reports and milk production. Generally, about 9 gallons per cow each day is exported from the dairy as milk and another 7 to 10 is excreted as urine, sweat and solids; equating to 0.01 to 0.02 Acre Foot (AF) per cow each year. Wash water varies by operation and is reported in dairy reports as outflow to lagoons; generally, about 72 gallons/cow each day which equates to about 0.08 AF per cow each year. The total water used in the dairy facility ranges from 80 to 90 gallons per cow each day, or 0.09 to 0.1 AF/cow each year.

Methodology:

The following parameters are taken into consideration in determining groundwater use by dairy facilities:

Surface Water:
- Surface water from all sources should be monitored monthly and totaled annually
- Calculate all water flowing into and out of the Ranch and dairy facility

Groundwater
- If possible, collect all well construction reports and map shallow and deep wells
- Track pumping from deep and shallow wells separately in dairy facility and cropped land
- Monitor groundwater levels in both shallow and deep aquifers

Recycled Water
- Recycled water or lagoon water produced and applied is found in dairy reports

Precipitation
- Typically, about 50% of precipitation is used for crops. The remainder can become deep percolation or runoff depending on geographic location

Consumptive use

- For dairies consumptive use is from both fodder crops and cows so it is important to know:
    - Number of cows
    - Total lagoon water produced from dairy operations (dairy permit report)
    - Acreage of dairy facility (non-cropped area), of dairy lagoons/ponds and of crops by crop type
    - Location and quantity of irrigation for crops
- This information can be found in annual dairy reports as part of the State Dairy Permit requirements. A couple of studies were also referenced for use by another consulting firm (EKI) we are working with in Kern County using University of Nebraska-Lincoln resource: https://beef.unl.edu/water-requirements-for-beef-cattle, http://extensionpublications.unl.edu/assets/html/g2060/build/g2060.htm and https://beef.unl.edu/amountwatercowsdrink.
- Consumptive use for dairies also includes milk production. Milk is about 88% water and a cow can produce an average of 75 lbs of milk per day. This becomes approximately 9 gallons of water used for milk production per cow each day, adding cow consumption and dairy facility wash water the total becomes about 80 to 90 gallons of water per cow each day. This was verified with local dairymen and numbers calculated were within a small margin of error.

Other Losses

- Evaporation is the main source of losses that are not returned to the system. Publications have several different references for open water evaporation. Upon examination it was found that evaporation from small ponds surrounded by irrigated agriculture is about 0.8 or 80% of reference ET.

Groundwater Replenishment

- In order to know how surface water recharges back into the groundwater system it is important to know about soil types and recharge rates of the soil which can vary.
- It is assumed that any applied water not lost to evaporation or ET of crops is recharged into the system
- Ponding seepage or canal seepage can be determined many ways. The easiest being the difference between measurements at specific monitoring points and pond drops under no inflow and outflow conditions. Soil types can also be used to estimate seepage by comparing to known/measured recharge areas on various soil types. In the case of dairy lagoons, the State Permit requires lining to prevent seepage, so the majority of losses from the lagoons are due to evaporation, not seepage.

Example Calculation:

In the case of one particular dairy studied in Merced County with 2,900 cows, about 0.009 AF/cow each year was exported as milk and 0.08 AF/cow each year was effluent sent to lagoon (per Dairy Annual Report). The total being 0.089 AF/cow each year, say 0.09 AF/cow each year.

In this case the dairy facility footprint was about 105 acres resulting in an average annual unit rate of 2.5 AF/Ac (2,900 cows x 0.09 = 261 AF; 261 AF/105 Ac = 2.5 AF/Ac). Keep in mind that the effluent component (0.08 x 2,900 cows = 232 AF) of the water generated in the Dairy facility minus that part lost to evaporation, is sent to the cropped grounds for effluent disposal/irrigation, which does reduce the crop water needs as would be estimated on the cropped field using ET methods. In this case there is about 2,000 acres of cropped land, so about 0.12 AF/Ac (232 AF/2000 Ac) is provided for irrigation coming from the Dairy facility lands. If the ET method was used to calculate groundwater pumping from the cropped field, the pumping would be overestimated from the cropped acreage which could be inappropriately subject to reduction if demand reduction is implemented.

CHOWCHILLA SUBBASIN
GROUNDWATER SUSTAINABILITY PLAN (GSP)
COMMENT FORM

Please complete the following information to provide comments on the draft Chowchilla Subbasin GSP. Type or print legibly for your comments to be considered.

Please return this form to (hand delivery, mail, or email accepted):

Stephanie Anagnoson
Madera County
200 W. Fourth Street
Madera, CA 93637
Email:ChowchillaGSPComments@maderacounty.com

Date Submitted: November 5, 2019

Submitted By: Molly Thurman, Water Resource Manager, Hancock Farmland Services (HFS)

Address: 301 E. Main Street, Turlock, CA 95380

Phone Number / Email: (661) 204-0568 / mthurman@hnrg.com

APNs: ______

Located in Groundwater Sustainability Agency (GSA):
☒ Madera County ☐ CWD ☒ Triangle TWD ☐ Merced County ☐ Other ______

Affiliation: ☒ Irrigated Ag ☐ Non-Irrigated Ag ☐ Rural Residential
☐ Disadvantaged Community Member ☐ Agency/Government ☐ Other ______

Chapter No. / Page No. of GSP: General

Comments: Hancock Farmland Services (HFS) would like to thank you for the momentous amount of work that has been put into the Draft Chowchilla Subbasin Groundwater Sustainability Plan (GSP). We especially appreciate the acknowledgment of the vitality of the agriculture industry in the local economy. In an effort to bolster the Draft GSP we provide the following comments:

Chapter No. / Page No. of GSP: Section 4.4.1.2, Page 4-5

Comments:

Under "Permitting process and agencies with potential permitting and regulatory control" HFS believes the California State Water Resources Control Board should be included.

Chapter No. / Page No. of GSP: Section 4.2.3, Page 4-27

Comments:

HFS applauds Madera County's efforts to work with stakeholders in developing specific details of a demand management policy. We encourage the GSAs in the basin to initiate a stakeholder-driven process to develop a methodology for establishing landowner-level allocations of native yield that are coordinated across the basin. The allocation methodology should be consistent with various legal considerations drawn from applicable case law and attempt to be consistent with groundwater rights, recognizing that GSAs do not have statutory authority to make a final determination of water rights. An equal-per-gross acre approach to allocations is not likely to be consistent with established water rights doctrine, which must recognize many equitable considerations, in addition to acreage owned, to determine a legally defensible allocation. Further information regarding allocation methodology can be found in Groundwater Pumping Allocations Under California's Sustainable Groundwater Management Act – EDF and NCWL, dated July, 2018.

Chapter No. / Page No. of GSP: Section 4.2.3, Page 4-27

Comments:

HFS encourages the development of a coordinated basin-wide data management system (DMS) that is capable of tracking groundwater and surface water use at the landowner, field, or parcel level, and a coordinated methodology for measuring landowner-level use of groundwater. The DMS should also include, or be capable of interfacing with, a groundwater market platform that allows for individual users to conduct transactions. Markets are essential in facilitating the highest and best use of a limited resource and will be most effective if there is trust in the accuracy of measurements and consistency in data sources, and flexibility available to allow for transactions across the basin.

Chapter No. / Page No. of GSP: Section 4.2.3.1, Page 4-28

Comments:

While HFS encourages the use of remote sensing to calculate crop evapotranspiration (ET) as a measurement of consumptive use, we also request the development of methodologies and quality assurance elements to allow for grower provided information to be included into the ET calculation and calibration. These methodologies should be developed in consultation with the vendor providing ET data to ensure it is applicable and useful in creating the best available data set. Additionally, GSAs should establish criteria and procedures to address apparent inaccuracies in the ET calculations. An obvious use of the procedure would be in instances where the grower can demonstrate that applied water, plus precipitation, is less than the calculated ET. In these instances, and subject to any requirements established by the GSA, the grower's use of groundwater should be reduced to the applied water total as the ET calculation should not be greater than applied water.

Chapter No. / Page No. of GSP: Section 4.2.3.2, Page 4-28

Comments:

Section 4.2.3.2 also describes groundwater pumping limits, beginning in 2020, to be imposed by Madera County. Starting in 2020 and continuing through 2025, average annual groundwater pumping is reduced by 2% (of the total demand reduction amount) per year, for a total cumulative reduction of 10% by 2025. Groundwater pumping is reduced by 6% per year starting in 2026 and continuing through 2040 to achieve an estimated reduction in groundwater pumping of 27,550 acre feet per year by 2040.

Chapter No. / Page No. of GSP: Section 4.2.3.2, Page 4-28

Comments:

The GSA should implement pumping restrictions, only if necessary to achieve sustainability, when supported by the best available data and appropriate analytical tools and implement such reductions by gradually ramping down pumping over the implementation period to avoid a sudden disruption in economic activity. The ramp down schedule should include an initial period where current levels of pumping can continue as data is gathered and potential water supply projects are pursued. As with native yield allocations, ramp down schedules should be developed in a coordinated manner across the basin.. Any imposed pumping restrictions should be "eased" or "flexed" during drought periods provided that overdraft during those periods can be replenished.

Chapter No. / Page No. of GSP: Section 4.2.3.2, Page 4-28

Comments:

The GSP lacks sufficient detail in defining how pumping reductions will be applied, measured, enforced and responded to if not met. These are critical details that must be addressed. For example, what is the baseline pumping period that the reductions will be applied to? At a minimum, the baseline period should be multiple years to avoid unnecessary and perhaps unintended penalization of lands in redevelopment or not yet in full demand due to planting schedules. Additionally, there is no significant discussion of how use will be measured and calculated, or of the costs to perform these activities.

Chapter No. / Page No. of GSP:

Comments:

Chapter No. / Page No. of GSP:

Comments:

November 5, 2019

Sent via email to ChowchillaGSPComments@maderacounty.com

Re: Comments on Draft Groundwater Sustainability Plan for Chowchilla Groundwater Basin

To Whom It May Concern,

On behalf of the above-listed organizations, we would like to offer the attached comments on the draft Groundwater Sustainability Plan for the Chowchilla Groundwater Basin. Our organizations are deeply engaged in and committed to the successful implementation of the Sustainable Groundwater Management Act (SGMA) because we understand that groundwater is a critical piece of a resilient California water portfolio, particularly in light of our changing climate. Because California's water and economy are interconnected, the sustainable management of each basin is of interest to both local communities and the state as a whole.

Our organizations have significant expertise in the environmental needs of groundwater and the needs of disadvantaged communities.

- The Nature Conservancy, in collaboration with state agencies, has developed several tools[1] for identifying groundwater dependent ecosystems in every SGMA groundwater basin and has made that tool available to each Groundwater Sustainability Agency.
- Local Government Commission supports leadership development, performs community engagement, and provides technical assistance dealing with groundwater management and other resilience-related topics at the local and regional scales; we provide guidance and resources for statewide applicability to the communities and GSAs we are working with directly in multiple groundwater basins.
- Audubon California is an expert in understanding wetlands and their role in groundwater recharge and applying conservation science to develop multiple-benefit solutions for sustainable groundwater management.
- American Rivers is committed to restoring damaged rivers and conserving clean water for people and nature.

[1] https://groundwaterresourcehub.org/

- Clean Water Action and Clean Water Fund are sister organizations that have deep expertise in the provision of safe drinking water, particularly in California's small disadvantaged communities, and co-authored a report on public and stakeholder engagement in SGMA[2].

Because of the number of draft plans being released and our interest in reviewing every plan, we have identified key plan elements that are necessary to ensure that each plan adequately addresses essential requirements of SGMA. A summary review of your plan using our evaluation framework is attached to this letter as Appendix A. Our hope is that you can use our feedback to improve your plan before it is submitted in January 2020.

This review does not look at data quality but instead looks at how data was presented and used to identify and address the needs of disadvantaged communities (DACs), drinking water and the environment. In addition to informing individual groundwater sustainability agencies of our analysis, we plan to aggregate the results of our reviews to identify trends in GSP development, compare plans and determine which basins may require greater attention from our organizations.

Key Indicators

Appendix A provides a list of the questions we posed, how the draft plan responds to those questions and an evaluation by element of major issues with the plan. Below is a summary by element of the questions used to evaluate the plan.

1. Identification of Beneficial Users. This element is meant to ascertain whether and how DACs and groundwater-dependent ecosystems (GDEs) were identified, what standards and guidance were used to determine groundwater quality conditions and establish minimum thresholds for groundwater quality, and how environmental beneficial users and stakeholders were engaged through the development of the draft plan.
2. Communications plan. This element looks at the sufficiency of the communications plan in identifying ongoing stakeholder engagement during plan implementation, explicit information about how DACs were engaged in the planning process and how stakeholder input was incorporated into the GSP process and decision-making.
3. Maps related to Key Beneficial Uses. This element looks for maps related to drinking water users, including the density, location and depths of public supply and domestic wells; maps of GDE and interconnected surface waters with gaining and losing reaches; and monitoring networks.
4. Water Budgets. This element looks at how climate change is explicitly incorporated into current and future water budgets; how demands from urban and domestic water users were incorporated; and whether the historic, current and future water demands of native vegetation and wetlands are included in the budget.
5. Management areas and Monitoring Network. This element looks at where, why and how management areas are established, as well what data gaps have been identified and how the plan addresses those gaps.
6. Measurable Objectives and Undesirable Results. This element evaluates whether the plan explicitly considers the impacts on DACs, GDEs and environmental beneficial users in the development of Undesirable Results and Measurable Objectives. In addition, it examines

[2] https://www.cleanwater.org/publications/collaborating-success-stakeholder-engagement-sustainable-groundwater-management-act

whether stakeholder input was solicited from these beneficial users during the development of those metrics.

7. Management Actions and Costs. This element looks at how identified management actions impact DACs, GDEs and interconnected surface water bodies; whether mitigation for impacts to DACs is discussed or funded; and what efforts will be made to fill identified data gaps in the first five years of the plan. Additionally, this element asks whether any changes to local ordinances or land use plans are included as management actions.

Conclusion

We know that SGMA plan development and implementation is a major undertaking, and we want every basin to be successful. We would be happy to meet with you to discuss our evaluation as you finalize your Plan for submittal to DWR. Feel free to contact Suzannah Sosman at suzannah@aginnovations.org for more information or to schedule a conversation.

Sincerely,

Jennifer Clary
Water Program Manager
Clean Water Action/Clean Water Fund

Danielle V. Dolan
Water Program Director
Local Government Commission

Samantha Arthur
Working Lands Program Director
Audubon California

Lisa Hunt, Ph.D.
Director of California River Restoration Science
American Rivers

Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

Appendix A
Review of Public Draft GSP

Groundwater Basin/Subbasin: Chowchilla Subbasin (DWR 5-022.05)
GSA: Chowchilla Water District GSA, Madera County GSA, County of Merced Chowchilla GSA, and Triangle T Water District GSA
GSP Date: August 2019 Public Review Draft, dated January 2020

1. Identification of Beneficial Users

Were key beneficial users identified and engaged?

Selected relevant requirements and guidance:
GSP Element 2.1.5, "Notice & Communication" (§354.10):
(a) A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.
GSP Element 2.2.2, "Groundwater Conditions" (§354.16):
(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.
(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.
(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.
GSP Element 3.3, "Minimum Thresholds" (§354.28):
(4) How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

Review Criteria		Yes	No	N/A	Relevant Info per GSP	Location (Section, Page[1])
1. Do beneficial users (BUs) identified within the GSP area include:	a. Disadvantaged Communities (DACs)		X		"Beneficial users, therefore, are any stakeholders who have an interest in groundwater use and management in the Chowchilla Subbasin community. Their interest may be related to GSA activities, GSP development and implementation, and/or water access and management in general. To assist in identifying categories of beneficial uses and users in the Chowchilla Subbasin, the Communications and Engagement Plan included a Stakeholder Engagement chart (Table 2-4)." Disadvantaged communities and tribes are included as examples of stakeholder groups in Table 2-4 Stakeholder Engagement Chart for GSP Development. However, the draft GSP does not identify the specific DACs or Tribes in the subbasin and does not include detailed descriptions of these. Table 2-4 also includes small community systems, but the GSP does not clearly define what they are and how are they considered as beneficial users. Appendix 2.C "Notice and Communication" of the draft GSP states that "The Chowchilla Subbasin has been identified by the California Department of Water Resources (DWR) as a high-priority and critically-overdrafted subbasin with conditions of historical groundwater level declines, land subsidence, and groundwater quality degradation. The area has a substantial agricultural	2.1.5.2, page 75; Table 2-4, page 76 Appendix 2.C, page 49
	b. Tribes		X			
	c. Small community public water systems (<3,300 connections)	X				

[1] Page numbers refer to the page of the PDF.

					community heavily reliant on groundwater. Nearly 79 percent of the Subbasin is designated as part of a severely disadvantaged community (SDAC) and approximately 30 percent of the Subbasin (primarily in the northern and southern central parts of the Subbasins and also around the City of Chowchilla) is designated as part of a DAC". However, the GSP still needs to identify DACs in the main GSP and throughout the discussions of the development of sustainable management criteria.	
2. What data were used to identify presence or absence of DACs?	a. DWR DAC Mapping Tool[2]			X	The draft GSP does not identify DACs.	
	i. Census Places			X		
	ii. Census Block Groups			X		
	iii. Census Tracts			X		
	b. Other data source			X		
3. Groundwater Conditions section includes discussion of:	a. Drinking Water Quality	X			"The U.S. Environmental Protection Agency (USEPA) has established a maximum contaminant level (MCL) for nitrate (as nitrogen) of 10 mg/L under its National Primary Drinking Water Regulations; this MCL standard is established for public health reasons and is a requirement of all public drinking water systems. Total Dissolved Solids (TDS) is a general measure of salinity and overall water quality. Elevated salinity in groundwater can be a result of land use activities, but can also be naturally-occurring, especially in western parts of the San Joaquin Valley where subsurface geologic materials are derived from marine sediments. Arsenic is a naturally occurring chemical found in groundwater and has a primary MCL of 10 mg/L." "A large percentage of the wells with nitrate data have maximum historical concentrations below 7.5 mg/L and many have concentrations below 5 mg/L. However, a number of areas of locally high nitrate concentrations above 7.5 mg/L or above 10 mg/L are apparent across the subbasin. The higher concentrations appear to be more common in the central parts of the subbasin. Several notable areas with a high density of wells with nitrate concentrations above the MCL of 10 mg/L (as N) are located in the more central parts of the subbasin to the west and southwest of the City of Chowchilla and between Ash Slough and Highway 152." "Although there are a few wells with higher arsenic concentrations above 7.5 µg/L, most of the wells with data have concentrations below 5 µg/L with a considerable number having concentrations of less than 2.5 µg/L. The available groundwater quality data do not indicate any wells with arsenic concentrations above the MCL of 10 µg/L. The map of arsenic concentrations in the Lower Aquifer (Figure 2-65) suggest that concentrations of arsenic may be somewhat higher in the Lower Aquifer, although still generally below the MCL."	2.2.2.3, page 92; 2.2.2.3, page 93; 2.2.2.3, page 94
	b. California Maximum Contaminant Levels (CA MCLs)[3] (or Public Health	X			See above.	2.2.2.3, page 92-94

[2] DWR DAC Mapping Tool: https://gis.water.ca.gov/app/dacs/
[3] CA MCLs: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html

	Goals where MCL does not exist, e.g. Chromium VI)					
4. What local, state, and federal standards or plans were used to assess drinking water BUs in the development of Minimum Thresholds (MTs)?	a. Office of Environmental Health Hazard Assessment Public Health Goal (OEHHA PHGs)[4]		X			
	b. CA MCLs[3]	X			"In accordance with the Basin Plan, groundwater in the Subbasin is considered suitable or potentially suitable for municipal and domestic water supply (MUN), agricultural supply (AGR), industrial service supply (IND), and industrial process supply (PRO) beneficial uses. From a groundwater quality standpoint, the municipal and domestic supply beneficial use is the most restrictive with Basin Plan water quality objectives linked to drinking water MCLs. As a result, the minimum thresholds for groundwater quality set for each of the three identified key water quality constituents (nitrate, arsenic, TDS) are the respective MCL values, except for cases where existing or historical concentrations for these constituents already exceed the MCL. When existing or historical concentrations for the key constituents already exceed the MCL, the minimum threshold is set at the current concentration plus 20 percent. When current or historical water quality for the key constituents has not been measured, the minimum threshold will be set as the MCL and will be adjusted if needed after water quality monitoring commences."	3.3.4.1, page 189
	c. Water Quality Objectives (WQOs) in Regional Water Quality Control Plans		X			
	d. Sustainable Communities Strategies/ Regional Transportation Plans[5]		X			
	e. County and/or City General Plans, Zoning Codes and Ordinances[6]		X			
5. Does the GSP identify how environmental BUs and environmental stakeholders were engaged throughout the development of the GSP?		X			The GSP authors have listed environmental agencies and environmental groups as one of the beneficial users of groundwater in the Subbasin in Table 2-4. The following footnote was added to the table: "The groups and communities referenced are examples identified during initial assessment. GSA Interested Parties lists shall maintain current and more exhaustive lists of stakeholders fitting into these groups." Environmental groups should be expanded in a manner similar to the environmental justice groups in the Human Right to Water category. The GSP should expand the stakeholder list associated with the Environmental and Ecosystem Uses category in Table 2-4 to include the appropriate agencies and list of environmental groups.	Table 2-4, page 75-76

Summary/ Comments

The Appendix 2.C of the draft GSP indicates that a majority of the subbasin area is considered to be DACs, however, the specific DACs are not clearly identified in the GSP. The GSP should explicitly provide a detailed description of how the DACs were identified, the names and locations of the communities and details of the population in the communities and how they use groundwater. Without this information, it is not clear how the GSP can consider the needs of these beneficial users. The GSP should also identify

[4] OEHHA PHGs: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.html
[5] CARB: https://ww2.arb.ca.gov/resources/documents/scs-evaluation-resources
[6] OPR General Plan Guidelines: http://www.opr.ca.gov/planning/general-plan/

other sensitive drinking water users, such as tribes and small community water systems, if any are present in the subbasin. If community water systems are present, the GSP should include information on the number of service connections and/or population served by each water system. This information is valuable for the reader to understand the scale of the vulnerable population dependent on groundwater for drinking water.

Environmental groups identified in the GSP should be expanded in a manner similar to the environmental justice groups in the Human Right to Water category. The GSP should expand the stakeholder list associated with the Environmental and Ecosystem Uses category in Table 2-4 to include the appropriate agencies and list of environmental groups. The GSP should expand the stakeholder list associated with the Environmental and Ecosystem Uses category in Table 2-4 to include the appropriate agencies and list of environmental groups.

The GSP should expand the stakeholder list associated with the Environmental and Ecosystem Uses category in Table 2-4 to include the appropriate agencies and list of environmental groups.

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 Chowchilla Subbasin can be found here: https://groundwaterresourcehub.org/sgma-tools/environmental-surface-water-beneficiaries/. Especially take 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 Chowchilla Area - https://ecos.fws.gov/ipac/

Lands that are protected as open space preserves, habitat reserves, wildlife refuges, etc. or other lands protected in perpetuity and supported by groundwater or interconnected surface waters should be identified and acknowledged.

2. Communications Plan

How were key beneficial users engaged and how was their input incorporated into the GSP process and decisions?

Selected relevant requirements and guidance: GSP Element 2.1.5, "Notice & Communication" (§354.10): *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:* *(c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.* *(d) A communication section of the Plan that includes the following:* *(1) An explanation of the Agency's decision-making process.* *(2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.* *(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.* *(4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.* **DWR Guidance Document for GSP Stakeholder Communication and Engagement**[7]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Is a Stakeholder Communication and Engagement Plan (SCEP) included?	X			"To facilitate stakeholder involvement in the GSA process, a Communication and Engagement Plan (Appendix 2) was created for the GSAs in the Chowchilla Subbasin" "Chowchilla Subbasin Stakeholder Communication and Engagement Plan August 2019"	2.1.5.1, page 74; Appendix 2.C, page 49
2. Does the SCEP or GSP identify that ongoing engagement will be conducted during GSP implementation?	X			"The Chowchilla Subbasin GSP Advisory Committee (Advisory Committee) was formed in 2018 to bring together local agencies and related parties vested with the authority and/or ability to support implementation of SGMA in the Subbasin… The GSAs agreed to hire a professional facilitator from California State University, Sacramento, to provide third-party facilitation support for GSP development and implementation, particularly to advance the GSAs' stakeholder engagement efforts." "A list of stakeholders and beneficial users is to be developed and updated throughout the GSP planning, implementation and enforcement processes. Each GSA is required to maintain a singular list, however coordinating these lists into a single Subbasin list will improve stakeholder engagement. Timely notification of opportunities for interested parties to participate in the development and implementation of the GSP should be given via the channels and strategies described in this document."	Appendix 2.C, page 49; Appendix 2.C, page 56; Appendix 2.C,

[7] DWR Guidance Document for GSP Stakeholder Communication and Engagement
https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Document-for-Groundwater-Sustainability-Plan---Stakeholder-Communication-and-Engagement.pdf

				"Chowchilla Subbasin GSAs recognize that stakeholder input into the development and implementation of a GSP is critical, as well as a SGMA requirement. As such, stakeholders are welcome to participate in the Chowchilla Subbasin GSP Advisory Committee meetings. Roundtables can also be used to best incorporate Chowchilla Subbasin stakeholder/beneficial user input into the GSP development and implementation process."	page 62
3. Does the SCEP or GSP specifically identify how DAC beneficial users were engaged in the planning process?		X		The GSP does not indicate specifically how DAC beneficial users were engaged during the planning process. Table 2-4. Stakeholder Engagement Chart for GSP Development in the GSP or named Table 1: Stakeholder Engagement Chart for GSP Development in Appendix 2.C includes DACs and the "Engagement purpose", which is "Inform and involve to provide a safe and secure groundwater supplies to all communities reliant on groundwater". The SCEP describes the planned strategy to engage DACs but the GSP does not explicitly identify efforts made during the planning process in terms of being "DAC outreach." However, as identified below, outreach included assistance by Self-Help Enterprises and the Leadership Counsel for Justice and Accountability, which focus on outreach to DAC beneficial users.	Table 2-4, page 75; Appendix 2.C, page 51
4. Does the SCEP or GSP explicitly describe how stakeholder input was incorporated into the GSP process and decisions?	X			"Subbasin-wide Technical meetings: Subbasin-wide technical meetings were held throughout the GSP development process to provide opportunities for the public to learn about the SGMA process and GSP components, receive updates about GSP planning activities, and provide input on GSP development. These meetings often included presentations by the GSP preparation consultants about technical aspects of GSP preparation, on topics such as basin setting, water budgets, and undesirable results. . . . There were also activities related to encouraging involvement and building capacity for engagement, including the following activities organized in coordination with Self-Help Enterprises and the Leadership Counsel for Justice and Accountability: • Capacity-building workshops: Workshops encouraged and prepared community members to participate in GSP development by providing technical information as well as information about opportunities for engagement. • Educational tours: Tours provided members of the public with additional opportunities to hear about the concerns of people with differing perspectives. Tours included stops in the community of Fairmead, La Vina, a farm, and at a groundwater recharge basin. • Presentations in communities: Self-Help Enterprises and the Leadership Counsel for Justice and Accountability both encouraged participation in GSP preparation through presentations held in communities around the Subbasin." "Chowchilla Subbasin GSAs recognize that stakeholder input into the development and implementation of a GSP is critical, as well as a SGMA requirement. As such, stakeholders are welcome to participate in the Chowchilla Subbasin GSP Advisory Committee meetings.	2.1.5.3, page 77; Appendix 2.C, page 62

				Roundtables can also be used to best incorporate Chowchilla Subbasin stakeholder/beneficial user input into the GSP development and implementation process. The circumstances of the Chowchilla Subbasin are such that each of the four GSAs has different resources, responsibilities, capacities, and stakeholder representation to take into consideration as they form Subbasin committees and workgroups, and coordinate among themselves for the GSP. There is a need to identify tools and processes whereby GSAs and their beneficial users are given fair representation while the resources and capacities of each GSA, as well as beneficial users, are taken into account. To this end, voluntary participation in Chowchilla Subbasin GSP Advisory Committee meetings by stakeholders will be helpful. Additional roundtable sessions or workgroups may be developed on specific topics as needed and identified through stakeholder outreach and engagement activities.”	

Summary/ Comments

The GSP describes the methods used to disseminate information but does not explicitly describe engagement of DAC members in such terms. It is recommended that further details of how DACs were engaged be provided in the GSP, and what level of participation was achieved.

The GSP states that stakeholder input was incorporated; however, detailed information about stakeholder input and responses from the GSA to address the stakeholder input are not presented.

3. Maps Related to Key Beneficial Uses

Were best available data sources used for information related to key beneficial users?

Selected relevant requirements and guidance:
GSP Element 2.1.4 “Additional GSP Elements” (§354.8):
Each Plan shall include a description of the geographic areas covered, including the following information:
(a) One or more maps of the basin that depict the following, as applicable:
(5) The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.

GSP Element 3.5 Monitoring Network (§354.34)
(b) Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:
(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:
(1) Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:
(A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.
(4) Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.
(6) Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:
(A) Flow conditions including surface water discharge, surface water head, and baseflow contribution.
(B) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.
(C) Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.
(D) Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.
(f) The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:
(3) Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.

Review Criteria		Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP Include Maps Related to Drinking Water Users?	a. Well Density	X			“The densities of domestic wells and irrigation wells per section within the Chowchilla Subbasin are shown in Figures 2-4 and 2-5, respectively. Notably, the number of wells reported by section were determined from Well Completion Report (WCR) data provided by DWR. These numbers include only reported wells and may not reflect the total number of existing or active wells in the subbasin. The highest concentrations of domestic wells are centered primarily along the southern side of the City of Chowchilla. Irrigation wells are generally less concentrated and more evenly distributed across the subbasin, though slightly higher concentrations are found in sectors within the western portions of Madera Co GSA and CWD GSA. Maps of general locations of domestic, agricultural, and public supply wells are provided	2.1.1, page 57 Figures 2-4, 2-5, and 2-6

					in Figures 2-4, 2-5, and 2-6." "Maps of the average depths of domestic, agricultural, and public supply wells by section are provided in Figures 2-43, 2-44, and 2-45. These maps generally indicated the majority of domestic wells are located in the central to eastern portions of the subbasin, agricultural wells are relatively spread out throughout the entire subbasin, and public supply wells are concentrated in the central to eastern portions of the subbasin. Domestic well depths are variable across the subbasin, with the most common well depth in the 300 to 400-foot range. Similarly, agricultural well depths are variable across the subbasin, with the most common well depths in the 500 to 750-foot range. Public supply wells are most commonly in the 500 to 750-foot depth range."	2.2.1.5, page 86
	b. Domestic and Public Supply Well Locations & Depths	**X**			Well locations are shown on the density maps identified above. "Maps of the average depths of domestic, agricultural, and public supply wells by section are provided in Figures 2-43, 2-44, and 2-45."	2.2.1.5, page 86 Figures 2-43, 2-44, and 2-45
	i. Based on DWR Well Completion Report Map Application[8]?	**X**			"The densities of domestic wells and irrigation wells per section within the Chowchilla Subbasin are shown in Figures 2-4 and 2-5, respectively. Notably, the number of wells reported by section were determined from Well Completion Report (WCR) data provided by DWR. These numbers include only reported wells and may not reflect the total number of existing or active wells in the subbasin."	2.1.1, page 57
	ii. Based on Other Source(s)?		**X**			

[8] DWR Well Completion Report Map Application: https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37

2. Does the GSP include maps related to Groundwater Dependent Ecosystem (GDE) locations?	a. Map of GDE Locations	**X**			"A DTW cutoff of 30 feet was used in the initial screening of potential GDEs. The use of a 30-foot DTW criterion to identify potential GDEs is based on reported maximum rooting depths of California phreatophytes and is consistent with guidance provided by The Nature Conservancy (Rohde et al. 2018) for identifying potential GDEs." ● 30-ft criteria from TNC Guidance: In TNC's GDE Guidance, the depth criterion 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). ● 30-ft as maximum rooting depths of California phreatophytes: Please use care when considering rooting depths of vegetation. While Valley Oak (Quercus lobata) have been observed to have a max rooting depth of ~24 feet (https://groundwaterresourcehub.org/gde-tools/gde-rooting-depths-database-for-gdes/), rooting depths are likely to spatially vary based on the local hydrologic conditions available to the plant. Also, max 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 like to have their roots submerged in groundwater for extended periods of time, and hence can access groundwater at deeper depths. In addition, while it is likely to be true that shallow water availability is necessary to support the recruitment of saplings, hydraulic lift of groundwater to shallow depths has been observed in Quercus spp. 2016 is after the SGMA benchmark date of January 1, 2015. The GSP should rely on groundwater condition data prior to the SGMA benchmark date. It is highly recommended 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. Refer to TNC's guidance on Identifying GDEs Under SGMA (https://groundwaterresourcehub.org/public/uploads/pdfs/TNC_NCdataset_BestPracticesGuide_2019.pdf) 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. While depth to groundwater levels within 30 feet are generally accepted as being a proxy for confirming that polygons in the NC dataset are connected to groundwater, it is highly advised that seasonal and interannual groundwater fluctuations in the groundwater regime are taken into consideration. Utilizing groundwater data from one or two points in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Based on a study we recently submitted to Frontiers in Environmental Science Journal, we've observed riparian forests along the Cosumnes River to experience a range in groundwater levels between 1.5 and 75 feet over seasonal and interannual timescales. Seasonal fluctuations in the regional water table can support perched groundwater near an intermittent river that seasonally runs dry due to large seasonal fluctuations in the regional water table. While perched groundwater itself cannot directly be managed due to its position in the vadose zone, the water table position within the regional aquifer (via pumping rate restrictions, restricted pumping at certain depths, restricted pumping around GDEs, well density rules) and its interactions with surface water	2.2.2.6, page 95 Figure 2-72

					(e.g., timing and duration) can be managed to prevent adverse impacts to ecosystems due to changes in groundwater quality and quantity under SGMA. The depth to groundwater contour maps (Figures 2-70 and 2-71) show large areas of data gaps, given the marked data points on the map where data exists. These maps were used to exclude all GDEs located adjacent to Chowchilla River, Ash Slough, and Berenda Slough (Figure 1 of Appendix 2.B). As stated above, 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.	
	b. Map of Interconnected Surface Waters (ISWs)		**X**		"A review of historical regional aquifer groundwater levels compared to stream thalweg (deepest portion of stream channel) elevations conducted for this study indicate that surface water – groundwater interactions are not a significant issue (i.e., regional groundwater levels are relatively far below creek thalweg elevations) along Chowchilla River, Ash Slough, and Berenda Slough in Chowchilla Subbasin." 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 that could identify which surface waters have groundwater consistently below surface water features, such that an unsaturated zone would separate surface water from groundwater. Groundwater elevations that are always deeper than 50 feet below the land surface can be used to identify the above ground reaches as disconnected surface waters. The GSP should provide further evidence that that ISWs are not present along Chowchilla River, Ash Slough, and Berenda Slough, such as a cross-section or corresponding hydrographs to show the relationship between the river channel and the depth to groundwater at wells near the rivers. Figures 2-70 and 2-71 present depth to shallow groundwater for 2014 and 2016. There are large data gaps over the Chowchilla Subbasin, particularly for 2016 (Figure 2-71). The GSP should further describe how these figures were developed, specifically noting the following best practices for developing depth to groundwater contours presented in Attachment D. 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. Depth to groundwater contours developed from depth to groundwater measurements at wells assumes that the land surface is constant, which is a poor assumption to make. The regulations [23 CCR §351(o)] define interconnected surface waters (ISW) as "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". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water. The GSP states in several places that the San Joaquin River is losing in the section adjacent to the Subbasin, and uses this as evidence that ISWs do not exist. However, ISWs can be either gaining or losing. To improve ISW mapping, The GSP should reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP. "It is likely that seepage from the San Joaquin River is the source of water that combined with the presence of shallow clay layers that serves to maintain shallow groundwater levels at these	2.2.2.5, page 94
	i. Does it identify which reaches are gaining and which are losing?			**X**		
	ii. Depletions to ISWs are quantified by stream segments.			**X**		
	iii. Depletions to ISWs are quantified seasonally.			**X**		

					locations." The GSP should provide estimates of current and historical surface water depletions for ISWs quantified and described by reach, season, and water year type.	
3. Does the GSP include maps of monitoring networks?	a. Existing Monitoring Wells	X			Maps of Existing and Historical Groundwater Monitoring Programs are included in the Appendix 2.E.	Appendix 2.E, page 24-26
	b. Existing Monitoring Well Data sources: i. California Statewide Groundwater Elevation Monitoring (CASGEM)	X			"Groundwater level monitoring has been conducted historically by variety of entities in the Subbasin including Chowchilla Water District, Madera County, Triangle T Water District, DWR, USBR, and Geospacer GAMA. The California State Groundwater Elevation Monitoring Program (CASGEM) was initiated in 2011, with the Madera-Chowchilla Groundwater Monitoring Group as the local monitoring entity. This Group includes Chowchilla Water District and the County, along with other entities in Madera Subbasin. Groundwater levels are collected and submitted each Fall and Spring as part of the CASGEM program."	2.1.2.3, page 65
	ii. Water Board Regulated monitoring sites		X			
	iii. Department of Pesticide Regulation (DPR) monitoring wells	X			"Groundwater quality monitoring has historically been conducted by a variety of entities in the Subbasin including the City of Chowchilla and other public drinking water suppliers, regulated facility operators and other contaminant site monitoring for the RWQCB, the East San Joaquin Water Quality Coalition (the third-party entity representing growers in the area) as part of the Irrigated Lands Regulatory Program (ILRP), USGS for the Groundwater Ambient Monitoring and Assessment Program (GAMA), and other programs under the direction of agencies such as the RWQCB, DPR, EPA, DTSC, USGS. Some historical groundwater quality monitoring has also been conducted by well owners in the Subbasin for other purposes."	2.1.2.3, page 65
	c. SGMA-Compliance Monitoring Network	X			"A map of the subbasin showing the overall groundwater level monitoring network is provided in Appendix 3.A, along with a table listing each well. Figures 3-5 and 3-6 illustrate the locations of the wells selected as representative monitoring sites for monitoring of groundwater levels in the Upper and Lower aquifers, respectively (composite wells are included in Figure 3-1)." "The representative monitoring sites for groundwater quality include a combination of irrigation, public supply, domestic, and monitoring wells to be sampled and analyzed by the Subbasin GSAs together with wells that are sampled by others as part of other groundwater quality monitoring programs. The selected RMS for groundwater quality are listed in Table 3-7 and shown on Figure 3-2. Information on well construction and historical groundwater quality monitoring for each of the indicator wells is included in Appendix 3.B."	3.5.1.1, page 200; Figure 3-1 3.5.1.4, page 205; Figure 3-2
	i. SGMA Monitoring Network map includes identified DACs?		X		The maps showing proposed Monitoring Network in the draft GSP do not include DACs. The draft GSP does not identify DACs.	
	ii. SGMA Monitoring Network map includes identified GDEs?		X		The maps showing proposed Monitoring Network in the draft GSP do not include GDEs.	

Summary/ Comments

Providing maps of the monitoring network overlaid with location of DACs, domestic wells, community water systems, GDEs, and any other sensitive beneficial users will allow the reader to evaluate the adequacy of the network to monitor conditions near these beneficial users.

The comprehensive evaluation of the San Joaquin River Riparian GDE unit following TNC's guidance, including analyzing hydrologic conditions, ecological conditions, providing an inventory of species and ecological value, along with concurrent field studies and reconnaissance, is appreciated. We also appreciate the use of TNC's GDE Pulse to examine

NDVI and NDMI trend data for the GDE polygons within the GDE unit.

The GSP should rely on groundwater condition data prior to the SGMA benchmark date.

The GSP should provide more details on how depth to groundwater contour maps were developed (Figures 2-70 and 2-71):

- Are the wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons to reflect local conditions relevant to ecosystems?
- Are the wells used for interpolating depth to groundwater screened within the surficial unconfined aquifer and capable of measuring the true water table?
- Is depth to groundwater 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 Digital Elevation Model (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 depth to groundwater measurements at wells assumes 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 contour depth to groundwater.

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.

The GSP should provide further evidence that that ISWs are not present along Chowchilla River, Ash Slough, and Berenda Slough, such as a cross-section or corresponding hydrographs to show the relationship between the river channel and the depth to groundwater at wells near the rivers.

To improve ISW mapping, the GSP should reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

The GSP should provide estimates of current and historical surface water depletions for ISWs quantified and described by reach, season, and water year type.

4. Water Budgets

How were climate change projections incorporated into projected/future water budget and how were key beneficial users addressed?

Selected relevant requirements and guidance: GSP Element 2.2.3 "Water Budget Information" (Reg. § 354.18) *Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.* *Projected water budgets shall be used to estimate future baseline conditions of supply, **demand**, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:* *(b) The water budget shall quantify the following, either through direct measurements or estimates based on data:* *(5) If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.* *(6) The water year type associated with the annual supply, demand, and change in groundwater stored.* *(c) Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:* *(1) Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, **water demand**, and land use information.* **DWR Water Budget BMP**[9] **DWR Guidance for Climate Change Data Use During GSP Development and Resource Guide**[10]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Are climate change projections explicitly incorporated in future/ projected water budget scenario(s)?	X			"To evaluate sensitivity to climate change, projected water budgets were also developed using: 1. Historical hydrologic data from water years 1965-2015 adjusted by DWR-provided 2030 mean climate change factors40 2. Historical water supply data from 1989-2015 adjusted similarly by climate change factors, with additional adjustment of CVP supply based on projected alteration of available Friant Releases by the San Joaquin River Restoration Program 3. 2017 land use adjusted for urban area projected growth from 2017 through 2070 (areas were held constant from 2071 through 2090)"	2.2.3.2, page 112
2. Is there a description of the methodology used to include climate	X			"To evaluate sensitivity to climate change, projected water budgets were also developed using:	

[9] DWR BMP for the Sustainable <management of Groundwater Water Budget: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-4-Water-Budget.pdf
[10]DWR Guidance Document for the Sustainable Management of Groundwater Guidance for Climate Change Data Use During GSP Development: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Climate-Change-Guidance_Final.pdf

change?						1. Historical hydrologic data from water years 1965-2015 adjusted by DWR-provided 2030 mean climate change factors40 2. Historical water supply data from 1989-2015 adjusted similarly by climate change factors, with additional adjustment of CVP supply based on projected alteration of available Friant Releases by the San Joaquin River Restoration Program 3. 2017 land use adjusted for urban area projected growth from 2017 through 2070 (areas were held constant from 2071 through 2090)"	
3. What is used as the basis for climate change assumptions?	a. [DWR-Provided Climate Change Data and Guidance](https://water.ca.gov/)[11]		X			"Climate change factors are from the DWR CalSim II simulated volume projections from State Water Project (SWP) and CVP operations under the 2030 mean climate change scenario."	2.2.3.2, page 112
	b. Other			X			
4. Does the GSP use multiple climate scenarios?				X		The draft GSP does not consider different climate scenarios, except that "Two primary projected water budget scenarios were considered: a projected without projects (no action) scenario, and a projected with projects scenario."	
5. Does the GSP quantitatively incorporate climate change projections?			X			"Table 2-25 provides a summary of the average annual inflows, outflows, change in GWS storage, and overdraft estimated at the subbasin-level in the historical, current, projected without projects, and projected with projects water budgets. This table also provides an estimate of subbasin sustainable yield from the projected with projects water budget."	2.2.3.4, page 144
						"Detailed projected with projects with climate change water budget results for Chowchilla Subbasin are presented in Appendix D.3.a. and Appendix D.3.c., and groundwater elevation hydrographs at select wells are included in Appendix E.2." "Detailed projected with climate change water budget results for Chowchilla Subbasin are presented in Appendix D.5.a. and Appendix D.5.c., and groundwater elevation hydrographs at select wells are included in Appendix E.4."	Appendix 6.E., page 242-243
6. Does the GSP explicitly account for climate change in the following elements of the	a. Inflows:	i. Precipitation	X			"The development of projected timeseries for precipitation, evapotranspiration, and surface water flows are briefly summarized in Tables 2-23 and 2-24 below."	Table 2-23 and Table 2-24, page 142-144
		ii. Surface Water	X				
		iii. Imported Water	X				
		iv. Subsurface Inflow		X		The tables include projected climate change adjustments for precipitation,	

[11] DWR Guidance Document for the Sustainable Management of Groundwater Guidance for Climate Change Data Use During GSP Development: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Climate-Change-Guidance_Final.pdf
DWR Resource Guide DWR-Provided Climate Change Data and Guidance for Use During GSP Development: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Resource-Guide-Climate-Change-Guidance_v8.pdf

future/projected water budget?	b. Outflows: i. Evapotranspiration	X			evaporation, surface water inflow, diversions from Madera Canal, and other diversions/bypasses.	
	ii. Surface Water Outflows (incl. Exports)		X			
	iii. Groundwater Outflows (incl. Exports)		X			
7. Are demands by these sectors (drinking water users) explicitly included in the future/projected water budget?	a. Domestic Well users (<5 connections)		X		The demands by drinking water users are not explicitly identified in the projected water budget.	
	b. State Small Water systems (5-14 connections)		X			
	c. Small community water systems (<3,300 connections)		X			
	d. Medium and Large community water systems (> 3,300 connections)		X			
	e. Non-community water systems		X			
8. Are water uses for native vegetation and/or wetlands explicitly included in the current and historical water budgets?			X		"…while for native vegetation lands, groundwater extraction by riparian vegetation was considered to be negligible because of the depth to groundwater in the subbasin." Because there are potential GDEs included in the Chowchilla Subbasin, the GSP should quantify the evapotranspiration from groundwater by riparian vegetation even if small.	2.2.3, page 134
9. Are water uses for native vegetation and/or wetlands explicitly included in the projected/future water budget?			X			

Summary/ Comments

Given the uncertainties of climate change, it is appropriate to analyze the impacts of climate change for a range of scenarios (e.g., a mild effects scenario and a high (worst case) effects scenario).

Based on the data presented, it is not clear how climate change is expected to affect specific elements of the water budget (i.e., subsurface flows, surface water and groundwater outflows, including exports).

The water budget does not include future water demands for drinking water users, including residential wells and small community water systems, and by doing so has omitted key drinking water beneficial users from consideration of future conditions. The GSP should incorporate and make reasonable demand projection assumptions relative to historic water demand and future growth projections for these drinking water users, including DACs.

Because there are potential GDEs included in the Chowchilla Subbasin, the GSP should quantify the evapotranspiration from groundwater by riparian vegetation even if small. The text and water budget should be revised as necessary to reflect this.

5. Management Areas and Monitoring Network

How were key beneficial users considered in the selection and monitoring of Management Areas and was the monitoring network designed appropriately to identify impacts on DACs and GDEs?

Selected relevant requirements and guidance:
GSP Element 3.3, "Management Areas" (§354.20):

(b) A basin that includes one or more management areas shall describe the following in the Plan:
(2) The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.
(3) The level of monitoring and analysis appropriate for each management area.
(4) An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.
(c) If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.

CWC Guide to Protecting Drinking Water Quality under the SGMA[12]
TNC's Groundwater Dependent Ecosystems under the SGMA, Guidance for Preparing GSPs[13]

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP define one or more Management Area?	X			"Chowchilla Subbasin was divided into two management areas – the Western Management Area and the Eastern Management Area. The primary differences between these two management areas in terms of Sustainable Management Criteria are related to land subsidence and GDEs." However, the draft GSP does not provide a map showing the Management Areas identified. The GSP includes references to a description of the management areas in Section 2.2.4; however, this section does not appear to have been included in the public review draft.	3.2.7, page 175
2. Were the management areas defined specifically to manage GDEs?	X			"Chowchilla Subbasin was divided into two management areas – the Western Management Area and the Eastern Management Area. The primary differences between these two management areas in terms of Sustainable Management Criteria are related to land subsidence and GDEs. … A single GDE unit occurs in the Western Management Area along the San Joaquin River, and there are no GDE units in the Eastern Management Area. Because GDEs are present in only one of the two management areas, there are no concerns about the basin operating under different MOs for GDEs in the two management areas.	3.2.7, page 175

[12] CWC Guide to Protecting Drinking Water Quality under the SGMA: https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858
[13] TNC's Groundwater Dependent Ecosystems under the SGMA, Guidance for Preparing GSPs: https://www.scienceforconservation.org/assets/downloads/GDEsUnderSGMA.pdf

				Thus, there will be no inconsistencies caused by setting of measurable objectives for the two different management areas. Differences in management area measurable thresholds for land subsidence and GDEs is discussed below in the section on Minimum Thresholds."	
3. Were the management areas defined specifically to manage DACs?		X			
a. If yes, are the Measurable Objectives (MOs) and MTs for GDE/DAC management areas more restrictive than for the basin as a whole?	X			"Groundwater level is the sustainability indicator most likely to affect GDEs in the subbasin. The subbasin's single GDE unit, the San Joaquin River Riparian GDE Unit, is located along the San Joaquin River in the Western Management Area (see Section 2.2.2.6 and Appendix 6.D). Groundwater in the GDE unit is tightly coupled with surface flow and runoff and is generally maintained at depths within the maximum rooting depth range of the dominant phreatophytic species present in the unit (see Section 2.2.2). The groundwater that is potentially accessible to the vegetation composing the GDE unit likely occurs as a shallow perched/mounded aquifer fed largely by percolation of surface flow from the San Joaquin River. As described in Section 2.2.5, it has been determined that a connection between regional groundwater and streams does not currently exist in the subbasin. However, there remains some potential for shallow groundwater and the associated GDE Unit to be affected by pumping from the regional aquifer (although the risk of this potential impact is considered low). Therefore, measurable objectives for the shallow Upper Aquifer wells in closest proximity to the San Joaquin River Riparian GDE Unit (SJRRP_MW-10-89, SJRRP_MW-11-161, and SJRRP_MW-11-163) are included in the list of RMS and are considered representative of groundwater conditions that could affect the GDE unit." "The Western Management area, which has had significant historic impacts to infrastructure related to subsidence, is subject to initial subsidence-based minimum thresholds. […] For the Eastern Management Area, with no historic subsidence-related impacts, subsidence will be monitored through an adaptive management approach."	3.2.1.1, page 158 3.3.3.1, page 185-186
b. If yes, are the proposed management actions for GDE/DAC management areas more restrictive/ aggressive than for the basin as a whole?		X		The GSP does not appear to have more restrictive / aggressive management actions for GDE/DAC management areas.	
4. Does the GSP include maps or descriptions indicating what DACs are located in each Management Area(s)?		X			
5. Does the GSP include maps or descriptions indicating what GDEs are located in each Management Area(s)?		X			
6. Does the plan identify gaps in the monitoring network for DACs and/or GDEs?	X			"Data gaps relative to GDEs can be characterized as incomplete information on the extent to which the vegetation composing the San Joaquin River GDE Unit may be impacted by occurrence of temporary short-term declines in shallow groundwater levels below historical lows. Biological monitoring, recommended every five years, will be used to evaluate potential beneficial or adverse effects on GDEs that may be related to changes in future groundwater conditions during the Implementation and Sustainability Periods." The draft GSP does not identify monitoring network for DACs.	3.5.4.2, page 216

a. If yes, are plans included to address the identified deficiencies?	X			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. The Monitoring Network section currently does not address future needs for ISW monitoring. In addition to the need for additional shallow monitoring wells in the upper aquifer to map GDEs, there is also a need to enhancing monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands. Ideally, co-locating stream gauges with wells that can monitor groundwater levels in both the upper and lower aquifers would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater. The GSP should provide sufficient detail for the investigation and monitoring program including stream gauges, screened intervals and frequency of monitoring, in order to describe monitoring of both the extent of ISWs and the quantity of surface water depletions from ISWs. The depth to groundwater contour maps (Figures 2-70 and 2-71) show large areas of data gaps, given the marked data points on the map where data exists. These maps were used to exclude all GDEs located adjacent to Chowchilla River, Ash Slough, and Berenda Slough (Figure 1 of Appendix 2.B). The GSP should therefore propose additional upper aquifer wells to reconcile this data gap.	

Summary/ Comments

The draft GSP appears to be incomplete, and does not include Section 2.2.4, which is referenced in Table 1-1 and Table 1-5 as containing the description of management areas, maps of the areas, etc. This information must be included in the GSP per 23 CCR § 354.20.

For transparency, the GSP should explicitly identify (preferably via maps) the extents of identified DACs and potential GDEs located within each separate Management Area; the GSP should also clearly present the proposed MOs and MTs in the two management areas (e.g., in Tables 3-2, 3-3, 3-4, etc.), and if the MOs and MTs for the GDE management area are more or less restrictive.

The GSP should provide sufficient detail for the investigation and monitoring program including stream gauges, screened intervals and frequency of monitoring, in order to describe monitoring of both the extent of ISWs and the quantity of surface water depletions from ISWs.

The GSP should propose additional upper aquifer wells to reconcile the data gap shown in Figure 2-70 and Figure 2-71.

6. Measurable Objectives, Minimum Thresholds, and Undesirable Results

How were DAC and GDE beneficial uses and users considered in the establishment of Sustainable Management Criteria?

Selected relevant requirements and guidance: GSP Element 3.4 "Undesirable Results" (§ 354.26): *(b) The description of undesirable results shall include the following:* *(3) Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results* GSP Element 3.2 "Measurable Objectives" (§ 354.30) *(a) Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Are DAC impacts considered in the development of Undesirable Results (URs), MOs, and MTs for groundwater levels and groundwater quality?		X		The draft GSP does not explicitly describe impacts to DACs, although impacts to drinking water users and domestic well users are discussed. WL MTs: "Groundwater level minimum thresholds are likely to have several effects on beneficial uses, users, land use, and property owners. Those expected to be impacted include agricultural land use and users, urban land use and users, domestic land use and users, and ecological land use and users. Overall agricultural land use and users will be significantly impacted in terms of increased costs to design and construct recharge projects and in terms of reduced crop yields from required reductions in consumptive use for irrigation. While conversion of current agricultural lands to urban areas that may occur in the future will tend to reduce per acre water demands, it is likely that urban water users will need to continue water conservation efforts due to limited water supplies. Domestic well owners can generally expect to see declining groundwater levels during the initial 10 to 15 years of the Implementation Period, followed by stabilization of water levels during the latter portion of the Implementation Period and some potential recovery in groundwater levels after 2040. However, significant adverse impacts to domestic wells from declining groundwater levels are expected to be addressed through a temporary domestic well mitigation program currently under consideration by the GSAs (Appendix 3.C). The economic analyses conducted to compare costs of implementing a domestic well mitigation program versus immediately requiring full implementation of demand reduction in 2020 is provided in Appendix 3.C." WQ MTs: "Significant and unreasonable degradation of water quality occurs when beneficial uses for groundwater are adversely impacted by constituent concentrations increasing to levels above the drinking water MCLs for one of the key constituents (nitrate, arsenic, TDS) previously identified in Section 2 of	3.3.1.4, page 182 3.3.4.4, page 188-189

				the GSP at indicator wells in the representative groundwater quality monitoring network due to implementation of a GSP project or management action. When existing or historical concentrations for the key constituents already exceed the MCL, the minimum threshold is set at the recent concentration plus 20 percent." "Municipal and domestic supply is the most restrictive beneficial use standard for groundwater quality with water quality objectives equal to drinking water MCLs. Setting the groundwater quality minimum thresholds for key constituent concentrations at respective drinking water MCLs, or within a tolerance for no more than a 20 percent increase above historical concentrations when existing or historical concentrations already exceed the MCL, is intended to limit degradation of groundwater quality caused by GSP projects and management actions in order to protect municipal and domestic supply beneficial uses. Protection of municipal and domestic beneficial uses is also protective of all other groundwater beneficial uses." WL UR: "For the Chowchilla Subbasin, the chronic lowering of groundwater levels undesirable result is defined as a relationship between frequency of groundwater elevation minimum threshold exceedances at a given RMS, and the number of RMS locations experience the exceedances at the same time. Using the Fall measurements (assumed to be collected in October), a groundwater elevation undesirable result is defined to occur when greater than 30% of the RMS each exceed the groundwater level minimum thresholds for the same two consecutive Fall readings. Given a total of 36 RMS sites, a total of 11 or more the RMS would need to exceed MTs as defined above to constitute an undesirable result for chronic lowering of groundwater levels. As the number of RMS evolves over time (e.g., adding nested monitoring well sites), the total number of RMS that have to exceed their MTs will change accordingly." WQ UR: "Degraded water quality is significant and unreasonable if the magnitude of degradation precludes the use of groundwater for existing beneficial use(s). Therefore, an undesirable result for degraded groundwater quality occurs when groundwater quality exceeds an established MCL and minimum threshold for arsenic, nitrate, or TDS for a significant duration of time and at a significant number of representative monitoring sites and is the direct result of projects or management actions undertaken as part of the GSP implementation. An exceedance of a minimum threshold at a given representative monitoring site is defined based on the average concentration over a three-year monitoring period. An undesirable result for degraded groundwater quality is greater than 10 percent of representative groundwater quality monitoring wells exceeding the minimum threshold for a given key constituent related to a GSP project or management action."	3.4.1, page 195; 3.4.4, page 197
2. Does the GSP explicitly discuss how stakeholder input from DAC community members was considered in the development of URs, MOs, and MTs?		X		According to the draft GSP, stakeholder input was considered for developing the URs, MOs, and MTs. However, input received from DACs is not explicitly identified or described and it is thus not clear what extent these community	3, page 155;

				members were actively engaged in the process. "The SMC presented in this chapter were developed using information from stakeholder and public input and correspondence with the GSAs, public meetings, hydrogeologic analysis, and meetings with GSA technical experts. The general process for establishing SMC included: • GSA public meetings that outlined the GSP development process and introduced stakeholders to the SMC • Conducting public meetings to present proposed methodologies to establish minimum thresholds and measurable objectives and receive additional public input. Two public meetings on SMC were held in the Subbasin • Reviewing public input on preliminary SMC methodologies with GSA staff/technical experts • Providing a Draft GSP for public review and comment • Establishing and modifying minimum thresholds, measurable objectives, and definition of undesirable results based on feedback from public meetings, public/stakeholder review of the Draft GSP, and input from GSA staff/technical experts." "The methodology to develop minimum thresholds for groundwater levels was based on discussion with GSA staff and technical representatives, input received from interested stakeholders and the public through public meetings, individual public/stakeholder input to various GSA representatives, and a meeting with DWR."	 3.3.1.1, page 179
3. Does the GSP explicitly consider impacts to GDEs and environmental BUs of surface water in the development of MOs and MTs for groundwater levels and depletions of ISWs?		**X**		"Groundwater in the GDE unit is tightly coupled with surface flow and runoff and is generally maintained at depths within the maximum rooting depth range of the dominant phreatophytic species present in the unit (see Section 2.2.2). The groundwater that is potentially accessible to the vegetation composing the GDE unit likely occurs as a shallow perched/mounded aquifer fed largely by percolation of surface flow from the San Joaquin River. As described in Section 2.2.5 [should be 2.2.2.5], it has been determined that a connection between regional groundwater and streams does not currently exist in the subbasin." Section 2.2.2.5 does not present evidence that ISWs do not exist in the Subbasin, and states that a historical connection between groundwater and the San Joaquin River did exist through 2008. The GSP fails to establish measurable objectives or minimum thresholds for this sustainability indicator. The existence of riparian GDEs along the streams in the basin has been identified in Appendix 2.B, and their connection to groundwater is assumed. Their occurrence in the riparian zone means that these GDEs should be considered a beneficial user of groundwater that could be affected by chronic groundwater level decline as discussed above, as well as beneficial users of surface water that could be depleted by groundwater extraction. A more robust discussion of the known facts regarding these surface-groundwater interactions in the riparian zone should be provided. In addition, more detailed discussion regarding specific data gaps should be included.	3.2.1.1, page 158;

				There is a need to evaluate and discuss potential effects on beneficial uses of surface and groundwater. In addition, the applicable state, federal and local standards for the protection of aquatic, riparian and other protected habitats should be discussed. This is necessary, at a minimum, so that the nature of the data gaps can be understood. See https://groundwaterresourcehub.org/sgma-tools/environmental-surface-water-beneficiaries/ for a list of freshwater species in Chowchilla Subbasin that may be exist within ISWs. It is recommended that after identifying which freshwater species exist in your basin, especially federal and state listed species, that you contact staff at the Department of Fish and Wildlife (DFW), 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 freshwater species list. Because 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. Refer to the Critical Species Lookbook[14] to review and discuss the potential groundwater reliance of critical species in the basin. The analysis for ISWs should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental. Refer to the San Joaquin River Restoration Program (SJRRP) that identifies instream flow needs for salmon. The GSP should include instream flow requirements in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment. This Minimum Threshold does not consider water quality needs of GDEs. "Protection of municipal and domestic beneficial uses is also protective of all other groundwater beneficial uses." The GSP should elaborate on this statement and 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. "Therefore, the surface water depletion sustainability criteria is not applicable to the subbasin." However, no evidence is provided in the GSP to show that a hydraulic connection between groundwater and surface water does not exist. Following the discussion presented above for, the GSP should include a discussion of Sustainable Management Criteria for ISWs, including Minimum Thresholds, in the GSP. Cite data gaps regarding ISWs and make plans to reconcile them in the Monitoring Section of the GSP.	3.3.4.4, page 189; 3.3.5, page 193
4. Does the GSP explicitly consider impacts GDEs and environmental BUs of surface water and recreational lands in the discussion and development of Undesirable Results?		**X**		The draft GSP only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. The GSP should add "potential adverse impacts to GDEs" to the list of potential undesirable results presented in Table 3-8 .	

[14] Available online at: https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/

				"Using the Fall measurements (assumed to be collected in October), a groundwater elevation undesirable result is defined to occur when greater than 30% of the RMS [representative monitoring sites] each exceed the groundwater level minimum thresholds for the same two consecutive Fall readings. Given a total of 36 RMS sites, a total of 11 or more the RMS would need to exceed MTs as defined above to constitute an undesirable result for chronic lowering of groundwater levels." The use of 30 percent to define an undesirable result does not allow for the occurrence of low water levels in one area, such as near a GDE, to be an Undesirable Result, which may impact environmental beneficial use. There are three RMS near the San Joaquin River Riparian GDE unit, which could be evaluated separately. The GSP should consider the use of a separate management area for the San Joaquin River Riparian GDE unit so that different sustainable management criteria can be established for this GDE unit. 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. The GSP should include a discussion of Sustainable Management Criteria for ISWs, including Undesirable Results, in the GSP. The GSP should cite data gaps regarding ISWs and make plans to reconcile them in the Monitoring Section of the GSP.	3.4.1, page 195
5. Does the GSP clearly identify and detail the anticipated degree of water level decline from current elevations to the water level MOs and MTs?		X		The GSP does not discuss the anticipated water level decline. However, Appendix 3.A. provides hydrographs which include information on current water levels, MTs/MOs, and depths of domestic wells.	
6. If yes, does it include: b. Is this information presented in table(s)?		X			
c. Is this information presented on map(s)?		X			
d. Is this information presented relative to the locations of DACs and domestic well users?		X			
e. Is this information presented relative to the locations of ISW and GDEs?		X			
2. Does the GSP include an analysis of the anticipated impacts of water level MOs and MTs on drinking water users?	X			"In the Chowchilla subbasin, 127 domestic wells are impacted in the without-SGMA case, but 87 of those appear to be impacted prior to the 2020 implementation start (DTW is greater than minimum depth to top perforation). Therefore, 40 (127 minus 87) wells are potentially affected in the comparison of scenarios. Thirty out of the 40 wells are impacted between 2021 and 2033, with the remaining 10 impacted by 2066. The present value (at 2020) of replacement costs for the 40 wells is $0.69 million. All but seven	Appendix 3.C., page 60
3. If yes: a. On domestic well users?	X				
b. On small water system production wells?		X			
c. Was an analysis conducted and clearly illustrated (with maps) to identify what wells would be		X			

	expected to be partially and fully dewatered at the MOs?				well replacements are avoided in the with-SGMA scenario. The present value of replacement cost for these is $0.13 million. The net well replacement cost avoided by the draft proposed GSP implementation plan is $0.56 million in present value." No maps are included and no explicit comparison to MOs and MTs is presented.	
	d. Was an analysis conducted and clearly illustrated (with maps) to identify what wells would be expected to be partially and fully dewatered at the MTs?		X			
	e. Was an economic analysis performed to assess the increased operation costs associated with increased lift as a result of water level decline?	X			The GSP includes a discussion of well replacement costs (see above) and reduced pumping costs due to SGMA implementation. "This analysis applies an aggregate calculation of change in water depth and pumping cost, using an average depth over all sections (weighted by well count in each section). As DTW decreases in the with-SGMA scenario relative to without-SGMA, the benefit (reduced pumping lift and cost) grows year to year. Both domestic wells and agricultural users benefit from this, though the agricultural cost saving is many times greater simply due to volume pumped. A more precise estimate can be created using an estimate of agricultural and domestic pumping in each section. For the Chowchilla Subbasin, benefits after 10 years are about $105,000 per year in total for all domestic well pumping and $3.29 million per year for agricultural pumping. The present value of savings over the analysis period is about $5.94 million for domestic pumping and $169.84 million for agricultural pumping. These savings are small relative to the loss of net return from demand management (see Table 1), so the benefit of achieving them sooner does not appear to be justified by implementing demand management sooner."	Appendix 3.C., page 61

Summary/ Comments

Based on the presented information, domestic well uses are considered under URs and for the development of water level MOs and MTs, but input from DAC members is not explicitly identified or discussed. More detail and specifics regarding DAC members, including those that rely on smaller community drinking water systems, not only domestic wells, is necessary to demonstrate that these beneficial users were adequately considered.[15] The GSP should discuss whether and how input from DAC members was considered and incorporated into the development of undesirable results, MOs, and MTs.

The GSP should present a thorough, robust, and transparent analysis, supported by maps, that identifies: (1) which domestic wells are likely to be impacted at the MTs and at the MOs, and (2) the location of the likely impacted wells with respect to DACs and other communities and systems dependent on groundwater.

The draft GSP should include more detailed information about the potential impacts on sensitive drinking water users, such as 1) where the likely impacted wells are located, 2) what communities are most affected (including DACs), 3) an estimate of the size of the population that relies on these domestic wells, or 4) if the creation of a new or expanded community water system could address some or all of the population affected by the loss of domestic wells.

[15] Community Water Center and Stanford School of Earth, Energy, and the Environmental Sciences, *Groundwater Quality in the Sustainable Groundwater Management Act (SGMA): Scientific Factsheet on Arsenic, Uranium, and Chromium,* https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1560371896/CWC_FS_GrndwtrQual_06.03.19a.pdf?1560371896; Community Water Center, *Guide to Protecting Drinking Water Quality Under the Sustainable Groundwater Management Act,* https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858.

A more robust discussion of the known facts regarding these surface-groundwater interactions in the riparian zone should be provided. In addition, more detailed discussion regarding specific data gaps should be included.

It is recommended that after identifying which freshwater species exist in your basin, especially federal and state listed species, that you contact staff at the Department of Fish and Wildlife (DFW), 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 freshwater species list. Because 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. Refer to the Critical Species Lookbook to review and discuss the potential groundwater reliance of critical species in the basin.

The analysis for ISWs should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental. Refer to the San Joaquin River Restoration Program (SJRRP) that identifies instream flow needs for salmon. The GSP should include instream flow requirements in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.

The GSP should include a discussion of Sustainable Management Criteria for GDE and ISWs, including MOs, MTs and Undesirable Results, in the GSP.

7. Management Actions and Costs

What does the GSP identify as specific actions to achieve the MOs, particularly those that affect the key BUs, including actions triggered by failure to meet MOs? What funding mechanisms and processes are identified that will ensure that the proposed projects and management actions are achievable and implementable?

Selected relevant requirements and guidance
GSP Element 4.0 Projects and Management Actions to Achieve Sustainability Goal (§ 354.44)
(a) Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.
(b) Each Plan shall include a description of the projects and management actions that include the following:
(1) A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action.

Review Criteria	Yes	No	N/A	Relevant Info per GSP	Location (Section, Page)
1. Does the GSP identify benefits or impacts to DACs as a result of identified management actions?	X			"Implementing projects and management actions to achieve sustainability objectives specified in the GSP will increase irrigation water costs and limit the quantity of water available for farming in some parts of the Chowchilla Subbasin. This will impact agriculture and create ripple effects across all sectors of the Madera County[54] economy, including County tax revenues and jobs that support many of the County's disadvantaged communities.	5.4, page 269
2. If yes: f. Is a plan to mitigate impacts on DAC drinking water users included in the proposed Projects and Management Actions?		X		"With groundwater levels anticipated to decline further during the Implementation Period as projects are implemented and demand reduction programs expand, the subbasin GSAs are in the process of developing a temporary domestic well mitigation program (Appendix 3.C). By 2040 and during the sustainability period, groundwater levels are expected to stabilize	3.3.1, page 175

					and potentially rebound, thus the domestic well mitigation program is not anticipated to be needed beyond the implementation period." Appendix 3.C. identifies that a domestic well mitigation program may be developed.	 Appendix 3.C.
g.	Does the GSP identify costs to fund a mitigation program?	X			Section 2.1 and 3.1 of Appendix 3.C. discuss the costs for a potential domestic well mitigation program. "In addition to funding GSA activities, GSP updates, and ongoing monitoring and reporting, GSA's will develop and implement projects and management actions to provide groundwater benefits for the Subbasin (see Figure 5-2) … The capital cost of each project and management action is summarized and discussed in more detail in Chapter 4. Figure 5-3 illustrates the capital outlay required to implement all of the projects specified in the GSP. The figure indicates the year that the projects would be completed and begin operation, not when all the capital cost would be incurred. The total capital cost of all projects equals approximately $325 million. The GSP implementation plan includes significant outlays when large recharge and storage projects are planned for development by multiple GSAs. These capital costs do not include the cost of developing the Madera County GSA demand management program or the cost of demand management (economic impacts from land idling and crop switching) under that program." "Madera County is currently developing the demand management program and assessing potential costs. Since the details are still under development, project costs cannot be estimated at this time, but demand management is anticipated to require substantial County administration and implementation budgets. Costs to measure pumping and monitor groundwater conditions are part of overall GSP management and not imposed by this program. The most significant cost of the demand management program falls on agricultural groundwater pumpers (growers) and the regional economy. An economic impact analysis of the demand management program has estimated average annual direct economic costs at $32 million per year. This represents reduced net returns to crop production resulting from demand management. It does not include indirect and induced economic impacts to other businesses, employees, and the Madera County regional economy."	Appendix 3.C., page 60-63 5.4, page 270; 4.2.3.5, page 248
h.	Does the GSP include a funding mechanism to support the mitigation program?	X			"The program would be funded by fees and external support including grants and low interest loan." "Madera County will conduct economic and fiscal feasibility studies as part of its ongoing planning efforts to better understand willingness and ability to pay for the projects included in the GSP. Demand management program costs will be covered through grants and fees on groundwater pumpers. To cover project costs, Madera County will pursue available state and federal	Appendix 3.C., page 62 4.2.4, page 248

					grants or loans to help construct projects. The remaining construction costs will be financed through issuance of bonds, to be repaid from revenues raised through water fees and other assessments. Operation and maintenance costs will be paid using revenues raised through water fees and other assessments. Madera County will conduct the necessary studies and decision processes (including Proposition 218 elections) to approve fees or assessments to provide the required funding. To cover demand management program costs, Madera County will obtain available state and federal grants or loans to help set up and test the program. Any remaining set-up cost will be paid for using revenues raised through fees and assessments. Water trading program operating costs may be paid using a per-unit fee on trades or using revenues raised through fees and assessments. Madera County will conduct the necessary studies and decision processes (including Proposition 218 elections) to approve rates, fees, or assessments to provide the required funding.”	
4. Does the GSP identify any demand management measures in its projects and management actions?		X			“A demand management action is described for the Madera County GSA, though the other GSAs within the Subbasin can also use it as needed to attain sustainability. The demand management action provides groundwater users a flexible way to meet any future pumping restrictions.”	4, page 217
5. If yes, does it include:	a. Irrigation efficiency program	X			“The Madera County demand management program will reduce consumptive water use (measured as evapotranspiration, ET) over the GSP implementation period. Demand management actions that reduce consumptive use can include changing to lower water-using crops, water-stressing crops (providing less water than the crop would normally consume for full yield), reducing evaporation losses, and reducing irrigated acreage. However, Madera County will not dictate which of those reduction methods growers would implement. Madera County’s primary approach to demand management is to set demand reduction targets for the GSA service area as a whole, based on conditions in the Subbasin. Achieving the targets can be approached through a variety of methods, including groundwater allocations, internal groundwater markets (e.g. limited to within the GSA), fee structures, and fallowing programs. The County seeks a balance of individual flexibility and GSA-wide accountability. Pumping will be monitored and enforced by Madera County to ensure compliance with the demand reduction targets and sustainability objectives. California Water Code §10726.4 (a)(2) provides the Madera County GSA with the authority to control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate. The following principles are guiding development of the demand management program. These are in no order of preference and Madera County recognizes tradeoffs exist among these principles. • Minimize the economic impacts of any demand management required in Madera County • Maintain established water rights • Incentivize investment in water supply infrastructure • Incentivize economically efficient water use	4.2.3.1, page 244
	b. Ag land fallowing (voluntary or mandatory)	X				
	c. Pumping allocation/restriction	X				
	d. Pumping fees/fines	X				
	e. Development of a water market/credit system	X				
	f. Prohibition on new well construction		X			
	g. Limits on municipal pumping		X			
	h. Limits on domestic well pumping		X			
	i. Other		X			

					• Incentivize recharge in aggregate, and in specific regions • Allow sufficient program flexibility for groundwater pumpers to adjust over time • Ensure access to domestic water supply (de minimis domestic use as defined by SGMA is less than 2 acre-feet annually per user)”	
6. Does the GSP identify water supply augmentation projects in its projects and management actions?		X			“Three types of projects are included in the Chowchilla Subbasin GSP for implementation: recharge, conveyance, and storage (Table 4-1). Recharge projects are designed to support sustainability by increasing recharge. Conveyance projects facilitate the delivery of additional water supplies to increase recharge or use for irrigation, thereby reducing groundwater pumping. Storage projects store additional water supplies to increase recharge or use for irrigation, thereby reducing groundwater pumping. Some projects have a specific water source, but many of the recharge projects can draw from the same general sources. A section at the end of this chapter describes and quantifies available water from the potential sources.”	4, page 217
7. If yes, does it include:	a. Increasing existing water supplies	X			"As part of the San Joaquin River Restoration Program, Reclamation, working with CWD, investigated the feasibility of expanding Eastman Lake[53]. The purpose of the project is to enlarge the capacity of Eastman Lake by approximately 50 thousand acre-feet (from 150 to 200 TAF). The additional capacity would allow for additional deliveries to CWD, and CWD would deliver water to growers to reduce groundwater pumping within the CWD service area. However, the additional deliveries would partially offset the availability of flood flows which are used for groundwater recharge benefits under other CWD projects (recharge basins and Flood-MAR). CWD will assess these tradeoffs under future project planning efforts.”	4.1.5, page 232
	b. Obtaining new water supplies	X			“The County GSA would directly acquire or facilitate the acquisition of approximately 5,000 acre-feet of new surface water supplies that would be available for diversion from Millerton during an irrigation season. The water would be acquired from a water supplier with rights/contracts for water from Millerton, or from another water supplier whose supply can be exchanged with water from Millerton. The water would be conveyed to Madera County East parcels that are within ½ mile of an existing major water delivery system (e.g. Madera Canal, CWD delivery system, natural stream course). Water would be conveyed to the various locations under a conveyance agreement entered into with CWD and others, as may be appropriate. Diversion and conveyance facilities would be constructed to serve the lands not currently within the delivery system of a district. The 5,000 acre-feet would be expected to serve the irrigation needs of approximately 3,000 to 5,000 acres of currently irrigated lands – depending on the irrigation needs of the properties.”	4.2.2.1, page 240
	c. Increasing surface water storage	X			"As part of the San Joaquin River Restoration Program, Reclamation, working with CWD, investigated the feasibility of expanding Eastman Lake[53]. The purpose of the project is to enlarge the capacity of Eastman Lake by approximately 50 thousand acre-feet (from 150 to 200 TAF). The additional capacity would allow for additional deliveries to CWD, and CWD would deliver water to growers to reduce groundwater pumping within the CWD service area. However, the additional deliveries would partially offset the availability of flood flows which are used for groundwater recharge benefits under other	4.1.5, page 232

					CWD projects (recharge basins and Flood-MAR). CWD will assess these tradeoffs under future project planning efforts.”	
	d. Groundwater recharge projects – District or Regional level	X			“CWD will construct groundwater recharge basins totaling about 1,000 acres, distributed throughout its service area. Locations and sizes of basins will be selected based on land uses, access to delivery facilities, and soils having appropriate percolation rates. Sites will be selected to maximize recharge efficiency and benefits to the Subbasin groundwater system.” “Flood-MAR is a groundwater recharge approach in which flood water available during winter and spring months is spread on agricultural or other suitable land for percolation to groundwater. The project is distinct from recharge basins that will be developed by CWD because existing land uses would be maintained, no basins would be constructed, and existing delivery facilities would be used. However, both projects rely on the same sources of supply: flood flows that are typically available in the winter and early spring that would have otherwise left the Subbasin.” “Madera County will develop recharge basins. Water will be diverted off the Eastside Bypass into basins where it will percolate into the deep aquifer. The size, location, and performance of Madera County recharge basins depends on site-specific characteristics that are currently being assessed by Madera County. Madera County will develop recharge basins to maximize recharge efficiency to ensure maximum net recharge benefits stay within the Subbasin.” “The project proposes to develop infrastructure and up to 300 acres of recharge ponds within the SVMWC area, or nearby lands, that could be used to recharge Chowchilla River flood flows during the winter months of wet years. SVMWC would keep track of the amount of water recharged and stored underground. In dry years, the recharged water would be pumped and used by landowners to irrigate the approximately 3,500 acres of irrigated farmland within SVMWC. Recharge ponds are assumed to recharge 4.6 inches of water per day when operating at full capacity.” “The recharge basins are being developed under an OES Federal Emergency Management Agency (FEMA) grant. The project proposes to develop infrastructure and 310 acres of recharge ponds within the Red Top area that would allow San Joaquin/Fresno River flood flows to be stored in the shallow aquifer. The stored water would be pumped in dry years to reduce pumping from beneath the Corcoran Clay layer, in order to reduce overdraft and mitigate land subsidence. Recharge ponds can accept approximately 500 acre-feet of additional water per day when operating at full capacity from existing and new turnouts and facilities.” “Water available to recharge projects in the Chowchilla Subbasin was evaluated following the process described in Appendix 4.F. In summary, four sources of water are available for the recharge and water supply projects: combined flood releases and Section 215 water from	4.1.1.1, page 220; 4.1.2.1, page 223; 4.2.1, page 237; 4.3.1.1, page 239; 4.4.1.1, page 253; 4.5, page 258

				Millerton Lake and Buchanan Dam, Eastside Bypass flows, Fresno River flood flows to Triangle T Water District, and water purchases. A summary of the total projected water available, the projected water committed to projects, and the expected water remaining after the projects recharge or use the water committed is provided below for each water source.”	
e. On-farm recharge		**X**			
f. Conjunctive use of surface water		**X**			
g. Developing/utilizing recycled water		**X**			
h. Stormwater capture and reuse	**X**			“Flood-MAR is a groundwater recharge approach in which flood water available during winter and spring months is spread on agricultural or other suitable land for percolation to groundwater. The project is distinct from recharge basins that will be developed by CWD because existing land uses would be maintained, no basins would be constructed, and existing delivery facilities would be used. However, both projects rely on the same sources of supply: flood flows that are typically available in the winter and early spring that would have otherwise left the Subbasin.”	4.1.2.1, page 223;
i. Increasing operational flexibility (e.g., new interties and conveyance)	**X**			“Water conveyance facilities consisting of a canal, pipeline and appurtenant facilities would be constructed to convey water from Merced Irrigation District (Merced ID) to CWD. CWD would then use that water within its service area in-lieu of groundwater pumping, or for recharge (basins or Flood-MAR), depending on conditions at the time water is available. The most likely option is that water would be acquired from Merced ID by short-term or long-term contract and delivered to CWD for direct irrigation use, thereby reducing groundwater demand within CWD’s service area.” “The Madera Canal is 36 miles in length. The first 7 miles are concrete lined and the remaining 29 miles are earth lined. The capacity at the head of the canal is 1,275 cfs and the capacity at the end is 600 cfs. The capacity of the first three siphons are 1,500 cfs with the remainder of the siphons and drop structures having capacities gradually declining to 935 cfs. This project would increase the capacity at the head of the canal to 1,500 cfs, with capacities gradually declining to 750 cfs at the end.”	4.1.3.1, page 227; 4.1.4.1, page 230
j. Other		**X**			
8. Does the GSP identify specific management actions and funding mechanisms to meet the identified MOs for groundwater quality and groundwater levels?	**X**			The Subbasin area includes GDEs and ISWs 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. The GSP should include environmental benefits and multiple benefits as criteria for assessing project priorities.	4, page 217
9. Does the GSP include plans to fill identified data gaps by the first five-year report?	**X**			“Data gaps have been presented in the groundwater level, groundwater storage, land subsidence, and groundwater quality monitoring networks. The following steps will be taken to address these data gaps: • Madera County is in process of adding seven new nested monitoring well	3.5.4.3, page 216

				sites with up to three well completions at each site (total of up to 27 new monitoring wells) within the subbasin. These new wells will address many of the data gaps described in the Upper and Lower Aquifers for groundwater level and quality data (Figures 3-1 and 3-2). • The GSAs will install sampling taps (as needed) on groundwater level wells designated for groundwater quality monitoring. These wells will then be sampled for both groundwater elevation data and groundwater quality data. • Sampling events will be coordinated with well owners to prevent pumping and access issues. In addition to these steps, the monitoring networks will be evaluated on a yearly and five-year basis. If additional data gaps arise, the GSA will consider the implications of these gaps, associated costs, and importance to the continued implementation of the GSP and take appropriate actions to address the gaps."	
10. Do proposed management actions include any changes to local ordinances or land use planning?		X		Potential new regulations or ordinances are still under development by the GSAs. "GSAs are continuing to monitor, manage, and collaborate to meet sustainability goals specified in the GSP. Within their allowed authorities, GSAs are evaluating new regulations or ordinances that could be implemented to help achieve sustainability objectives. Any changes in regulations or ordinances will be summarized in the periodic update. The effect on any aspect of the GSP, including the basin setting, measurable objectives, minimum thresholds, or undesirable results will be described. The five-year periodic evaluation will include a summary of state laws and regulations or local ordinances related to the GSP that have been implemented since the previous periodic evaluation and address how these may require updates to the GSP. Enforcement or legal actions taken by the GSAs in relation to the GSP will be summarized along with how such actions support sustainability in the Subbasin."	5.6.3, page 274
11. Does the GSP identify additional/contingent actions and funding mechanisms in the event that MOs are not met by the identified actions?		X			
12. Does the GSP provide a plan to study the interconnectedness of surface water bodies?		X		"For depletion of interconnected surface waters, available data indicate that streams in the Subbasin do not have direct connections to the regional groundwater system; therefore, this GSP does not provide monitoring for the surface water depletion sustainability indicator."	3.5.1, page 199
13. If yes: a. Does the GSP identify costs to study the interconnectedness of surface water bodies?			X		
b. Does the GSP include a funding mechanism to support the study of interconnectedness surface water bodies?			X		

14. Does the GSP explicitly evaluate potential impacts of projects and management actions on groundwater levels near surface water bodies?		X		Section 4 identifies many important 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, the GSP should 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, additional management actions and projects targeted for protecting ISWs should be included and described. Recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed to 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, the GSP should consider identifying if there is habitat value incorporated into the design and how the recharge ponds will be managed to benefit environmental users. For examples of case studies on how to incorporate environmental benefits into groundwater projects, visit our website: https://groundwaterresourcehub.org/case-studies/recharge-case-studies/.	4, page 217

Summary/ Comments

A discussion should be added for each project or management action to clearly identify the benefits to DACs, drinking water users, and potential impacts to the water supply. For all potential impacts, the project/management action should include a clear plan to monitor for, prevent, and/or mitigate against such impacts. For example, groundwater recharge projects can have either a positive or negative impact on local groundwater quality, depending upon the design of the project.

The GSP should identify additional actions and funding mechanisms for potential failures of achieving the MOs by the identified actions.

The GSP should include environmental benefits and multiple benefits as criteria for assessing project priorities.

For the projects already identified, the GSP should consider stating how ISWs and GDEs will benefit or be protected, or what other environmental benefits will accrue.

For projects that construct recharge ponds, the GSP should consider identifying if there is habitat value incorporated into the design and how the recharge ponds will be managed to benefit environmental users.

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

Appendix A
Review of Public Draft GSP

CHOWCHILLA SUBBASIN
GROUNDWATER SUSTAINABILITY PLAN (GSP)
COMMENT FORM

Please complete the following information to provide comments on the draft Chowchilla Subbasin GSP. Type or print legibly for your comments to be considered.

Please return this form to (hand delivery, mail, or email accepted):

Stephanie Anagnoson
Madera County
200 W. Fourth Street
Madera, CA 93637
Email:ChowchillaGSPComments@maderacounty.com

Date Submitted: November 9, 2019

Submitted By: Phil Janzen, President, Madera Ag Water Association

Address: 1102 S. Pine Street, Madera, CA 93637

Phone Number / Email: (559) 674-8871 maderaagwater@gmail.com

APNs: ______

Located in Groundwater Sustainability Agency (GSA):
☑ Madera County ☐ CWD ☐ Triangle TWD ☐ Merced County ☐ Other ______

Affiliation: ☑ Irrigated Ag ☐ Non-Irrigated Ag ☐ Rural Residential
☐ Disadvantaged Community Member ☐ Agency/Government ☐ Other ______

Chapter No. / Page No. of GSP: See attached letter.

Comments: ______

MADERA AG
WATER ASSOCIATION

November 5, 2019

Stephanie Anagnoson
Madera County
200 W. Fourth Street
Madera, CA 93637
Email: ChowchillaGSPComments@maderacounty.com
MaderaGSPComments@maderacounty.com

Re: Comments on the Madera and Chowchilla Draft GSPs

Dear Ms. Anagnoson:

The Madera Ag Water Association (MAWA) appreciates the extraordinary effort that has gone into developing the Draft Groundwater Sustainability Plans for the Madera and Chowchilla Subbasins (Draft GSPs). Throughout the development process, the Madera County Groundwater Sustainability Agency (Madera County GSA) has made every effort to be inclusive and transparent in the development of the Draft GSPs. We thank you for that approach and for the opportunity to provide comments on the Draft GSPs.

MAWA is a non-profit membership organization representing farmers operating in areas of Madera County managed by the Madera County GSA. We are committed to working with all stakeholders in our community and with the Madera County GSA to make our basins sustainable. While this difficult task means significant changes for the agricultural community, we recognize the importance of being successful. State intervention is simply not an option.

We also want to thank the team at Madera County for identifying funding to offset the costs of establishing the Madera County Groundwater Sustainability Agency and developing the Draft GSPs. This allowed our community to comply with the rigorous initial requirements of the Sustainable Groundwater Management Act (SGMA) without simultaneously being financially burdened from the outset. We believe this deliberate approach has provided best possible opportunity for our community to successfully implement SGMA.

Even with this sound start, implementing the GSP will be challenging, particularly for agriculture. While many will be impacted, the greatest burden will be borne by the agricultural community. Because of that circumstance, MAWA encourages the Madera County GSA to continue to ensure that farmers and ranchers have the appropriate opportunity to engage with the SGMA process.

Comments

Planning vs. Prescribing: One of the key challenges in drafting a GSP is balancing between establishing a workable long-term strategy and providing near-term certainty through specific prescriptions. The reality is that the first step in the journey to groundwater sustainability is establishing and refining critical measurement and monitoring systems. While this means that certainty about some parameters is delayed, this is a necessary foundation to ensuring a fair and workable system is ultimately implemented.

The Draft GSPs appropriately manage this balance by clearly identifying what is needed, how it will be obtained, and how it will be used to implement the management actions and projects that will achieve sustainability. The specific prescriptions and implementation of the tools is rightfully left to the implementation phase of the GSP. While this does leave some uncertainty at present, it is important that the tools and prescriptions be based on the needed information and not hurriedly placed on a flawed foundation.

ETAW vs. AW: In discussing the Draft GSPs with stakeholders there is some confusion about the difference between the Evapotranspiration of Applied Water (ETAW) and Applied Water (AW). Although the Draft GSPs are not deficient in their explanation of this distinction, additional clarification, perhaps in the Executive Summary, would help the reader understand the difference between these terms and how they are used in the Draft GSPs.

Projects and Management Actions – Section 4: The Draft GSPs identify recharge, conveyance, and (for the Chowchilla Subbasin) storage as projects, and demand management as a management action. These tools will be utilized to bring the basins into balance over the next twenty years.

While these projects and management actions may be implemented by the GSAs, it would be useful to clarify in the Draft GSPs how these projects and management actions may be also implemented by other entities or individuals. This would allow others, in coordination with the GSAs and consistent with the GSPs, to implement projects and management actions that move us toward sustainability. In some cases, these entities may be able to implement these projects or management actions more quickly and efficiently than the GSAs.

Recharge – Section 2.2.3.3 & Section 4 (Table 4-2): In discussing groundwater recharge, the Draft GSPs appropriately focus on Flood-MAR, recharge basins, and in lieu recharge. While these surface water diversion projects should remain the priority of the GSP, it may be useful for the GSP to anticipate inclusion of other types of projects and management actions that may not divert surface water but may contribute to the groundwater replenishment portfolio.

Increasing consideration and study is being given to forest management, tillage practices, stormwater management, and other management practices that may increase the amount of precipitation infiltrating into the groundwater system. While these management practices are not sufficiently developed to be included in the projected budget, it would be helpful if the GSP also referenced groundwater replenishment practices that do not rely on diverted surface water.

Measurement – Section 4.4.4.3/4.2.3.3: The Draft GSPs identify several methods for measuring groundwater use that may be used in the basins. While simply identifying these tools is appropriate for the GSP, it will be useful to for tools like remote-sensing measurement and analysis of ETAW to be implemented quickly so that bugs can be worked out and groundwater users can gain confidence in these systems as soon as possible.

Rampdown – Section 4.4.4.2/4.2.3.2: The Draft GSPs identify a target for ramping down groundwater use of 2% per year for the first five years and 6% per year thereafter. While this is an appropriate goal, there are two clarifications that would be useful to include.

First, it would be helpful to further explain that the annual rampdown targets apply to the Madera County GSA area as a whole and not to individual parcels or ownerships. Although the Draft GSP already indicates this is the case, highlighting this fact in the Executive Summary and in the relevant sections may help alleviate some confusion.

Second, during the first few years of implementation, information and tools may not be available to provide specificity about whether these targets are being met. This is an expected challenge as not all the information needed to demonstrate these conditions is available. However, it may be useful to indicate this fact so that an inability to conclusively demonstrate planned reductions in the first year of implementation does not suggest the plan is inadequate. While actions will be taken to reduce demand immediately upon implementation of the GSPs, whether certain targets are hit may not be demonstrable for some time.

Allocations – Section 4.4.4.2/4.2.3.2: Implementing a groundwater allocation program may not be the only way to achieve the required demand reduction goals. Another option may be carefully managing access, consistent with property rights, and limiting the total available water without individual user allocations. Amending the Draft GSP to refer to "Allocation/Access" may clarify that approaches other than allocation may also be used to meet demand reduction goals.

Trading – Section 4.4.4.2/4.2.3.2: The Draft GSPs refer to a "water trading program" as a means of trading water credits. While market systems can add important flexibility to a system where available supply is limited, the details of the market system may end up being something other than a water trading program. Consider describing a "market system" generally to ensure that other types of market systems are also anticipated in the GSP.

Easements – Section 4.4.4.2/4.2.3.2: Because the term "easements" can be understood in different ways, it would be helpful to use a more descriptive term to refer to voluntary programs to cease irrigating lands. Whether through easements or leases, irrigation abeyance agreements are a useful tool and should remain in the GSP. Find a good term to describe the range of such alternatives will help reduce confusion.

Fallowing – Section 4.4.4.2/4.2.3.2: The Draft GSPs appear to use the term fallowing to refer to ceasing to irrigate land that is currently irrigated. To the extent this term is used in the typical agronomic context, namely referring to land that has been plowed and left unseeded or is otherwise not in use, it is unnecessarily restrictive.

As the GSP is implemented and land come out of irrigated agricultural production, much of that land may find other uses that do not require irrigation. Such land, for example, may be dryland farmed, transitioned to rangeland, converted to habitat, or be used for a solar array. Each of these new uses would cease irrigation, but would not technically be fallowing. Consider amending the Draft GSPs to refer to "land transition" or a similar term that indicates cessation of irrigation but anticipates a future economic use.

Conclusion

The GSAs that worked together on the Draft GSP have done a remarkable job setting forth a plan to bring the Madera and Chowchilla Subbasins into a sustainable condition. MAWA appreciates this work and looks forward to working with these GSAs and with other stakeholders to ensure our community follows the best path forward.

Thank you for considering these comments.

Sincerely,

/s/ *Phil Janzen*

Phil Janzen, President
Madera Ag Water Association, Inc.

CHOWCHILLA SUBBASIN
GROUNDWATER SUSTAINABILITY PLAN (GSP)
COMMENT FORM

Please complete the following information to provide comments on the draft Chowchilla Subbasin GSP. Type or print legibly for your comments to be considered.

Please return this form to (hand delivery, mail, or email accepted):

Stephanie Anagnoson
Madera County
200 W. Fourth Street
Madera, CA 93637
Email:ChowchillaGSPComments@maderacounty.com

Date Submitted: Nov 2, 2019

Submitted By: MARK Hutson

Address: 13534 Ave 19 1/2 Chowchilla, CA 93610

Phone Number / Email: 559-217-6609

APNs: 023-040-014 022 023-110-009 +008

Located in Groundwater Sustainability Agency (GSA):
☐ Madera County ☒ CWD ☐ Triangle TWD ☐ Merced County ☐ Other ______

Affiliation: ☒ Irrigated Ag ☐ Non-Irrigated Ag ☐ Rural Residential
☐ Disadvantaged Community Member ☐ Agency/Government ☐ Other ______

Chapter No. / Page No. of GSP: 5.5

Comments: I would remove the word 'All' in comply with All of the Requirements"

Chapter No. / Page No. of GSP: 5.6.1

Comments: Implementation of all projects. Remove "all"

In Short – Remove The words all, shall, will, etc. These words are strong assertions + can be left out. This would apply to all chapters

Chapter No. / Page No. of GSP: 4

Comments: I believe it is very important to strongly state in This chapter + others, That as Knowledge, Technology + management practices adapt + change, that the Methodology of projects will adapt. This area of operation is so new, what we think is right may be wrong, and visa-versa. Please leave

Chapter No. / Page No. of GSP:

Comments: A wide area to manuver within The GSP as GSA's become more Knowledgeable. They need to be nimble and not constrained by a plan that may become obsolete.

CHOWCHILLA SUBBASIN
GROUNDWATER SUSTAINABILITY PLAN (GSP)
COMMENT FORM

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Stephanie Anagnoson
Madera County
200 W. Fourth Street
Madera, CA 93637
Email: ChowchillaGSPComments@maderacounty.com

Date Submitted: 10-23-19

Submitted By: Jennifer Spaletta for Sierra Vista Mutual Water Co.

Address: PO Box 2660, Lodi, CA 95241

Phone Number / Email: jennifer@spalettalaw.com

APNs: Various

Located in Groundwater Sustainability Agency (GSA):
☑ Madera County ☐ CWD ☐ Triangle TWD ☑ Merced County ☐ Other ____

Affiliation: ☑ Irrigated Ag ☐ Non-Irrigated Ag ☐ Rural Residential
☐ Disadvantaged Community Member ☐ Agency/Government ☐ Other ____

Chapter No. / Page No. of GSP: Chapter 2, App2F

Comments: See attached

SIERRA VISTA MUTUAL WATER COMPANY COMMENTS

October 23, 2019

To: Chowchilla Subbasin Technical Committee, ChowchillaGSPcomments@maderacounty.com

Re: Comments on Draft Chowchilla Basin Groundwater Sustainability Plan

Sierra Vista Mutual Water Company provides these comments regarding the allocation of seepage from the Chowchilla River in Appendix 2.F.d and Appendix 2.F.a, and as further reflected in Chapter 2 and the balance of the Draft GSP using the information from these two appendices.

Currently the non-flood period seepage for Reach C-2 is allocated 100% to Chowchilla Water District in the water balances and none of this seepage is allocated to Sierra Vista Mutual Water Company. Sierra Vista Mutual Water Company contends it has a right to some or all of the Reach C-2 seepage pursuant to its existing water rights, agreements with Chowchilla Water District and a court judgment.

To avoid a dispute over this allocation, for purposes of the GSP and SGMA water balance calculations only, Chowchilla Water District and Sierra Vista Mutual Water Company have agreed that the GSP should be amended to allocate 70% of the non-flood period seepage for Reach C-2 to Sierra Vista Mutual Water Company and 30% to Chowchilla Water District. The allocation of seepage for Reach C-2 between Sierra Vista Mutual Water Company and Chowchilla Water District has no impact on the total water balance for the subbasin. We understand that this change will be incorporated into the final GSP.

Edgar deJager, SVMWC Board President

CHOWCHILLA SUBBASIN
GROUNDWATER SUSTAINABILITY PLAN (GSP)
COMMENT FORM

Please complete the following information to provide comments on the draft Chowchilla Subbasin GSP. Type or print legibly for your comments to be considered.

Please return this form to (hand delivery, mail, or email accepted):

Stephanie Anagnoson
Madera County
200 W. Fourth Street
Madera, CA 93637
Email:ChowchillaGSPComments@maderacounty.com

Date Submitted: November 4, 2019

Submitted By: San Joaquin River Exchange Contractors GSA

Address: 541 H Street, PO Box 2115, Los Banos, CA 93635

Phone Number / Email: 209-827-8616 / cwhite@sjrecwa.net

APNs: ____________________

Located in Groundwater Sustainability Agency (GSA):
☐ Madera County ☐ CWD ☐ Triangle TWD ☐ Merced County ☒ Other SJREC GSA

Affiliation: ☐ Irrigated Ag ☐ Non-Irrigated Ag ☐ Rural Residential
☐ Disadvantaged Community Member ☒ Agency/Government ☐ Other ____________

Chapter No. / Page No. of GSP: ____________________

Comments: The SJREC GSA, representing two public water agencies, two mutual water companies, six disadvantaged communities and county white areas, include our comments in the attached letter.

Chapter No. / Page No. of GSP: ______

Comments: ______

Chapter No. / Page No. of GSP: ______

Comments: ______

Chapter No. / Page No. of GSP: ______

Comments: ______

SAN JOAQUIN RIVER EXCHANGE CONTRACTORS GROUNDWATER SUSTAINABILITY AGENCY

Post Office Box 2115
Los Banos, CA 93625
(209) 827-8616

November 4, 2019

Ms. Stephanie Anagnoson
Chowchilla Subbasin GSP
Madera County
200 W. Fourth Street
Madera, CA 93637

RE: ***Comments on the draft Chowchilla Subbasin Groundwater Sustainability Plan***

Dear Stephanie:

The San Joaquin River Exchange Contractors Groundwater Sustainability Agency (SJREC GSA) has reviewed the draft GSP for the Chowchilla Subbasin. Additionally, the SJREC GSA participated in two joint workshops between the Delta-Mendota Subbasin and the Chowchilla Subbasin. The purpose of these workshops was to review groundwater conditions along our shared basin boundary and evaluate the draft proposed Sustainable Management Criteria and potential impacts our adjacent subbasin. Included herein are comments from the SJREC GSA.

1. The GSP relies too heavily on a numerical groundwater model that has not been calibrated and therefore does not accurately reflect boundary conditions with the Delta-Mendota Subbasin. In addition, the numerical model used has projected water levels to decline significantly in the Delta-Mendota Subbasin by the year 2040. This is contradictory to SJREC GSP which will maintain historic water levels through 2040 in order to maintain sustainability.

2. This plan assumed that no land subsidence will occur so long as water levels do not drop below historic low water levels. Evidence in the El Nido area, the Mendota area, and elsewhere, shows that land subsidence will significantly occur at levels above historic low levels.

3. Your draft plan sets the Land Subsidence Undesirable Result for the Western Management Area as "50 percent of Western MA Lower Aquifer wells below minimum threshold for two consecutive fall measurements." It also sets the minimum threshold for

Land Subsidence in the Wester Management Area as "the highest of (a) projected lowest future groundwater level at the end of estimated 10-year drought or (b) or recent groundwater level lows". As defined, the Sustainable Management Criteria for Land Subsidence poses an immediate and long-term risk to the SJREC GSA and its member entities. Chapter 10 Section 10733 of the SGMA requires DWR to "evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin". Your draft plan will adversely impact our ability to successfully implement our GSP and prevent our achievement of sustainability.

The Chowchilla GSP should be updated to mitigate land subsidence in the areas closest to the Delta-Mendota Subbasin. A successful mitigation program is being implemented by the Triangle T Water District in cooperation with the member agencies of the SJRECWA GSA. Other areas in the western Madera County should be held to a similar standard and immediately reduce extractions from the lower aquifer at or below the sustainable yield. Of particular importance is the area within the Clayton Water District. The SJREC GSA has participated in several conversations with the Chowchilla Subbasin to describe the need for regional coordination to achieve regional sustainability.

4. In your plan the minimum threshold for Chronic Lowering of Groundwater Levels is defined as "the lowest of a) projected lowest future groundwater level at end of estimated 10-year drought or b) lowest modeled groundwater level from projected with projects model simulation (2019-2090)". The undesirable result for this same indicator is defined as "30 percent of wells below minimum threshold for two consecutive fall measurements". As defined, this poses an immediate risk to the SJREC GSA and the Delta-Mendota Subbasin. Water levels at the end of a 10-year drought are projected to be significantly lower this historic water levels. Intentional decline in water levels in the Chowchilla Subbasin will directly impact the Delta-Mendota Subbasins infrastructure, water supply, and for the following sustainability indicators: a) chronic lowering of groundwater levels, b) reduction of groundwater storage, c) land subsidence, d) degraded water quality and e) depletion of interconnected surface water.
    a. Chronic lowering of groundwater levels: the SJREC GSP is managing groundwater levels to maintain historic levels. If the Chowchilla subbasin intends to lower the water levels across the subbasin boundary, inherently more groundwater will flow out of the Delta-Mendota Subbasin inducing a groundwater imbalance and overdraft in the Delta-Mendota Basin.
    b. Reduction of groundwater storage: As described above lowering water levels will increase the lateral groundwater outflow from the Delta-Mendota Subbasin. The

results of increased outflow will result in a reduction in groundwater storage in the Delta-Mendota Subbasin.

c. Land subsidence: this GSP plans to use water levels as a proxy for land subsidence. It should be noted that the proposed water level minimum thresholds will have very significant impacts to the Delta-Mendota Subbasin
d. Degraded water quality: Lowering water levels in the Chowchilla subbasin will exacerbate the problem of migrating high TDS water into the SJREC GSA. This problem is not discussed in the GSP and should be evaluated to ensure regional sustainability.
e. Depletion of interconnected surface water: The plan indicates that overdraft in the Chowchilla subbasin has caused water levels to drop low enough to a point where the surface water is not connected with the ground water. The SJREC GSP describes that there are times when the area adjacent to the San Joaquin River has interconnected surface water and groundwater. This GSP needs to describe how its groundwater management efforts are not depleting surface waters. Of particular importance are the areas adjacent to the Delta-Mendota Subbasin in the Madera County white areas and the Clayton Water District.

5. The groundwater overdraft presented in this report vary substantially. Table 2-26 indicates an average annual overdraft of 29,000 acre-feet while the Figure ES-3 estimates the average annual overdraft to be 101,900 acre-feet.

6. Page 6 of the Executive Summary references that the sustainable yield was only calculated for the period 2040-2090. A sustainable yield should be calculated for the period 2020-2040 in order to achieve sustainability. One method used to calculate sustainable yield uses "average annual groundwater extraction minus the average annual change in groundwater storage". Groundwater extractions in this subbasin has resulted in inelastic land subsidence. These extractions need to be removed from the sustainable yield calculation.

7. This GSP did not include a regional water quality concern of the northeasterly flow of high TDS groundwater associated with overdraft in the Chowchilla Subbasin. Declining water levels in the upper aquifer of the Chowchilla Subbasin has increased the migration of high TDS groundwater into the Delta-Mendota Subbasin.

8. On Page 2-29 the groundwater system conceptualization in the draft plan only analyzes a single homogenous aquifer which renders it untenable for predicting aquifer trends etc. the analysis must recognize actual conditions and include at least two aquifers: a shallow semi or unconfined aquifer and a deeper confined aquifer.

9. On Page 2-34 the lower aquifer discussion should include lateral groundwater inflow and outflow across Subbasin boundaries. There has consistently been groundwater flows in both the upper and lower aquifers from the Delta-Mendota Subbasin to the Chowchilla Subbasin. Based on natural (pre-pumping) conditions, all of these flows have been induced by pumping in the Chowchilla Subbasin.

10. The reduction in land subsidence, shown on Figure 2-68, should describe the joint project between CCID/SLCC and the Triangle T Water District. The plan should have more emphasis on the successes of the Red Top area subsidence mitigation and require others in the vicinity to similarly solve the subsidence problem

11. Existing shallow monitor wells on both sides of the San Joaquin River should be used to determine if surface water and groundwater are connected. The SJREC GSP has determined that portions of the San Joaquin River are at times connected along the boundary between the Delta-Mendota and Chowchilla Subbasins.

This letter serves as a continuation of the regional coordination the SJREC GSA has pursued with neighboring subbasins and GSP's adjacent to the Delta-Mendota Subbasin. Please feel free to contact us with any questions or concerns you have so we can collectively and collaboratively manage our groundwater sustainability in the future.

Sincerely truly,

Chris White

Chris White,
Executive Director

The Nature Conservancy
Protecting nature. Preserving life.

CALIFORNIA WATER | **GROUNDWATER**

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nature.org
GroundwaterResourceHub.org

November 4, 2019

Stephanie Anagnoson, Director
Water and Natural Resources Department
200 W. Fourth Street
Madera, CA 93637

Submitted via email to: ChowchillaGSPComments@maderacounty.com

Re: Chowchilla Subbasin Draft Groundwater Sustainability Plan

Dear Ms. Anagnoson,

The Nature Conservancy (TNC) appreciates the opportunity to comment on the Chowchilla Subbasin Draft Groundwater Sustainability Plan (GSP) 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 Chowchilla Subbasin region 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 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. Some of these tools have been used in the preparation of the present draft plan. Additional resources are available and referred to in the comments that follow, and are considered pertinent to the development of this plan.

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 [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, which include environmental uses, such as plants and animals. The Nature Conservancy has identified each part of the GSP 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, The Nature Conservancy has prepared a checklist (**Attachment A**) for GSAs and their consultants to use. The Nature Conservancy believes the following elements are foundational for 2020 GSP submittals and are developed from 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 groundwater dependent ecosystems (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 online[2] 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.

3. Potential Effects on Environmental Beneficial Users

[1] GDEs 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, The Nature Conservancy 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 Chowchilla 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 Department of Fish and Wildlife (DFW), 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 Lookbook[3] prepared by The Nature Conservancy and partner organizations for additional background information on the water needs and groundwater reliance of critical species. Because 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.

The Nature Conservancy has reviewed the Chowchilla Draft GSP. We appreciate the work that has gone into the preparation of this plan. Specifically, we recognize the use of the NC dataset, GDE Pulse, and other TNC guidance for initial identification and evaluation of GDE areas in the basin. However, we believe that additional work is needed for further identification of GDEs and ISWs in the basin. Hence, we consider the current GSP draft to be **incomplete** under SGMA.

Our specific comments related to the Chowchilla Subbasin Draft 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 Chowchilla 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 Natural Communities Commonly Associated with Groundwater Dataset[2].

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 not* 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 *are available* 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 *are not available* 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
Chowchilla Subbasin Groundwater Sustainability Plan

A complete draft of the Chowchilla Subbasin Groundwater Sustainability Plan (GSP) Public Draft was provided for public review on August 9, 2019. This attachment summarizes our comments on the complete public draft GSP.

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

[Section 2.1.5.2 Description of Beneficial Uses and Users (p. 2-20)]

- The GSP authors have listed environmental agencies and environmental groups as one of the beneficial users of groundwater in the Subbasin in Table 2-4 (p. 2-20 to 2-21). The following footnote was added to the table: "The groups and communities referenced are examples identified during initial assessment. GSA Interested Parties lists shall maintain current and more exhaustive lists of stakeholders fitting into these groups." Environmental groups should be expanded in a manner similar to the environmental justice groups in the Human Right to Water category. **Please expand the stakeholder list associated with the Environmental and Ecosystem Uses category in Table 2-4 to include the appropriate agencies and list of environmental groups**.
- 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 Chowchilla 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 Chowchilla Area - https://ecos.fws.gov/ipac/
  - Lands that are protected as open space preserves, habitat reserves, wildlife refuges, etc. or other lands protected in perpetuity and supported by groundwater or interconnected surface waters should be identified and acknowledged.

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 2.1.2.2 Surface Water Monitoring and Management Programs (p. 2-8 to 2-10)]

- This section describes the types of monitoring performed by federal, state and local agencies of surface water inflows, outflows, and irrigation releases. The monitoring stations for flows and water deliveries are listed in Table 2-3. Local stations for flow or irrigation releases are listed in the text (p. 2-8 to 2-9). **Please explain the relationship of existing stream flow monitoring to the protection of ISWs and GDEs.**
- There is no discussion of the in-stream flow requirements for the San Joaquin River or any other surface water. The San Joaquin River Restoration Program (SJRRP) requires the release of flows from Friant Dam to the confluence with the Merced River to support the life-stages of salmon and other fish species. This section should discuss or reference any instream flow requirements, especially flow needs for critical species, including the amount, time of year when the flow minimum is specified, the duration, the species for which it applies, associated permits that set forth the requirements, and the regulating agency setting forth the compliance requirements. **Please discuss the future impact of the SJRRP on the riparian areas and potential GDEs present along or adjacent to the river.**

[Section 2.1.3.1 Madera County General Plan (p. 2-12 to 2-14)]

- The Madera County General Plan from 1995 (with updates from 2015) includes restrictions on development in "areas with sensitive environmental resources" (Policy 1.A.5) and provides "the preservation of natural vegetation, land forms, and resources as open space, with permanent protection where feasible" (Policy 5.H.1) (p. 2-12). This section should 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.**
- The Merced County General Plan adopted in December 2013 and amended in 2016 "has established policies to promote compact development of existing or well-planned new urban communities established apart from productive agricultural land, to limit growth in rural centers, and to forbid development adjacent to wetland habitat (Policies LU-1.1-5, 7, 9-10, 13)" (p. 2-13). Agricultural land uses "shall not have a detrimental effect on surface water or groundwater resources." **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.**
- These sections 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 Lookbook[4] 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 2.1.3.4 Permitting Process for Wells in Chowchilla Subbasin (p. 2-15 to 2-16)]

- Madera County Environmental Health Division has an online well permitting system that includes agricultural wells, observation/monitoring wells, community water supply wells, and individual domestic water supply wells. There is a requirement for new wells to "include a flow measurement device on new wells and the resulting groundwater pumping records" (p. 2-9). Other requirements follow the State standards (DWR, 1981). **Please include a discussion of how future well permitting will be coordinated with the GSP to assure achievement of the Plan's sustainability goals.**
- 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.**
- Madera County allows wells designated for abandonment to be converted into a monitoring well. **Please clarify in the text that only wells screened in one aquifer and appropriate for monitoring will be include in the monitoring program.**

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

[Section 2.2.1.2 Lateral and Vertical Subbasin Boundaries (p. 2-26 to 2-27)]

- In the Chowchilla Subbasin, the base of the usable aquifer corresponds with the base of fresh water, generally defined as groundwater with total dissolved solids (TDS) of 1,000 milligrams per liter (mg/l) as modified from Page (1973), except in the eastern part of the basin where the of basement complex is shallower. 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.
- The cross sections in Chapter 2 (Figures 2-23 through 2-33) clearly show the base of freshwater and the top of the basement rocks. However, they do not include a graphical representation of the manner in which shallow groundwater may interact

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

with ISWs or GDEs that would allow the reader to understand this topic. **Please include an example near-surface cross section that depicts the conceptual understanding of shallow groundwater and river interactions at different locations, as well as potential GDEs and ISWs**.

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

[Section 2.2.2.5 Groundwater-Surface Water Interaction (p. 2-39)]

- The text states (p. 2-39): "A review of historical regional aquifer groundwater levels compared to stream thalweg (deepest portion of stream channel) elevations conducted for this study indicate that surface water – groundwater interactions are not a significant issue (i.e., regional groundwater levels are relatively far below creek thalweg elevations) along Chowchilla River, Ash Slough, and Berenda Slough in Chowchilla Subbasin." 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 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 further evidence that that ISWs are not present along Chowchilla River, Ash Slough, and Berenda Slough, such as a cross-section or corresponding hydrographs to show the relationship between the river channel and the depth to groundwater at wells near the rivers.**
- Figures 2-70 and 2-71 present depth to shallow groundwater for 2014 and 2016. There are large data gaps over the Chowchilla Subbasin, particularly for 2016 (Figure 2-71). **Please further describe how these figures were developed, specifically noting the following best practices for developing depth to groundwater contours presented in Attachment D. 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. Depth to groundwater contours developed from depth to groundwater measurements at wells assumes that the land surface is constant, which is a poor assumption to make.
- The regulations [23 CCR §351(o)] define interconnected surface waters (ISW) as "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". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water. The GSP states in several places that the San Joaquin River is losing in the section adjacent to the Subbasin, and uses this as evidence that ISWs do not exist. However, ISWs can be either gaining or losing. The defining feature of disconnected surface waters is that groundwater is consistently below surface water features such that an unsaturated zone always separates surface water from groundwater, not whether the reach is gaining or losing. **To improve ISW mapping, please**

reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

- The GSP states (p. 2-40): "It is likely that seepage from the San Joaquin River is the source of water that combined with the presence of shallow clay layers that serves to maintain shallow groundwater levels at these locations." **Please provide estimates of current and historical surface water depletions for ISWs quantified and described by reach, season, and water year type.**

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

[Section 2.2.2.6 Groundwater Dependent Ecosystems (p. 2-40)]
[Appendix 2.B (Assessment of Groundwater Dependent Ecosystems)]

- The text states (p. 2-40): "A DTW cutoff of 30 feet was used in the initial screening of potential GDEs. The use of a 30-foot DTW criterion to identify potential GDEs is based on reported maximum rooting depths of California phreatophytes and is consistent with guidance provided by The Nature Conservancy (Rohde et al. 2018) for identifying potential GDEs." We have the following comments regarding this sentence and on the methodology for identifying GDEs in the Subbasin.
  - *30-ft criteria from TNC Guidance:* In TNC's GDE Guidance, the depth criterion 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).**
  - *30-ft as maximum rooting depths of California phreatophytes:* Please use care when considering rooting depths of vegetation. While Valley Oak (*Quercus lobata*) have been observed to have a max rooting depth of ~24 feet (https://groundwaterresourcehub.org/gde-tools/gde-rooting-depths-database-for-gdes/), rooting depths are likely to spatially vary based on the local hydrologic conditions available to the plant. Also, max 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 like to have their roots submerged in groundwater for extended periods of time, and hence can access groundwater at deeper depths. In addition, while it is likely to be true that shallow water availability is necessary to support the recruitment of saplings, hydraulic lift of groundwater to shallow depths has been observed in *Quercus* spp.
  - *Use of depth to water maps from 2014 and 2016:*
    - 2016 is <u>after</u> the SGMA benchmark date of January 1, 2015. **Please rely on groundwater condition data prior to the SGMA benchmark date.**
    - **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. 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 <u>until</u> data gaps are reconciled in the monitoring network. While depth to groundwater levels within 30 feet are generally accepted as being a proxy for confirming that polygons in the NC dataset are connected to groundwater, it is highly advised that seasonal and interannual groundwater fluctuations in the groundwater regime are taken into consideration. Utilizing groundwater data from one or two points in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Based on a study we recently submitted to Frontiers in Environmental Science Journal, we've observed riparian forests along the Cosumnes River to experience a range in groundwater levels between 1.5 and 75 feet over seasonal and interannual timescales. Seasonal fluctuations in the regional water table can support perched groundwater near an intermittent river that seasonally runs dry due to large seasonal fluctuations in the regional water table. While perched groundwater itself cannot directly be managed due to its position in the vadose zone, the water table position within the regional aquifer (via pumping rate restrictions, restricted pumping at certain depths, restricted pumping around GDEs, well density rules) and its interactions with surface water (e.g., timing and duration) can be managed to prevent adverse impacts to ecosystems due to changes in groundwater quality and quantity under SGMA.

- **Please provide more details on how depth to groundwater contour maps were developed (Figures 2-70 and 2-71)**:
  - Are the wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons to reflect local conditions relevant to ecosystems?
  - Are the wells used for interpolating depth to groundwater screened within the surficial unconfined aquifer and capable of measuring the true water table?
  - Is depth to groundwater 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 Digital Elevation Model (DEM)[5] 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 depth to groundwater

[5] 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://iewer.nationalmap.gov/basic/

measurements at wells assumes 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 contour depth to groundwater.

- The depth to groundwater contour maps (Figures 2-70 and 2-71) show large areas of data gaps, given the marked data points on the map where data exists. These maps were used to exclude all GDEs located adjacent to Chowchilla River, Ash Slough, and Berenda Slough (Figure 1 of Appendix 2.B). **As stated above, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP <u>until</u> data gaps are reconciled in the monitoring network.**

<u>Checklist Items 16 to 20, Describing GDEs (23 CCR §354.16)</u>

[Appendix 2.B (Assessment of Groundwater Dependent Ecosystems)]

- TNC acknowledges and appreciates the comprehensive evaluation of the San Joaquin River Riparian GDE unit following our guidance, including analyzing hydrologic conditions, ecological conditions, providing an inventory of species and ecological value, along with concurrent field studies and reconnaissance. We also appreciate the use of TNC's GDE Pulse to examine NDVI and NDMI trend data for the GDE polygons within the GDE unit.

<u>Checklist Items 21 and 22 – Water Budget (23 CCR §354.18)</u>

[Section 2.2.3 Water Budget Information (p. 2-43 to 2-98)]

- The text states (p. 2-79): "…while for native vegetation lands, groundwater extraction by riparian vegetation was considered to be negligible because of the depth to groundwater in the subbasin." **Because there are potential GDEs included in the Chowchilla Subbasin, please quantify the evapotranspiration from groundwater by riparian vegetation even if small. Please revise the text and budget as necessary.**

<u>Checklist Items 23 to 25 – Sustainability Goal (23 CCR §354.24)</u>

[Section 3.1 Sustainability Goal (p. 3-2)]

- The sustainability goal does not specifically mention beneficial uses or users of groundwater, including environmental users. It states "the six sustainability indicators, established measurable objectives, and minimum thresholds will ensure that no undesirable results of significant and unreasonable economic, social, or environmental impacts occur…" **Please rephrase the Sustainability Goal to specifically call out beneficial uses and users of groundwater including environmental users. Please state how the sustainability of environmental uses will be protected. In addition, a statement about any intention to address pre-SGMA impacts should be included.**

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

[Section 3.2.5 Measurable Objectives for Depletion of Surface Water (p. 3-21)]

- The GSP states (p. 3-5): "Groundwater in the GDE unit is tightly coupled with surface flow and runoff and is generally maintained at depths within the maximum rooting depth range of the dominant phreatophytic species present in the unit (see Section 2.2.2). The groundwater that is potentially accessible to the vegetation composing the GDE unit likely occurs as a shallow perched/mounded aquifer fed largely by percolation of surface flow from the San Joaquin River. As described in Section 2.2.5 [should be 2.2.2.5], it has been determined that a connection between regional groundwater and streams does not currently exist in the subbasin." However, Section 2.2.2.5 does not present evidence that ISWs do not exist in the Subbasin, and states that a historical connection between groundwater and the San Joaquin River did exist through 2008.
- The GSP fails to establish measurable objectives or minimum thresholds for this sustainability indicator. The existence of riparian GDEs along the streams in the basin has been identified in Appendix 2.B, and their connection to groundwater is assumed. Their occurrence in the riparian zone means that these GDEs should be considered a beneficial user of groundwater that could be affected by chronic groundwater level decline as discussed above, as well as beneficial users of surface water that could be depleted by groundwater extraction. **A more robust discussion of the known facts regarding these surface-groundwater interactions in the riparian zone should be provided. In addition, more detailed discussion regarding specific data gaps should be included.**
- There is a need to evaluate and discuss potential effects on beneficial uses of surface and groundwater. In addition, the applicable state, federal and local standards for the protection of aquatic, riparian and other protected habitats should be discussed. This is necessary, at a minimum, so that the nature of the data gaps can be understood. **Please refer to Attachment C for a list of freshwater species in Chowchilla Subbasin that may be exist within ISWs. We recommend that after identifying which freshwater species exist in your basin, especially federal and state listed species, that you contact staff at the Department of Fish and Wildlife (DFW), 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 freshwater species list. Because 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. Please refer to the Critical Species Lookbook[6] to review and discuss the potential groundwater reliance of critical species in the basin.**
- The analysis for ISWs should include all beneficial users of surface water that could be affected by groundwater withdrawals, including environmental. Refer to the San Joaquin River Restoration Program (SJRRP) that identifies instream flow needs for salmon. **Please include instream flow requirements in this section and**

[6] Available online at: https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/

whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.

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

[Section 3.3.1 Minimum Thresholds for Lowering of Groundwater Levels (p. 3-22)]

- Please correct the call-out on p. 3-23 to Appendix 6.D (it should be 2.B).
- The text states (p. 3-23): "The minimum thresholds for chronic lowering of groundwater levels are based on selection of RMS from among existing production and monitoring wells located throughout the subbasin and screened in both in the Upper and Lower Aquifers." Please clarify the text to state that wells were chosen that monitor a single aquifer, but not both at the same time (i.e. composite), if that is the intended meaning.

[Section 3.3.4 Minimum Thresholds for Degraded Water Quality (p. 3-35)]

- This Minimum Threshold does not consider water quality needs of GDEs. The text states (p. 3-36): "Protection of municipal and domestic beneficial uses is also protective of all other groundwater beneficial uses." **Please elaborate on this statement and 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.**

[Section 3.3.5 Minimum Thresholds for Depletion of Surface Water (p. 3-40)]

- The text states (p. 3-40): "Therefore, the surface water depletion sustainability criteria is not applicable to the subbasin." However, no evidence is provided in the GSP to show that a hydraulic connection between groundwater and surface water does not exist. **Following the discussion presented above for Checklist Item 26 (Measurable Objectives), please include a discussion of Sustainable Management Criteria for ISWs, including Minimum Thresholds, in the GSP. Please cite data gaps regarding ISWs and make plans to reconcile them in the Monitoring Section of the GSP.**

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

[Section 3.4 Undesirable Results (p. 3-40)]

- This section only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. **Please add "potential adverse impacts to GDEs" to the list of potential undesirable results presented in Table 3-8 (p. 3-41).**

[Section 3.4.1 Undesirable Results for Lowering of Groundwater Levels (p. 3-42)]

- The GSP states (p. 3-42): "Using the Fall measurements (assumed to be collected in October), a groundwater elevation undesirable result is defined to occur when greater than 30% of the RMS [representative monitoring sites] each exceed the groundwater level minimum thresholds for the same two consecutive Fall readings. Given a total of 36 RMS sites, a total of 11 or more the RMS would need to exceed MTs as defined above to constitute an undesirable result for chronic lowering of groundwater levels." The use of 30 percent to define an undesirable result does not allow for the occurrence of low water levels in one area, such as near a GDE, to be an Undesirable Result, which may impact environmental beneficial use. There are three RMS near the San Joaquin River Riparian GDE unit, which could be evaluated separately. **Please consider the use of a separate management area for the San Joaquin River Riparian GDE unit so that different sustainable management criteria can be established for this GDE unit.**

[Sections 3.4.4 Undesirable Results for Degraded Water Quality (p. 3-44)]

- 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.**

[Sections 3.4.5 Undesirable Results for Depletion of Surface Water (p. 3-45)]

- **Following the discussion presented above for Checklist Item 26 (Measurable Objectives), please include a discussion of Sustainable Management Criteria for ISWs, including Undesirable Results, in the GSP. Please cite data gaps regarding ISWs and make plans to reconcile them in the Monitoring Section of the GSP.**

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

[Section 3.5 Monitoring Network (p. 3-45)]

- Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater <u>*and related surface conditions*</u> (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. The Monitoring

Network section currently does not address future needs for ISW monitoring. In this section, please describe monitoring for ISWs as described below:

  - In addition to the need for additional shallow monitoring wells in the upper aquifer to map GDEs, **there is also a need to enhancing monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands.** Ideally, co-locating stream gauges with wells that can monitor groundwater levels in both the upper and lower aquifers would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater. **Please provide sufficient detail for the investigation and monitoring program including stream gauges, screened intervals and frequency of monitoring, in order to describe monitoring of both the extent of ISWs and the quantity of surface water depletions from ISWs.**

[Section 3.5.1.1 Groundwater Level Monitoring Program (p. 3-47)]

- As noted in our comments above on Checklist Items 11-15, the depth to groundwater contour maps (Figures 2-70 and 2-71) show large areas of data gaps, given the marked data points on the map where data exists. These maps were used to exclude all GDEs located adjacent to Chowchilla River, Ash Slough, and Berenda Slough (Figure 1 of Appendix 2.B). **Please propose additional upper aquifer wells to reconcile this data gap.**

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

[Section 4 Projects (p. 4-1)]

- The Subbasin area includes GDEs and ISWs that are beneficial uses and users of groundwater, and may include potentially sensitive resources and protected lands. Protection of environmental uses and users 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.**
- This section identifies many important 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 can be designed as multiple-benefit projects to 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, **please consider identifying if there is habitat value incorporated into the design and how the recharge ponds can be managed as multiple-benefit projects that have a benefit to 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.**
- 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/

Attachment C

Freshwater Species Located in the Chowchilla 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 Chowchilla 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 Chowchilla groundwater basin 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. 2015[7]. 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 BIOS[8] as well as on The Nature Conservancy's science website[9].

Scientific Name	Common Name	Legally Protected Status		
		Federal	State	Other
BIRD				
Actitis macularius	Spotted Sandpiper			
Aechmophorus occidentalis	Western Grebe			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
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		Special Concern	BSSC - Third priority
Aythya collaris	Ring-necked Duck			
Aythya valisineria	Canvasback		Special	
Botaurus lentiginosus	American Bittern			

[7] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710
[8] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS
[9] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

Bucephala albeola	Bufflehead			
Bucephala clangula	Common Goldeneye			
Butorides virescens	Green Heron			
Calidris alpina	Dunlin			
Calidris mauri	Western Sandpiper			
Calidris minutilla	Least Sandpiper			
Cistothorus palustris palustris	Marsh Wren			
Egretta thula	Snowy Egret			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Grus canadensis	Sandhill Crane			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Himantopus mexicanus	Black-necked Stilt			
Limnodromus scolopaceus	Long-billed Dowitcher			
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Numenius americanus	Long-billed Curlew			
Numenius phaeopus	Whimbrel			
Nycticorax nycticorax	Black-crowned Night-Heron			
Oxyura jamaicensis	Ruddy Duck			
Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Phalaropus tricolor	Wilson's Phalarope			
Plegadis chihi	White-faced Ibis		Watch list	
Pluvialis squatarola	Black-bellied Plover			
Podiceps nigricollis	Eared Grebe			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			
Rallus limicola	Virginia Rail			
Recurvirostra americana	American Avocet			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa semipalmata	Willet			

Tringa solitaria	Solitary Sandpiper			
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEAN				
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Branchinecta mesovallensis	Midvalley Fairy Shrimp		Special	
Lepidurus packardi	Vernal Pool Tadpole Shrimp	Endangered	Special	IUCN - Endangere d
Linderiella occidentalis	California Fairy Shrimp		Special	IUCN - Near Threatened
FISH				
Catostomus occidentalis occidentalis	Sacramento sucker			Least Concern - Moyle 2013
Cottus asper ssp. 1	Prickly sculpin			Least Concern - Moyle 2013
Lampetra hubbsi	Kern brook lamprey		Special Concern	Vulnerable - Moyle 2013
Lavinia exilicauda exilicauda	Sacramento hitch		Special	Near-Threatened - Moyle 2013
Mylopharodon conocephalus	Hardhead		Special Concern	Near-Threatened - Moyle 2013
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Oncorhynchus tshawytscha - CV fall	Central Valley fall Chinook salmon	Species of Special Concern	Special Concern	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV late fall	Central Valley late fall Chinook salmon	Species of Special Concern		Endangere d - Moyle 2013
Orthodon microlepidotus	Sacramento blackfish			Least Concern - Moyle 2013
Ptychocheilus grandis	Sacramento pikeminnow			Least Concern - Moyle 2013
HERP				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC

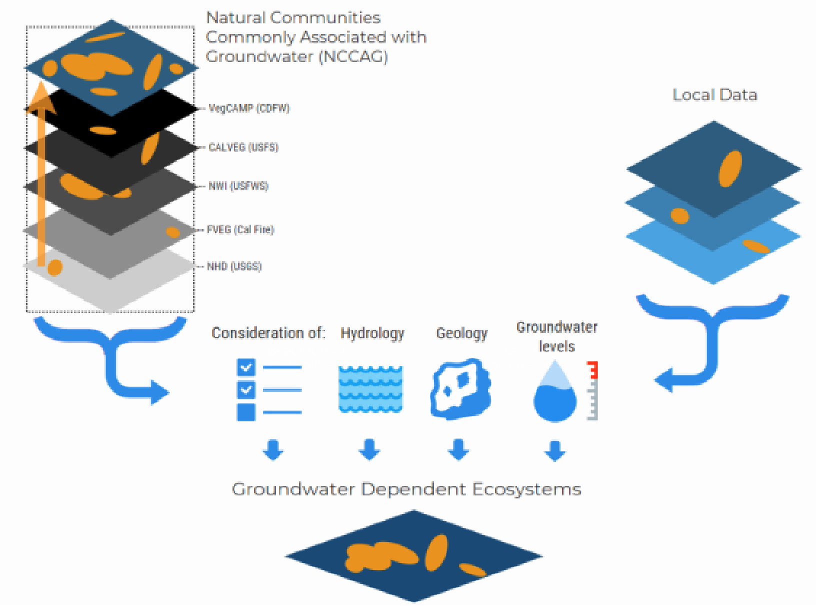
Ambystoma californiense californiense	California Tiger Salamander	Threatened	Threatened	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Thamnophis gigas	Giant Gartersnake	Threatened	Threatened	
Thamnophis sirtalis sirtalis	Common Gartersnake			
INSECT & OTHER INVERT				
MAMMAL				
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
MOLLUSK				
Anodonta californiensis	California Floater		Special	
Margaritifera falcata	Western Pearlshell		Special	
PLANT				
Callitriche longipedunculata	Longstock Water-starwort			
Castilleja campestris succulenta	Fleshy Owl's-clover	Threatened	Endangered	CRPR - 1B.2
Chloropyron palmatum	NA	Endangered	Special	CRPR - 1B.1
Crassula aquatica	Water Pygmyweed			
Eryngium spinosepalum	Spiny Sepaled Coyote-thistle		Special	CRPR - 1B.2
Lasthenia fremontii	Fremont's Goldfields			
Myosurus minimus	NA			
Orcuttia inaequalis	San Joaquin Valley Orcutt Grass	Threatened	Endangered	CRPR - 1B.1
Phacelia distans	NA			
Pilularia americana	NA			
Plagiobothrys leptocladus	Alkali Popcorn-flower			
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			

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) online[10] 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)[11]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.



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[10] *NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/*

[11] 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 California[12]. 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 dataset[13] on the Groundwater Resource Hub[14], 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 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*.

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[12] *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*

[13] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/

[14] *The Groundwater Resource Hub: www.GroundwaterResourceHub.org*

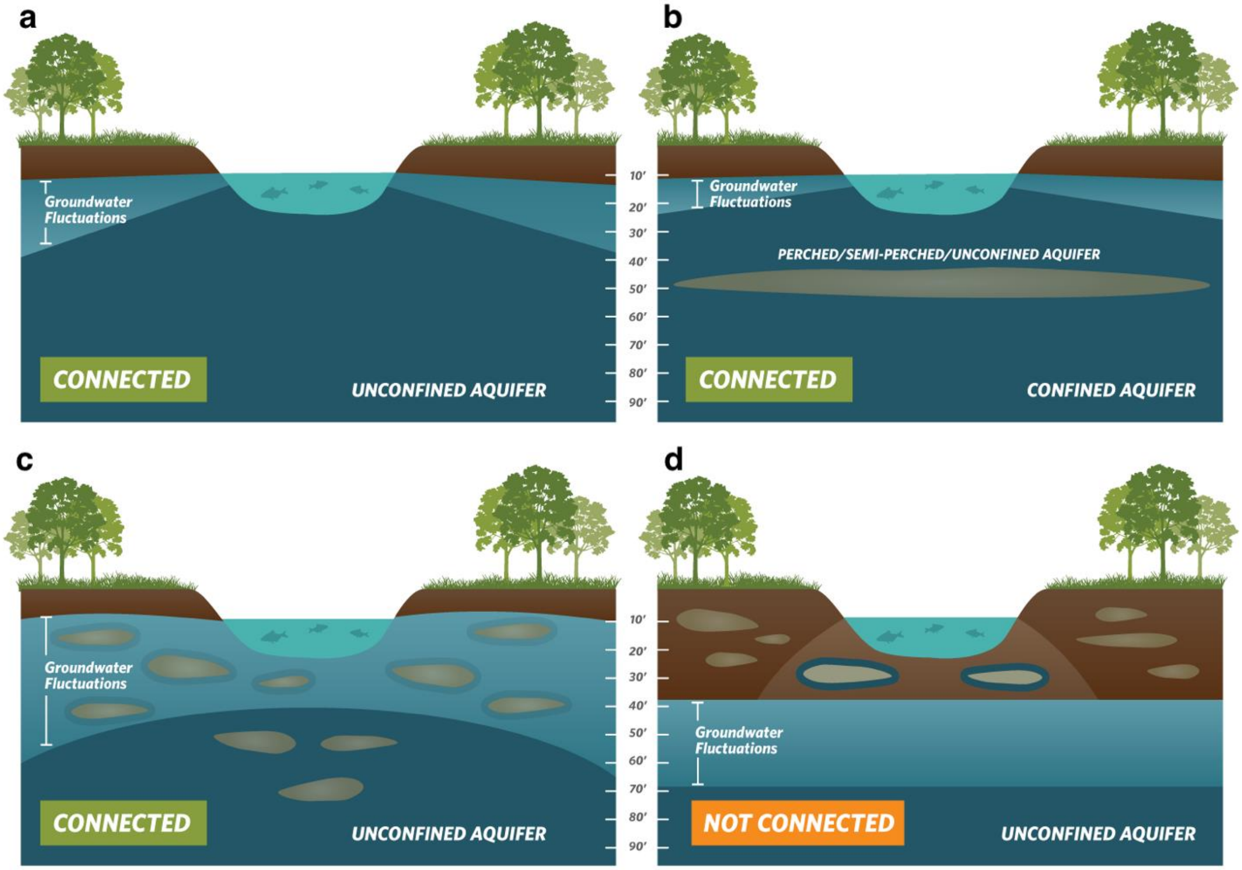

Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying 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 budgets[15] 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 baseline[16] 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 approach[17] 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 document[4], 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 feet[4] 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 Viewer[18]. 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).

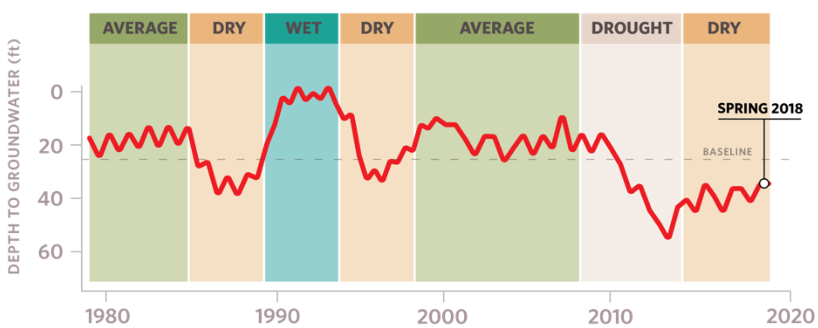

Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so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

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[15] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[16] *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)]*

[17] 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 GSPs[4]).

[18] *SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?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 animals[19], 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).

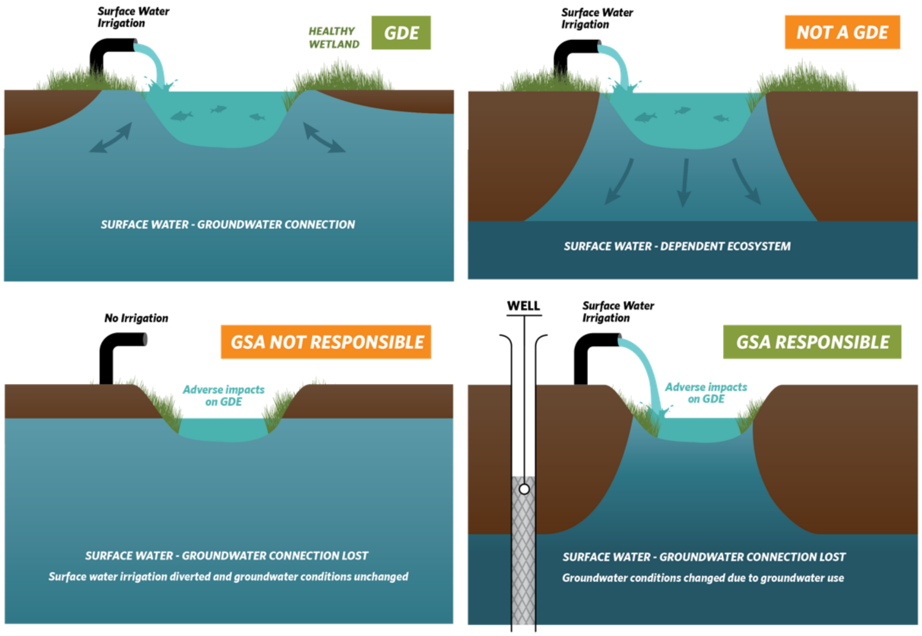

Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **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.

[19] *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.

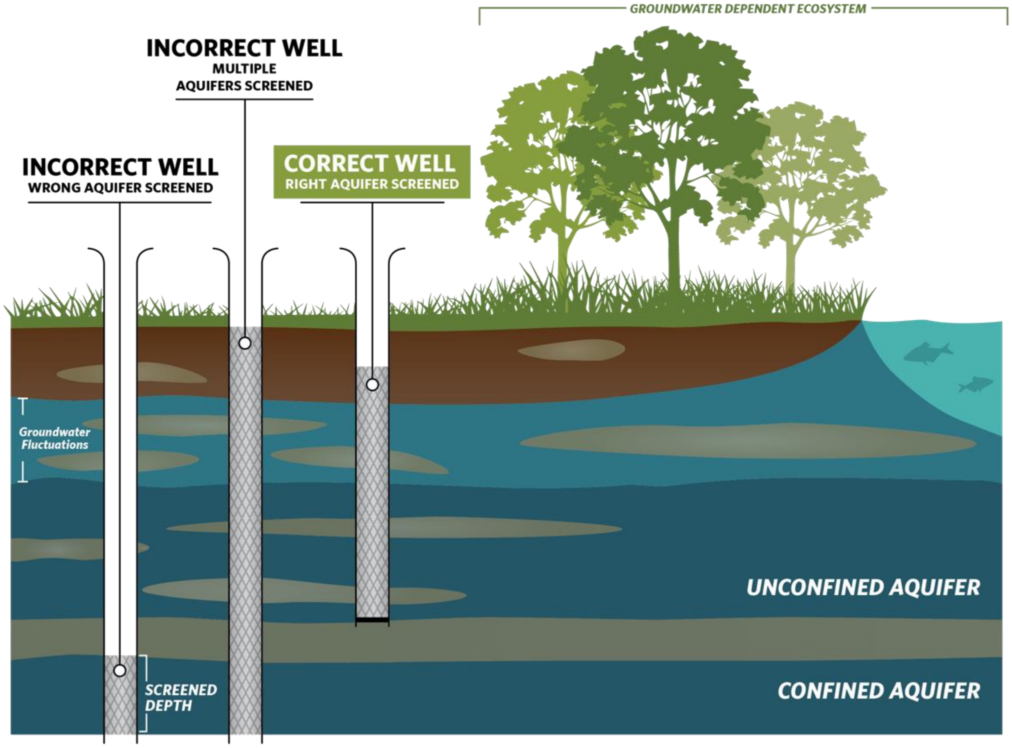

Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

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)[20] 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.

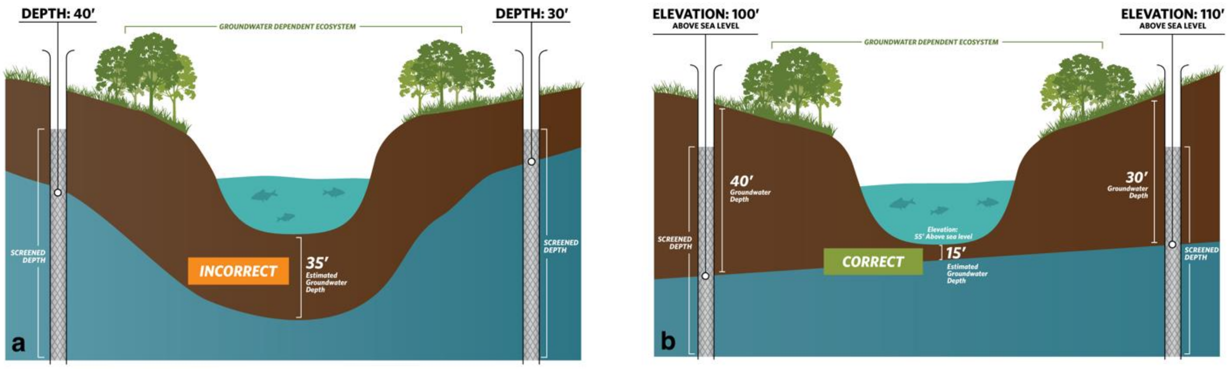

Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

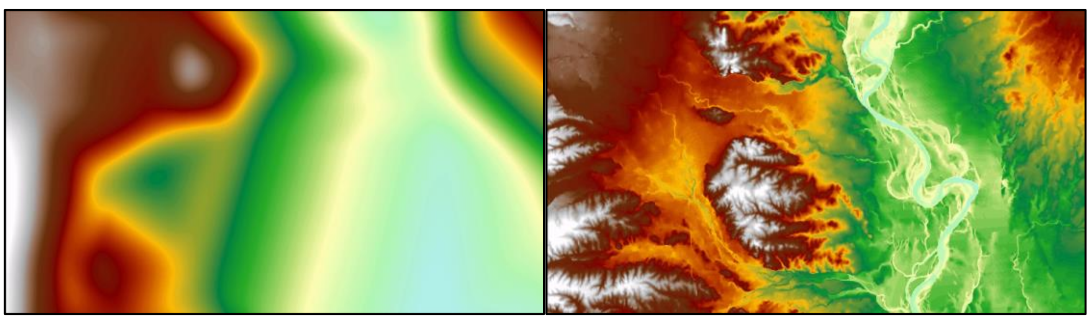

Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation 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.

[20] 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://iewer.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.

Listening Session Notes

Chowchilla Subbasin
Wednesday, October 23, 2019
2:00 – 4:00pm
Chowchilla Water District

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1. GSP Presentation

Doug W presented a summary/overview of the GSP for the Chowchilla Subbasin (GSP Highlights). He then stated that the deadline to submit comments regarding this plan is November 9, 2019.

2. Listening Session – the public is invited to comment on the Chowchilla Subbasin GSP
   The following comments were made:

- What does the hydrology mean on Figure 3-3A?

- In the plan do you have any idea of what the timing of the two sides of supply enhancement and groundwater enhancement? – How does that roll out in 20 years?

- On the project side – starting right now on the reduction and demand side – when do you expect that to kick in in any meaningful way?

- One question not clear to landowners – The 2%, is that a target for the whole GSA or is it a target for each individual to reach?

- The longer we could avoid allocating the better for farmers – see how the projects and other things will make it happen without out the farmers having to cut back. Maybe the projects and other things will take care of the problem.

- Merced County is suggesting 2% voluntary per year – they are probably not going to do anything for 5 years. Can we wait? (Correction from Merced member - They are still going to work out what is going to happen during the first 5 years – it will be voluntary in the beginning because there is no enforcement action now.)

- A lot of what is being talked about are management strategies - Triangle T just changed their management strategies and if you check the DWR website you can see maps that show the change in groundwater, just from the change of management policies. Farmers need to just work on their farm management strategies. The Madera/Chowchilla RCD is going to help farmers do some of this – farmers can do a lot on their own property, without asking permission. They can take out 5% of their land and it won't be the worst farming decision they will ever make.

- I hope that allocating and pumping to individual farmer is a long way off. I think there should be some way for the farmers to receive credit for the water they are putting into the ground. With a credit it will give farmers incentive to put more water into the ground.

- Merced is proposing a pumping fee on the growers - How many growers didn't take surface water this year when it was available because they can still pump? The frustration is our neighbors that are not helping and are pumping when they don't take surface water when it is available.

- I didn't know what recharge was until recharge happened. Neighbors are pumping and not using surface water – it is the need of education – people don't know – you have to always educate because the wheels of agriculture turns slow. All of this technology is going to change over time, but what we do on our farms we can do now without technology. We just need to educate farmers.

- We can't accomplish this without your cooperation (pointing at the Committee at the head table). We have two canals that drain water to the southern state – they cut the water off from the south side of the valley. Somehow or another we need to put enough clout in the system. We are proposing to set those limits not as a tomorrow morning demand – but every time we have a wet year – we have to do it now – we have to be able to send it into our water districts, not south or to the ocean. Kings River sends ½ of their water to LA and San Diego, we need to put a stop to that and put the water in the ground here and now. It is up to you and I – we have deep wells. Draw a line in the middle of Madera County, use highway 99 or the airport as a goal, and get the water up at least 50 feet if not 100 feet – we are currently below sea level. We have run our limit out so we have to all give a little up. We have to do something – we can't keep on doing what we are doing.

- The GSA had to be formed quickly, the GSP had to be formed quickly – there is no thought to what other GSAs are charging.

3. Adjournment
   November 20 is the next Advisory Committee meeting, here (Chowchilla Water District) at 2:00.